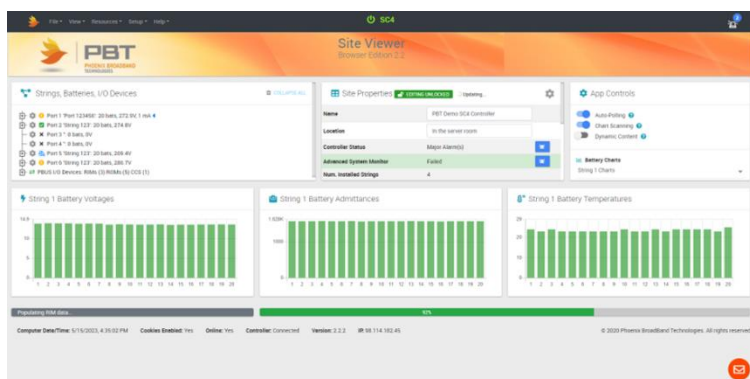# PBT
A SENS COMPANY

Phoenix Broadband Technologies, LLC.

SC4 Site Controller

Installation and Operation Manual

Document Number: 700-000028-00 Rev: 1.3

March 18, 2025

PBT
A SENS COMPANY

Revision History

Revision	Author	Date
1.0	Jeffrey L. Seltzer	13 Nov 2016
1.1	Mike Quelly	11 Apr 2017
1.2	Frank Kaiser and Josh Phillips	12 Jul 2023
1.3	Dan Gray	18 Mar 2025

Version Notes

Revision	Details of Change
1.0	First Release
1.1	Added additional warning
1.2	Updated Web Page Pictures and Features (SiteViewer), Removed Java Page References. Updated diagrams and product photos. Corrected minor grammatical errors and added clarity to various statements. Updated port usage table.
1.3	Changed procedure number 705-000009-00 to 705-000021-00 in Section 2.2.

Table of Contents

Important Information

1.1   Important Symbols

The following symbols are used in this document.

WARNING/CAUTION: The use of WARNING indicates safety information intended to prevent serious injury or death.

The use of a CAUTION indicates safety information intended to prevent damage to the equipment.

NOTE: A NOTE provides additional information to help complete a specific task or procedure.

1.2   Safety Notes

WARNING: High currents and voltages may be present on the equipment terminals and on the interior of the equipment. Make sure you understand and observe all appropriate safety codes and regulations. Follow prudent electrical safety practices when installing or servicing the equipment. Installation, maintenance, and servicing of the equipment should only be performed by qualified, trained, and authorized personnel. PBT offers installation services should you need them.

WARNING: Before installation, take measurements with a Voltmeter to ensure that no jar post in the system has lethal AC or DC voltages relative to earth ground.

WARNING: Except as explained in this manual, there are no user-serviceable parts inside the PBT Battery Monitoring System components. Opening the equipment could expose you to dangerous voltages and void the product warranty. All product servicing should be referred to factory-authorized personnel.

WARNING: Use only interconnection cables supplied or authorized by Phoenix Broadband Technologies. Use of user-made interconnection cable assemblies could result in damage to equipment and potential safety hazards and voiding of equipment warranties.

WARNING: Ensure that the equipment is not exposed to liquids, moisture, or explosive/corrosive vapors.

WARNING: The Site Controller produces voltages and currents which can cause harmful or fatal electric shock. To prevent accidental injury or death, these safety procedures must be strictly observed when handling or using the Site Controller

CAUTION: Do not exceed the voltage specifications of the product. Doing so may damage the product and void equipment warranties.

CAUTION: Where applicable, ensure the equipment is grounded properly. Failure to do so may damage the product and void equipment warranties.

1.3   Glossary of Terms

Term/Acronym	Definition
Admittance	The inverse of Impedance in units of Siemens. Admittance is a measure of how easily a circuit or device will allow a current to flow. Resistance is a measure of the opposition of a circuit to the flow of a DC current, while impedance takes into account not only the resistance but AC effects (known as reactance) as well. Likewise, admittance is not only a measure of the ease with which a DC current can flow (admittance, the inverse of impedance), but also takes in to account the AC effects of susceptance (the inverse of reactance).
Battery	A collection of jars or cells connected in series. A battery is sometimes referred to as a Battery String or String in this document.
Cell	A cell is a set of plates, immersed in electrolyte, within a single container. A cell includes a single positive and single negative terminal. (The cell may have multiple positive and negative connections.) A lead acid cell produces approximately 2.1 volts.
Jar	A collection of one or more cells connected in series in a single housing. A 12 volt jar contains 6 cells. A Jar is commonly, and incorrectly, referred to as a battery.
P-Bus	A Phoenix proprietary communications interface and protocol used to connect devices to the Site Controller for the purpose of providing additional input, output, and measurement capability.

1.4   Contact Information

If you have any questions about the installation or use of the equipment described in this manual, contact Phoenix Broadband Technologies: (215) 997-6007 or support@phoenixbroadband.com.

When contacting PBT, please have the following information available:

1. Site Controller Model Number and firmware version (from the Site Controller Web Page).

2. Battery Sensor Model Number, hardware version and firmware version. The version numbers are shown on the Site Controller Single Jar Web Page.

3. The Battery and String Voltage.

4. The battery model number.

5. UPS or DC power plant.

6. If a UPS, the manufacturer, and model number.

System Overview

The Phoenix Broadband Technologies (PBT) Battery Management System is a comprehensive solution for remotely monitoring the state of health for individual cells or jars within a UPS or DC power plant system.
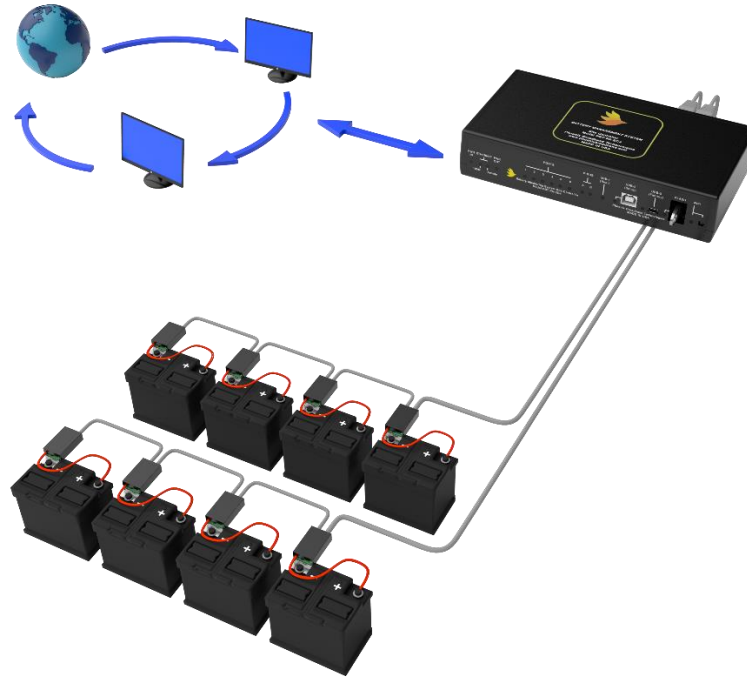
The system consists of sensor modules, which are electrically and mechanically affixed to the terminal posts of the jars being monitored, and a PBT Site Controller unit which collects readings from the individual sensors and makes the information available for management purposes via a network connection. The Sensor modules are designed for use with 1, 2-, 6-, 12-, or 16-volt jars in DC power plants, and UPS power systems up to 600 volts DC, and with several choices of mounting brackets for different post configurations.

Each sensor in a PBT Battery Management System measures its associated cell or jar's terminal voltage, post or case temperature, and internal cell impedance (admittance). Multiple sensors within a string of monitored jars are interconnected in a "daisy-chain" utilizing CAT-5 cabling and RJ-45 connectors. Each daisy-chain of sensors is connected via another CAT-5 cable to one of the six ports on the Site Controller. Each Site Controller can manage up to 32 strings of batteries, with a maximum of 40 batteries in any one string, and a site total of 240 jars. The Site Controller has extensive, user-definable set-up capabilities, including labels for every monitored jar, as well as alarm thresholds for voltage, temperature, and admittance on each individual jar.

The Site Controller has several user interface mechanisms built-in, including a configurable web server that displays site, string, and individual jar information, as well as an SNMP (Simple Network Management Protocol) interface that allows any SNMP compliant management software to collect data and perform jar tests. Other features of the Site Controller include a password protected SSH port for remotely configuring the unit, A DHCP (Dynamic Host Configuration Protocol) client that automatically obtains an IP (internet protocol) address from a DHCP server, and FTP (File Transfer Protocol) server for uploading firmware changes remotely.

Upon power-up, the Site Controller automatically begins a search sequence to determine which of its string ports are attached to battery sensors and then discovers each sensor module.

The Site Controller supports both High Voltage and Low Voltage sensors. When a string of High Voltage (HV) sensors is discovered, the controller discovers the factory-programmed address of the sensor module as part of this discovery process. The HV sensor is randomly assigned to one of the jars in the string, allowing you to configure these assignments after installation is complete.

When a string of Low Voltage sensors is discovered, the controller automatically discovers each sensor and its correct position in the string. (No factory programmed address is necessary with low voltage sensors.)

Once the "auto-discovery" process is finished, the Site Controller can individually address each sensor, collect its readings, and display those readings in a hierarchical web page display. Except for the final user assignment of High Voltage sensors to jars, this process is 'plug & play'. See "High Voltage" and "Low Voltage" Sensors for more information.

All sensor assignments and configuration information are saved in non-volatile memory, so the system automatically reconfigures itself if power is lost or if the system is turned off for maintenance.

2.1   Sensor Description

Sensor modules are small, inexpensive units designed to mount in close mechanical, electrical, and thermal proximity to the monitored jar's terminal posts. The sensor takes a very small amount of "idling" power from the monitored jar (typically less than 10ma). Internally, a programmable microcontroller chip provides an optically isolated communications interface for the Site Controller. Sensors are connected to the Site Controller using a CAT5 cable daisy chain.

Each sensor continuously monitors the voltage and temperature of the connected jar. At user-defined intervals, the microcontroller generates a digitally synthesized AC test signal of approximately 0.5 to 6.0 amps (depending on sensor type), which drives the jar's terminals for testing purposes. This test current causes a small AC voltage, proportional to jar impedance, to be superimposed on the jar's DC terminal voltage. This AC voltage is separated from the DC terminal voltage and amplified inside the sensor module. It is then fed to an analog-to-digital converter inside the microcontroller chip. The microcontroller digitally samples the AC waveform and performs a DSP (digital signal processing) algorithm that filters out noise and measures the amplitude of the AC signal. These measurements and subsequent calculations determine the jar's internal AC impedance, which is the basis for Admittance measurements.

Mechanically, the sensor consists of a nickel-plated copper mounting bracket or wired connector which fits on the jar's negative terminal post, a short wire (terminated in a terminal lug) that connects to the jar's positive terminal post, and an electronics assembly that contains the test signal generation and measurement circuitry.

Sensors which include mounting brackets have the advantage of being able to more accurately measure the temperature of the electrolyte in the connected cell. The two wire sensors have the advantage of working with a wide variety of cell and jar mechanical configurations that might require several different bracket types. See Sensor Selector Guide for more details.

Each sensor is shipped with a 1-foot CAT5 cable to connect the sensor to the daisy chain. This cable is the proper length for most applications. Longer cables are available from PBT. See Accessories for more details.

2.1.1 "High Voltage" and "Low Voltage" Sensors

Sensors are typically used in DC power plants and UPS applications. DC power plant applications commonly utilize two-volt cells and twelve-volt jars wired in series, with total nominal string voltages typically ranging from 24 to 48 VDC. In many UPS systems, voltages can be significantly higher (480 volts or more). Because of the specific requirements of high voltage systems, Phoenix Broadband has developed sensors to accommodate each environment.

When working in environments where string voltages are greater than 59 VDC, always use the High Voltage sensors. The communications path in "High Voltage" (HV) sensors is completely optically isolated from the controller and each other, with no string-level voltages present in the interconnecting CAT5 cables. This architecture was designed to ensure safety and prevent equipment damage. For environments where string voltages are 59 VDC and lower, Low Voltage sensors are appropriate. However, either sensor type (High or Low voltage) can be used with low voltage strings.

 WARNING: Installing Low Voltage sensors on a high voltage string will damage the sensors and may present a shock hazard.

Both sensor types are auto discovered by the controller. The Low Voltage sensor has the advantage that its position in the string is automatically discovered. This means the sensors can be connected in any order and the controller will automatically discover upon which cell or jar the sensor is installed. High Voltage sensors have an address. The address and cell or jar number must be recorded when the sensor is installed. These addresses are then entered into the Site Controller Web page so that the ordering of the cells or jars will be correct.

High Voltage and Low Voltage sensors should not be mixed in the same string.
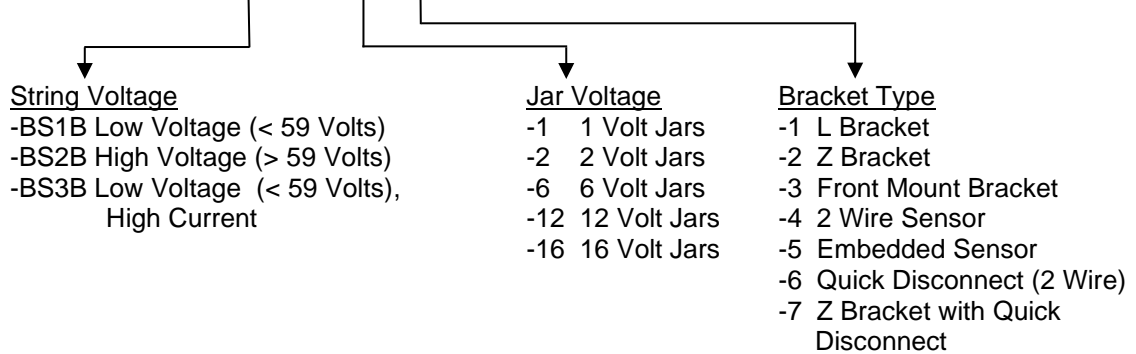
Each sensor has a bi-color red/green LED that indicates the operational state of the sensor and its communications status with the Site Controller. Each sensor is also internally fused so that a reverse polarity connection to the jar will not damage the jar, the jar cabling, or the sensor. Again, the sensors are optically isolated from the Site Controller.

2.1.2   Sensor Selector Guide

Selecting a sensor requires first determining if a Low or High voltage sensor is required. (See "High Voltage" and "Low Voltage" Sensors.) Then a jar voltage is selected: either 1, 2, 6, 12, or 16 volts. Finally, the bracket style is selected.

The sensor model number is constructed as shown below.

PBT-PA-<u>BS1B</u>-<u>12</u>-<u>2</u>

String Voltage	Jar Voltage	Bracket Type
-BS1B Low Voltage (< 59 Volts)	-1 1 Volt Jars	-1 L Bracket
-BS2B High Voltage (> 59 Volts)	-2 2 Volt Jars	-2 Z Bracket
-BS3B Low Voltage (< 59 Volts),	-6 6 Volt Jars	-3 Front Mount Bracket
High Current	-12 12 Volt Jars	-4 2 Wire Sensor
	-16 16 Volt Jars	-5 Embedded Sensor
		-6 Quick Disconnect (2 Wire)
		-7 Z Bracket with Quick Disconnect

When selecting a bracket, be sure to consider the clearance above the jar. This is particularly important when the jars are installed in a cabinet (as is typical with most UPS systems). Be sure there is enough space for the CAT-5 cables to exit the sensor without kinking.

Each sensor type is described below.

NOTE: The Bracket Type "5" battery sensor is an embedded battery sensor that is designed to fit directly onto the top of specific front terminal 12V jars. For more information on the available variants of this sensor, contact PBT.
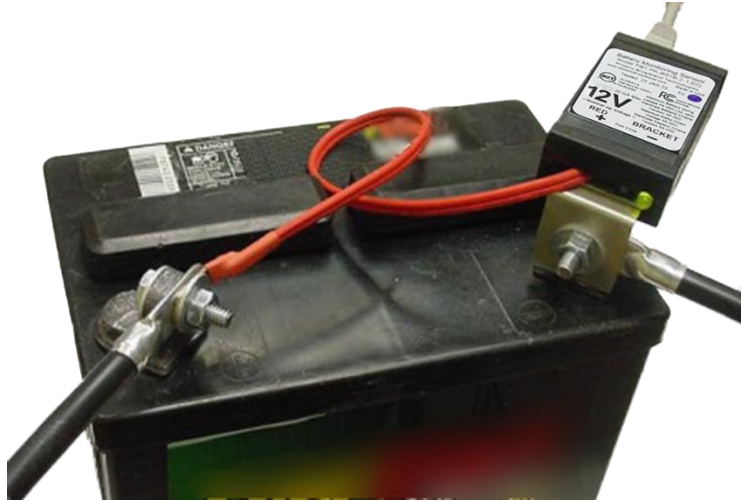
Type 1 Bracket

This bracket (commonly referred to as an "L" bracket) is typically used on jar terminals where the sensor must stand up off of the jar. The example shown below illustrates vertical, blade type terminals where the bolt is parallel to the top of the jar. The maximum bolt size for the terminal and bracket is 5/16 inch.

