Alber

Trust Your Batteries

CELLCORDER®

CRT-400 Cell Resistance Tester

Quick Start Instructions
Operating Instructions

POWERING ON THE CELLCORDER

1. Press and release the green POWER KEY.

P O W E R

2. The firmware version number appears.

```
System Initializing
    ● ○ ○ ○ ○
Flash Vers. ##.#####
Boot Vers. ##.#####
```

3. If readings are in temporary storage, messages appear.

4. To save readings, insert the USB device and press YES/F1. Whether you select YES or NO/F2, readings stay in the memory.

```
Readings are in
temporary storage.
Save readings to
the USB device?

YES    NO    HELP
```

5. To clear readings from the memory, press YES/F1. Do this if you are starting a new set of readings.

```
Do you want to erase
 the readings from
 temporary storage?


YES    NO
```

6. To keep readings in memory, press NO/F2. Do this if you are not finished taking readings or want to examine the readings.

7. The MAIN MENU appears.

```
⁑ CELLCORDER
   CRT-400

TEST   VIEW    LOAD   CRT
MODE  RESULTS  DATA  SETUP
```

NOTE:
It is highly recommended that the calibration constants are saved to the USB device.

POWERING OFF THE CELLCORDER

1. Press and hold the green POWER KEY.

POWER

System is now shutting down 3

System is now shutting down 2

System is now shutting down 1

Release Power Button

2. Powering off doesn't automatically delete voltage or resistance readings from the memory.

3. If readings are in memory, you will be asked to save them.

Readings are in temporary storage. Save readings to the USB device?
YES   NO   HELP

Do you want to erase the readings from temporary storage?
YES   NO

TAKING VOLTAGE READINGS

1. Connect the voltage probes to the Cellcorder and select TEST MODE/F1.

CELLCORDER CRT-400
TEST   VIEW   LOAD   CRT
MODE RESULTS DATA SETUP

2. From the Test Mode menu, select F1-VOLTAGE.

Test Mode
F1 - Voltage
F2 - Resistance
F3 - S.G./Temp.
VOLT   RES SG/TEMP BACK

3. If "Resume Test" appears, put the probes on the cell.

CELL 001
13.50 Volts
(RESUME TESTING)
DVM   DONE

WARNING

Don't measure voltages greater than 20V DC.

4. If "Stored in Memory" appears, retest the cell or change the cell number by typing a number and pressing ENTER.

CELL 001
13.50 Volts
(STORED IN MEMORY)
DVM   RETEST DONE

5. When the unit beeps, remove the probes. The cell number advances automatically to the next cell.

THE CELLCORDER IS ALSO A DIGITAL VOLTMETER (DVM)

1. In the voltage mode, select DVM by pressing the F1 button.

```
CELL 001

13.50 Volts
(RESUME TESTING)
DVM            DONE
```
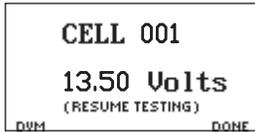
2. The screen displays the measured voltages.

3. Readings are not saved in DVM mode.

```
13.50 Volts
WARNING! 20VDC
maximum input
        CANCEL
```
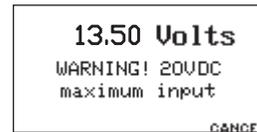
TAKING RESISTANCE READINGS

1. Connect the resistance test leads to the Cellcorder and select TEST MODE/F1.

```
⚡ CELLCORDER
  CRT-400

TEST    VIEW    LOAD    CRT
MODE  RESULTS   DATA   SETUP
```
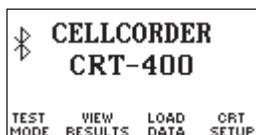
2. From the Test Menu, select F2-Resistance.

```
▪Test Mode▪
F1 - Voltage
F2 - Resistance
F3 - S.G./Temp.
VOLT   RES  SG/TEMP BACK
```
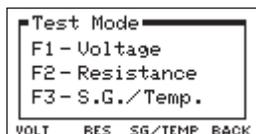
3. Select the AMP HOUR rate/F2 of the cell being tested. Specify the number of INTERCELL connections/F3 per cell.

```
Amp Hours:          ▲
Intercell           H
       Type:        E
                    L
                    P
       AMP   INTER  ▼
TEST   HOUR  CELL  BACK
```

4. Select TEST/F1.

Voltage

Internal cell resistance

```
CELL - ###    Vc(    )●
##.### Vc Ric1)----- μΩ
          Ric2)----- μΩ
   Rc     Ric3)----- μΩ
#####μΩ   Ric4)----- μΩ
                    DONE
```

(mem) voltage readings stored in memory
(act) actual voltage reading
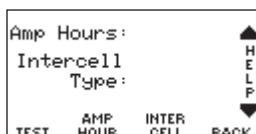
Up to 4 intercell readings

No VFloat Readings Exist. Now What?

