



Rockaway NJ USA 07886
www.btechinc.com



***Battery Validation Manager –
Software and Battery Validation
System***

Operating Manual

Safety Information

- Except as explained in this manual, do not attempt to service BTECH equipment yourself. Opening the equipment may expose you to dangerous voltages. Refer servicing beyond that described in this manual to authorized personnel.
- Do not allow liquids or moisture to get into the equipment. If liquid does get into the equipment, unplug it immediately and contact your nearest authorized service center or BTECH directly.
- Ensure equipment is provided adequate ventilation. Do not block equipment ventilation openings.
- Do not exceed equipment voltage or power ratings and capabilities.
- Make sure that equipment is properly grounded.
- Do not let unauthorized persons operate the equipment.
- Do not energize the cabinet or any component with 115VAC or battery voltage until after the installation is complete.
- Use of this product in a manner not specified could compromise the designed-in safety of this product.



WARNING! The Battery Validation System is designed to connect to UPS systems that are 600VDC or less and a maximum of 300V with respect to earth ground. The voltage with respect to earth ground must be verified before connecting the system. This can be done by measuring the voltage from each battery post referenced to earth ground. The voltage cannot exceed 300V.



WARNING! High Voltage or current may be present in the equipment. Only qualified personnel should perform the operations described in this manual.



WARNING! High Voltages exist inside the system components and on the equipment terminals. Calibration must be performed only by technically qualified persons. Observe electrical safety precautions when removing and installing equipment covers, and when connecting leads and making adjustments.



WARNING! Fuses cannot be changed by the operator.



WARNING! Only use the AC power cord provided with the system. Substituting this cord may cause damage to the system and place personnel at risk electric shock.

Technical Specifications

SCM-600					
AC Input	Models		S5x-xxxxxx-xx-xx-A0		
			S5x-xxxxxx-xx-xx-A1		
	Voltage		90 - 125	VAC	US,CAN, & JPN
			100 - 240	VAC	Europe, Korea
	Power	Maximum	75	Watts	
	Frequency		50-60	Hz	
DC Input	Models		S5x-xxxxxx-xx-xx-D2		
			S5x-xxxxxx-xx-xx-D3		
	Voltage	Nominal 48VDC	26-60	VDC	
		Nominal 120VDC	95-145	VDC	
	Power	Maximum	75	Watts	
Operating Environment	Temperature Range		41 - 104	°F	5 - 40 °C
	Humidity		0% to 80% RH (32 - 86°F)		0 - 30 °C
0% to 50% RH (88 - 104 °F)			31 - 40 °C		
	Altitude		0 - 2000	m	
Mechanical	Length		16.875	ins	(429 mm)
	Width		16.5625	ins	(421 mm)
	Depth		3.5	ins	(89 mm)
	Weight		24	lbs	(10.9 kg)

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C

This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and, (2) this device must accept any interference received, including interference that may cause undesired operation.



Caution to user: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment



Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful

interference in which case the user will be required to correct the interference at his own expense.

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1. Product Overview

Thank you for choosing BTECH's S5 Battery Monitoring and Validation System. The S5 is BTECH's fifth generation of battery monitoring products, including all of the engineering and field experience the company has generated since its inception in 1989. Today, with over 30 00 systems installed worldwide, BTECH is the undisputed leader in the battery monitoring industry with experience that is unmatched. BTECH has a staff of engineers and technicians supporting the product at our headquarters in Rockaway, NJ, and has built a network of trained service technicians across North America, Asia, Europe, Africa and the Middle East. We are there for your questions and concerns.

BTECH Inc. manufactures the only patented online real-time impedance monitor. BTECH believes that the best way to assure emergency critical power continuity is to empower our customers with immediate battery data. Thus enabled, preventative battery maintenance can be performed, minimizing the chance of the DC plant being compromised at its most critical moment, going under load. BTECH's battery management system is comprised of two principle components, the BVS (Battery Validation System) hardware and BVM (Battery Validation Manager) software. The combined package allows you to have at your computer fingertips the following monitoring power:

- Individual unit / cell impedance monitor
- Pilot unit/cell temperature monitor
- Individual unit / cell voltage monitor
- Total voltage monitor
- String current float and discharge monitor
- Battery discharge monitor
- Cycle counter monitor
- Real-time system monitoring

This monitor is the most powerful battery management system available today.

Battery health and its correlative relationship to impedance is well documented. A rise in a battery's impedance signifies diminished battery health. The single-most powerful feature is the ability to trend daily or weekly impedance readings in the software and automatically alarm when default conditions are met. Simultaneous alarm communications to cell phones, pagers, and host computers are available. Thus, the user is continually informed with preemptive data, empowering the ability to implement proactive battery preventative maintenance before disaster can strike.

For more detailed information about analyzing your battery data, see our *Complete Guide To Battery Monitoring*, included in the box.

General Information

Customer and Product Support

To obtain assistance and support for any BTECH product contact the company as described below.

Main Office

BTECH, Inc.
10 Astro Place
Rockaway, NJ, USA

07866

Web Site:

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973-983-1120

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Customer Support

Support Desk	Phone	Email
Technical Support	(US) 973-983-1120	techsupport@btechinc.com

Additional Product Technical Information

The following publications are available from BTECH and can be downloaded from the BTECH website as PDF files.

S5 Communications

This document describes the S5 communication options including serial connection links, telephone and internet links, and Ethernet network links.

MODBUS Messaging to the S5 Battery Validation System

This document describes how to configure a computer to monitor and evaluate measurements taken by the S5 and send them to a Building Management System.

SNMP Integration of the S5 Battery Validation System

This document describes how to configure the S5 BMS software as an agent on an SNMP network.

Technical Support Bulletins

BTECH posts technical support bulletins as PDF files on its website. These files and other support materials can be downloaded as necessary.



Customers are encouraged to check the site periodically to see if important new information has been added.

About This Guide

All of the information contained in this guide was current and accurate at time of publication. Check the BTECH website to see if any 'Service' or 'Product' update bulletins have been issued or additional documentation posted following the Guide's publication.

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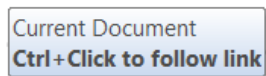
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- Table of Contents, Figures, and Tables List,
- References to Figures and *page numbers* within the text,
- References to Headings and Titles within the text.

Embedded MS Word Links

To follow a link in MS Word, place the cursor on a link item. If the tool-tip shown below appears hold down the Ctrl key and click. The user jumps to the target link location






Adobe PDF Files

Place the cursor on a link item. The cursor changes to a pointing finger (see below). Click and the user jumps to the target link location.



Symbols and Terms Used in the Guide

Throughout the guide there are items set off by themselves and preceded by one of the symbols shown below. The symbol indicates the type of information and its relative importance.

Symbol	Name	Purpose
	Note	Indicates an important point that customers should be aware of.
	Important	Indicates a critical, non-safety related item. In general, failure to comply with these items may result in damage to equipment and voiding of Warranty.
	Safety Warning	Indicates a procedure that can result in personal injury if not performed properly and with the necessary safeguards in place.

Key Terms

Key terms used throughout this manual are defined below. Refer to Figure 2- Battery System Diagram

Term	Definition
Alarm	A critical warning requiring immediate attention.
Alarm Relays	A physical connection on the rear of the S5 used to pass alarm data to a building system central monitoring station.
Alert	Refers to a non-critical warning. Sometimes called a “maintenance” alert.
Battery	The battery backup system in its entirety
Battery Bar or Strap	A piece of metal or cable connecting two battery cells/jars
Battery Jar	One to six cells enclosed in a common smallest replaceable part
Battery String	A set of battery cells/jars wired in series
Battery Unit	The smallest segment of the battery being monitored by the S5 system (can be 1 or more cells/jars in a unit)
Controller	An individual S5 unit. Sometimes specific to the memory functions.
Observer	BVS Observer. A Windows service that runs in the background of the host computer and collects data from the S5.
POTS	“Plain Old Telephone Service”. A basic service line used with a dial-up modem.
Site	References a particular S5 unit (i.e. one <i>location</i> can have <i>multiple</i> sites)

Term	Definition
SNMP	Simple network management protocol. A IP network protocol that can be used when linking a S5 to battery system locations using a network.
SQL (Sequel)	A sophisticated database system that can be used with BVM 4.x
Status Monitor	BVS Status Monitor.

Integrated User HELP

The BVM software includes integrated Help available by clicking **HELP** in the menu bar. Select *Help Topics* in the drop-down menu. A two-pane screen is displayed with a master volume shown on the left side, (see Figure 1- Partially Expanded Help panel

To view help content –

- a. Double-click on a master volume icon to expand it. This displays a set of topic volumns,
- b. Click on a topic volume to display its topics,
- c. Select a topic to view its content in the right pane.



Integrated User HELP can be printed by selecting a volume, folder or topic and clicking the **Print** icon. The complete Help content can be printed by selecting the master volume and clicking the **Print** icon.

Figure 1- Partially Expanded Help panel

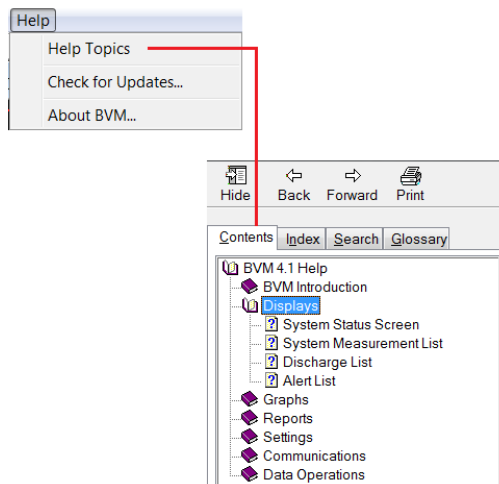
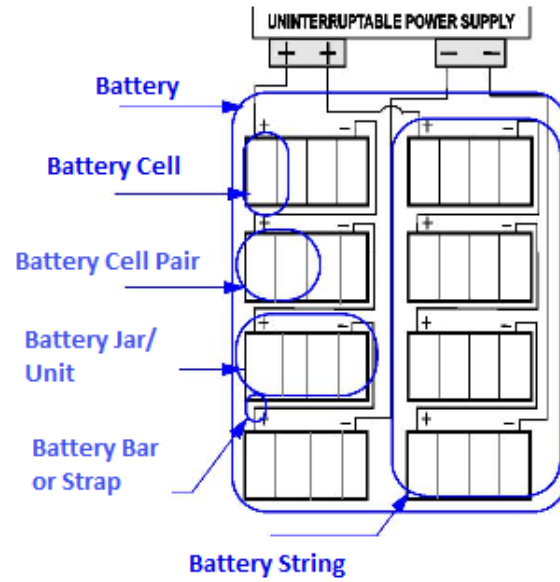


Figure 2- Battery System Diagram



2. Installing the Software

BVM Software Applications

Battery Validation Monitor (BVM): Enables users to analyze and interpret all measurement data by providing a graphical analysis of performance. It also serves as the direct link to the controller to manipulate system settings, clear alarms, or enter the system's diagnostic mode. Additionally, it provides a real-time discharge data logger that enables users to view ongoing voltage and current information during a discharge event or discharge test.

BVS Observer: Observer is a Windows service that runs in the background on the host PC and periodically collects the latest measurement data from the battery monitoring system controllers, (S5s). Over time, a valuable battery trend database is built that continually tracks the battery system's performance and compares it with results obtained when the battery system was new.

BVS Status Monitor: Provides the user with a summary of all, or a group of battery systems' status. It provides 'drill-down' functionality from all of the battery systems to individual units by launching the BVM. It also provides the user with an audible and visible alert when new alarms are received by the BVS Observer.

BVM Filed Types

Database Files: BVM installs one or more database files in the "BVMDData" folder. Generally these are "MS Access" files but the user has the option of switching to SQL databases if they prefer.

.bvm File: Microsoft database file.

.set File: These are supplied by BTEC and contain the initial controller settings based on manufacturer specifications. Users can override the file content or create new .set files as needed. It is particularly relevant to backing up and restoring the controller settings, (see The Get/Set Configuration, on pg. 63). When multiple locations are monitored by an S5 there will be one .set file for *each location*.

.mib files: These are supplied by BTECH on an as-needed basis. They are used when a customer implements SNMP traps in a network environment, (see SNMP Manager Description and Configuration, beginning on page 136).



The .bvm and .mdb files **MUST** have matching serial numbers and **MUST** be located in the same directory.



- The BTECH installation disk includes a copy of Microsoft's SQL Server Express. A number of other Microsoft SQL server packages will also work with BVM 4.x (see Appendix). For sites using 'Server Express', BTECH provides a stored procedure for use with back-ups.

- All BTECH application and data files should be included as part of regular computer or server backup scheduling.

There is *one each* of the following program files for *each* S5 unit in the installation. They are created by BTECH specifically for the site and are identified by the *serial number* of the *unit*. They *must* all be in the same directory on the host computer or the server’s hard drive.

- **Sitename+Serial Number.mdb** – This is a Microsoft Access database file,
- **Sitename+Serial Number.bvm** – There will be one of these files for each S5,
- **Sitename+Serial Number.set** – This is a text file containing the site settings.

Installation Machine Requirements

The following Windows and computer hardware specifications are *required*.

Machine Requirements

OS	Processor	Memory	HD Space	Display
Windows XP (SP3) (32-bit) or Windows 2003 (32-bit)	800 MHz Pentium III	512 MB	100 MB for programs and small data files	1024 x 768
Windows Vista (32-bit) Windows 2008 (32-bit)	1.4 GHz – x86 or x64 processor	2 GB	100 MB for programs and small data files	1024 x 768
Windows 7 (32-bit) Windows Vista (64-bit) Windows 2008 (64-bit) Windows 7 (64-bit)	2 GHz – x64 processor	2 GB	100 MB for programs and small data files	1024 x 768

- ▶ Mouse or other pointing device
- ▶ Dial-up modem if one or more S5 units will utilize communication over a POTS line.
- ▶ IP network connection for sites communicating over a network.



The BVM software can be run on a *virtual machine* provided that the processor resources, memory, and disk space described above are available.

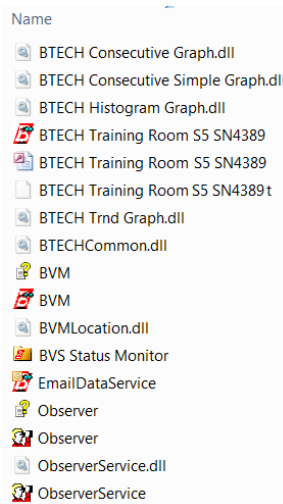
Installation Files and Directory Structure

When the BVM software is installed on a local disk it creates a new, BVM4 directory and various certain sub-folders where it copies files. Some additional files are specific to each particular location and must be transferred to the host computer or server manually, (see Starting Observer and Adding Locations, , pg. 10). Other programs are placed in specific folders where they must remain or the system will not function properly. See Figure 3, page 9, for an illustration of the folder structure.

Installing the BVM Software on a Windows-based PC or Server

The BVM software is supplied on a standard CD-ROM. Once the installation is complete the CD and sleeve should be kept in a safe location for future use. The CD can be used to activate future versions of the BVM software.

Figure 3-The BVM 4.x Install Directory



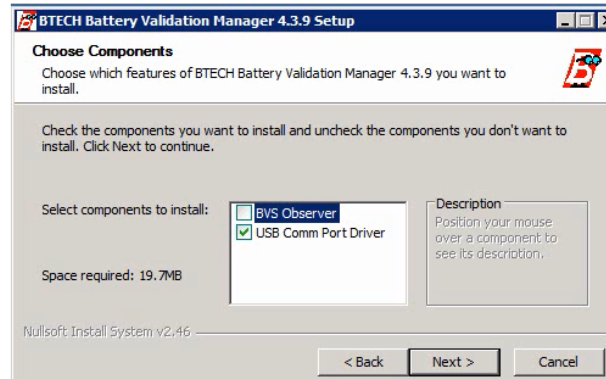
To install the software use the following procedure, (see Figure 4, below).

- a. Insert the BVM software CD-ROM into the machine’s CD. In a few moments the *Autoplay* panel is displayed.
- b. Click run BVM_4.x.x_Setup.exe.
- c. In the resulting options check box select the following items based on the Installation:
 - Install *BVS Observer* if the S5 will be monitored on a full-time basis, by a server or *dedicated* work station, (only one instance of BVM can be run on a network).
 - Install the USB Com Port driver if the S5 will be monitored by directly connecting a computer via a USB cable.

The *Update System* panel is displayed showing a progress bar indicating the installation status. If the *BVM Software Activation* dialog is displayed refer to Activating BVS Observer, pg. 12. This only occurs under certain circumstances.

- d. Select the desired destination folder and click **Next**.
 - MS Windows selects a default drive and folder for the software installation on the computer’s hard drive. In general it’s best to accept the default. To install the BVM software in another location, click the **Browse** button in the Destination Folder box to display a list of drives and folders.
- e. Click **Finish** when the “*successful installation dialog*” is displayed.

Figure 4-BVM 4 Installation Component Selection Dialog



Do not remove the CD-ROM from the computer at this time. Some BVM files must be transferred from the CD to the BVM directory on the computer’s hard drive.

Adding Locations to BVM

In the S5 ‘world’ a “location” refers to a specific *battery system* being monitored by an S5 controller. For illustration purposes this guide uses only one location with two strings. The BVM software delivered with the S5 unit(s) includes a .bvm file for *each* S5 unit in the order. These files must be transferred to the BVM application folder manually before battery monitoring can take place.



The .bvm files **MUST** be *transferred* as described in this section. They **CANNOT** be *copied and pasted*.




All files for a specific site will be labeled:

[location id]+S5+[sequence #]+x4.bvm

where the sequence number = 1,2,3, etc, (see Figure 5, page 11).

Starting BVM and Transferring Location Files from the CD

The BTECH-supplied CD includes one or more custom files used by the BVM software (one .bvm file for each S5 being added). These files are NOT copied during the installation process and must be transferred to the BVM4 folder on the computer’s hard drive using the BVM application. As shown above, each .bvm file is uniquely identified by its *serial number*.

- a. Start the BVM software by doing either of the following:
 - If there is a BVM icon in the Windows Start menu  click on it,

- Open the Windows Start menu and select “All programs”. Navigate to the BTECH folder and double-click on the Battery Validation Manager 4.x entry.
- b. The first time the BVM software is started, a dialog will appear asking if the user wants to add Locations. Click **Yes**. The Location List screen is displayed (see Figure 5 below).

The Location List Screen

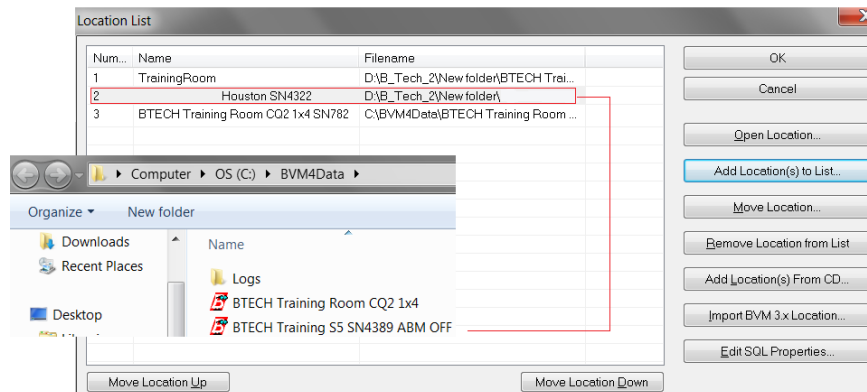
- c. In the Location List screen click the **Add Locations from CD** button, a *Windows Explorer* dialog opens.
 - Navigate to the Installation CD if necessary.
- d. In Explorer, select the correct .bvm file using its serial number and click **Open**.

The user returns to the *Location List* screen which is populated with the selected file. Repeat this process for each available file. Once all site files have been added, the CD can be removed from the computer, placed in its *sleeve*, and stored in a *safe* location.



- If the number of installed S5 units increases, a corresponding .bvm file (provided by BTECH) *must* be added as described above.
- If the number of installed S5 units decreases, the corresponding .bvm file(s) for the unit(s) should be deleted from the *Location List* screen.

Figure 5-The Location List screen with Windows Explorer inset



Installing the BVS Observer Software

The BVS Observer software should be installed anytime the S5 will be monitored 24/7 by a dedicated computer or server connected either directly, or over a TCP/IP network (see Installing BVM 4.x Software on a Server, pg. 112).

Adding S5 Locations to Observer

The same locations added to BVM must also be added to Observer. This process is essentially identical to the process used for BVM. Observer has the same hardware and OS requirements as BVM.

Starting Observer and Adding Locations

Observer serves as data collector and automatically retrieves the latest measurements and alarms from the S5 controller on a user-defined schedule. It also builds a battery performance database on the server or host computer. If configured for it can also distribute detailed email and/or cell phone alarm information text messages.

Observer is installed along with the BVM software in the BVM4 folder on the host computer. Like BVM, it must be correctly configured for *each location*. The first time Observer is started, locations must be added to it. To start Observer use the following procedure.

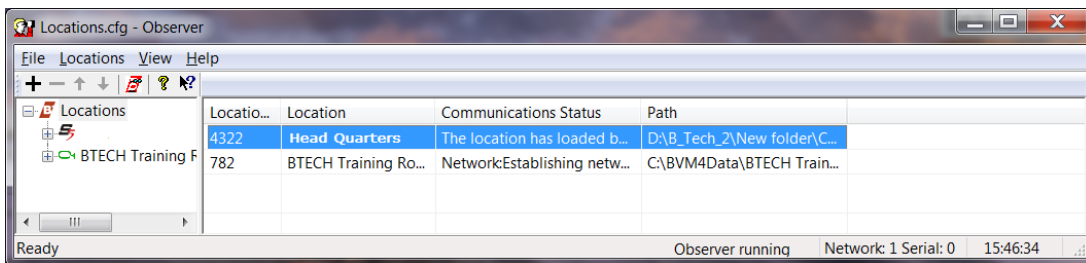
- a. Navigate to the BVM folder on the computer's hard drive,
- b. Double-click the Observer icon to start the program. The *Locations.cfg - Observer* screen is displayed, (see below),
- c. Click on the plus sign (+), or click **File** and select *Add Location(s)* in the menu list. A Windows Explorer screen opens,
- d. Navigate to the location files to be added and select them,



To select multiple locations in the Windows Explorer screen hold down the Control key (Ctrl) and click on the individual locations.

- e. Click **Open**. The selected files are added in the *Locations.cfg - Observer* screen.

Figure 6-The Locations.cfg - Observer Screen with a Location Selected



Activating BVS Observer

THE FOLLOWING STEP IS ONLY REQUIRED IF THE ACTIVATE BVS OBSERVER SOFTWARE DIALOG IS DISPLAYED

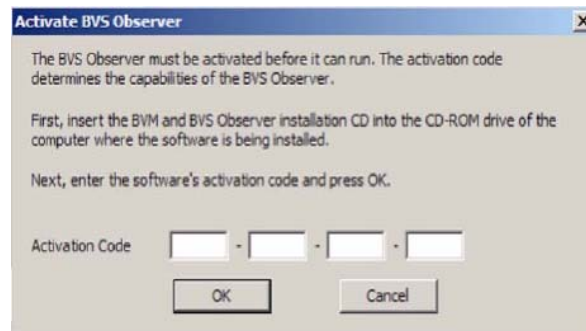
If the BVS Observer software validation dialog is displayed as part of the initial install process, enter the installation code printed on the CD sleeve (see below). This can occur when 10 or more S5s are used in the system.

- a. Type the 16-character code printed on the CD sleeve into the four boxes shown in the *Activation* dialog. Type four characters in each box, see below.
- b. Click **OK**.
- c. Click **Finish** when the *successful installation window* is displayed.



The *Activation* dialog is displayed *only* when a location has *at least* ten (10) S5 units installed.

Figure 7-The Activate BVS Observer software dialog



The BVM Home Screen

The BVM Home screen (see Figure 8, pg. 16) provides a summary of the selected location as well as quick access to various additional features such as reports, and graphs.

Status Colors

The BVM4 Home screen is displayed when a particular site is opened from the *Location List* screen and provides access to a large number of features. Strings and individual batteries are shown in one of three colors, based on the latest set of measurements.

- Green – System is running within set points and is considered to be healthy. No analysis of the system is necessary.
- Yellow – System is in maintenance status based on predetermined set points. Analysis of the string is recommended unless the alert cause is already known.
- Red – System is in critical alarm status based on predetermined set points. Detailed analysis of the indicated string(s) should be performed immediately.

Quick Measurements

These measurements (sometimes referred to as “Tool Tips”) appear when the cursor is placed on an icon in the Home screen.



More detailed data can be viewed using the options listed under **Reports** and **Graphs** in the menu bar. Consult the following Guide sections:

- 7 Reports, beginning on page 80,
- 8 Graphs, beginning on page 97

Home Screen Display Options

While the status color coding is permanent, the user has limited control over the way battery system architecture is displayed. For details on changing the Home Screen display see: BVM Home Screen Display Options, beginning on page 128.

The Home Screen Menu and Icon Bar

The Home Screen menu bar provides access to a variety of functions covered in this guide (see Figure 9, pg. 17). The availability of items on the Icon bar varies depending on Menu/Submenu selections. Available items are displayed at full value. Unavailable items are displayed in shades of gray. See next illustration.

Basic Individual Battery Measurements

To view basic measurements for a single battery place the cursor over the battery’s numbered block to display a tool tip with the following data.

- Unit #, String # – This identifies the specific battery by its string and sequence within the string.
- Unit Voltage – Volts DC.
- Unit Impedance – in milOhms.
- Unit Temperature – Pilot cell temperature in Fahrenheit or Celsius (user selectable).

Individual Battery Measurement Graphs

Double-clicking on the battery icon displays a date dialog (see Figure 80, page 97). By entering a specific date, (or date range) a user can graph the data. Within the graph the user can select *Voltage*, *Impedance*, or *Temperature* by selecting the appropriate icon in the tool bar.



The graphs available from the battery rectangle are also available from the Home Screen Graph menu. For additional information and examples refer to:

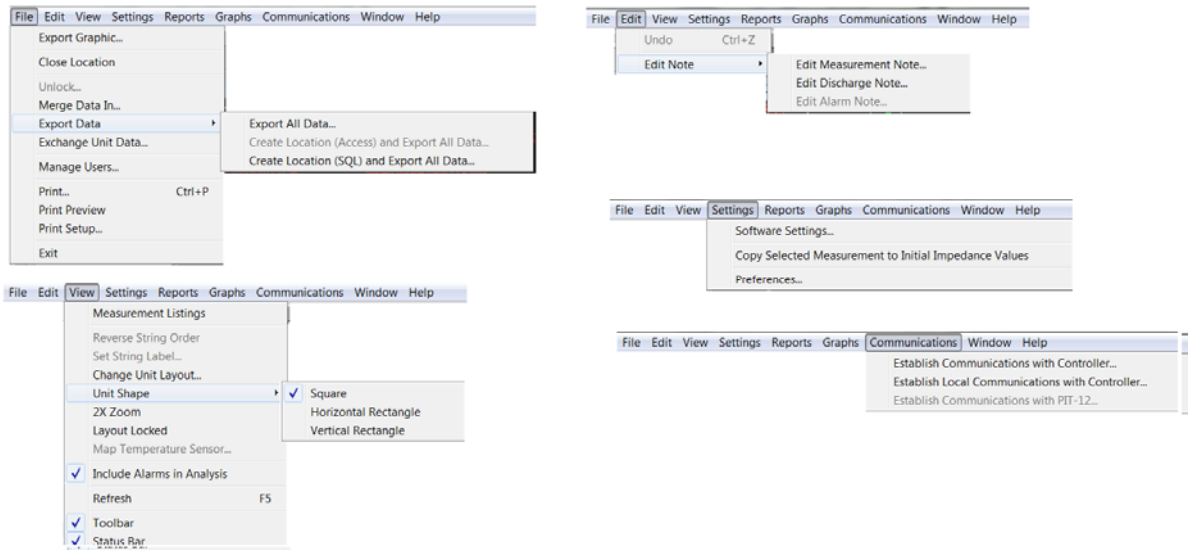
- Graphs, beginning on page 97.

Figure 8--An exploded illustration of the BVM Home screen

The image shows a screenshot of the BVM Home screen software interface with several callouts and annotations:

- Top Menu Bar:** File, Edit, View, Settings, Reports, Graphs, Communications, Window, Help. A callout points to the Reports and Graphs menus: "Click the Reports menu to select a report type" and "Click the Graphs menu to select a graph type".
- Unit Selection:** A dropdown menu shows "Unit 1". A callout points to the unit selection area: "Click on an icon to change the view of a report or graph between Voltage, Current, or Temperature." Above this are icons for Voltage (V), Impedance (Ω), Current (I), and Temperature (T).
- Left Sidebar:** Contains buttons for Reports (System Analysis, Discharge Intervals, Alerts and Alarms), Graphs (Unit Snapshot, Unit Trend, Temp Trend, String Trend, System Trend), and Discharge Graphs (Unit Snapshot, Unit Trend, Temp Trend, String Trend, System Trend). A callout states: "The side bar contains buttons to access graphs and reports. These are also accessible from the menu bar".
- Main Content Area:**
 - Charger:** Shows a red icon with a slash. Callout: "Click the Reports menu to select a report type".
 - String:** Shows a green icon with a slash. Callout: "Click the Graphs menu to select a graph type".
 - Auxiliary Inputs:** Shows a red icon with a slash. Callout: "Click on an icon to change the view of a report or graph between Voltage, Current, or Temperature." Below it, a callout says: "If an icon is unavailable, no data of that type is available." and "Auxiliary Inputs icon".
 - Status Data:** A callout points to a text box: "Selecting a String and holding the cursor over an icon pops-up status data".
- Bottom Section:** A 2x2 grid of numbered blocks (1, 2, 3, 4) representing batteries in a string. Callouts explain: "Each numbered block represents one battery in a string." and "Individual batteries can be selected for graphing and reports." A callout for block 4 says: "Moving the cursor over a unit, displays a tool tip with the most recently logged data".
- Measurement Listings:** A button at the bottom left. Callout: "Measurement Listings displays a tabbed log screen showing historical Measurement, Discharge, and Alert data".

Figure 9-The BVM4 Home Screen Menus



Notes:

Throughout this guide various procedures require the user to navigate to, and select, certain menu items. The above graphic displays most menu items and sub-items.

- The availability of some menu items depends on the specific function the user is performing.
- Reports and Graphs are described in detail in sections 7 and 8 respectively.
- Information on the Help functionality is located at: About This Guide, beginning on page 3.

3. S5 Start-Up

Once the S5 controller has been installed and the software loaded onto the computer, the controller and computer must be linked and the locations configured. For new installations initial S5 controller location files must be added to the BVM software.

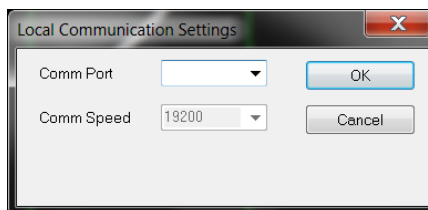
Connecting a Computer to the S5 Controller Via USB Cable

In order to load the BVM software and complete an initial S5 configuration a host computer must be connected directly to the S5 unit. To connect a local computer to an S5, use the BTECH-provided USB communication cable.

- a. Plug the USB cable into the port on the S5 *front panel*, and to an available USB port on the computer,
- b. In the BVM menu bar click **Communications** and select *Establish Local Communications with Controller* from the submenu. The *Local Communication Settings* dialog is displayed (see below),
- c. If the **Comm Port** list box is not showing a default entry (or if the default is incorrect) click the drop-down arrow and select the *communications port* to be used to connect to the S5,
 - Enter the correct port number if it does not appear in the drop-down list.
- d. If the *Comm Speed drop-down* is available select the communication speed or accept the default,
- e. Click **OK** to open the communications port and establish communications with the controller,
 - **NOTE:** These communication parameters become the defaults used by the BVM software as long as the same USB port is utilized.
- f. Click **OK** in the dialog asking if 'all new data should be retrieved'.


The *Communications* screen is now displayed. It serves as the base or 'core' location for the remainder of the configuration process, (see Figure 12, pg. 22).

Figure 10-Local Communications Settings dialog



Start-up for New Locations

The first time that BVM is started – and any time a new location is added and configured – this procedure should be followed.

- a. Connect the S5 unit and the computer using the USB cable (see “Connecting a Computer to the S5 Controller Via USB Cable“ beginning on page 18),
- b. Turn the S5 ON and start the BVM4 software by clicking the BVM icon  in the start menu. A location list screen is displayed, (see Figure 11, below),
 - If the BVM Location List screen is not displayed when the software is started – click **File** in the menu bar and select *Open* in the option list.
- c. Select the location to configure in the *Location List* screen and click **OK**.
 - If the target location is not listed it must be added. See “*Adding Locations to BVM*”, beginning on page 10.

The BVM home screen is displayed for the selected location, (see Figure 8, pg. 16).



- The serial number of the S5 and the selected site MUST match or errors will be generated by the controller.
- The first time a location is opened the user is given an option to add and configure user privileges. This can be done at this point or any time in the future.
see: *Managing Users*, beginning on page 34.



For sites with multiple S5s, each unit must be set up individually.

Opening the Communications Screen

Most of the initial steps for configuring a location are accessed from the main communications screen. Use the following procedure.


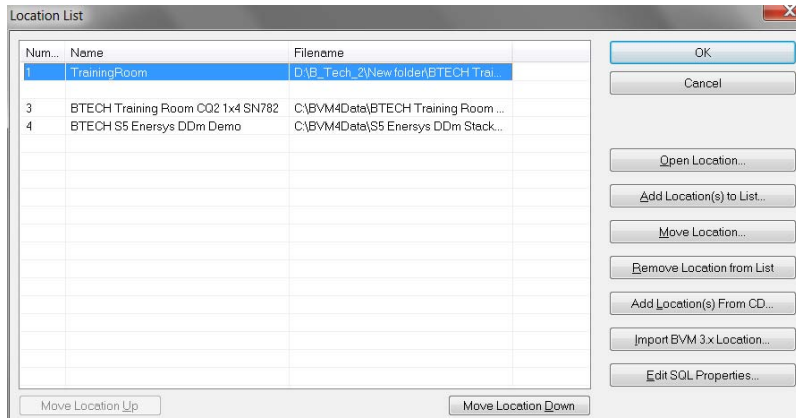
- a. In the Home screen menu bar click **Communications** and select *Establish Local Communications with Controller*, (see Figure 9, pg. 17),
- b. In the *Communications* dialog:
 - Accept or change the *Comm Port* and *Comm Speed* settings and click **OK**.
- c. The *first time* a location is opened an [BVM] *error dialog* is displayed. This is normal. Click **OK**.
- d. The main Communications screen is displayed, (see Figure 12-, pg. 22).

Figure 11-The BVM4 Locations List Screen -



Reviewing the Battery System Configuration

The location file provided by BTECH with the S5 contains data on the battery system. This procedure checks the actual system configuration against the file data.

