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1. System Overview

1.1 Description

1.1.1. Introduction:

Note: The BTAS16(K) is a complete new version of the BTAS16 that has been in operation since 2001. It is characterized by new features, faster operation, modern screens and a wider utilization of Windows tools.

The BTAS16(K) is a system designed to automate the measurement and analysis of battery parameters as encountered in the process of the testing and certification of aircraft Nickel-Cadmium batteries. *Note: Applicable also to Lead-Acid batteries.*

Proper servicing of Nickel-Cadmium aircraft batteries requires that each of the cells be monitored throughout the charge and discharge cycles, not just the battery terminal voltage. Due to the large number of cells, typically 20, this is a laborious and error prone task, so much that it is currently reduced to a practical minimum of readings.

Although this minimum of test data marginally satisfies certification requirements, it does not provide the time detailed information needed to determine the “true” condition of the cells. Lack of continuous cell voltage measurements prevents a better assessment of the condition of the battery and also prevents a better prediction of the future performance of the battery.

The continuous measurements provided by the BTAS16 make it possible to determine, well in advance, the condition of the battery thus providing opportunities to save testing time.

Measurements are not limited to cell voltages. The system measures also the temperature of the battery as well as the charge/discharge current, thus providing a more complete picture of the test being performed.

Cell readings also become more accurate because they are all performed at the same time, and are conveniently stored with a time stamp, which provides an accurate voltage vs. time performance indication.

In addition, the system provides limited monitoring and control of specially modified Charger-Analyzers such as the Superseder IIIC and MasterCharger LXC, and full monitoring and control of new Intelligent Charger-Analyzers SupersederXG, SuperMasterCharger, 24-400xg, MiniCharger and MiniMasterCharger.

1.1.2. System Components:

The BTAS System is comprised of a number of Data Acquisition Terminals (from one to 16), known as the C-Scan. The C-Scan collects the data from the battery and connects to a computer running the BTAS software that receives and processes the information.

There are two types of accessories used to read the individual cell voltages, Cables with Clips suitable for any battery and custom Crowns for specific types of batteries.

A Test Box, known as the Cell Simulator, is also part of the system and it is used to test all functions and verify the performance of the system.

In addition to battery measurement, the BTAS16 also provides monitoring and control of Battery Charger-Analyzers.

A Barcode scanner can optionally be used to simplify the task of entering battery tracking information.

1.1.3. Screen views:

User-friendly screens provide the environment to select the terminals in operation and to program the tests to be performed. Once started, the computer collects data from all terminals and displays the information in graphical and numerical format. Colors in the bar graphs are used to indicate the relative state of the batteries and of individual cells.

1.1.4. Reports:

Once tests are completed, screen and printed reports are available showing the information accumulated, and providing an end-of-cycle summary analysis. Note that this information is also available as the data is being collected.

1.1.4.1. Types of Reports:

- Battery Data
- Cell Data (if applicable to the type of battery)
- Test Summary
- Work Order Log
- Work Order Summary
- Work Order List

1.1.5. Graphs

During the tests or once tests are completed (or terminated), screen and printed graphs are available showing the information accumulated, and providing an end-of-cycle summary analysis.

1.1.5.1. Types of Graphs:

- Battery Voltage
- Battery Current
- Battery Temperature
- Cell Voltages (if applicable to the type of battery)

1.1.6. Data archive:

All information is tracked and archived using work orders as the primary record and battery serial number and barcode as identifiers. Data from new tests can be compared to the previous test to establish battery performance benchmarking.

1.1.7. Databases:

Databases for Customer Batteries and Customers are used to fill in work orders and to provide Test Parameter programming for the Intelligent Charger-Analyzers.

1.1.8. Charger-Analyzer Monitoring and Control:

- The system can also provide full monitoring and control of new Intelligent Charger-Analyzers such as SupersederXG, SuperMasterCharger, 24-400xg, MiniCharger and MiniMasterCharger.
- A special feature of this new release is the programming of Battery Test Parameters directly from the computer based on stored information for specific batteries.
- The system can also provide limited monitoring and control of specially modified Charger-Analyzers such as the Superseder IIIC, Supercharger60C, and the MasterCharger LXC
- Special modifications to the above mentioned instruments allow the C-Scan to determine if a Charger-Analyzer is connected, if the power is on, which type of charger it is and can start/stop its operation synchronizing the data recording with the operation of the Charger-Analyzer.

1.2 Specifications

- 1.2.1. Number of C-Scan Terminals: 16 max (15 practical)
- 1.2.2. Number of Charger-Analyzers: 16 max (8 practical)
- 1.2.3. Number of cells per C-Scan: 24 max
- 1.2.4. Number of C-Scans per Charger: 1 or 2 (battery type dependent)
- 1.2.5. Number of batteries per C-Scan: One battery of up to 22 cells, two batteries of up to 11 cells and 3 batteries of up to 7 cells (adaptors are needed for 11 and 7 cell batteries).
- 1.2.6. Cell Voltage: 2V max
- 1.2.7. Battery Voltage: 40V max
- 1.2.8. Battery Current: 100A max for Charger-Analyzers for Mainship Batteries and 2A/10A for Charger-Analyzers for small battery packs.
Current is measured via the internal shunt on Intelligent Chargers and specially modified chargers or via an external accessory shunt cable for other types of Charger-Analyzers.
- 1.2.9. Battery Temperature (4 sensors via the Temperature Plate or Temperature Cable for battery packs)

1.3 Customer supplied items:

- 1.3.1. Computer: Dual Core PC minimum, i5 recommended, 2.5GHz clock speed
- 1.3.2. Operating System: Windows XP Professional, Vista, Windows 7, 8 or 10 (best).
- 1.3.3. Memory: 4G
- 1.3.4. Monitor: 19" minimum, 24" recommended
- 1.3.5. Screen Resolution: as required to fit the screen in the monitor (highest recommended).
- 1.3.6. Hard Drive: 20G minimum
- 1.3.7. R/W CDROM Drive
- 1.3.8. Audio Speakers
- 1.3.9. Bar Code Scanner (optional)
- 1.3.10. Printer: Standard Color Inkjet (recommended) or color Laser
- 1.3.11. Power Back-up for the Computer: 500VA minimum, 1000VA recommended
- 1.3.12. Power Back-up for the C-Scan Terminals: 300VA minimum

1.4 Operating Overview

1.4.1. Operating Summary

The BTAS16 main function is to collect data from each of the batteries and to store the information in data tables.

The acquisition of data is the function of the Data Acquisition Terminals (C-Scan) which measures and converts all parameters for the batteries under test.

Once the data is collected and stored, it can then be retrieved for review in screen views and for reporting through the printer.

All data is organized primarily under Work Orders (one per battery type and serial number). It is therefore necessary to enter a Work Order before any testing can be performed. [See 5.1]

In addition to Work Orders, Customers [See 4.2] and Customer Batteries must also be entered in the database. [See 4.4]

Batteries must also be identified in the database. The Battery Database contains information on the batteries currently in use where the end-user must enter the basic parameters (current, voltage, time, etc.) as outlined in the CMMs.

The Operator programming a particular work order can also be identified with the Work Order. See [4.3]

Once the Work Order and other basic information is available in the System, the Work Order(s) can now be associated with a Data Terminal Station. [See 6.3]

A Charger Station Number must now be associated with the Data Terminal. [See **Error! Reference source not found.**]

If the Charger-Analyzers are interfaceable with the C-Scan, the Link check mark can be set. See [7.1.3] for the BTAS to be able to control it (start/stop).

If the Charger-Analyzers are recognized as “Intelligent” the automatic configuration can be set for the BTAS to load the Test Parameters.

The color of the box surrounding the check mark will determine the status of the Charger-Analyzer. See [7.1.2]

The Test to be performed must be selected from the pull down menu.

If all preliminary information is set and the Data Terminal is Active, the Record check mark area will be green indicating that the test can be started. See [6.5]

Once the recording of data has started, the E-Time box will display the elapsed time and the Status box will display the number of records taken and the total number of recordings expected for the specific test.

The recording can be Stopped (and Resumed) by unchecking and rechecking the Rec box.

The recording will also stop automatically at the end of the test duration (as determined by the test selected) or will stop at any time if the Charger-Analyzer operation is interrupted (no current detected).

Voltage, Current and Temperature readings can be seen in real time, in numerical format in the right hand area or in bar graph format in the bottom area.

Data from any current or past test can be viewed and printed in numerical format (reports) or in bar-graph format (graphs).

When viewing bar-graph data, two tests can be displayed for comparison, such as first and last capacity test, or current capacity test compared to a prior capacity test, or battery voltage vs. charger current, etc.

Colors in all bar-graphs reflect good-marginal-fail conditions of battery or cell voltages.

Note: Do not run any other programs simultaneously with the BTAS-16 as this may result in severe performance degradation, (speed and data integrity).

1.4.2. Opening Screen

The opening screen provides the greeting and the Program Version

1.4.3. Comm Ports Screen

The Com Ports Screen is used initially to synchronize the two USB Data and Control connections. For more details, see [3.2.2]

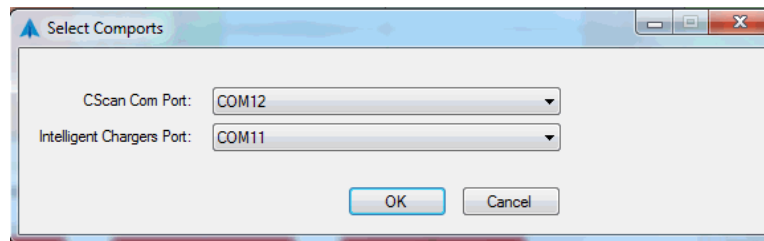


Figure 1 – Comm Ports Screen

1.4.4. There are four sections in the Main Screen – [See Figure 2]:

1.4.4.1. DATA TERMINAL STATUS

- Data Terminal / Charger Status
- This is the area where tests and operating details of each of the 16 possible Data Terminals and Chargers can be monitored and controlled

1.4.4.2. MESSAGE CENTER

- Miscellaneous information on selected Work Order, Battery, Cells order and Temperature Display options and special status messages on the tests being performed.

1.4.4.3. REAL TIME DATA

- Real time numerical data for the selected Data Terminal
- This is the data that originates in the Data Terminals as it is received by the program with each one of the scans.
- The data displayed can be printed (right click).

1.4.4.4. GRAPHICAL DATA

- Graphical data for the selected Data Terminal
- This bar-graph display provides information as it is received and stored by the program.
- Cell Voltages is the bar graph voltmeter display of the numerical data seen on the right hand side. This is real time data. All others are cumulative (voltage, current and temperature vs. time) type of bar-graph displays.
- Bar Graphs currently being displayed can be printed (right click).

1.4.5. Main Screen displays and controls

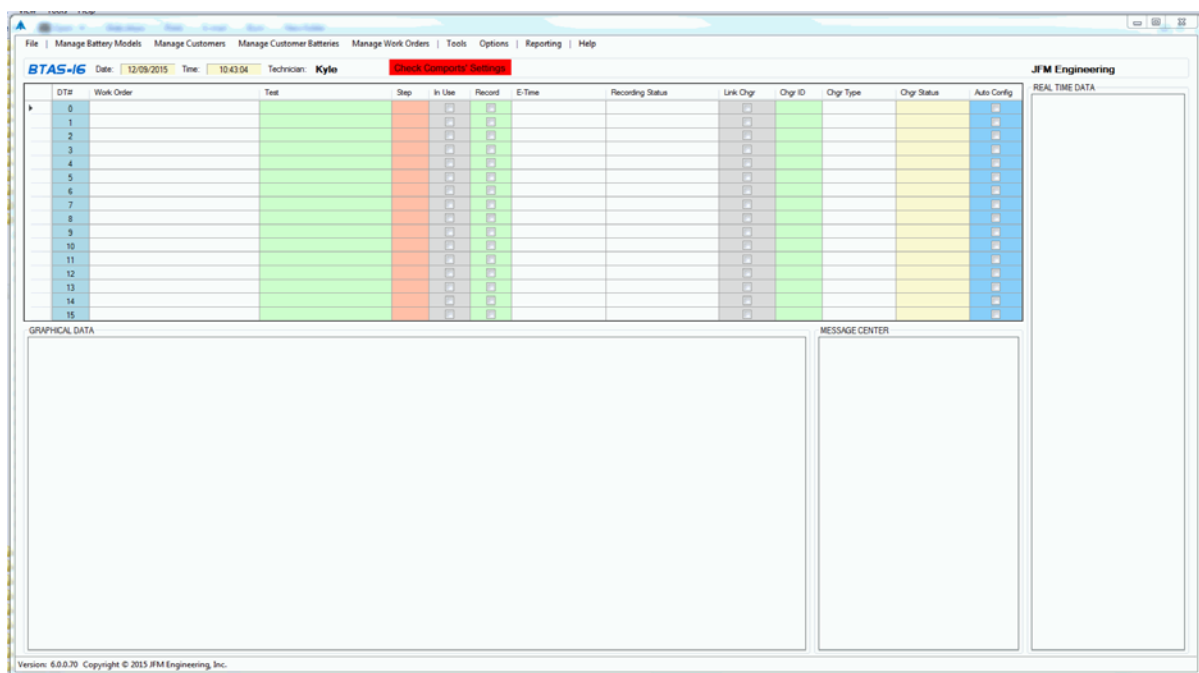


Figure 2 - Main Screen

1.4.6. Other sections are:

1.4.6.1. Pull down menus (from the toolbar at the top of the screen)

1.4.6.1.1. File

- Comm Port Operations (USB port assignment for data and control)
- Database Operations. Backup and restore the database. Also, to import the database from the previous version.

1.4.6.1.2. Manage Battery Models

- Manufacturer and type (model) basic information
- Test parameters per the CMM for each specific battery entry.

1.4.6.1.3. Manage Customers

- View/Enter/Edit/Delete Customers

1.4.6.1.4. Manage Customer Batteries

- Entry of specific Customer/Battery information (serial number, etc.)

1.4.6.1.5. Manage Work Orders

View/Enter/Edit/Delete Work Orders

1.4.6.1.6. Tools

- Sequential scanning: see information on each channel, one at a time.
- Find Stations: see the C-Scans that are connected
- Water level (MasterFiller). Sub screen to enter and record water dispensed into each of the cells (it becomes part of the Summary Report).
- Custom Test Settings
- Other Tools to enhance/shape the operation of the program

1.4.6.1.7. Options

- Temperature units (C or F)
- Cells order (from Positive Terminal or Negative Terminal)
- Select Technician
- Other Options to enhance/shape the operation of the program

1.4.6.1.8. Reporting

- Select from a variety of printable reports and graphs

1.4.6.1.9. Help

- Program Version (TBD)
- Help (TBD)

1.4.6.2. MESSAGE CENTER

- Window to display error messages and a charger status messages
- Test termination due to completion of expected number of samples.
- Test termination due to Charger-Analyzer termination (no current detected)
- System error messages
- Message Report shows the details of Windows error messages
- Clear: clears the information in the window

2. Condensed Operating Procedure

2.1 Introduction

Simplified Instructions for the operation of the BTAS software

Numbers in parenthesis () refer to sections in the Instruction Manual

Note: The BTAS16 requires that specific data be available in the database before a Work Order can be entered and processed:

- Technician (name)
- Customer (name)
- Battery (manufacturer, Type and Test Parameters)
- Customer's Battery (Type and serial number)

2.2 Operational Steps

2.2.1. Enter basic information

- 2.2.1.1. Edit Technicians (4.3) (OPTIONS: Edit Technician)
Enter the names of technicians that will use the system
- 2.2.1.2. Select Technician (4.3) (OPTIONS: Select Technician)
Select from the list
- 2.2.1.3. Customers Table (4.2)
Enter the names of customers that are/will be serviced. If your organization does not perform battery test for others, enter the name of your organization.
- 2.2.1.4. Battery Model Table (4.1)
 - Enter the information specific for each battery (Manufacturer and Type)
 - For automatic operation with Intelligent Charger-Analyzers, enter Battery Test Parameters from the CMM.
- 2.2.1.5. Customer Battery Table (4.4)
Enter the serial numbers of batteries belonging to your customers and/or your organization.
- 2.2.1.6. Create Work Orders (5.1)
Create a Work Order for a battery that is listed in the Customer Battery Table
- 2.2.1.7. Apply the Work Order (**Error! Reference source not found.**)
Apply the Work Order to the Data Terminal (C-Scan DT#) where the battery is connected (Pull down menu).
- 2.2.1.8. Select the Test (6.4.2)
Select the test to be performed (Pull down menu). The program will fill-in the Step # once the test has started.

2.2.1.9. Click “In Use” (6.5.1)

If not already selected, click “In Use”. The area around the check box will turn greens indicating that the program is communicating with the Data Terminal.

2.2.2. Set the Charger-Analyzer

2.2.2.1. Select the Charger-Analyzer (7.2.4)

From the Pull-down, select the Charger-Analyzer Station Number:

2.2.2.1.1. Intelligent Charger-Analyzer (ICA)

For an Intelligent Charger-Analyzer (SupersederXG, SuperMasterCharger, etc.) enter the terminal number in the upper left hand corner of the LCD window (T1, T2, etc.)

2.2.2.1.2. Controllable Charger-Analyzer (CCA)

For a Controllable Charger-Analyzer (Superseder IIIC, SuperrCharger60C, MasterCharger C, etc.) select a unique station number (different from any other). Note that current is monitored through an internal shunt connected to the C-Scan and that control is through a cable between the C-Scan and the Charger-Analyzer.

2.2.2.1.3. Other Charger-Analyzer

For any other Charger-Analyzer select a unique station number (different from any other). Note that the BTAS must be able to see current as provided by an external shunt connected to the C-Scan.

2.2.2.2. Program the Charger-Analyzer

Setup the Charger-Analyzer for the test to be performed (see the Charger-Analyzer instruction manual).

2.2.2.3. Link the Charger-Analyzer (6.5.3)

Click on Link (check) to allow the program to control (Start-stop) the Charger-Analyzer in synchronization with the starting/stopping of recording. The box will turn yellow to indicate that the Charger-Analyzer is ready to be linked. Note that this is applicable only for ICAs and CCAs.

2.2.2.4. Automatic loading of Battery Test Parameters for Intelligent Charger-Analyzers

- Open the Auto Config Column (Tools: Enable Automatic Charger Configuration)
- Click on Auto Config. When the test is started, it will first configure the Charger-Analyzers with the Battery Test Parameters and it will then start the operation.

Note: The battery needs to be defined in the Battery Database before this feature can be used. An error message will be displayed if attempting to run with the battery not properly defined.

2.2.3. Run the Test

2.2.3.1. Start the Test and Charger-Analyzer

Prior to starting a new test verify that the data displayed in the Readings Window is consistent.

Click on Record to start the recording of battery data (check).

If the Charger-Analyzer is not linked, then it must be started prior to the start of the recording. Otherwise it will be started automatically with the start of the test.