Type 2 Bracket

This bracket (commonly referred to as the "Z" bracket) is typically used with jars that are connected together with straps. It is also used when the jar cables are secured by bolts that extend into the jar. The maximum bolt size for the terminal and bracket is 5/16 inch.
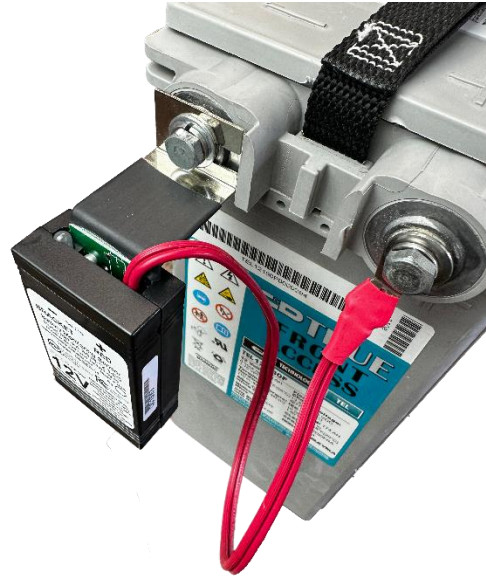
Type 3 Bracket

This bracket, commonly referred to as the "Front Mount" bracket, is used for front terminal Jars. While specifically designed for the Marathon, the bracket will fit most front terminal Jars. This bracket was designed for a M6 (6 mm) bolt.

Type 4 Sensor

This sensor does not make use of brackets. Instead, it has two wired connections. This is a universal sensor that will work with most jars. The maximum bolt size for the terminals is 5/16 inch. The one disadvantage of this sensor is that it does not directly measure the jar post (electrolyte) temperature like the bracketed sensors do. When the sensor is mounted to the top of the jar (as shown below), and not in the direct cooling air flow, the sensor will read the approximate jar case temperature. The sensor is equipped with a self-adhesive industrial Velcro strip for fastening the sensor to the jar.
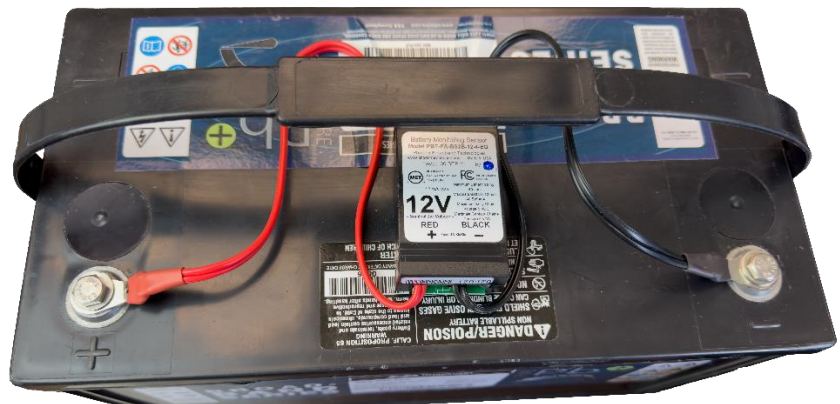
Type 6 Sensor

Like the Type 4 sensor, this sensor does not make use of a bracket. Instead, it has two wired connections. However, each wire is equipped with a quick disconnect female receptacle crimped on to the end of the wire. This receptacle is designed to be mated with a male tab terminal. Washers equipped with dual male tab terminals are available from PBT. Two sizes of washers are available, for accommodating different bolt sizes. (Please contact us for assistance.) The one disadvantage of this sensor is that it does not directly measure the jar post (electrolyte) temperature like the bracketed sensors. When the sensor is mounted to the top of the jar, and not in the direct cooling air flow, the sensor will read the approximate jar case temperature. The sensor is equipped with a self-adhesive industrial Velcro strip for fastening the sensor to the jar.
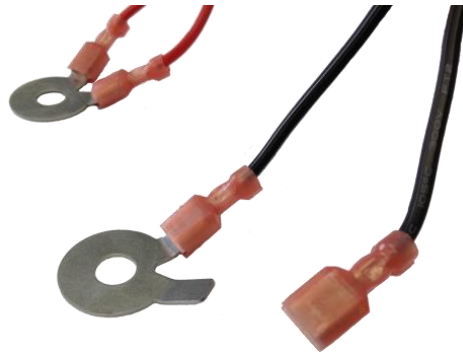
Type 7 Sensor

This bracket (commonly referred to as the "Z" bracket) is typically used with jars that are connected together with straps. It is also used when the jar cables are secured by bolts that extend into the jar. The maximum bolt size for the terminal and bracket is 5/16 inch. Each wire is equipped with a quick disconnect female receptacle crimped on to the end of the wire. This receptacle is designed to be mated with a male tab terminal. Washers equipped with dual male tab terminals are available from PBT. Two sizes of washers are available, for accommodating different bolt sizes. (Please contact us for assistance.)

2.2 Site Controller Description

The SC4 Site Controller is a compact unit that monitors connected sensor modules and makes the data collected by them available via a network connection.

The Site Controller front panel has numerous indicators for quick assessment of power, connection status, and network connectivity.

A front panel USB connection (USB-2) allows direct connection to a PC for configuration purposes (setting the Site Controller IP address and other parameters during installation). Setup can also be performed over the network connection.

The front panel mini USB connection (USB-3) is for factory use only.

An included USB flash drive provides for storage of logged data via installation in the FLASH USB port.

The front panel WiFi indicator is for future use (not currently supported).

The rear panel ETHERNET connection provides a TCP/IP (internet protocol) interface to a local area network or to the internet. A built-in web server is accessible via this interface, with no need for any software other than a common PC web browser. More sophisticated monitoring and control of the Site Controller can be performed remotely using any SNMP-capable network management software system. See SNMP for more information.

The Site Controller has six RJ-45 PORTS on the rear panel for interfacing with up to six strings of monitored jars. Each port has a corresponding front panel indicator. The LED lights when the string connected to the port is being polled. A green LED indicates everything is normal; a red LED indicates abnormal conditions within that string.

The AUX OUT port on the rear panel provides four relay outputs. Refer to the *Aux Port Wiring Diagram (705-000021-00)* for details on this feature.

The two P-BUS ports (A and B) provide expansion capabilities for connection to current sensors, RIMs, and ROMs, which allows for additional inputs and outputs.

The rear panel USB port (USB-1) is for factory use only.

The Site Controller can be powered directly from a battery string voltage of 24-48VDC, by an optional 24VDC wall adapter, or by an optional 48VDC battery string power adapter. (See Accessories for more information.) The supported voltage range is 20 to 59 Vdc. Power consumption is approximately 5 watts, with current draw dependent on the input voltage. Power is supplied to the unit via a rear-panel terminal block. The power supply input is floating. The terminal block also provides a chassis ground connection.

The Site Controller can be rack-mounted in a standard 19" or 23" equipment rack using one of the two optional rackmount brackets, or can be mounted on a wall using our wall mount bracket. (One rack bracket can hold one or two Site Controllers.) See Accessories for more information.

Rubber feet, screws for mounting the Site Controller to the rack bracket, and extra sensor fuses are included with the Site Controller.

2.3   Accessories

Various optional accessories are available to aid in system installation.

2.3.1   Cable Kits

A Cable Kit provides the cables necessary to connect a string of battery sensors to the Site Controller. Each string requires a Cable Kit. The Cable Kit contains the cables most commonly required to connect the string of jars. Cable Kits are available for common string sizes. Contact PBT for any special requirements such as individual cable lengths. Individual cable lengths can be purchased.

These are the most common Cable Kits. Other Cable Kits are available. Please contact us for assistance.

Cable Kit Model Number	Jars Per String
PBT-PAC-BMS-04	4
PBT-PAC-BMS-12	12
PBT-PAC-BMS-20	20
PBT-PAC-BMS-24	24
PBT-PAC-BMS-30	30
PBT-PAC-BMS-40	40
PBT-PAC-BMW-60	60

CAUTION: We strongly recommend that you order the appropriate Cable Kit for each string and not make your own sensor cables. A single improperly made cable can destroy an entire string of sensors.

If you do choose to make your own cables, you must test them with a good Ethernet (CAT-5) cable tester that tests all 8 pins for continuity and shorts.

2.3.2   CAT5 Cables

Each sensor is shipped with a one-foot CAT5 cable to connect the sensor to the daisy chain. This cable is the proper length for most applications. Longer cables are available from PBT. Please contact us for assistance.

2.3.3 Power Transformers

The Site Controller is normally powered from the Rectifier or UPS battery charger (24 to 60 VDC). In cases where this power is not available, you can use the following:

- A 24 VDC wall mount transformer is available to power the Site Controller. This transformer can be ordered from PBT as model number WT-3.
- A 48 VDC transformer is available to power the Site Controller from a 139V battery string. This transformer can be ordered from PBT as model number DCC-125.

Models are also available for international use. Please contact us for assistance.

2.3.4 Rack Mount Brackets

A bracket that mounts up to 2 Site Controllers in a 1U space in a 19 or 23 inch rack is available. (Screws for mounting the Site Controller to the rack bracket are included with the Site Controller.)

Rack Mount Bracket Model Number	For Rack Size
PBT-RK-1	19-inch
PBT-RK-2	23-inch

2.3.5 Additional Mounting Solutions

If an alternate mounting solution is required (for example, wall mounting), please contact us for assistance.

Test Setup

If you have no previous experience with a PBT Battery Management System, it is recommended that a small local test and evaluation of the system components be set up prior to field deployment of the equipment. This approach can save a significant amount of time by helping you understand the system prior to connecting to a much larger network. It will allow you to verify proper operation of the Site Controller's web server; SSH configuration, and DHCP client without having to troubleshoot larger network issues (such as firewall, router, and connectivity issues, and so on).

It is recommended that you read and understand the remainder of this manual prior to performing a test evaluation.

The above diagram shows a laptop computer connected to an SC4 Site Controller. In this scenario, the installation steps are as follows:

NOTE: In order to perform the following procedure, DHCP must be enabled for the network adapter in your computer. Dynamic Host Configuration Protocol (DHCP) allows your computer to automatically acquire an IP address from the SC4 Site Controller. Refer to your computer's documentation or operating system documentation for details on enabling DHCP.

1. Power up your computer.

2. Power up your SC4.

3. Connect the SC4 to the computer using a CAT5 cable (via the ETHERNET connection on the rear panel).

4. Use a pen or small tool to press and hold the WiFi button on the front panel of the SC4. Hold the button down until the corresponding WiFi indicator lights.

5. Use your computer's operating system to verify that an IP address has been acquired from the SC4.

6. Write the acquired IP address down.

7. Connect sensors to the each other (via CAT 5 cables daisy chained from sensor to sensor). See Connecting Battery Sensors for details.

8. Connect the last sensor in the daisy chain to one of the six SC4 Site Controller rear panel PORTS.

9. By default, the SC4 will use an IP address of 192.168.2.200. If, for some reason, you cannot ping this IP address from your computer, do the following:

    a. Connect to the SC4 using a USB connection. (See Accessing the SC4 Configuration Program over USB.)

    b. Use the SC4 configuration program to determine the SC4 IP address. (See IPv4 Configuration.)

10. On your computer, open a web browser.

11. Type the IP address of the SC4 into your computer's web browser in the following format:

    `http://<ip address>`

12. Verify that the web pages display properly. See Site Controller Web Pages for details.

13. Verify that all sensors have been auto discovered.

14. Verify that the parameter information displayed in the web pages appears reasonable.

15. Verify SSH connectivity by connecting to the controller via PuTTY or a similar terminal emulator. See Direct USB Connection or Ethernet Direct Connection Method for details.

16. If you are using an SNMP manager, verify proper SNMP operation (gets, sets & traps). See SNMP for details.

This test setup can also be performed using the free Lookout software described in the SNMP section of this manual. See SNMP for details.

Sensor Installation

Refer to *Battery Sensor Installation and Operation (700-000015-01)* for detailed information before installing the battery sensors.

WARNING: Lethal voltages may be present on the battery strings. If you are not fully trained to work safely around batteries and our monitoring system, leave the installation to a certified technician. Read the sensor installation instructions carefully.

CAUTION: Be sure to disconnect the Rectifier or Charger before installing the Sensors. Failure to do so could result in sensor damage.

Site Controller Installation

NOTE: Before any sensor strings are connected to the Site Controller, it should be mounted (either in a rack, wall mount bracket, or shelf), connections should be made to the network (Ethernet connection), and it should be powered up and checked out for network connectivity. See Accessories for details on mounting hardware and other accessories.

Site Controller installation consists of the following tasks:

- Mounting/Locating the Site Controller

- Powering

- Network Connection

- Connecting Battery Sensors

- Connecting RIMs and ROMs

- Connecting Current Sensors

- Configuring the Site Controller

Each of these tasks is described below.

5.1   Mounting/Locating the Site Controller

Select a location for the Site Controller. The location should be central to the strings being monitored. It should be dry and free of corrosive or explosive vapors.

The maximum cable length between the SC4 Site Controller and the battery string varies with the number of battery sensors on the string. With 40 sensors a maximum total cable length of 200 feet is recommended. This includes the sensor-to-sensor cables. With 24 sensors this increases to 300 feet.

Mount the Site Controller in an equipment rack using a rack mount bracket, wall bracket, or place the Site Controller on a shelf. See Accessories for details on mounting hardware.

5.2 Powering

The Site Controller is powered via the PWR IN connector on the rear panel.

Connect a source of 20 to 59 VDC to the PWR IN connector. This can be DC power from a DC power plant, or it can be 24 VDC from the optional WT-3 plug-in transformer. (See Power Transformer for details.)

The power supply input is floating on the Site Controller. To ground the Site Controller, connect the center ground pin on the power connector to an earth ground.

For UPS installations, the Site Controller should be powered from the WT-3 or similar DC source. The WT-3 should be plugged into an outlet that is backed up by the UPS.

CAUTION: Never power the Site Controller from UPS batteries. This can cause damage to the equipment.

NOTE: The SC4 Site Controller can also be powered from low voltage AC. Contact PBT for the voltage range limitations. (See Contact Information for details.)

NOTE: There is a power input fuse inside the Site Controller. It is extremely rare for this fuse to blow.

5.3 Network Connection

The SC4 Site Controller communicates with your network via the rear panel ETHERNET connector. (Network infrastructure varies from site to site. Your SC4 will generally be connected to your network via a hub or switch. On a managed switch, make sure that the corresponding switch port has been enabled.)

The IP address of your Site Controller is set to a factory default which is indicated on the label affixed to the top of the unit. If this IP address needs to be changed, do one of the following:

- Run the Site Controller Configuration Program (see Configuring the Site Controller for details).

- Use the Site Viewer IP Configuration function (see Site Viewer IP Configuration for details).

Once your IP address is set as desired, verify network communications by accessing the Site Controller web pages over the network. See Web Server for details.

5.4   Connecting Battery Sensors

Connect the cable from the battery sensor daisy-chain to one of the six available controller inputs (PORTS) on the Site Controller rear panel.

> ⚠️ **CAUTION:** We strongly recommend that you order the appropriate Cable Kit for each string and not make your own sensor cables. A single improperly made cable can destroy an entire string of sensors. See Accessories for details.

The Site Controller will begin to auto-discover the sensors connected in each of the daisy-chains. You will notice the String LEDs on the front panel flashing in sequence left to right. This indicates that the controller is polling each string and looking for sensors on that string. Once a string has been discovered, it will be visible on the Web page. (See Site Controller Web Pages for more information.)

5.5   Connecting RIMs and ROMs

RIMs and ROMS are connected to one of the P-BUS connectors on the rear of the Site Controller using CAT-5 cables. Up to 200 feet of cable can be connected to each of the two P-BUS ports. Up to 4 RIMs and 4 ROMs can be connected to each P-Bus port, for a total of 8 RIMs and 8 ROMs. Refer to the *Remote Input Module Installation and Operation Manual (700-000012-00)* and the *Remote Output Module Installation and Operation Manual (700-000016-00)* for information on mounting and configuring RIMs and ROMs.

5.6   Connecting Current Sensors

Up to 6 Current Measurement Interfaces (CMI) can be daisy-chained and connected to P-BUS port A via a standard CAT5 cable (straight through). These 6 units correspond to the 6 strings. Each CMI is manually set to a unique address, from 1 to 6. The Addresses correspond to the 6 ports. For example; current measurements made on CMI address 2 are displayed with string 2. Refer to the *CCS Installation and Operation Manual (700-000029-00)* for information on
configuring and using current sensors.

5.7   Configuring the Site Controller

The Site Controller can be configured via a direct Ethernet cable connection from a PC, over a network, or through a USB connection from a PC. In all cases, configuration is performed via a terminal emulator or other similar program (such as PuTTY).

1. Obtain a Terminal Emulator Client. See Obtaining a Terminal Emulator Client for details.

2. Once you've obtained and setup your Terminal Emulator Client, determine and implement the method of connection to be used:

3. Ethernet Direct Connection Method

4. Direct USB Connection

5. Once you're connected, proceed with Accessing the SC4 Configuration Program.

5.7.2   Obtaining a Terminal Emulator Client

Whichever method you use to connect to the Site Controller for Site Configuration, a terminal emulator client is required.