If "No VFloat readings exist. Are you sure you want to continue?" appears, choose NO/F2, read voltage, then resume resistance testing. Reading voltage before resistance results in more accurate voltage readings because skewing is not a factor. If you choose YES/F1, voltage and resistance are read concurrently. Concurrent readings are subject to the skewing effect.

5. Connect the leads to the cell. See lower left for some examples; refer to manual for more details. Press the orange Test button. The display shows test progress.

```
TEST PROGRESS

■■■■□□□□□
0%            100%
             STOP
```
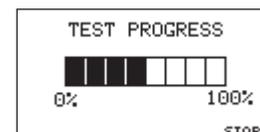
6. When the unit beeps, remove the probes. When leads are moved, the cell number advances automatically to the next cell.

7. When finished testing, press the DONE/F4 button.

```
CELL - ###    Vc(    )
##.### Vc Ric1)----- μΩ
          Ric2)----- μΩ
   Rc     Ric3)----- μΩ
#####μΩ   Ric4)----- μΩ
                    DONE
```
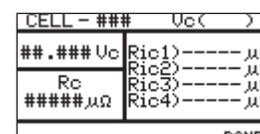
CONNECTING THE RESISTANCE LEADS

These figures show connections for dual post cells.

- **Take two readings.**

 Read with the intercell leads connected from terminal posts A to C.

 Then read with the intercell leads connected from terminal posts B to D.
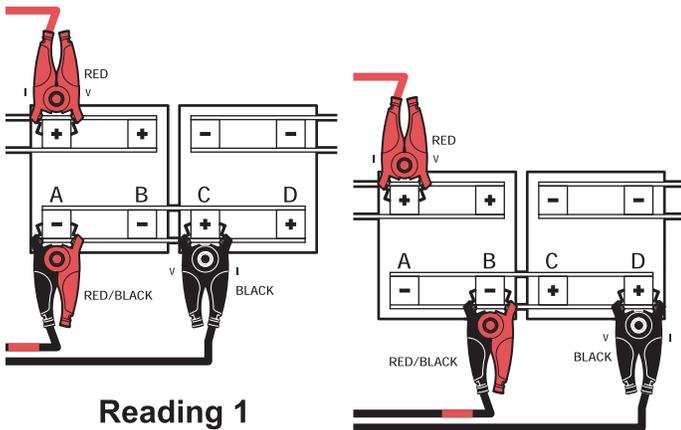
Reading 1

Reading 2

- **Take two readings.**

  Read with the intercell leads connected from terminal posts A to C.

  Then read with the intercell leads connected from terminal posts B to D.
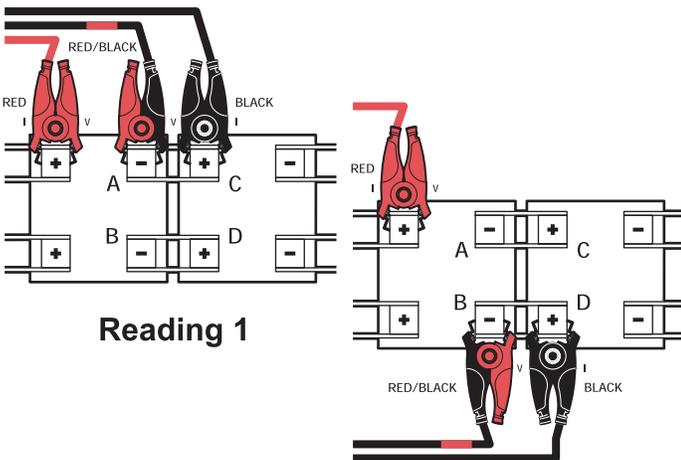
Reading 1

Reading 2

These figures show connections for triple post cells.