- Click **Advanced** in the main *Communications* screen and click **System Configuration**. A group of six *property sheets* are displayed, (see Figure 12- 2 , pg. 22),
- In the *System Configuration property sheet* click the **Module Config** button to display the Module Configuration screen, (see Figure 12- 3 , pg. 22),
- Click the **Module Diagnostics** button to display the Module Diagnostics screen, (see Figure 12- 4 , pg. 22),

The first time this screen is opened it performs an audit on the default module (Module 1) and display results at the bottom of the *Units Assigned* and *Temps* columns. The count for each group should be *identical*.

- Units Assigned *must equal* Units Found
 - Temps *must equal* Temps [Found]
- Click the **Module** drop-down and select the *next* module. Repeat this procedure for all modules in the system.



If the totals for any module do NOT match, a problem with the battery system hardware connections is present. Resolve the hardware issue, see *Equipment Checks and Troubleshooting*, beginning on page 67. When the problems have been corrected repeat this procedure.

Re-learning the Connections

Once the Module Diagnostic results are correct the next process is to re-learn the connections. Proceed as follows.

- a. Navigate to the main *Communications* screen and click **Advanced** if necessary (see Figure 12-1, pg. 22),
- b. Click on **System Configuration** to display the property sheets,
- c. In the *System Configuration* property sheet click the *Clear Memory* drop-down arrow, (see Figure 12-5, pg. 22),
- d. Click *Relearn Connections* in the drop-down list and click **OK** in the *Warning* dialog.

The Communication screen elements are all unavailable (grayed out) for a brief time period. When the screen is refreshed the process is complete. If the Communications screen indicates an error the cause must be corrected and this procedure repeated.

Obtaining Preliminary Measurements

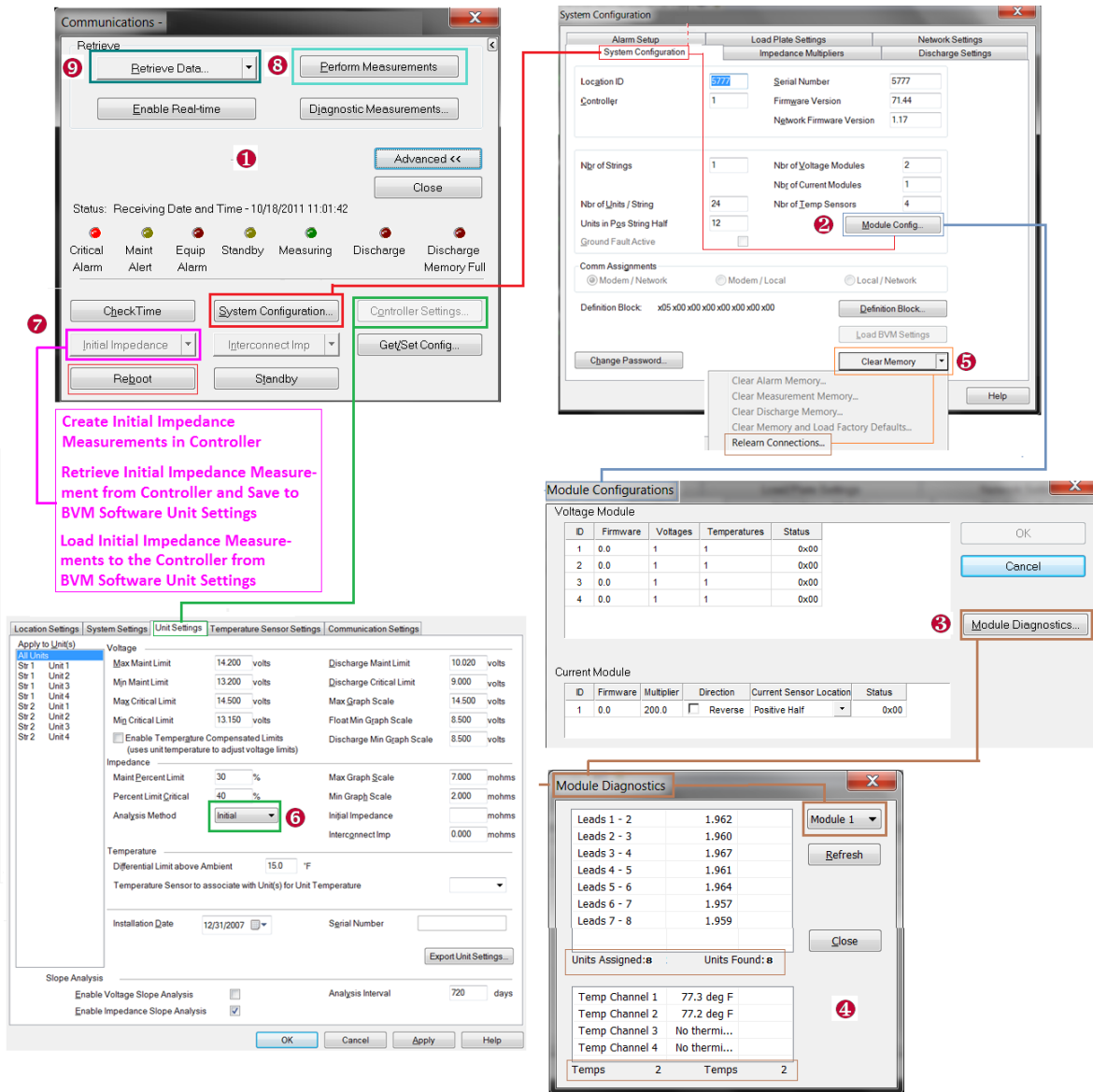
Initial measurements are obtained using the following procedure.

- a. Navigate to the main *Communications* screen and click **Advanced** if necessary (see Figure 12-1, pg. 22),
- b. Click **Perform Measurements** to capture battery data to the controller, (see Figure 12-8, pg. 22),
 - The screen controls will become inactive for a period of time until “Measurement Complete” appears in the status line.
- c. Click the **Retrieve Data** drop-down arrow and select *Retrieve All* in the list. The data has now been updated to the computer, (see Figure 12-9, pg. 22).
 - Click **OK** if a dialog is displayed.



For a large, multi-string site, measurements can take up to approximately 2 hours – during which the controller is unavailable.


Figure 12: Configuration Procedure Screen Flow



Verify the Measurement Data

Impedance (together with *voltage* and *temperature*) start-up data is verified through the “Graphs” function.

- a. In the *Home screen menu* bar click on **Graphs** and select *Snapshot of Unit Measurements*, (see Figure 9, pg. 17),
 - see Unit Snapshot Graph, beginning on page 100 for a description of the graph data.
- b. Select the *current date* in the date dialog,

When the graph is displayed the default measurement is 'Voltage'. Click the Impedance symbol in the icon bar, , (see Figure 8, pg. 16).

- It is advisable to also check *voltage* and *temperature* data by clicking their respective icons.
- Pressing F10 will cycle through the available graphs.



If the data indicates a problem, resolve the issue(s) before continuing.

Impedance Multipliers

Obtaining Baseline Impedance Values

Certain parameters must be set once the computer and the S5 controller are communicating. This is done from various functions contained in the *primary Communications* screen. Utilizing this screen the user can acquire a base set of measurements from the S5, save them to the S5's *location file*, and store them in the controller memory.

Impedance Multipliers compensate for the output impedance of the battery charger, the impedances of other parallel strings of cells, and also DC bus wiring and switching. They can be set for systems requiring the impedance measurements to have absolute accuracy (as contrasted with relative accuracy). Multipliers exist for both the positive and negative half of each string. Multipliers are set using the *automated function*.

Setting Impedance Multipliers automatically can be done when – and *only* when –



- There are an equal number of batteries in the positive and negative halves of the string,

In ALL other situations impedance multipliers *must* be set *manually*.

Before attempting to set multipliers manually, customers should contact the BTECH Technical Support department for assistance.

Setting Impedance Multipliers Automatically


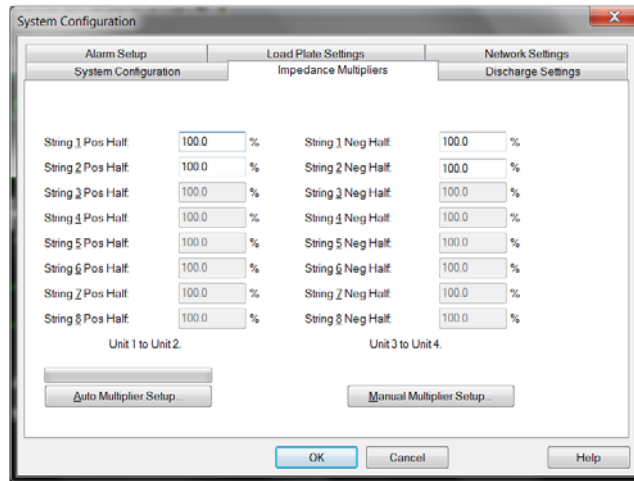
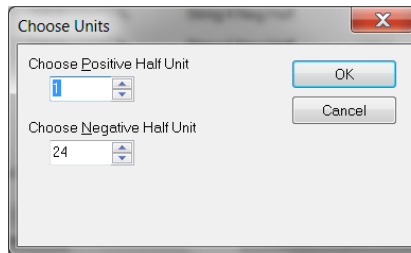
- a. Navigate to the main *Communications* screen and click **Advanced** if necessary (see Figure 12-, pg. 22),

Figure 13-Impedance Multipliers Populated Automatically



- b. Click **System Configuration**. The System Configuration properties tab screen is displayed, (see Figure 12- 2, pg. 22),
- c. Click the *Impedance Multipliers property tab*. The properties are displayed, (see above),
- d. Click **Auto Multiplier Set Up**. BVM begins capturing impedance data from each unit,
 - The new data populates the screen fields.
- e. In the *Choose Units* dialog select the *Positive and Negative half units*, (see below).
 - BTECH recommends NOT using the *first or last* unit in this procedure.

Figure 14- The Choose Units dialog



It takes *about* 15 seconds per unit to acquire each reading. Depending on the overall size of the installation it may take several minutes to complete the process.

Setting Impedance Multipliers Manually

Setting Impedance Multipliers Manually

This option is generally used only when the number of units in the positive and negative parts of the string are *unequal*. BTECH strongly advises that customers consult with the Technical Support department prior to making any manual impedance changes.

Obtain a New Set of Base Measurements

Once the Impedance Multipliers have been set, new, *post-Impedance multiplier* values must be obtained.

- Repeat “Obtaining Preliminary Measurements”, page 21.



Generally it is *not* necessary to repeat the data verification procedure.

Copy Initial Impedance Values to BVM Software Settings

The new data obtained in this procedure is used for trend analysis as well as any user-requested reports or graphs.

- a. Navigate to the main *Communications screen* and click **Advanced** if necessary (see Figure 12-**1**, pg. 22),
- b. Click the *Initial Impedance* drop-down arrow,
- c. Select “*Retrieve Initial Impedance Measurements from Controller and Save to BVM Software Unit Settings*”, (Figure 12-**7**, pg. 22)
- d. Select the date of the measurements and click **Yes** in the confirmation dialog,
- e. Click **OK**.

The unit’s initial impedance measurements in the BVM software settings have now been replaced with the data from the selected date.

Load Initial Impedance Values to the S5 Controller

The new data obtained in this procedure is used for trend analysis as well as any user-requested reports or graphs.

- a. Navigate to the main *Communications screen* and click **Advanced** to display the options contained in the screen extension, (see Figure 12-**1**, pg. 22)
- b. Click the Initial Impedance drop-down arrow,
- c. Select “*Load Initial Impedance Measurements to the Controller from the BVM Software*,”
- d. Click **Yes** in the confirmation dialog,
- e. Click **OK**.

The unit's initial impedance measurements in the controller have now been replaced with the data from the selected date.

Changing Software Setting

Units Properties

Once the new impedance values have been added to the controller and to BVM, some software configuration changes must be made.

- a. In the *Home screen* menu bar click **Settings**, and select *Software Settings*. A group of tabbed property sheets are displayed, (see Figure 8, pg. 16),
- b. Click the *Units Properties sheet*,
- c. In "*Impedance*" (mid section of the screen) click the **Analysis Method** drop-down arrow and select *Initial* from the list, (see below),
- d. Click **OK** to change the setting.

Changing Controller Settings Properties

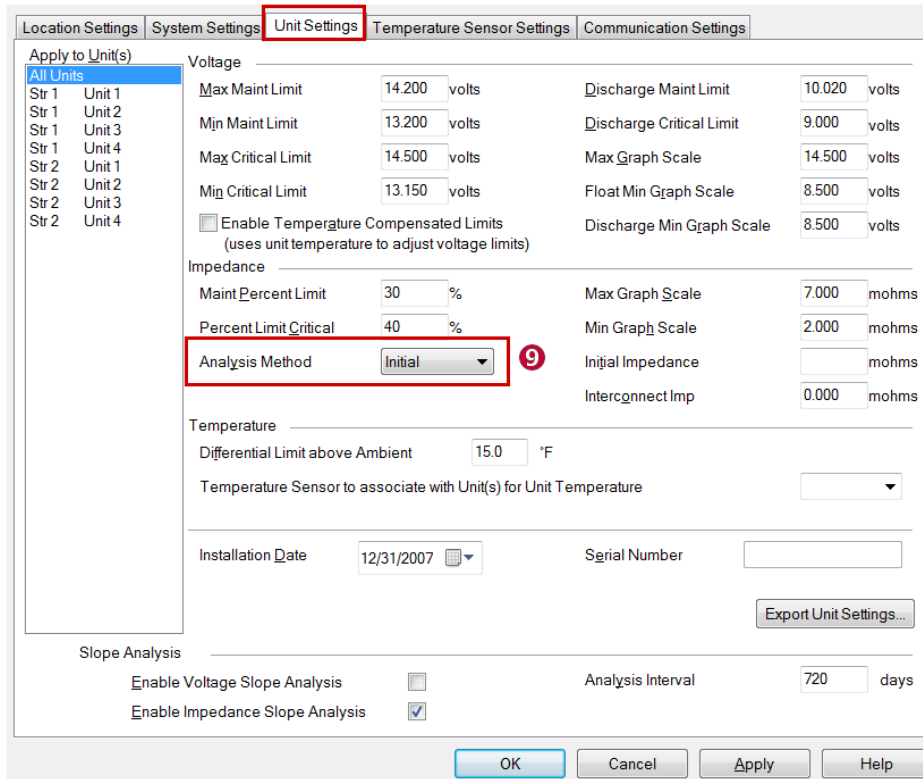
- a. Navigate to the main *Communications* screen and click **Advanced** to display the options contained in the screen extension, (see Figure 12- ❶, pg. 22),
- b. Click **Controller Settings**. A group of tabbed property sheets is displayed,
- c. Select the *Unit Limits* sheet, (see Figure 15- ❹ below),
- d. Click the *Analysis Method* drop-down and select "*Initial*",
- e. Click **OK** to change the setting.

Adding Setup Notes

BTECH strongly advises that setup notes be added to BVM once the setup procedures are complete. This is accomplished using the following procedure.

- a. Navigate to the BVM home page (see Figure 12, pg. 16),
- b. Click the *Measurement Listings* button at the bottom of the *left* panel. The *Measurement* sheet is displayed, (see Figure 60, pg. 83),

Figure 15- Unit Settings Property Sheet



- c. Select the *record* for the current date (usually at the list bottom).
- d. Right click and select “*Edit Measurement Note*”, from the context menu,
 - Click **OK** in the *Select Measurement* dialog.
- e. In the *Note* dialog enter a brief commentary including the site location and technical ID. Click **OK** when finished.
 - Enter “This data used for initial impedance”.
 - Notes can be edited at any time however the user is limited to the column space in the Measurement sheet.

Identifying Problems

If the S5 system indicates an alarm or alert use the following procedure to identify the cause.

Navigate to the BVM Home screen and click **Measurement Listings** at the bottom of the left panel, (see Figure 8, pg. 16).

- a. In the *Measurement Listing's* three-tab sheet screen select *Alarms and Alerts*, page 3, (see **Error! Reference source not found.**, pg. 29).
- b. Identify any Alarm/Alert messages for the date and time that the startup process was begun.

The Alarm and Alerts column message(s) indicate the source problem(s) that must be corrected. Once all problems have been resolved, clear the alarm state as described below and continue with the startup.

Acknowledging Alarms and Alerts

Once the hardware/software problem(s) is corrected use the following procedure to acknowledge the record in the Alarms/Alerts column (see **Error! Reference source not found.**, below). The Alarm/Alert message (and the acknowledgement) will remain as part of the log.

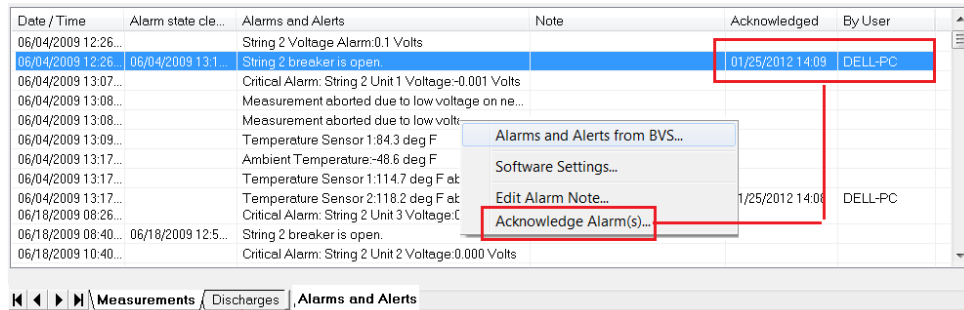
- a. Navigate to the Communications screen and click the **Retrieve Data** drop-down,
- b. Select *Retrieve Alarms and Alerts* from the drop-down list. This copies the alarm data to the BVM software,
- c. Navigate to the BVM Home screen and click **Measurement Listings** at the bottom of the *left* panel,
- d. In the *Measurement Listing's* three-page screen select *Alarms and Alerts* – page 3,
- e. Select the alarm or alert to be acknowledged,
 - **NOTE:** Multiple Alarms/Alerts can be selected by holding down the Ctrl key while selecting individual entries.
- f. Right-click to display a popup menu and select *Acknowledge Alarm(s)*. Click **OK** in the confirmation dialog,
 - BVM populates the “Acknowledged” and “By User” columns for the selected entry(ies) with user data, and clears the alarm.
- g. Close the *Alerts and Alarms* page by clicking the red “X” in the corner and navigate back to the *Communications* screen.

Setting Read Date/Time

At start-up the S5 needs to have the current date and time set so that it can accurately label events and perform certain scheduled tasks correctly. Use the following procedure.

- a. Navigate to the *Communications* screen (see Figure 31, pg. 48),
 - **NOTE:** expand the screen by clicking the **Advanced** button if necessary.
- b. Click **Check Time**. The screen's *Status* line displays the time the S5 currently has in its memory.
 - If the S5 time and the host computer time differ, a dialog suggesting that the date/times be synchronized is displayed. Click **OK**.

Figure 16- The Alerts and Alarms page with popup menu inserted.



Three pages or 'tabs' are included in the Home screen Measurement Listings

Scheduling Periodic Measurement Readings

Measurements can be downloaded to the S5’s controller on a user-entered schedule. This usually provides the most consistent data set for trending and other purposes. Manual readings can still be taken if necessary.

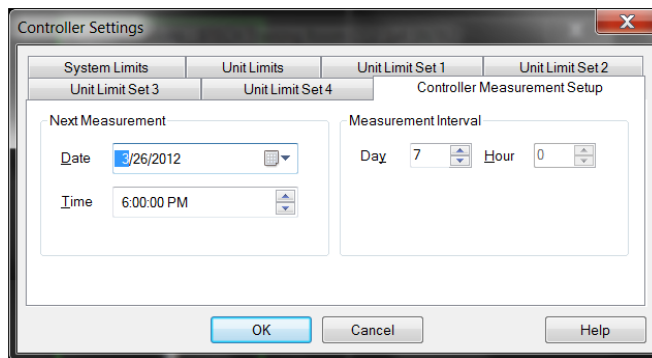
- a. Navigate to the Controller Measurement Setup tab,
- b. Enter the date-time information using the spinbox located in the in the *Measurement Interval* block,
 - The Date and Time entries in the *Next Measurement* block (re-) adjust automatically.
- c. In the Measurement Freq[ueency] drop-down list, select the appropriate frequency.

The measurements will occur automatically on the schedule entered. Schedules can be revised as necessary.

Alarm Output Relays

The alarm output relays connect the S5 to a building management system. As shown below up to six output relays can be connected.

Figure 17-Scheduling Controller Measurements Automatically

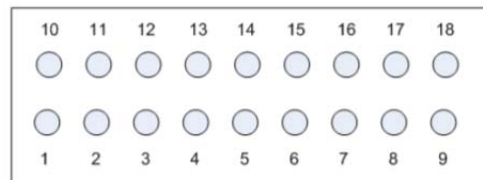




- The S5 Controller stores a maximum of 5 readings. As new readings are added the oldest ones are deleted.
- BTECH recommends setting the measurement interval at seven to 30 days.

All six relays are Com, ND/NC. Three terminals (COM-ND-NC) for each relay are present in the (2) 6-pin plugs (see diagram below).

Figure 18-Alarm Output Relays



Wire Connections

- ALARM #1 = 1-3 CLOSURE = ALARM; 1-2 OPEN = ALARM
- ALARM #2 = 4-6 CLOSURE = ALARM; 4-5 OPEN = ALARM
- ALARM #3 = 7-9 CLOSURE = ALARM; 7-8 OPEN = ALARM
- ALARM #4 = 10-12 CLOSURE = ALARM; 10-11 OPEN = ALARM
- ALARM #5 = 13-15 CLOSURE = ALARM; 13-14 OPEN = ALARM

ALARM #6 = 16-18 CLOSURE = ALARM; 16-17 OPEN = ALARM



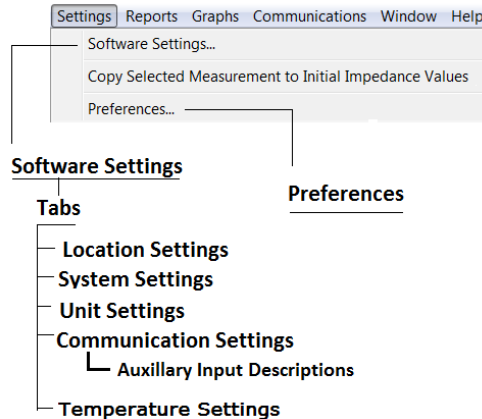
Relay outputs are in the specified condition when the S5 is in normal operating mode and no programmed alarms are present. If the S5 is unpowered all relays will change state and alarms are *activated*.

4. Configuring the BVM and BVS Software

The *site* files added to the BVM system have been configured at the factory according to the battery manufacturer’s specifications. A few items (e.g. time zones, temperature scale) must be set locally. Any of the software’s settings can be modified as necessary although this should only be done when absolutely necessary.

Settings are checked and changed from the BVM menu bar displayed in the Home screen (see Figure 9, page 17). Some settings are specific to each site and consequently this procedure must be performed each time a site (a new S5 unit) is added. Certain site-specific measurements (e.g. Impedance) must be recorded from the battery installation and loaded into the host computer.

Figure 19- Settings Menu Map



Downloading and Copying Local Measurements

Unlocking a Location File

When the BVM opens a location file, it locks the file to prevent another BVM from making any changes to the settings (not the data). If a location file remains locked, this command is available to unlock the *location file* manually. Before doing so, make sure the location file is not being used by anyone else.

- a. Select the location to be unlocked,
- b. Click **File-Unlock** to unlock the location.
 - If the 'Unlock' submenu option is grayed out, the location file is not locked.

Data Merge Functions

This menu command merges data from a selected location file into the currently open location. After selecting this command, a *Windows Explorer File Open* dialog box appears where the user can select the *source* location file. Once the file is selected, the location is opened and various criteria are checked to ensure that the data being merged is from the

same location. The location number and number of units in the source location file *must* match those in the currently open location. If there is a difference in the number of strings, the user is notified. The user then chooses the date range and the type of data to merge.

The merge process begins after the user clicks **Start**. A status bar shows the progress of the merge operation which can take some *length of time*.

Figure 20-File Menu: Merge Data sub-menu dialog

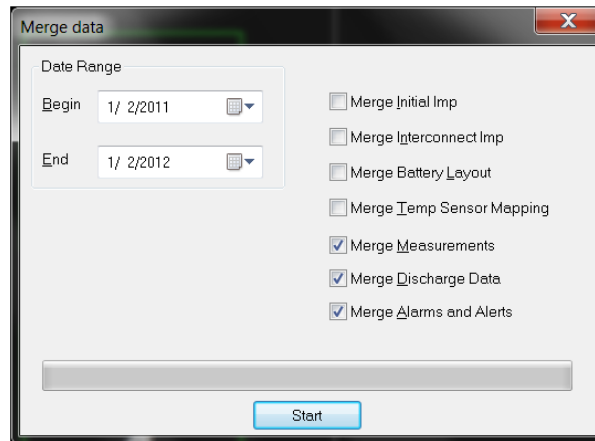


Table 1. Merge Data Screen Content

Entry Name	Description
Date Range	
Begin/End	Use the drop-down box to select the beginning and ending dates of the data merge procedure.
Merge Initial Imp[edance]	Takes baseline unit impedance values and merges them into a new file.
Merge Interconnect Imp[edance]	Takes long interconnect values and merges them into a new file.
Merge Battery Layout	Represented by the battery map in the Home page.
Merge Temp Sensor Mapping	Assigns pilot cell temperature units in software.
Merge Measurements	Merges measurement data from the user-selected date range to the currently open location file.
Merge Discharge Data	Merges discharge data from the user-selected date range to the currently open location file.
Merge Alarms and Alerts	Merges alarm and alert data from the user-selected date range to the currently open location file.

Exchange Unit Data

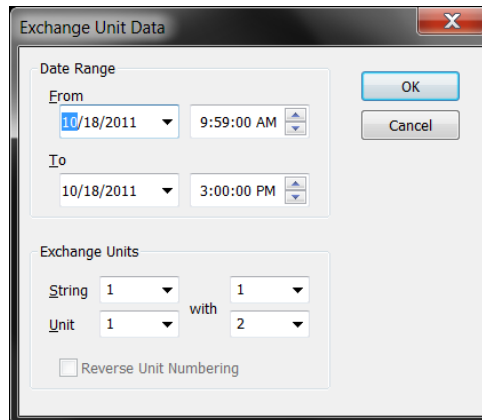
This is used to exchange the measurement data of two units and is useful in situations where two or more units in the battery system are physically swapped during maintenance. Typically this date range would be the entire time the battery system was monitored before the swap took place and must be selected *first*. The string and unit of the two units to be swapped must be selected and the **OK** button clicked.

After the user confirms the swap in a dialog, the swap operation continues to completion and the data is swapped. *Note:* this operation may take some *time* to complete.



Once the process begins it cannot be stopped and the results cannot be reversed.

Figure 21-File Menu: Exchange Unit Data Dialog menu option

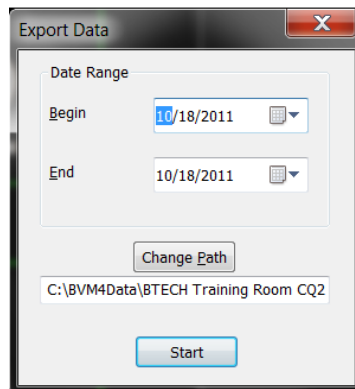


Exporting Data

The *Export Data* selection in the *File menu* allows the user to export all archived data in a selected date range to a *comma-delimited text file*. This file can then be imported into spreadsheets, databases, and other software. The following options are available.

- a. Click the *Begin* and *End Dates*- select the beginning and ending dates for the source data from the drop-down date lists,
- b. Change Path – accept the default location or select the path to a new location where the data will be exported,
- c. Click **Start**.

Figure 22-File menu: Export Data Dialog



Managing Users

User management is done from the *Manage Users* option of the *File menu*. This option enables the system manager to add, remove, or change user profiles. By default, there are no users listed in the software so changes can be made to the location file by anyone accessing it. Once a user is added, anyone opening the location file will be prompted for a user name and password.



BTECH recommends that customer employ strong security measures and user management policies to protect any location information, measurement data, analysis or notification messages that are deemed sensitive or proprietary. This is especially important if data is sent over public networks.

There are three permission levels:

- *Technicians* are limited to viewing data,
- *Supervisors* have access to everything except for the *Manage Users* function,
- *Administrators* have no limitations on what they can do,

To add, remove, or modify a user do the following (see Figure 23, below):

- a. In the *File* submenu select *Manage Users*. The *Manage Users* screen is displayed.

To add a user -

- b. Click **Add User** . . . The *Add User* screen is displayed.
- c. Complete the required entries and click **OK**.

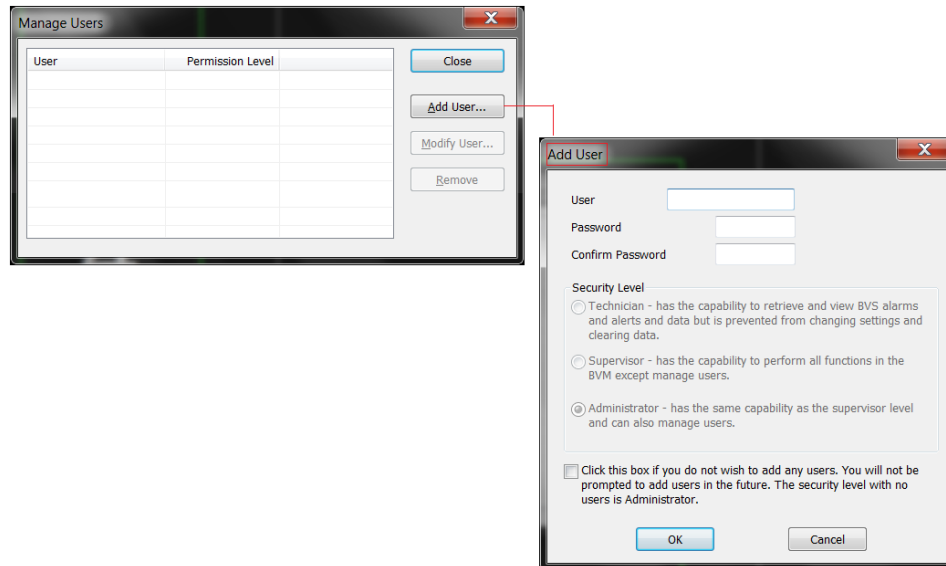
To change a user's privileges or remove a user -

- d. Open the *Manage Users* screen as described above,
- e. Select the user to be removed or modified by clicking on their entry and do one of the following:
 - To remove a user click **Remove** or,
 - To modify a user click **Modify User**. The *User* screen (identical to the Add User screen) is displayed. Make any necessary changes and click **OK**.

The changes are effective immediately.



Exercise caution when removing a user. There is *no* confirmation dialog after the *Remove* button is clicked and no '*un-do*' function is available.

Figure 23- Manage Users/Add Users dialogs

The Preferences Menu Option

The BVM Preferences screen is used to configure settings which apply to all locations. These settings are also used by the BVS software, (see above).

- a. In the BVM menu bar click **Settings**, and select *Preferences* from the drop-down list,
- b. Enter, or change any of the available fields, radio buttons, or checkboxes and click **OK**.

Changes become effective immediately.

Figure 24-The [Software] Preferences Menu Option

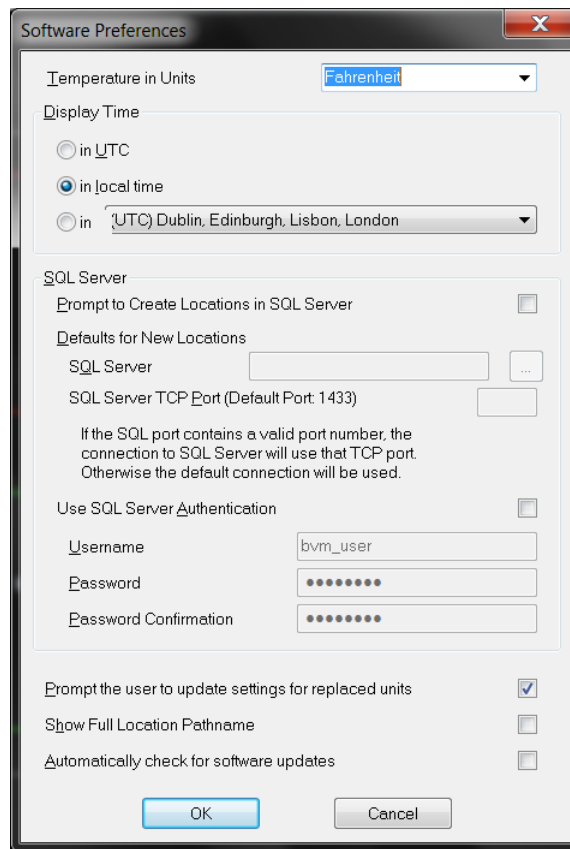


Table 2. Preferences Menu Entries

Entry Name	Description
Temp. Units	Select either Fahrenheit or Celsius for use when reporting temperature information.
Display Time	
Display Time	Select either Universal Time, local time, or a time zone for use when displaying time. The local time is determined by <i>Window's Time Zone</i> selection.
SQL Server	
NOTE: SQL entries are only used when an SQL server is used to create and maintain the BVM database(s). See: Installing BVM 4.x Software on a Server beginning on page 112 for additional information.	
Prompt to create Locations . . .	When this is selected, the user is prompted whether to store the new location's settings and data in an <i>SQL Server database</i> .
Defaults for new Locations	The SQL Server instance is where new locations are created or added. Click the button to view a list of all the <i>available SQL Servers</i> .
SQL server TCP port	The default TCP port to use when creating or adding new locations. The <i>default</i> value is: 1433 .
User SQL Server Authentication	Not available in the preferences menu. A new SQL User name and Password should be entered when the SQL server is installed and set up.

Entry Name	Description
Username	Not available in the preferences menu. Entered during SQL setup.
Password	Not available in the preferences menu. Entered during SQL setup.
Password Con.	Not available in the preferences menu. Entered during SQL setup.
Prompt the user . . .	When enabled, the software scans through its 'saved measurements' to detect any units that may have been replaced. If it finds any, it prompts the user for confirmation. Following a confirmation, it sets the installation date and initial impedance.
Show Full Location . . .	Displays the full path of the location file in the title bar.
Automatically check . . .	When enabled, the software checks BTECH's website for new or updated software. NOTE: to download the new software, a software maintenance subscription with BTECH is required (one year is included free with the purchased of the software).

Software Settings Menu Option

The *Settings menu* option displays a set of five property sheets described in this section.

The Location Settings Property Sheet

This property sheet is used to capture basic descriptive information for the associated BVS. The *Location settings tab* is completed as described below:

- In the BVM menu bar click **Settings**, and select *Location Settings* from the drop-down list,
- Enter or change any of the available fields, radio buttons, or checkboxes,
- Click **Apply**.

The entries become effective immediately.

Table 3. Location Settings Property Sheet field descriptions

Entry Name	Description
Location ID	This entry is used to identify each controller. This is especially important when there are multiple monitors. NOTE: Information is supplied by BTECH and should NOT be changed.
Serial Number	The System Controller Module serial number found on the side of the controller. NOTE: Information is supplied by BTECH and should NOT be changed.
Model	Chose the model of the BVS from the drop-down list. For an S5 system with multiple strings, utilizing isolated charges, choose the "S5 w/Isolated Chargers." option. NOTE: Information is supplied by BTECH and should NOT be changed.
Name	A name identifying the BVS and the battery string being monitored.