If you're using the Direct USB Connection method, you'll need a terminal emulator like PuTTY.

- You can download PuTTY from http://www.putty.org/.

NOTE: We recommend PuTTY which can be downloaded for free at the link provided above. Be sure to comply with all licensing requirements.

5.7.3   Ethernet Direct Connection Method

In order to communicate via a direct Ethernet connection, or over the network, the Site Controller must be assigned an IP address.

The Site Controller is shipped from the factory configured with a static IP Address of 192.168.2.200.

Generally, static IP addresses are used so that the Network Manager can associate the IP address with a physical location. Contact your network administrator or IT department to obtain a static IP address, gateway address, and subnet mask that will work on your network.

NOTE: If the IP address of the SC4 is known, you can use the following methods to change it via a connected internet browser:

- Use the Site Viewer IP Configuration function (see Site Viewer IP Configuration for details).

Procedures are provided below for:

- Using the SC4 DHCP server to assign an IP address to a connected computer.

- Using a direct Ethernet connection when the IP address of the SC4 is known.

5.7.3.1   Using the SC4 Site Controller DHCP Server

This method can be used when the Site Controller is set on its factory default IP Address of 192.168.2.200.   When powered up on the default IP Address the Site Controller runs a DHCP Server and will assign an IP Address to the computer connected to its Ethernet port.

NOTE: In order to receive an IP Address from the SC4, DHCP must be enabled for the network adapter in your computer. Dynamic Host Configuration Protocol (DHCP) allows your computer to automatically acquire an IP address from the SC4 Site Controller. Refer to your computer's documentation or operating system documentation for details on enabling DHCP.

1. Power up your computer.

2. Power up your SC4.

3. Connect the SC4 to the computer using a CAT5 cable (via the ETHERNET connection on the rear panel).

4. Use a pen or small tool to press and hold the WiFi button on the front panel of the SC4. Hold the button down until the corresponding WiFi indicator lights.

5. Use your computer's operating system to verify that an IP address has been acquired from the SC4.

6. By default, the SC4 will use an IP address of 192.168.2.200. If, for some reason, you cannot ping this IP address from your computer, do the following:

    a. Connect to the SC4 using a USB connection. (See Accessing the SC4 Configuration Program over USB.)

    b. Use the SC4 configuration program to determine the SC4 IP address. (See IPv4 Configuration.)

5.7.3.2   Connecting to an SC4 via Ethernet with a Known IP Address

This method can be used when the Site Controller IP address is set to a known, static IP address. To use this method, do the following:

1. Connect an Ethernet (straight-through or crossover) cable between the PC and the ETHERNET connector on the rear panel of the Site Controller.

2. Set your PC IP address to the same network as the Site Controller address. For example, if the Site Controller IP address is set to 192.168.2.200, you can set your PC network adapter to 192.168.2.201.

3. Set the PC subnet mask to the same subnet mask as the Site Controller.

4. Set the PC default gateway of the same default gateway as the Site Controller.

5. Ping the SC4 IP address. If, for some reason, you cannot ping this IP address from your computer, do the following:

    a. Connect to the SC4 using a USB connection. (See Accessing the SC4 Configuration Program over USB.)

    b. Use the SC4 configuration program to determine the SC4 IP address. (See IPv4 Configuration.)

5.7.4   Direct USB Connection

Connecting a PC to the Site Controller via a USB cable is required when provisioning the Site Controller from a non-network connected PC, or, if the controller has been programmed with an unknown, static IP Address.

A serial communications program such as Tera Term or Putty is required. See Obtaining a Terminal Emulator Client for details.

A USB cable is provided with the Site Controller. This is a Type A/Type B cable.
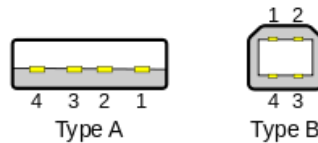
Complete the USB Connection as follows:

1. Connect the Type A connector to an available USB port on your computer.

2. Connect the Type B connector to the USB-2 (Setup) port on the front panel of the Site Controller.

> **NOTE:** You must use the USB-2 (Setup) port for all direct USB connection related tasks. Ports USB-1 (Rear) and USB-3 (Factory) are for factory use only.

3. To connect to the Site Controller with your serial communications program you will need to identify which COM port is being used for the USB serial communications. To do this, do the following:

    a. From the **Start** menu, choose **Control Panel**. The Control Panel window appears.
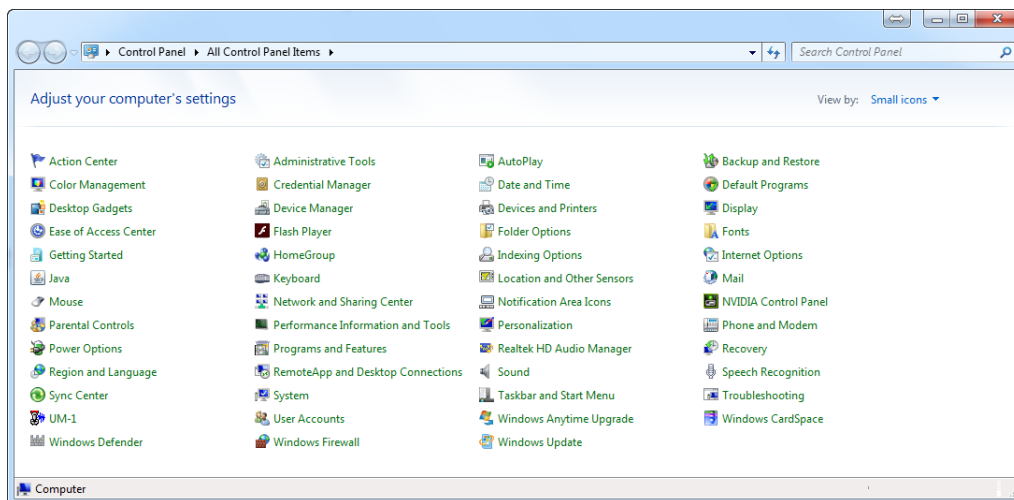
b.   Access **Device Manager**. The Device Manager window appears.
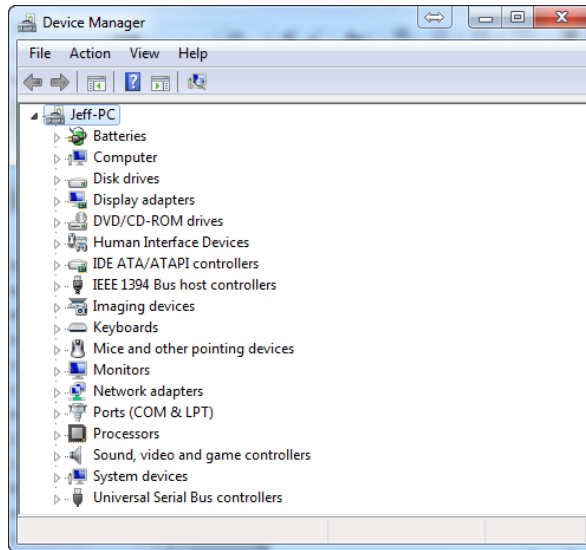
c.   Navigate down the tree of Devices and locate the Site Controller. (The naming and location of the Site Controller may vary, depending on which operating system you're using.)
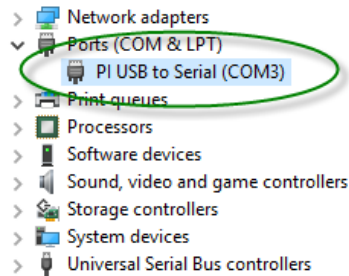
d.   In the example shown above, the Site Controller is labeled "PI USB to Serial (COM3)." The COM Port that the Site Controller is installed on is shown in parenthesis (COM3 in the example). When configuring your Serial Communications program, use this identified COM port number.

5.8   Accessing the SC4 Configuration Program

Once you've connected to the Site Controller (see Configuring the Site Controller), you can use a terminal emulator client to access the SC4 Configuration Program. Instructions are given below for using PuTTY.

5.8.1   Accessing the SC4 Configuration Program over Ethernet

These instructions make use of PuTTY, although any Telnet client will work. (See Obtaining a Terminal Emulator Client for details.)

1. Launch PuTTY. The PuTTY Configuration dialog box appears.
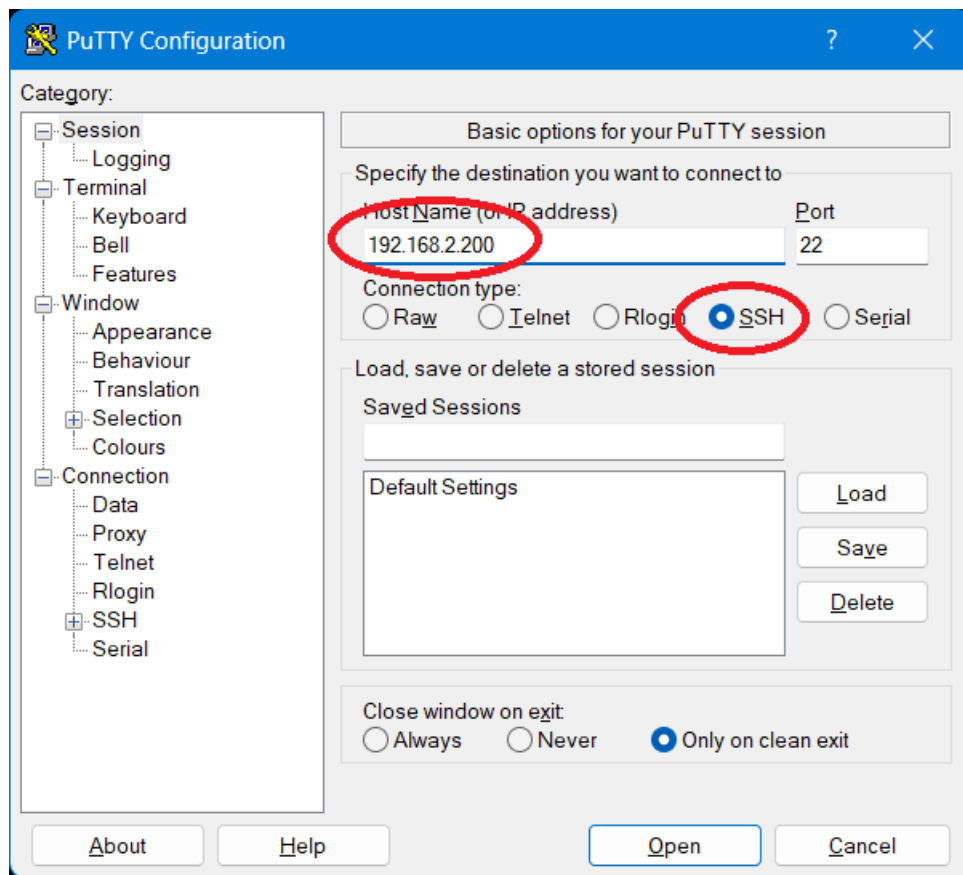
2. Enter the IP address of the Site Controller in the Host Name (or IP address) field.

3. In the Connection type area, choose **SSH**.

4. Click **Open**. The PuTTY Configuration dialog box closes. The PuTTY window is displayed. You are prompted for your login.

NOTE: The default username/password combination is `pbtuser`/`pbtpassword`.

5. Enter your username and press ENTER. You are prompted for your password.

6. Enter your password and press ENTER. The command prompt is displayed on the PuTTY window.

7. The command prompt is displayed on the window.


```
premierwave login: pbtuser
Password:

Welcome to the SC4 by Phoenix Broadband Technologies
To set the SC4 IP Address type "./sc4config <enter>"
To close this connection type "exit <enter>"

SC4:
```

8. Launch the SC4 Configuration Program by typing: `./sc4config` and then pressing ENTER. The SC4 Configuration Program appears. See SC4 Configuration Program for details.

5.8.2   Accessing the SC4 Configuration Program over USB

These instructions make use of PuTTY, although any serial terminal emulator should work. (See Obtaining a Terminal Emulator Client for details.)

> **NOTE:** The default settings for Tera Term should work properly. If they have been changed, ensure that the settings are: date rate: 9600, 8 data bits, one stop bit, no parity, and no flow control.

1.   Launch PuTTY. The PuTTY Configuration dialog box appears.
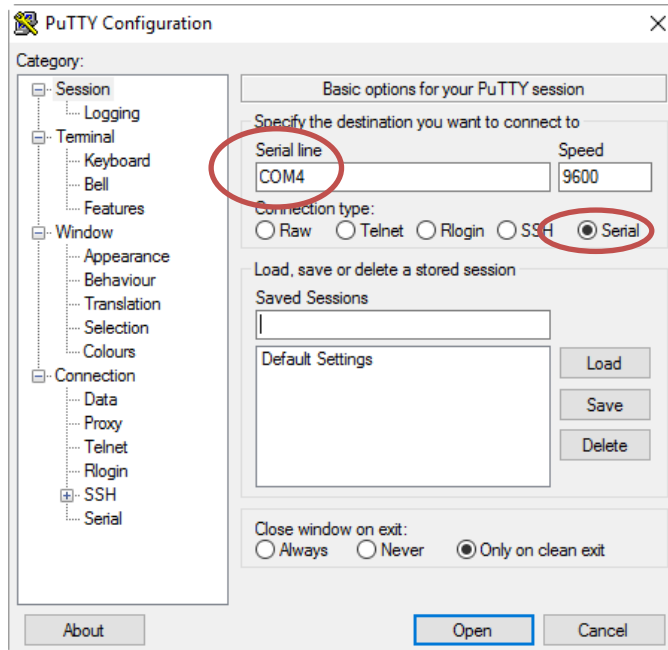
2.   Ensure that the Site Controller COM port is selected. (See Direct USB Connection for details.)

3.   Choose the **Serial** radio button.

4.   Click **Open**. The dialog box closes. The PuTTY window is displayed. You are prompted for your login.
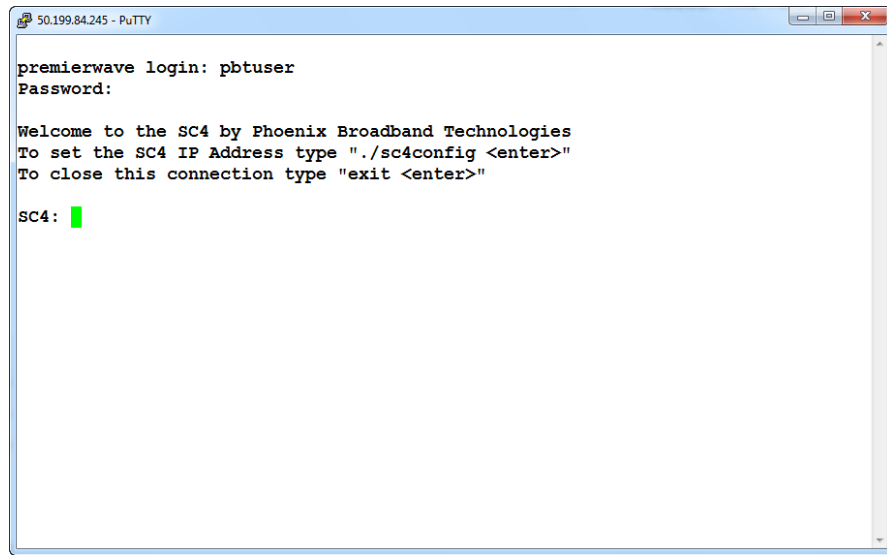
> **NOTE:** The default username/password combination is `pbtuser`/`pbtpassword`.

5.   Enter your username and press ENTER. You are prompted for your password.

6.   Enter your password and press ENTER. The command prompt is displayed on the PuTTY window.

```
premierwave login: pbtuser
Password:

Welcome to the SC4 by Phoenix Broadband Technologies
To set the SC4 IP Address type "./sc4config <enter>"
To close this connection type "exit <enter>"

SC4:
```

7. Launch the SC4 Configuration Program by typing: `./sc4config` and then pressing ENTER.
    The SC4 Configuration Program appears. See SC4 Configuration Program for details.