- **Take three readings.**

  Read with the intercell leads connected from terminal posts A to D.
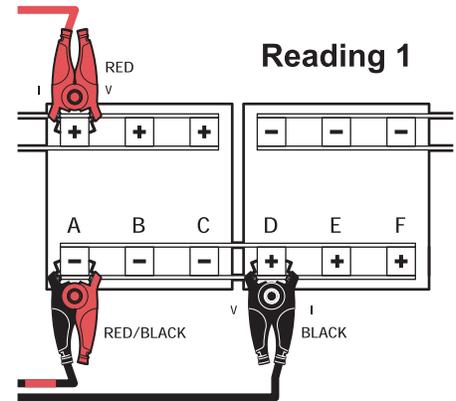
Reading 1

- **Then read with the intercell leads connnected from terminal posts B to E.**
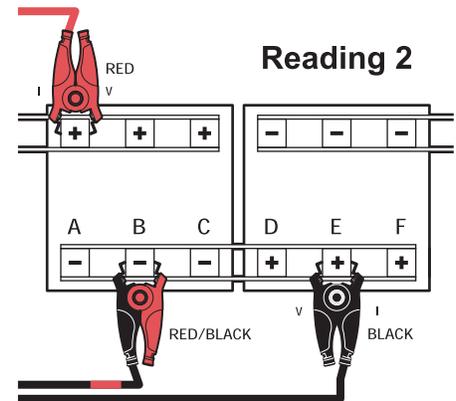
Reading 2

- **Then read with the intercell leads connnected from terminal posts C to F.**
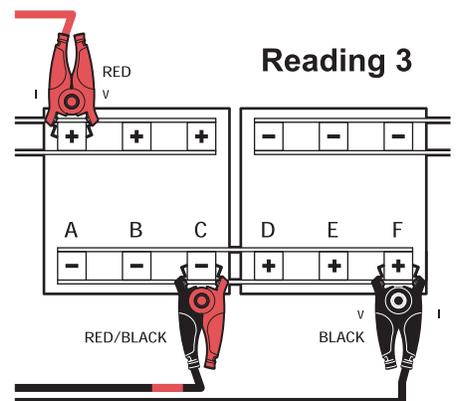
Reading 3

TRANSFERRING SPECIFIC GRAVITY AND TEMPERATURE READINGS

SAVING THE READINGS

1. On the CRT-400, select a cell data file to transfer SG and Temp readings into. This can be readings that already exist in memory or you can open a previously saved set of readings from the USB device.

2. From the Main Menu, select TEST MODE/F1.

```
* CELLCORDER
   CRT-400

TEST   VIEW    LOAD   CRT
MODE   RESULTS DATA   SETUP
```
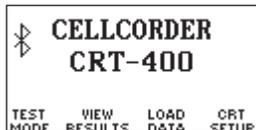
3. From the Test Mode menu, select F3-S.G./Temp.

```
┌Test Mode────────
│F1 - Voltage
│F2 - Resistance
│F3 - S.G./Temp.

VOLT   RES  SG/TEMP BACK
```
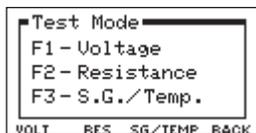
4. From the SG/TEMP screen, select IMPORT by pressing F2.

```
    CELL - 001

   S.G.      Temp.
  #.###      ##.#

   IMPORT      CANCEL
```
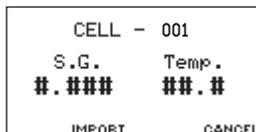
5. On the Data Module, select a channel (A-H) of data to transfer.

```
  On hydrometer
  memory module,
  select string (A-H)
  and align IR ports.

  CONTINUE      BACK
```
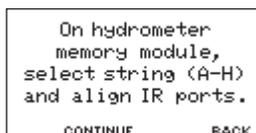
6. Align the Data Module and CRT-400 IR port.

7. On the CRT-400 press F2 for CONTINUE.

```
  Receiving data

              CANCEL
```
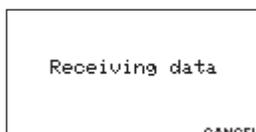
8. When transfer is done, the S.G./Temp. value from Cell 1 appears.

```
    CELL - 001

   S.G.      Temp.
  #.###      ##.#

   IMPORT      CANCEL
```
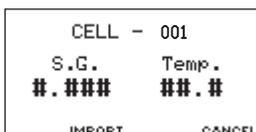
9. Select IMPORT/F2 to save the file to the USB device.