Figure 25-Location Settings Property Sheet of the Settings Menu

Entry Name	Description
Address 1-2	The first line of the address where the system is installed.
Description 1-2	A place to enter any descriptive text used to identify the system.
Type of System	The type of system the BVS is monitoring e.g. UPS or telecommunications.
Type of Batteries	The type and model of jars the BVS is monitoring e.g. VLRA, Flooded, NiCad.
Contact Info	The contact information for the person responsible for the battery system at the install location.
Note 1-2	Used to enter any additional information that would help manage the battery system.

The System Settings Property Sheet

System Settings contain essential parameters used by the software. When setting up a new location the software automatically creates default values for the remaining fields when enough data has been entered into the first fields. The default values can be changed as necessary.

To complete the *System Settings* property sheet proceed as follows:

- a. In the BVM menu bar click **Settings** and select *the System Settings* from the drop-down list,
- b. Select the *Systems Settings* Property sheet in the resulting tabbed screen,
- c. Enter, or change any of the available fields, radio buttons or checkboxes and click **Apply**.

The entries become effective immediately.

Figure 26-System Settings Property Sheet

The screenshot shows the 'System Settings' property sheet with the following fields:

- Battery Configuration:**
 - Units Per String: 4
 - Number of Strings: 2
 - Units in Pos String Half: 2
 - Positive to Negative Unit Numbering:
- System Voltage Measurements:**
 - Max Charge Voltage: 55.2 volts
 - Discharge Voltage Limit: 42.0 volts
 - Min Charge Voltage: 54.0 volts
 - Graph Scale Max: 60 volts
 - Enable Temperature Compensated Limits:
 - Graph Scale Float Min: 50 volts
 - Graph Scale Discharge Min: 40 volts
- Current Measurements:**
 - Current Measured: Per System, Per String, Not Measured
 - Charge Current Graph Max: 30.0 amps
 - Discharge Current Graph Max: 20 amps
 - Charge Current Limit: 25.0 amps
 - Discharge Current Limit: 12 amps
- Temperature Measurements:**
 - Maximum Temp Limit: 82 °F
 - Temp Graph Scale Max: 100 °F
 - Minimum Temp Limit: 62 °F
 - Temp Graph Scale Min: 50 °F
 - Differential Limit: 15.0 degrees
 - Number of Temp Sensors (Not including ambient): 0

Buttons at the bottom: OK, Cancel, Apply, Help.

Table 4. System Settings Property Sheet field descriptions

Entry Name	Description
Battery Configuration	
Units per String	Enter the number of units per battery string, i.e. the total number of units (cells or jars) per string that the BVS is measuring. A unit can be an individual cell, a jar consisting of multiple cells, or multiple jars. NOTE: The number of units is NOT equal to the number of leads connected to the BVS.
Number of Strings	The number of strings MUST range from 1 to 8 – the maximum for a single S5 unit.
Units per Pos String Half	The number of individual batteries in the first (positive) side of a string. If there are 12 batteries in a string, units 1-6 are in the positive half.
Positive to Negative Unit Numbering	This checkbox indicates the battery unit numbering runs from positive to negative, (for telecommunications battery systems, the unit numbering may be negative to positive). For the S5 controller clicking this checkbox changes the numbering. NOTE: see BVM Home Screen Display Options, pg. 128 for additional information.
System Voltage Measurements	
Max Charge Voltage	The <i>maximum</i> and <i>minimum</i> system float voltage limits should be set to the battery manufacturer's recommended specification. NOTE: BTECH sets these values to manufacturer's specifications and recommends keeping them at the factory values.
Loaded Voltage	The minimum voltage the UPS or other load requires during a discharge.

Entry Name	Description
Limit	This value is shown on the System Discharge Voltage Graph by a dashed line.
Min Charge Voltage	see Max Charge Voltage.
Graph Scale Max	Determines the ordinate range of the temperature graph.
Enable Temperature Compensated Limits	The voltage limits are adjusted based on the measured temperature.
Graph Scale Float Min	These values determine the ordinate values for the battery voltage graphs. Values are used that clearly show the changes that take place.
Graph Scale Discharge Min	These values determine the ordinate values for the battery voltage discharge graphs. Use values that clearly show the changes that take place – including load periods.
Current Measurements	
Current Measured	Choose whether current is being measured and, if so, whether on a system wide or individual string basis.
Current Charge Graph Max	This value is the maximum scale value on the Charge Current graphs.
Discharge Current Graph Max	This value is the maximum scale value on the Discharge Current graphs.
Charge Current Limit	This value is the upper charge current limit.
Discharge Current Limit	This value is the upper discharge current occurring during a discharge.
Temperature Measurements	
Maximum Temp Limit	Specifies the highest temperature measurement.
Temp Graph Scale Max	Specifies the maximum numeric value to be displayed in any temperature graph generated by the BVM4 software.
Minimum Temp Limit	The lower temperature limit for all temperatures.

The Unit Settings Property Sheet

Unit Settings contain essential parameters that are used by the software. If a new location is being set up, the software automatically creates *default values* for the remaining fields when enough data has been entered in the *first fields*. The default values can be changed at the discretion of the user.

Every unit (cell or jar) is capable of having a unique array of unit settings, i.e. this sheet can be used to enter settings *for all* strings or for just *selected strings*. This tab is the interface for entering and modifying these settings. On the left of the sheet is a list of all the units in the system with the entry of *All Units* at the top which is selected by default. If *All Units* is selected, the value shown in a field is the value for all the units.

When all units do not have the same value for a particular setting, the field will be blank. By selecting individual units or groups of units, each can be assigned unique settings.

Normally, most settings are identical for all units. The Initial Impedance and Interconnect Impedance are exceptions and usually have different values.

To complete the *Unit Settings* property sheet (see Figure 27 below) proceed as follows:

- a. In the BVM *Home* screen menu bar click **Settings**, and select *Software Settings* from the drop-down list, (see Figure 9, pg. 17),
- b. Select the *Unit Settings* tab,
- c. In the left side panel select the unit that is to have its settings changed,
- d. Enter or change any of the available fields, radio buttons or checkboxes and click **Apply**.

The entries become effective immediately.



Although very typical – not all installations include temperature sensors in the system.

Figure 27-Unit Settings Property Sheet

Table 5. Unit Settings Property Sheet Field Descriptions

Entry Name	Description
Voltage	
Min. and Max Maint. Limit	Set the unit’s maximum and minimum voltage limits to indicate units outside of the manufacturer’s recommended range. These limits are shown on the unit voltage graphs.
Discharge Maint. Limit	The discharge voltage limits are the minimum voltages a unit is allowed to reach during a discharge. These values are shown on the unit voltage graphs for discharge.

Entry Name	Description
Discharge Critical Limit	The discharge voltage limits are the minimum voltages a unit is allowed to reach during a discharge. These values are shown on the unit voltage graphs for discharge.
Min. and Max. Critical Limit	Set the unit's maximum and minimum critical unit voltage limits so that any voltage outside of them indicates a critical problem. These limits are shown on the unit voltage graphs.
Max. Graph Scale	The unit voltage graph maximum and minimum values determine the ordinate range of units on voltage graphs.
Float Min. and Max. Graph Scale	Set these values to most clearly display the range of impedance on the unit impedance graphs. The values are in <i>milliohms</i> .
Enable Temperature . . .	Check this box to adjust the voltage limits based on temperature.
Impedance	
Maint. Percent Limit	This entry determines the point where increased unit impedance indicates a potential problem. The value is the percent increase of an impedance measurement above the average or initial impedance reading. Units with impedance values above the alarm limit should be investigated further. This limit is shown as a box on the impedance graphs and is also used to identify units in the various unit reports.
Min. and Max. Graph Scale	The unit voltage graph maximum and minimum values determine the ordinate range of the vertical (y-axis) on unit voltage graphs.
Percent Limit Critical	This entry has the same function as the Maintenance Percent Limit but should be set to a higher value to indicate more severe problems. Units with impedance values above the critical alarm limit should be investigated immediately. These units appear in the various unit reports in boldface type and as a box on the impedance graphs.
Analysis Method <i>Drop-down List</i>	Select one of the two available types of impedance analysis methods by clicking the drop-down arrow and pick one of the two options. <i>Average method:</i> compares each unit to the average string impedance and sets the <i>Maintenance</i> and <i>Critical Percent</i> alarm limits to the percentages above the average impedance. If the temperature of the battery room is relatively constant (+/- 5° Fahrenheit, +/- 3° Celsius), this method should be used. <i>Initial method:</i> compares each unit to its own <i>initial</i> reading and sets the <i>Maintenance</i> and <i>Critical Percent</i> alarm limits to the percentages above this initial impedance reading. If the battery room is not temperature-controlled this method should be used. Preferably, this initial impedance reading should be taken shortly after the battery is first installed, or alternatively when the monitor is installed. The main criterion to consider in choosing the impedance analysis method is the thermal environment of the battery room. If the Initial method is chosen, the initial impedance readings will have to be established in the BVS and the software settings.
Initial Impedance	The initial impedance value the software uses when the <i>Analysis Method</i> is set to "Initial".
Interconnect Impedance	The value used to adjust individual unit impedance readings where there are different length interconnects used on the rest of the battery, (<i>e.g. a long interconnect that cannot be compensated for by another voltage sense lead, or the absence of a short interconnect on the last jar of a string.</i>)

Entry Name	Description
	<p>A <i>positive</i> interconnect value <i>reduces</i> the impedance value to compensate for a long interconnect. A <i>negative</i> interconnect value <i>increases</i> the impedance value. This latter correction is almost always needed at the end of a row or tier where a link or short interconnect between jars is not measured.</p> <p>This particular unit will have lower impedance than those that include the link between jars. If the impedance is being analyzed using the average method, it is important to bring the impedance value of those jars up to the average impedance.</p> <p>If this is not done, one of the jars will have to undergo a greater impedance change to bring it to the alarm point. It is important to load these values into the BVS <i>after they have been changed on this sheet</i>. This is done using the "Load Interconnect Values To Controller From BVM Software" in the Advanced section of main <i>Communications screen</i>.</p>
Temperatures	
Differential Limit above Ambient	The maximum increase that temperature sensors associated with each battery unit can record above the ambient temperature. The purpose of this limit is to sense a possible <i>thermal runaway condition</i> .
Installation Date	<p>This field contains the installation date of a unit, which is used for analyzing the data and graphing. When a report or graph calculates the rate of change for the impedance, it will only use the measurements taken <i>after</i> the unit is installed. When a unit is replaced, the new unit's installation must be entered here.</p> <p>A replaced unit's previous measurements are shown in the graphs with a <i>dimmed color</i>. The replacement unit's measurements are shown with a full value color.</p>
Serial Number	This optional field allows the user to enter a serial number of a unit.
Slope Analysis	
Enable Voltage Slope Analysis	<p>This checkbox enables the slope analysis of the voltage measurements (see Unit Trend Graph (Voltage), pg. 101). This can provide an early alert to a unit failure when the unit's voltage starts trending lower. BTECH recommends enabling this option for wet cell applications. The <i>default</i> is off (unselected).</p> <p>The analysis can be set – in days – anywhere from <i>two weeks</i> up to <i>two years</i> (720 days). Note the following:</p> <ul style="list-style-type: none"> • the larger the interval the less precise the analysis, • a 35 to 90 day interval is suggested for VRLA batteries, • the <i>minimum interval</i> for flood jar systems is 180 days.
Analysis Interval	Indicates the maximum number of days of data to be included in trending calculations before the measurements are re-set to zero.
Enable Impedance Slope Analysis	This checkbox enables the slope analysis of the impedance measurements (see Unit Trend Graph (Impedance), pg. 101). This provides an early alert to a failing unit when the unit's impedance starts trending higher.

Child Screens

Export Unit Settings Button

Clicking the Export Unit Settings screen button displays a *Windows Explorer* window where the user must navigate to, and select the destination file where the settings are to be stored.

- a. In the Windows Explorer screen navigate to the BVM4Data directory,
- b. Select the location file the settings will be exported to.
- c. Click **Open**. The settings are written to the file.

Temperature Sensor Settings Property Sheet

This sheet allows the user to label the battery temperature sensors available on an S5 as well as enable their limits.

Figure 28-Temperature Settings Property Sheet

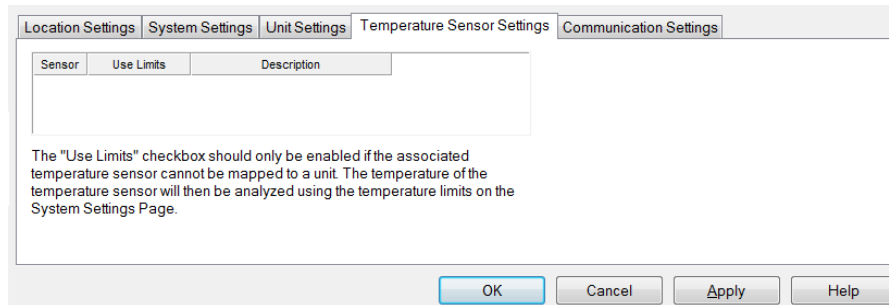


Table 6. Temperature Settings Screen Content

Entry Name	Description
Sensor	Temperature sensor number.
Unit Limits	This setting determines whether the software checks the temperature sensor against the temperature limits.
Description	A user-entered, free form description for the associated temperature sensor.

Communication Settings Property Sheet

The communication settings determine how the communications with the BVS will occur. The most commonly used settings are displayed as *defaults*. BVM supports two types of communication with the BVS.

- **Serial Communication** between the serial port of the PC and the BVS utilizing an external modem connected to the serial port on the mid-panel of the S5, a USB serial cable (for short distances) connected to the front of the S5, or a short-haul modem pair (for long distances)
- **Network Communication** between the PC and BVS using a TCP/IP network.

To set parameters in the Communications Settings property sheet proceed as follows:

- a. In the BVM menu bar click **Settings**, and select *Software Settings* from the drop-down list,
- b. Select the *Communications Settings* tab in the property sheets,
- c. Enter or change any of the available fields, radio buttons, or checkboxes,
- d. Click **Apply**.

The entries become effective immediately.

Figure 29 –Communications Settings Property Sheet



Only *one* of the options in this property sheet can be in effect at any given time. The selection of the *group radio button* determines which data set is active.

Table 7. Communications Settings Property Sheet

Entry Name	Description
Serial Communications [Settings] Radio Button	
Phone Number	If the battery monitor communicates through dial-up modems, enter the phone number of the modem. Otherwise leave this space blank.
Init String	Enter an initialization string to supplement the initialization string of the modem in use.
Comm Port	Choose the port to use for communications. All available ports on the PC will be listed.
Speed	Select the speed of the communications port. If direct communications are being used (short haul, etc.), the speed must match the communication speed of BVS – 19,200 bps. If an external modem is used, select a speed of 19,200 bps.

Entry Name	Description
Network Communications [Settings] Radio Button NOTE: Uses incoming port 3001, and outgoing port 8842	
Network Address	The unique IP address assigned to the battery monitor. If the PC and the BVS are connected to a company network, the address for the BVS should be obtained from the <i>network administrator</i> . The network address of the BVS can be set in the Network Configuration sheet. If a DNS server is available, each battery monitor could be "named" and that name used as the network address. This can also be accomplished on a small network using a host file.
Network Port	This is the "address" of the BVS on its network adapter. This value should not be changed. The default port is 3001. note: BVM Listens on Port 3001 and responds on Port 8842.

Child Screens

Auxiliary Input Descriptions

Clicking the Auxiliary Input Descriptions screen button displays. Each of the six inputs can have a description added to it. This description will be used when an alert is generated from the input.

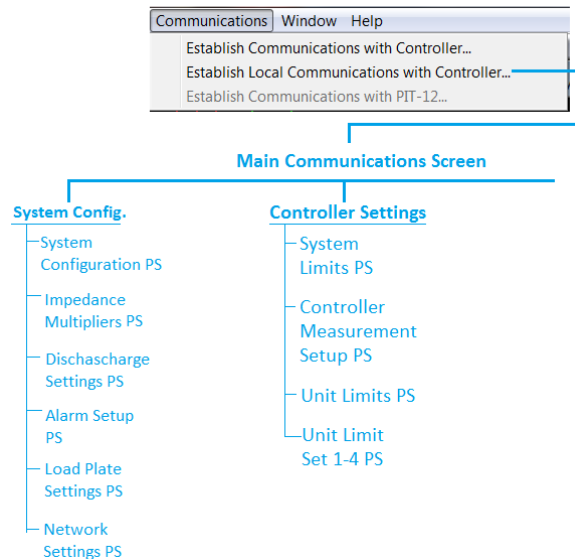
Refer to: Alarm Output Relays, beginning on page 29 for additional information.

5. Communications Menu Options

Communications Menu options enable the user to select and configure the communications parameters that the S5 uses to talk with the host computer. These include:

- A direct interface using a USB cable,
- Network interface (see *Installing SQL Server Express 2008*, page 114),
- A basic service (POTS) telephone line connected to the S5's internal modem via the center panel serial port, (see Figure 55, pg. 73).

Figure 30-The Communications Screen Property Sheet Map



Primary Communication Screen Options

Once communications are established with the S5 the primary communications screen is displayed (see Figure 31, pg. 48). There are a substantial number of functions and property sheets available from this screen. The functions contained in the 'primary' screen are described in this section.

The Retrieve Data Drop-down

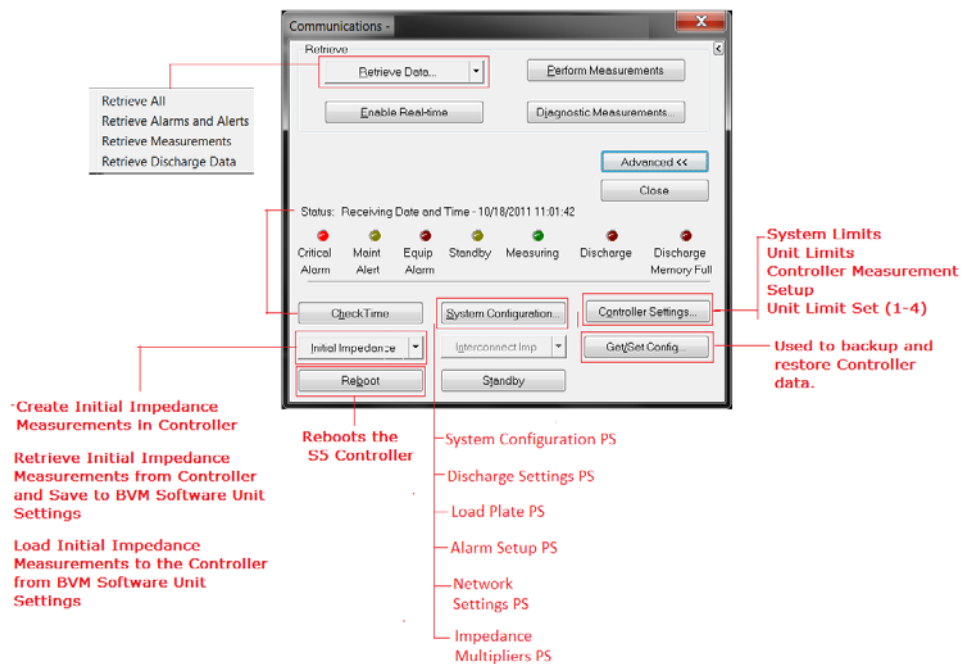
The *Retrieve* drop-down in the *Primary Communications* screen provides options for retrieving different types of data.

The *Retrieve Data* drop-down list enables the user to select the data set and download it from the S5 controller to the *Site file*. The options are:

- **Retrieve All** – retrieves *Alarms, Alerts, Measurements, and Discharge* data,

- **Retrieve Alarms and Alerts** –retrieves any alarms or alerts the S5 has in memory. Alarms and alerts are saved to the database file and can be viewed in the alarm listing. The user is prompted to clear the alarms from the S5's memory,
 - ▶ Measurements that are 'cleared' after downloading are removed from the controller memory but remain in the software database.
- **Retrieve Measurements** –retrieves and saves any measurements stored in the S5. Up to five measurements can be stored in the S5's memory.
- **Retrieve Discharge Data** –retrieves and saves any *new* discharge data stored in the S5. The user is prompted to delete the discharge data to make room for any future discharge retrievals.

Figure 31-The Primary Communications screen (including Advanced' Options)



Perform Measurements Function

Click this button to initiate a measurement. A progress bar is displayed in the *Status line* and the *simulated Measuring LED* turns green (see above).

- When the measurement is complete, click the **Retrieve Data** list box arrow and select *Retrieve Measurements* to download the data to the host computer for review and analysis, (see Figure 31, above).

Enable Real-time Measurements Function

This enables the S5 to begin monitoring measurements in real-time and send all the data to BVM. When viewed in a graphical format the graphs are refreshed each time a new data item is received by the computer. Three graphs are available.

- The Real-time Graph of *Unit Measurements* displays all of the unit's voltages and temperatures, see Unit Snapshot Graph beginning on page 100.
- The *Real-time Graph of System Voltage* displays a moving graph of the system voltage. The user can also opt to show real-time graphs of *System Current* and *Ambient Temperature*.
- Real-time graphs of *String Voltages and Currents*, and/or *System Voltage and Current* (availability depends on configuration) displays the system and/or each string's charge or discharge current. The title of the graph changes to reflect the measurement selected. If both the system and string graphs are available, they can be selected from the *View* menu. See *Comments*
- *Individual* Graph data can be exported or printed using the File menu.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- Users can select a specific sensor from the drop-down list in the tool bar.
- Data can be graphed as either data points (shown) or bars by pressing F8.
- String Trend beginning on page 102.



Features and options of graphs are described in section 8 Graphs, beginning on page 97.

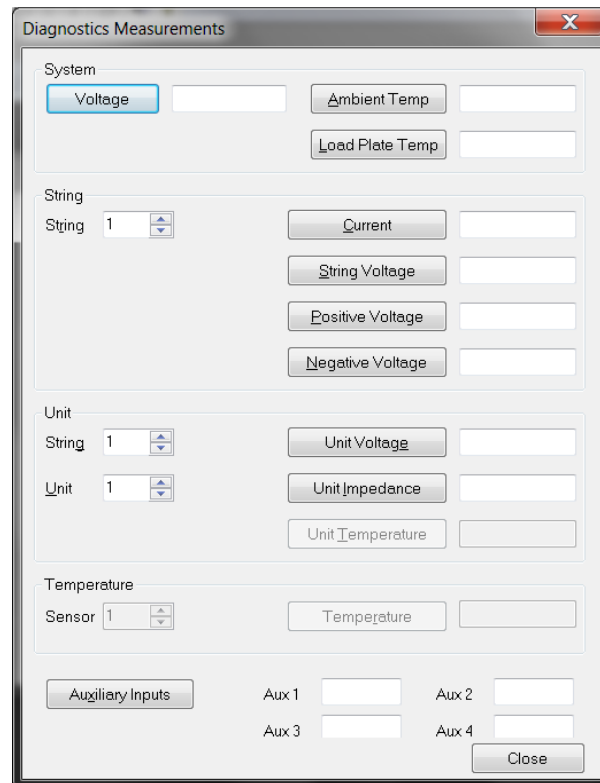
Diagnostic Measurements Option

Diagnostic Measurements is a tool for collecting specific battery information and troubleshooting the system.

Table 8. Diagnostic Measurements screen content

Entry Name	Description
System	
Voltage	Displays the (total) voltage for the currently selected system.
Ambient Temp	This displays the ambient temperature for the currently selected system.
String	
Current	This displays the current in the selected <i>string</i> .
String Voltage	This displays the total string voltage in the <i>selected string</i> .
Unit	
Unit (spin box)	Use the arrows to increment and select the unit number in the selected string to be viewed.
Unit Voltage	This displays the unit voltage of the selected unit.
Unit Temperature	This displays the temperature of the selected unit.
Temperature	
Sensor (spin box)	Use the arrows to increment and select the sensor number in the selected string to be viewed. Unit 1 is the <i>default</i> .
Auxiliary Inputs	
Aux. 1-6	

Figure 32-Diagnostic Measurements Display Screen



Advanced Communication Screen Options

These options are displayed (or hidden) by clicking the **Advanced** button appearing in the 'Primary' Communications base window.

Check Time

Clicking the **Check Time** button displays the date and time set in the S5 unit in the *Status* line of the tab screen. The time is used to label all events recorded by the unit as well as to schedule any measurements set in the software. If the time is different from the computer's actual current date and time the user is prompted to synchronize the time. The time is displayed in the *status line* of the Communications home screen when the Check Time button is clicked.

Initial Impedance

See Obtaining Baseline Impedance Values, beginning on page 23 for additional information.

System Configuration [Property Sheets]

This "System Configuration" button displays the six property sheets shown in Figure 33 below.

System Configuration Properties

The first properties tab displays the system configuration screen containing the settings that are programmed into the battery monitoring hardware.

Figure 33-System Configuration Property Sheet

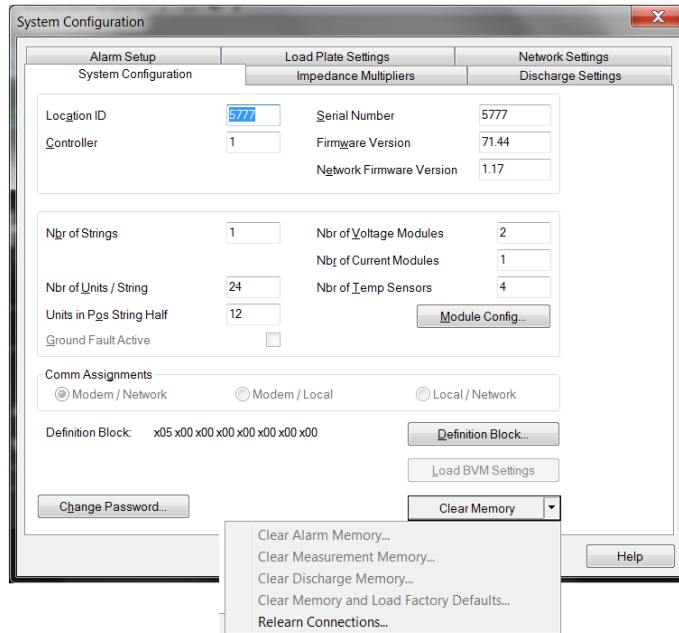


Table 9. System Config Property Sheet Screen Content

Entry Name	Description
Location ID	This number is used to identify each S5. Especially important when there are multiple units in the configuration.
Serial Number	The serial number of the S5 found on the side of the controller.
Firmware Version	The version number of the firmware in the unit's controller.
Nbr of Strings	The number of strings connected to the selected S5.
Nbr of Voltage Modules	The number of voltage modules in the strings connected to the selected S5.
Nbr of Units/Strings	The number of units (batteries) in each string connected to the selected S5.
Nbr of Current Modules	The number of current modules in the strings connected to the selected S5.
Units in Pgs String Half	
Clear Memory (drop-down)	Clicking this button drops down a menu allowing the user to perform the following actions: Clear Alarm Memory - This command clears the controller's alarm memory regardless of whether the data has been retrieved. Clear Measurement Memory - This command clears the controller's measurement memory. This normally does not have to be performed since measurements are overwritten automatically. Clear Discharge Memory - This command clears the controller's

Entry Name	Description
	discharge memory. Clear Memory and Load Factory Defaults - This clears all controller memory and loads the factory defaults. Note: This command should only be issued under the direction of BTECH.

Child Screens

Module Config[uration] Button

This function displays information about the state of *Voltage* and *Current* modules. Data is populated automatically.

Figure 34- Module Configuration Button Screen

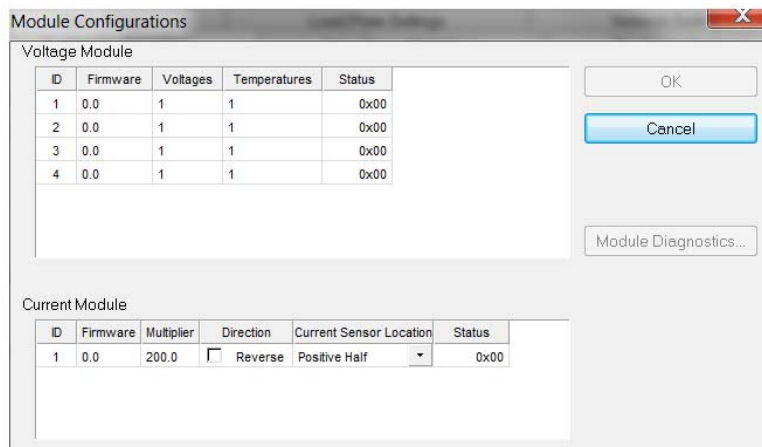


Table 10. Module Configuration screen entries

Entry Name	Description
Voltage Module	
ID	The module identifier from the controller. It can range from 0-24. These are numbered in the order they are connected to the controller. The module closest to the controller is number 001.
Firmware	This field displays the firmware version of the voltage module.
Voltages	This is the number of active voltage channels used on each voltage module.
Temperature	This is the number of active temperature channels used on each voltage module.
Status	Displays the module status byte. This is only used for diagnostic purposes. NOTE: Contains "0xff" if module is off line.
Current Module	
ID	This is the module identifier from the controller. They are numbered in the order in which they are connected to the controller.

Entry Name	Description
Firmware	This field displays the firmware version of the voltage module.
Multiplier	The Multiplier determines the full scale current value based on the current transducer. Select and change the current Multiplier by "double-clicking" to highlight the value and entering a new number. In the case of the current transducer, this value is also used to determine the current based on the number of cables that the current clamp goes around.
Direction	This indicates the direction of the current clamp used within the system. NOTE: Check this box ONLY if the clamp is installed <i>in reverse</i> .
Current Sensor Location	This is used to indicate whether the current clamp is in the positive half or negative half of the string. Click the arrow within the field and select the proper option from the displayed list.
Status	Displays the module status byte. This is only used for diagnostic purposes. NOTE: Contains "0xff" if module is off-line.

Definition Block

Clicking this button displays a dialog where the user can view or change various options that are set through the definition block.

Figure 35-Definition Block screen

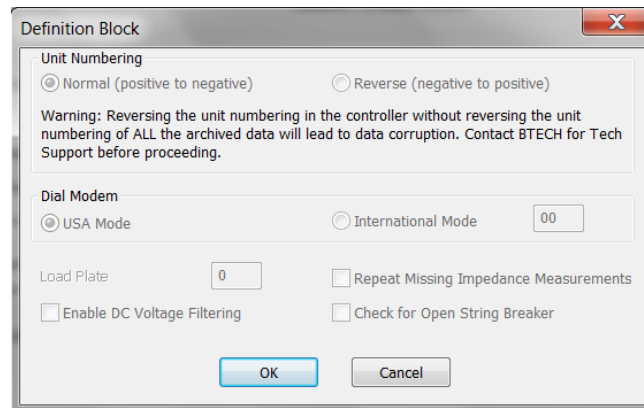
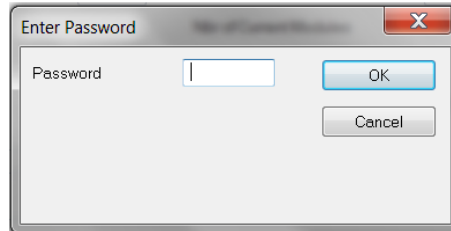


Table 11. Definition Block Screen Content

Entry Name	Description
Unit Numbering	
Normal*	Selecting this radio button displays the units shown in the home screen from 1 to 'n' beginning on the positive side.
Reverse*	Selecting this radio button displays the units shown in the home screen from 'n' to 1 beginning on the negative side.
Dial Modem	

Entry Name	Description
USA Mode	
International Mode	
* see BVM Home Screen Display Options, pg. 128 for additional information.	

Figure 36-The Password dialog.



Discharge Setting Properties

Table 12. Discharge Settings Properties

Entry Name	Description
Discharge Trigger Levels	
Current Trigger Level (Amps)	The current level, in <i>amps</i> , at which point the controller determines a battery discharge is occurring.
Current Reset Level (Amps)	The current level, in <i>amps</i> , at which point the controller determines a battery discharge has stopped.
Voltage Trigger Level (Volts)	If a BVS has no current module, it uses the system voltage to determine when a discharge is occurring. When the system voltage is below this level, the controller determines a discharge is occurring. NOTE: Because the system voltage drop at the beginning of a discharge is not instantaneous, determining discharges is more accurate using a <i>current transducer</i> .

Figure 37-Discharge Settings Properties

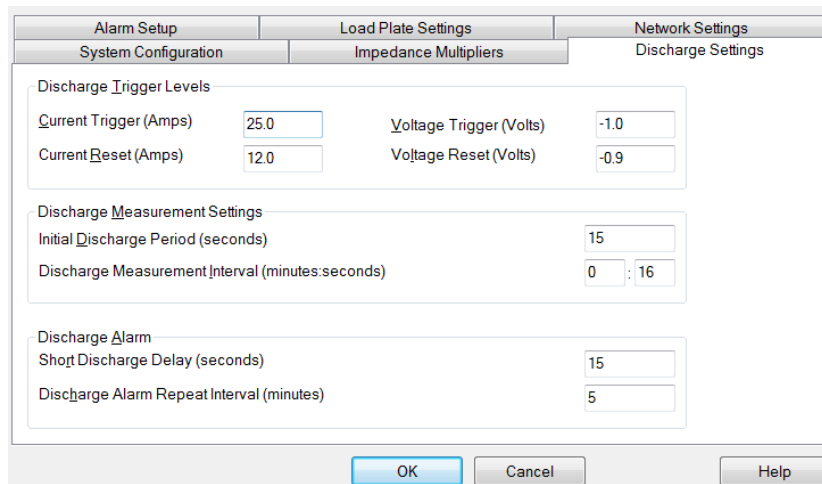


Table 13. Discharge Settings Properties

Entry Name	Description
Voltage Reset Level (Volts)	If a BVS has no current module, it uses the system voltage to determine when a discharge is occurring. If the system voltage is above this level (<i>and in discharge</i>), the controller determines that a discharge has <i>stopped</i> .
Discharge Measurement Settings	
Initial Discharge Period-(seconds)	Enter the amount of time at the beginning of a discharge where only system <i>current</i> and <i>voltage</i> are measured. The <i>default</i> is 15 seconds.
Discharge Measurement Interval (min:sec)	This is the amount of time between complete measurement cycles during a discharge. During one measurement cycle, all of the unit measurements and four system and string measurements are taken.
Discharge Alarm	
Short Discharge Delay (seconds)	The length of time in seconds that a discharge has to exist before a discharge alarm is triggered. Typically the delay is set to <i>15 seconds</i> to eliminate any nuisance alarms from short power discharges.
Discharge Alarm Repeat Intervals (minutes)	During a battery discharge, the alarm will be sent out and repeated at this interval – specified in minutes.

Alarm Setup Properties

This screen sets various alarm parameters as described in the subsequent table.