5.9   SC4 Configuration Program

No matter what method of access is used, the SC4 Configuration Program menu is displayed as shown below. (See Accessing the SC4 Configuration Program.) These screen shots were made with a PuTTY client, but they will appear virtually the same in any serial terminal emulator.

```
50.199.84.245 - PuTTY

Main Menu

item #
  1 - IPv4
  2 - IPv6 (under construction)
  3 - SNMP
  4 - Email
  5 - Firmware Server
  6 - NTP
  7 - FTP
  8 - Change Web Page Settings

 81 - Delete the Entire Database
 89 - Backup Database to Flash Drive
 90 - Help and Hints
 91 - Shutdown sc4Web Only
 94 - Reboot
 95 - Shutdown SC4 Completely
 99 - Exit this Application

Enter an item #:
```
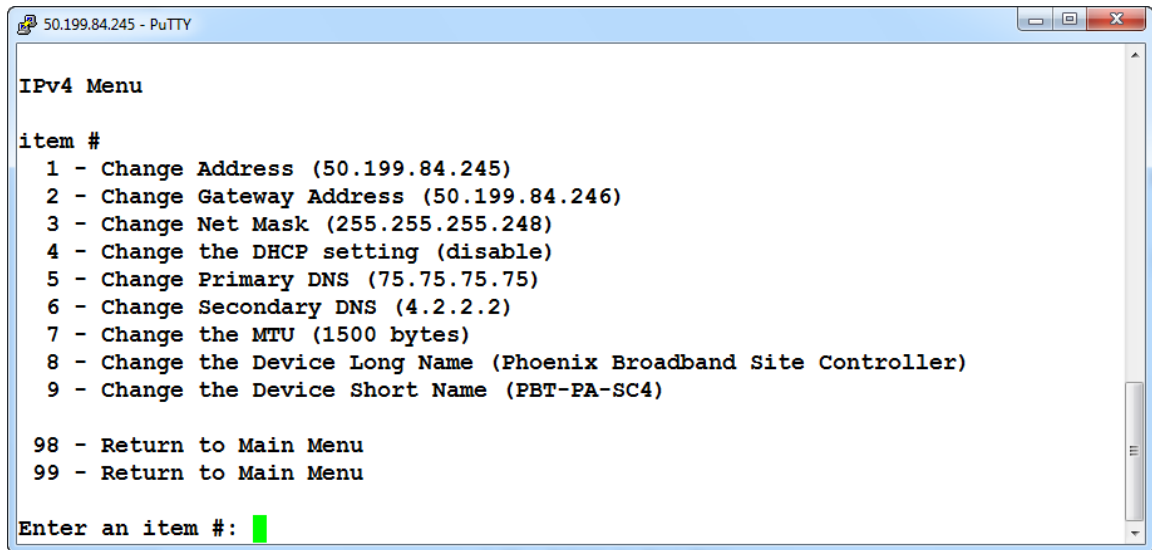
To select any option from the menu, enter the corresponding number and press ENTER.

5.9.1 General Configuration Information

The SC4 uses a Linux operating system. The configuration menus are similar to those used by the Linux operating system.

Individual menu screens are used to set parameters for specific functionality. The example below shows the configuration menu for IPv4.
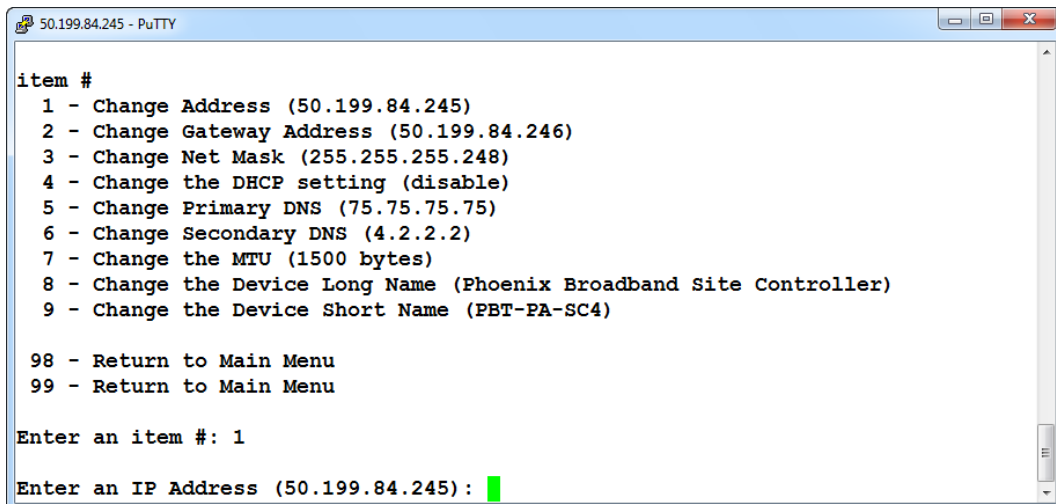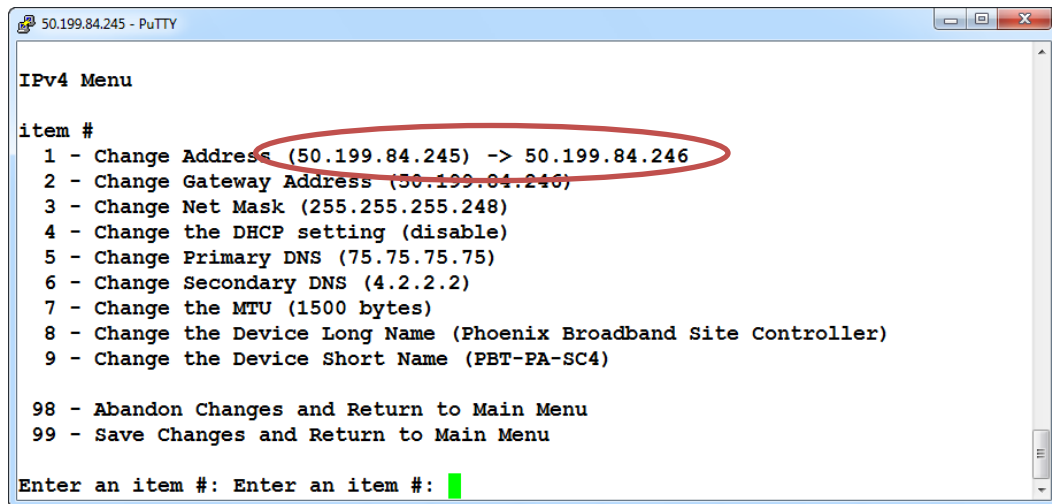
```
50.199.84.245 - PuTTY

IPv4 Menu

item #
  1 - Change Address (50.199.84.245)
  2 - Change Gateway Address (50.199.84.246)
  3 - Change Net Mask (255.255.255.248)
  4 - Change the DHCP setting (disable)
  5 - Change Primary DNS (75.75.75.75)
  6 - Change Secondary DNS (4.2.2.2)
  7 - Change the MTU (1500 bytes)
  8 - Change the Device Long Name (Phoenix Broadband Site Controller)
  9 - Change the Device Short Name (PBT-PA-SC4)

 98 - Return to Main Menu
 99 - Return to Main Menu

Enter an item #:
```

Items are selected by entering the corresponding item number (**item #**) and then pressing ENTER.

This allows you to change the value (or values) associated with the keystring. In the example shown above, selecting item 1 allows you to change the IPv4 address.

Some keystrings can accept more than one value. Where this is the case, values are entered separated by a space. For example, when changing an IP address:

1. Press the number corresponding to the item you wish to change and then press ENTER. (The image shown below shows changing the IPv4 IP Address.)

```
50.199.84.245 - PuTTY

item #
  1 - Change Address (50.199.84.245)
  2 - Change Gateway Address (50.199.84.246)
  3 - Change Net Mask (255.255.255.248)
  4 - Change the DHCP setting (disable)
  5 - Change Primary DNS (75.75.75.75)
  6 - Change Secondary DNS (4.2.2.2)
  7 - Change the MTU (1500 bytes)
  8 - Change the Device Long Name (Phoenix Broadband Site Controller)
  9 - Change the Device Short Name (PBT-PA-SC4)

 98 - Return to Main Menu
 99 - Return to Main Menu

Enter an item #: 1

Enter an IP Address (50.199.84.245):
```

2. Enter the desired value at the prompt and then press ENTER. A confirmation message appears.


```
50.199.84.245 - PuTTY
item #
  1 - Change Address (50.199.84.245)
  2 - Change Gateway Address (50.199.84.246)
  3 - Change Net Mask (255.255.255.248)
  4 - Change the DHCP setting (disable)
  5 - Change Primary DNS (75.75.75.75)
  6 - Change Secondary DNS (4.2.2.2)
  7 - Change the MTU (1500 bytes)
  8 - Change the Device Long Name (Phoenix Broadband Site Controller)
  9 - Change the Device Short Name (PBT-PA-SC4)

 98 - Return to Main Menu
 99 - Return to Main Menu

Enter an item #: 1

Enter an IP Address (50.199.84.245): 50.199.84.246
Entered: 50.199.84.246  Are you sure (y/n <enter>)?
```

3. To confirm your entry, press Y and then press ENTER. The IP v4 Menu appears. The entered value is displayed to the right of the previous value.


```
50.199.84.245 - PuTTY

IPv4 Menu

item #
  1 - Change Address (50.199.84.245) -> 50.199.84.246
  2 - Change Gateway Address (50.199.84.246)
  3 - Change Net Mask (255.255.255.248)
  4 - Change the DHCP setting (disable)
  5 - Change Primary DNS (75.75.75.75)
  6 - Change Secondary DNS (4.2.2.2)
  7 - Change the MTU (1500 bytes)
  8 - Change the Device Long Name (Phoenix Broadband Site Controller)
  9 - Change the Device Short Name (PBT-PA-SC4)

 98 - Abandon Changes and Return to Main Menu
 99 - Save Changes and Return to Main Menu

Enter an item #: Enter an item #:
```

4. Repeat steps a through c for any other values you wish to change.

NOTE: As noted above, keystrings (or keys) correspond to an item # on the menus. These item numbers may vary depending on how your SC4 is configured. In all cases, use the item number displayed on the menu rather than any specific item number documented in this manual.
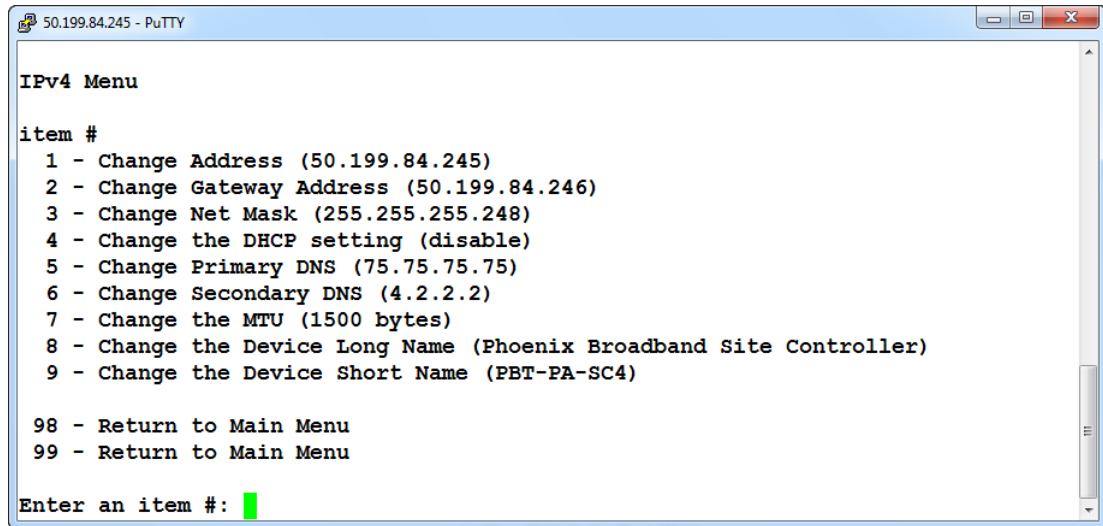
5. To save the changes you've made, press 99 and then press ENTER. (Pressing 98 and then ENTER exits the menu without saving any of the changes made.

5.9.2 IPv4 Configuration

The IPv4 Menu allows you to set the IPv4 address, default gateway, and net mask. You can selectively enable/disable DHCP to allow automated IP configuration. You can also specify the primary and secondary DNS and the MTU (Maximum Transmission Unit) size.

To configure IPv4:

1. Press 1 and then ENTER on the SC4 Configuration Program Main Menu. The IPv4 Menu appears.

```
50.199.84.245 - PuTTY                                                    — □ ✕

IPv4 Menu

item #
  1 - Change Address (50.199.84.245)
  2 - Change Gateway Address (50.199.84.246)
  3 - Change Net Mask (255.255.255.248)
  4 - Change the DHCP setting (disable)
  5 - Change Primary DNS (75.75.75.75)
  6 - Change Secondary DNS (4.2.2.2)
  7 - Change the MTU (1500 bytes)
  8 - Change the Device Long Name (Phoenix Broadband Site Controller)
  9 - Change the Device Short Name (PBT-PA-SC4)

 98 - Return to Main Menu
 99 - Return to Main Menu

Enter an item #:
```

2. Change any of the currently set values as desired. See General Configuration Information for details.

3. To save the changes you've made, press 99 and then press ENTER. (Pressing 98 and then ENTER exits IPv4 setup without saving any of the changes made.)

5.9.3   IPv6 Configuration

The IPv6 Menu allows you to set the IPv6 address, default gateway, and domain. You can selectively enable/disable IPv6. You can also enable/disable DHCP to allow automated IP configuration. Additionally, you can specify the primary and secondary DNS.

NOTE: As of this writing, there is a known issue with IPv6 configuration. When IPv6 is enabled, the Site Controller is forced to use an IPv6 time server. This may cause an issue if you do not have access to an IPv6 time server. The Site Controller uses Simple Network Time Protocol (SNTP) to communicate with an external time server. See NTP Configuration for details.

To configure IPv6:

1. Press 2 and then ENTER on the SC4 Configuration Program Main Menu. The IPv6 Menu appears.

```
50.199.84.245 - PuTTY

IPv6 Menu

item #
  1 - Enable or Disable IPv6 (disable)
  2 - Enable or Disable IPv6 DHCP (disable)
  3 - Change Address (2002:32c7:54f2:0:280:a3ff:fe9a:236b/64)
  4 - Change Default Gateway (<None>)
  5 - Change Domain ()
  6 - Change Primary DNS (<None>)
  7 - Change Secondary DNS (<None>)

 98 - Return to Main Menu
 99 - Return to Main Menu

Enter an item #: 
```

2. Change any of the currently set values as desired. See General Configuration Information for details.

3. To save the changes you've made, press 99 and then press ENTER. (Pressing 98 and then ENTER exits IPv6 setup without saving any of the changes made.)

5.9.4   SNMP Configuration

Simple Network Management Protocol (SNMP) is an Internet-standard protocol for collecting and organizing information about managed devices on IP networks and for modifying that information to change device behavior.

SNMP configuration allows you to specify identifying information such as syslocation, syscontact, and so on. The SNMP Community Strings and Trap destinations are configured from the SNMP Configuration Menu.

In typical uses of SNMP one or more administrative computers, called managers, have the task of monitoring or managing a group of hosts or devices on a computer network. Each managed system executes, at all times, a software component called an agent which reports information via SNMP to the manager.

An SNMP-managed network consists of three key components:

- Managed device

- Agent — software which runs on managed devices.

- Network management station (NMS) — software which runs on the manager.

A managed device is a network node that implements an SNMP interface that allows unidirectional (read-only) or bidirectional (read and write) access to node-specific information. Managed devices exchange node-specific information with the NMSs. Sometimes called network elements, the managed devices can be any type of device, including, but not limited to, routers, access servers, switches, cable modems, bridges, hubs, IP telephones, IP video cameras, computer hosts, and printers.
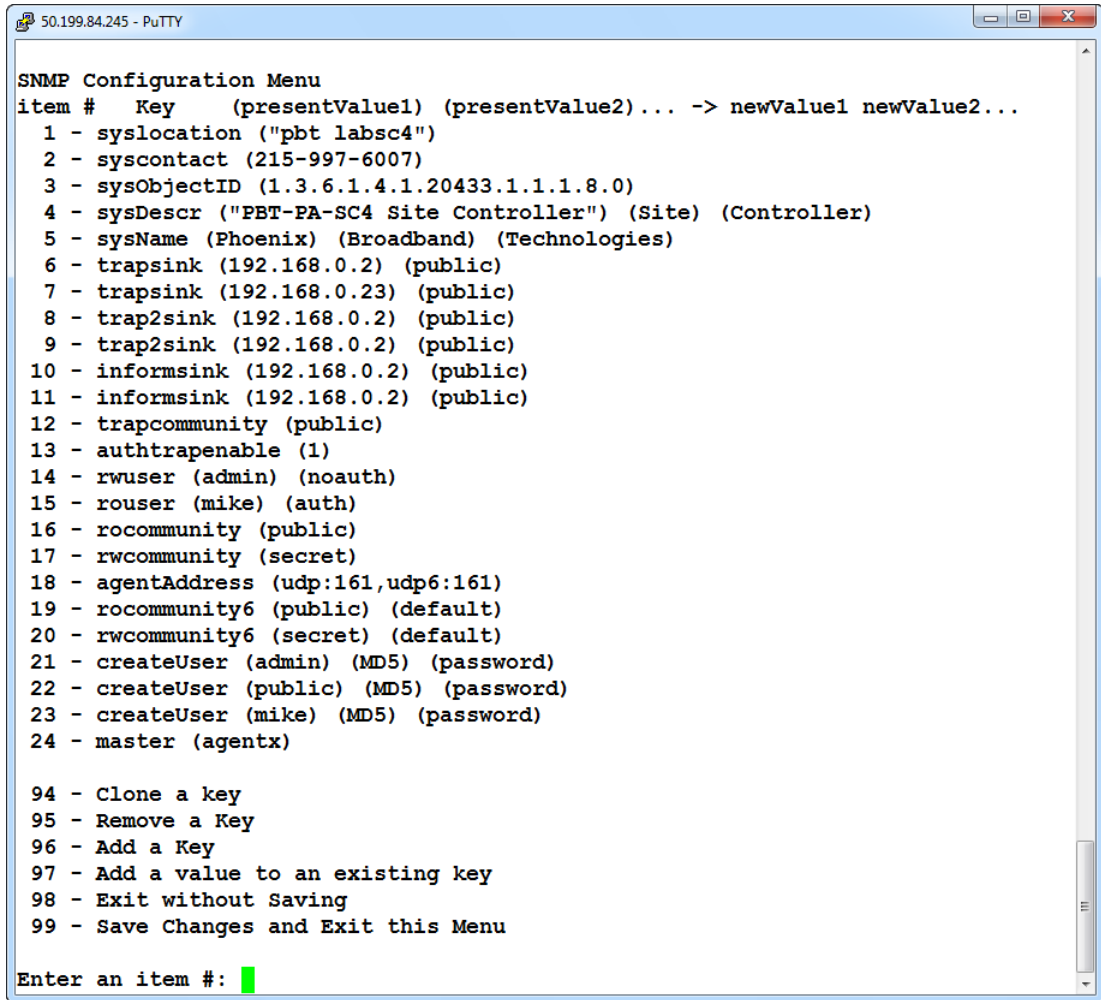
An agent is a network-management software module that resides on a managed device. An agent has local knowledge of management information and translates that information to or from an SNMP-specific form.