Saving new data readings to the USB

1. Make sure the Cellcorder has been charged properly.

2. The USB device may be placed into the left side USB port on the Cellcorder before or after the Cellcorder is powered on.

3. Connect the test leads to the Cellcorder and select F1-TEST MODE.

4. The F1, F2 or F3 buttons may be selected on the Cellcorder to perform the necessary tests.

5. Follow the prompts on the Cellcorder's LCD accordingly.

6. WHEN PROMPTED TO SAVE READINGS TO THE USB DEVICE SELECT YES/F1.

7. Follow the prompts and enter the file name and select SAVE/F2.

8. If the file already exists, a WARNING displays, asking for overwrite confirmation. Press F1 to overwrite the file or F2 to enter a new file name.

The USB device now has stored the new data.

NOTE:
DO NOT REMOVE THE USB DEVICE WHILE ACCESSING DATA, i.e. TESTING, WRITING TO A FILE, READING INFORMATION etc.

The USB MEMORY INDICATOR light is on when the USB device is in use. Double-check this indicator before removing the USB device.

WARNING

Readings cleared from Cellcorder temporary storage cannot be retrieved unless they've been saved to the USB device or PC.

Loading readings from the USB device.

1. Insert a USB device with readings into the Cellcorder. From the Main Menu, select F3-LOAD DATA.

```
 ⃰ CELLCORDER
    CRT-400

TEST    VIEW    LOAD    CRT
MODE  RESULTS   DATA   SETUP
```
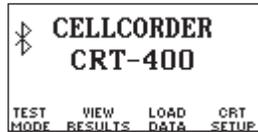
2. Next select F2-CELL DATA.

```
F1-Load site template
F2-Load previously
    saved readings.

SITE    CELL
SETUP   DATA   HELP   CANCEL
```
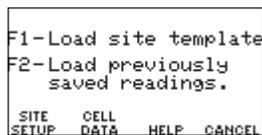
3. SELECT-F2 the file from the list provided.

```
 ▄Cell Data File▄▄
                  ▲

                  ▼
       SELECT      CANCEL
```

Recommended Steps to SAVE CAL-K

The CAL-K are calibration constants that are utilized for calibration correction during calibration. In the event these constants are lost, they can be restored easily.

It is highly recommended that the calibration constants are saved to the USB device.

To save the constants, make sure the CRT is powered on.
Select SHIFT, then the number 7 from the keypad.
Enter the password, '1234' and push ENTER.
Select Calibration by pressing the number 1 on the keypad.
Choose CAL-K by selecting F2.
Select F2 once again to confirm the BACKUP.
Enter a File Name and select F2 to SAVE.

Using the BT headset

1. Make sure the CRT and the BT headset have been charged properly.

2. Power the BT headset on.

3. Power the CRT on.
The CRT attempts to connect to the last used BT device when powered on.

4. Select CRT SETUP/F4 and use the ▼down arrow key to go to F3-Bluetooth, press F3.

```
 ⃰ CELLCORDER       ▄CRT Setup▄▄▄
    CRT-400         F1- Date/Time  ▲
                    F2- Reserved
TEST   VIEW  LOAD  CRT   F3- Bluetooth
MODE RESULTS DATA SETUP  DATE      BT    BACK
```
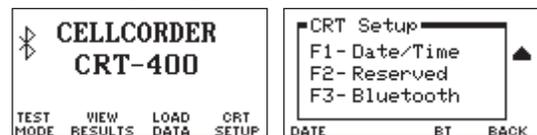
5. A message displays, "Checking for Bluetooth option." All stored BTdevices will display automatically, use the arrow keys to select the desired device and press F2 to CONNECT.

```
Headset




NEW  CONNECT DELETE CANCEL
```

6. When connecting to a new BT headset
   a. Press F1-NEW
   b. Now press F1-Headset
   c. Place BT device in discovery mode.
   d. Press F2 to CONTINUE.
   e. When BT devices are found, a list is populated, use the arrow keys to select the desired device and press F1.

7. Once the BT headset and CRT are paired, press F1-TEST MODE.

8. Choose the desired test by pressing either F1, F2 or F3.

```
 ▄Test Mode▄▄▄
 F1- Voltage
 F2- Resistance
 F3- S.G./Temp.
VOLT   RES  SG/TEMP BACK
```
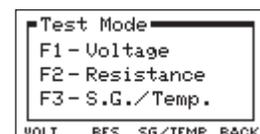
9. Place the BT headset on your ear for test status information.