Figure 38-Alarm Setup Properties

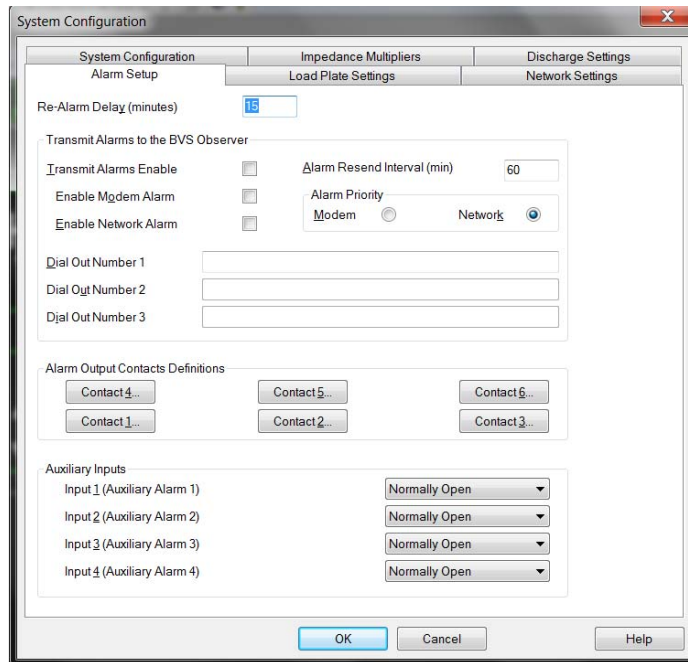


Table 14. System Configuration: Alarm Setup Properties Screen Content

Entry Name	Description
Re-Alarm Delay-(min)	The amount of time the BVS waits before re-triggering a specific alarm. If the system voltage is out of limits and the Alarm Delay is set to 1 minute, the BVS will go into alarm mode, send out an alarm, be reset by the BVS Observer, and wait for 1 minute before going back into alarm for system voltage.
Transmit Alarms to the BVS Observer	
Transmit Alarm Enable	When this box is checked, alarms are emailed out after they occur.
Alarm Resend Interval (min)	Determines the time interval before an active alarm is re-sent.
Alarm Priority	Check the appropriate button to indicate which alarm mode – network or modem – has priority. Alarms for the selected mode are sent out first. If the alarm is not reset, it resends the alarm using the non-priority mode.
Enable Modem Alarm	Check this box to have alarms dialed out over a phone line. Enter the number to be dialed in the "Dial Out" field. If this box is not checked, no alarms are dialed out.
Enable Network Alarm	Check this box to have alarms transmitted over an IP network connected to the S5.
Dial Out Number 1-3	These fields are used to enter the phone number(s) to dial if the Dial Out Alarms option is enabled. Number 1 is dialed first and, if the alarm is not reset, the BVS proceeds to dial Number 2 and so on.
Alarm Output Contacts Definition	
Contact 1-6 (below)	Each Alarm Output [Relay] that may be used must be configured separately. When the button for any of the Contacts is clicked, the <i>Output Alarm Definition Properties Sheet</i> is displayed.
Auxiliary Inputs	
Auxiliary Inputs 1-4	Default to "Open" but users can select from the drop-down list.

Network Settings Properties

The Network Settings Properties sheet is shown below. It is only necessary to complete the property items if the S5 is being monitored over a TCP/IP network.



Information for the entries in this property sheet are generally provided by a network administrator.

Figure 39-Network Settings Property Sheets

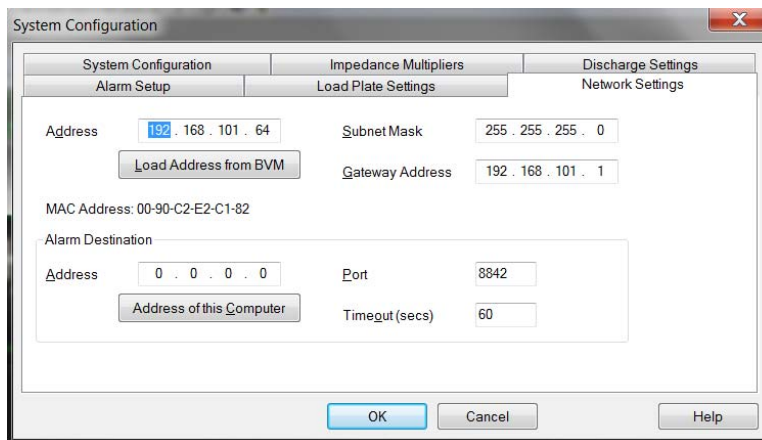


Table 15. Network Settings Properties screen content

Entry Name	Description
Address	TCP/IP address assigned to the controller. Clicking the <i>Load Address From BVM</i> button loads the network IP address from the BVM Communication Settings into the TCP/IP Address. Depending on the firmware version of the controller, the MAC address of the controller's network interface is also displayed. NOTE: If the IP address entered is 0.0.0.0, the controller attempts to retrieve and assign its address from a DHCP server
Subnet Mask	The subnet mask that the controller uses for network communications.
Gateway Address	The gateway IP address that the controller uses for network communications.
Alarm Destination	
Address	The IP address of the computer running the <i>BVS Observer</i> (where the alarms are sent). Clicking the <i>Address of this Computer</i> button loads the network IP address of the computer on which the BVM is running into the <i>Alarm Destination</i> field.
Port	The port on the BVS Observer where the alarm occurring on the controller will be sent. NOTE: The <i>default</i> value is 8842.
Time-Out	The amount of the time in <i>seconds</i> the controller waits to connect. NOTE: The <i>default</i> value is 60 seconds.

Child Screens

Load Address from BVM

This loads the network address in the software communication setting into the address field.

Address of this Computer

This button loads the address of the current computer into the alarm destination address field.

Impedance Multipliers

Refer to: Impedance Multipliers

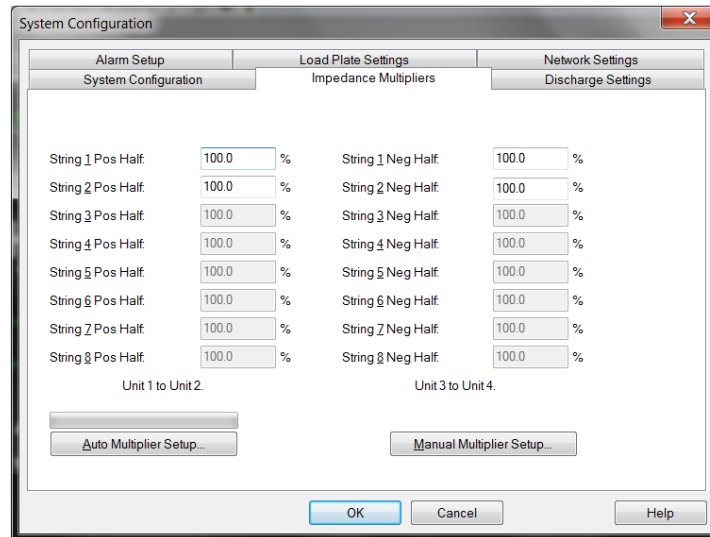
Obtaining Baseline Impedance Values

Certain parameters must be set once the computer and the S5 controller are communicating. This is done from various functions contained in the *primary Communications* screen. Utilizing this screen the user can acquire a base set of measurements from the S5, save them to the S5's *location file*, and store them in the controller memory.

Table 16. Impedance Multipliers Tab Properties

Entry Name	Description
String <i>n</i> - % Pos Half	
String <i>n</i> - % Neg Half	

Figure 40-Impedance Multipliers Property Sheet



Child Screens

Auto Multiplier Setup

Manual Multiplier Setup

Refer to “Impedance Multipliers

Obtaining Baseline Impedance Values

Certain parameters must be set once the computer and the S5 controller are communicating. This is done from various functions contained in the *primary Communications* screen. Utilizing this

screen the user can acquire a base set of measurements from the S5, save them to the S5's *location file*, and store them in the controller memory.

Load Plate Settings Properties

The following values are the system voltage limits between which Impedance measurements may be taken. If the system shows measurements that are out of these limits, no impedance measurements can be made and an alarm will be generated.



These settings are determined by BTECH and are read only. They should only be changed by authorized personnel.

Figure 41-Load Plate Settings Property Sheet

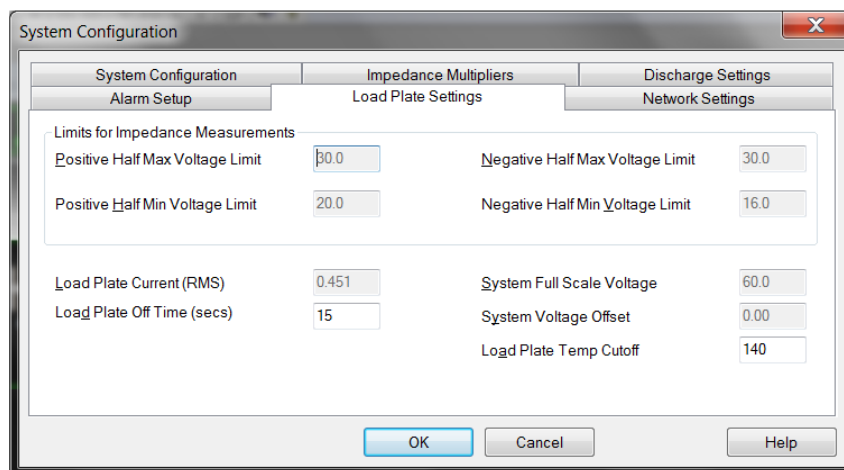


Table 17. Load Plate Properties

Entry Name	Description
Limits for Impedance Measurements	
Positive Half Max Voltage Limit	Not Available. The maximum voltage limit for the positive half of the battery.
Positive Half Min Voltage Limit	Not Available. The minimum voltage limit for the positive half of the battery.
Negative Half Max Voltage Limit	Not Available. The maximum voltage limit for the negative half of the battery.
Negative Half Min Voltage Limit	Not Available. The minimum voltage limit for the negative half of the battery.
Load Plate Current (RMS)	Not Available. The amount of load current drawn by the load plate (depends on the load plate supplied with the system).
System Full Scale Voltage	Not Available.
Load Plate Off Time (sec)	Not Available.
System Voltage Offset	Not Available. This value is used by the controller to compensate

Entry Name	Description
	for an offset of the system voltage measurement by the load plate.
Load Plate Temp Cutoff	Not Available. Determines under what temperature, impedance measurements can be taken. This is to prevent the load plate from overheating.

Controller Settings

Within the *Controller Settings* screen, there are six property tab pages where settings can be made and/or viewed (see Figure 42). The majority of these settings are controller alarm limits.

System Limits Properties

Figure 42- System Limits Property Sheet

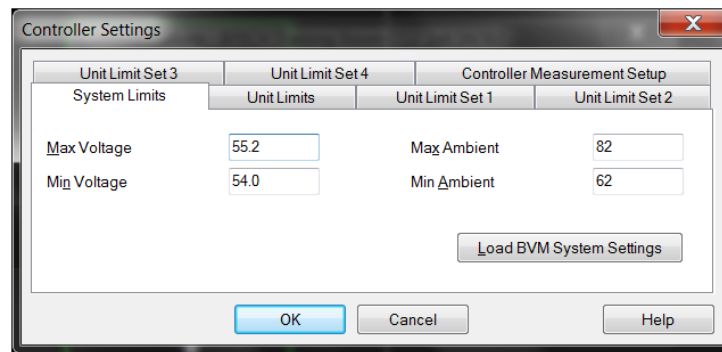


Table 18. System Limits Properties Description

Entry Name	Description
Max Voltage	The maximum allowed system voltage. If the measured voltage is above this value it may indicate there is a problem with the charger.
Min Voltage	The minimum allowed system voltage. If the measured voltage is below this value it may indicate there is a problem with the charger, or that the charger is disconnected from the battery or battery string.
Max Ambient	The maximum allowed ambient temperature.
Min Ambient	The minimum allowed ambient temperature.

Child Screens

Load BVM System Settings

Clicking this button loads the software's system limits into the appropriate fields and syncs the hardware system limits to the software system limits. There is no screen activity when this button is clicked.

Unit Limits Properties

The *Unit Limits* allows the limits for each unit to be selected from one of the four sets of limits in the drop-down. The settings allow each individual unit to have custom configured alarm limits, (typically Unit Limit Set 1 is used for all units).

Figure 43- The Unit Limits Property Sheet

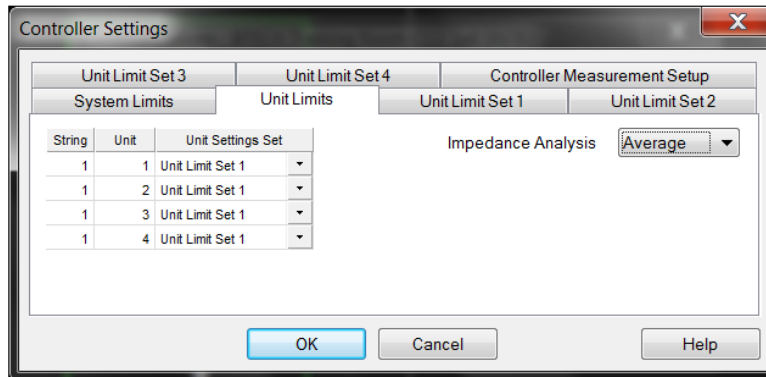


Table 19. Unit Limits Properties Description

Entry Name	Description
String #	The string number.
Unit #	The unit number within the string.
Unit Settings Set	Enables the user to select the unit settings based on another String and Unit settings.
Impedance Analysis Drop-down	
Impedance Analysis drop-down	Contains two options: Average – Average impedance limits are derived from the average string impedance. Initial – the unit impedance limits are calculated from an ‘initial’ or ‘baseline’ impedance measurement taken when the battery is known to be healthy.

Controller Measurement Setup Properties

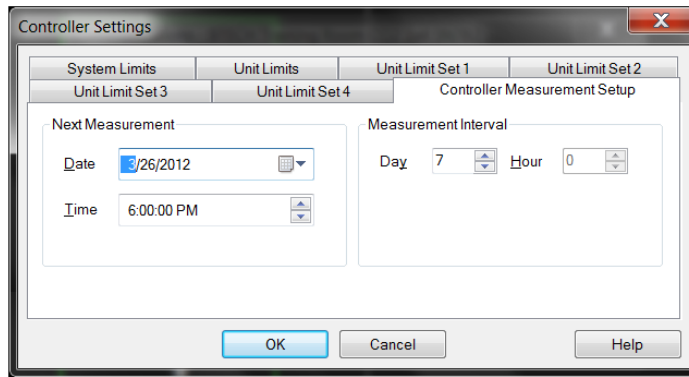
The controller measurement sheet allows the day, time, and measurement frequency to be set. The recommended measurement interval is *seven days*. The frequency used for performing the impedance measurement is also displayed and *cannot be changed*.

Table 20. Controller Measurements Setup Properties Description

Entry Name	Description
Next Measurement	
Date (calendar box)	The date of the next measurement.
Time	The time of the next measurement.

Entry Name	Description
(spin box)	
Measurement Interval	
Day (spin box)	The number of days between measurements.
Hour (spin box)	Only available if a measurement will be taken again in less than 24 hours.

Figure 44- Controller Measurement Setup Property Sheet



Unit Limit Set [1-4] Properties

Four sets of alarm limits that define when a unit's measurement is in an alarm state.



All entered limits should correspond to limits recommended by the battery manufacturer for the particular make and model.

Figure 45- Unit Limit Set Property Sheet

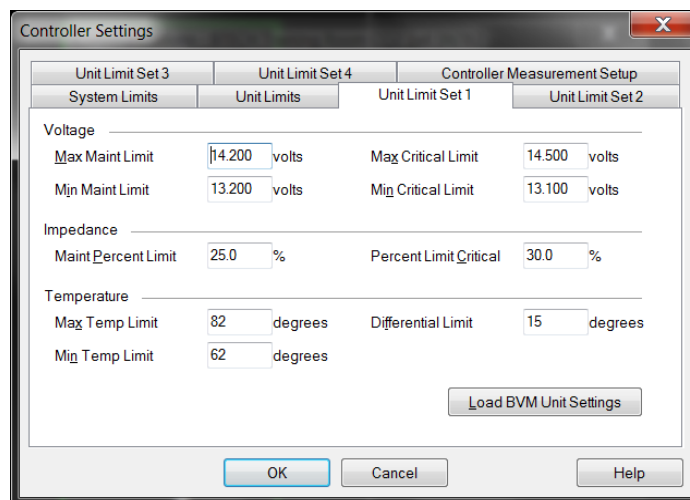


Table 21. Unit Limit Set # Properties Description

Entry Name	Description
Voltage	
Max Maint Limit	The maximum maintenance alarm limit.
Min Limit	The minimum maintenance alarm limit.
Max Critical Limit	The maximum critical alarm limit.
Min Critical Limit	The minimum critical alarm limits.
Impedance	
Maint[enance] Percent Limit	A percentage that determine whether a unit's impedance is in a maintenance alarm state.
Percent Limit Critical	A percentage that determine whether a unit's impedance is in a critical alarm state.
Temperature	
Max Temp Limit	The maximum alarm limit.
Min Temp Limit	The minimum alarm limit.
Differential Limit	The <i>Differential Limit</i> is the difference in temperature between the ambient and unit temperature.

Child Screens

Load BVM Unit Settings

This button loads the software's unit limits for *Unit 1* of *String 1* into the appropriate fields, and syncs the hardware unit limits to the software unit limits. There is no confirming dialog.

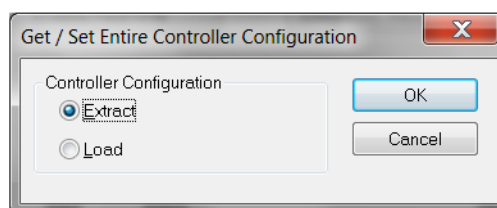
The Get/Set Configuration Option

This allows the user to extract and load the configuration and settings from the controller to BVM4.x. Extracting the memory to the file does not change anything in the controller. However, loading the configuration file *into* the controller will erase all its memory. Every controller is shipped from the factory with a file containing its configuration and default settings. The user will also be prompted to extract or load the Initial and Interconnect Impedances values.



The Get/Set Controller Configuration dialog is critical to backing up, *and restoring*, the controller's memory. This procedure should be performed prior to backing up the BVM4.x application and database files.

Figure 46- The Get/Set Controller Configuration dialog



Extracting Controller Data to the Software

Controller data content can be extracted periodically and sent to a *location file*. Use the following procedure.

- a. Navigate to the *Communications main screen* and expand it by clicking **Advanced**, (see Figure 31, pg, 48),
- b. Click the Get/Set Controller Configuration button, (see above),
- c. In the resulting dialog (see above), select the *Extract* radio button and click **OK**,
- d. In the resulting dialog select the *file and location* (must be a .set file) where the data will be saved and click **Save**,
- e. Click **Yes** when prompted to save the *Initial* and *Interconnect* measurement values if the data will be retained.

Restoring Controller Data from BVM4.x Using Load

Using the Get/Set Controller Configuration button, data from a *.set file* can be downloaded to the S5 controller. Generally this is done to restore controller settings that have become corrupt or otherwise unreliable. To restore data use the following procedure.

- a. Navigate to the *Communications main screen* and expand it by clicking **Advanced**,
- b. Click the **Get/Set Controller Configuration** button, (see Figure 31, pg. 48),
- c. In the resulting dialog (see above), select the *Load* radio button and click **OK**,
- d. In the resulting dialog select the desired *.set file* and click **OK**. This loads the data from the selected file.
 - **NOTE:** In most cases the most recent data will be restored, however any available data file can be used for the 'restore'.

Click **Yes** when prompted to load the *Initial* and *Interconnect* measurement values,

The Reboot Option

This button reboots the S5. There is no specific screen for rebooting but a confirmation dialog is displayed where the user can proceed or cancel the action (see Figure 31, pg. 48).

The Standby Option

This button functions as a toggle and is most often used to perform work on the battery string. Placing the battery monitor in *Standby* prevents closure of the relays that connect the battery string to the battery monitor. This prevents the battery monitor from alarming for any out-of-limits conditions, as well as protecting personnel and equipment. Use the following procedure.

- a. Click the *Standby* button and the *status indicator* in the window indicates the monitor is being placed in standby mode.
 - the Standby button text changes to "Exit Standby".
- b. To exit Standby mode click the *Exit Standby* button.

- the Standby button text changes to “Standby”.

The Interconnect Impedance Drop-down

The unit interconnect impedance values are used to adjust individual unit impedance measurements where there are different length interconnects than used on the rest of the battery. The drop-down contains the following options (see Figure 31, pg. 48).

“Retrieve Interconnect Impedance Values from Controller and Save to BVM Software”

This option retrieves the current interconnect impedance values and writes them to the location file.

- Click on the *Initial Impedance* drop-down and select ‘Retrieve Interconnect Impedance . . .’
- In the preview data screen click **OK**,
- Click **OK** in the warning dialog.

“Load Interconnect Impedance Values to Controller from BVM Software”

This option reads the interconnect vales from the location file and writes them to the S5 controller.

Figure 47-Interconnect Impedance Options



Initial Impedance Drop-down Options

The options listed in this drop-down function are used to retrieve initial impedance values from the batteries. The data can then be saved to the BVM database and/or be written to the controller’s memory. The options are generally used during the initial configuration of a new site, or when major changes are made to the configuration of an existing site. Refer to Figure 48, on page 66.

Create Initial Impedance Measurements in Controller

This function causes the controller to perform a new impedance measurement. The impedance data is recorded for each unit during this measurement and is used as the new "Initial Impedance" data. The user is alerted and prompted that performing this action will overwrite the initial impedance information stored in the controller. After this operation has is completed, the user

should perform the "Retrieve Initial Impedance Measurements From Controller and Save to BVMSoftware Unit Settings" command to retrieve the initial impedance measurements.

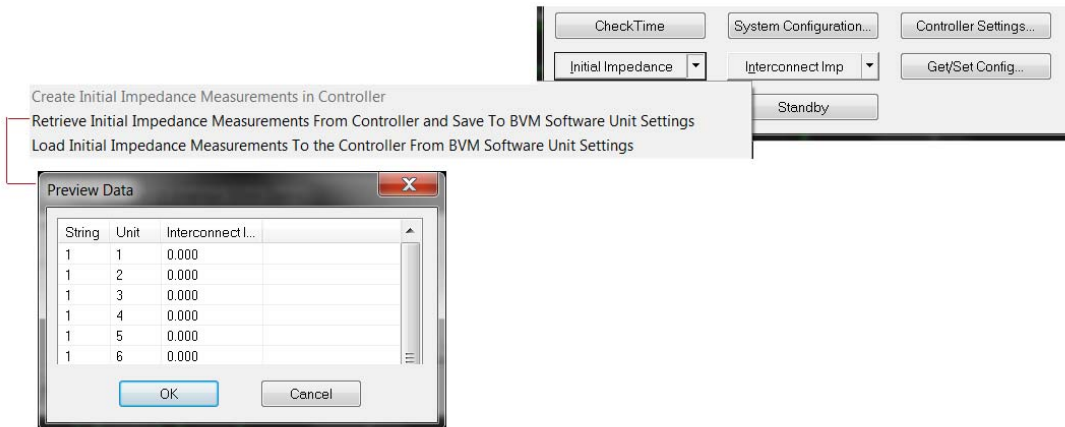
- a. Click the drop-down and select this option from the list,
- b. Select the *current date* in the date dialog and click **OK**,
- c. Click **Yes** in the warning dialog.

Retrieve Initial Impedance Measurements from Controller and Save to BVM Software Unit Settings

This retrieves the initial impedance measurements from the controller and shows them to the user. This allows the user to preview the information before making any changes. It then prompts the user to overwrite any existing initial impedance measurements in the Unit Settings. If they agree, it saves the initial impedance measurements to the Unit Settings.

- a. Click the *Initial Impedance* drop-down and select 'Retrieve Initial Impedance ...'
- b. In the preview data screen confirm that **TBA** and click **OK**,
- c. Click **OK** in the warning dialog.

Figure 48-Initial Impedance Drop-down Options



Load Initial Impedance Measurements to the Controller from BVM Software Unit Settings

This loads the controller's initial impedance memory with the initial measurements stored in the BVM's Unit Settings. The user is alerted and prompted that performing this action will overwrite the initial impedance information stored in the controller.

- a. Click the *Initial Impedance* drop-down and select 'Load Initial Impedance Measurements ...',
- b. Click **Yes** in the dialog.

6. Equipment Checks and Troubleshooting

BTECH provides a complete, custom wire list and install diagram(s) that specifies the position and connections for all components. If this diagram is not available contact BTECH for a duplicate. If a thorough check of all component connections does not resolve pending issues, check the components and connections to the BTECH-provided diagram(s).

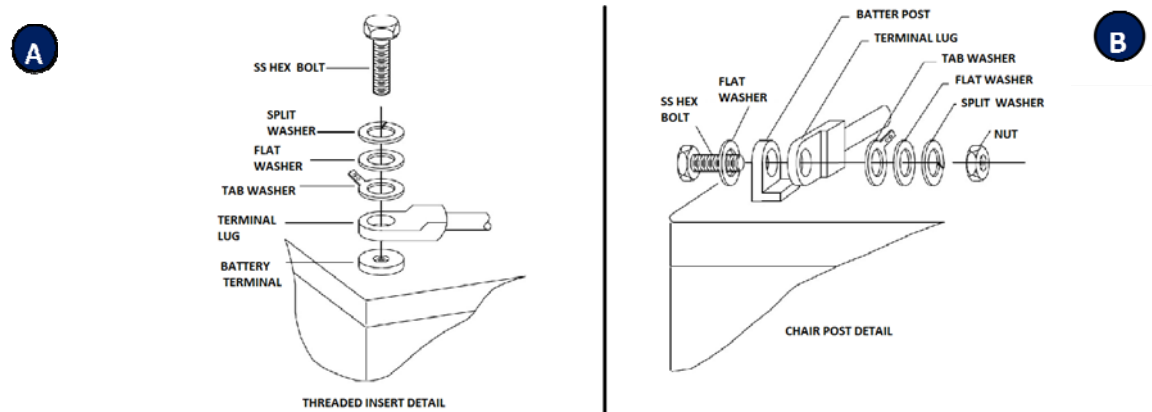
Battery Connections

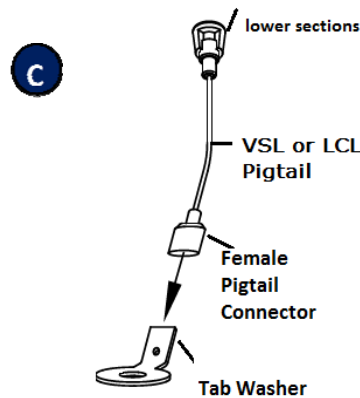
If tab washers are used, verify that they are correctly installed to the cell terminal bolt or nut; and in compliance with the wiring diagram. Tabs should be facing in an appropriate direction for correct wire routing (see Routing VSL and LCL Wiring, beginning on pg. 68). If the cell has 3 pairs of posts, tab washer should be installed under the middle cell terminal bolt if possible.

Where the VSL and LCL Pigtails connect to battery terminals using a Tab washer confirm the following:

- Tab washers and related hardware are properly connected to battery terminals as shown below (A & B),
- The female end of the pigtail is securely connected to the tab washer, (C)

Figure 49: Tab Washers mounted Directly to Batteries (A & B); VSL Pigtail connection using a Tab washer (C),



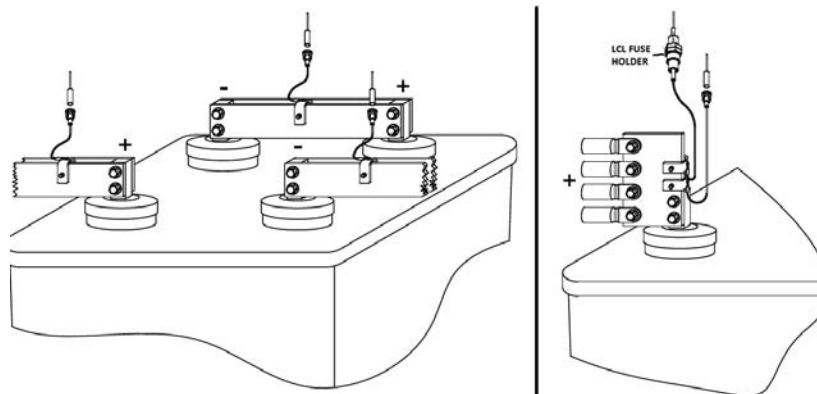


Stainless Steel Clamps

For installations where the connection are made to *battery straps*, BTECH include sets of stainless steel clamps with the pigtail assembled to the clamp. Actual positioning of the clamp(s) on the battery straps is determined by the system wiring diagram. Verify that the clamps are positioned as close to cell post as practical. If the cell has three pairs of posts, clamp should be near the *middle post* if possible.

- Confirm that the clamps are securly attached to the battery straps.

Figure 50- Attaching Stainless Steel Clamps to battery straps



The LCL and VSL Wires

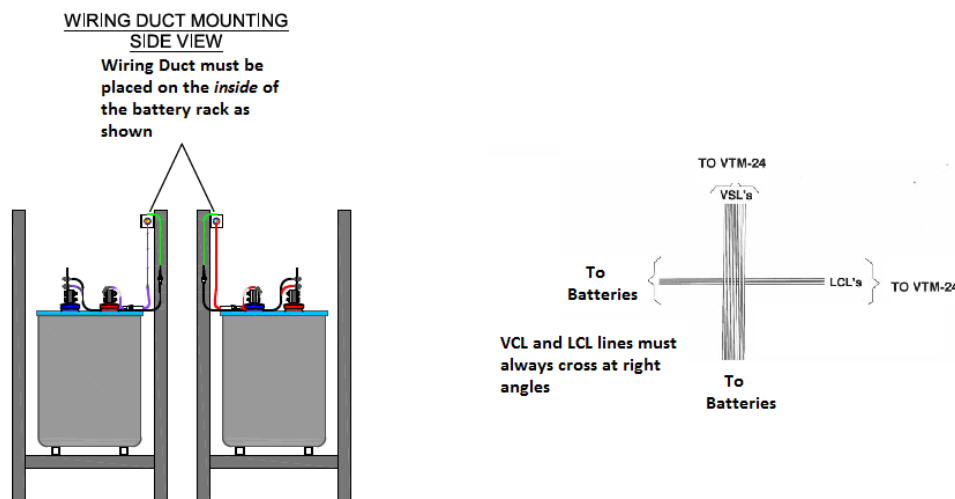
The VSL wires must be secured in the appropriate 10- and 16-pin Wago™ connectors and terminated to the VM-24i unit. Additionally, the LCL wires must be secured in a 4-pin screw connector and terminated to the S5. The path used to route the wires and the conduit (if used) through which the wires pass, must be installed correctly or erroneous readings may result, (see Figure 51 below).

Routing VSL and LCL Wiring

The following practices should be observed for VSL and LCL wire routing.

- Confirm that the VSL wiring is routed along the *current path*.
- Wiring ducts mounted on battery racks are installed on the *INSIDE* of the rack.
- Whenever VSL and LCL lines are routed in parallel, they **MUST** be separated by a minimum of 2 feet, (61 cm).
- Whenever VSL and LCL wiring cross – they **MUST** do so at *right angles*.
- VSL and LCL lines *must be* routed in *separate* channels or conduits.
- Communication cables **MUST** be routed separately from VSL and LCL wiring.

Figure 51- VSL-LCL Wiring Diagrams



Connecting S5 and VM-24i Units

Single Unit Connections

Confirm that the following conditions have been met, (see Figure 52, pg. 70).

- The 'White' connector is securely plugged into the the back of the S5 unit and the 'Orange' connector is plugged into the IN port of the VM-24i.
- The BTECH-provided 'Communication Termination plug is correctly positioned and securely plugged into the OUT port of the VM-24i.



DO NOT attempt to use the S5 system without the Termination Plug in place.

Daisy-chained VM-24i Unit Connections

VM-24i units are daisy-chained in an S5 system using 'Communication' cables. Confirm the following connections have been made.

- The 'White' connector is securely plugged into the the back of the S5, and the 'Orange' connector is plugged into the IN port of the first VM-24i (see Figure 52, pg. 70).

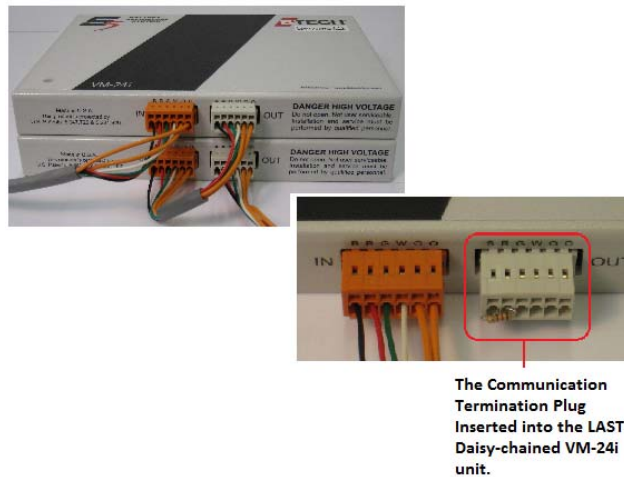
- The 'White' connector is plugged into the 'OUT' port of the *first* VM-24i, and the 'Orange' connector is plugged into the IN port of the *next* VM-24i.

Continue this process until the *last* daisy-chained VM-24i is connected using the BTECH-provided 'Communication Termination plug into the OUT port (see below).



The termination plug should be used as described in this guide. DO NOT insert any wires into the plug.

Figure 52- Daisy-chained VM-24i units. The last unit MUST have the 'termination plug installed



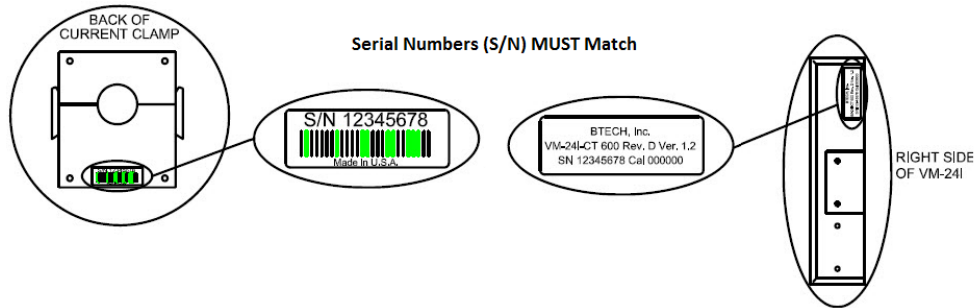
The Communication Termination Plug Inserted into the LAST Daisy-chained VM-24i unit.

Current Transducer Connections

Current Transducers (CTs) are shipped by BTECH terminated to the 4-pin connector. Confirm that the CTs are correctly installed.

- The CTs are installed around the 'Battery Charging' cable so that the *red* dot faces the *positive* side of the UPS (uninterruptable power supply).
- The CT cable is securely plugged into the VM-24i.
- The serial number on each CT is correctly matched to the corresponding VM-24i (see below).
- The green plug of the current transducer is correctly inserted into the left-side of the eight-pin connector.

Figure 53-Matching serial numbers between a CT and S5



Battery Top Temperature Sensors (Thermistors)

Thermistors are not a required component of an S5 monitoring system. If they are used, the following items should be checked.