The SC4 Site Controller supports SNMP v1, SNMP v2c and SNMP v3.

5.9.4.1   SNMP Configuration - General

To setup SNMP:

1. Press 3 and then ENTER on the SC4 Configuration Program Main Menu. The SNMP Configuration Menu appears.

```
50.199.84.245 - PuTTY

SNMP Configuration Menu
item #   Key    (presentValue1) (presentValue2)... -> newValue1 newValue2...
  1 - syslocation ("pbt labsc4")
  2 - syscontact (215-997-6007)
  3 - sysObjectID (1.3.6.1.4.1.20433.1.1.1.8.0)
  4 - sysDescr ("PBT-PA-SC4 Site Controller") (Site) (Controller)
  5 - sysName (Phoenix) (Broadband) (Technologies)
  6 - trapsink (192.168.0.2) (public)
  7 - trapsink (192.168.0.23) (public)
  8 - trap2sink (192.168.0.2) (public)
  9 - trap2sink (192.168.0.2) (public)
 10 - informsink (192.168.0.2) (public)
 11 - informsink (192.168.0.2) (public)
 12 - trapcommunity (public)
 13 - authtrapenable (1)
 14 - rwuser (admin) (noauth)
 15 - rouser (mike) (auth)
 16 - rocommunity (public)
 17 - rwcommunity (secret)
 18 - agentAddress (udp:161,udp6:161)
 19 - rocommunity6 (public) (default)
 20 - rwcommunity6 (secret) (default)
 21 - createUser (admin) (MD5) (password)
 22 - createUser (public) (MD5) (password)
 23 - createUser (mike) (MD5) (password)
 24 - master (agentx)

 94 - Clone a key
 95 - Remove a Key
 96 - Add a Key
 97 - Add a value to an existing key
 98 - Exit without Saving
 99 - Save Changes and Exit this Menu

Enter an item #:
```

2. Change any of the currently set values as desired. See General Configuration Information for details.

    For more details, see:

    - SNMP v1 Configuration

    - SNMP v3 Configuration

3. To save the changes you've made, press 99 and then press ENTER. (Pressing 98 and then ENTER exits IPv4 setup without saving any of the changes made.)

5.9.4.2   SNMP v1 Configuration

It is assumed that customers using SNMP v1 are using IPv4. For details on setting up IPv4, see IPv4 Configuration.

To configure SNMP for v1:

1. Set the trapsink strings to the desired values. (Two trapsink entries are provided. More can be added as desired.)

2. Set the trapcommunity string to the desired value.

3. Set the rocommunity and rwcommunity strings to the desired values. <u>SNMP v1 is enabled when rocommunity, rwcommunity, or trapcommunity have values</u>.

5.9.4.3   SNMP v3 Configuration
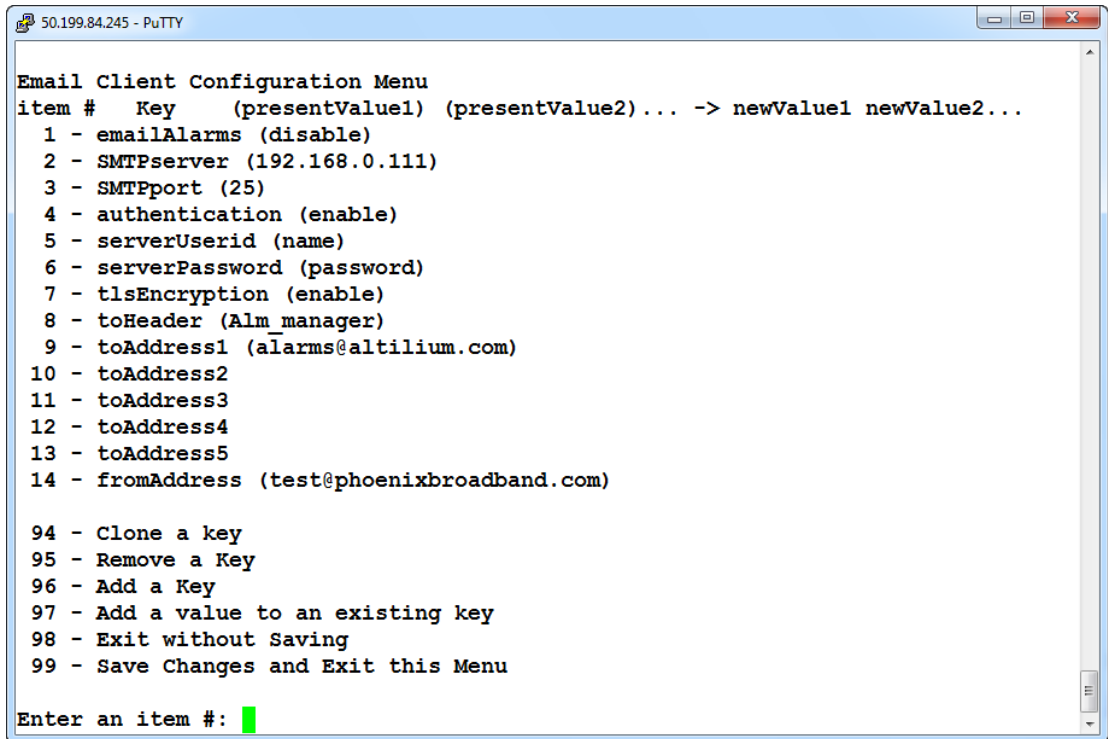
It is assumed that customers using SNMP v3 are using IPv6. For details on setting up IPv6, see IPv6 Configuration.

5.9.5 Email Client Configuration

The Email Client will email alarm messages to a maximum of 5 email addresses.

To setup email:

1. Press 8 and then ENTER on the SC4 Configuration Program Main Menu. The Email Client
   Configuration Menu appears.

```
50.199.84.245 - PuTTY

Email Client Configuration Menu
item #   Key     (presentValue1) (presentValue2)... -> newValue1 newValue2...
  1 - emailAlarms (disable)
  2 - SMTPserver (192.168.0.111)
  3 - SMTPport (25)
  4 - authentication (enable)
  5 - serverUserid (name)
  6 - serverPassword (password)
  7 - tlsEncryption (enable)
  8 - toHeader (Alm_manager)
  9 - toAddress1 (alarms@altilium.com)
 10 - toAddress2
 11 - toAddress3
 12 - toAddress4
 13 - toAddress5
 14 - fromAddress (test@phoenixbroadband.com)

 94 - Clone a key
 95 - Remove a Key
 96 - Add a Key
 97 - Add a value to an existing key
 98 - Exit without Saving
 99 - Save Changes and Exit this Menu

Enter an item #:
```

2. Change any of the currently set values as desired. See General Configuration Information for
   details.

   - You can selectively enable/disable emails by using option 1 from the Email Client
     Configuration Menu. This will open/close TCP port 25 on the Site Controller, respectively.

   - Use option 2 to specify the SMTP server. If no name (or IP address is specified, the email
     client is disabled. If a server name was previously entered it will be shown. The IP address
     of the mail server can be entered in place of the server name if desired.

   - By default, the SMTP port is set to 25. You can change this if desired.

   - You can enable/disable email authentication as required by your email server.

   - If your server requires a user ID and password, enter them in the corresponding line items.
     If the user ID is left blank, the Site Controller will not send the username and password to
     the mail server.

   - TLS (Transport Layer Security) uses PKI (Public Key Infrastructure) to encrypt messages
     from mail server to mail server. This encryption makes it more difficult for hackers to

intercept and read messages. If your email server uses TLS encryption, it can be enabled via item 7 (tlsEncryption) on the Email Client Configuration Menu.

- Use item 8 to specify the toHeader. This is the email address that will show in the To header of the email message, which technically doesn't have to be the recipient of the message. It is important to distinguish between toHeader and the toAddress entries. In most business cases, these will be the same email address and therefore the same value. If you want to send an email to john@company.com, then ToEmailAddress=john@company.com and ToHeader=john@company.com, because you want the toHeader to show the same email address to which the message was sent.

- Up to 5 destination Email addresses (toAddress1 through toAddress5) may be entered, as desired.

- Specify the fromAddress. This is the "from" address that will show up in the email when it is received.

> **NOTE:** The "fromAddress" should generally be set to an address that is registered on the SMTP server. Many servers use this to authenticate the outgoing email.

3. To save the changes you've made, press 99 and then press ENTER. (Pressing 98 and then ENTER exits Email Client Configuration without saving any of the changes made.)

> **NOTE:** If you have problems with email, ensure that the Domain Name Server (DNS) IP address is set correctly. The DNS allows the Email application to obtain the IP address of the specified server so it can send the mail. There are fields for a primary and secondary DNS. (See SC4 Configuration Program for details.) The default is a commonly used DNS (4.2.2.2). Change this to your local DNS if you prefer. As long as the Site Controller can see the internet the default DNS will work. If the DNS IP addresses are set to zeros, the email functionality will be disabled.

5.9.7   Firmware Server Configuration
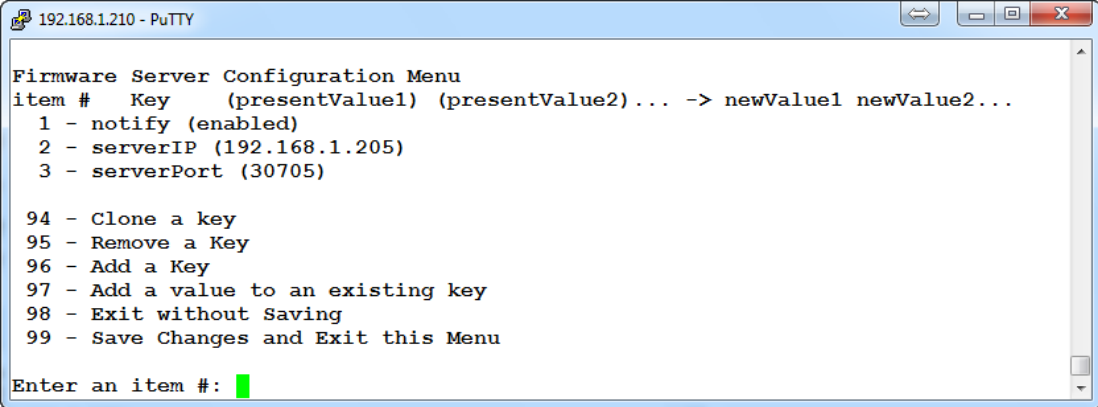
If the Firmware Server is enabled, the SC4 Site Controller will send the Firmware Server its IP address, Date/Time stamp, MAC Address, Unit Type and Firmware Version at random times.

This feature is used in conjunction with a dedicated Firmware Server to enable automatic updates of firmware and web pages on the SC4.

The Firmware Server can be selectively enabled/disabled. The IP address and port number can also be entered from this menu.

To setup the Firmware Server:

1. Press 4 and then ENTER on the SC4 Configuration Program Main Menu. The Firmware Server Configuration Menu appears.

2. Change any of the currently set values as desired. See General Configuration Information for details.

3. To save the changes you've made, press 99 and then press ENTER. (Pressing 98 and then ENTER exits Email Client Configuration without saving any of the changes made.)

5.9.8   NTP Configuration

The Site Controller can set its internal clock from any time server that supports Simple Network Time Protocol (SNTP). There are many such servers around the world. Many of these servers are operated by government standards organizations. Most private networks also have time servers.

NOTE: The Site Controller can be configured to use the local PC time. See Site Setup for details.

This is intended to be used to set the real time clock in Site Controllers that do not have access to a time server. The time is set by sending GMT from the PC to the Site Controller and applying the time offset programmed in the Site Controller as described below. This allows the time to be set in Site Controllers that are not in the same time zone as the PC. If the Site Controller is able to access a time server, the time sent from the PC will be overwritten when the time update occurs (at approximately 10 minutes past the hour).

To setup NTP:

1. Press 6 and then ENTER on the SC4 Configuration Program Main Menu. The NTP Menu appears.

```
50.199.84.245 - PuTTY                                        [ - ] [ □ ] [ X ]
NTP Menu

item #
  1 - Enable or Disable NTP (SNTP)
  2 - Edit the NTP Server Name (time.nist.gov)
  3 - Change Time Zone (US/Eastern)
  4 - Change Time Offset (-0400)

 98 - Return to Main Menu
 99 - Return to Main Menu

Enter an item #: █
```

2. Change any of the currently set values as desired. See General Configuration Information for details.

NOTE: The Site Controller is shipped with the NTP configuration set to get the time from at US National Institute of Standards (NIST) time server (time.nist.gov). The IP addresses of these servers can be changed in the NTP Configuration. If the time server addresses are not configured or the Site Controller is unable to contact either time server, the Site Controller will initialize the time to 00:00:00 1/1/2008. If communication is not established with a time server, the internal clock will run from this point.

The time provided by most time servers is Greenwich Mean Time (GMT). The Site Controller will convert this to Local

Time using a time offset that can be entered in the NTP Configuration.

Enter either a Time Zone or an Offset. You do not need to enter both.

If you choose to use offset rather than a Time Zone, DST (Daylight Savings Time) is not applied to the time setting of the Site Controller.

The following is a list of valid Time Zones that can be entered. Note that entries are case-sensitive.

- US/Alaska

- US/Aleutian

- US/Arizona

- US/Central

- US/Eastern

- US/East-Indiana

- US/Hawaii

- US/Indiana-Starke

- US/Michigan

- US/Mountain

- US/Pacific

- US/Pacific-New

- US/Samoa

NOTE: Other time zones can be used. If your time zone is not listed above, contact PBT technical support.

The entries are concatenations of a directory name and a file within the directory. For example US/Eastern.

Note that entries are case- sensitive.

3. To save the changes you've made, press 99 and then ENTER. (Pressing 98 and then ENTER exits the NTP Menu without saving any of the changes made.)

5.9.9   FTP Configuration
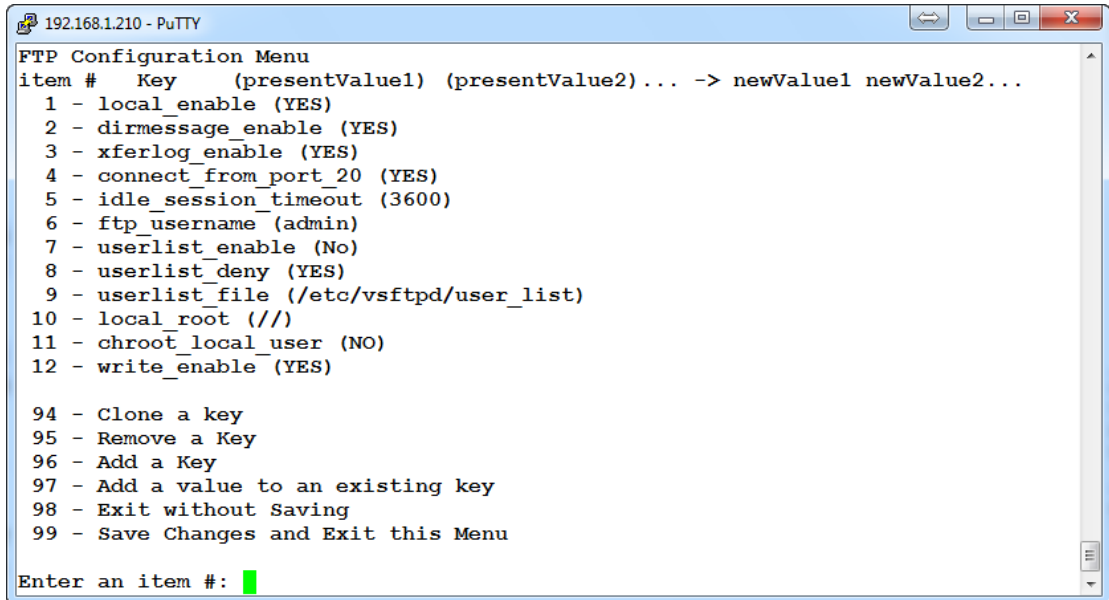
The most common uses for the FTP functionality are to access log files and to update the SC4 firmware. FTP functionality is factory configured for almost all purposes.