FILES USED BY THE CRT-400 CELLCORDER AND BATTERY ANALYSIS SYSTEM (BAS) PROGRAM

There are many file types used with the Cellcorder and BAS program, and they are fully described in the user's guides. This section describes the two most common.

.CDF Cell Data File -

Created by the CRT-400 when saving readings to the USB device. It is the transport file that gets data from the CRT-400 to the computer. This file contains one set or multiple sets (if in multi-string mode) of readings for a complete string of batteries. The Battery Analysis System (BAS) program imports this file into an ADF file.

.ADF Accumulated Data File -

Contains sets of readings that were imported from CDF files. One ADF file can contain many CDF files from the same string. This gives the BAS program the ability to trend over many sets (different dates) of data. Create one ADF file for each string or one battery with parallel strings. Every time readings are taken for that string, import the data in the CDF file into the ADF file.

IMPORTING A CDF FILE INTO AN ADF FILE

To import a CDF file into an ADF file, select File|Open. In the Open dialog box at File Type, select Cellcorder Data File (*.cdf) from the drop-down list, then navigate to the USB flash hard drive which is normally labeled 'Removable Disk' under My Computer.

1. File|Open

2. Select CDF file type

**3. Select the USB device.**
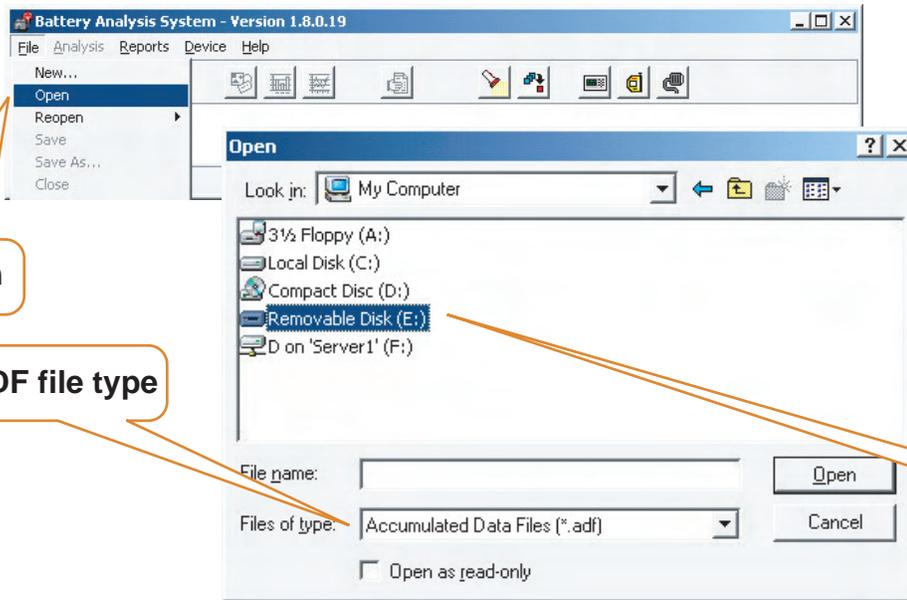
In the Confirmation dialog box, click Import to Existing File or Create New File. Both buttons refer to an ADF file. If this is the first time importing, click Create New File and then, each time you take additional readings for that string, click Import to Existing File and select the appropriate previously-created ADF file.
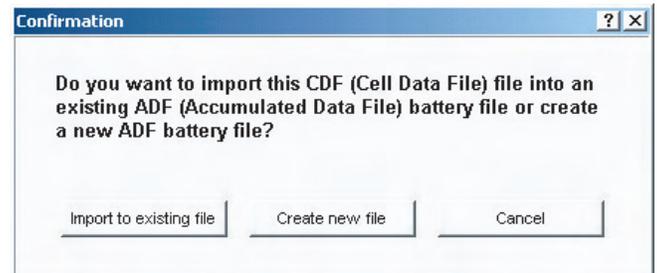
If you select Import to Existing File, navigate to the desired ADF file and select it. The new data will be added to the existing data as a new read date when viewing the readings.