Note: The program must detect current (charge or discharge) to process the recordings. The program will stop and generate an error message if current is not detected.

For Intelligent Charger-Analyzers, when the test is started, it will first configure the Charger-Analyzers with the Battery Test Parameters and it will then start the operation (If so configured).

2.2.3.2. Stop the Test and Charger-Analyzer (6.5.4)

Click off Record to stop the recording of battery data.

If linked, it will stop the Charger-Analyzer.

If the Charger-Analyzer is not linked, then it must be stopped manually.

2.2.3.3. Message Center (1.4.6.2)

The system will report through the Message Center the reasons for stopping the recording.

2.2.4. View information as it develops

2.2.4.1. Numerical

View numerical data on the selected channel (DT#) for cell voltages, battery voltage, current, etc. (right hand screen)

2.2.4.2. Bar Graph

View graphical data on the selected channel (DT#) cell voltages, battery voltage, current, etc. (bottom screen)

2.2.5. Review the information after the test

2.2.5.1. Reports (**Error! Reference source not found.**)

Click on Reports and select the Work Order and Test Step
View and print the results

2.2.5.2. Graphs (**Error! Reference source not found.**)

Click on Graphs and select the Work Order and Test Step
View and print the results

3. Initial Setup

Typical installation pictures

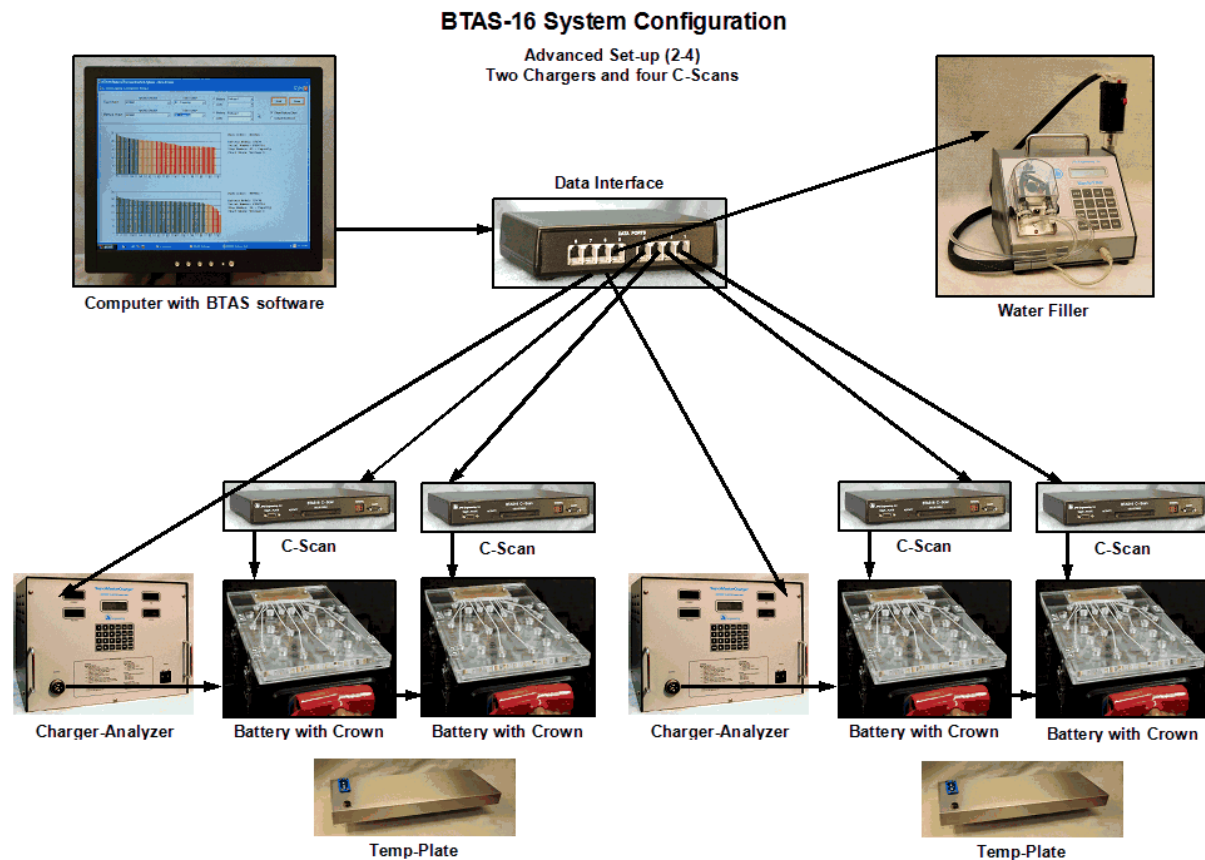


Figure 3 – Typical System Configuration for two Charger-Analyzers and four batteries

3.1 Connections

3.1.1. Computer

- Setup, connect and power up the computer per the computer manufacturer's instructions.
- Load the BTAS16 special software. Follow the instructions provided with the CD ROM

3.1.2. Data Interface

- Connect the Data Interface USB cables to the Computer's USB ports
- Note that the USB cables are identified as USB1 and USB2 although the order of connection is of no importance at this time.
- Verify that the power LED turns on



Figure 4 - Data Interface Front Panel

- Connect the 6 pin Data Cables to the Data Interface and route to the locations where the C-Scans and Charger-Analyzers will be operating.
- Ports 1 – 4 are for the C-Scans (Data)
- Ports 5 – 8 are for the Intelligent Charger-Analyzers (Control)

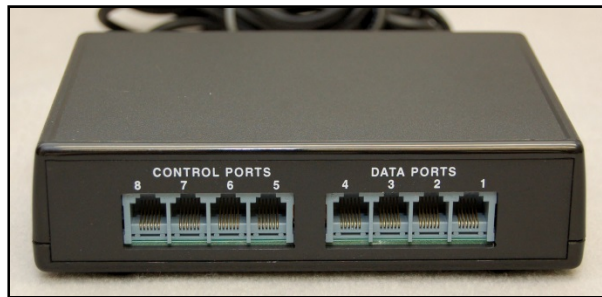


Figure 5 - Data Interface Rear Panel

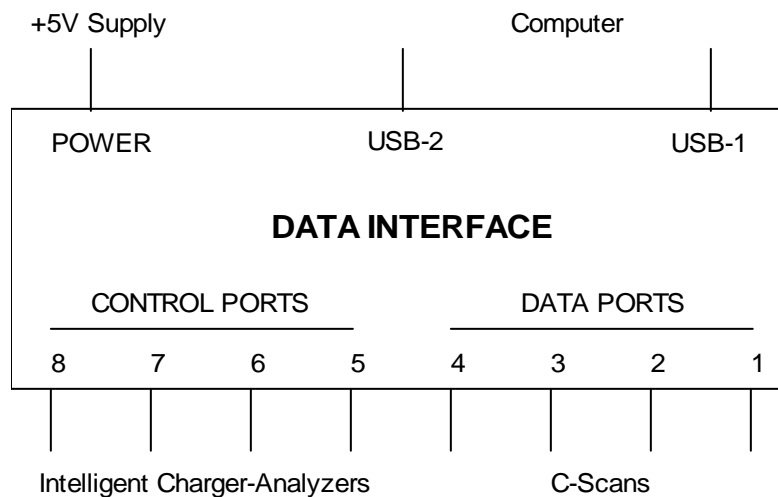


Figure 6 - Data Interface Connections

- Use Data Hubs to facilitate the routing of Data and Control Cables from the Data Interface to the C-Scans (cascading daisy chain as opposed to direct connections). For connections, see [Figure 12], [Figure 13] and [Figure 11]
- *Note: if using Hubs, observe that hubs have one input (from the Interface) and four outputs. Three for terminals and one to cascade to the next location.*



Figure 7 – Data/Control Hub

3.1.3. C-Scan

- Locate the C-Scans in the vicinity of the Charger-Analyzers.
- Set the desired Channel Numbers (0 through 15) with the Rotary Switch labeled TERMINAL.

**Figure 8 - C-Scan Rear Panel**

- Note: The rotary switch to select the channel number is marked 0 through 9 and A through F, where A is channel 10, B is 11, C is 12, D is 13, E is 14, and F is 15.

Note: verify that all channel numbers are unique. Any repetition of channel numbers will cause the system to fail.

- Connect the Power Supplies to the C-Scans in the connector labeled POWER.
- Connect the Power Supplies to a battery backed-up AC source (UPS).
- Connect the Control Cable from the Charger-Analyzer with the “C” mod (Superseder IIIC, SuperMasterCharger60C and MasterCharger LXC) to the connector labeled “CONTROL”

Note: the Control Cable is not used by the Intelligent Charger-Analyzers.

- Connect the 6 pin flat Data cables to the C-Scans in the connector labeled DATA

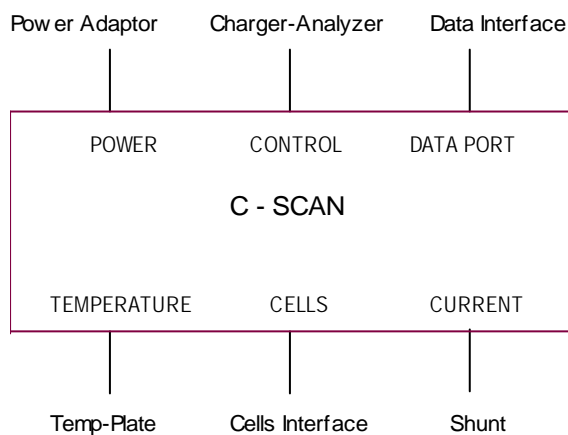
**Figure 9 - C-Scan Connections**



Figure 10 - C-Scan Front Panel

- Connect the Shunt Cable to the connector labeled SHUNT
- Connect the Temp-Plate Cable to the connector labeled TEMP-PLATE.
- Verify that the Terminal Number LED Readouts turn on showing the selected terminal number (requires that the C-Scan be interrogated by the Program).

Note: The ACTIVITY LEDs will not blink until the program has been started and the Terminal selected.



Figure 11 – Data/Control Hub

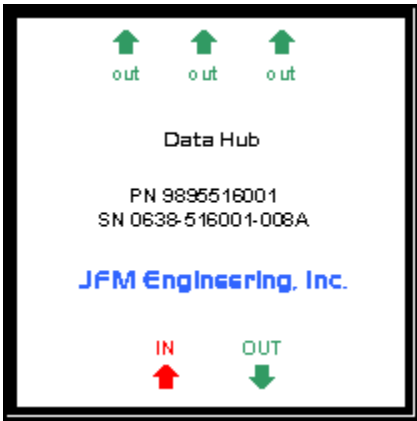


Figure 12 - Data Hub Label

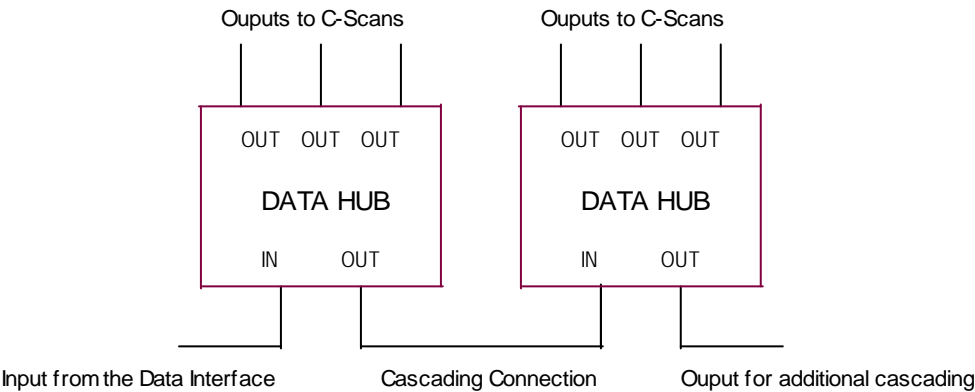


Figure 13 - Data Hub Connection for cascading

- 3.1.4. Connection for control of Intelligent Charger-Analyzers
Connect ports 5-8 in the Data Interface to the Connector in the rear of the Charger-Analyzer labeled BTAS. See [Figure 14].

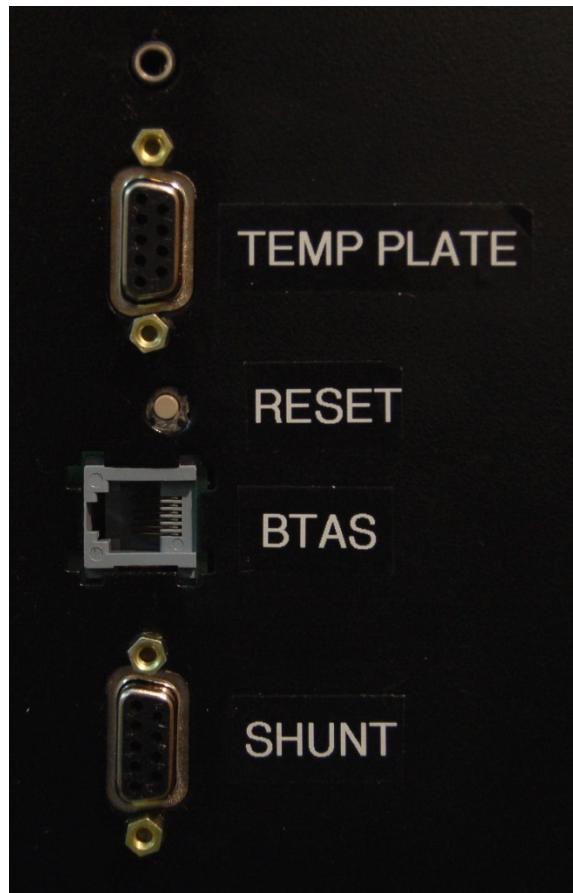


Figure 14 – SMC Rear Panel Connections

3.2 System Test

- 3.2.1. Start the BTAS-16 program. The screen should come up with no selections (immediately after setup).

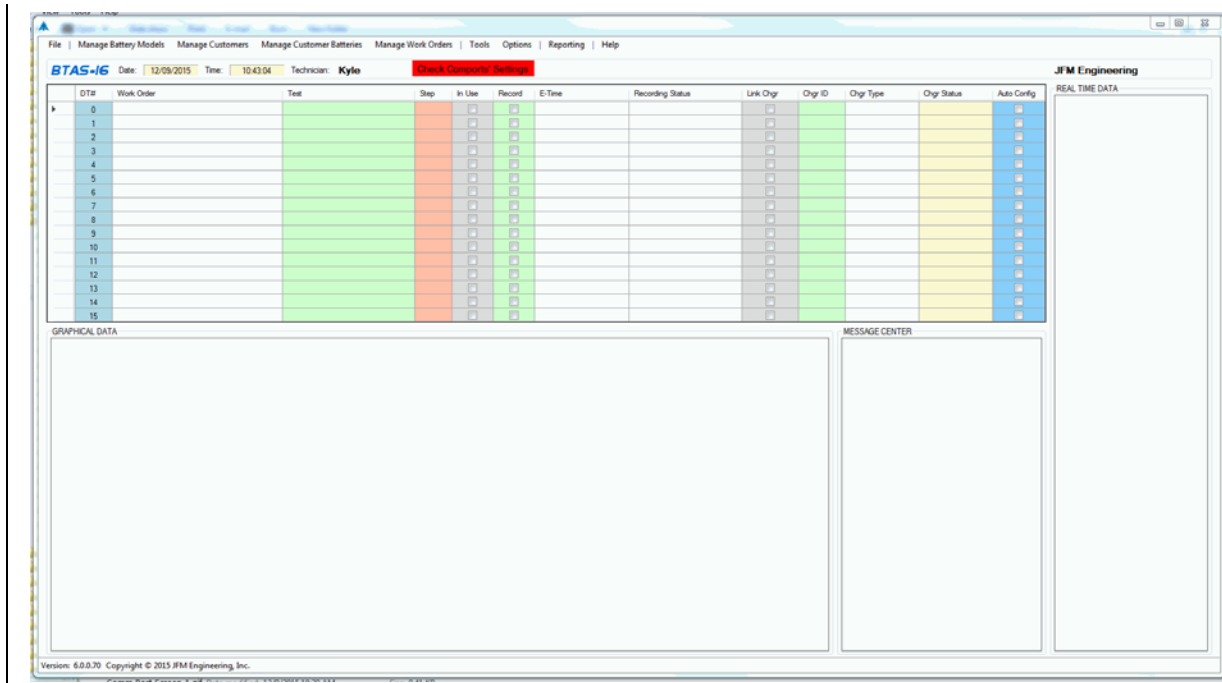


Figure 15 - Control Program Main Screen

- 3.2.2. Assign USB Ports for Data and Control

On the Main Screen:

- Click on the File pulldown (upper left)
- Open Comm Port Operations – see [Figure 16]
- Determine that two USB channels are available (there may be other USB ports already assigned depending on the accessories connected to the computer).
- With the up/down arrows, update the number of the Comm Ports for Data (C-Scans) and Control (ICAs) to match the available USB ports.
- Observe the activity lights for USB1 and USB2 on the Data Interface
- If the LED for USB1 is blinking (about once every two seconds) then, the setup is OK.
- If the LED for USB2 is blinking, then invert the numbers for the USB Comm Ports
- Verify that the blinking LED now corresponds to USB1

- 3.2.3. Click on the In Use section for each of the C-Scan channels available
- 3.2.4. Click the FIND TERMINALS button to automatically display all available C-Scan Terminals.
- 3.2.5. Verify that basic C-Scan information is displayed on the data window at the right hand of the screen.
- 3.2.6. The ACTIVITY LED indicators in the front panel of the C-Scan will indicate if the program is interrogating terminals (top LED, green) and if the particular Terminal is responding (bottom LED, red).
- 3.2.7. The top C-Scan LED indicates that the terminal (all terminals, simultaneously) is being interrogated (short flash, about once every two seconds), and the bottom LED responds when it detects its assigned terminal number (longer flash, once per cycle, the actual time period depending on the number of terminals connected).