The only changes you will likely ever make to this configuration are:

- Enabling/disabling the FTP functionality via the local_enable setting.

- Changing the idle_session_timeout value (the amount of idle time before an FTP session closes).

To make changes to the FTP configuration:

1. Press 3 and then ENTER on the SC4 Configuration Program Main Menu. The FTP Configuration Menu appears.

```
192.168.1.210 - PuTTY

FTP Configuration Menu
item #    Key     (presentValue1) (presentValue2)... -> newValue1 newValue2...
  1 - local_enable (YES)
  2 - dirmessage_enable (YES)
  3 - xferlog_enable (YES)
  4 - connect_from_port_20 (YES)
  5 - idle_session_timeout (3600)
  6 - ftp_username (admin)
  7 - userlist_enable (No)
  8 - userlist_deny (YES)
  9 - userlist_file (/etc/vsftpd/user_list)
 10 - local_root (//)
 11 - chroot_local_user (NO)
 12 - write_enable (YES)

 94 - Clone a key
 95 - Remove a Key
 96 - Add a Key
 97 - Add a value to an existing key
 98 - Exit without Saving
 99 - Save Changes and Exit this Menu

Enter an item #:
```

2. Change any of the currently set values as desired. See General Configuration Information for details.

3. To save the changes you've made, press 99 and then ENTER. (Pressing 98 and then ENTER exits the NTP Menu without saving any of the changes made.)

5.10   Web Server

The Site Controller contains a Web Server that provides a complete set of Web Pages to observe and configure the Monitoring System from a Web Browser.

Currently supported browsers are:

- Google Chrome

- Microsoft Internet Explorer

- Mozilla Firefox

5.10.1   Accessing the Web Server

See Site Controller Web Pages for details on accessing the Site Controller web pages.

5.10.2   Ports

The Site Controller Web server uses Ports 80 and 8081 to receive requests from the PC. The ports on the PC are selected automatically. Port 80 is the normal HTTP port. Port 8081 is used for web sockets to get data from the Site Controller for real time screen updates.

The transaction goes something like this; When the Web browser is opened the PC assigns an outgoing port X and sends a request to port 80 on the Site Controller. The Site Controller replies with a response to the PC sent to port X. The web sockets open a connection on PC port Y to request the real time data and sends this request to Site Controller port 8081. The Site Controller responds to PC port Y with the requested data.

Both ports X and Y are selected by the PC. These ports may be mapped to other ports by routers in the communication path. This does not cause any problems since the Site Controller always responds to the port specified in the request.

If the Web page draws but the web sockets are unable to connect to the Site Controller, chances are good that port 8081 is being blocked by a firewall or router. This could be on your PC or somewhere in the network. Consult with your IT department to find the problem.

Site Controller Web Pages

Site Viewer is a web-based viewer for information collected by the SC4 Site Control Unit. The Site Viewer web interface is a fully featured application that provides complete capability to view and change most of the important aspects of the SC4's configuration and provisioning.
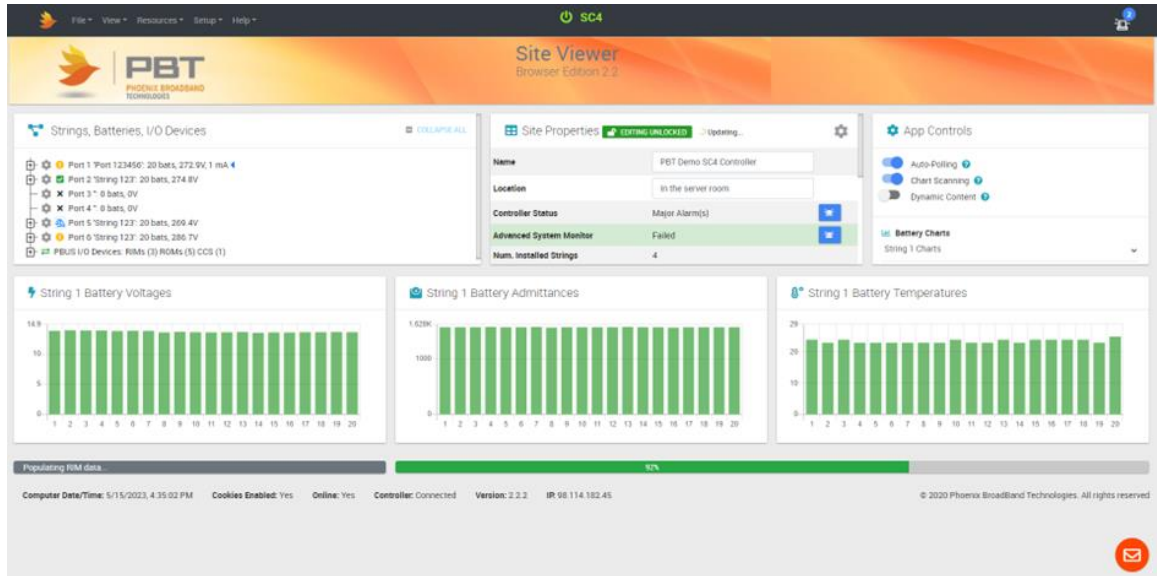
6.1 Site Viewer Web Page

Site Viewer uses HTML5 "WebSockets" to provide a communications interface between the user's PC and the SC4. This eliminates any special network configuration or requirement for any plug-ins on the user's PC. HTML5 and WebSockets are also supported by many modern pocket and tablet devices.

When the Site Controller starts, the previous string configuration is loaded from the database. This configuration is updated as new strings or jars are discovered. During the Site Controller initialization, a message "Site Controller Initializing" will appear. While this message is present, the Site Controller checks for new sensors and collects data for all sensors.

> **NOTE:** Alarm checking, and SNMP communications are disabled until initialization is complete and the Site Controller Initializing message disappears. This prevents alarming or the reporting of erroneous readings.

6.1.1 Accessing the Site Viewer Web Page

To access the Site Viewer web page, do the following:

1. Launch your internet browser.

2. Type the IP address of the Site Controller in the browser's URL address space, prefixed with `http://`. For example:

   `http://192.168.0.18`

   The Site Viewer page appears.
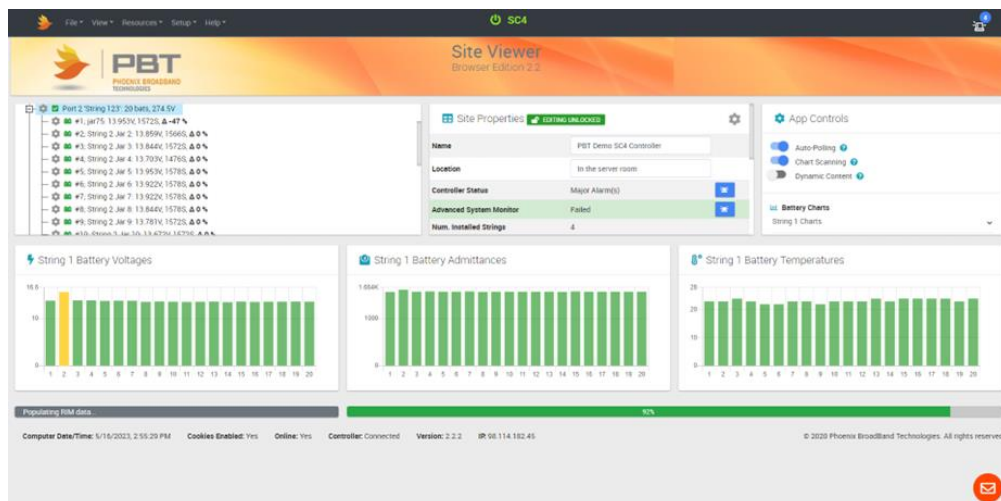
6.1.2   General

These links/controls/indications appear on one or more web pages on the Site Controller GUI.

Menu Bar

The menu bar provides access to specific functions and resources such as log file access, links to documentation, IP configuration, and so on.

Web Page

The Site Viewer web page provides current status information for all connected strings, batteries and I/O devices. Site properties are displayed along with application control settings. Graphs are provided to indicate battery string voltages, admittances, and temperatures.

Page Footer

Site Controller status is displayed on the left side of the page footer. This display generally toggles between "Populating String x Data" and "Populating site Variables" among other things. This indicates normal operation. If you see the message "Connection Error" you may have problems with a firewall or router blocking port 8081. If this persists, contact your IT department for assistance.
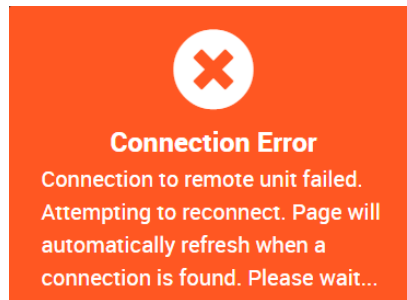
6.1.3   Site Viewer Main Page

The Site Viewer web page provides up to date status information for all connected strings, batteries, and I/O devices. Site properties are displayed along with application control settings. Graphs are provided to indicate battery string voltages, admittances, and temperatures.
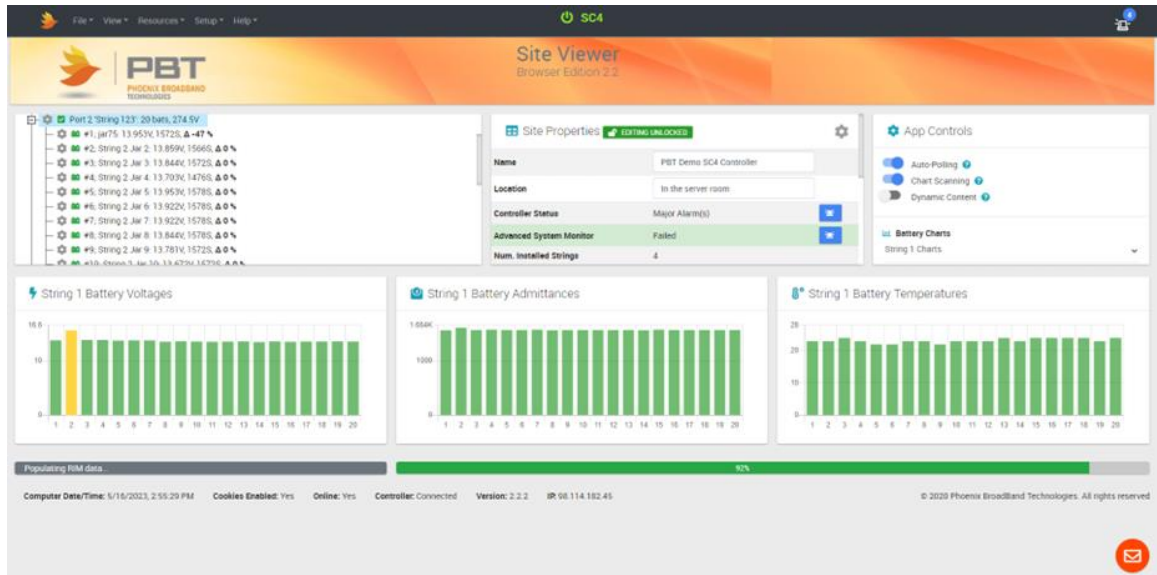
When Site Viewer starts, it immediately displays the Site Viewer graphic page and begins collecting data about the site and all the strings and batteries connected to the SC4. If there is no obvious sign of activity or data after the connection to the SC4 is made, try refreshing the web page. If there is still no obvious sign that Site Viewer is collecting data, check for the correct IP address, verify network connectivity, and/or confirm that your PC has a compatible version of the web browser.

For purposes of discussion, the Site Viewer web page can be divided into the following functional areas:

- Banner

- System Tree pane

- Site Properties pane

- App Controls pane

- Status pane

Each of these is discussed below.

6.1.3.1 Banner

The Site Viewer logo banner contains the product logo, including a display of the version of Site Viewer currently loaded.

6.1.3.2 System Tree Pane

The system tree contains a hierarchical display of all the strings, batteries and I/O devices connected to the SCU. Clicking on a tree branch toggles it folded or unfolded to display all the elements within that branch. Tree branches are color-coded and icon-coded with status information. This includes each of the physical PORTS on the SC4 as well as the PBUS ports.
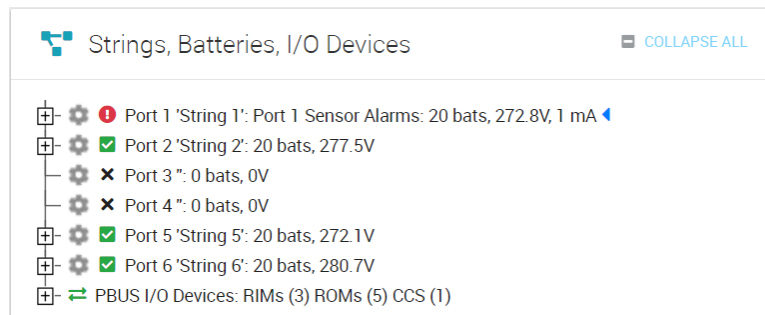
Double-clicking or clicking the plus sign on any of the active data connections expands it to display all subsidiary devices.
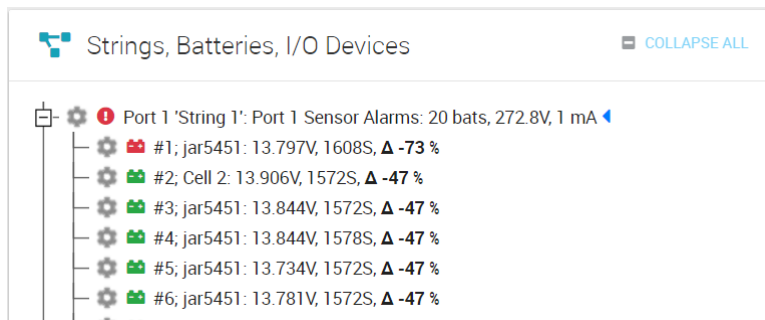
Right-click on any entry to bring up a popup which contains additional information about the selected item.
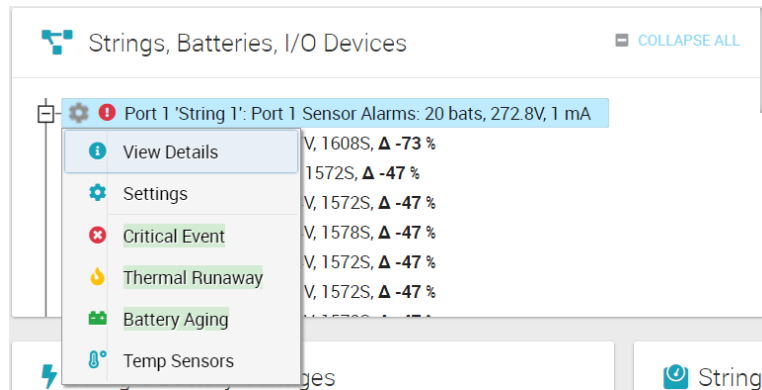
Double-clicking or clicking the minus sign on the active data connection again contracts the display to the top level only.

Data updates can be disabled using the App Controls pane.

Each branch in the Site Viewer tree has a color-coded icon that indicates the alarm status of the branch or its components:

Green = Everything is normal.

Bright Green = Taking Admittance Measurement

Yellow = Minor alarm with something on or within String or Group.

Red = Major alarm with something on or within String or Group.

Magenta = Warning condition.

Grey = Node Disabled.

String status

Combined String status

Split String status

Group status (no battery sensors)

Battery status

Measuring Indicator

Balancing Indicator

Expand Tree Node

Collapse Tree Node

Port Status

Settings Gear

6.1.3.2.1   Port Information

Each port shown in the Tree View shows the port number, port name (user configurable), alarms (if any), how many sensors are attached (bats), the string voltage and float current (if available).
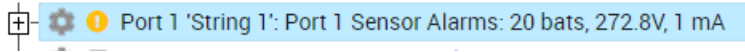
6.1.3.2.1.1   Port or Group Details

Right-clicking on the port and selecting "View Details" or left-clicking on the Gear Icon next to the port (if available) will bring up the port or group Details. The following fields are listed below.

Name – User configurable (must unlock editing first).

String Status –Displays the present string status which is a summary of the sensor status as described below.

String Status	Description
Normal	The status of all sensors on this string are Normal
Disabled	The string is disabled through SNMP
Shorted	The Site Controller output is shorted somewhere in the sensor daisy chain
MissingSensors	More sensors were expected
TooManySensors	More sensors are present than the string can handle
SensorFault	One or more sensors are not communicating
Alarms	One or more sensors have alarms
Initializing	The string is initializing
SensorDisabled	One or more sensors are disabled through SNMP
StringDisconnected	Nothing is connected to the Site Controller string port
NoSensorCom	Something is connected to the port, but no sensors are communicating

Discharge Status – Displays the present state of the string: "Normal" or "Discharge." The discharge event is detected by the Float Current Sensor or by the Automatic Discharge Detection Threshold Voltage. A count of the Discharge Events and the duration of the Present (or Previous) Event are available in the Settings tab under Discharge Settings. A digital alarm (major or minor) can be set for Discharge Status by clicking the corresponding alarm button. ▣ (See Setting Alarms for details.)