If you select Create New File, the Configuration Information dialog box appears. This box can be configured using the CRT-400 template setup or with the configurator in the program. You can change or add information at this time or later using File|Properties.
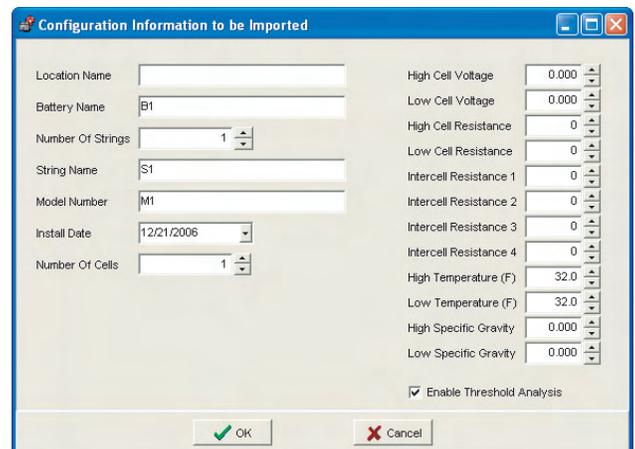
VIEWING BATTERY FILE PROPERTIES

This page describes the five File Properties pages, which you may use to edit battery data. Open a file, then click File|Properties. You must click File|Save to save changes.

The General page edits details such as battery name, model, location, and install date. Temperature scale and number of cells affects the battery data file. Edit the Location Name, Battery Name, String Name, and Battery Model in these boxes. You cannot have identical battery names under the same location name or identical string names under the same battery name.
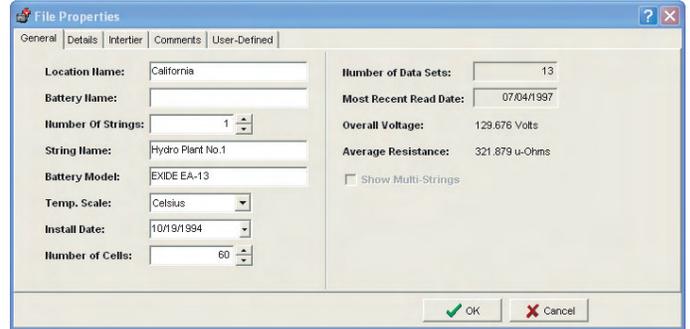
The Details page displays a table of values for all cells with data. Columns display cell number, cell voltage, internal resistance, intercell R1 to R4 resistance, temperature, and specific gravity. This list view can display cell data in colors based on threshold values, and intertier cell data in bold.
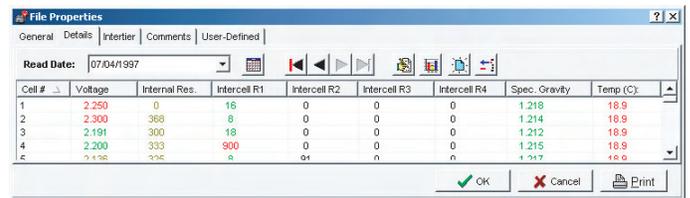
The Intertier page manually or automatically marks cells in a battery as intertier cells to indicate they are on the boundary of an intertier connection. By convention, only the cell with the lower cell number is marked. For example, if Cell 10 is the last cell of one tier and connected to Cell 11, which is the first cell of the next tier, only Cell 10 is marked as an intertier cell.
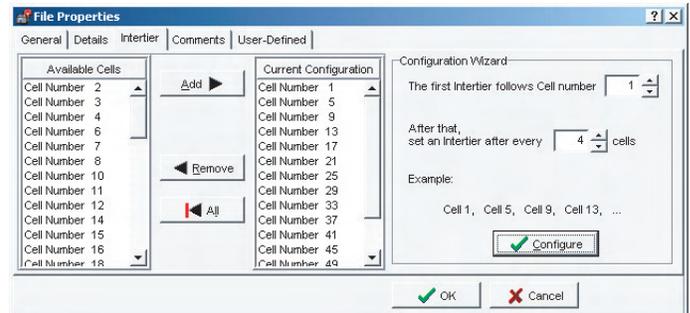
The Comments page has a text editor for typing comments, such as the date and type of readings taken or when connectors were cleaned. The Select a New Read Date dialog box lets you associate comments with a read date. To save a Comments page as a template, click the Save As New Comment Template button.
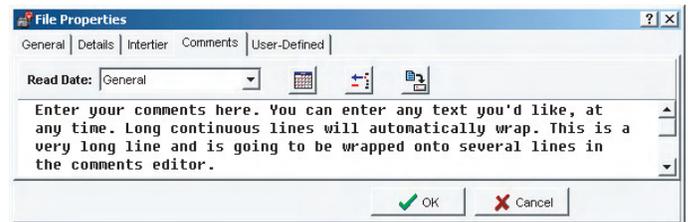
Use the User-Defined page to list reference notes. The notes, which can be included in reports, might identify pilot cells or equipment such as chargers.
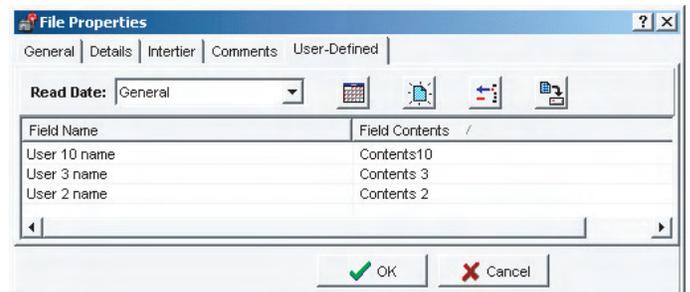
VIEWING BATTERY READINGS