- The sensor should be positioned adjacent to the rack or cabinet containing the battery unit:
 - ▶ Rack Mounted batteries – install near battery strings.
 - ▶ Cabinet Configurations – install inside the cabinet approximately 3/4 of the distance to the cabinet bottom.
- The 2-pin connector should be firmly inserted into the designated port on the S5 mid-panel. (see Figure 55, pg. 73).



Thermistors installed to measure ambient temperatures must be placed away from heating or cooling sources to prevent erroneous readings.

S5 Ground Connections

Once all wires have been terminated to the correct module the S5 system **MUST** be grounded.



The SCM-600 should NOT be connected to a power source until grounding is complete.

Ground the S5

The S5 system must be grounded before power is applied. Confirm that the following condition exists.

- The ground wire tip is secured to the GnD connector on the mid-panel of the S5 (see Figure 55, pg. 73).
- The BTECH supplied 3/8 inch (9.5 mm) connecting ring or similar device is attached to the opposite end of the wire and secured to a grounding point on the rack or cabinet (see below).



The S5 System **MUST** be properly grounded as described in this section or damage to the system and voiding of the warranty may result.

Figure 54 – S5 Grounding Example



Fuses and to Power Source Connections

The inline fuses for all of the LCL and VSL pigtails must be correctly installed. BTECH provides all of the fuses required for the S5 system. Confirm the following conditions are met.

- All pigtails have the correct fuse in place,
 - ▶ For VSL leads BTECH supplies 62 Ma fuses,
 - ▶ For LCL leads BTECH provides ATM fuses.
- The leads from the VSL and LCL pigtail are correctly paired with the corresponding lead from the S5 or VM-24i as specified in the wiring diagram.
- The halves of the fuse holders are securely connected.

Checking Fuses

When installing or inspecting fuses the following practices should always be observed.

- Insert the fuse into the fuse holder attached to the lead terminating at the VM-24i or the S5. Mate the two halves of the fuse holder and rotate clockwise until the two sections are connected. Rotate counter-clockwise to separate the fuseholder halves.



Always insert the fuse in section of the fuse holder attached to the lead that terminates at the VM-24i unit. **DO NOT** insert the fuse into the section of the fuse holder for the pigtail attached to the battery.

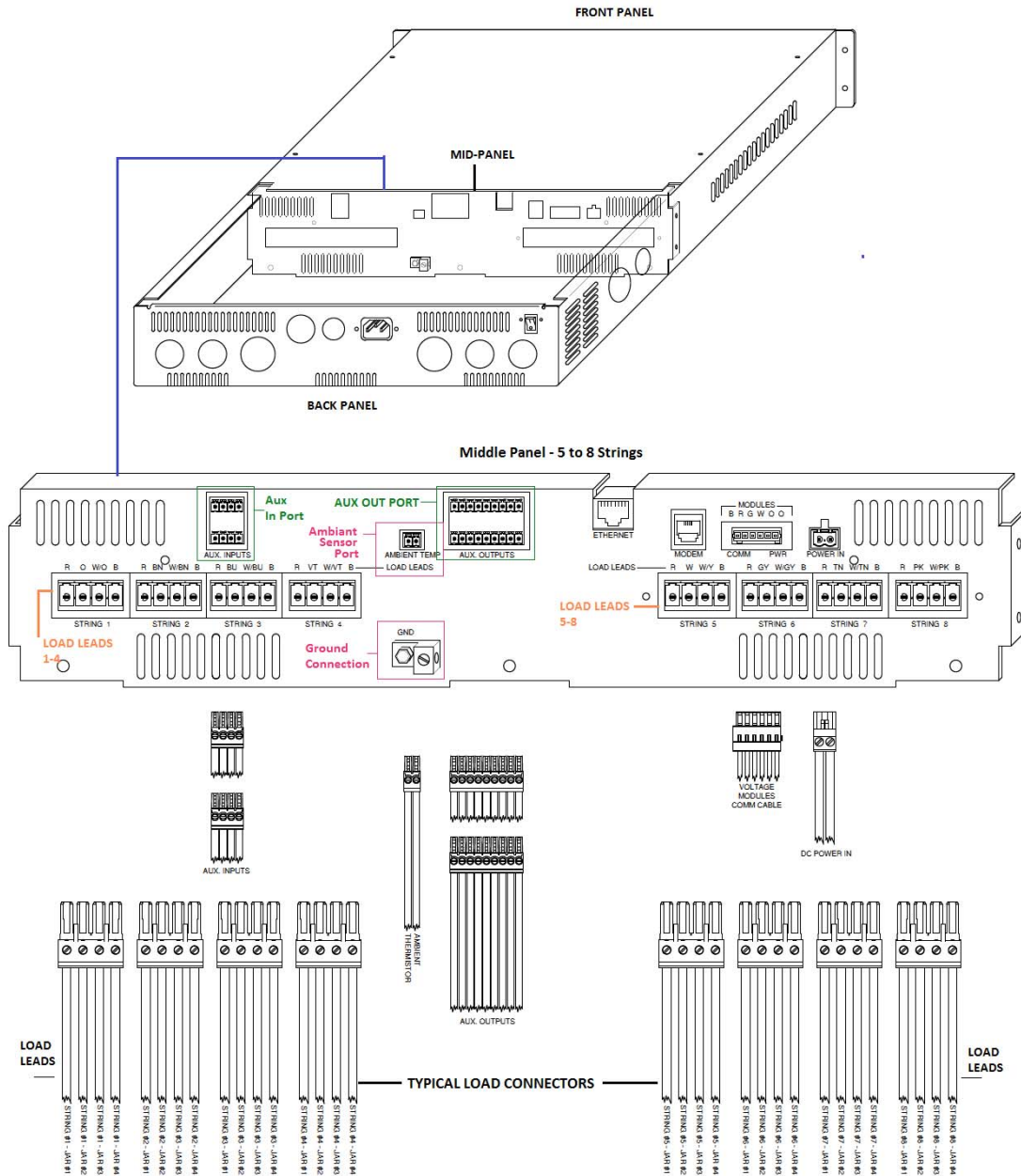


Do **NOT** use fuses of a different power rating than the ones provided or damage to the system and voiding of the warranty may result.



Do **NOT** connect the S5 to a power source until **ALL** fuses have been installed. Always disconnect the S5 from its power source before inspecting fuses.

Figure 55 – S5 Mid-panel showing with certain connections Labeled

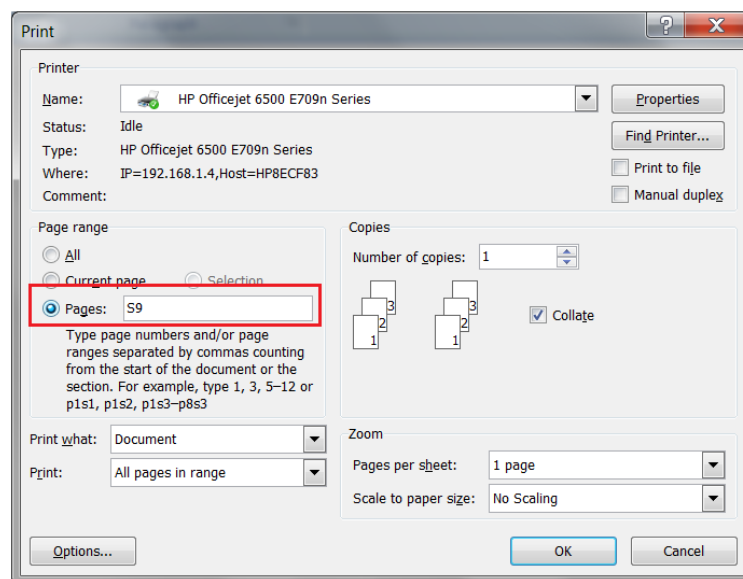


Installation Check List

This section contains an checklist for the installer to record equipment, communication, and configuration information for a particular customer S5 site. The form should be completed and signed by the customer and forwarded to the BTECH home office.

This section can be printed by clicking Print and entering "S9" (no quotes) in the 'Pages' field on the Windows Print dialog, (see below). The form can be copied and pasted and completed using Microsoft Word.

Figure 56-The Win 7 Print Dialog



S5 Startup Check List

Customer		Location	
		Date:	
BVS M/N	BVS Serial #	System #/ID	

VM-24i-CT	Serial #	Installed Around	String Cables CAL Code
		of	
		of	
		of	
		of	
		of	
		of	
		of	
		of	

A. Installation, Inspection, and Confirmation

		YES	NO				
1	Was there any shipping damage? If YES describe						
2	Was the BVS wired completely and according to instructions? (Was this a BTECH install?) Describe <input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable						
3	Was enclosure clean and free of metal chips and filings?						
4	Is a ground wire correctly installed (chassis ground lug to battery rack\cabinet)?						
5	Are power and communications (if required) installed and active?						
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;"></td> <td style="width: 20%; text-align: center;">Power</td> </tr> <tr> <td></td> <td style="text-align: center;">Communications</td> </tr> </table>		Power		Communications		
	Power						
	Communications						
6	Is ambient temp. installed away from heating or cooling air ducts? <i>Installed Location:</i>						
7	A. Do the serial numbers of the current clamps and CM-2/VM-24i modules match? B. CT is around _____ of _____ battery cables. Multiplier is:						
8	Were pilot cell thermistors correctly installed? <i>Record jar numbers on attached form</i>						

		YES	NO
9	Was wiring between cells and VM-24s terminated and routed correctly?		
10	Were the VSL fuses installed?		
11	Was Comm. wiring between modules terminated correctly (color code and order)?		
12	Was Comm. wiring damaged in any way?		
13	Were the Load Leads (LCL) correctly routed and terminated?		
14	Are all LCL fuses installed? Confirm the fuse rating matches the load plate current.		
15	Confirm the load lead terminal voltage matches the split as designed. Correct as required.		
16	Confirm that the BVS is powered according to design. (DC Powered)		
17	Is the single Comm. cable terminator installed at last 24i?		

B. Operation Verification

After section “A” is complete, power can be applied to the BVS S5. *Turn on both switches.*

		YES	NO
1	Confirm that the number of modules matches the configuration of the .set file.		
2	Is an inline power delay module in use?		
	Measure and record the voltage supplied to the last module. <i>(Min. acceptable is 18 VDC).</i>		
3	Use Module diagnostics to confirm that the number of units and Thermistors connected to each VM-24i matches the module configuration. Correct module configuration as required.		
4	Run <i>Relearn Connections</i> . Did the S5 learn the system correctly? If NO explain modifications that were made.		
5	Confirm installation of the current clamps (polarity and number of cables).		
6	Confirm that the multiplier in the module configuration matches the physical configuration as recorded in Sect A-7A (above). Change the CM-2/VM-24i as necessary.		
7	Is the voltage to the current clamp 5 VDC (red to black) and 2.5 VDC (white to black)?		
8	Was current clamp operation verified, (disconnect the CT cable in real-time mode)?		
9	Was VSL wiring and Comm. wiring verified by removing VSL fuses (one per Voltage Module towards one end) while watching real-time unit voltage graph?		
10	Where the impedance multipliers set? Check one. Auto is for even split ONLY.		
	<input type="checkbox"/> Manual setup <input type="checkbox"/> Automatic setup		
11	Are any interconnect impedance values set? <i>If YES load values into SCM.</i>		
12	Did the S5 perform a complete measurement?		
	If NO – explain.		
13	Download alarms, measurements, and discharge data. If setup and alarms are in BVS memory – clear memory and delete alarms and measurements from memory.		
14	Were successive impedance measurements consistent?		

YES NO

--	--	--	--

D. Customer Sign off

Customer	Date
BTECH Rep.	Date
Additional Comments and Information:	

Post-Startup/Service Report

Site	Date
BTECH Personnel	Serial #

List ALL changes made at Startup

List ALL follow-up issues

Items that need to be shipped to customer

Item	Cost	Date Shipped

--	--	--

Items that need to be returned from customer

Item	Date Received

Contact 1	Contact 2
Name:	Name:
Address:	Address:
Off. Phone/Ext:	Off. Phone/Ext:
Cell:	Cell:
FAX:	FAX:
Email:	Email:

Thermistor Mapping

VM 24i		VM 24i	
1		2	
3		4	
5		6	
7		8	
9		10	
11		12	
13		14	
15		16	
17		18	
19		20	

7. Reports

BVM software incorporates base report formats for a number of parameters that it records and trends. Depending on the particular measurement the user must provide a specified date, and/or a date range and time.

General Information

- The columns on most reports can be expanded or condensed by placing the cursor on the column border in the *heading row* and dragging the border right or left. When placed on the border the cursor changes to a double-pointed arrow(see Figure 60, pg. 83).
- Data can be deleted from the report.

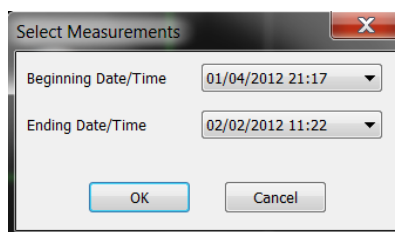
Exporting Data

The data from most reports can be exported in .csv format by selecting **File>Export Data** in the menu bar. A submenu of options is displayed. Formats for exported data will vary.

Date-Time Parameters

Many reports require the user to set or enter one, or a pair of dates. Generally this is done in a calendar spin box. If no date is available it means no data is currently available for that date.

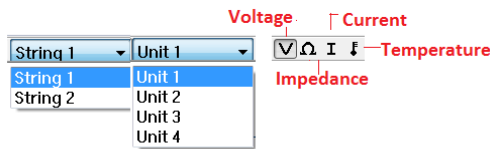
Figure 57-Accept or change the date or the date range for a report.



String/Unit Parameters

Some reports can be restricted to a particular string and/or unit by selecting them in the tool bar. The default is 'All Strings and Units'. Users can also display data for Voltage, Impedance, Current, or Temperature by selecting the appropriate icon in the tool bar.

Figure 58- Selecting Strings and/or Units for Reports



The menu bar of some report screens will have dropdown lists where the user can select specific strings and/or units.



If an icon is grayed out (unavailable) it cannot be used for the report type selected from the menu or side bar.

Sorting Report Data

Data from some – but not all – reports can be sorted by clicking on the column title or on a sort arrow in the title row (see Figure 61, page 84). It’s possible to sort report data on multiple columns but only one column can be sorted at a time.

Highlighted Data

Many reports display data row entries highlighted in red or yellow if the data is outside of normal parameters (see Figure 63, pg. 86).

Printing Reports

Some – but not all – reports can be printed from the File menu in the menu bar. If the **Print** option is unavailable (grayed out) in the menu list the data must be exported to another application to be printed.

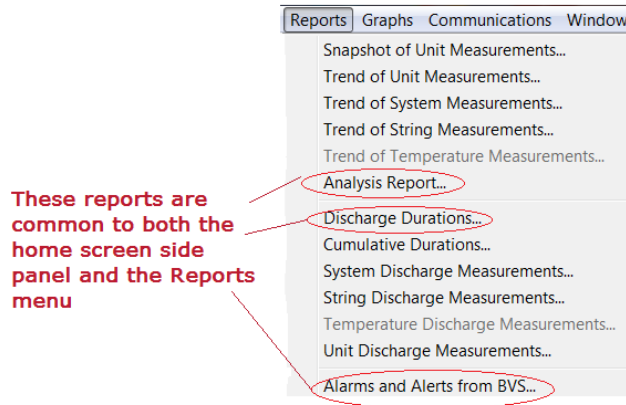
Dual Report Sources

Some reports can be generated from *multiple* sources (typically the Home screen side bar *and* the *Reports* or *View* menu). It makes *no difference* which source is used. The individual report descriptions in this section describe all sources for a particular report.

BVM Home Screen Side Bar Reports

The side panel of the Home screen provides a list of reports and graphs that BVM can generate (see , page 16). *All* sidebar reports are also available from *Reports* in the menu bar.

Figure 59-The Reports menu from the BVM4 main screen.



Measurement Listings Reports

Clicking **Measurements** at the bottom of the *Home* screen sidebar displays a three-page log report containing data described below. Default dates appear in the date-dialog and can be changed by clicking the drop-down arrow for either or both of the fields (see Figure 57, page 80). To print the report data, first export it as a coma delimited file, load it into a spreadsheet application, and then print it.



This data is also available by selecting *Measurement Listings* in the *View* menu.

Measurements Log

This log is tab 1 and provides a chronological listing of system voltage, system current, and system temperature. Data in this report *cannot* be sorted.

Comments

- Data from this report can be exported using the **File>Export data** menu function.
- To refresh data and display the most current readings select **View>Refresh** in the menu bar or press **F5**.
- The column widths can be changed by moving the heading column border right or left.
- Notes can be added to, and edited in, the report by right clicking and selecting the 'Note' option in the resulting context menu.
- Data can be deleted from the report.

Figure 60-The Measurements Log – Measurements tab

Date / Time	System V...	System Cu...	Ambient T...	Model	Note
11/18/2011 05:00	0.0	0.0	67.9 deg F	S5	
11/18/2011 09:00	0.0	0.0	67.5 deg F	S5	
11/18/2011 13:00	0.0	0.0	68.0 deg F	S5	
11/18/2011 17:00	0.0	0.0	68.2 deg F	S5	
11/23/2011 16:37	Out of Ran...	0.0	69.9 deg F	S5	
11/29/2011 06:00	Out of Ran...	0.0	69.5 deg F	S5	
12/01/2011 21:00	53.9	0.0	70.3 deg F	S5	
12/08/2011 21:00	53.9	0.0	68.9 deg F	S5	
		0.0	69.8 deg F	S5	
		0.0	67.3 deg F	S5	
		0.0	67.4 deg F	S5	Test Comment

Report columns can be expanded or condensed by dragging the column border left or right.

Right-clicking in the log screen displays a context menu. Select "Edit Measurement Note"

Discharge Intervals Logs

This report is tab two and is formatted as two separate tables. It provides date and duration data for any discharge periods occurring during the covered period, (i.e. any periods that power was supplied from the battery source rather than the power grid). The top panel table discharge start date, time, and duration; the bottom table displays system discharge current, system voltage, and ambient temperature.

Comments

- Discharges: Selecting a row in the Discharges log (top table) determines the *detail data* displayed in the *System Discharge* log, (bottom table).
- Data contained in the report logs can be exported using the **File>Export** option in the menu bar.
- The column widths can be changed by moving the heading column border right or left.
- Notes can be added to, and edited, in the report.
- Data can be deleted from the report.

Figure 61-Discharge and System Discharge Measurement Logs

Discharges		
Start Date/Time	Duration (hh:...	Note
11/08/2009 08:39:54	00:00:08	
01/07/2010 01:29:28	07:58:16	
03/08/2010 13:52:46	07:32:16	
05/08/2010 03:01:02	07:28:16	
07/07/2010 14:46:06	07:24:16	
09/06/2010 02:09:49	07:22:16	
11/05/2010 15:52:15	10:38:16	

System Discharge Data			
Date / Time	System V...	System Cu...	Ambient T...
10/05/2011 01:56:00	54.1	11.8	
10/05/2011 01:56:01	54.1	11.8	
10/05/2011 01:56:02	54.0	11.9	
10/05/2011 01:56:13	53.7	12.0	
10/05/2011 01:56:14	53.7	11.9	
10/05/2011 01:56:15	53.7	11.9	66.0 deg F
10/05/2011 01:58:15	50.5	12.6	66.1 deg F

Alarms and Alerts Tab Log

This report (called the “Alerts and Alarms from BVS” in the Reports menu) provides *date-time*, and *type of alert or alarm* during the specified period. It also reflects actions taken by the individual site staff and records the identity of the staff member updating the log entry.



Alarms and alerts can be acknowledged in this page. See Acknowledging Alarms and Alerts , pg. 28.

- Data from this report can be exported using the **File>Export data** menu function.
- The column widths can be changed by moving the heading column border right or left.
- Notes can be added to, and edited, the report.

Figure 62-The Alarms and Alerts Logs (partial illustration)

Date / Time	Alarm state cle...	Alarms and Alerts	Note	Acknowledged	By User
10/18/2011 09:07...		System Voltage Alarm:53.9 Volts			
10/18/2011 09:07...		Critical Alarm: Unit 1 Voltage:13.027 Volts			
10/18/2011 09:07...		Ambient Temperature:			
12/21/2011 10:22...		System Voltage Alarm:53.9 Volts			
01/15/2012 13:31...		Ambient Temperature:62.0 deg F			
01/27/2012 12:08...		System Voltage Alarm:53.9 Volts		01/27/2012 12:12	DELL-PC
01/27/2012 12:12...		System Voltage Alarm:53.9 Volts			
01/27/2012 14:40...		Critical Alarm: Unit 1 Voltage:13.098 Volts			
01/28/2012 08:19...		Maint Alert: Unit 1 Voltage:13.070 Volts			
02/02/2012 09:00...		System Voltage Alarm:53.9 Volts		02/02/2012 09:26	DELL-PC
02/02/2012 09:30...		System Voltage Alarm:53.9 Volts			

Side Bar Reports

These buttons are short cuts to the most commonly used reports. Each of the reports is also available underneath “Reports” in the menu bar.

System Analysis Report

This report, (called the “Analysis Report” in the *Reports* sub-menu) requires the user to select a date/time. It shows a variety of statistical information about the voltage, impedance, and temperature data gathered during a measurement. Another result of the analysis is a list of the *unit measurements* that are out-of-limits. Depending on the selection, either all units can be shown or just the out-of-limits.

Comments

- The column widths can be changed by moving the heading column border right or left.
- Data from this report can be exported using the **File>Export data** menu function.
- Data from this report can be printed using the **File>Print** menu function.

Figure 63-System Analysis Report from the BVM Main Screen Side Bar

Date:	10/18/2011 15:00	(Measurement taken by model CellQ2)
Note:		
System Voltage:	53.9 Volts	System voltage below limits: 0.3 (Temperature compensated limits.)
System Charge Current:	0.0 Amps	System charge current within limits.
Ambient Temperature:	71.9 deg F	Ambient temperature within limits.
Number of discharges since previous measurement:	0	
Total discharge time since previous measurement:	00:00:00	
Number of BVS alarms since previous measurement:	0	
Statistics		
Average Unit Voltage:	13.473 Volts	Non-temperature compensated limits.
Maximum Unit Voltage:	13.833 Volts	(Unit 2)
Minimum Unit Voltage:	13.344 Volts	(Unit 3)
Number within voltage limits:	4	
Number above voltage limits:	0	
Number below voltage limits:	0	
Average Unit Impedance:	3.589 mOhms	
Maximum Unit Impedance:	4.328 mOhms	(Unit 2)
Minimum Unit Impedance:	3.282 mOhms	(Unit 1)
Number within impedance limits:	4	
Number above impedance limits:	0	
String Average Impedance:	3.589 mOhms	
Average Unit Temperature:	72.4 deg F	
Maximum Unit Temperature:	72.4 deg F	(Unit 2)
Minimum Unit Temperature:	72.4 deg F	(Unit 2)
Number within temperature limits:	1	
Number above temperature limits:	0	
Number below temperature limits:	0	
Unit Analysis		
Unit 1	Within Limits	
Unit 2	Within Limits	
Unit 3	Within Limits	
Unit 4	Within Limits	

Discharge Intervals

This report (called “Discharge Durations” in the *Reports menu*) requires the user to enter a beginning and ending date/time. It displays the date and time, duration and any notes recorded for the selected date and time range.



This report is essentially identical to the Discharges tab in the “Measurement Listing Report (see Discharge Intervals, page 86). Using this report option enables the user to set specific dates.

Comments

- Data from this report can be printed using the **File>Print** menu function.

- Data from this report can be exported using the **File>Export data** menu function.
- Report data can be sorted by clicking the arrow in the column heading.

Figure 64-Discharge Intervals (Home screen sidebar – partial illustration)

Date / Time ▾	Duration ▾	Note
07/03/2009 18:23	08:02:24	
08/21/2009 17:31	00:00:09	
08/21/2009 21:23	00:16:16	
09/01/2009 19:31	00:00:09	
10/06/2009 07:00	00:00:08	
10/25/2009 09:07	00:00:07	
11/08/2009 08:39	00:00:08	
01/07/2010 01:29	07:58:16	
03/08/2010 13:52	07:32:16	

Alerts and Alarms Report

This report displays the date, time, and a description of any alerts received from the BVS over the stipulated range. Any notes added to an alert by a user are also shown. The date and time the alarm was acknowledged by the user will also be shown. If the alarm state was resolved, (e.g. a temperature returning to within limits), the date and time are also shown.



This report is essentially identical to the Alarms and Alerts tab in the “Measurement Listing Report (see Alerts and Alarms Report, page 87). Using this report option enables the user to set specific dates.

Comments

- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- Report data can be sorted by clicking the arrow in the column heading.
- Right-clicking in the report screen displays a popup menu (described below).

Figure 65-Alerts and Alarms, Sidebar (partial illustration)

Date / Time ▾	Alarms and Alerts ▾	State Cleared	Acknowledged
08/29/2011 10:39:53	Critical Alarm: String 1 Unit 1 Impedance:4.251 mOhms Initial Method Note:		
08/29/2011 10:39:53	Critical Alarm: String 2 Unit 1 Impedance:4.398 mOhms Initial Method Note:		
08/29/2011 10:39:53	Critical Alarm: String 2 Unit 4 Impedan Note:		
08/29/2011 10:39:53	Maint Alert: String 1 Unit 2 Impedance Note:		
08/29/2011 10:39:53	Maint Alert: String 2 Unit 2 Impedance Note:		
08/29/2011 10:39:53	Maint Alert: String 2 Unit 3 Impedance Note:		
09/03/2011 08:37:29	Temperature Sensor 1:62.0 deg F		

Filter and Sort Alarms and Alerts...

Export Report Data...

Print... Ctrl+P

Print Preview

Preferences...

Filter and Sort Alarms and Alerts

This functionality is available from the report’s popup menu. It enables the user to broaden or restrict the report results according to selected criteria. It also allows sort criteria to be defined.

Figure 66-Alarms and Alerts Filter screen

Reports Menu

An extensive number of additional reports are found under the Reports menu. As previously noted some items are available in the Home screen sidebar and will *not* be repeated here.

When most reports are selected a date dialog box is displayed (see Figure 57, page 80). For some reports the user must enter a date and time range (or accept the default). In other cases only a single date is necessary.



If no date(s) appear in the drop-down box no data is available for the report.

Snapshot of Unit Measurements

This report displays all the voltage, impedance, and temperature measurements taken during one read of the BVS. Any units with measurements exceeding the maintenance limits are highlighted in *yellow* while those exceeding the critical limits are shown in *red*. The measurement (s) (voltage, impedance, or temperature) causing the out-of-limits condition are displayed in *bold*.

Comments

- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.

- Users can move the report date backward or forward by right-clicking in the report screen and making the appropriate selection in the popup menu (see below – inset).
- Data can be sorted by clicking the arrow in the heading row.

Figure 67-Snapshot of Unit Measurements Report Example (partial illustration)

String	Unit	Date / Time	Voltage	Impedance	Imp Freq	Temp
1	1	07/04/2011 10:32	13.487 Volts	4.047 mOhms	216 Hz	73.3 deg F
1	2	07/04/2011 10:32	13.639 Volts	3.867 mOhms	216 Hz	73.3 deg F
1	3	07/04/2011 10:32	13.681 Volts	3.280 mOhms	216 Hz	73.3 deg F
1	4	07/04/2011 10:32	13.732 Volts	3.528 mOhms	216 Hz	73.3 deg F
2	1	07/04/2011 10:32	13.673 Volts	4.148 mOhms	216 Hz	75.3 deg F
2	2	07/04/2011 10:32			216 Hz	75.3 deg F
2	3	07/04/2011 10:32			216 Hz	75.3 deg F
2	4	07/04/2011 10:32			216 Hz	75.3 deg F

Show Previous Date

Show Next Date

Print... Ctrl+P

Print Preview

Software Settings...

Preferences...

Trend of System Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows the system's voltage, charge current, average unit temp, and ambient temp over the date and time selected. Any measurements exceeding the limits are shown in *yellow or red*. The measurement (s) (voltage, current, or temperature) causing the out-of-limits condition are displayed in bold.

Comments

- The measurements can be sorted by clicking on the arrow in the top of each column.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.

Figure 68- Trend of System Measurements Report (partial illustration)

Date / Time	Voltage	Current	Temp
09/19/2011 09:10	55.0 Volts	0.5 Amps	63.1 deg F
Note:			
09/19/2011 10:27	55.0 Volts	0.5 Amps	62.6 deg F
Note:			
09/19/2011 10:35	55.0 Volts	0.5 Amps	63.4 deg F
Note:			
09/20/2011 12:09	55.0 Volts	0.5 Amps	62.8 deg F
Note:			
09/23/2011 12:06	54.9 Volts	0.5 Amps	67.2 deg F
Note:			
09/26/2011 10:32	54.9 Volts	0.5 Amps	67.0 deg F
Note:			
10/03/2011 10:32	55.1 Volts	0.5 Amps	61.4 deg F
Note:			

Trend of Unit Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows data for one unit's voltage, impedance, and temperature measurements over the date and time selected. Any measurements exceeding *maintenance limits* are highlighted in *yellow* while those exceeding

critical limits are shown in *red*. The measurement (s) (voltage, impedance, or temperature) causing the out-of-limits condition is displayed in **bold**.

Comments

- Data from this report can be printed using the **File>Print** menu function.
- Users can move the selected unit backward or forward, or select it directly by right-clicking in the report screen and making the appropriate selection in the popup menu (see below – inset).
- Data from this report can be exported using the **File>Export data** menu function.
- The measurements can be sorted by clicking on the arrow in the top of each column.

Figure 69-Trend of Unit Measurement Report (partial illustration)

String	Unit	Date / Time	Voltage	Impedance	Imp Freq	Temp
1	1	09/15/2011 17:49	13.610 Volts	4.311 mOhms	216 Hz	61.2 deg F
1	1	09/19/2011 09:10	13.613 Volts	4.311 mOhms	216 Hz	59.8 deg F
1	1	09/19/2011 10:27	13.617 Volts	4.304 mOhms	216 Hz	59.5 deg F
1	1	09/19/2011 10:35	13.616 Volts	4.318 mOhms	216 Hz	60.1 deg F
1	1	09/20/2011 12:09	13.612 Volts	4.310 mOhms	216 Hz	59.9 deg F
1	1	09/23/2011 12:06	13.587 Volts	4.324 mOhms	216 Hz	63.2 deg F
1	1	11/10/2011 09:49	13.732 Volts	3.606 mOhms	216 Hz	61.8 deg F
1	1	11/10/2011 11:40	13.715 Volts	3.584 mOhms	216 Hz	60.2 deg F
1	1	11/14/2011 09:13	13.685 Volts	3.597 mOhms	216 Hz	60.2 deg F
1	1	11/14/2011 09:32	13.692 Volts	3.603 mOhms	216 Hz	60.2 deg F
1	1	11/21/2011 09:19	13.622 Volts	3.543 mOhms	216 Hz	60.2 deg F
1	1	11/21/2011 09:32	13.627 Volts	3.542 mOhms	216 Hz	60.2 deg F

Trend of String Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows one or more string's charge current spanning the date and time selected. With the latest firmware, the reports will also show the individual string voltages. Any current measurements exceeding the string charge current limit or voltage measurements outside the voltage limits are highlighted in *red*.

Comments

- The measurements can be sorted by clicking on the arrow in the top of each column.
- Users can select individual Strings and units for the report in the tool bar.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- Users can select individual units or *All* units by right-clicking in the report screen and making the appropriate selection in the popup menu (see below – inset).

Figure 70- Trend of String Measurements (partial illustration)

String	Date / Time	Current	Voltage
1	10/03/2011 10:32:00		55.1 Volts
2	10/03/2011 10:32:00		55.1 Volts
1	10/10/2011 10:32:00		55.1 Volts
2	10/10/2011 10:32:00		55.1 Volts
1	10/17/2011 10:32:00		55.1 Volts
2	10/17/2011 10:32:00		55.0 Volts
1	10/24/2011 10:32:00		54.8 Volts
2	10/24/2011 10:32:00		54.8 Volts
1	11/07/2011 09:32:00		55.1 Volts
2	11/07/2011 09:32:00		55.1 Volts
1	11/10/2011 08:38:00		55.1 Volts
2	11/10/2011 08:38:00		55.1 Volts
1	11/10/2011 09:49:00		55.1 Volts

Trend of Temperature Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows the temperature measurements trended over the date and time selected. Any measurements exceeding the limits are *highlighted red*.

Comments

- The measurements can be sorted by clicking on the arrow in the top of each column.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- Users can select a specific sensor to report on by selecting it from a drop-down list in the tool bar.
- Users can select individual sensors or *All* sensors by right-clicking in the report screen and making the appropriate selection in the popup menu (see below – inset).

Figure 71- Trend of Temperature Measurements (partial illustration)

Sensor	Description	Date / Time	Temp
1	Temperature Sensor 1	07/04/2011 10:32:00	73.3 deg F
1	Temperature Sensor 1	07/11/2011 10:32:00	69.3 deg F
1	Temperature Sensor 1	07/18/2011 10:32:00	71.7 deg F
1	Temperature Sensor 1	07/25/2011 10:32:00	73.2 deg F
1	Temperature Sensor 1	08/01/2011 10:32:00	73.3 deg F
1	Temperature Sensor 1		70.0 deg F
1	Temperature Sensor 1		70.1 deg F
1	Temperature Sensor 1		69.5 deg F
1	Temperature Sensor 1		68.7 deg F
1	Temperature Sensor 1		62.7 deg F
1	Temperature Sensor 1		61.8 deg F
1	Temperature Sensor 1		62.0 deg F
1	Temperature Sensor 1		61.5 deg F
1	Temperature Sensor 1		61.2 deg F
1	Temperature Sensor 1		59.8 deg F

Discharge Durations Report

This report requires the user to enter a beginning and ending date/time. It displays the date/time the discharge took place and the length of time it lasted.

Comments

- The measurements can be sorted by clicking on the arrow in the top of each column.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.

Figure 72-Discharge Durations Report

Date / Time ▾	Duration ▾	Note
09/01/2009 19:31	00:00:09	
10/06/2009 07:00	00:00:08	
10/25/2009 09:07	00:00:07	
11/08/2009 08:39	00:00:08	
01/07/2010 01:29	07:58:16	
03/08/2010 13:52	07:32:16	
05/08/2010 03:01	07:28:16	
07/07/2010 14:46	07:24:16	
09/06/2010 02:09	07:22:16	
11/05/2010 15:52	10:38:16	

Cumulative Durations Report

This report requires the user to enter a beginning and ending date/time. It shows the cumulative number and duration of discharges over the selected date and time range. It also shows the distribution of discharges by duration. For each duration category, it lists the number of discharges, its percentage of the total number of discharges, the cumulative discharge time, and the percentage of the total discharge time.

The duration categories can be changed in the *Change Discharge Duration Grouping* screen accessed from the View menu (see Figure 37, pg.54).

Comments

- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- The grouping for the Discharge Data can be re-grouped by right-clicking in the report screen and selecting *Change Discharge Duration Group*, see below – inset).