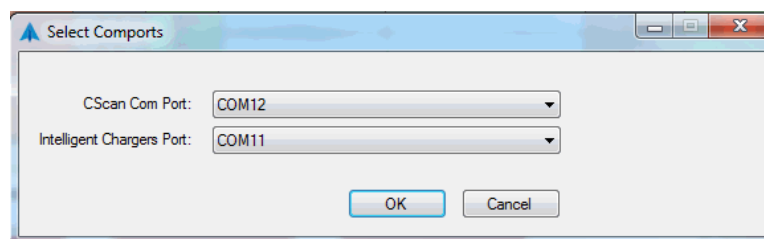


Figure 16 – Comm Ports

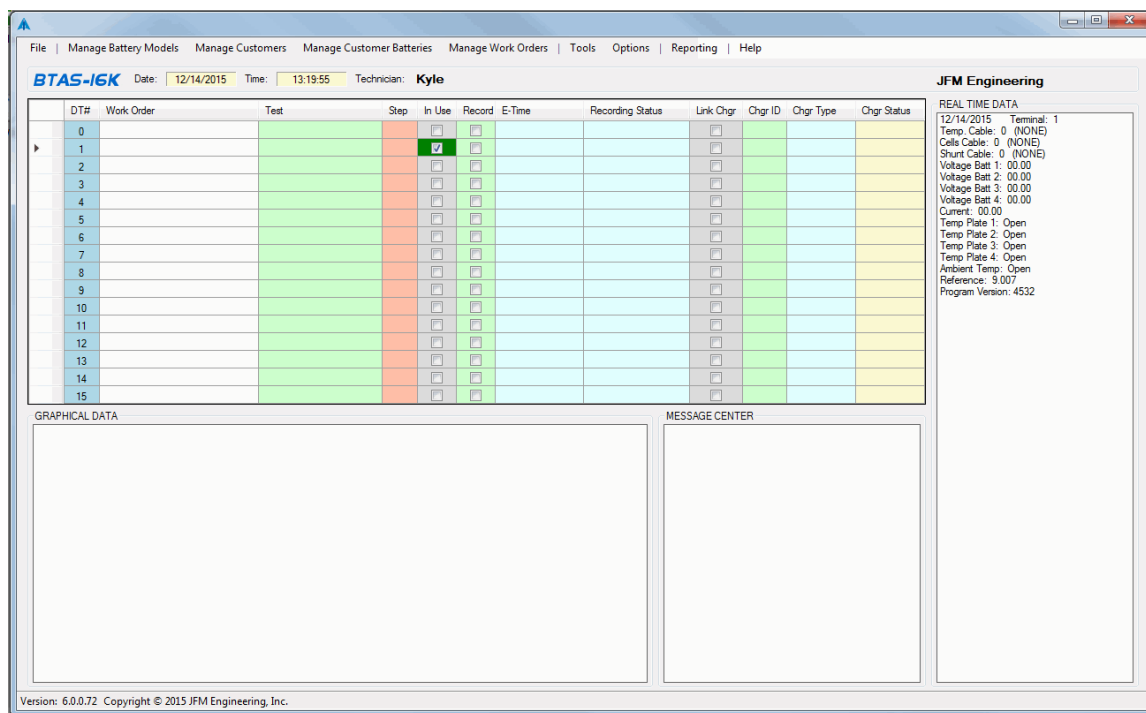


Figure 17 - Main Screen, Showing a C-Scan available as Terminal #1

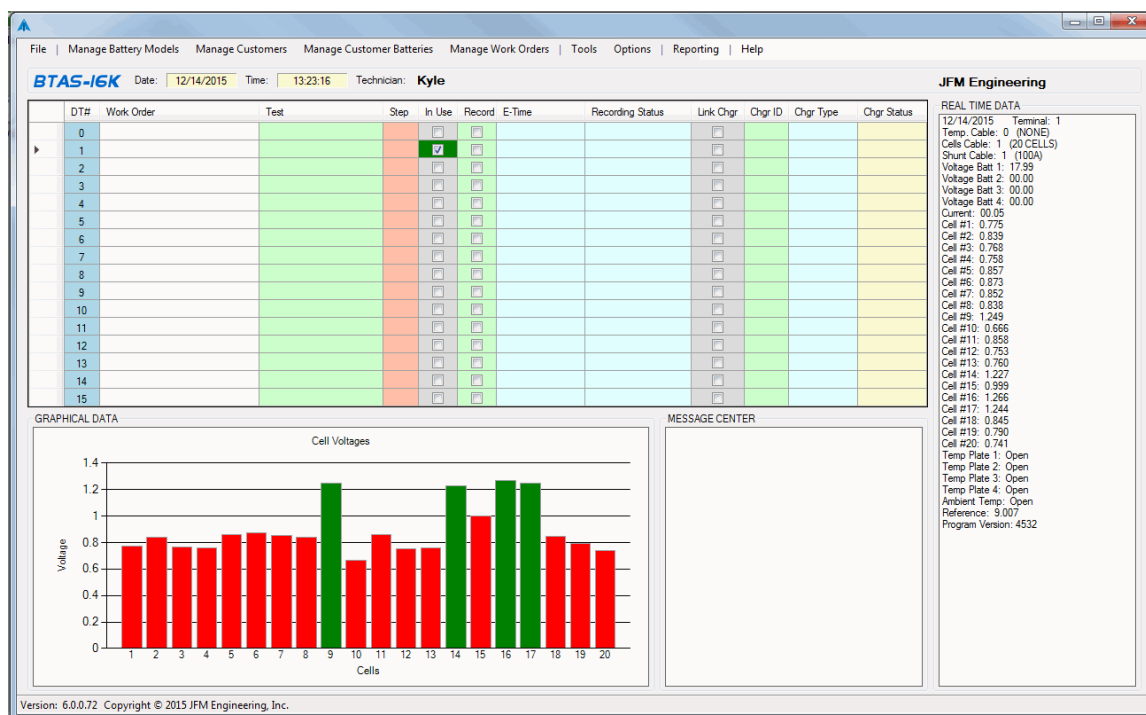


Figure 18 - Main Screen, Showing a battery

3.3 Tests with the Cell Simulator

- 3.3.1. Connect the Cells Simulator to the C-Scan using the 50 conductor flat cable
- 3.3.2. Connect the 12V Power Supply to the Cell Simulator



Figure 19 - Cells Simulator Rear Panel

- 3.3.3. Connect the DB9 cables to the SHUNT, TEMP-PLATE and CONTROL corresponding connectors on the C-Scan



Figure 20 - Cells Simulator Front Panel

3.3.4. Simulating cells AS RECEIVED

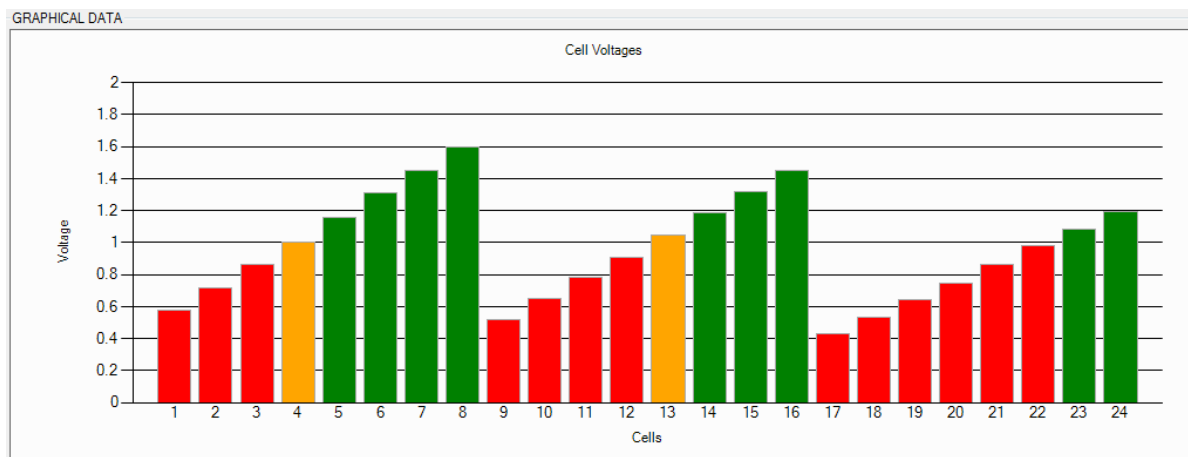


Figure 21 – 20 Cells Simulation pattern with “as Received” test

3.3.5. Numerical values from the simulator

REAL TIME DATA

12/14/2015 Terminal: 1
 Temp. Cable: 3 (TEST BOX)
 Cells Cable: 31 (CELL SIM)
 Shunt Cable: 7 (TEST BOX)
 Voltage Batt 1: 08.65
 Voltage Batt 2: 07.85
 Voltage Batt 3: 06.48
 Voltage Batt 4: 10.10
 Current#1: 34.76
 Current#2: 69.42
 Cell #1: 0.574
 Cell #2: 0.717
 Cell #3: 0.861
 Cell #4: 1.001
 Cell #5: 1.154
 Cell #6: 1.308
 Cell #7: 1.453
 Cell #8: 1.600
 Cell #9: 0.520
 Cell #10: 0.650
 Cell #11: 0.782
 Cell #12: 0.908
 Cell #13: 1.046
 Cell #14: 1.186
 Cell #15: 1.319
 Cell #16: 1.450
 Cell #17: 0.429
 Cell #18: 0.535
 Cell #19: 0.642
 Cell #20: 0.746
 Cell #21: 0.862
 Cell #22: 0.978
 Cell #23: 1.087
 Cell #24: 1.195
 Temp Plate 1: 09.8
 Temp Plate 2: 21.4
 Temp Plate 3: 34.4
 Temp Plate 4: 41.6
 Ambient Temp: 24.8
 Reference: 9.007
 Program Version: 4532

Figure 22 - Numerical results from the Cells Simulator

4. Databases

4.1 Batteries

4.1.1. Enter the Battery Definitions and Test Parameters (per the CMM)

Figure 23 – Blank Screen for a new Battery entry

Figure 24 – Sample Battery Model and Full Charge 6 Test Parameters

The screenshot shows the 'View, Edit and Add Batteries' window. The 'Battery Model' is 4078, and it is the 23rd of 65 models. The battery parameters are: Model: 4078, Manufacturer: Saft, Part Number: (empty), Technology: (dropdown), Nominal Voltage: 25.0, Capacity: 43, Number of Cells: 20. The 'Cell' parameters are: Charge Min Voltage (V): 1.55, Charge Max Voltage (V): 35.00, Capacity Min Voltage (V): 20.00. The 'Battery' parameters are: Min Voltage (V): 31.00, Max Voltage (V): 35.00, OverTemp (C): 40. The 'Notes' section is empty. The 'Charge' tab is selected, showing a '10 Single Rate' mode. The 'Time (Hours)' is 14. The 'Charge Current' is 4.30 Amps, and the 'Charge Over Voltage' is 35.00 Volts. The 'Full Charge-6' tab is also visible.

Figure 25 - Sample Battery Model and 14 hour Charge Test Parameters

The screenshot shows the 'View, Edit and Add Batteries' window. The 'Battery Model' is 4078, and it is the 23rd of 71 models. The battery parameters are: Model: 4078, Manufacturer: Saft, Part Number: (empty), Technology: (dropdown), Nominal Voltage: 25.0, Capacity: 43.0, Number of Cells: 20. The 'Cell' parameters are: Charge Min Voltage (V): 1.55, Charge Max Voltage (V): 1.75, Capacity Min Voltage (V): 1.00. The 'Battery' parameters are: Min Voltage (V): 31.00, Max Voltage (V): 35.00, OverTemp (C): 40. The 'Notes' section is empty. The 'Capacity-1' tab is selected, showing a '20 Dual Rate' mode. The 'Main Charge' parameters are: Time (Hours): 2, Main Charge Current: 21.50 Amps, Main Over Voltage: 35.00 Volts. The 'Topping Charge' parameters are: Time (Hours): 4, Topping Charge Current: 4.30 Amps, Topping Charge Over Voltage: 35.00 Volts. The 'Full Charge-6' tab is also visible.

Figure 26 - Sample Battery Model and one hour Capacity Test Parameters

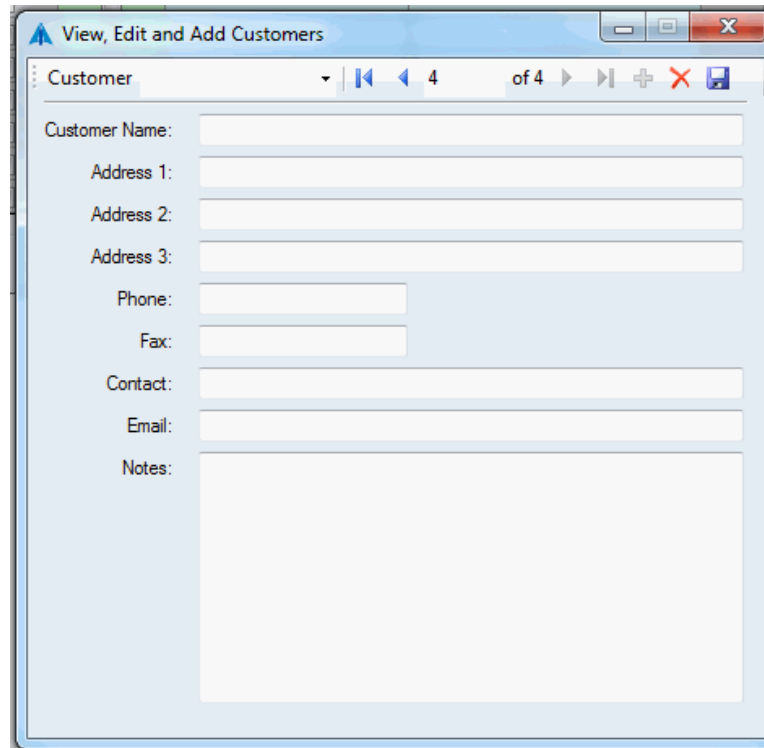
4.2 Customers

4.2.1. Enter the Customers Information

Note: Customers must be entered in the database before Work Orders can be created

4.2.2. Enter the Customer Name

4.2.3. Other information is optional



The screenshot shows a software window titled "View, Edit and Add Customers". At the top, there is a tab labeled "Customer" and a status bar indicating "4 of 4" records. The form contains the following fields:

- Customer Name: [Text Field]
- Address 1: [Text Field]
- Address 2: [Text Field]
- Address 3: [Text Field]
- Phone: [Text Field]
- Fax: [Text Field]
- Contact: [Text Field]
- Email: [Text Field]
- Notes: [Large Text Area]

Figure 27 - Screen for the entry of Customer Information

4.3 Operators List

- 4.3.1. From the Options Pull Down, open View, Edit and add Technicians (select + to add a new record).

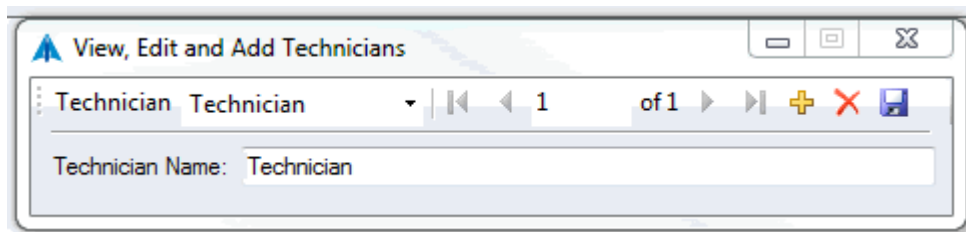


Figure 28 - Screen to enter/edit the names of the system operators

4.4 Add Customer Batteries

Note: Customers Batteries must be entered in the database before Work Orders can be created

- From the Work Orders pull-down menu select New Customer Battery and enter the Customer Battery Information - see [Figure 29].
- Make sure that all fields are blank before starting

4.4.1. Battery Model

Select the Battery Model from the Manage Batteries pull-down list

4.4.2. Serial Number

Enter the serial number as it appears in the battery nameplate

4.4.3. Customer

Enter the Customer Name.

4.4.4. Barcode

Enter the Barcode. If a Barcode is not used, leave it blank.

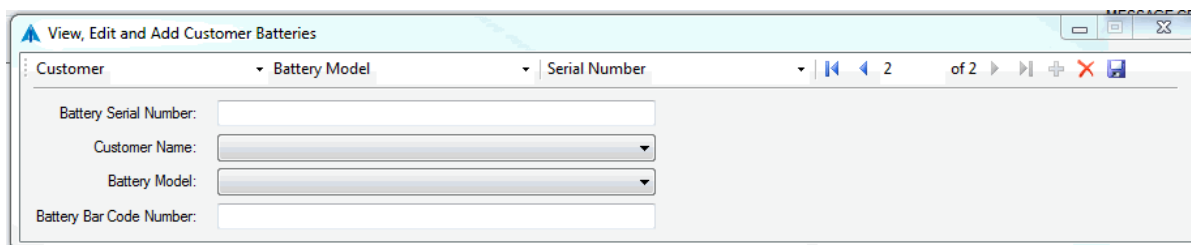
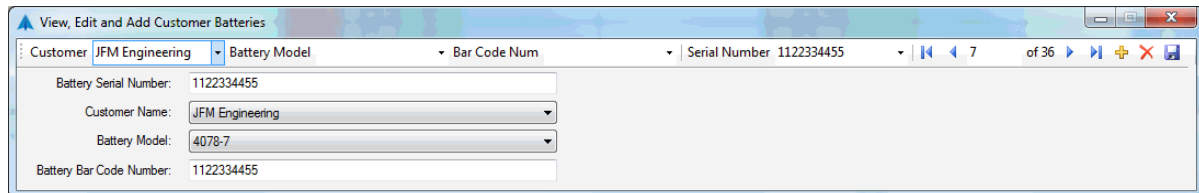


Figure 29 – View/Edit/Add Customer Battery Screen

4.5 Find Customer Batteries

- 4.5.1. Open the Manage Customer Batteries Pull-Down.
- 4.5.2. Customer Batteries can be located by Customer, Battery Model, Bar Code and Serial Number.
- 4.5.3. Click on the Pull-Downs to see the lists.
- 4.5.4. Use the scroll arrows to navigate from record to record.



The screenshot displays a software window titled "View, Edit and Add Customer Batteries". At the top, there are four search criteria: "Customer" (JFM Engineering), "Battery Model" (4078-7), "Bar Code Num" (1122334455), and "Serial Number" (1122334455). Below these, there are four input fields: "Battery Serial Number" (1122334455), "Customer Name" (JFM Engineering), "Battery Model" (4078-7), and "Battery Bar Code Number" (1122334455). On the right side, there are navigation controls showing "7 of 36" records, with arrows for navigating between records.

Figure 30 - Find Customer Battery Screen

5. Work Orders

5.1 Entering (creating) Work Orders

- 5.1.1. Open the **Manage Work Orders** Menu Pull-Down.
- 5.1.2. Search by the Customer or Serial Number
- 5.1.3. Select the Battery
- 5.1.4. Note that the Battery Information is already populated (not editable in this screen)

Figure 31 - Screen to enter information into a new Work Order

- 5.1.5. In the Work Order screen, enter the following information:
 - Work Order Number
 - Enter a new Date Received if different from the Date shown
 - Aircraft Type (optional)
 - Tail Number (optional)
 - Select Test Requested (pull down)
 - Notes (optional)
- 5.1.6. When all basic information has been entered click the **OK** button to store the new Work Order or click the **Close** button to close the screen without entering the new Work Order.