To show a graph of an ADF battery file: Click File|Open on the main menu and select a file name, then click Analysis|Data Set|Detail. To enlarge a graph area, drag a rectangle across it. To return to normal size, right click the graph and click Undo Zoom.

View voltage, resistance, intercell resistance, temperature or SG.

Set threshold display properties and the graph scale.

View different data sets by selecting a date from the list.

Print the graph.

Export to a file or the clipboard.

Data Set Detail Graph

Graph   Parameters   Help

Read Date: 07/04/1997

Hydro Plant No.1
Data Set Detail Graph for 07/04/1997

2.176

Cell Number	5	10	15	20	25	30	35	40	45	50	55
Voltage	2.136	2.124	2.193	2.176	2.176	2.180	2.189	2.190	2.187	2.160	2.134

Voltage
Overall Voltage = 129.676
Data Set 1 of 13

Close

High Cell (2) =   2.300
Average   =   2.161
Low Cell (60) =   1.500

Shows the minimum, maximum and average values of the readings.

Cell Data 7/4/1997

Cell Number: 25

Voltage:	**2.176**
Internal Resistance:	320
Intercell Resistance 1:	8
Intercell Resistance 2:	0
Intercell Resistance 3:	0
Intercell Resistance 4:	0
Specific Gravity:	1.218
Temperature: (C)	18.9

Close

Bar Graph Cell Data

To display text data for a cell, click on a bar. The Cell Data box shows cell number, cell voltage, internal resistance, intercell resistance, SG and temperature when available.

TRENDING A PARAMETER OVER TIME

Trending a specific parameter can help identify a problem. Open a file with at least two data sets and click the View Battery Data Set Graphs button. Click a cell in the graph, then click Parameters|Trend|Cells. Click the Select Which Parameters Appear in Graph button. On the Data Subsets box, select Internal Resistance only. A Battery Cell Trend Graph displays the cell values over time. Click a data point or date to display details in the Cell Data box. If the box does not appear, enable it under File|Preferences.
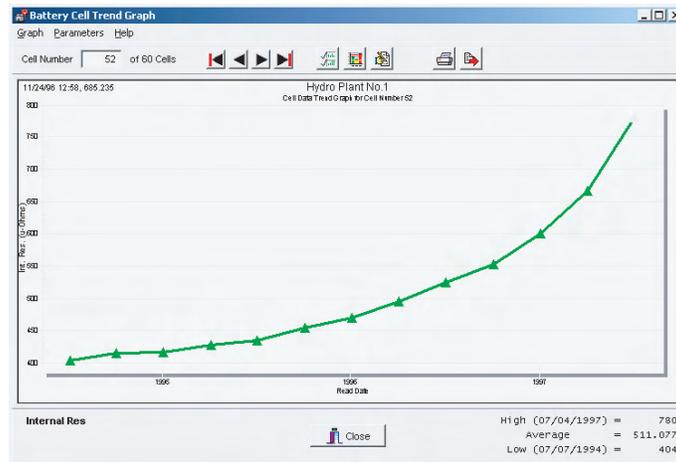
TRENDING A PARAMETER AVERAGE OVER TIME

Trending a parameter average helps identify inconsistencies in a battery system, and trending internal resistance averages helps determine a battery's end of life. The average summaries on the internal resistance screen are calculated to reduce false averages. The calculation eliminates cells above or below the true average by 25%, and then recalculates a new Modified Average.