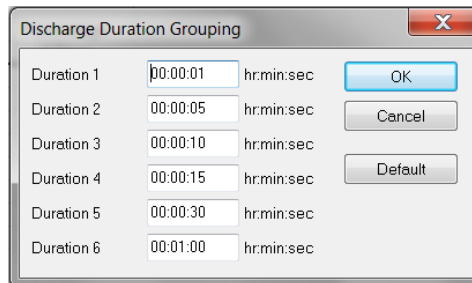
Figure 73-Cumulative Durations Report (partial illustration)

Date Range:	07/07/2010 14:46 - 10/05/2011 01:56			
Total Number Of Discharges:	9			
Total Discharge Time:	63:24:05			
Duration (hr:min:sec >= d < hr:min:sec)	Number of Discharges	Percentage of Discharges	Cumulative Time (hr:min:sec)	Percentage of Time
00:00:00 - 00:00:01	1	11.1 %	00:00:01	0.0 %
00:00:01 - 00:00:05	0	0.0 %	00:00:00	0.0 %
00:00:05 - 00:00:10	0	0.0 %	00:00:00	0.0 %
00:00:10 - 00:00:15				
00:00:15 - 00:00:30				
00:00:30 - 00:01:00				
00:01:00 - 00:02:00				
00:02:00 - 00:05:00				
00:05:00 - 00:10:00				
00:10:00 - 00:30:00	0	0.0 %	00:00:00	0.0 %

Discharge Duration Grouping Screen

This screen is used to view or modify the 15 categories groupings.

Figure 74-Discharge Duration Grouping screen



System Discharge Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows the system's voltage, discharge current, average unit temp, and ambient temp while the battery is undergoing discharge. Any measurements exceeding the discharge limits are shown in *red*. The measurements (voltage, current, or temperature) causing the out of limits condition are displayed in *bold*. Any current measurements exceeding the system charge current limit or voltage measurements outside the voltage limits are highlighted in *red*.

Comments

- The Date/Time entries can be sorted by clicking on the arrow in the top of each column.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- If the system voltage and current are *both available*, the discharge performance is calculated and shown at the bottom of the report.

Figure 75-System Discharge Measurements Report (partial illustration)

Date / Time	Elapsed Time	Voltage	Current	Temp
07/07/2010 14:46:06	00:00:00	53.8 Volts	12.0 Amps	
07/07/2010 14:46:07	00:00:01	53.7 Volts	12.1 Amps	
07/07/2010 14:46:08	00:00:02	53.7 Volts	12.1 Amps	
07/07/2010 14:46:09	00:00:03	53.7 Volts	12.1 Amps	
07/07/2010 14:46:10	00:00:04	53.6 Volts	12.0 Amps	
07/07/2010 14:46:11	00:00:05	53.6 Volts	12.1 Amps	
07/07/2010 14:46:12	00:00:06	53.6 Volts	12.1 Amps	
07/07/2010 14:46:13	00:00:07	53.5 Volts	12.1 Amps	
07/07/2010 14:46:14	00:00:08	53.5 Volts	12.1 Amps	
07/07/2010 14:46:15	00:00:09	53.5 Volts	12.1 Amps	
07/07/2010 14:46:16	00:00:10	53.4 Volts	12.1 Amps	
07/07/2010 14:46:17	00:00:11	53.4 Volts	12.1 Amps	
07/07/2010 14:46:18	00:00:12	53.4 Volts	12.1 Amps	
07/07/2010 14:46:19	00:00:13	53.3 Volts	12.0 Amps	
07/07/2010 14:46:20	00:00:14	53.3 Volts	12.1 Amps	
07/07/2010 14:46:21	00:00:15	53.3 Volts	12.1 Amps	73.2 deg F
07/07/2010 14:48:21	00:02:15	49.9 Volts	13.0 Amps	73.1 deg F

String Discharge Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows discharge current while the battery is in a *discharge* for one or more strings. With the latest firmware, the reports also show the individual string voltages. Any measurements exceeding the string discharge current limit, or the voltage limits, are highlighted in *red*.

Comments

- The measurements can be sorted by clicking on the arrow in the top of each column.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- The user can select a specific string for the report by selecting it from a drop-down list in the tool bar; or by right-clicking in the report screen and selecting it from the the *Display String* sub-menu, see below – inset).
- If one string is selected and the string voltage and current are *both available*, the discharge performance is calculated and shown at the bottom of the report.

Figure 76-String Discharge Measurements Report (partial illustration)

String	Date / Time	Elapsed Time	Current	Voltage
1	09/06/2010 02:09:49	00:00:00		11.2 Volts
2	09/06/2010 02:09:49	00:00:00		53.7 Volts
1	09/06/2010 02:09:50	00:00:01		11.4 Volts
2	09/06/2010 02:09:50	00:00:01		53.6 Volts
1	09/06/2010 02:09:51	00:00:02		11.4 Volts
2	09/06/2010 02:09:51	00:00:02		53.6 Volts
1	09/06/2010 02:09:52	00:00:03		11.2 Volts
2	09/06/2010 02:09:52			
1	09/06/2010 02:09:53			
2	09/06/2010 02:09:53			
1	09/06/2010 02:09:54			
2	09/06/2010 02:09:54			
1	09/06/2010 02:09:55			
2	09/06/2010 02:09:55			

Display String	▾	✓ All Strings
Print..	Ctrl+P	String 1
Print Preview		String 2
Software Settings...		String 3
Preferences...		String 4
		String 5
		String 6
		String 7
		String 8

Temperature Discharge Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows the temperature measurements over the date and time selected. Any measurements exceeding the limits are highlighted.

Comments

- The measurements can be sorted by clicking on the arrow in the top of each column.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- The user can select a specific string to report on by selecting it from a drop-down list in the tool bar.

Figure 77-Temperature Discharge Measurements Report (partial illustration)

Sensor	Description	Date / Time	Elapsed Time	Temp
1	Temperature Sensor 1	07/07/2010 14:46:21	00:00:15	69.5 deg F
1	Temperature Sensor 1	07/07/2010 14:54:21	00:08:15	69.6 deg F
1	Temperature Sensor 1	07/07/2010 15:02:21	00:16:15	69.7 deg F
1	Temperature Sensor 1	07/07/2010 15:10:21	00:24:15	69.9 deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/0		deg F
1	Temperature Sensor 1	07/07/2010 16:30:21	01:44:15	70.6 deg F

Show Previous Sensor	PgUp	deg F
Show Next Sensor	PgDn	deg F
All Sensors		deg F
Print..	Ctrl+P	deg F
Print Preview		deg F
Software Settings...		deg F
Preferences...		deg F

Unit Discharge Measurements Report

This report requires the user to enter a beginning and ending date/time. It shows one unit's voltage and temperature measurements while the battery is in discharge. Any measurements exceeding the discharge limits are highlighted. The measurement (voltage or temperature) causing the out of limits condition is displayed in *bold*.

Comments

- The measurements can be re-sorted by clicking on the arrow in the top of each column.
- Data from this report can be printed using the **File>Print** menu function.
- Data from this report can be exported using the **File>Export data** menu function.
- The user can select a specific string and limit to report on by selecting it from a drop-down list in the tool bar; or by right-clicking in the report screen and selecting it from the the *Display String* sub-menu, see below – inset).
- If string current is available, the discharge performance is calculated and shown at the bottom of the report.

Figure 78-Unit Discharge Measurements Report (partial illustration)

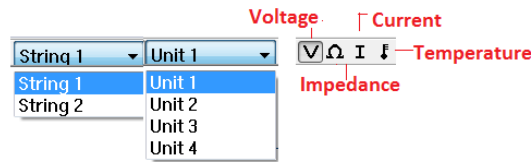
String	Unit	Date / Time	Elapsed Time	Voltage	Temp
1	1	09/06/2010 02:10:04	00:00:15	13.356 Volts	72.3 deg F
1	1	09/06/2010 02:18:04	00:08:15	12.387 Volts	72.5 deg F
1	1	09/06/2010 02:26:04	00:16:15	12.400 Volts	72.7 deg F
1	1	09/06/2010 02:34:04	00:24:15	12.398 Volts	72.8 deg F
1	1	09/06/2010 02:42:04	00:32:15	12.391 Volts	72.7 deg F
1	1	09/06/2010 02:50:04	00:40:15	12.385 Volts	72.7 deg F
1	1	09/06/2010 03:00:04			
1	1	09/06/2010 03:08:04			
1	1	09/06/2010 03:16:04			
1	1	09/06/2010 03:24:04			
1	1	09/06/2010 03:32:04			
1	1	09/06/2010 03:40:04			
1	1	09/06/2010 03:48:04			
1	1	09/06/2010 03:56:04			
1	1	09/06/2010 04:04:04	02:32:15	12.619 Volts	72.9 deg F
1	1	09/06/2010 04:12:04	02:40:15	12.615 Volts	72.7 deg F

8. Graphs

The BVM4 graphing options are accessed from the menu bar and, in some cases the Home screen side bar (see , page 16). Some S5 data can be graphed on up to four parameters (Voltage, Current, Impedance, and Temperature). Graphs can be printed either by selecting Print from the *File menu* or clicking the Print icon in the *Icon bar*.

The graphing feature uses the range and other parameters entered when configuring the BVM 4 software. Symbols and colors can be chosen or changed using the customization feature.

Figure 79-Selecting graph



The menu bar of some graph screens will have dropdown lists where the user can select specific strings and/or units.



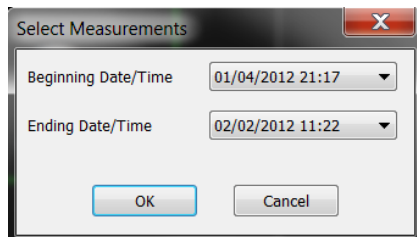
If an icon is grayed out (unavailable) it cannot be used for the graph type selected from the menu or side bar.

General Information

Date-Time Parameters

Most reports require the user to enter *one*, or a *pair* of dates and times (see below). Generally this is done in a calendar spin box. If no date is available it means no data is currently available for the graph. BVM will generally display default dates/times which can be changed.

Figure 80-Date-Time Spin box. Some boxes only have one entry



Viewing Individual Unit and String Measurements

Many graphs include a feature allowing a user to view individual measurements for specific data points. Placing the cursor on a graphed measuring point will display a 'tool tip' showing the actual measurement data (see Figure 83, page 101). Most illustrations in this section include examples of this feature.

Exporting Graphs

Most graphs can be exported in one or more *graphical* formats by selecting **File** in the menu bar and clicking *Export Graphic*. A submenu of options is displayed showing the available export format options.

Printing Graphs

Some – but not all – graphs can be printed directly from the *File* menu in the menu bar. If the Print option is unavailable in the menu list the data must be exported to another application to be printed.

Graph Menu

The BMV4 Graph menu includes the options shown in Figure 67. Note that not all graphs are available at all times. After selecting the graph title and entering dates, one or more of the parameter icons (current, impedance, temperature, or voltage) may be available in the icon bar. Selecting one of these icons determines precisely which measurement will be graphed.

When a particular graph style can be switched among several different parameters (one at a time) pressing F10 will cycle through the available parameters.

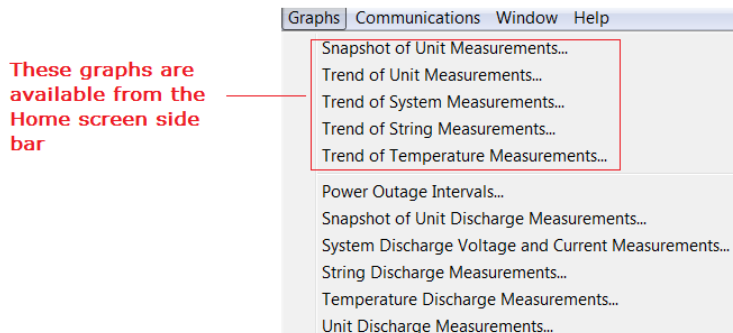
Sources for Graphs

Some Graphs can be generated from *multiple* sources (typically the Home screen sidebar *and* the Graphs menu). It makes *no difference* which source is used. In either case date/time parameters usually must be entered. In a few instances graphs common to two sources have slightly different titles in each source. When this occurs both titles are referenced in the specific graph descriptions later in this section.



Graphs available from multiple sources will only be described *once* this section.

Figure 81-The BVM4 'Graphs' drop-down menu



Setting Graph Display Parameters and Features

Many of the Graphing parameters such as dates are selected at the time the graph is created. Other parameters such as ranges are set when the software is configured. All graph styles have default settings. *Some* display parameters for *some* graphs, such as bar and line colors, marker symbols, etc., can be changed when the graph is open and selected by using the View menu, (see Figure 82, below).

- These commands are also available (on an individual graph basis) from a context menu that is displayed by right-clicking on the graph.
- Graphs can be saved as an image file (bmp, jpg, gif, or png) using the Export Graphics function found in the File menu.



Not all graphs can have their formats changed and not all display parameters can be changed for all graphs. When a graph is selected only the options that appear under the View menu or in the popup menu can be changed.

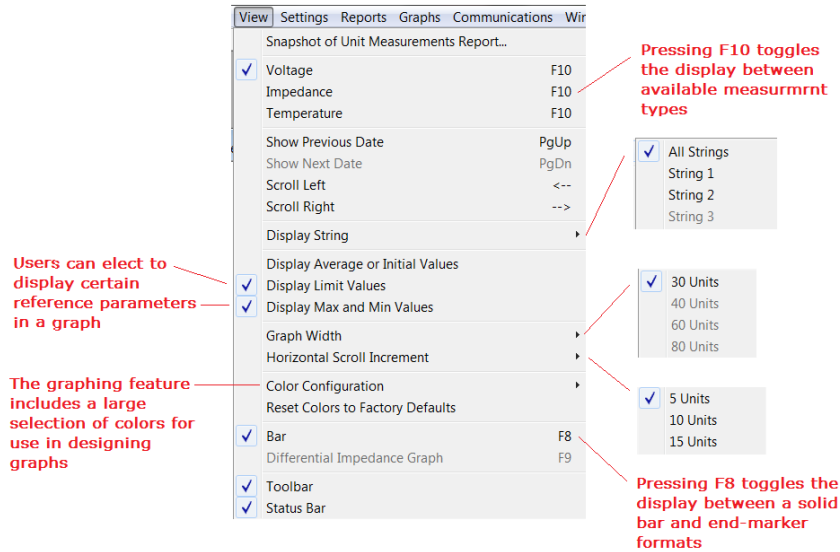
The Graphs View Menu

The *View* menu can be used to control the display a large number of color, symbol, and marker shapes used in a graph. The graph illustration used in this section show a variety of these options. The actual options available in the menu depend on the selected graph type. Both the items and the options shown in the menu will vary. Not all options are available for all graphs.



The View menu can be 'popped up' as a *context menu* within a graph panel by right-clicking.

Figure 82-An extended example of the View menu.



BVM Home Screen Side Bar Graphs

The side panel of the Home screen provides a list of reports and graphs that BVM can generate (see Figure 8, page 16). *Some* sidebar reports are also available from the *Reports* menu bar.

Unit Snapshot Graph

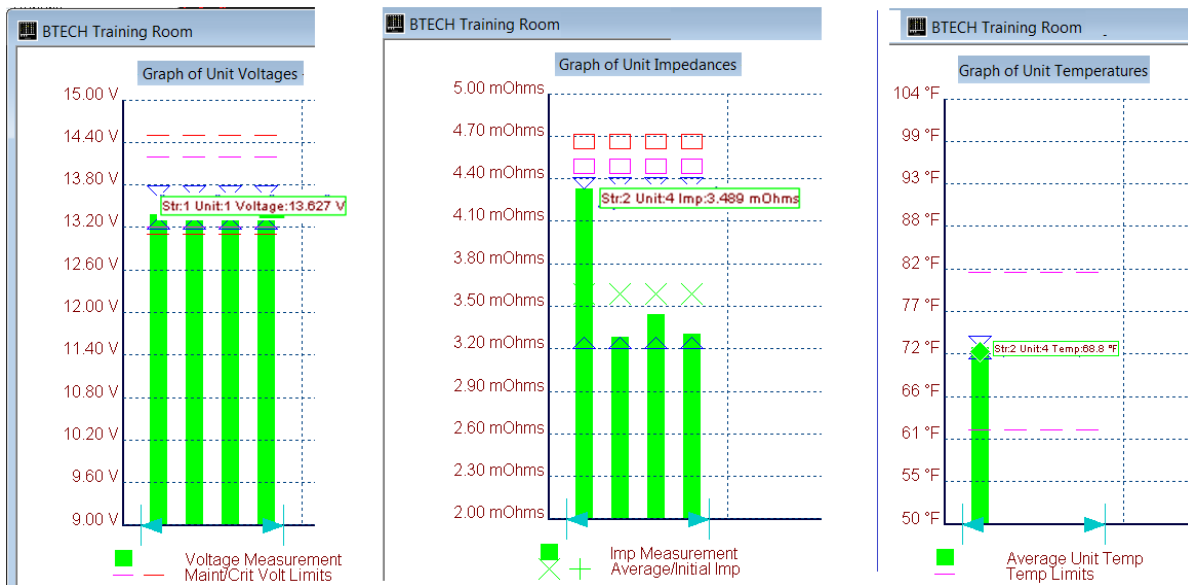
This graph – called the *Snapshot of Unit Measurements* in the *Graphs* menu – can be displayed for either unit *voltage, impedance, or temperature* measurements taken during one ‘read’ on one’ specified date. It requires the user to select a specific date from a drop-down list. Users must enter/select a date for the graph.

The unit numbers are shown on the x-axis while the voltage, impedance, and temperature values are shown on the y-axis. Position the mouse pointer over the measurement point to view the unit number and exact measurement value in a tool tip. Double-clicking on the measurement of a particular unit will open a Unit Trend Graph of that unit.

Comments

- This graph can be generated for Current, Impedance. or Temperature by clicking the appropriate icon in the icon bar, or by pressing F10.
- Individual Graph data can be exported or printed using the File menu.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- The user can elect to graph data for all strings, or select a specific string from a drop-down list in the tool bar.
- Data can be displayed as either bars (shown) or data points by pressing F8.

Figure 83-Unit Snapshot [of Unit Measurements] Graphs for Voltage, Impedance, and Temperature



Unit Trend Graph

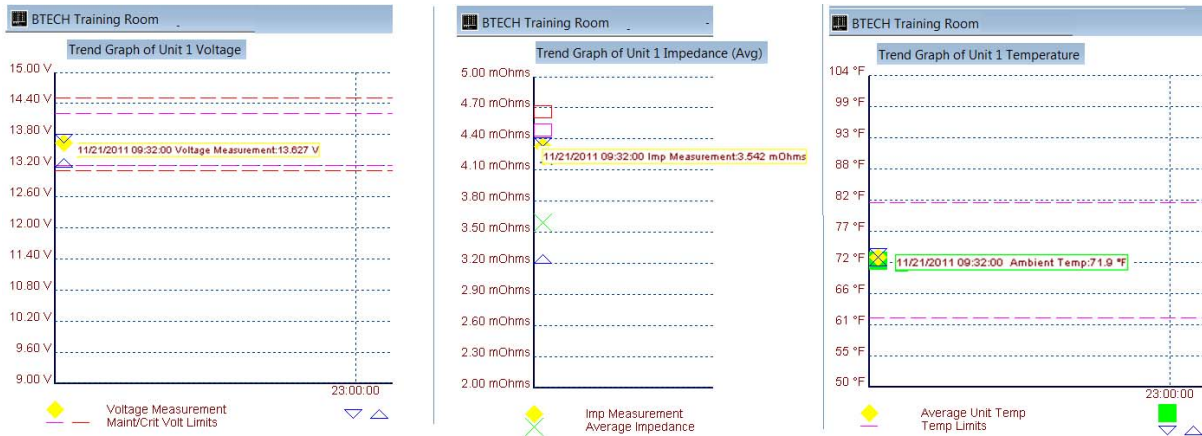
This graph – called the *Trend of Unit Measurements* in the Graphs menu – show one unit’s Voltage, Impedance, or Temperature for a user-specified range of dates. The graph's x-axis will vary depending on the period of time selected.

The unit maintenance voltage limits are represented by two *purple* dashed lines. Critical limits are represented by two *red* lines. The unit float voltage should remain steady between those two limits. A best-fit curve of the voltage and impedance measurements is graphed to assist the user in spotting a rising or falling unit voltage or impedance. To disable this feature, un-check the Display Best Fit Voltage Measurement Trend.

Comments

- This graph can be generated for *Current, Impedance, or Temperature* by clicking the appropriate icon in the icon bar or pressing F10.
- Users can select a specific string and unit from the drop-down list in the tool bar.
- Individual Graph data can be exported or printed using the *File* menu.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- Data can be graphed as either data points (shown) or bars by pressing F8.

Figure 84-Unit Trend (Trend of Unit Measurement) Graphs for Voltage, Impedance, and Temperature

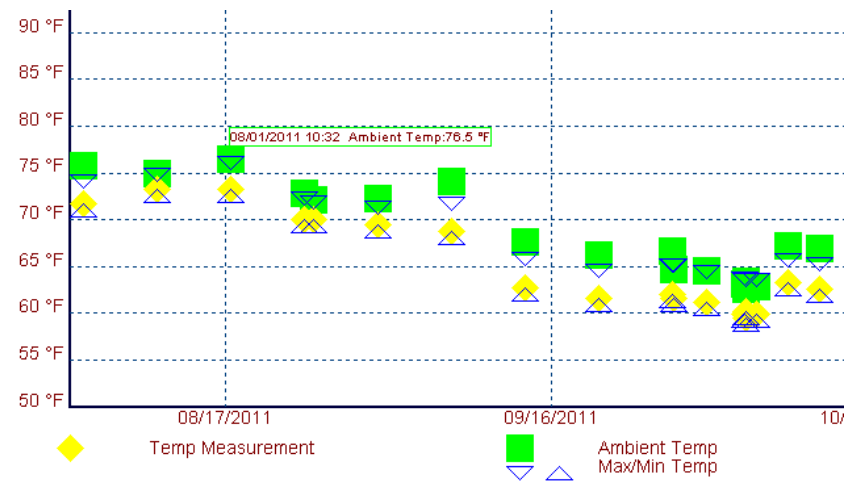


Temp Trend

Called “Trend of Temperature Measurements” in the *Graphs* menu, it shows the temperature measurements trended over the dates and times selected.

To increase or decrease the date and time range of the displayed measurements, use the *Zoom In* or *Zoom Out* selection in the *View* menu.

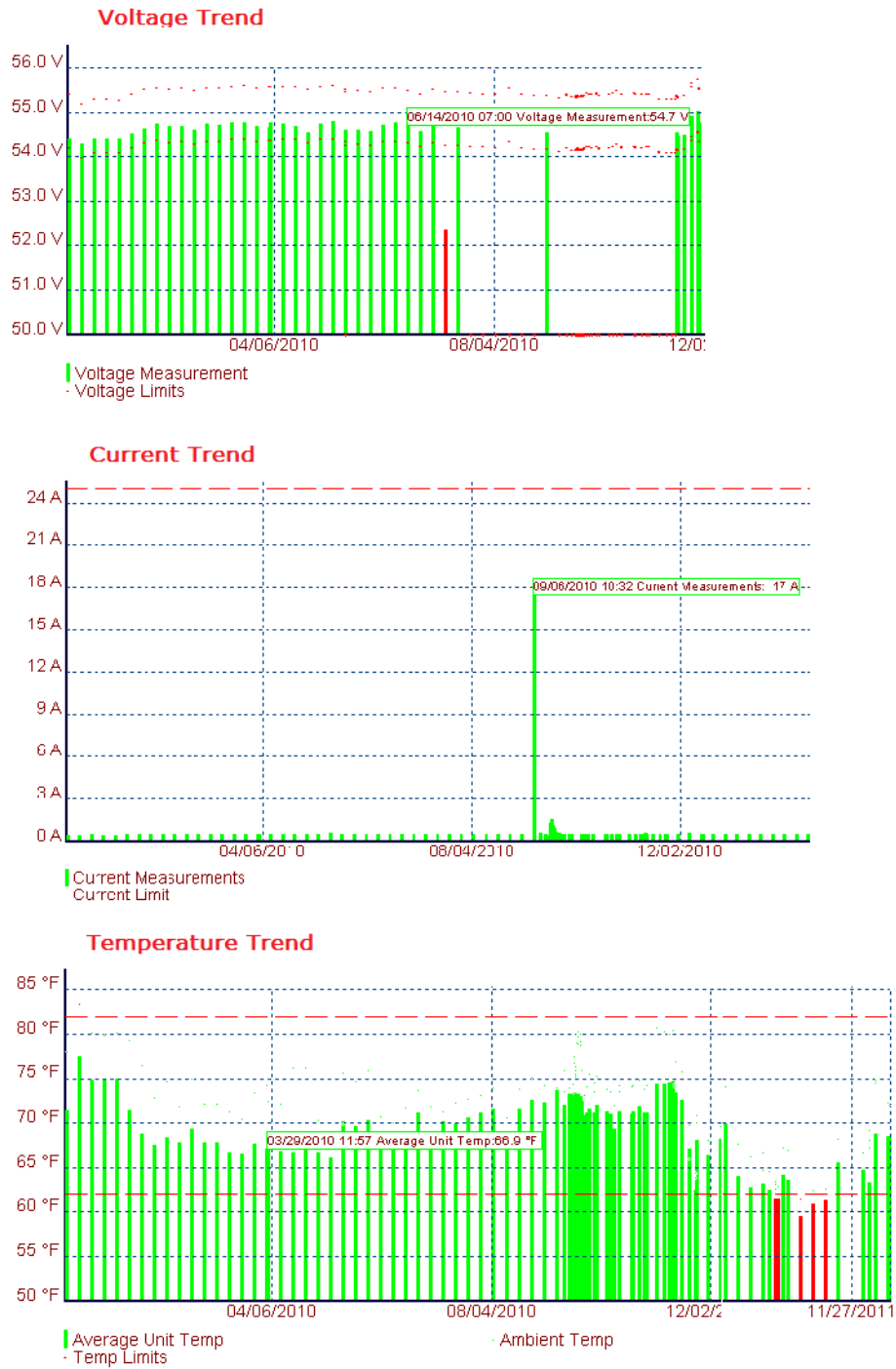
Figure 85- Temperature Trends (Trend of Temperature Measurements) Graph



Comments

- Individual Graph data can be exported or printed using the File menu.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- Users can select a specific sensor from the drop-down list in the tool bar.
- Data can be graphed as either data points (shown) or bars by pressing F8.

Figure 87-System Trend (Trend of System Measurements) Graph



Discharge Graphs – Menu Bar

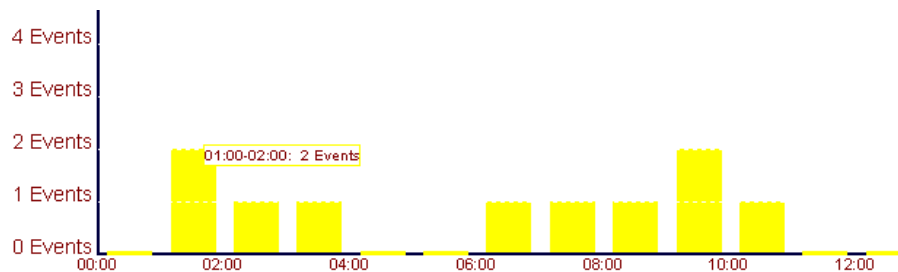
Power Outage Intervals Graph

This graph shows the distribution of discharges for hours-of-the-day, days-of-the-week, or months-of-the-year over the user-determined date and time range. The distribution of discharges by the duration of the outages *can also be graphed*. The data can be classified either by the number of discharges or by the discharge durations,

Comments

- The duration categories can be changed in the Change Discharge Duration Grouping screen accessed from the View menu.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- The graph can be saved as an image file (bmp, jpg, gif, or png) using the Export Graphics function found in the *File* menu.
- The graph can be printed from the *File* menu.

Figure 88-Power Outage Interval Graph



Snapshot of Unit Discharge Measurements Graph

These graphs depict the voltage and temperature measurements taken during one measurement scan for either a single string or all strings in the battery system. The graph's x-axis varies depending on the period of time selected.

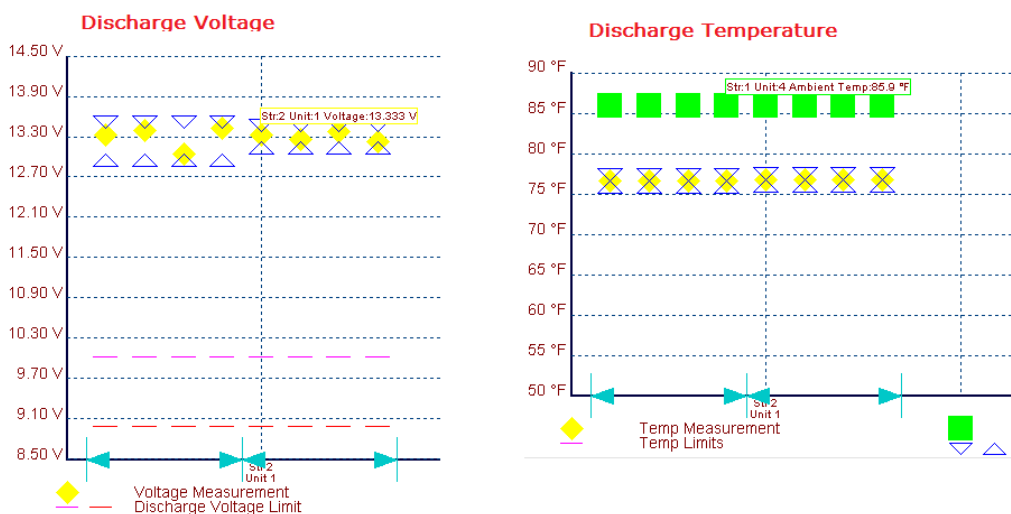
Any measurements exceeding the discharge limits are highlighted. If a unit is replaced, the measurements taken before the new (replacement) unit is installed are dimmed. To determine the date and exact measurement value represented by a yellow diamond, place the mouse cursor over the measurement. The string and unit number and value are shown in a tool tip.

Comments

- To scroll the time of the displayed measurements, use the left and right arrow keys.
- Use F10 to toggle between the unit voltage and unit temperature.
- To toggle between data points (shown), or bars press F8.
- BVM can graph average, initial, max, min, and limits data. Each data type can be enabled and disabled in the *View* menu.

- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- The Page Up and Page Down keys can be used to change the graph to the previous or next unit's data.
- To increase or decrease the date and time range of the displayed measurements, use the "Zoom In" and "Zoom Out" selections in the View menu.
- The user can select all strings or specific strings from a drop-down list in the tool bar.
- Double-clicking on the measurement of a particular unit will open a *Unit Trend Graph* of that unit.

Figure 89- Voltage and Temperature Discharge Measurements Graph



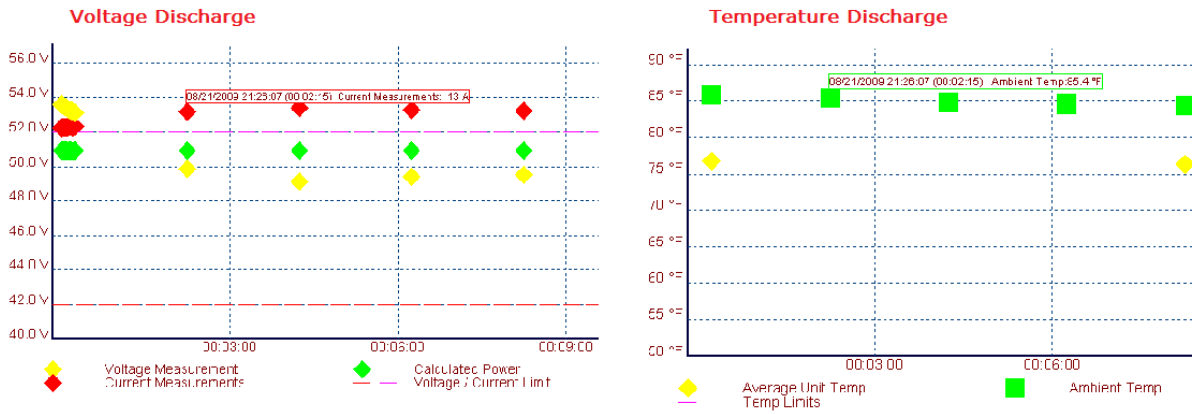
System Discharge Voltage and Current Measurements Graphs

These graphs show the system's voltage, current, average temp, and ambient temp while the battery is in a discharge. The graph's x-axis will vary depending on the time period selected. The string discharge current limit is shown as a purple dashed line. The current should remain below the line during the discharge operation. On the string voltage graph, the discharge voltage limits are represented by two dashed lines. The string voltage should not go below these limits during a discharge.

Comments

- Use the F10 key to toggle between graphs for Voltage and Temperature.
- To scroll the date and time of the displayed measurements use the *left* and *right* arrow keys.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- The graph can be saved as an image file (bmp, jpg, gif, or png) using the Export Graphics function found in the *File* menu.
- The graph can be printed from the *File* menu.

Figure 90-System Discharge Voltage and Current Trend Graphs



String Discharge Measurements Graph

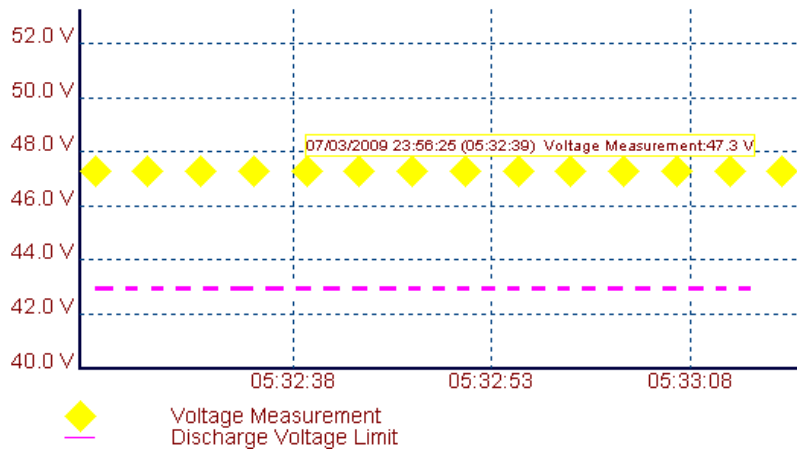
This graph shows string discharge current taken from the battery during discharge. With the latest firmware, the graphs will also show the individual string voltages. The graph's x-axis will vary depending on the period of time selected.

The string discharge current limit is shown as a purple dashed line. The current should remain below this line during the discharge operation. On the string voltage graph, the discharge voltage limits are represented by two dashed lines. The string voltage should remain between these limits during a discharge or an alarm will be generated.

Comments

- The graph can be saved as an image file (bmp, jpg, gif, or png) using the Export Graphics function found in the *File* menu.
- The graph can be printed from the *File* menu.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- The user can graph data for individual strings by selecting a string from a drop-down list in the tool bar.

Figure 91-String Discharge Measurement Graph (partial illustration)



To scroll the date and time of the displayed measurements, use the left and right arrow keys. To determine the date and exact measurement value represented by a red diamond, place the mouse cursor over the measurement. The measurement and its value are shown in a pop-up window. To increase or decrease the date and time range of the displayed measurements, use the *Zoom In* or *Zoom Out* selection in the View menu.