*Note: The **OK** button is not available until all required information is entered.*
- 5.1.7. Exit the screen by clicking **Close**

5.2 Viewing and Editing Work Orders

- 5.2.1. Pull down the Manage Work Orders Menu (top tool bar)
- 5.2.2. Search for the desired Work Order by the Customer/Serial Number/Work Order Number pull-downs
Note that if a Work Order is assigned, the number will not appear (cannot be edited until de-assigned)
Note also that editing information may conflict with prior generated data
- 5.2.3. Edit information as required
- 5.2.4. Click on the Diskette icon to save the information
- 5.2.5. Click Close to exit the screen

5.3 Closing Work Orders

- 5.3.1. Open the **Manage Work Orders** Pull-Down
- 5.3.2. Search for the desired Work Order by the Customer/Serial Number/Work Order Number pull-downs.
- 5.3.3. Open the Status Pull-Down and select Close

5.4 Deleting a Work Order

- 5.4.1. Pull down the Work Orders Menu (top tool bar)
- 5.4.2. Select Edit/Delete Work Orders
- 5.4.3. Search for the desired Work Order
- 5.4.4. Click X to remove it
Note that deleting a Work Order will render its data unrecoverable

5.5 Archiving a Work Order

Archiving the Work Orders reduces the database overload when searching for graphs and reports. If needed, they can be recalled. See [6.10], Viewing Graphical Results

- 5.5.1. After closing the work order (per [5.3]), select find and enter Closed as the status.
- 5.5.2. From the returned list, select the desired Work Order and Click Archive.

5.6 Selecting/deselecting the Work Order

5.6.1. Single Work Order (One battery connected to the C-Scan)

- Click on the Work Order section of the desired station
- The Select Work Orders Screen will come up showing available work orders

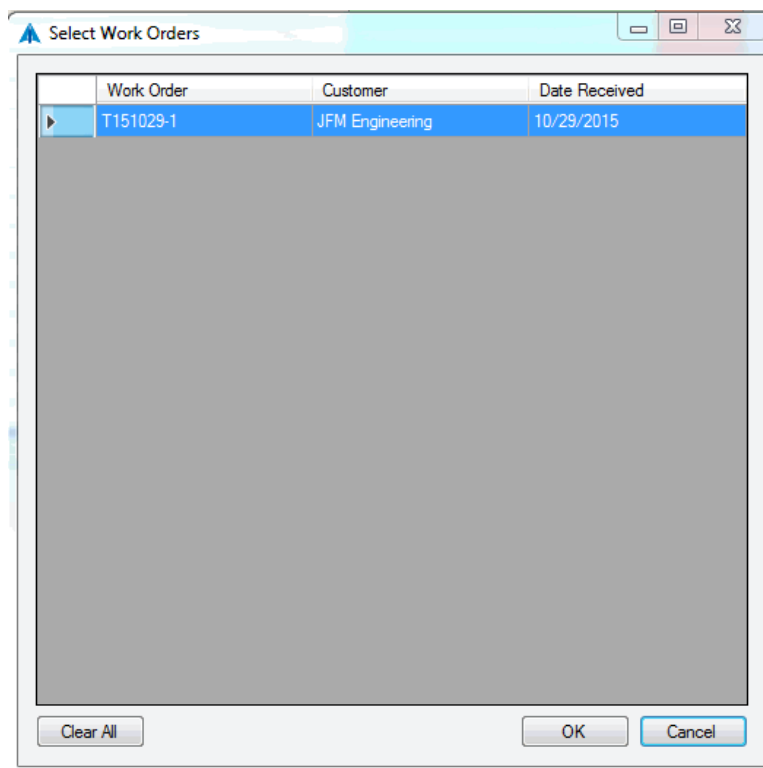


Figure 32 - Screen to select Work Orders

- Search for the desired Work Order (scroll down if needed) or Create a New Work Order.
- Highlight the Work Order in the Work Orders List. Then, click the OK button. The selected Work Order will appear in the small box. See [Figure 33]

	DT#	Work Order	Test
	0		
▶	1	T151029-1	
	2		
	3		
	4		
	5		

Figure 33 – Work Order assigned on DT #1

5.6.2. Multiple Work Orders (More than one battery connected to one C-Scan and one Charger-Analyzer).

Note: more than one battery in one C-Scan implies that the combined number of cells is no greater than 24 (the S-Can can work with one battery up to 24 cells, two batteries up to 12 cells each and three batteries up to 8 cells each – special cables required).

5.6.2.1. Search for the desired Work Orders.

5.6.2.2. Highlight the first Work Order in the Work Orders List. Then, click the OK button. The selected Work Order will appear in the small box.

5.6.2.3. Highlight the second Work Order in the Work Orders List. Then, click the OK button. The selected Work Order will appear in the small box after the first Work Order that was assigned.

	DT#	Work Order	Test
	0		
▶	1	T151221-1 T151221-2	
	2		
	3		

Figure 34 – Two Work Orders in the same C-Scan

5.6.3. Two C-Scan in one Charger-Analyzer (two Work Orders)

When testing more than one battery in one Charger-Analyzer (i.e. two 20 cell batteries) two C-Scans must now be associated with the Charger-Analyzer.

The C-Scan for the first one is the Master and the second one is the Slave.

With this configuration, the “Master” will be controlling the Charger-Analyzer (if a CCA) and it will be reading the current from the Charger-Analyzer and the battery temperature from the Temp-plate. The second C-Scan, the Slave, will only report voltage information from the battery that it is attached to.

- In addition, each of the batteries will have its own Work Order.
- Per figures [Figure 35] and [Figure 36], associate the Master C-Scan with Battery #1 and the Slave C-Scan with Battery #2.

DT#	Work Order	Test	Step	In Use	Record	E-Time	Recording Status	Link C.	CID	Charger Type	Charger Status	Auto Config
0				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				<input type="checkbox"/>
1	T151221-1			<input checked="" type="checkbox"/>	<input type="checkbox"/>			<input checked="" type="checkbox"/>	1-M	ICA SMC	RESET	<input type="checkbox"/>
2	T151221-2			<input checked="" type="checkbox"/>	<input type="checkbox"/>			<input checked="" type="checkbox"/>	1-S	ICA SMC	RESET	<input type="checkbox"/>
3				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				<input type="checkbox"/>

Figure 35 - Data Terminals #1 (Master) and #2(Slave) are associated with Charger-Analyzer #1

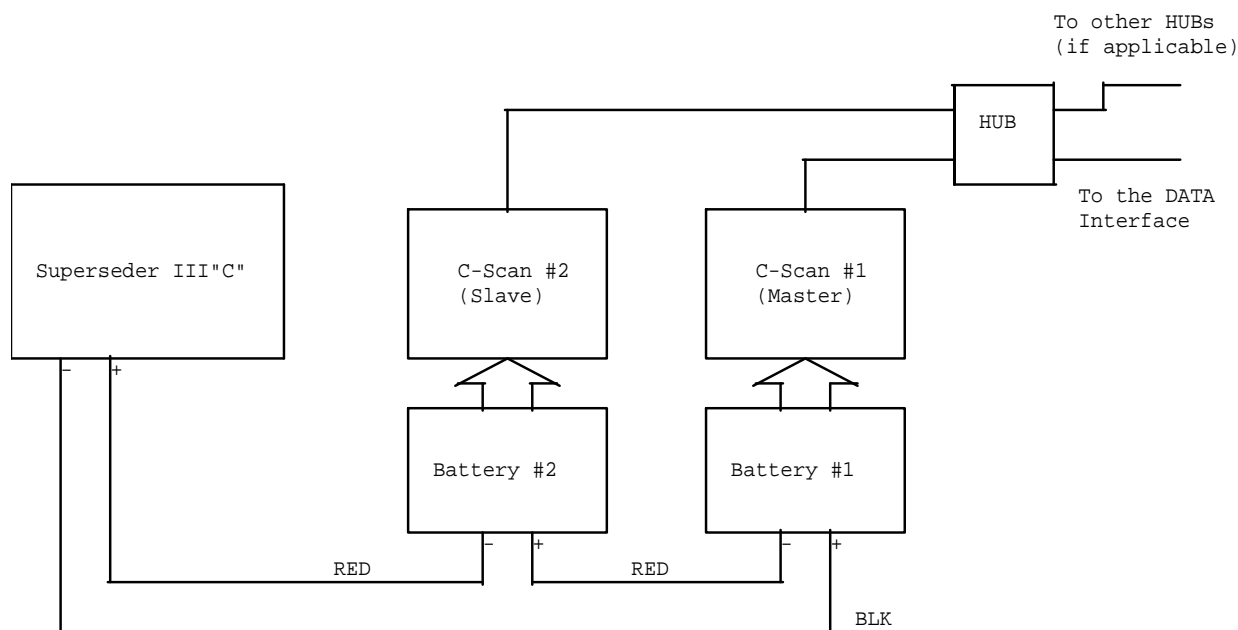


Figure 36 - Two C-Scan with one Charger-Analyzer

6. Data Acquisition (to take battery readings)

6.1 Connecting a Nickel-Cadmium Battery with available cell terminals.

Connection to the battery by way of a Universal Cell Cable with clips or with a battery specific Crown.

Note that when connecting a Universal Cell Cable or a Crown, the C-Scan will recognize what is connected to it and will display its description in the upper section of the right hand window (i.e. 20 Cell Cable, 2x11 Crowns, etc.) – see [Figure 37]

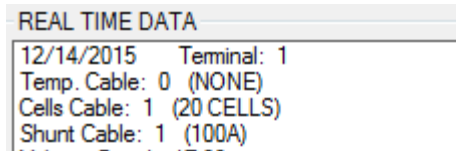


Figure 37 - Screen showing information on cables detected

6.1.1. Using Cell Clips

- Select a Cells Cable with clips consistent with the number of cells of the battery. Connect the Cells Cable to the C-Scan via the 50-conductor ribbon cable.
- Connect the BLK clip to the most negative side of the battery (negative post of the first cell) and connect the remaining cell clips to the corresponding cells positive post.
Note: cells are numbered from the most negative terminal.
Under OPTIONS the cell order can be reversed but this is for display and reporting purposes only. Internally, the most negative remains as cell #1
- Monitor the Cell voltages in the bottom left side of the screen to verify that all cells are connected properly as per [6.2]

6.1.2. Using a Crown

- Select a Crown consistent with the battery type
- Connect to the C-Scan via the 50-conductor ribbon cable.
- Monitor the Cells voltages in the bottom left side of the screen to verify that all cells are reading properly as per [6.2]

6.2 Testing the connection

6.2.1. Select the cells order.

- The BTAS16 allows for cells to be numbered from the most negative side or from the most positive side of the battery.
Note: Internally, all data is referenced from the most negative terminal; what changes is how it is displayed.
- Open the options menu and select the required order
- Note: All examples are shown from the most negative side.

6.2.2. After the C-Scans have been connected to the battery, verify that all connections are proper by viewing the Bar Graph (bottom screen) and the cell voltage readings (right screen). Any bars, which are red, or with an abnormally high value, may indicate an error.

6.2.3. If any of the cells read full scale (2V) and negative, it indicates that a connection is open and or reversed.

Note: A cell with a true negative voltage will display without a corresponding overscale bar (this is a true reading!).

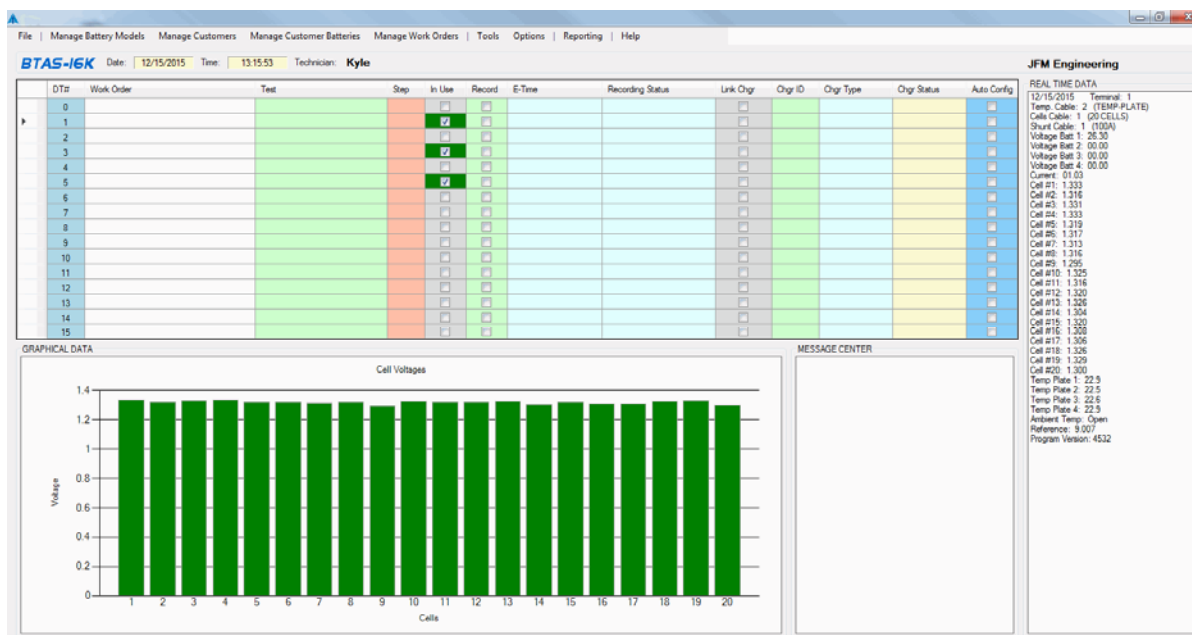
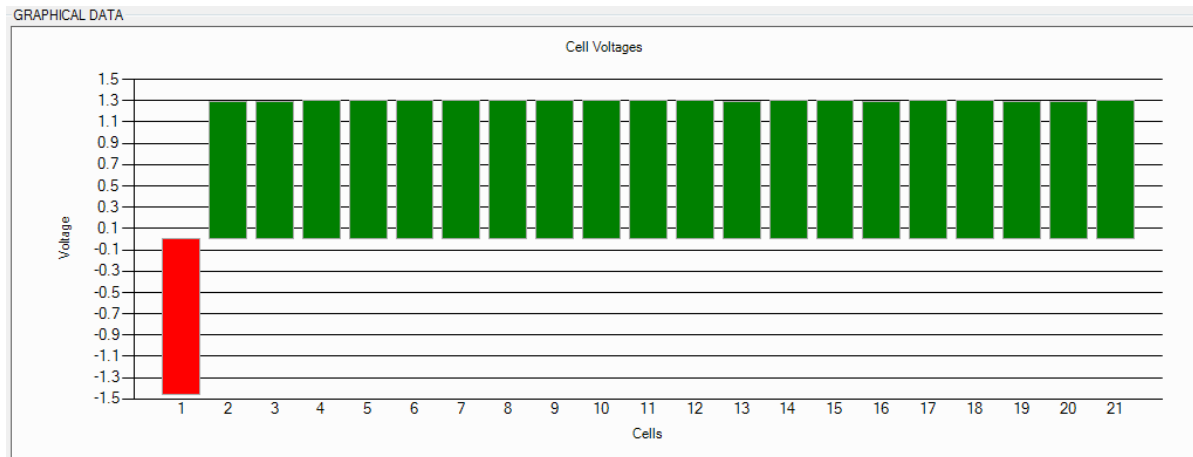


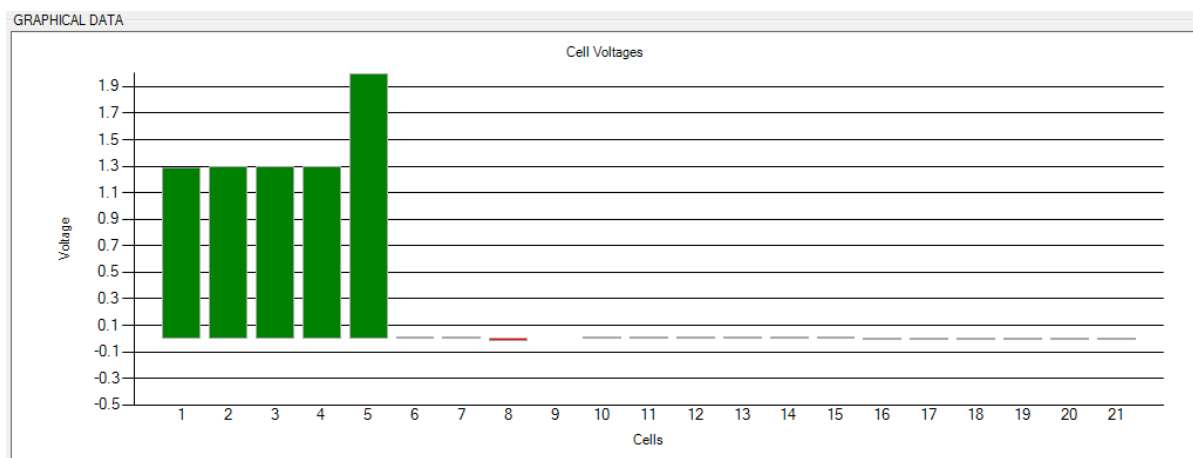
Figure 38 - Main Screen showing information from various Data Terminals

6.2.4. Bar graph showing the effect of the Common lead disconnected

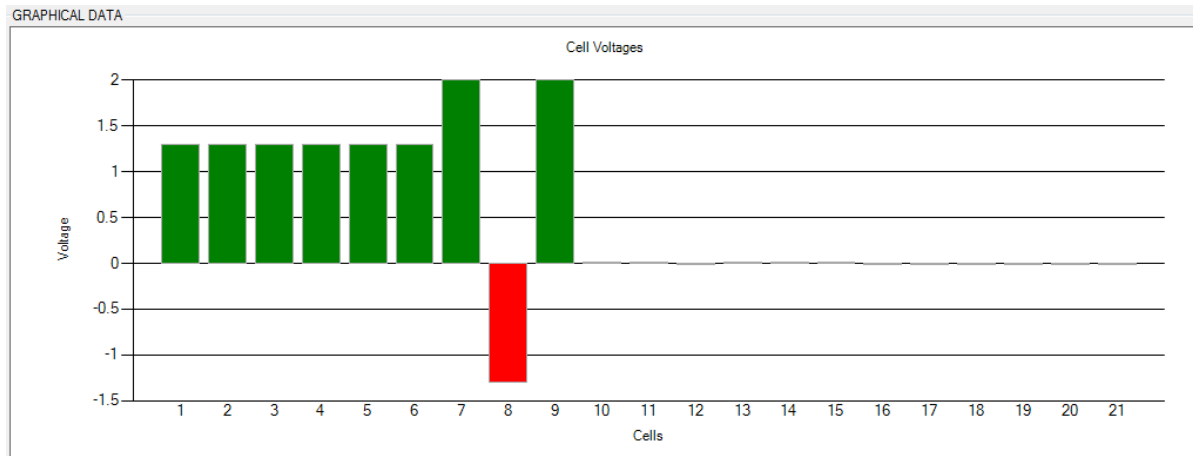
**Figure 39 - Common lead disconnected**

6.2.5. Bar Graph showing cells 1-4 connected

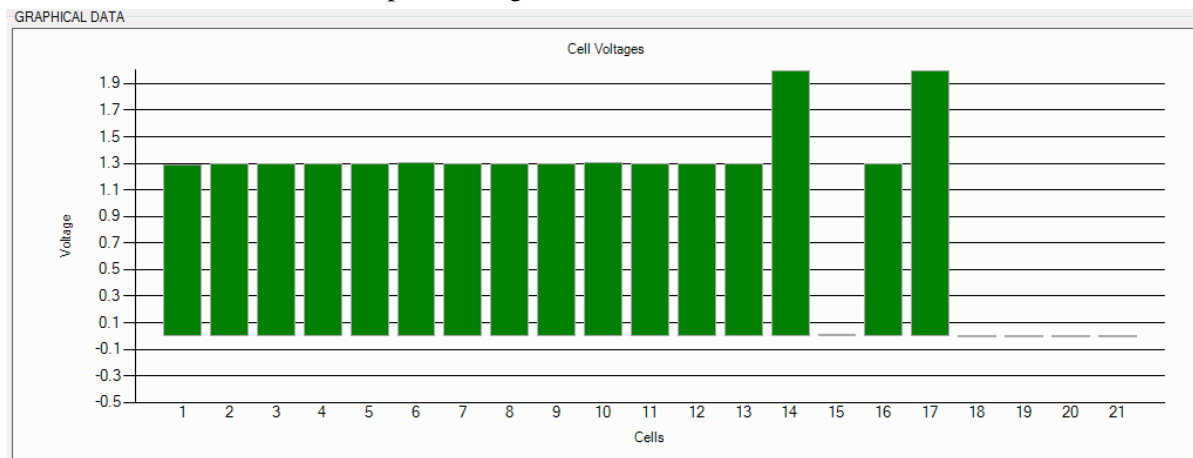
Note that cell #5 is also affected

**Figure 40 – Cells 1-4 conected**

6.2.6. Bar Graph showing cells 1-8 connected with #7 and #8 reversed

**Figure 41 – Cells 1-8 connected with #7 and #8 reversed**

6.2.7. Bar Graph showing Cells 1-16 connected with #14 connected with #15

**Figure 42 – Cells 1-16 connected with #14 connected to #15**

6.3 Connecting a Battery with no blocks or cell terminals

Connection to the battery(ies) by way of a Four Battery Cable (with clips – two clips for each of the batteries), as applicable to small battery packs or sealed Lead-Acid batteries where there is no access to cells.