Open a file with at least two Data Sets and click the View Battery Data Set Graphs button. Click a cell in the graph, then click Parameters|Trend|Cell Averages. Click the Select Which Parameters Appear in Graph button. On the Data Subsets box, select Internal Resistance only. A Battery Cell Averages Trend Graph displays internal resistance over time. Click a data point or date to display details in the Cell Data box.
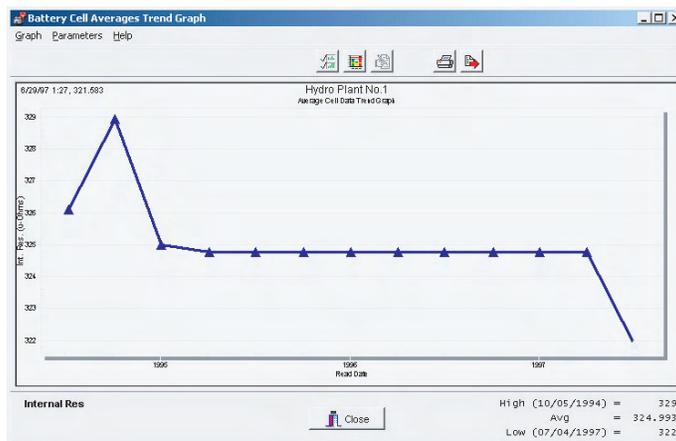
GENERATING REPORTS

The BAS Report Generator creates five reports: a Detail, Comparison, Threshold Deviation, Cell Trend, and Cell Average Trend Report with lists, graphs or both. Click Create Report after setup. View saved reports using the Archive Reader. Buttons on report pages change view size, print, and save as a ZRF archive file. To save the text portion as a text file, select TXT in the Save As Type field.

Data Set Detail

This report creates lists and graphs of selected Data Sets. Reports|Data Set|Detail opens five setup pages: Data Sets selects sets of readings to include. Cells identifies cell range. Graphs and Tables includes tabular or graph information. User Defined defines user fields and comments. Other Options offers title, date, time, page number, size and footer.

Data Set Comparison Report

This report compares selected data sets referenced to one data set. Click Reports|Data Set|Comparison. All data set dates except the reference can be in one report.

Cell Trend Report

This report creates a tabular list of selected data sets with respect to time. Click Reports|Trend|Cells.

Threshold Deviation Report

The Data Set Threshold Report creates a list that shows threshold violations of selected data sets.

Cell Average Trend Report

This report creates a tabular list of selected data sets averages with respect to time. Click Reports|Trend|Cell Averages.
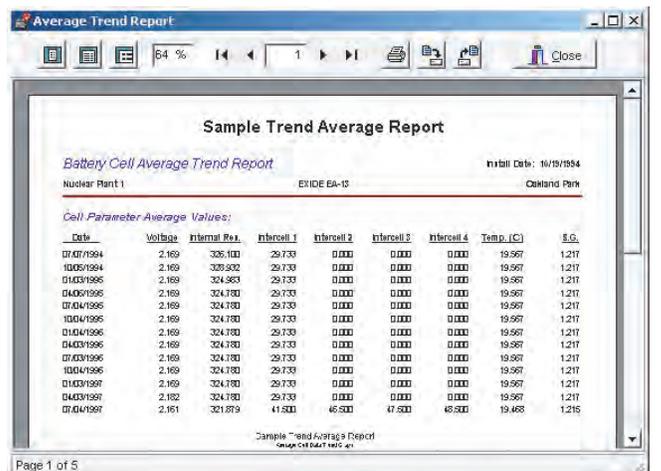
Archive Reader

The Archive Reader displays and prints reports that were generated and saved with the Report Generator. To start the reader, click Reports|Load and open a report file. You may open a previously saved report any time the Archive Reader is on screen. The reader opens CRT-400 ZRF report files and may be downloaded from the Albér Web site: www.alber.com