String Voltage – Displays the total string voltage measured by the sensors. For a Low Voltage string this voltage is measured directly by the sensor on the most negative jar. For a High Voltage string this voltage is the sum of the individual jar voltages. Analog alarms (major and/or minor) can be set by clicking the corresponding alarm button. ▣ (See Setting Alarms for details.)

Voltage Delta – Displays the difference between the highest and lowest jar voltage within the string. Too much variation in jar voltages could be an indication that there are problems with some jars. Analog alarms (major and/or minor) can be set by clicking the corresponding alarm button. ▣ (See Setting Alarms for details.)

Float Current & Ripple Current – Displays the float & ripple current when there is a Current Monitoring Interface (CMI) connected to the Site Controller P-Bus A port (with its address set to the correct string number) and when the Float Sensor (toroid) is connected to the CMI. When both are connected, the Float & Ripple Current readings are displayed. If either one is not connected, the Float & Ripple Current readings will display "N/A". Analog alarms (major and/or minor) can be set by clicking the corresponding alarm button. ▣ (See Setting Alarms for details.)

Ripple Voltage – Displays the value calculated based off the Ripple Current. If either the CMI or the Float Sensor is not connected, the reading will display "N/A".

CMI COM – Displays "Normal" when the Site Controller is communicating with the Current Monitoring Interface. "Failed" is displayed when the Site Controller has lost communications with the Current Monitoring Interface. "Not Installed" is displayed if the port never had a CMI associated with it. A digital alarm (major or minor) can be set by clicking the corresponding alarm button. ▣ (See Setting Alarms for details.)

Float Sensor COM – Displays the status of the Float Sensor, either N/A, Normal or Failed. A digital alarm (major or minor) can be set by clicking the corresponding alarm button. 🔔 (See Setting Alarms for details.)

Battery Sensor COM – Displays the status of battery sensor communications and will show "Normal" when the Site Controller is communicating with all the battery sensors in the string and will show "Failed" when the Site Controller has lost communications with one or more battery sensors. A digital alarm (major or minor) can be set by clicking the corresponding alarm button. 🔔 (See Setting Alarms for details.)

Battery Model – User configurable to enter in the battery model (must unlock editing first). If a battery model number is selected in the Runtime Estimator, it will override this field.

Battery Warranty – User can select from 0 to 20 years.

Installation Date – User can enter in date of installation.

Battery Manufacture Date – User can enter in date of manufacture.

Logging Interval – User can select Daily (default), Hourly, or Disabled (not recommended).

Battery Balancing – User can select Disabled (default) or Enabled.

String Type – Displays the type sensors connected to the port either DCP(LV) or UPS(HV). LV refers to Low Voltage type sensors and HV refers to High Voltage type sensors. (See Sensor Selector Guide for details.)

6.1.3.2.1.2 Port or Group Settings

Right-clicking on the port and selecting "View Details" or left-clicking on the Gear Icon next to the port (if available) will bring up the port or group Details and from there you can click on the Settings tab. The following fields are listed below.

Discharge Settings

Automatic Discharge Detection – The Automatic Discharge Detection area allows you to specify a discharge threshold. When set to a value other than 0, if the string voltage measurement for that port is below the specified threshold identified the SC4 will recognize the string in discharge. A digital alarm (major or minor) can be set by clicking the corresponding alarm button.   (See Setting Alarms for details.)

Simulated Discharge Control – The Simulated Discharge Control area allows you to manually simulate a discharge by clicking the **START** button. This instructs the SC4 to generate more frequent log entries as is done in the case of real discharge events. The SC4 will remain in this mode until the specified Timeout (Min) (in minutes) has elapsed or the user manually stops the simulated discharge.

Select Discharge Current Source – If equipped with a discharge sensor (optional) you can select the RIM number and Input number associated with the discharge sensor and assign it to this port. When the string goes into discharge the values returned from the discharge sensor will be recorded in the discharge log file for that string.

Discharge Statistics – The discharge event is detected by the Float Current Sensor or by the discharge string voltage threshold. A count of the Discharge Events and the duration of the Present (or Previous) Event and the Total Time (total discharge time) are also displayed. The event counter and total time are stored in nonvolatile memory and can be reset from SNMP or by deleting the string. Users can also reset all values by pressing RESET DISCHARGE TIME & EVENT COUNT button.

NOTE: Admittance measurements and Battery Balancing are automatically disabled on all strings when a discharge event is detected on any string.

Logging Settings

Status – Displays the USB Flash Drive Status

USB Flash Drive Status	Description
Removed	USB drive has been removed
Trouble	Read-only or corrupt file system
Failed	Inoperative
Full	No more free space left on drive
Ready	Normal mode ready to read or write
In Use	Reading or writing to drive

Periodic Logging – User can select Daily (default), Hourly, or Disabled (not recommended). Pressing the LOG NOW button writes the data associated with the string into the String log file (str_x.csv) on the flash drive.

Discharge Logging – The SC4 will display a discharge logging interval of 10 or 20 seconds depending on how many sensors are attached to the SC4. Discharge logging can be disabled with the slider button (not recommended).

Actions

Actions –

- Measure Admittance on all Jars – This button forces each sensor on the string to take a new admittance measurement.
- Discover Now – This button forces the SC4 into discovery mode for this port.
- Reset String X – This button sends a global reset command down to all sensors on this port. After resetting the string will reinitialize.

Disable / Enable Sliders –

- **Disable Discovery for Port X** – If disabled the SC4 will skip this port during discovery.

- **Disable the Advanced System Monitor for Port X** – When the Advanced System Monitor is enabled in Site Properties, this slider gives you the option to turn off Advanced System Monitor for individual ports.
- **Enable Battery Balancing** – This slider allows the user to enable battery balancing. Battery Balancing is a PBT patent pending process that equally distributes the charge voltage throughout the battery string.

Ripple Current Measurement – Displays the present Ripple Current reading and the Date/Time of the measurement. Measurements are taken once per hour. User can force a new measurement by pressing the MEASURE NOW button.

Delete String – Pressing the DELETE STRING X button will delete all string information including all alarm settings for the port.

<u>**Alarm Settings**</u>

Aggregate Admittance Alarm – User configurable to generate an alarm when more than x blocs have an admittance change greater than x %. To generate an alarm both fields must have nonzero entries. A digital alarm (major or minor) can be set by clicking the corresponding alarm button. (See Setting Alarms for details.)

Notifications – Not used at this time.

6.1.3.2.1.3 Port or Group Advanced System Monitor

The Advanced System Monitor continuously monitors float charging current, ambient temperature and battery temperatures at multiple points. If any battery temperature rises above the ambient temperature by an amount that exceeds user-defined thresholds, an alarm condition is generated, SNMP traps are sent and a contact closure on the control unit is activated. If any float current exceeds user-defined thresholds, an alarm is also generated in a similar manner.

The real power of the Advanced System Monitor is in its intelligent correlation algorithms. There are three special alarms that are generated algorithmically.

- **Critical Event** - If, at any time, any battery's ambient referenced temperature exceeds a user-defined value AND the string's float current exceeds a user-defined value, a "critical event" alarm condition is generated.
- **Thermal Runaway** - If the time since a recent discharge or recharge event is more than a user-defined interval AND any battery's ambient referenced temperature exceeds a user-defined limit AND the associated float current has risen a user-defined amount from the user-defined baseline, a "thermal runaway" alarm condition is generated.
- **Battery Aging** - If the time since a recent discharge or recharge event exceeds a user-defined interval AND the float current exceeds a user-defined value, BUT the temperature is below a user-defined value, a "battery aging" alarm condition is generated.

For the Advanced System Monitor to function properly on a port you need to have Float Current, an Ambient Temperature probe, and either battery sensors or a separate temperature probe on the battery string.

Right-clicking on the port and selecting "Critical Event", "Thermal Runaway", "Battery Aging", "Temp Sensors" will bring up the Advanced System Monitor dialog. The following fields are listed below.


At the top of the Advanced System Monitor dialog there is an enable / disable slider where you can choose whether to have this port support Advanced System Monitor. Pressing the LOG NOW button writes the data associated with the Advanced System Monitor parameters to the Group log file (group_x.csv) on the flash drive for this port.

Temperature Sensor Config

To set up temperature probes, click on the TEMPERATURE SENSOR CONFIG button. If no temperature probes have been setup click on the ADD NEW TEMPERATURE SENSOR button and select Ambient Temperature.
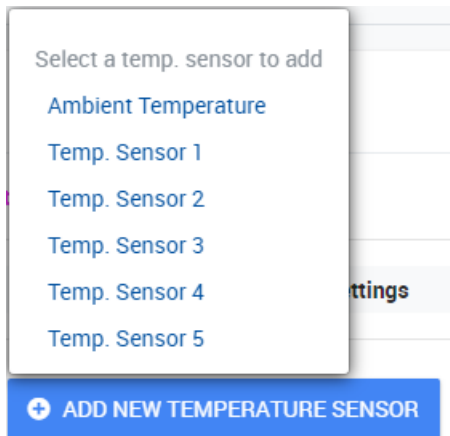
To configure the Ambient Temperature, click on the gear button.
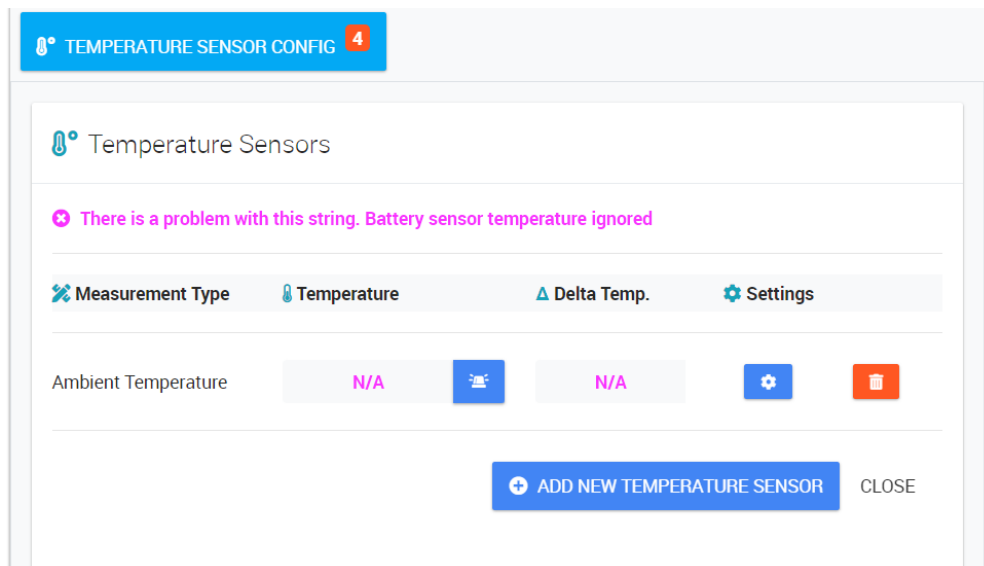
Select a RIM number and Input Number which has the ambient temperature probe attached. When set up properly the RIM Com Status and Temp. Sensor Status should say Normal. A digital alarm (major or minor) can be set by clicking the corresponding alarm button. (See Setting Alarms for details.) Repeat the process for adding any other temperature probes connected to the RIM and attached to the battery string you are configuring. When all temperature probes are configured, press the GO BACK TO TEMP SENSORS button.

To include temperatures from battery sensors attached to the string, check the checkbox below the LOG NOW button.

Critical Event

To set up a Critical Event, click on the Critical Event link and enter values into the Max Delta Temp and Float Current fields. When both conditions are met a Critical Event event will be triggered. A digital alarm (major or minor) can be set by clicking the corresponding alarm button.   (See Setting Alarms for details.)

Thermal Runaway

To set up Thermal Runaway, click on the Thermal Runaway link and enter values into the Time since discharge, Max Delta Temp and Float Current fields. When all 3 conditions are met a Thermal Runaway event will be triggered. A digital alarm (major or minor) can be set by clicking the corresponding alarm button. ☀ (See Setting Alarms for details.)

Circuit Breaker Control – Requires an optional ROM present in the system and properly wired to the breaker. Press the CIRCUIT BREAKER CONTROL button to select the ROM number and Output number.   Once configured if a Thermal Runaway event occurs it will activate the ROM Output, tripping the breaker which isolates the battery string from the charger and will stop the Thermal Runaway. After 15 seconds the ROM Output is set back to Normal to facilitate closing the breaker in the future. A digital alarm (major or minor) can be set by clicking the corresponding alarm button. ☀ (See Setting Alarms for details.)

There is also a safety backup in association with Circuit Breaker Control. If you enable the Major High Alarm Limit on any of the Group X, Measurement X temperature probes (see Temperature Sensor Config) and the temperature of that probe crosses the threshold for greater than 120 seconds it will activate the ROM Output to trip the breaker, after 15 seconds the ROM Output is set back to Normal to facilitate closing the breaker in the future.

Battery Aging

To set up a Battery Aging, click on the Battery Aging link and enter values into Time Since Discharge, Max Delta Temp, Float Current delta, and Float Baseline fields. When all 3 conditions are met continuously for 48 hours a Battery Aging event will be triggered (the Battery Aging Settings screen will show a countdown timer starting at 2880 minutes). A digital alarm (major or minor) can be set by clicking the corresponding alarm button. ☀ (See Setting Alarms for details.)

6.1.3.2.2 Battery Information

Expanding the port will show the individual jars / cells. The information shown will be the jar / cell name (user configurable), the jar / cell voltage, the jar / cell admittance and the jar / cell admittance change in a delta percentage as compared to the initial admittance set.

6.1.3.2.2.1 Battery Details

Right-clicking on the individual cell / jar and selecting "View Details" or left-clicking on the Gear Icon next to the cell / jar (if available) will bring up the cell / jar Details. The following fields are listed below.

Name – User configurable (must unlock editing first).

Voltage – Displays the present voltage to three decimal places. Measurements are made and reported each time the sensor is polled. Analog alarms (major and/or minor) can be set by clicking the corresponding alarm button. ▣ (See Setting Alarms for details.)

Admittance Change – Displays the current admittance reading in Siemens along with the admittance change delta percentage as compared to the initial admittance. Analog alarms (major and/or minor) can be set by clicking the corresponding alarm button. ▣ (See Setting Alarms for details.) The Cell Admittance Change indicates the difference between the present Cell Admittance and the user specified Initial Cell Admittance expressed as a percentage. This is, perhaps, the most useful parameter on this display. The Cell Admittance Change provides an indication of how the jar has changed over time. (If no Initial Cell Admittance has been set, this indication will read "N/A." The date and time of the admittance measurement and the initial admittance setting add a time perspective to the change.

Last Admittance – Displays the date and time the last admittance reading was taken.

Temperature – Displays the current temperature. Measurements are made and reported each time the sensor is polled. Analog alarms (major and/or minor) can be set by clicking the corresponding alarm button. 📧 (See Setting Alarms for details.)

Temperature (hold) – Activating Battery Balancing and taking Admittance Measurements can heat up the sensor. When this happens the Site Controller will put a hold on taking a temperature measurement and allow the sensor to cool back down to jar temperature.

Temp. Measurement Time – Displays the date and time the last temperature measurement was taken.

Ripple Voltage – Displays the current ripple voltage.

Software Version – Displays the battery sensor firmware version.

Hardware Version – Displays the battery sensor hardware version.

Electrolyte Level – Displays the status of electrolyte level. If the battery sensor is equipped with the electrolyte level detection option, the Electrolyte Level is displayed as either "Normal", "Low," "Warning," "Sensor Com Failed," or "Not Installed."

Sensor Address – Displays the sensor address programmed into the sensor from the factory for high voltage sensors. For low voltage sensors it will display zero.

Physical Port, Jar – Displays the physical port number the battery sensor daisy chain is connected to on the rear of the SC4 along with the assigned jar number.

6.1.3.2.2.2 Battery Settings

Right-clicking on the individual cell / jar and selecting "Settings" or left-clicking on the Gear Icon next to the port (if available) will bring up the cell / jar Details and from there you can click on the Settings tab. Pressing the PREVIOUS JAR / NEXT JAR will cycle through all the jars.

Sensor Address – Displays the current sensor address (zero for low voltage sensors). Each High Voltage sensor has a factory programmed address. These addresses are recorded during the discovery process. The sensors are discovered in a random order and assigned sequentially to the jars. This results in the random ordering of the jars shown on the web page. To correct this ordering problem, start with jar 1 and enter the address of the sensor recorded during installation in the Change Sensor Address field. When all addresses have been changed reset the String to reinitialize the sensors with the correct jar numbers. This should be done before entering any jar specific information such as alarm limits or initial admittance.