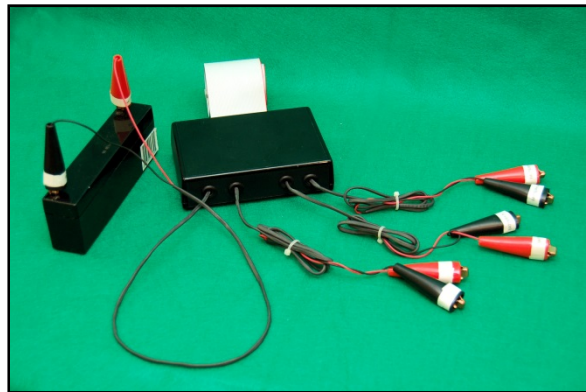


Figure 43 – Four Battery Cable

- Note that when connecting this cable, the C-Scan will recognize it as cable #10 – see [Figure 46]
- See [Figure 44] and [Figure 45] for samples of batteries with no accessible blocks/cells



Figure 44 – SLA Battery with no accessible block terminals



Figure 45 – Nickel-Cadmium Battery with no accessible cell terminals

- The Shunt Cable shown will correspond to the type of Charger being used

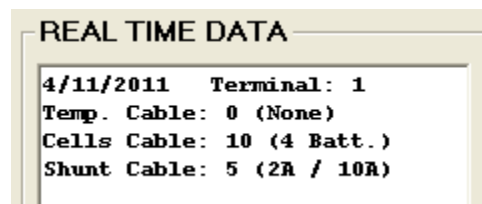


Figure 46 - Screen showing information on cables detected

6.3.1. Connecting the Four Battery Cable to one or more small Battery Packs

For this application you can connect one, two, three, or four packs in series depending on the total voltage capability of the Charger being used.

- Connect each of the clip pairs to each of the batteries being tested.
- Monitor each of the battery voltages in the REAL TIME DATA Screen.
- See [Figure 47]

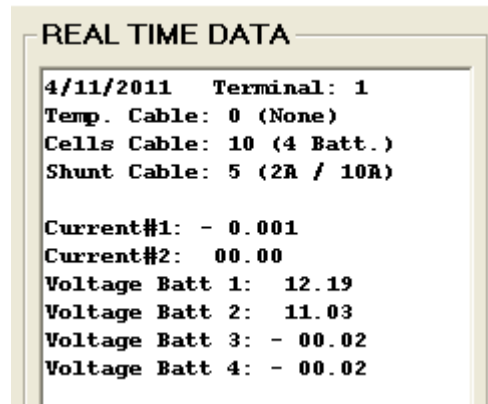


Figure 47 - Screen showing information on two batteries connected

6.3.2. Connecting the Four Battery Cable to one or two mainship batteries.

For this application you can connect one or two mainship batteries in series depending on the total voltage capability of the Charger being used.

- Connect each of the clip pairs to each of the batteries being tested.
- Monitor each of the battery voltages in the REAL TIME DATA Screen.

6.3.3. Connecting the Four Battery Cable to one battery with accessible blocks/terminals.

This is applicable for batteries where the individual block connections become available after removing the lid.

- Battery #1 can be used to measure the entire battery while Battery #2 and #3 can be used to monitor each block individually (Battery #4 is not used).
 - See [Figure 48] for a battery with available blocks and terminals
- Monitor each of the battery voltages in the REAL TIME DATA Screen.



Figure 48 – SLA Battery with accessible blocks

6.4 Programming the Test

- 6.4.1. Click on the Test section
- 6.4.2. Select the Test from the pull down menu

6.5 Recording the Test Data

- 6.5.1. Activate the station, if not already activated, in the In Use section.
- 6.5.2. A check mark will appear and the region will turn green.
- 6.5.3. Click on Link if the Charger-Analyzer is equipped for it.
- 6.5.4. Setup the Charger-Analyzer for the test to be performed or allow the program to load the Test Parameters if it is an Intelligent Charger-Analyzer.
- 6.5.5. When an Intelligent Charger-Analyzer (ICA) is connected, the BTAS program checks for consistency between the Test selected in the Main Screen and the Mode programmed in the ICA. If an inconsistency is detected an error message is generated.
- 6.5.6. If the Rec (record) section is green, activate recording by clicking on it.
 - A message screen will come up confirming that a new test will be started.
 - The Charger-Analyzer will start.
- 6.5.7. The Status section will indicate the number of readings taken and the total number of readings. The area is Green while readings are taken and Orange when the total number of readings has been reached.
- 6.5.8. The E-time section will indicate the Elapsed Time in hours, minutes and seconds.
- 6.5.9. Monitor in the screen the progress of the Battery Voltage, Cell Voltages, Battery Current and the Battery Temperature (if the Temp-Plate option is installed).

	DT#	Work Order	Test	Step	In Use	Record	E
	0				<input type="checkbox"/>	<input type="checkbox"/>	
▶	1	T151221-1	Capacity-1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2				<input type="checkbox"/>	<input type="checkbox"/>	
	3				<input type="checkbox"/>	<input type="checkbox"/>	
	4				<input type="checkbox"/>	<input type="checkbox"/>	

Figure 49 - Recording test data

6.6 Sample Screens

6.6.1. As received, battery in poor charge condition

- Red indicates cells under 1.2V
- Orange indicates cells between 1.2V and less than 1.25V
- Green indicates 1.25V or above

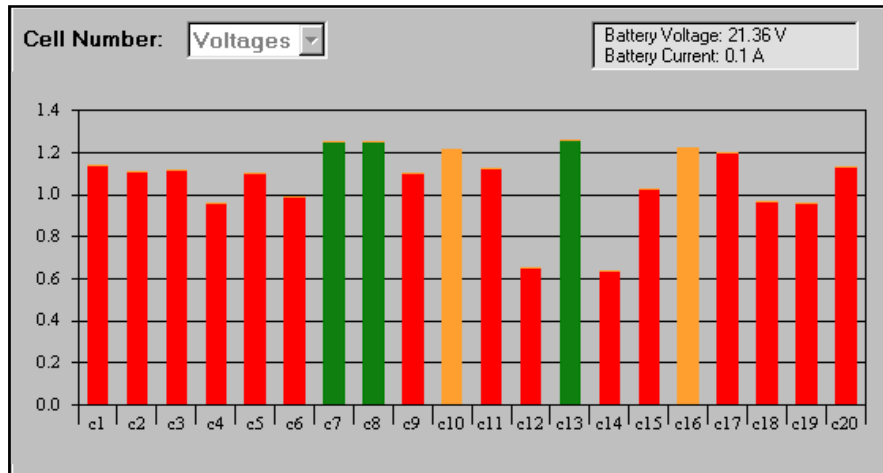


Figure 50 - Battery cells with colors for “AS RECEIVED”

6.6.2. Same battery, beginning of charge

- Yellow indicates cells under 1.2V
- Orange indicates cells between 1.2V and less than 1.25V
- Green indicates 1.25V or above

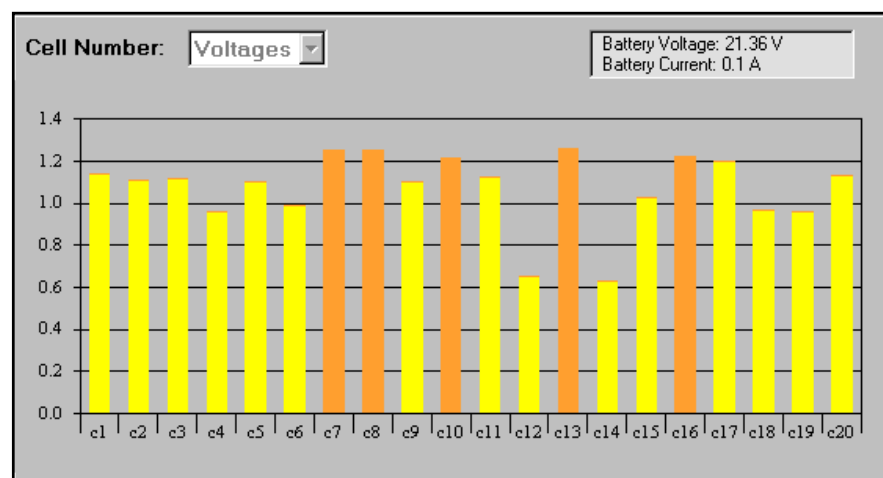


Figure 51 - Same battery cells with colors at the beginning of “CHARGE”

6.6.3. Same battery during charge

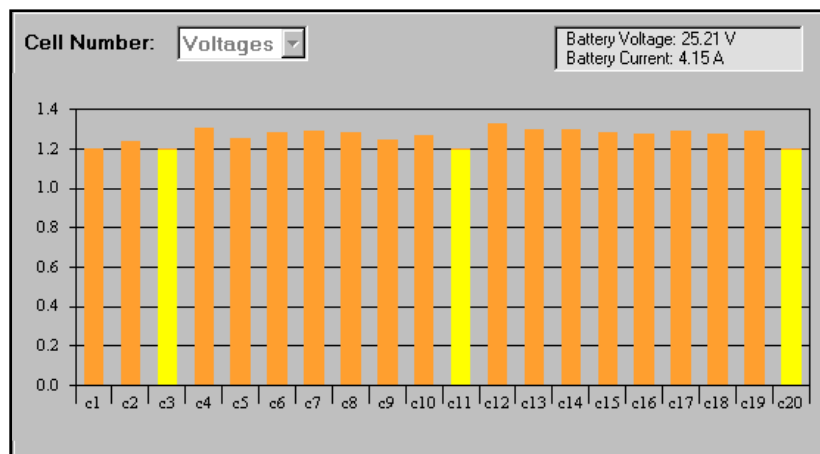


Figure 52 - Same battery cells with colors during “CHARGE”

6.6.4. Same battery, further into charge

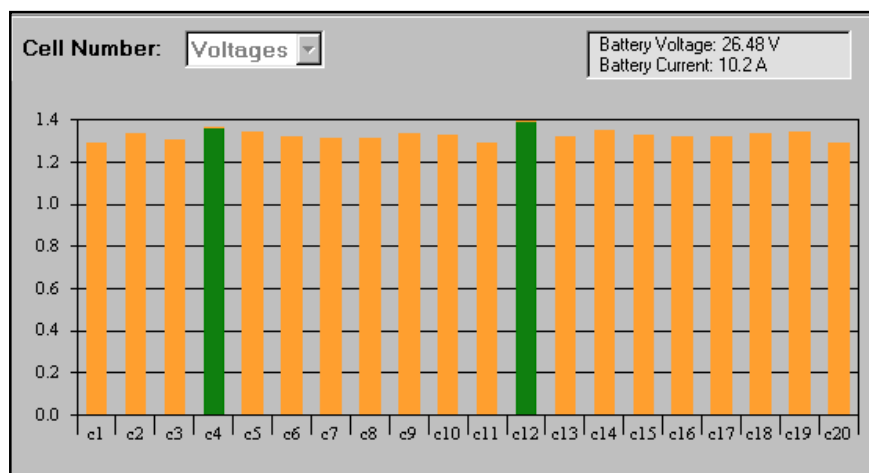


Figure 53 - Same battery with cells, showing bar colors further into “CHARGE” (higher cell voltages)

6.6.5. Same battery, capacity failure

- Red indicates less than 1V or reversed
- Orange indicates between 1.00V and 1.05V (marginal capacity)
- Green indicates 1.05V or greater

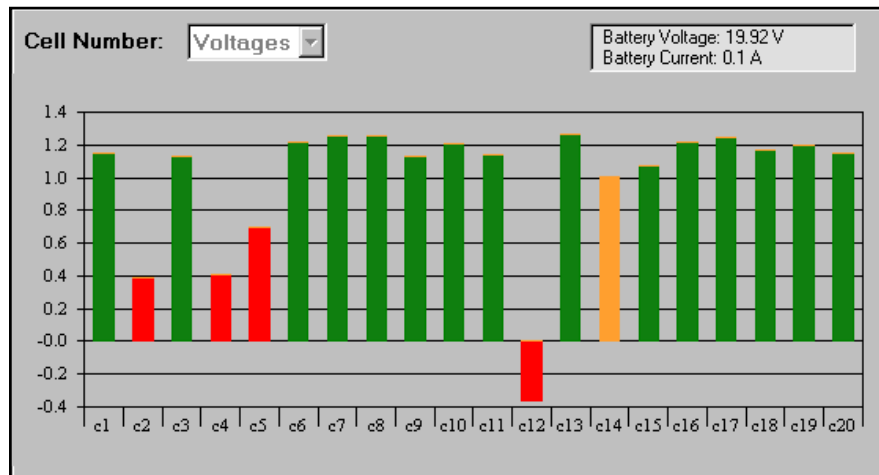


Figure 54 - Screen showing bar colors for the cells of a battery during “DISCHARGE”

6.7 Stopping the Test

Click in the **Rec.** section. A message screen will come up confirming that the readings will be stopped.

6.8 Resuming the Test

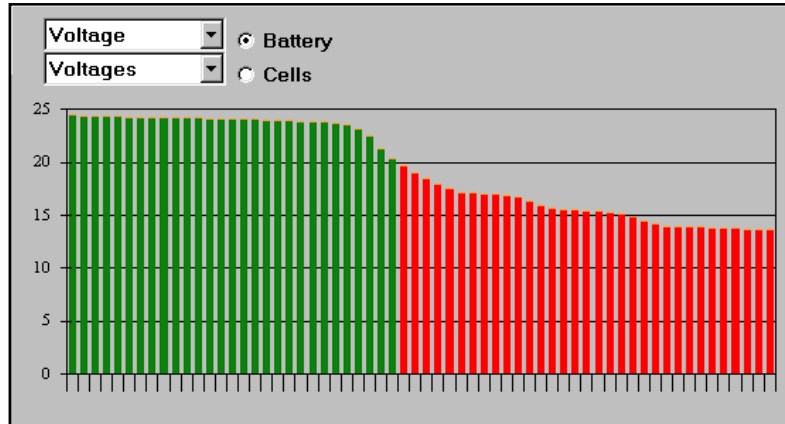
Click in the **Rec.** section. A message screen will come up asking if you wish to re-start the Test, or to start a new one.

6.9 Viewing Real Time Graphical Results (Main Screen)

The Bar Graph display can be selected to show Battery or Cell information via the respective pull down selection

6.9.1. The Battery information consists of Battery Voltage vs. Time, Battery Current vs. Time and Battery Temperature vs. Time.