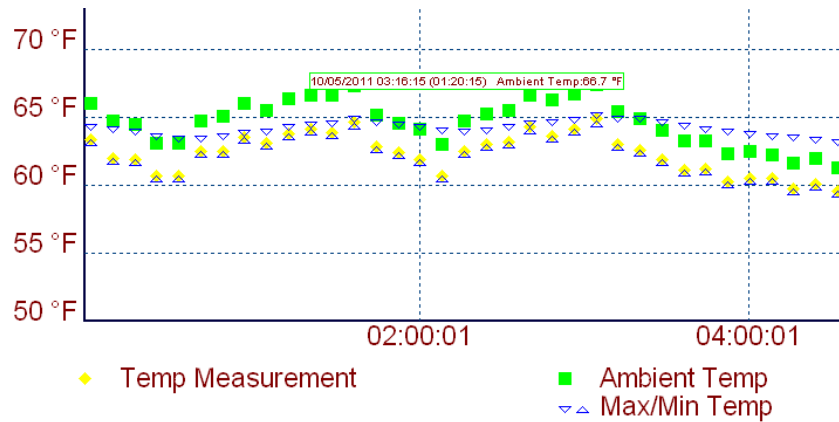
Temperature Discharge Measurements Graph

This graph shows the temperature sensor measurements taken while the battery is under discharge. The graph's x-axis will vary depending on the period of time selected. The red dashed line on the temperature graph shows the temperature limits. Both the ambient and temperature measurement should remain within the limits.

Comments

- The graph can be saved as an image file (bmp, jpg, gif, or png) using the Export Graphics function found in the *File* menu.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- The graph can be printed from the *File* menu.
- The data can be graphed as bars or data points (shown).
- The user can select individual sensors from a drop-down list in the tool bar.

Figure 92-Temperature Discharge Measurement Graph



Unit Discharge Measurements Graphs

These graphs show one unit’s voltage or temperature measurements taken while the battery is under discharge. The graph's x-axis will vary depending on the period of time selected.

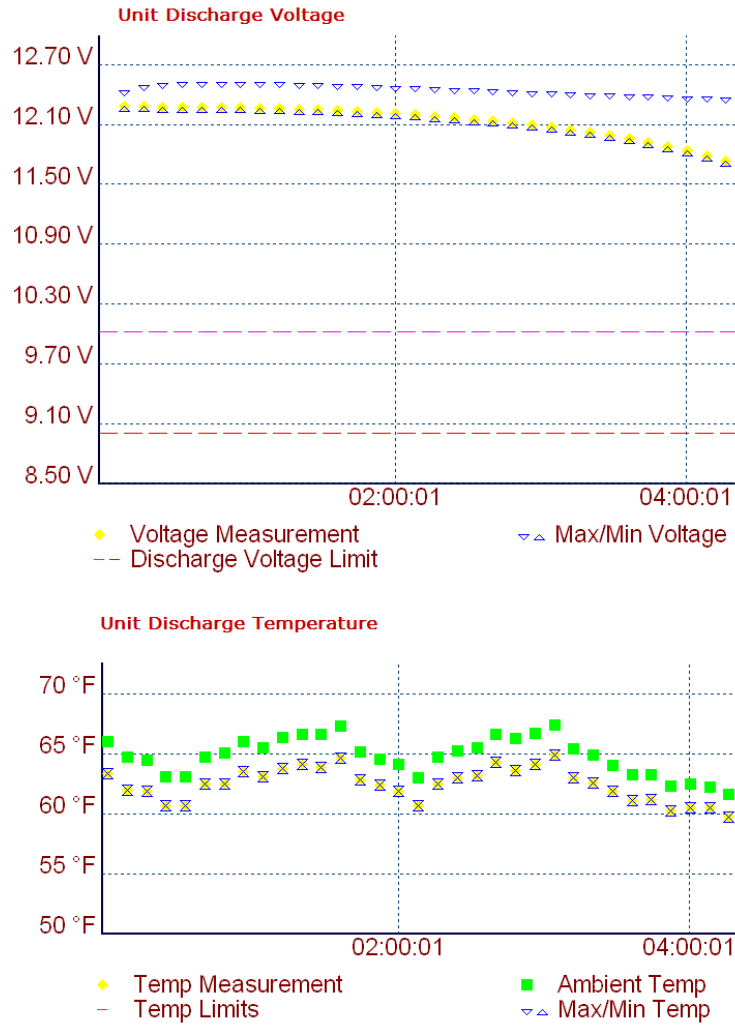
To determine the date and exact measurement value represented by a yellow diamond, place the mouse cursor over the measurement. The string and unit number and value will be shown in tool tip. To increase or decrease the date and time range of the displayed measurements, use the *Zoom In* or *Zoom Out* selection in the *View* menu.

On the unit *Voltage* graph, the unit discharge voltage limits are represented by two colored dashed lines. The unit voltage should not go below these voltages during a discharge. Unit *Temperatures* during discharge are also available on the graph. During a discharge, unit temperatures will elevate within a reasonable range.

Comments

- The graph can be saved as an image file (bmp, jpg, gif, or png) using the Export Graphics function found in the *File* menu.
- The graph can be printed from the *File* menu.
- If a unit is replaced, the measurements taken before the replacement unit is installed are dimmed.
- The user can toggle between bars and datapoints (shown) by pressing F8.
- Placing the cursor on a bar or symbol will display individual unit data in a tool tip.
- Use F10 to toggle between the unit Voltage and unit Temperature.
- The user can select a *string and unit* from a drop-down list in the tool bar.

Figure 93-Unit Discharge Measurements Graph



Appendix

Installing BVM 4.x Software on a Server

When the BVM 4.x software is installed to a server or dedicated workstation use the following procedure. The installation software can be downloaded from the BTECH web site or run from the BTECH installation CD.

- a. Do one of the following:
 - Insert the BVM software CD-ROM into the machine's CD drive and close the tray. In a few moments the *Autoplay* panel is displayed.
 - Navigate to the "Downloads" directory.
- b. Click run BVM_4.x.x_Setup.exe
- c. In the resulting options dialog select *Install BVS Observer*,
 - **NOTE:** It is not necessary to include the *USB Comm Port* driver for server-based installations.

The *Update System* panel is displayed showing a progress bar indicating the installation status. If the *BVM Software Activation* dialog is displayed refer to **THE FOLLOWING STEP IS ONLY REQUIRED IF THE ACTIVATE BVS OBSERVER SOFTWARE DIALOG IS DISPLAYED**

- Click **Finish** when the *successful installation window* is displayed.

Setting Up BVM Observer Services

One or two services must be configured when Observer is run on a server. *BTECH Observer Services* collects data from the S5 controller (including *Alarms and Alerts*). The *BTECH Email Data Services* emails data to BTECH if the customer has contracted to have BTECH do the monitoring.

Opening the Services Window

To access either service use the following procedure,

- a. Click the Windows Start button and type "services" in the "Search files and programs" text box.
- b. In the response screen click **Services**. The Services screen is displayed.
- c. Select *BTECH Observer Service* in the list and right-click. In the resulting tabbed screen click **Log On**, (see Figure 94 below).
- d. Select the *This account* radion button and complete the field. Enter a password and confirm it in the fields provided,
 - The system will use the default passwords unless these entries are changed.
- e. Click **Apply** to enforce the changes.

IF the BTECH Email Data Services function will be used – repeat this procedure after selecting it from the Service list.

Restarting the Services

Once the services have been configured they must be restarted. For *each service* to be utilized do the following:

- a. Select each of the service(s) to be restarted and right click.
- b. In the popup menu click **Restart**.

Figure 94-Configuring BTECH Observer Service

The figure illustrates the process of configuring the BTECH Observer Service. It shows three main components:

- Services (Local) List:** A table listing various services. The 'BTECH Observer Service' is highlighted with a red box. Its status is 'Started' and its startup type is 'Automatic'. A red line connects this service to the configuration dialog.
- Log On dialog:** A dialog box with tabs for 'General', 'Log On', 'Recovery', and 'Dependencies'. The 'Log On' tab is active, showing options for 'Local System account' and 'This account'. The 'This account' option is selected, and the 'Log On' button is highlighted with a red box. A red line connects this dialog to the instruction text.
- Context Menu:** A right-click context menu for the service, with the 'Restart' option highlighted in blue. A blue line connects this menu to the instruction text.

Instructional Text:

Select **BTECH Observer Service** and right-click. Select **Properties** and in the resulting tab screen click **Log On**.

Once the services have been configured, select each and right click. Click **Restart** in the popup menu

Installing and Configuring SQL Server Software

For larger sites (approximately 20 or more BTECH BVS S5 units) BTECH recommends using *Microsoft SQL Server Express* (in place of Microsoft Access) as the backend database. *Server Express* is usually included on the BTECH installation CD. In situations where a location has increased the number of S5 units over time, *Server Express* can be installed to replace Access, see “Converting to SQL from MS Access”, pg. 126. If a full version of SQL is available it can also be used.



SQL Server Express 2008 can be installed as the database engine regardless of the battery system size. It may be advisable to include it in the initial installation to avoid having to complete the conversion process at a later time.

Password Authentication

The BVM software can use either SQL or Windows authentication to connect to the database server. The type of authentication, username, and password will be part of the configuration for each of the software components. By default, there are two SQL logins; one is for web access and the other is for BVM access. Each uses the same default password: “p@ssw0rd”.



BTECH strongly recommends changing the password to more secure versions and then changing them periodically.

Installing SQL Server Express 2008

The *SQL Server Express 2008* and the *SQL Server Management Tools*, together with the installation application, are included on the BVM installation disk. Both 32-bit and 64-bit versions of SQL Express are available. Be certain to install the *correct* version for the host operating system.

Once the installation is complete, the TCP/IP protocol needs to be enabled if the battery data will be accessed by a remote machine running BVM or BVS Status Monitor software. To enable TCP/IP, launch the SQL Server Configuration Manager. Under the SQL Server Network Configuration, enable TCP/IP and then restart the SQL Server service under SQL Server Services.



This guide section depicts a full install to a machine that does *not* have an existing SQL Express version resident and active.

To install SQL Express 2008 from the BTECH installation disc do the following:

- a. Use Windows Explorer to navigate to, and download the executable install file from the BTECH installation CD –
 - SQLEXPRT_x86_ENU.exe. (32-bit), or

- SQLEXPRT_x64.exe (64-bit),

By default, Windows downloads all files to the Download folder. This can be changed in the download dialog if necessary.

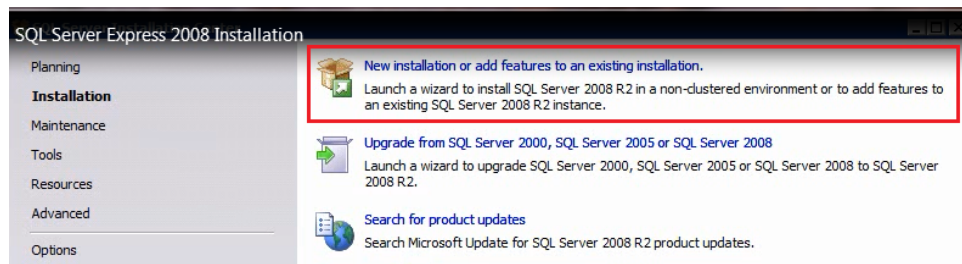
- b. Double-click on the correct installation file. A number of files are extracted and a number of progress bar dialogs are displayed in succession.



Be certain to download and install the correct file – 32-bit or 64-bit, for the host system OS. If the wrong program version is installed, delete it completely using the Windows Control panel and repeat this procedure for the correct program.

- c. In the *SQL Server Express Installation Center* screen, select the “New Installation or add features . . .” option (see Figure 95 below),
- d. After verifying that the installation computer has the necessary hardware – accept the license terms and conditions by clicking **Next**. The *Setup Support Files* screen is displayed with a progress bar at the bottom.
 - The install process next displays the *Set Up Rules* screen with a progress bar at the bottom.
- e. The Set-up program continues the install displaying a number of informational dialogs and progress bar panels.

Figure 95-The initial SQL installation screen

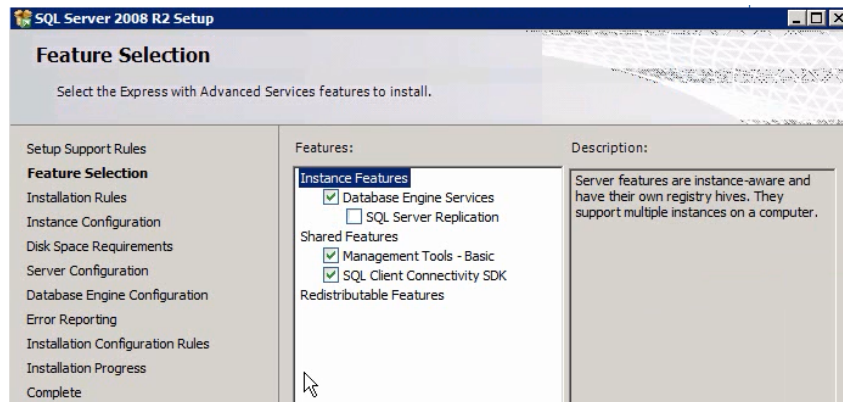


Installing SQL Express 2008 Features

The *Feature Selection* dialog is displayed automatically. It is not necessary (or advisable) to install all of the available features. In the *Feature Selection* screen do the following:

- a. Clear the checkbox for *SQL Server Replication* (if it is checked),
- b. Leave the following items selected (or select them if necessary):
 - Database Selection Services,
 - Management tools – basic,
 - SQL Client Connectivity SDK.
- c. Click **Next**.

Figure 96-The SQL Express Server Feature Selection screen



Naming the Instance

Once the base installation is complete the following items must be added, (see Figure 97, below).

- a. Select the Named Instance radio button (if necessary),
- b. Accept the default or change the following:
 - Named instance entry,
 - Instance id entry,
 - Instance root directory entry.
- c. Click **Next** to proceed to the configuration portion of the installation.

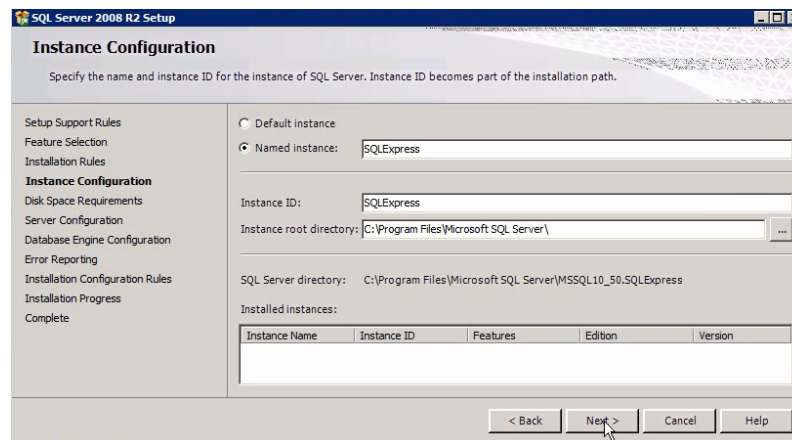
Configuring the Database Engine – Server Accounts Tab, Accounts Provisioning Tab

The Database Engine Configuration screen is displayed and must be configured as described below (see Figure 98, pg. 118). Some items are specific to the particular server.

Server Accounts Tab -

- a. In the *Server Accounts tab* use the drop-down arrow to set *Start up type* for both the *SQL Server Database engine* AND the *SQL Server Browser* entries to *Automatic*, (see Figure 99) Click **Next** to proceed to the *Account Provisioning* tab,

Figure 97-Instance Configuration Screen



Account Provisioning Tab -

This tab sets user authentication requirements and passwords.

- a. Select the Radio button for: *Mixed Mode (SQL Server . . .)*. This enables the use of both SQL and Windows authentication, (see Figure 98, below).
- b. Enter and confirm a *password* and click **Next**, then **Next** again to start the configuration.

The installation will run for several minutes and display various informational and progress dialogs.

- c. Once the install program indicates that the process is complete, click **Close** to close the SQL setup panel and click **Close** again to close the Install center.



- The password entries **MUST** conform to minimum requirements or an error message is displayed.
- The current and any additional users can be added via the buttons beneath the ‘...administrators’ list box

Figure 98-Account Provisioning tab

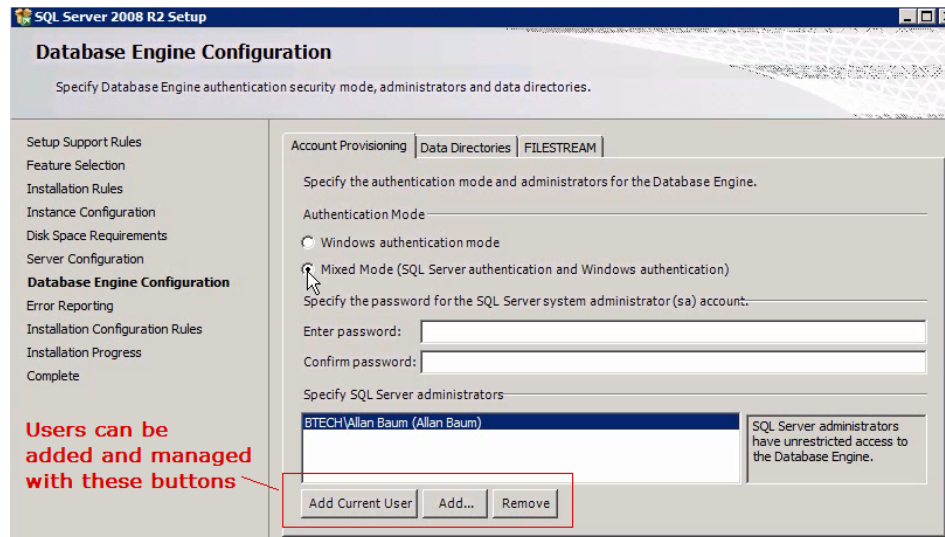
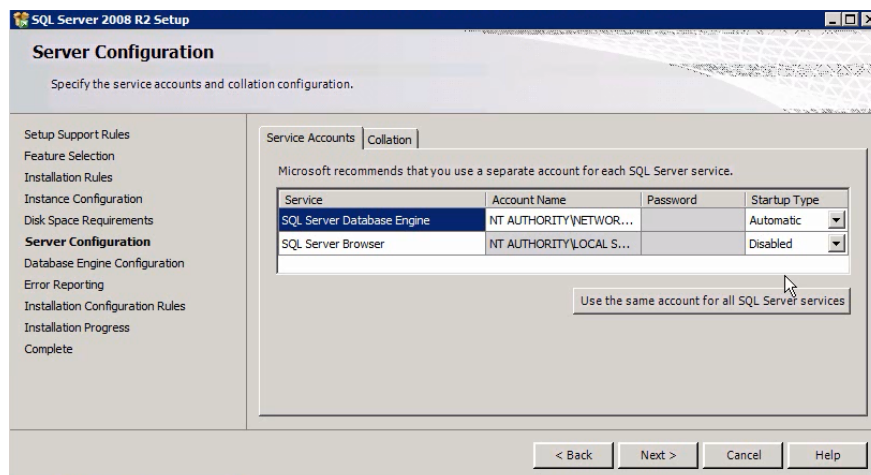


Figure 99-Service Accounts tab



Configuring and Controlling SQL Network Access

By default SQL Express does not have network access. It must be turned on using the management tools. In the programs list, navigate to:

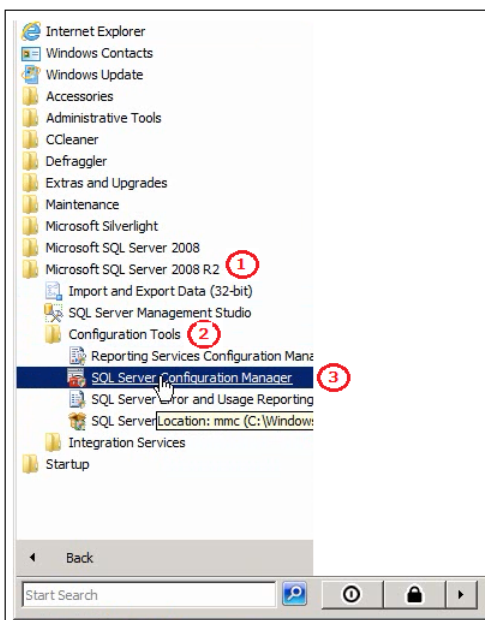
Microsoft SQL Server 2008 R2>SQL Server Management Studio>Configuration Tools>SQL Server Configuration Manager.

Configuring Network Access to Server Express

- Click the **Windows Start** button, and select *All Programs*,
- Click Microsoft SQL Server 2008 to expand it and select and expand *Configuration tools* in the resulting list,
- Select *SQL Server Configuration Manager* to display the properties panels,

- d. In the left panel select and expand *SQL server network configuration*,
- e. Select *Protocols for SQL Express* in the expanded list and –
- f. in the *right panel*, right-click on *TCP/IP*,
- g. select **Enable** from the pop-up menu and click **OK** in the Warning dialog.
- h. Return to the left panel and select *SQL Server Services*
- i. Right-click *SQL Server (SQL Express)* in the right panel and select *Stop* in the popup menu.
- j. Select *SQL Server Browser* in the right panel. and select *Stop* in the popup menu.
- k. Repeat the process in steps and h but select *Start* in the popup menu.

Figure 100-Installed directory structure for SQL server



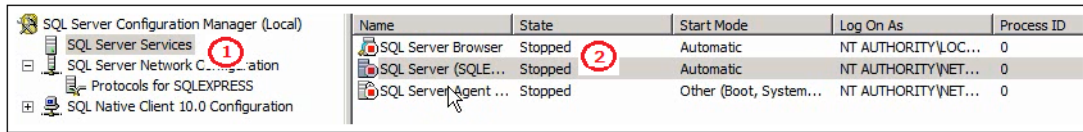
Stopping and Starting SQL Services

In order to activate the configuration settings that have been added or changed, it's necessary to stop, and re-start two SQL services. This is done from the *SQL Server Configuration Manager* (see Figure 101) as follows.

- a. In the left side navigation panel select **SQL Server Services**,
- b. In the right panel – *right click SQL Server* and select *Stop* from the popup menu,
- c. Select *SQL Server Browser* – right click, and select *Stop* from the popup menu,
- d. Repeat steps *b and c* but select *Start* from the popup menu.

When the procedure steps are finished, the two services should show “Running” in the *State* column. Close the *Installation* screen.

Figure 101-Stopping and starting SQL server services



Updating SQL Server

Once the installation and configuration is complete it's a good idea to check for any upgrades or patches to any of the programs. This should also be done periodically. Use the procedure below.

- a. Click the **Windows Start** button, and select *Windows Updates*,
- b. When the *Windows Update* screen opens, select *Check for updates*. One of the following will occur:
 - If updates are available click **Install Updates**. A progress bar is displayed to indicate the download and installation activity,
 - If no updates are available the panel can be closed.

Figure 102-Configuring Network Access



Verifying Database Connectivity

Following the installation and configuration, and before ending the session, it is advisable to confirm that the database is accessible using the SQL server. This is done using the *SQL Server 2008 Studio Manager* (see Figure 103).

- a. Click the **Windows Start** button, and select *All Programs*,
- b. Click Microsoft SQL Server 2008 to expand it and select *Microsoft SQL Server 2008 Studio* in the resulting list,
- c. Click **Connect** when the *Connect to Server* pane is displayed.

If any errors occur address them at this point. Otherwise a panel is displayed showing the database structure using expandable elements. Administrators can select elements for viewing and editing.

Figure 103-The SQL Express Server database Connect to Server panel



Installing the SQL Database

Once the SQL server has been installed it's necessary to install the requisite BVM databases.

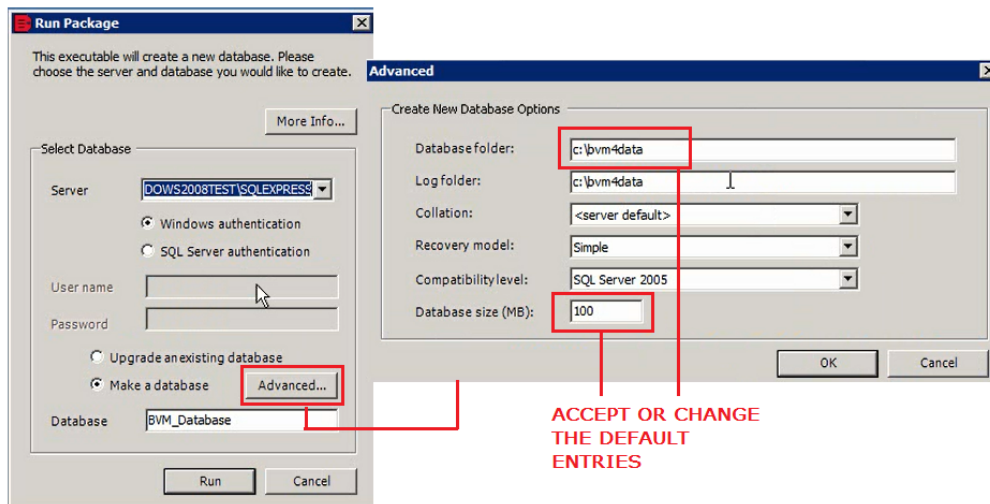
Run the BVM database executable: "BVM_Database_Setup.exe" which is located in either the computer's download folder, the computer's BVM4 directory, the BTECH distribution CD, or the BTECH web site.

- a. Locate the executable file and double-click,
- b. In the *Run Package* dialog – select the name of the server where the database will be installed (see Figure 104),
 - Be certain that the *correct instance* is selected when multiple instances have been installed.
- c. Click **Advanced** to display the Advanced panel.
 - Accept or change the database folder where the db files will be kept.
 - Accept or change the database size entry.
- d. Click Run. The *Execution Started* dialog with a progress bar is displayed.
- e. When the "Package executed successfully" message dialog is displayed – click **OK**.



BTECH recommends 100 MB for the initial installation, and 100 MB for each additional 25 locations

Figure 104- The Run Package/Advanced screens



SQL Server Management Studio

Once the database installation is complete use the SQL Server Management Studio to verify that the installation is correct and set the required passwords.

- a. Navigate to and start the SQL Server Management Studio from the Windows Start panel.

- Click **Connect** in the *Connect to Server* dialog, (see below). This displays a twp-panel screen.

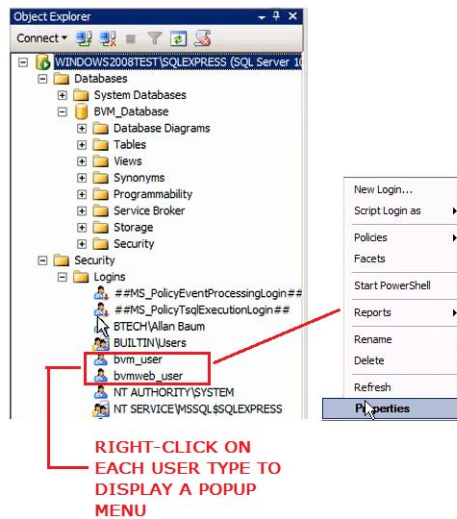
Figure 105-The Connect to Server dialog



Setting User Passwords

- Click **Security** to expand it, and select *Logins* in the left panel. The list expands as shown in Figure 106.
- Right-click on either *bvm_user* or *bvmweb_user* to display a pop-up menu.
- Click **Properties** to display the Properties panel for the selected user type.

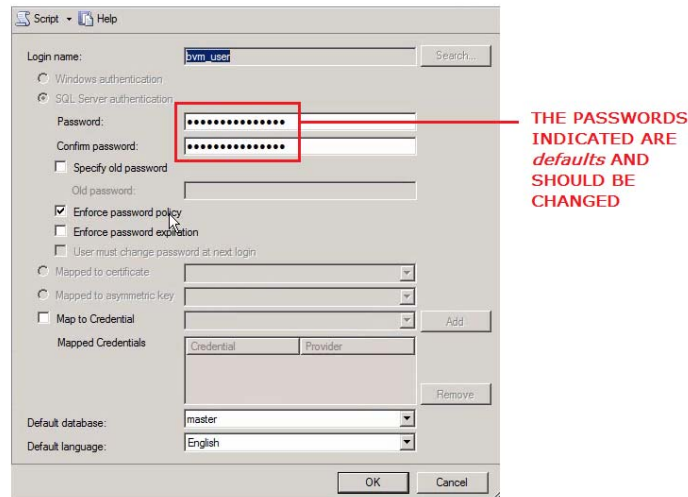
Figure 106-Setting Database Server user passwords



Setting User Properties and Passwords

- In the *Properties Panel* (see Figure 107) change the password from the default to a more secure one and confirm the change in the second field.
- Repeat steps 'c' through 'e' for the *bvmweb_user* password.

Figure 107-Changing User Passwords



Close the SQL Server Management Studio tool once the passwords have been changed.



The default `bvm_user` password is `P@ss0rd`. The default `bvmweb_user` default password is the same as the default SQL Server login.

Configuring BVM to Work with the SQL Server

Once the SQL server is installed and configured BVM must be linked to it and have certain items (e.g. user passwords) configured. The configuration entries required for BVM and BVS Observer are described in this section.


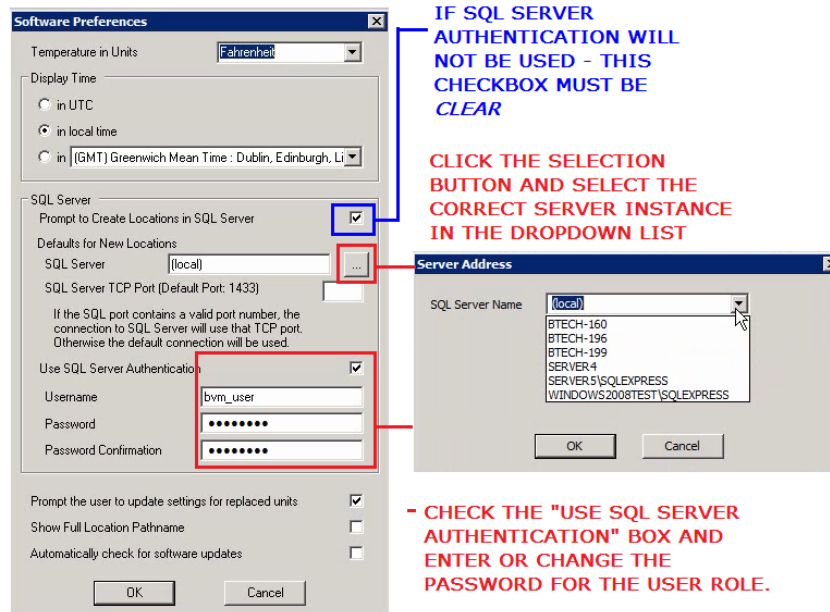
- a. Start *BVM* and close the location list panel if it's displayed.
- b. Click **Settings** in the menu bar and select *Preferences* from the submenu. The *Software Preferences* dialog is displayed.
- c. Click the  button to display a list window. Drop down the list and select the correct server instance (see Figure 109).
- d. Check the "Use SQL Server Authentication" box and enter or change the user role and password.
- e. Close *BVM*.

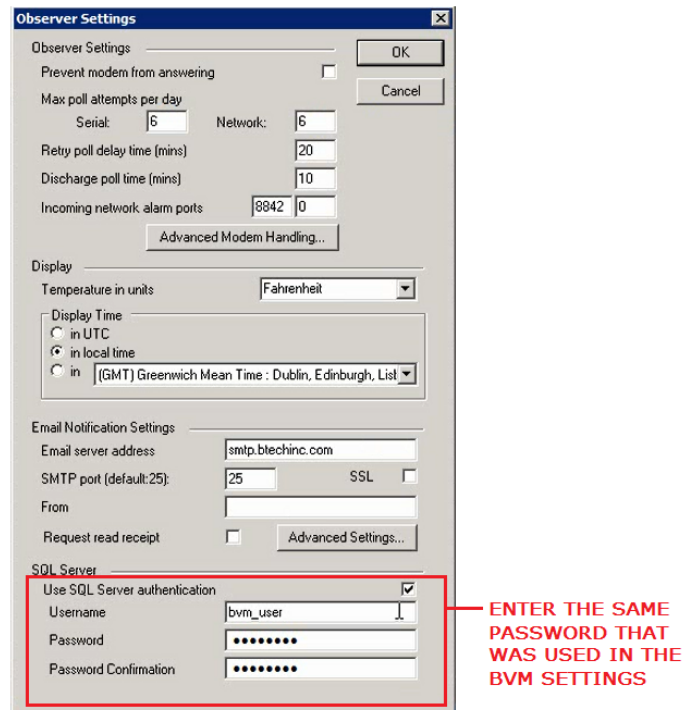
Figure 108-Setting SQL Server Authentication



Setting Passwords in BVS Observer

- Open BVM Observer and select *Locations*.
- Click **File** in the menu bar and select *Observer Settings*. The Observer Settings dialog is displayed (see Figure 109).
- Enter the same *user role and password* that was entered in the *BVM Settings* dialog.
- Repeat this process for all additional user roles.

Figure 109-The Observer Settings Dialog



Converting to SQL from MS Access

S5 installations consisting of fewer than (approximately) 20 units will generally use Microsoft Access as a database. If the monitoring configuration increases substantially converting to Microsoft SQL Express 2008 server is recommended. The conversion process is described below.



During the conversion process, existing MS Access database files are backed up to a separate sub-directory. They can be recovered using the Windows backup/recovery functionality and opened in MS Access.

Removing Locations from BVM, Observer, and Status Monitor

Most S5 installations use Microsoft Access as the BVM database. This generally works well as long as the total number of S5s for a location does not exceed about 20 units. When a location exceeds this level, the SQL Express Server should be installed (see Installing SQL Server Express 2008), and have SQL databases created and configured. To convert to SQL databases use the following procedure.

- a. Install the SQL server and server management software.
- b. Start BVM and navigate to the *Locations List* screen (see Figure 5, pg. 11),
- c. Select all of the current locations and click **Remove Locations from List** and click **OK**. All of the locations are removed from the List screen.
- d. **NOTE:** Each location must be selected and removed separately.

e. Start Observer

Once the locations have been removed configure BVM to work with SQL, (see *Configuring BVM to Work with the SQL Server*, above).

Adding Locations to SQL

After BVM has been configured to work with SQL add the locations as follows:

- a. In the *Locations List* screen click **Add Location(s) to List**. Windows Explorer opens and displays the .bvm files on the computer's BVM4 directory.
 - **NOTE:** refer to
 - Starting BVM and Transferring Location Files from the CD, pg. 10.
- b. Select all of the appropriate .bvm files from the CD and click **OK**.
- c. In the option dialog select *SQL*.

All of the Location files will now have their data kept in an SQL database.

Using BVS Observer and Status Monitor in an SQL Environment

The BVM Observer and the Status Monitor (if installed) is compatible with an SQL database once the following steps are performed. Note that the steps must be performed separately for each application.



Convert the BVM 4.x software to SQL as described above prior to converting Observer

- a. Start the *BVS Observer* or *Status Monitor*. If the BVM Home screen is displayed close it, (see , pg. 16).
- b. In the blank BVM screen open the *Location List* screen by selecting **File-Open** in the menu bar or clicking the **File icon** in the icon bar, (see Figure 5, pg. 11).
- c. Select each of the current locations and click **Remove Locations from List**. Click **OK**. All of the locations are removed from the List screen.
 - **NOTE:** Each location must be selected and removed individually.
- d. Close and re-open BVS Observer and navigate to the *Location List* screen (if necessary).
- e. Click Add Locations to List(s).
- f. Windows Explorer opens and displays the .bvm files on the computer's hard drive.
- g. Select all of the appropriate .bvm files and click **OK**.