- Battery voltage during discharge.
The color change indicates the transition into “Capacity Failure”



**Figure 55 - Screen showing battery voltage vs. time.
Note the color change as the battery fails capacity**

6.9.2. The Cell information consists of Real Time Cell Voltages (all cells) and Individual Cell Voltages vs. Time

Individual cell during discharge

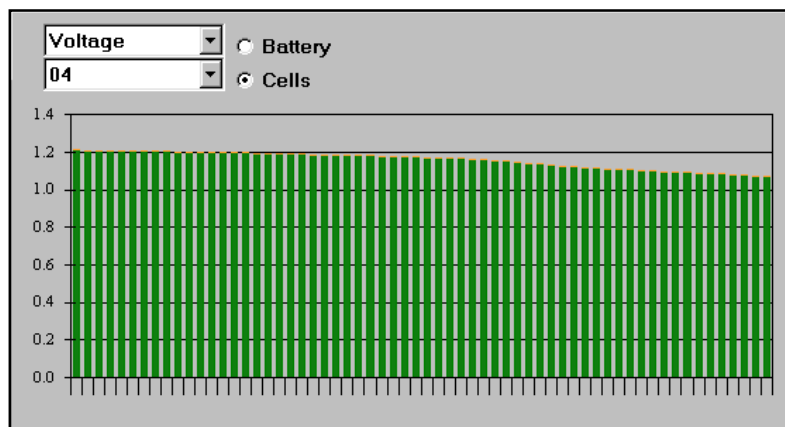


Figure 56 - Screen showing a cell voltage vs. time during capacity testing

6.10 Viewing Graphical Results

6.10.1. Click on **Graphs** and select the desired Work Order

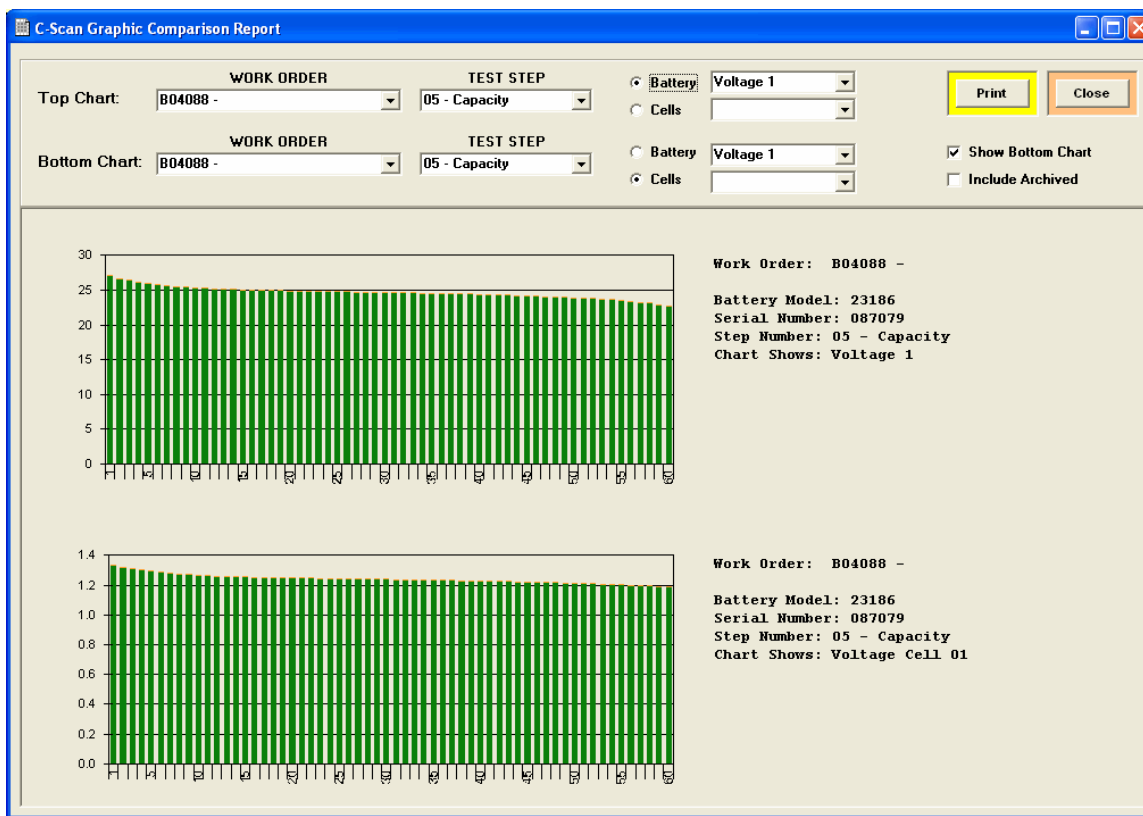


Figure 57 - Graphical Comparison Screen

- 6.10.2. Select **SHOW BOTTOM CHART** to compare results
- 6.10.3. Select the **WORK ORDER** from the pull down
 - Top Chart for only one result
 - Top and Bottom Chart for results comparison
- 6.10.4. Select the **TEST STEP** from the pull down
 - Top Chart for only one result
 - Top and Bottom Chart for results comparison (e.g. First and Second Capacity Test)
- 6.10.5. Select **BATTERY** or **CELLS** data
 - Select **BATTERY** to view battery data such as Voltage, Current or Temperature
 - Select **CELLS** to view cells data such as All Cell Voltages or individual Cell Voltage (by cell number)

6.11 Viewing Numerical Results

- 6.11.1. Click on **View Report** and select the desired Work Order

Note: In most cases three print requests are needed, one for the basic data, one for the cell data and one for the summary (the exception is when the “Four Battery” cable is used, in which case there are no cell readings, only battery readings).

- 6.11.2. Select Scan Data for the basic results (total voltage, current and temperature)

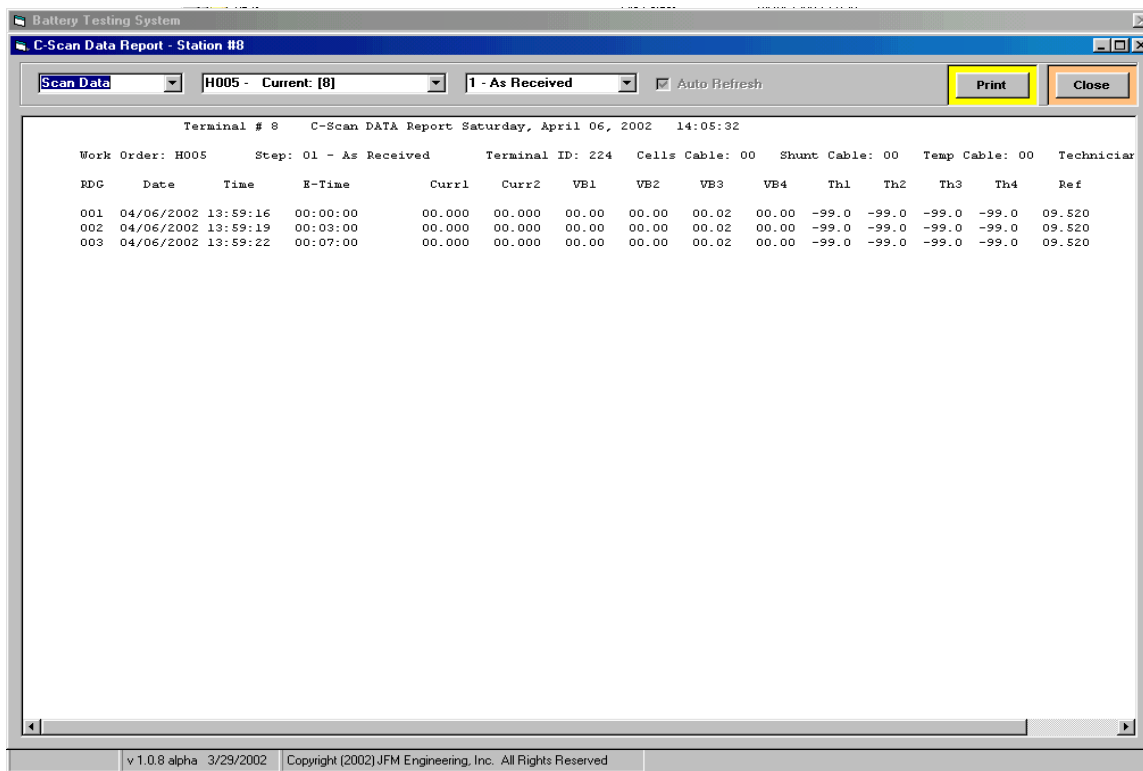


Figure 58 - Report with main battery data (reading number, date & time, Elapsed Time, Battery Voltage, Battery Current and Temperatures)

6.11.3. Select Cell Data for Cell Voltages

Battery Testing System
C-Scan Data Report - Station #8

Cell Data | H005 - Current: [8] | 1 - As Received | ☒ Auto Refresh | **Print** | **Close**

Terminal # 8 C-Scan DATA Report Saturday, April 06, 2002 14:06:50

Work Order: H005 Step: 01 - As Received Terminal ID: 224 Cells Cable: 00 Shunt Cable: 00 Temp Cable: 00 Technician: Edma

RDG	E-Time	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
001	00:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00
002	00:03:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.27	0.00	0.00	0.00	0.00	0.00
003	00:07:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.10	0.00	0.00	0.00	0.00	0.00

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Figure 59 - Report with cells data (reading number, Elapsed Time, Cell Voltages)

6.11.4. Select Test Summary for a summary report of cell readings

Battery Testing System
C-Scan Data Report - Station #11

Test Summary | B0206 - | 1 - Full Charge-4 | ☒ Auto Refresh | **Print** | **Close**

Terminal # 11 C-Scan DATA Report Saturday, May 18, 2002 17:50:02

Work Order: B0206 Step: 01 - Full Charge-4 Terminal ID: 227 Cells Cable: 01 Shunt Cable: 00 Temp Cable: 00 Technician:

RDG	E-Time	Voltage	Cell	Status
037	03:56:01	1.63	Cell 01:	OK
037	03:56:01	1.65	Cell 02:	OK
037	03:56:01	1.62	Cell 03:	OK
037	03:56:01	1.63	Cell 04:	OK
037	03:56:01	1.62	Cell 05:	OK
037	03:56:01	1.63	Cell 06:	OK
037	03:56:01	1.63	Cell 07:	OK
037	03:56:01	1.65	Cell 08:	OK
037	03:56:01	1.64	Cell 09:	OK
037	03:56:01	1.63	Cell 10:	OK
037	03:56:01	1.64	Cell 11:	OK
037	03:56:01	1.63	Cell 12:	OK
037	03:56:01	1.61	Cell 13:	OK
037	03:56:01	1.59	Cell 14:	OK
037	03:56:01	1.65	Cell 15:	OK
037	03:56:01	1.64	Cell 16:	OK
037	03:56:01	1.65	Cell 17:	OK
037	03:56:01	1.66	Cell 18:	OK
037	03:56:01	1.64	Cell 19:	OK
037	03:56:01	1.66	Cell 20:	OK

6.11.5. Select Work Order Summary for a summary report of all tests performed

Battery Work Order Summary Report																							Page 1	
=====																								
Work Order		Date		Customer				Battery				S/N		Cells		A-Hr.	Main	Top	Slow Ch.		Capacity			
T031403A		03/14/2003		JFM Engineering, Inc.				7-75M3				NSN		7		75	40A/2h	8A/4h	A/h		40A/115m			

Test Performed			Time Started				Time Completed				Station		Charger		Technician		Notes							
01 As Received			03/14/2003 09:55:25				03/14/2003 09:55:25				7		Superseder		Edmundo									
01	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C01	
min	1.22	1.22	1.22	1.22	1.22	1.22	1.22		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.5	
Test Performed			Time Started				Time Completed				Station		Charger		Technician		Notes							
02 As Received			03/14/2003 09:57:31				03/14/2003 09:57:31				7		Superseder		Edmundo									
41	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C01	
min	1.32	1.31	1.30	1.31	1.31	1.31	1.32		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	
Test Performed			Time Started				Time Completed				Station		Charger		Technician		Notes							
03 Full Charge-6			03/14/2003 09:58:46				03/14/2003 09:58:46				7		Superseder		Edmundo									
05:57	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C01	
hrs	1.73	1.73	1.77	1.76	1.74	1.75	1.76		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.5	
Test Performed			Time Started				Time Completed				Station		Charger		Technician		Notes							
04 Custom Capacity			03/17/2003 08:53:28				03/17/2003 08:53:28				7		Superseder		Edmundo									
01:59	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C01	
hrs	1.00	1.05	1.06	1.07	1.06	1.05	0.92		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.2	

Figure 61 - Summary Report with cell voltage results from all tests performed

6.11.6. Select Work Order Log for a list of all tests performed for a specific Work Order.

Work Order Log for: T022103-1 Monday, March 10, 2003 1:03:52 PM																						
Test Performed	Time Started				Time Completed				Station		Charger		Technician		Notes							
01 As Received	2/21/03 10:02:32				2/21/03 10:02:32				5		Superseder		Pepe									
02 As Received	2/21/03 13:22:17				2/21/03 13:22:17				7		Superseder		Pepe									
03 As Received	2/21/03 13:22:25				2/21/03 13:22:25				7		Superseder		Pepe									
04 Full Charge-6	2/24/03 08:26:37				2/24/03 08:26:37				7		Superseder		Pepe									
06 Full Charge-6	2/25/03 09:25:43				2/25/03 09:25:43				7		Superseder		Pepe									
07 Custom Capacity	2/28/03 08:47:17				2/28/03 08:47:17				7		Superseder		Pepe									
08 Full Charge-6	2/28/03 12:25:09				2/28/03 12:25:09				7		Superseder		Pepe									
09 Custom Capacity	3/3/03 08:28:13				3/3/03 08:28:13				7		Superseder		Pepe									
10 Custom Charge	3/3/03 11:20:27				3/3/03 11:20:27				7		Superseder		Pepe									
11 Custom Capacity	3/4/03 08:43:49				3/4/03 08:43:49				7		Superseder		Pepe									
12 Custom Charge	3/5/03 12:31:47				3/5/03 12:31:47				7		Superseder		Pepe									
13 Full Charge-6	3/5/03 12:32:17				3/5/03 12:32:17				7		Superseder		Pepe									
14 Custom Capacity	3/7/03 09:38:02				3/7/03 09:38:02				7		Superseder		Pepe									
15 Custom Charge	3/7/03 13:34:20				3/7/03 13:34:20				7		Superseder		Pepe									
16 Custom Charge	3/7/03 13:34:33				3/7/03 13:34:33				7		Superseder		Pepe									
17 Custom Capacity	3/10/03 09:05:23				3/10/03 09:05:23				7		Superseder		Pepe									

Figure 62 - Work Order Log with record of tests performed

6.12 Printing results

6.12.1. Click **Print** to print the data displayed

7. Charger-Analyzer Monitoring and Control

This is for the monitoring and control of specially modified (“C” modification) versions of the Superseder III and MasterCharger and for the new Intelligent Charger-Analyzers (SupersederXG, SuperMasterCharger, 24-400XG and MiniMasterCharger) that communicate directly with the BTAS.

7.1 Modified Charger-Analyzers

- 7.1.1. Connect the control cable from the rear of the C-Scan to the control connector (or cable) on the Charger-Analyzer. Note: for Intelligent Charger-Analyzers see [7.2].



Figure 63 - C-Scan Rear Panel

- 7.1.2. Verify that the column named “Charger” turns green if the Charger-Analyzer is ON or red if it is OFF.

[illegible]

Figure 64 – Charger-Analyzer status

- 7.1.3. Click on the little box inside the area. If the power is ON for the Charger-Analyzer, then the color will change from green to yellow to indicate that the charger is now controlled (held) by the C-Scan.

Recording Status	Link Chgr	Chgr ID	Chgr Type	Chgr Status
	<input type="checkbox"/>			
	<input checked="" type="checkbox"/>	1	ICA Mini	Online
	<input type="checkbox"/>			

Figure 65 - Charger is ON and Linked to the C-Scan Data Terminal

- 7.1.4. Program the Charger-Analyzer and start it. Verify that it will not run.
- 7.1.5. Start the test in the BTAS16 screen and verify that the Charger-Analyzer is now running (current is flowing). If the system detects that there is no current in the Charger-Analyzer (three attempts), the program will stop the test.
- 7.1.6. The test (recording) will be terminated at the completion of the programmed test in the BTAS16 or if the Charger-Analyzer has stopped (no current).

7.2 Intelligent Charger-Analyzers

- 7.2.1. Connect a control cable to the Rear Panel of the Charger-Analyzer (connector labeled BTAS) – see [Figure 66]

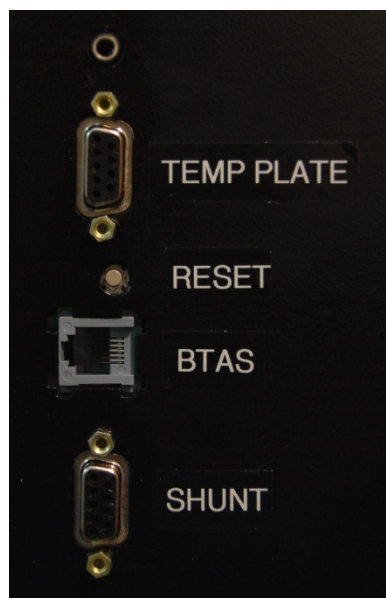


Figure 66 – Rear Panel Connections

- 7.2.2. Enter a Terminal ID number (0 to 15) on the Charger-Analyzer
- 7.2.3. Enter a Work Order
- 7.2.4. Select from the **Charger** column pull-down, the number assigned to the Charger-Analyzer
- 7.2.5. Verify that the Charger-Analyzer is recognized – see [Figure 67]

DATA TERMINAL STATUS												
DT#	Work Order	Test	Step	In Use	Rec.	E-Time	Status	Link1	Charger	Chg Type	Chg Status	
0				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
1	T090922-2	As Received		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0:00:00		<input type="checkbox"/>	1	ICA Super	Online	
2				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
3				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
4				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
5				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
6				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
7				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
8				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
9				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
10				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
11				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
12				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
13				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
14				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
15				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				

Figure 67 – Screen showing that the Charger is On Line (controllable)

DATA TERMINAL STATUS												
DT#	Work Order	Test	Step	In Use	Rec.	E-Time	Status	Link1	Charger	Chg Type	Chg Status	
0				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
1	T090923-1	Top Charge-1	01	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0:00:52	Recording 1 of 61	<input checked="" type="checkbox"/>	1	ICA Super	Run	
2				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
3				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
4				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
5				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
6				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
7				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
8				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
9				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
10				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
11				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
12				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
13				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
14				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
15				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				

Figure 68 – Screen showing that the Charger is running

DATA TERMINAL STATUS												
DT#	Work Order	Test	Step	In Use	Rec.	E-Time	Status	Link1	Charger	Chg Type	Chg Status	
0				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
1	T090923-1	Top Charge-1	01	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0:01:50	Recorded 2 of 61	<input checked="" type="checkbox"/>	1	ICA Super	Hold	
2				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
3				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
4				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
5				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
6				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
7				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
8				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
9				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
10				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
11				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
12				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
13				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
14				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
15				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				

Figure 69 – Screen showing that the Charger is on hold

8. Water Level

To record the water dispensed into each of the cells, select the Data Terminal (DT#) with the applicable Work Order and open the Water Level pull-down.

Verify that the window opens with the required Work Order number or manually select a different Work Order.

8.1 Manual

- Enter the amount of water dispensed into each of the cells in CCs (no decimals)
- When finished, click on Save Data to store the information under the selected work order.
- Close the Water Level screen

8.2 Automatic

- Set the MasterFiller to be ready to communicate with BTAS.
- Click Acquire for BTAS to interrogate the MasterFiller.
- Verify that the data received is proper (edit manually if needed)
- Click on Save Data to store the information under the selected work order.
- Close the Water Level screen

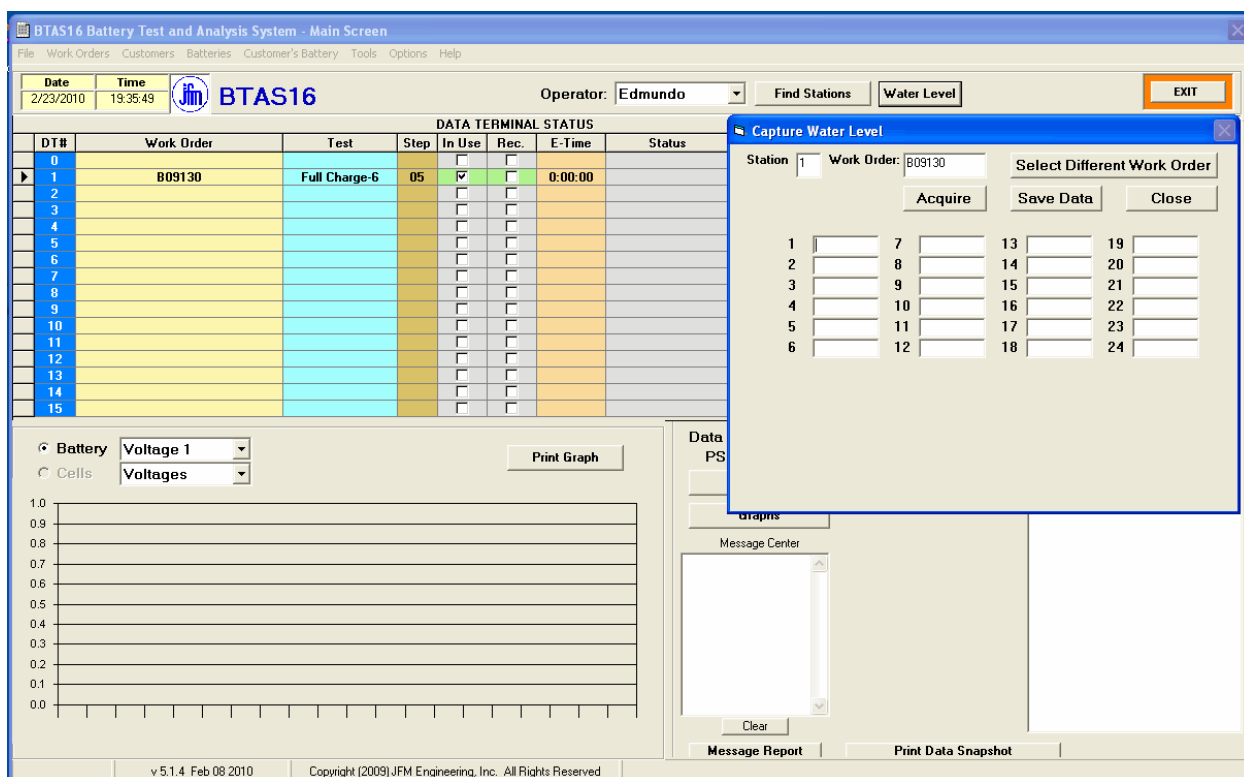


Figure 70 – Main Screen with Water Level sub Screen

9. Calibration

There are no adjustments to perform on any part of this system. A verification of performance, however, is to be performed to determine if the system is functioning correctly.

In case of uncorrectable situations, contact the distributor or manufacturer for applicable repairs.

Perform at least once per year or at any time, to determine the integrity of the system.
(See Verification of Performance)

10. Verification of Performance

10.1 Cell Simulator

- 10.1.1. The **Cell Simulator** generates simulated cell voltages, battery voltages, currents and temperatures as needed for system test and verification.
- 10.1.2. The stair case pattern and resulting screen colors are used to quickly determine if all cell channels are reading correctly without the need for actual voltage measurements.
- 10.1.3. All numerical information is made available at the right hand window of the Main Screen and can be printed to have a record of it. Do a right click and select to print the data,
- 10.1.4. The **Cell Simulator** can be set to simulate a 20 cell battery, two 11 cell batteries, three 7 cell batteries or display all 24 cell channels.
- 10.1.5. In addition, front panel switches can be used to simulate the Charger-Analyzer connected/disconnected and with power-on/power-off.
- 10.1.6. Simulation of a 20-cell battery (default simulation mode)

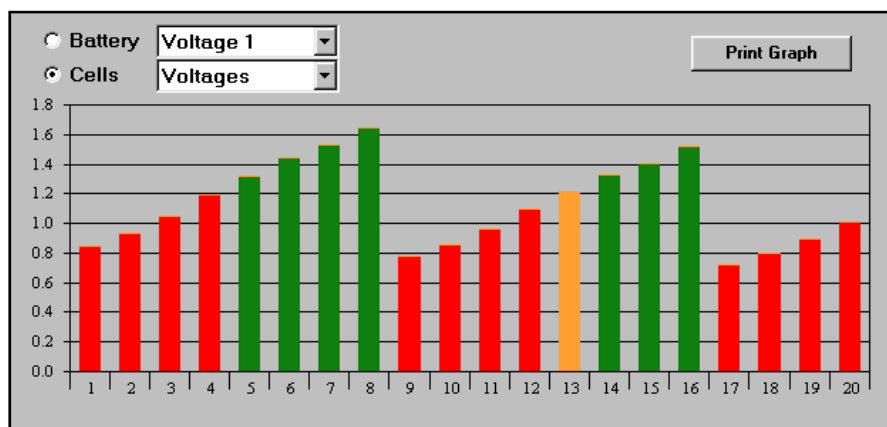


Figure 71 - Cells simulation for a 20 cell battery

10.1.7. Simulation of two 11-cell batteries

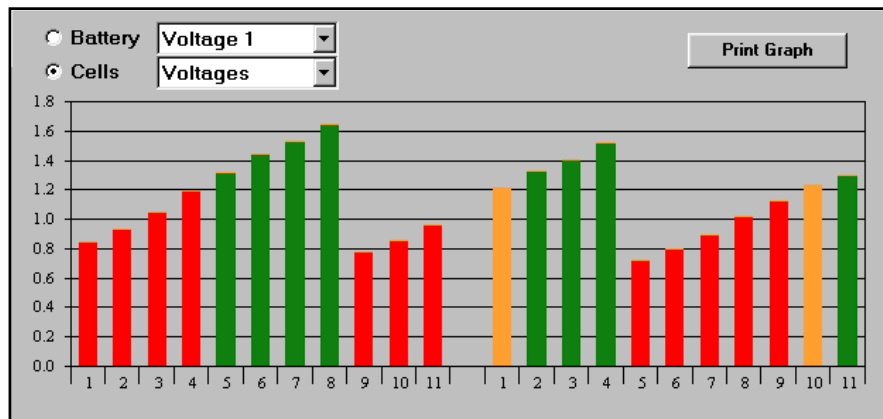


Figure 72 - Cells simulation for two eleven cell batteries

10.1.8. Simulation of three 7-cell batteries.

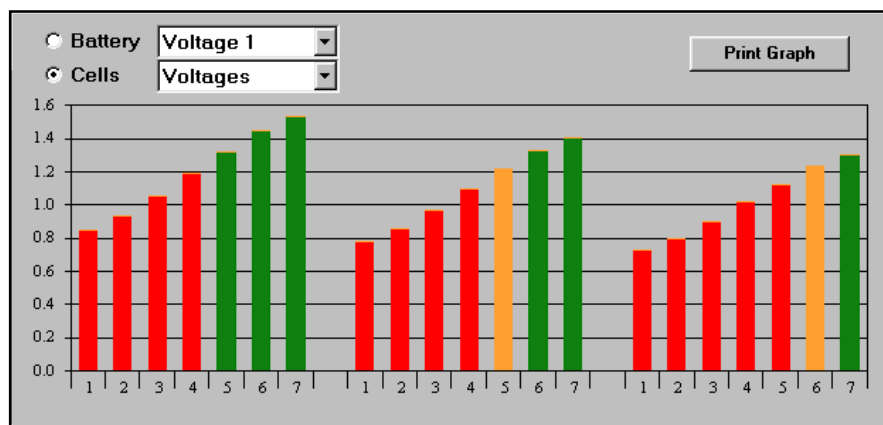


Figure 73 - Cells simulation for three seven cell batteries

10.1.9. Test of all 24 channels

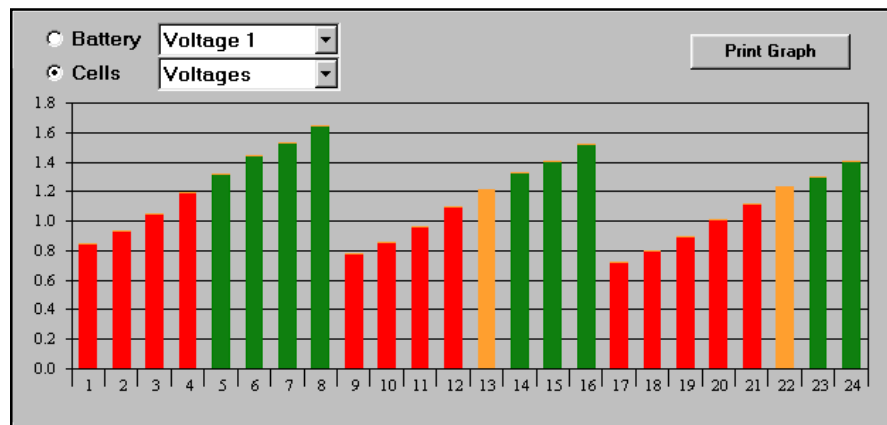


Figure 74 - Simulation for 24 cells

10.1.10. Cable simulation Selector Switch



Figure 75 - Cable Code Switch (#1 shown)

Cable Codes:

- 1 – 20 Cells
- 2 – 19 Cells
- 3 – 2x11 Cells
- 4 – 3x7 Cells
- 10 – Four Batteries
- 21 – 21 Cells
- 22 – 22 Cells
- 31 – 24 Cells (Test)

- 10.1.11. Charger-Analyzer Simulation (for controllable, non-intelligent equipment)
Refer to the switches as shown in Figure 76



Figure 76 - Cell Simulator Front Panel Switches

- CON simulates that the Charger-Analyzer Control Cable is connected
- PWR simulates that the Charger-Analyzer is turned ON
- TYPE is not used at this time

10.2 External Measurements

Using external measurements of voltage and current for system test and verification

- 10.2.1. Perform an AS RECEIVED test on a battery using an external voltmeter and compare the internal system readings with the external measurements.
- 10.2.2. Perform a charge or discharge test using an external ammeter or shunt and compare the internal system readings with the external measurements.
- 10.2.3. For any of the tests print a Data Snapshot for record purposes.

11. Tools

11.1 Change Custom Times

For tests requiring time periods other than what is available in the standard list, enter the required duration for the test (number of cycles and time interval per cycle)

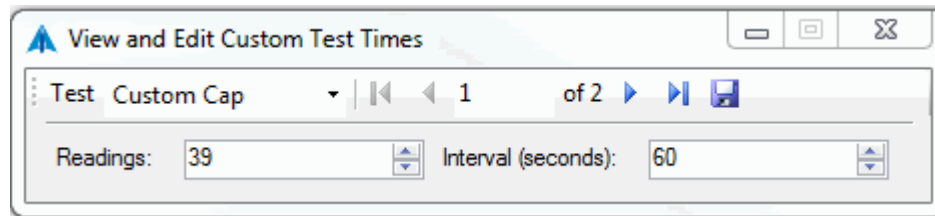


Figure 77 - Screen to change custom charge and discharge times (in minutes)

11.2 Technicians

Use Edit Technicians to add, edit or delete the names of the system operators

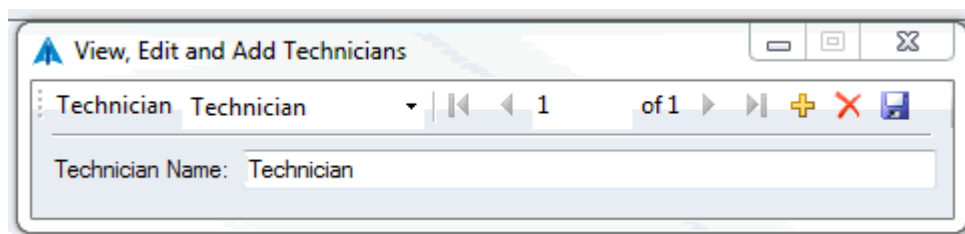


Figure 78 - Screen to enter/edit the names of the system operators

12. Installation

12.1 Power (mains):

- 12.1.1. Provide backed-up (UPS) power for the computer, peripherals and BTAS devices.
- 12.1.2. Insure that there is a solid earth ground connection between the charger analyzers and the BTAS.
Note: a faulty earth ground will result in unstable current and corrupted communication between the computer and the C-Scans and Charger-Analyzers.

12.2 Computer

- 12.2.1. Install and test the computer and its peripherals in accordance to the instructions from the computer manufacturer.
- 12.2.2. Install the BTAS program per the instructions provided with and within the installation CD.

12.3 Connections

- 12.3.1. Connect the BTAS devices and test per section [2]

12.4 Test

- 12.4.1. Perform a Verification of Performance to determine the integrity of the installation, per section [10]