These files are added to the BVS Observer that is now utilizing SQL.

BVM Home Screen Display Options

The BVM home screen typically uses a default set of styles to display string data. Some of the styles can be changed as described below. Any style changes made by a user become the default and the Home screen for all strings will use them.

There are a limited number of options that a user can select that control the way the String and Unit architecture is displayed. Once a desired display is achieved it can be locked so that other users cannot change it. Setting display options is done either by:

- a. Clicking View in the Menu bar and selecting the configuration options from the resulting menu list or,
- b. Right-clicking in the Home screen and selecting the configuration options from the popup menu (shown below).

Figure 110- The Home Screen Popup Configuration Menu

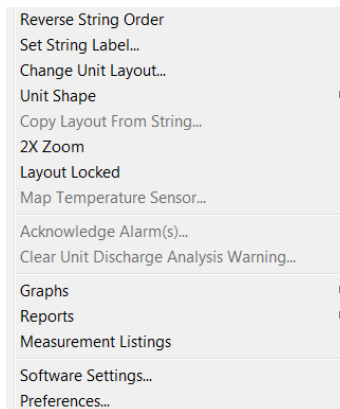
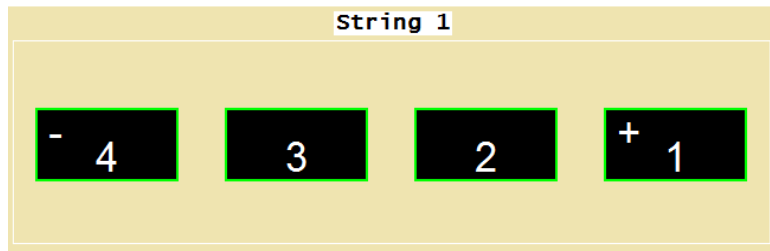


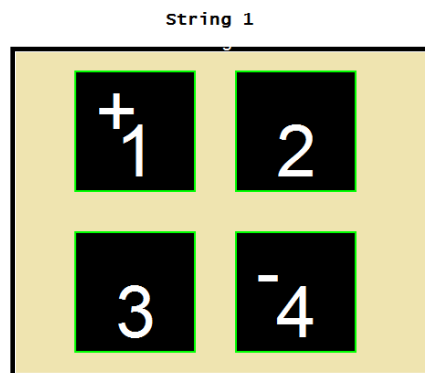
Table 22. Home Screen Configuration Options

Reverse String Order –	This option displays the stings from highest to lowest numbered, i.e. negative to positive (reverses the default order)
Set String Label –	Enables the user to set custom labels for each string
Change Unit Layout –	Enables the user to display the individual unit blocks horizontally or ‘stacked’ in columns. See Figure 112 below.
Unit Shape –	Enables the user to select one of three shapes to display the individual units
Layout Locked –	Enables the administrator to lock the display parameters so users cannot change them.

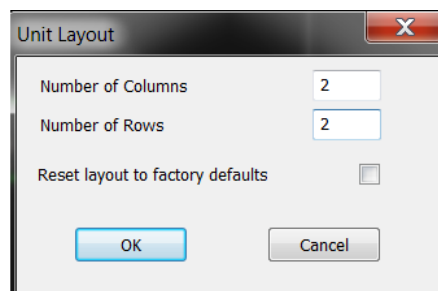
The following illustration shows the unit list reversed and the unit numbers in horizontal rectangles. Note – some changes have been made to the graphic below to improve readability.

Figure 111 -Example of Home screen with units in reverse order

The Unit layout below was changed to a 'stacked' format using the Change Unit Layout option.

Figure 112-A changed layout after using "Change Unit Layout

When 'Change Unit Layout' is selected from the menu the following dialog is displayed. This is the only changes that can be made to the Units display.

Figure 113-The Change Unit Layout dialog

Battery Monitor Alarms – Descriptions

Alarm Message Description

Error Message	Cause
AC Power Failure –	The battery monitor has detected a loss of AC power to itself.
Battery Discharge Alarm –	The battery monitor has detected a discharge of the battery system.
System Voltage Alarm:450.0 Volts –	The system or charger voltage is out of limits.
Critical Alarm: String 1 Unit 1 Voltage:12.500 Volts –	A unit voltage is outside of critical voltage limits.
Maint Alert: String 1 Unit 1 Voltage:12.750 Volts –	A unit voltage is outside of maintenance voltage limit.
Critical Alarm: String 1 Unit 1 Impedance:4.500 mOhms Average Method –	A unit impedance is above of the average critical impedance limit.
Maint Alert: String 1 Unit 1 Impedance:4.250 mOhms Average Method –	A unit impedance is above of the average maintenance impedance limit.
Critical Alarm: String 1 Unit 1 Impedance:4.500 mOhms Initial Method –	A unit impedance is above of the initial critical impedance limit.
Maint Alert: String 1 Unit 1 Impedance:4.250 mOhms Initial Method –	A unit impedance is above the initial maintenance impedance limit.
Ambient Temperature:95.0 deg F –	The ambient temperature sensor is outside the temperature limits.
Battery Temperature 1:96.8 deg F	– S3/S4 Alarm – A battery temperature sensor is outside the temperature limits.
String 1 Unit 1 Temperature:96.8 deg F –	A unit temperature is outside of the temperature limits.
Battery Temperature 1 Alarm:18.0 deg F above ambient –	A battery temperature sensor is above the differential temperature limit. This indicates a possible thermal runaway.
String 1 Unit 1 Temperature Alarm:18.0 deg F above ambient –	A unit temperature is above the differential temperature limit. This indicates a possible thermal runaway.
Standby battery out of limits –	The backup battery in the battery monitor is outside of limits. The battery may not be able to power the battery monitor when power is lost.
BVS is unlearned –	The battery monitor doesn't know the battery configuration.
BVS is unable to learn	– The battery monitor cannot determine the battery configuration.
Ground Fault –	The battery monitor detected a ground fault.
BVS is unable to learn -	The battery monitor cannot determine the battery configuration.
(Auxiliary) Alarm (Relay Outputs) –	One of the Alarm Relay Outputs was triggered.
Memory battery out of limits -	The backup battery in the battery monitor is outside of limits. The battery may not be able to power the battery monitor when power is lost.

BVS found the wrong number of units –	The battery monitor found the wrong number of units when determining the battery configuration.
BVS found the center lead placed incorrectly –	The battery monitor found the center lead placed incorrectly when determining the battery configuration.
BVS was unable to take impedance measurements –	The battery monitor was unable to take impedance measurements.
String 1 Voltage Alarm: 396.0 Volts -	The string voltage is out of limits.
(Auxiliary) Alarm [Relay Outputs] 1 – 4	The particular alarm relay (auxiliary) output was triggered.
Wrong number of voltage modules found: 3 –	The battery monitor found the wrong number of voltage modules attached.
Wrong number of current modules found: 1 –	The battery monitor found the wrong number of current modules attached.
Found unknown type of module: 13 –	The battery monitor found an unknown type of module.
Corrupted configuration due to bad checksum –	The battery monitor determined its configuration was corrupted due to the checksum not matching. It will then reset the configuration to the factory default.
Corrupted configuration due to value out of limits –	The battery monitor determined its configuration was corrupted due to a value of limits. It will then reset the configuration to the factory default.
Hardware failure of network and local serial port –	The battery monitor detected a hardware failure of a serial port.
Hardware failure of modem serial port –	The battery monitor detected a hardware failure of a serial port.
Hardware failure of module serial port –	The battery monitor detected a hardware failure of a serial port.
Backup battery out of limits: 9.5 Volts –	The backup battery in the battery monitor is outside of limits. The battery may not be able to power the battery monitor when power is lost.
Module failed to initialize at position: 5 –	A module failed to initialize.
Measurement aborted due to high voltage on positive half string –	The measurement aborted due to a high half string voltage on the positive half of the battery string.
Measurement aborted due to low voltage on positive half string –	The measurement aborted due to a low half string voltage on the positive half of the battery string.
Measurement aborted due to high voltage on negative half string –	The measurement aborted due to a high half string voltage on the negative half of the battery string.
Measurement aborted due to low voltage on negative half string –	The measurement aborted due to a low half string voltage on the negative half of the battery string.
Measurement aborted due to high load plate temperature –	The measurement aborted due to a high load plate temperature. The “Load Plate Off Time” needs to be increased to allow the load plate to cool down before the next measurement
Modem Failure –	The battery monitor’s modem is not functioning.
Modem line error –	The battery monitor’s modem was unable to detect a dial-tone to dial out.
Invalid communications configuration –	The communication’s configuration in the battery monitor is invalid.

Network controller is missing –	The battery monitor cannot detect its network controller.
Wrong number of voltages (1) found on module 1 –	A voltage module on the battery monitor was unable to find the correct number of unit voltage connections.
Wrong number of temperatures (1) found on module 1 –	A voltage module on the battery monitor was unable to find the correct number of temperature sensors.
Temp Sensor 5:59.0 deg F -	The temperature sensor is outside of the temperature limits.
Temp Sensor 7:18.0 deg F above ambient –	The temperature sensor is above the differential temperature limit. This indicates a possible thermal runaway.
Module 11 failed to relearn its connections -	A module on the battery monitor was unable to find the correct number of connections.
Measurement aborted due to a discharge –	The measurement was aborted when a battery discharge occurred.
String 2 breaker is open –	The battery monitor detected the breaker to a string was open.
Measurement aborted due to string 2 breaker being open –	The measurement was aborted due to a string being open.
Ambient Sensor Fault - Equipment Hardware Alarm –	The battery monitor was unable to detect a connected ambient temperature sensor.
S-Bus Module 1 Communications Fault -	Equipment Hardware Alarm – The battery monitor was unable to communicate with a module on the S-Bus.
I-Bus Module 1 Communications Fault -	Equipment Hardware Alarm – The battery monitor was unable to communicate with a module on the S-Bus.
Controller needs to reboot –	Changes to the configuration require the battery monitor to be rebooted.
S-Module Communication Fault during Measurement –	A communications error occurred between the controller and a module on the S-Buss during a measurement.
I-Module Communication Fault during Measurement –	A communications error occurred between the controller and a module on the I-Buss during a measurement.
S-Module not Ready –	A module on the S-Bus is not ready to perform a command. This can occur when a voltage module has just performed an impedance reading and receives a command to take another impedance reading. To prevent any damage to the module, there is a timeout period which prevents consecutive impedance measurements.
Redundant S-Module Address - Equipment Configuration Alarm –	The controller encountered multiple models on the S-Bus with the same address.
Redundant I-Module Address - Equipment Configuration Alarm –	The controller encountered multiple models on the I-Bus with the same address.
Redundant S-Module BVM Address - Equipment Configuration Alarm	
Redundant I-Module BVM Address - Equipment Configuration Alarm	
Location Quantity out of Range - Equipment Configuration Alarm	
Module / BVM Quantity Mismatch - Equipment Configuration Alarm	
S-Module Quantity out of Range - Equipment Configuration Alarm –	The number of modules on the S-Bus is out of range.

I-Module Quantity out of Range - Equipment Configuration Alarm –	The number of modules on the I-Buss is out of range.
S-Module Address out of Range - Equipment Configuration Alarm –	The address of the module on the S-Bus is not in the valid range.
I-Module Address out of Range - Equipment Configuration Alarm –	The address of the module on the I-Bus is not in the valid range.
S-Module BVM 1 String or Unit - Equipment Configuration Alarm	
I-Module BVM 1 String - Equipment Configuration Alarm –	
I-Module BVM String Mismatch –	
Measurement has been aborted manually –	An ongoing measurement was commanded to abort.
Measurement has been aborted due to a major equipment alarm –	A major equipment alarm prevented a measurement from completing.
Wrong number of TSV modules found: 2 –	The battery monitor controller found the wrong number of TSV modules connected.
The controller lost external power –	

BVS Observer Logged Alarms

BVS Logged Alarms

Message	Cause
	A network error between the computer and BVS has occurred

BVS Observer Alarms

The following alarm descriptions must be resolved through the communications functionality.

- The discharge memory is full. Please retrieve the discharge data and clear the discharge memory.
- The system does not have the correct number of connections to the battery system. Please use Module Diagnostic in the BVM and the installation wiring list to identify any connection issues.
- Unable to open comm port - comm port is not present.
- Unable to open comm port - comm port is busy.
- Unable to load location.
- Unable to load communication settings.
- Comm port is wrong.
- Unable to change the comm speed.
- Communications failure occurred. No Response.

- Location ID's did not match.
- Wrong Controller.
- Number of strings did not match.
- Number of units did not match.
- Model number does not match.
- The number of temperature sensors did not match.
- The serial numbers did not match.
- The BVS is busy measuring impedance.
- The BVS is busy taking discharge measurements.
- Error retrieving discharge measurements.
- No response from modem.
- Number busy.
- Modem Error.
- No Dialtone.
- Dial Timed Out.
- No Answer.
- No Carrier.
- Error retrieving measurement data.
- Phone number is missing.
- Dial modem not available on comm port.
- Network connection timeout.
- Permission Denied.
- The address is already in use.
- The address is not available.
- Address family not supported by protocol family.
- Operation already in progress.
- Network connection has aborted.
- Connection refused.
- Network connection has reset.
- Destination address required.
- Bad address.
- No route to host.
- Operation now in progress.
- Interrupted function call.
- Invalid argument.
- Socket is already connected.
- Too many open sockets.
- Message too long.

- Network is down.
- Network connection was reset.
- The network cannot be reached from this host at this time.
- No buffer space available.
- Socket is not connected.
- Network connection has closed.
- Socket operation on non-socket.
- Protocol family not supported.
- Too many processes.
- Protocol not supported.
- Protocol wrong type for socket.
- Network connection has shutdown.
- Socket type not supported.
- Attempt to connect timed out without establishing a connection.
- Host not found.
- Network initialization not successful.
- This is non-recoverable error.
- Network subsystem is unavailable.

SNMP Manager Description and Configuration

BVM 4.x allows an SNMP manager to use an S5 as an SNMP agent. The S5 includes an SNMP model web server capable of responding to “Get” and “GetNext” requests, and sending *unsolicited* ‘trap’ messages.

As an agent, the S5 listens on UDP port 161 for SNMP messages from the manager. When the S5 BVS encounters an alarm in the battery system, a SNMP trap is sent out. Configuration of IP addresses that receive the SNMP trap, and the resend interval is provided. Optionally up to three IP addresses can receive a trap.

.mib Files

A MIB (Management Information Base) file, named *BTECH Battery Monitor S5.mib* is provided. All objects provided and defined in the MIB file are in the enterprise sub tree. The set of objects in the alarm directory describe an alarm as an object’s:

- Severity,
- Description,
- Type,
- Year,
- Month,
- Day,
- Hour, Minute, Second,
- String,
- Unit.

The S5 BVS sends a *SNMP trap* when an alarm occurs which is bound with these objects so the SNMP manager can determine a course of action. If more than one alarm occurs at a given time, multiple traps are sent to the manager. Each trap describes one alarm. One of the objects bound to the trap is called “Severity”. The S5 BVS defines this object as one of the following:

1=Critical – immediate action needed, page someone even after hours

2=Major – action needed soon, if after hours, next business day will do

4=Minor – action could probably wait for next maintenance window

8=Warning – informative, sometimes require action

There is one object in the MIB tree that indicates if other applications, such as BTECH’s BVM 4.x, BTECH’s Observer program, or a MODBUS master, are connected to the S5 BVS. The SNMP manager can still access SNMP objects but the objects or traps will not be available at this time. The S5 BVS can be configured to automatically connect to an Observer application when an alarm occurs. The Observer retrieves the alarms and, if set, can clear the alarms. In this scenario, the S5 BVS will at least send out one trap before connecting to the observer.

Configuration

To modify these settings click the Configure SNMP Settings button. A user name of “btech” and password of “monitor” is required to display the Configure SNMP Settings page. After modifying the settings, click on the Submit button.

- The S5 BVS IP address is set using the BVM 4.1 software. The IP address can be fixed or obtained using DHCP,
- The S5 BVS listens on Ethernet adapter UDP port 161 for SNMP messages. Use the community name “public” for all of the read objects. There are *no* write objects. Authentication protocol of “MD5” and Privacy protocol of “DES” should be used. Use only “Get” and “GetNext” requests.
- The SNMP settings can be queried and modified using the web pages the S5 BVS serves. Using Internet Explorer, type the IP address in the address bar. The SNMP SETTINGS web page is displayed with the present settings of trap resend interval, three trap IP addresses, and a trap community name. All Zeroes in the IP address indicates a trap will not be sent out for that IP address.

MIB Objects Table

The base directory of the following objects is (.1.3.6.1.4.1.26059.1.1.1) or (iso.org.dod.internet.private.enterprise.btech.battery.monitor.S5.)

MIB Objects Table

Name	Address	Type	Comment
Connect	1.0	Integer	B0= Observer B1=BV M B2=MODB US
Severity	2.1.0	Integer	1=Critic al, 2=Major, 4=Minor, 8=Warning
Description	2.2.0	String	Phrase
Type	2.3.0	Integer	See Alarm Type Table
Year	2.4.0	Integer	
Month	2.5.0	Integer	
Day	2.6.0	Integer	
Hour	2.7.0	Integer	
Minute	2.8.0	Integer	
Second	2.9.0	Integer	
String	2.10.0	Integer	String Causing Alarm

Name	Address	Type	Comment
Unit	2.11.0	Integer	Unit Causing Alarm

Modbus Messaging – S5 [-ML] Battery Validation System

This S5 feature allows a plant computer (DCS) to monitor the measurements taken by the S5. The DCS communicates with the S5 over an Ethernet connection using the MODBUS over TCP/IP protocol. The plant DCS reads and displays the following measurements taken by the S5:

- System voltages
- System current
- String Currents/Voltages
- Ambient temperature
- Unit float voltage
- Unit temperature
- Unit Impedance

As soon as the MODBUS Master connects, its holding registers for *Unit Impedance* are the values taken at the last impedance read. Measurements (#1 thru #6) are then updated to the MODBUS *holding registers* every time the VTz3 modules are scanned. This update happens even when the S5 is in *discharge* mode.

Unit Impedance is updated to the MODBUS holding registers at a rate configured by the user. During an impedance measurement, measurements numbered 1 through 6 are not updated. There are a couple of MODBUS registers that indicate when the last impedance measurement was taken.

Comments

- All data values are supplied to the registers *pre-scaled*.
- Logged Discharge data is NOT reported via MODBUS.

All MODBUS holding registers are **read only**, meaning the DCS can only interrogate the S5 but not configure it. Neither can the DCS clear alarms in the S5 via MODBUS. All configurations and alarm resets are done with the BVM software through another S5 connection. The DCS can examine a couple of MODBUS registers that indicate how the S5 was configured. They are:

- location,
- number of strings, and
- units per string.

Additional Measurement Registers

In addition to the above measurements, the S5-ML also lets the DCS obtain status of the S5 through the following output coil registers.

- Maintenance Alarm
- Critical Alarm
- Equipment error
- In Discharge
- Impedance measurement in progress
- Discharge memory full

Alarm Registers

The S5-ML updates a set of registers if an alarm occurs. The last 32 alarms can be monitored by the DCS. However, once the 32 alarm registers are filled, the S5-ML cannot accept additional alarms. The alarms can only be cleared by using the BVM software.

The S5-ML can report an alarm to an OBSERVER that is connected to the network. The socket connection to the MODBUS master remains open during the conversation from the S5-ML to the OBSERVER.

The BVM software can connect to the S5-ML while the MODBUS master is also connected. The socket connection to the MODBUS master remains open during the conversation from the S5-ML to the BVM software.

See

Alarm Definitions, page 141

Configuration

The S5 IP address is set up within the BVM Software. It can be a fixed IP address or obtained from a DHCP server. The S5 has a fixed port address (502) for MODBUS. The MODBUS slave address is 1. On power-up, the S5 opens two sockets for either the BVM software or the DCS.

S5-ML Location Registers and Addresses

The S5-ML can be configured to have at most 4 locations.

Location 1: add offset of 0 to holding Registers,
and 0 to Coil addresses (Same as addresses in table).

Location 2: add offset of 1000 to holding Registers,
and offset of 20 to Coil addresses.

Location 3: add offset of 2000 to holding Registers,
and offset of 30 to Coil addresses.

Location 4: add offset of 3000 to holding Registers,
and 40 to Coil addresses.

MODBUS Registers

Name	Address	Type	Comment
Location	40001	Integer	
Number of Strings	40002	Integer	
Number Units per String	40003	Integer	
System Voltage	40004	Float	(volts)
System Current	40006	Float	(a)
Ambient Temperature	40008	Float	(deg c)
String Current 1	40010	Float	(a)
String Current 2	40012	Float	(a)
String Current 3	40014	Float	(a)

Name	Address	Type	Comment
String Current 4	40016	Float	(a)
String Current 5	40018	Float	(a)
String Current 6	40020	Float	(a)
String Current 7	40022	Float	(a)
Unit Float Voltage 1	40024	Float	(volts)
Unit Float Voltage 2	40026	Float	(volts)
Unit Float Voltage 3	40028	Float	(volts)
Unit Float Voltage 4	40030	Float	(volts)
Unit Float Voltage 498	41018	Float	(volts)
Unit Float Voltage 499	41020	Float	(volts)
Unit Float Voltage 500	41022	Float	(volts)
Unit Temperature 1	41024	Float	(deg c)
Unit Temperature 2	41026	Float	(deg c)
Unit Temperature 3	41028	Float	(deg c)
Unit Temperature 4	41030	Float	(deg c)
Unit Temperature 496	42016	Float	(deg c)
Unit Temperature 498	42018	Float	(deg c)
Unit Temperature 499	42020	Float	(deg c)
Unit Temperature 500	42022	Float	(deg c)
Impedance Measure Year	42024	Integer	Last done
Impedance Measure Month	42025	Integer	
Impedance Measure Day	42026	Integer	
Impedance Measure Hour	42027	Integer	Time in UTC
Impedance Measure Minute	42028	Integer	Time in UTC
Unit Impedance 1	42029	Float	(milliohms)
Unit Impedance 2	42031	Float	(milliohms)
Unit Impedance 3	42033	Float	(milliohms)
Unit Impedance 4	42035	Float	(milliohms)
Unit Impedance 498	43023	Float	(milliohms)
Unit Impedance 499	43025	Float	(milliohms)
Unit Impedance 500	43027	Float	(milliohms)
Alarm 1 Year	43029	Integer	

Alarm Definitions

Table 23. Alarm Definitions

Alarm	Type	Severity	Number	Value	Notes
Discharge	1	8	Blank	Blank	
System Voltage	2	4	Blank	Voltage	
Ambient Temperature	3	4	Blank	Temp	
Ground Fault	4	2	Blank	Value	
Unit Voltage – Critical	5	2	Blank	Voltage	String, Unit

Alarm	Type	Severity	Number	Value	Notes
Unit Voltage - Maintenance	6	4	Blank	Voltage	String, Unit
Unit Impedance Average - Critical	7	2	Blank	Impedance	String, Unit
Unit Impedance Average - Maintenance	8	4	Blank	Impedance	String, Unit
Unit Impedance Initial - Critical	9	2	Blank	Impedance	String, Unit
Unit Impedance Initial - Maintenance	10	4	Blank	Impedance	String, Unit
Unit Temperature	11	4	Blank	Temp	String, Unit
Unit Temperature - Differential	12	4	Blank	Temp Difference	String, Unit
String Voltage	13	4	Blank	Voltage	String #
Aux Alarm [Relay outputs] 1	14	4	Blank	Blank	
Aux Alarm [Relay outputs] 2	15	2	Blank	Blank	
Aux Alarm [Relay outputs] 3	16	2	Blank	Blank	
Aux Alarm [Relay outputs] 4	17	2	Blank	Blank	
Wrong Number of Voltage Modules	18	2	Number	Blank	
Wrong Number of Discharge Current Modules	19	2	Number	Blank	
Communication Error with Voltage Module	20	2	Module #	Blank	
Communication Error with Current Module	21	2	Module #	Blank	
Unknown Type of Module	22	2	Module #	Blank	
Corrupted Configuration	23	2	Reason	Blank	1 = Bad checksum 2 = Value out of limits
Hardware Failure	24	2	Serial port	Blank	1 = Network or front panel 2 = Modem 3 = Module port
Backup Battery	25	2	Blank	Voltage	
Module Initialization Failure	26	4	Physical probe position		
Modem Failure	27	2			
Modem Line Failure	28	2			
Invalid Communication's Configuration	29	2			
Network controller is missing	30	2			
Number of units found is not equal to the amount specified. (voltage modules)	31	2	Module #	# of Voltages found	
Number of temperatures found is not equal to the amount specified. (voltage and temp module)	32	2	Module #	# of Temperatures found	

Alarm	Type	Severity	Number	Value	Notes
Temperature Sensor	33	2	Sensor Number	Temperature	
Temperature Sensor – Differential	34	2	Sensor Number	Temperature Difference	
Module Relearn Connection Failure	35	2	Module #		
Impedance measurement aborted due to high voltage on positive half string.	101	8		Voltage	
Impedance measurement aborted due to low voltage on positive half string.	102	8		Voltage	
Impedance measurement aborted due to high voltage on negative half string.	103	8		Voltage	
Impedance measurement aborted due to low voltage on negative half string.	104	8		Voltage	
Impedance measurement aborted due to high load plate temperature.	105	8		Temp	
Impedance measurement aborted due to discharge	106	8			

Product Warranty

NOTE: THIS WARRANTY IS GIVEN TO THE ORIGINAL PURCHASING END USER AND IS APPLICABLE ONLY TO PRODUCTS AND LICENSED MATERIALS SOLD OR DISTRIBUTED TO SUCH END USER BY AN AUTHORIZED BTECH RESELLER, OR BTECH INC. AND BEARING THE “BTECH” BRAND NAME.

A. Hardware Warranty

- BTECH warrants to the original purchasing End User that each unit of BTECH hardware products (“Hardware Products” or “Products”) will be free from defects in material and workmanship for a period of one (1) year from the date of shipment to End User.
- The warranty period will be defined as (15) fifteen months from shipment or (1) one year from startup, whichever comes first.
- Breach of warranty will be enforceable against BTECH only if written notice of such breach is received by BTECH within the applicable warranty period.
- If a warranty claim is invalid for any reason, the End User will be charged for services performed and expenses incurred by BTECH in repairing, handling and shipping the returned Product.
- Expendable parts, such as fuses and other parts that are regularly replaced due to normal use, are excluded from this warranty.
- As to Products repaired or replaced during the original warranty period for such Product, the warranty period on the replacement Product or the repaired Product shall terminate thirty (30) days after shipment to End User or upon the termination of the original warranty period, whichever is longer.
- As to any out-of-warranty Products repaired, modified or replaced by BTECH at BTECH regular charges, the warranty period with respect to the material and workmanship hereunder shall expire thirty (30) days after the date of shipment of said Product to End User.

B. Software Warranty

The only warranty BTECH makes to End User in connection with BTECH licensed materials, which includes BTECH software, together with related documentation and the media embodying the software (“Licensed Materials”), is that the media on which the Licensed Materials are recorded will be replaced without charge, if BTECH, in good faith, determines that the media was defective and not subject to misuse for a period of ninety (90) days from the date of shipment to End User. Within thirty (30) days of determination of same, BTECH shall use commercially reasonable efforts to replace any defective media that BTECH has determined to be under warranty.

C. Entitlement During the Applicable Warranty Period

Technical Support

Technical telephone support will be provided by BTECH Factory Technical Service Assistance Center to End User from 8:00 a.m. to 5:00 p.m. EST Monday through Friday, excluding holidays. Telephone support provided hereunder will be limited to that necessary to confirm functional

operation or determine if a Product is performing in accordance with Section A or B above, whichever applies. Should further support be required, normal support charges will apply.

Firmware/Software for the Version Licensed

Should BTECH Factory Service determine, during the course of providing support hereunder, that the End User may benefit from the installation of a firmware patch, upgrade or software bug fix, if and when BTECH, at its sole discretion, develops and releases said firmware patch, or upgrade, or software bug fix, BTECH may make same available to the End User at no charge.

Product Replacement

During the initial thirty (30) days from the date of shipment of Hardware Products having a one (1) year warranty hereunder, such Hardware Products which, after reasonable due diligence and support attempts by BTECH Factory Service, is determined by BTECH Factory Service to be non-functioning due to product defect, shall be replaced on a commercially reasonable efforts basis. BTECH and End User will follow the procedures outlined in Section C herein for the return and replacement of such Hardware Products during the above referenced periods that End User has purchased directly from BTECH. For such Hardware Products that End User has purchased from a BTECH Reseller, the following procedures shall be followed for the return and replacement of such Hardware Products during the above referenced periods:

- BTECH must be notified by End User prior to the return of said Product. Within ten (10) days of the date of said notification BTECH will provide End User with a valid Return Material Authorization Number (RMA).
- b) Within ten (10) days of receipt of a Return Material Authorization Number from BTECH, the End User will notify the Reseller from whom the Product was purchased of the RMA Number, request Product replacement, and obtain information regarding the location to which the End User must return the Product claimed to be defective, as well as any other pertinent information.
- Transportation costs relating to the delivery of warranty claims to Reseller will be borne by the End User. In no event will Reseller accept any returned Product that does not have a valid RMA Number. All Products returned to Reseller must be packaged in packing materials that affords the same degree of protection from damage and electrical discharge as the original packaging materials.
- All Products returned to Reseller should be configured as originally shipped to End User by removing all add-on hardware. Add-on hardware returned with the Products may be lost in the repair process, and Reseller shall bear no responsibility for such loss.
- End User shall promptly, but in no event later than ten (10) days of receipt of an RMA Number from BTECH, deliver said shipment to a carrier at End User's facilities as previously stated.
- Within thirty (30) days of receipt of same, Reseller shall use commercially reasonable efforts to replace any defective Products that BTECH or Reseller has determined to be under warranty.
- Transportation costs relating to the return of warranty claims to the End User will be borne by Reseller only in cases where replacement is made and authorized pursuant hereto, but any applicable duties or taxes will be paid by End User. If no warranty replacement was required, all transportation costs will be borne by End User. "Emergency" transportation costs shall be borne by End User.

Return and Repair

- During the remainder of the hardware warranty period, if Products under warranty are claimed to be defective, BTECH must be notified by End User prior to the return of said Product. Within ten (10) days of the date of said notification BTECH will provide End User with a valid Return Material Authorization number and the location to which End User must return the Product claimed to be defective. Transportation costs relating to the delivery of warranty claims to BTECH will be borne by the End User. In no event will BTECH accept any returned Product which does not have a valid Return Material Authorization number. All Products returned to BTECH should be configured as originally shipped to End User by removing all add-on hardware. Any add-on hardware returned with the Products may be lost in the repair process, and BTECH shall bear no responsibility for such loss.
- Within the (10) days of receipt of notice from BTECH requiring return, End User shall deliver said shipment to a carrier at End User's facilities as aforesaid.
- Within thirty (30) days of receipt of same, BTECH shall use commercially reasonable efforts to fix or replace, at its option (except as provided in Section C herein), any defective Products that BTECH has determined to be under warranty.
- Transportation costs relating to the return of warranty claims to the End User will be borne by BTECH only in cases where repair or replacement is made and authorized pursuant hereto, but any applicable duties or taxes will be paid by End User. If no warranty repair or replacement was required, all transportation costs will be borne by End User. "Emergency" transportation costs shall be borne by End User.

General

The warranties set forth in Sections A and B above, and the entitlements set forth in Section C above, are for the benefit of and shall apply only to End User.

- BTECH warranties shall not apply to any Product or Licensed Material which has been damaged as a result of, or subjected to, accident, neglect, misuse, abuse, vandalism, riot, war, acts of terrorism, negligence in transportation or handling, failure or surges in electric power, air conditioning, humidity control, flood, water, fire or smoke and heat damage, causes other than ordinary use, acts of God or causes beyond BTECH control, or if the Product or Licensed Material was not properly maintained by End User during the warranty period.
- There shall be no warranty or liability for any Products or Licensed Materials that have been modified by End User without BTECH prior written approval.
- Replacement Products or Licensed Materials outside the scope of this warranty or with respect to Product(s) or Licensed Materials out-of-warranty will be furnished at the established charges of BTECH then in effect. End User shall ensure that BTECH will have full and free access to the Products and Licensed Materials and End User's site, if required. BTECH shall not be responsible for failure to repair or replace Products or Licensed Materials due to causes beyond its control. BTECH shall not be required to replace any Product or Licensed Material if it would be impractical for BTECH personnel to do so because of unauthorized alterations to the Products or Licensed Materials or its unauthorized connection by mechanical or electrical means to another system or device.

Limitation of Liability

THESE WARRANTIES AND BTECH AND ITS AFFILIATES' LIABILITY AND END USER'S REMEDIES WITH RESPECT THERETO, AS SET FORTH HEREIN, ARE EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, LIABILITIES, REMEDIES, EXPRESS OR IMPLIED, INCLUDING ANY OBLIGATION, LIABILITY, RIGHT, CLAIM OR REMEDY IN TORT, WHETHER OR NOT ARISING FROM NEGLIGENCE OF BTECH OR ITS AFFILIATES, ACTUAL OR IMPUTED, AND NO WARRANTIES, EXPRESS OR IMPLIED REPRESENTATIONS, PROMISES OR STATEMENTS HAVE BEEN MADE BY BTECH OR ITS AFFILIATES UNLESS CONTAINED IN THIS AGREEMENT. NO WARRANTY, EXPRESS OR IMPLIED, IS MADE HEREIN THAT THE LICENSED MATERIALS, PRODUCTS OR ANY PARTS ARE MERCHANTABILITY, OR FIT OR SUITABLE FOR THE PARTICULAR PURPOSES FOR WHICH THE LICENSED MATERIALS, PRODUCTS OR PARTS MAY BE ACQUIRED BY END USER. IN NO EVENT SHALL BTECH OR ITS AFFILIATES BE LIABLE TO END USER FOR ANY INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES INCLUDING WITHOUT LIMITATION, LOSS OF DATA, OR PROFITS, WHETHER CLAIMED BY REASON OF BREACH OF WARRANTY OR OTHERWISE, AND WITHOUT REGARD TO THE FORM OF ACTION IN WHICH SUCH CLAIM IS MADE.

- The Products and Licensed Materials are not specifically developed, or licensed for use in any nuclear, aviation, mass transit, or medical applications or in any other inherently dangerous applications.
- End User agrees to indemnify and hold BTECH harmless from any claims for losses, costs, damages, or liability arising out of or in connection with the use of the Products and/or Licensed Materials in such applications.
- Notwithstanding anything contained herein to the contrary, the total maximum liability of BTECH and its Affiliates under this warranty for the affected Product(s) and Licensed Materials is limited, at the option of BTECH, to either:
 - BTECH use of reasonable efforts to repair any Product or Licensed Materials; or BTECH use of reasonable efforts to replace any Product or Licensed Materials, or any shipment as to which any defect is claimed by End User and duly verified by BTECH; or
 - The refund of the purchase price or license fee paid.