12.5 System Installation Pictures

Typical connections in a BTAS16 system

12.5.1. Data Interface and C-Scan

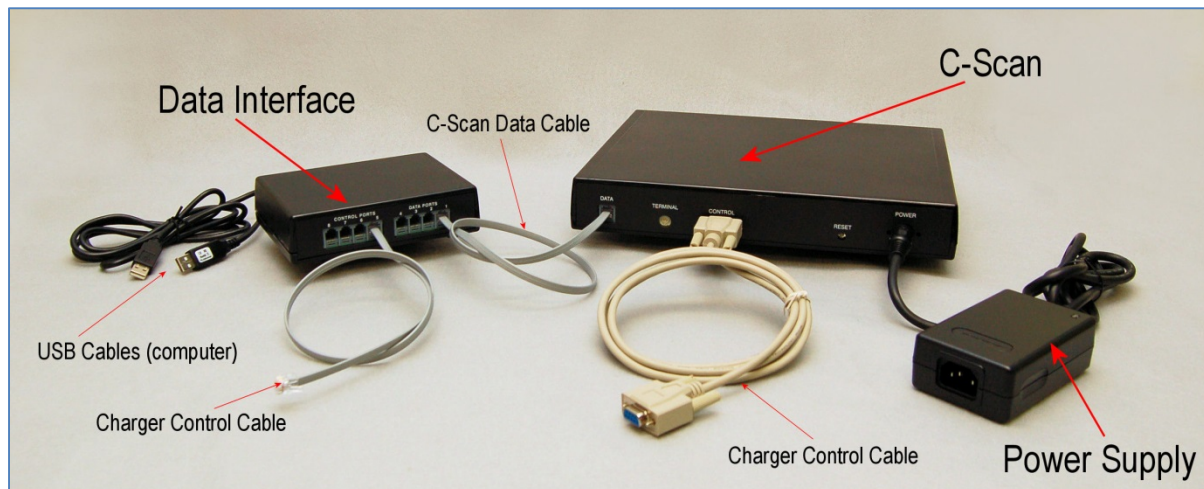


Figure 79 – Data Interface and C-Scan

12.5.2. Cell Simulator and C-Scan

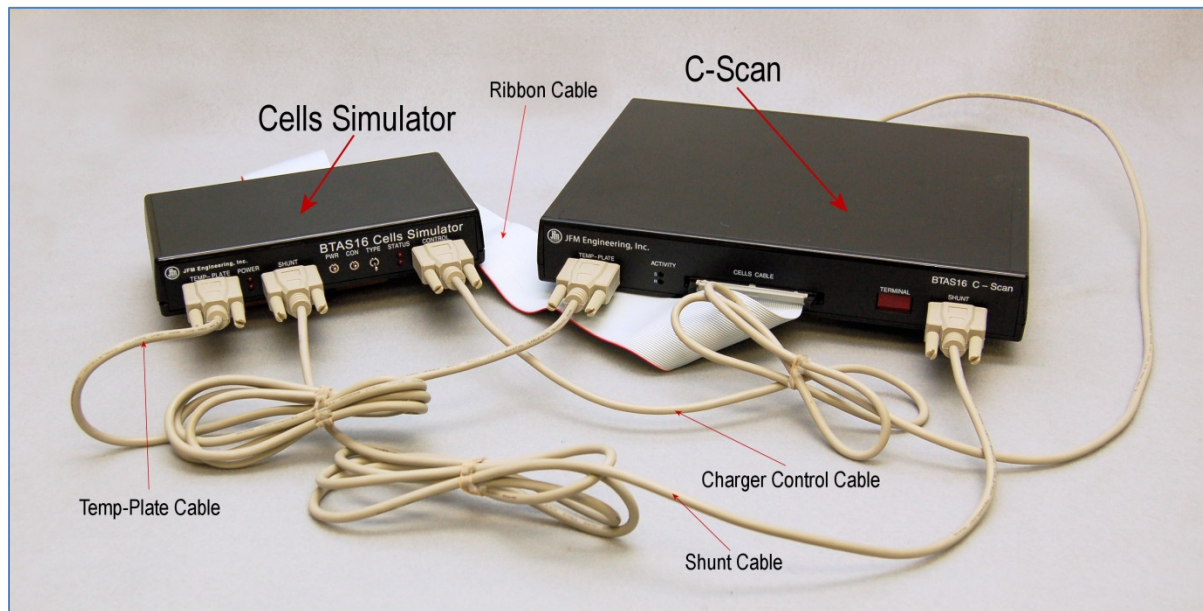


Figure 80 – Cell Simulator and C-Scan

12.5.3. Temp-Plate and C-Scan

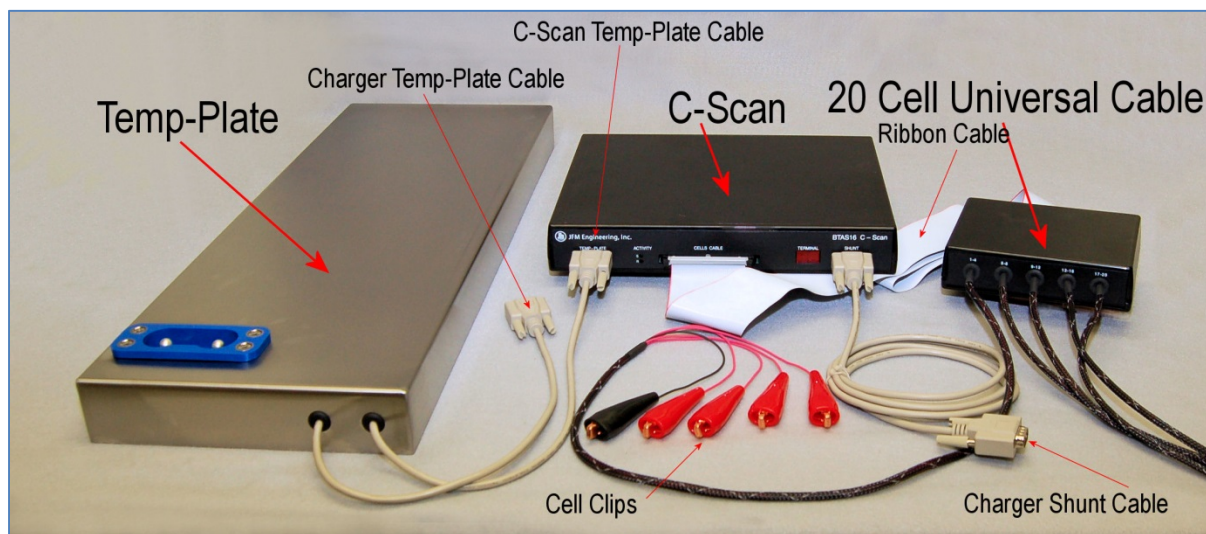


Figure 81 – Temp-Plate and C-Scan

12.5.4. Charger-Analyzer, Data Interface, C-Scan and Temp-Plate

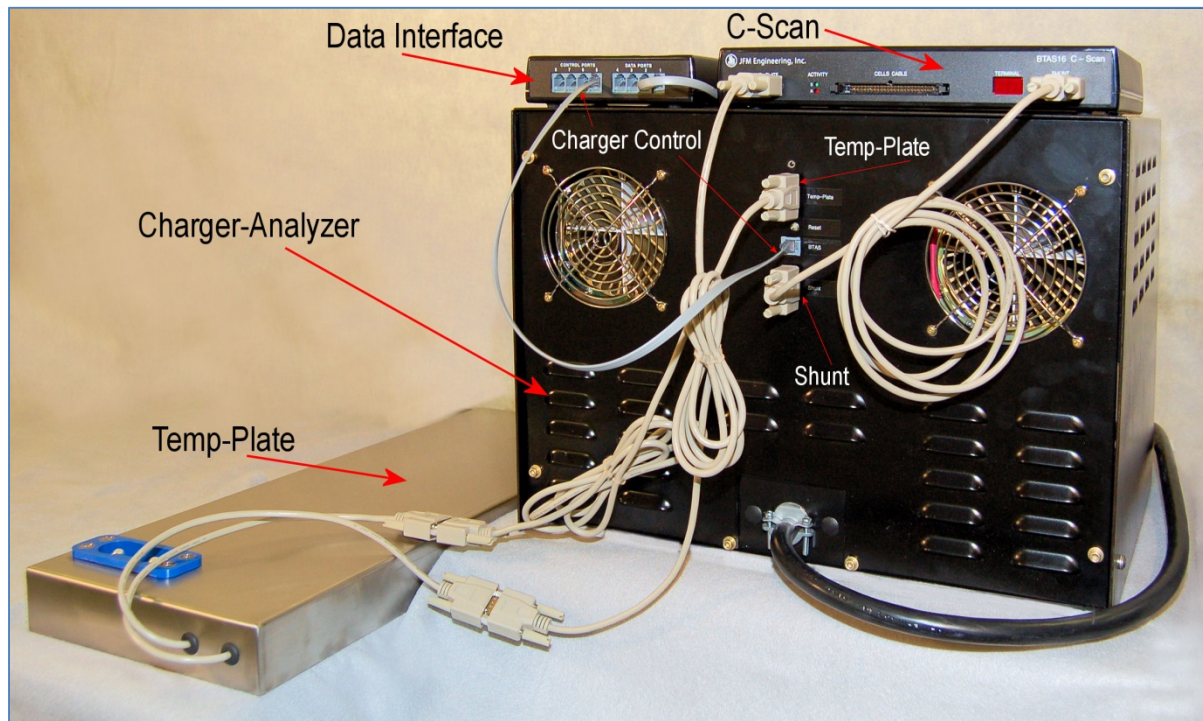


Figure 82 – Charger-Analyzer, Data Interface, C-Scan and Temp-Plate

13. System Maintenance

13.1 Data Files

Data Files are located in the folder C:\btsPrg\BTS Files. The name of the file is BTS16NV.mdb

13.2 Data File Backup

For best safeguard from data losses, backup data on a daily basis.

In case of heavy daily workload, backup data more than once a day.

- 13.2.1. Click on FILE
- 13.2.2. Click on BACKUP DATA BASE
- 13.2.3. The program will respond with the message: Backup Successful
- 13.2.4. The Back-up files are stored in C:\btsProg\Backup and are named with the date and time of the backup.
- 13.2.5. Alternate File Backup
- 13.2.6. Copy and store the file BTS16NV.mdb. Rename the file adding the date of the copy.
- 13.2.7. Copy the Data onto CDs and store in a safe place.

13.3 Data File Restore

Copy the data from the latest backup and rename it BTS16NV.mdb into the folder C:\btsProg\BTS Files

13.4 Viewing Data Files

The content of the data files can be viewed using MS Access (2000 or XP)

Caution: Altering the file structure or contents could render the system unusable.

13.5 Software Location and Updates

- 13.5.1. Review the notes pertaining to the latest software release. The notes will indicate if this is a mandatory file replacement (to correct a problem) or if it is optional (new functionalities, screen changes, etc.).
- 13.5.2. The program file is named btsProg.exe and it is located within the directory C:\btsProg
- 13.5.3. If updates are received, there will be an updated btsProg.exe file (Inside a ZIP folder).
- 13.5.4. Rename the existing file by adding program version as in “btsProg-rev.exe”
- 13.5.5. Copy the new file into the C:\btsProg directory.
- 13.5.6. Start the program and note the revision level in the bottom left hand side of the screen. Verify that it is consistent with the information received with the update.

14. Troubleshooting

14.1 List of common operational issues

#	Problem	Probable Cause	Solution
14.1.1	C-Scan Terminal Number not visible	<ul style="list-style-type: none"> No Power No communication with the computer 	<ul style="list-style-type: none"> Connect power Press the RESET button in the rear panel of the C-Scan
14.1.2	C-Scan Scan Indicator not turning on (not blinking)	<ul style="list-style-type: none"> C-Scan data cable not plugged-in Program not running Data Interface with no power or not connected. 	<ul style="list-style-type: none"> Connect the data cable in the back of the C-Scan Start the program Verify that power is on for the Interface and that the Interface is connected to the Computer.
14.1.3	C-Scan Reading indicator not turning on (not blinking)	<ul style="list-style-type: none"> Data Terminal not selected in the main screen 	<ul style="list-style-type: none"> Click the corresponding IN USE check-box
14.1.4	IN USE box is RED	<ul style="list-style-type: none"> C-Scan not responding. 	<ul style="list-style-type: none"> See [3.2] Verify that the data cables are properly connected all the way to the Interface Box. Temporarily connect a different C-Scan Terminal and determine if the problem is with the cabling or with the original terminal. Reset or Disconnect and re-connect power C-Scan defective
14.1.5	No battery cell readings	<ul style="list-style-type: none"> Crown or Cell Cables not connected to the battery. Ribbon Cable not connected to the C-Scan 	<ul style="list-style-type: none"> Connect Crown or Cell Cables to the battery. Connect Ribbon Cable to the C-Scan
14.1.6	One or more cells not reading correctly when using a crown	<ul style="list-style-type: none"> Improper contact with the cell link. 	<ul style="list-style-type: none"> Verify that the link in the battery and the spring loaded contact in the Crown are free from corrosion. Clean or replace links and contacts as necessary
14.1.7	Cannot fit the crown on to the battery	<ul style="list-style-type: none"> Crown shape, size, or configuration not for the battery. Attempting to fit the crown backwards. Battery can is distorted 	<ul style="list-style-type: none"> Use a crown made for the battery. The proper orientation of the crown is with the ribbon cable opposite to the battery connector. Straighten up the distortion in the battery can until the crown fits the battery properly.
14.1.8	One or more cells not reading correctly when using the Cables with Clips	<ul style="list-style-type: none"> Clips out of sequence or reversed Corroded clip Broken connection 	<ul style="list-style-type: none"> Verify that clips are placed in the correct order (cell #1 is the most negative one). Clean or replace the clip Repair the connection

14.1.9	The number of cells reported is not consistent with the number of cells in the battery when using the Cables with Clips.	<ul style="list-style-type: none"> • Cable not consistent with the battery type. 	<ul style="list-style-type: none"> • Replace with the cable wired for the specific number of cells. (Verify the type of cable reported in the top section of the numerical results screen).
14.1.10	Recording stops after 20-30 seconds	<ul style="list-style-type: none"> • No current is detected – check for the “No Current” error message. 	<ul style="list-style-type: none"> • Verify that the Shunt Cable is connected to the C-Scan.
14.1.11	No temperature data	<ul style="list-style-type: none"> • Temp-Plate Cable not connected to the C-Scan 	<ul style="list-style-type: none"> • Verify that the Temp-Plate Cable is connected.
14.1.12	No control of Charger-Analyzers.	<ul style="list-style-type: none"> • Control Cable not connected between the Charger-Analyzers and the Data Interface or between the Charger-Analyzer and the C-Scan. • Link Charger not selected 	<ul style="list-style-type: none"> • Verify that the Control Cable is connected. • Verify that Link Charger is checked
14.1.13	(Removed)	<ul style="list-style-type: none"> • --- 	<ul style="list-style-type: none"> • ---
14.1.14	The number of recordings is less than expected	<ul style="list-style-type: none"> • Recording turned off prematurely. • Charger-Analyzer terminated prematurely (no current detected) • Charger-Analyzer terminated ahead of the program. 	<ul style="list-style-type: none"> • Check for proper system operation. • Check the programming in the Charger-Analyzer
14.1.15	The colors of the Cells Bar Graph in the Main Screen change color after a test is finished.	<ul style="list-style-type: none"> • The Cells Bar Graph in the Main Screen is real time. Voltages in a battery at rest will change (If it was being discharged, the cell voltages will go up and vice-versa). 	<ul style="list-style-type: none"> • Program an additional minute in the Charger-Analyzer • The color coding in the Bar Graphs is always in accordance to the test requested (or just finished). • For true end-of-test readings, check the display through the Graphs Screen.
14.1.16	Current readings are unstable or different at the BTAS screen but are stable at the charger.	<ul style="list-style-type: none"> • Improper earth grounding between the charger(s) and the BTAS computer. 	<ul style="list-style-type: none"> • Verify/rectify the integrity of the earth grounding between the charger(s) and the BTAS computer.

15. Parts List

List of parts used in the BTAS16 System

15.1 Data Interface – P/N 9895516003

Used for the computer to communicate with C-Scans (data transfer) and Charger-Analyzers (control).



15.2 Data Hub – P/N 9895516001 (optional)

Used to expand the Data Interface with more than four C-Scans or more than four Intelligent Charger-Analyzers, or to simply facilitate the routing of Data and Control Cables.



15.3 C-Scan – P/N 9895202001



15.4 Cell Simulator – P/N 9895202301

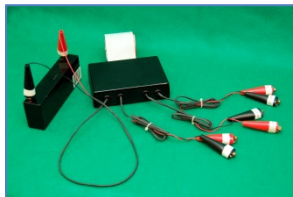


15.5 20 Cell Cable with Clips (large) – P/N 9895202L20**15.6 External Shunt - P/N 9895202803 (Charger-Analyzer dependent)**

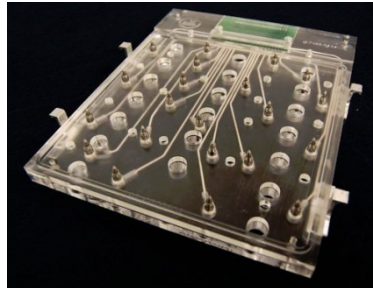
Used with Charger-Analyzers that are not BTAS ready (“C” modification) or for any other type Charger-Analyzer.

**15.7 Four Battery Cable – P/N 9895202804 (optional)**

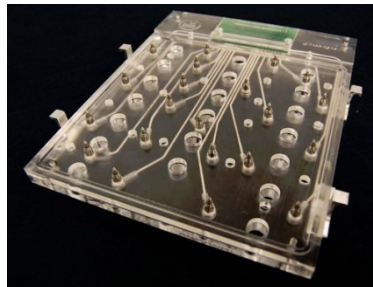
Note: battery shown for reference only

**15.8 20 Cell Cable with Clips (small) – P/N 9895202M20****15.9 21 Cell Cable with Clips (large) – P/N 9895202L21**

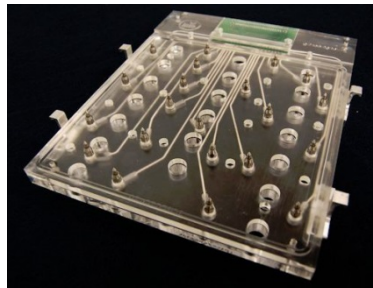
- 15.10 2x11 Cell Cable with Universal Clips – P/N 9895202D11**
- 15.11 3x7 Cell Cable with Universal Clips – P/N 9895202307 (optional)**
- 15.12 Data Cable 6 (6 conductor cable with telephone modular plugs; 12 ft) – P/N 6079M0D612**
- 15.13 DB9 Data Cable 9 (9 conductor cable with DB9 plugs; 6 ft) – P/N 6079DB9MF6**
- 15.14 Crown for SAFT 20 Cell Batteries “Universal” Configuration) – P/N 9895203C01**

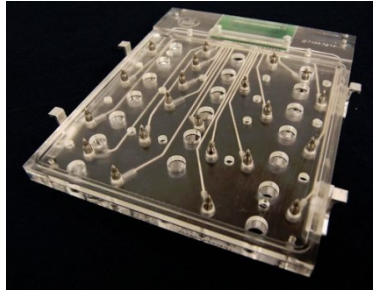


- 15.15 Crown for SAFT 5317, 21 Cell Batteries – P/N 9895203C02**



- 15.16 Crown for SAFT 4579, 20 Cell Batteries – P/N 9895203C03**



15.17 Crown for SAFT 276CH, 19 Cell Batteries – P/N 9895203C05

16. GLOSSARY

- **Battery Management Software:** The program installed in a computer to run the Battery Management System
- **Battery Management System:** The Battery Management Software and the associated hardware interfaces that effect the measurement of parameters for batteries under test.
- **Battery Manual:** General Technical information provided by a manufacturer applicable to a series of batteries.
- **Battery Test Profile:** A specific group of parameters for a specific type of test (i.e., Time, Current and Voltage).
- **Battery Test System:** The Charger-Analyzer(s) and the Battery Management System that enable a Battery Test Facility to operate in an automated mode.
- **BTAS16:** A computerized Battery Management System (manufactured by JFM Engineering).
- **CCA:** Controllable Charger-Analyzer. A Charger-Analyzer that can be started and stopped by the BTAS software (Superseder IIIC, MasterCharger LXC, SuperCharger60C, manufactured by JFM Engineering).
- **Capacity Test:** Test performed to determine if a battery can deliver the advertised, specified or required amount of current.
- **Cell Imbalance:** The difference of voltage from cell to cell at the end of a Capacity Test or Charge.
- **Charge Acceptance:** The capability of the cells to transform the incoming current into charge stored in the plates.
- **CMM:** Component Maintenance Manual - Technical information provided by a manufacturer for a specific battery.
- **Constant Current:** As applicable to a charge or discharge test, a current that remains within a few percent of a center value, independent of battery voltage, temperature or line voltage (mains). This is the preferred charge/discharge method for Nickel-Cadmium batteries.
- **Constant Voltage:** As applicable to a charge test, a voltage that remains within a few percent of a center value. In this case, as the battery is charged the current is automatically decreased by the charger to maintain the voltage at the required level. This is the typical charge method for Lead-Acid batteries. Note that in the aircraft, the charge method is constant voltage, regardless of the type of batteries used.
- **C-SCAN:** A Data Acquisition Terminal (part of the BTAS16 manufactured by JFM Engineering).
- **Deep Cycle:** As applicable to Nickel-Cadmium batteries, the process of discharge to zero for each of the cells, done to equalize the cells.
- **Electrolyte Level Test:** As applied to Nickel-Cadmium cells that have a vent cap, the process of verifying the level of the electrolyte and the addition of distilled water as required (Note that this test is performed only at the end of a charge cycle).
- **Full Discharge:** Constant Current Discharge with no voltage limit (discharged to the lowest possible level first by the Charger-Analyzer and finished by resistors and/or shorting clips).
- **ICA:** Intelligent Charger-Analyzer. A Charger-Analyzer that is microprocessor driven and can communicate with the BTAS16 software for parameter programming and control (this is specific to equipment manufactured by JFM Engineering)..

- Lead-Acid: Chemistry system of batteries used for most stand-by applications and for applications demanding less severe discharge currents (as compared with Nickel-Cadmium).
- Main Charge: As applicable to Nickel-Cadmium batteries, the C/2 (or 1C) charge current that provides 100% of the A-hr rating.
- Nickel-Cadmium: Chemistry system of batteries as used in aviation and other heavy duty applications.
- Overhaul: The process of disassembly of all interconnections, cleaning/replacement of interconnecting hardware, removal of cells and cleaning of cells and the interior of the battery. This is applicable to batteries that are made up from an interconnection of multiple cells.
- Reserve Voltage: The difference between the Capacity Test Voltage and the minimum voltage for each of the cells.
- SLA: Sealed Lead-Acid Battery
- Temp-Plate: A plate used to measure the temperature of batteries under test (this is specific to equipment manufactured by JFM Engineering).
- Thermal Runaway: Destructive condition under constant voltage charging where one cell fails and heats up and causes all other cells to fail by the transmission of heat from one cell to the next. The drop in internal voltage causes an increase in charge current that intensifies the heating, thus accelerating the process.
- Topping Charge: As applicable to Nickel-Cadmium batteries, the C/10 charge current that provides 40% of the A-Hr rating (after the 100% provided by the Main Charge).
- VRLA: Valve Regulated Lead-Acid Battery
- Water Leveling: The process of bringing the electrolyte level to the prescribed level by the addition of distilled water (or de-ionized).

17. DISCLAIMER

17.1 The BTAS16 is a precision system intended to be operated by personnel qualified in the servicing of aircraft, industrial or medical batteries.

17.2 JFM Engineering's responsibility is limited to the repair/replacement of any malfunctioning part of the system (not responsible for any losses incurred from the usage of the system).

17.3 User's Responsibility

- 17.3.1. It is the user's responsibility to verify suitability in the intended application.
- 17.3.2. It is the user's responsibility to verify the performance of the instruments and to operate and maintain it in accordance with the above given instructions.
- 17.3.3. It is the user's responsibility to test batteries in accordance to the instructions and recommendations of the manufacturers of the batteries.
- 17.3.4. It is the user's responsibility to operate the Instrument within standard safety procedures applicable to the operation of a Battery Test Facility.
- 17.3.5. It is the user's responsibility to install power receptacles and wiring in accordance with local wiring codes.
- 17.3.6. It is the user's responsibility to observe all necessary precautions and to be equipped with personal protective equipment when working with batteries to avoid injury due to electrolyte splashing, short circuits with tools and to avoid injury due to the size and weight of the batteries.
- 17.3.7. It is the user's responsibility to provide backup power (UPS) for the Computer and the Data Acquisition Terminals.
- 17.3.8. It is the user's responsibility to backup data files to safeguard against data losses due to hardware (Computer) malfunction.
- 17.3.9. It is the user's responsibility to verify the integrity of the performance of this instrument in accordance with the instructions of Section [10].
- 17.3.10. It is the user's responsibility to install the equipment in accordance with the instructions of section [12].

18. REVISION INDEX

REV	DATE	SOFTWARE	NOTES
0.1	9 December 2015	6.0.0	First draft
0.2	10 December 2015	6.0.0	Second draft
0.3		6.0.0	Third draft
0.4	6 January 2016	6.0.0	Fourth draft
0.5	7 January 2016	6.0.0	Fifth Draft
0.6	11 January 2016	6.0.0	Sixth Draft

19. Notes

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