Admittance Settings

Jar Information – Displays the current cell admittance, initial admittance (if set), and calculated cell impedance. If the initial admittance has not been set the initial admittance field will display zero.

Measure – Displays the sensor status (see table below) and sensor control state. The Sensor Control State indicates whether monitoring of the sensor is Enabled or Disabled. (Control state can be set via SNMP.) To force an admittance measurement, press the MEASURE NOW button.

Sensor Status	Description
Normal	This sensor is operating normally
Fault	There is no communications with this sensor
Measuring	This sensor is making an admittance measurement
Sensor Disabled	This sensor was disabled through SNMP
String Disabled	This string was disabled through SNMP
Missing	This sensor was expected based on the string voltage, but is not present
Measurement Failed	The last admittance measurement failed

Set Initial Cell Admittance – Users can set an admittance baseline for the individual cell /jar or the entire string. There are two options, setting a baseline based on the present admittance reading and setting a baseline based on a specification. For either option you can apply this to the current jar only or to the entire string by selecting the appropriate radio button.

- To set a baseline based on the present admittance reading press the COPY PRESENT CELL ADMITTANCE TO INITIAL CELL ADMITTANCE button. The present cell admittance value will be copied to the initial cell admittance value and the Cell Admittance Change delta percentage will be updated to show the difference between the Cell Admittance and the Initial Cell Admittance. The date and time will be recorded in the Initial Admittance Time field.
- To set a baseline based on a specification, enter the baseline admittance reading into the Set Initial Cell Admittance field and press the INITIAL CELL ADMITTANCE button. The value will appear in the Initial Cell Admittance field and the Cell Admittance delta percentage will be updated to show the difference between the Cell Admittance and the Initial Cell Admittance. The date and time will be recorded in the Initial Admittance Time field.

Logging Settings

On-Demand Logging – Press the LOG NOW button to create a manual entry in the string log file (str_x.csv).

Actions

Delete Jar – Press the DELETE JARX button to delete the current jar. This will remove the jar from the string and any associated alarm settings.

LED Controls – Displays the Sensor LED Control ("Normal" or "Flash Green/Red"). Clicking the FLASH LED button commands the battery sensor to flash its LED alternating between Red and Green. The flashing LED can help onsite personnel locate a jar in a large deployment. Depending on what the Site Controller is doing it may take a minute for the LED to start or stop flashing when the button is clicked.

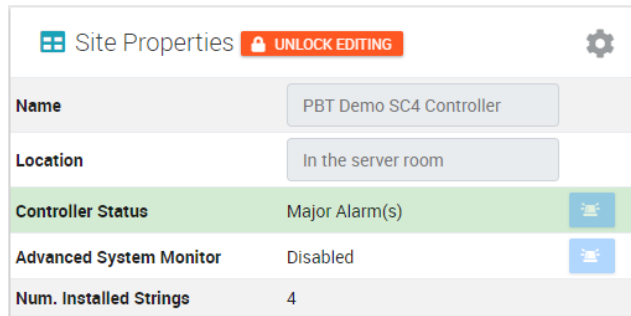Additional LED states can be set when using SNMP Manager. (See SNMP for details.).

Alarm Settings

This section is not used currently.

Notifications

This section is not used currently.

6.1.3.3   Site Properties

The Site Properties pane displays site specific information for the SC4. This includes the SC4 location, name, number of installed strings, string mode, overall status, unit temperature, software version, and IP configuration details.

Site Properties contain user configurable fields Name and Location (must unlock editing first).

Other status fields in Site Properties that cannot be edited are:

Controller Status – Indicates status of Normal, Minor Alarms, Major Alarms or if any Port is in Discharge.

Advanced System Monitor – Indicates Status of Disabled, Normal, Minor Alarms, Major Alarms, Failed, or Trouble.

Number of Strings Installed – Shows number of ports that have battery sensors attached.

Controller Temperature – Shows the internal temperature within the SC4.

Firmware Version – Shows the currently loaded firmware version.

Linux Version – Shows the currently loaded OS version.

MAC Address - Shows the Site Controller Media Access Control (MAC) address. The MAC address is a unique identifier assigned to network interfaces for communications on the physical network segment. MAC addresses are used as a network address for most IEEE 802 network technologies, including Ethernet and WiFi.

IPv4 IP Address – Shows the current IP Address.

IPv4 Gateway – Shows the current gateway address.

IPv4 Netmask – Shows the current netmask.

DHCP Status – Shows either Enabled or Disabled.

Up Time - Shows the time the Site Controller has been running since the last reset.
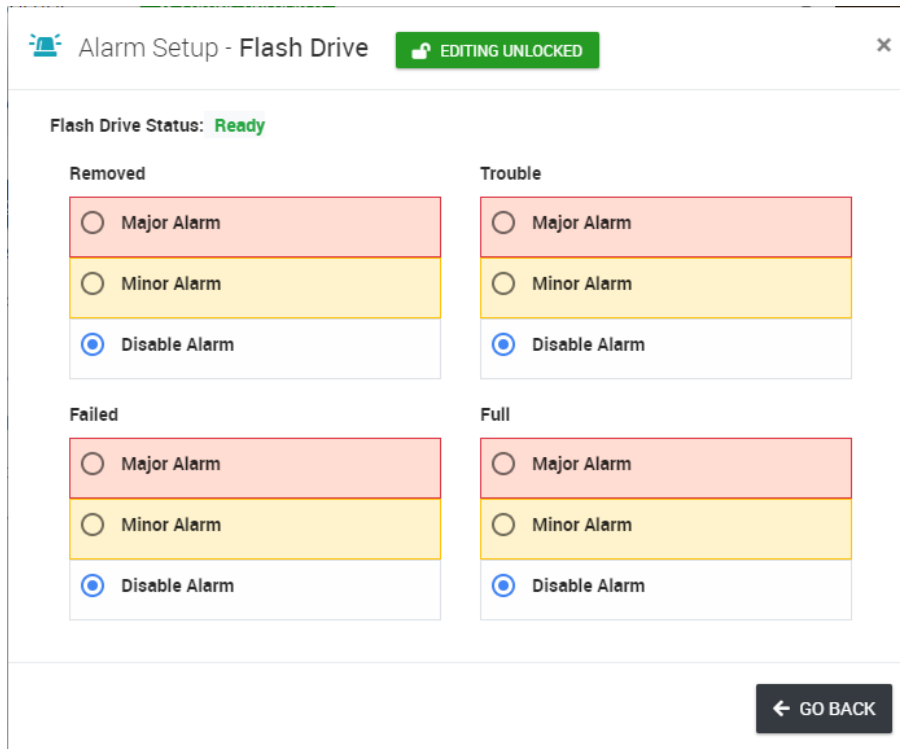
System Time – Shows the current SC4 time and date.

6.1.3.3.1 Site Properties (additional settings)

Clicking on the Gear Icon in Site Properties will bring up a dialog with additional settings.

Logging Settings

Event Logging – Displays the Flash Drive Status and Free Space in MB. To disable event logging move the slider to the left (not recommended). Digital alarms (major and/or minor) can be set by clicking the corresponding alarm button. 🔔 Individual alarms can be set on the four different parameters shown below.

Actions

Site Information – Displays the Admittance Measurement Interval, Min Alarm Time, and Admittance Meter Notes.

- To change the Admittance Measurement Interval for the Site Controller, enter the desired interval, in hours, in the Change Admittance Measurement Interval (Hours) field. Setting this field to zero will disable all admittance measurements.
- The Minimum Alarm Time (Sec) field allows you to specify how long an alarm condition exists (in seconds) before it triggers an alarm.
- The Admittance Meter Notes field provides a location to note the type and serial number of the meter used to make the reference measurements. (This is useful since there is substantial variation in the measurements made by different model meters.) This field is limited to 32 characters.

Maintenance Mode – Maintenance mode is used for suppressing alarms for a specified amount of time. Enter in the amount of anticipated time in minutes and move the slider to the right to enable Maintenance Mode. When activated, alarm processing will be suspended until the timer runs out or the slider is moved back to the left.

<u>**Actions**</u>

Setup Alarm Outputs – Pressing the SETUP ALARM OUTPUTS allows you to setup up to four built-in alarm outputs on the Site Controller. The configuration of these outputs is identical to the ROM configuration. See Using Controller to Provision Alarm ROM Outputs for instructions. These outputs can be wired from the Aux port on the Site Controller to external devices that accept contact closure inputs. Refer to the *SC4 AUX Port Wiring Diagram (705-000021-00)* for more information.

Select Site Output – Select one of the 4 built in outputs using the radio buttons. When selected each output will show the what the active state of the output will be (ie, "Relay Contacts Closed"). Change the active relay state with the slider button.

Select Site Output X Control Mode – With one of the outputs selected in Select Site Output, select one of the 4 modes.

- **Manual Control** – change the state of the relay only through the web page.
- **Site Controller – Major Alarms** – Relay state will change with only major alarms in the selected categories (see category list below).
- **Site Controller – Minor Alarms** – Relay state will change with only minor alarms in the selected categories (see category list below).
- **Site Controller – Major & Minor Alarms** – Relay state will change with major or minor alarms in the selected categories (see category list below).

To select a category, move the slider to the right. Multiple categories can be selected.
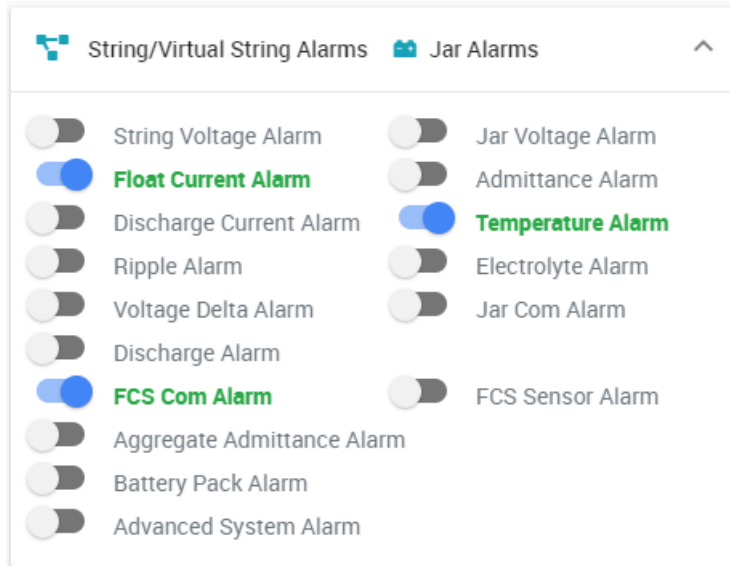
If any alarm is generated within the category and the severity is also selected in Output Control Mode, it will set the relay to the active state. Once the alarm clears it will set the relay back to the inactive state. If multiple categories are selected, one or more alarms will activate the relay but all selected categories / severities must be cleared in order to set the relay back to the inactive state.

Discover All Sensors On All Ports – Pressing this button will force the SC4 into discovery mode to identify any new sensors that have been connected. The Site Controller will periodically discover new sensors, but clicking the button initiates the discovery process immediately.

Set Controller Time From PC – Pressing this button sets the real time clock in the Site Controller to the local machine (PC) time. This is intended to be used to set the real time clock in Site Controllers that do not have access to a time server. The time is set by sending GMT from the PC to the Site Controller and applying the time offset programmed in the Site Controller. This may not result in the Site Controller time being the same as the PC time, allowing the time to be set in Site Controllers that are not in the same time zone as the PC. If the Site Controller is able to access a time server, the time sent from the PC will be overwritten when the time update occurs (at approximately 10 minutes past the hour). (See NTP Configuration for details.)

RESET DISCHARGE TIME & EVENT COUNT – Pressing this button resets all discharge time and event counters in the SC4 to zero.

FLASH MODEM POWER – Pressing this button will interrupt the 12Vdc output from the Site Controller. (This is useful for cycling the power of a connected component, such as a modem.)

MEASURE ADMITTANCE ON ALL JARS – Pressing this button will force an admittance measurement on all jars connected to the SC4.

RESET ALL SENSORS – Pressing this button sends a reset command to every battery sensor on every string. The database is unaffected. The sensors will be rediscovered during the next polling cycle.

RESET CONTROLLER – Pressing this button will reboot the SC4. The database is unaffected.

<u>**Account**</u>

LOG OFF – Pressing this button will log off the user and editing will be locked until logging in again.

<u>**Advanced System Features**</u>

Advanced System Monitor – To enable Advanced System Monitor, slide the button to the right, do disable slide to the left.

Alarm Annunciator – When enabled any alarm within the controller will constantly cycle the power on the 12 VDC output of the SC4. Users can attach a 12 volt bulb to have a local flashing indicator that there is an alarm.

<u>**Information**</u>

File System Free Space – Displays the File System Status and Free Space available in MB.

<u>**Virtual String**</u>

Activate Virtual Strings – There are 3 radio buttons, Combined Strings, Split Strings, and Disable Virtual Strings (default). There are two different types of virtual strings. The Site Controller can:

- Combine separate port inputs to create a virtual string.
- Split the sensors on one port input into several virtual strings.

Details on how to set up the different types of virtual strings are provided below.

<u>**Combining Strings**</u>

The Site Controller has a limitation of 40 sensors for each of the 6 ports (240 total). If your battery string contains more than 40 jars, you can attach the first 40 sensors to port 1 and attach any subsequent sensors (up to 40 at a time) to ports 2 through 6. You can then combine them so that they are displayed on the Site Controller web pages as a single string.

NOTE: The combine feature only works with High Voltage sensors.

When combining strings there is a limit of three virtual strings.

To combine strings, do the following:

1. Choose the Combined Strings radio button, a confirmation dialog will appear with a warning that a restart is required, click YES.
2. The Site Controller reconfigures the current string and battery database, converts internal memory mappings, and sets up the proper log file system for the virtual string type. These operations may take a few minutes during which time the Site Controller will be unresponsive. After the conversion is complete the Site Controller will reset and rediscover any sensors.

3. When initialization is complete, reorder the sensor addresses on each physical port and reset the string before adding that string to the virtual string. (See Cell Setup/Jar Setup for details on reordering sensors.)

NOTE: You must reorder the sensor addresses for each physical port and reset the string before adding that string to the virtual string.

4. When all the physical strings have been reordered and reset, add them to the virtual string. To do this, do the following:
    a. Go to the Gear Icon in Site Properties and click on Virtual String.
    b. In the Manage Combined Virtual Strings dialog, select "A", "B", or "C" from the Combined String dropdown.
    c. Check the box next to each port you want to include in the virtual string.
    d. After selecting ports to include, click the X button to close.
    e. If monitoring float current or using an Unintentional Ground Monitor (UGM) go to the virtual string Settings page by clicking on the Gear Icon in the Tree View next to the virtual string, then click on Settings.
        i. In the Select Current Sensor use the drop-down to select the address of the CMI associated with the virtual string.
        ii. In the Select UGM use the drop-down to select the address of the UGM associated with the virtual string.
5. Finally, enable or disable the display of the physical ports.

Split Strings

The Site Controller has a limitation of 40 sensors for each of the 6 ports (240 total). Under normal operation each port is considered a separate battery string. It is possible to have more than 6 strings by splitting the sensors on one or more of the ports. For example, if you have ten 24-volt battery strings (each string is made up of two 12-volt jars), then you can put all 20 battery sensors on the same input into the controller, and then split them into 10 virtual strings. The battery sensors must be the High Voltage type.

WARNING: Only use High Voltage battery sensors when splitting strings. Using Low Voltage battery sensors will damage the sensors and may present a shock hazard. Read the sensor installation instructions carefully.

NOTE: The split feature only works with High Voltage sensors.

When splitting strings there is a limit of 32 virtual strings.

To split strings, do the following:

1. Choose the Split Strings radio button, a confirmation dialog will appear with a warning that a restart is required, click YES.

2. The Site Controller reconfigures the current string and battery database, converts internal memory mappings, and sets up the proper log file system for the virtual string type. These operations may take a few minutes during which time the Site Controller will be

unresponsive. After the conversion is complete the Site Controller will reset and rediscover any sensors.

3. When initialization is complete, reorder the sensor addresses for each physical port and reset the string before splitting that port into virtual strings. (See Cell Setup/Jar Setup for details on reordering sensors.)

> **NOTE:** You must reorder the sensor addresses for each physical port and reset the string before adding that string to the virtual string.

4. When all the physical ports have been reordered and reset, you must define how you want to split the string. To do this, do the following:

    a. Go to the Gear Icon in Site Properties and click on Virtual String. A new section called Manage Split Virtual Strings will be on the right.

    b. Use the dropdowns to specify the Port, Jars per Substring, and Substrings per Port.

    c. Press the SAVE CHANGES button, a confirmation dialog box appears.

d. Click YES. The Site Controller will assign the first (Jars per Substring) to Virtual String 1, then the next (Jars per Substring) to Virtual String 2, and so on, until it reaches (Substrings on Port X). For this reason, it is imperative that you first reorder and reset the strings as specified in step 3 above.

> **NOTE:** When monitoring float current, only one virtual string per physical input will report float current. The current shows up on the first virtual substring.

e. When one or more strings have been successfully split, the virtual strings are displayed on the Tree View. (For this example, the, "**Show Physical Strings"** is enabled.)
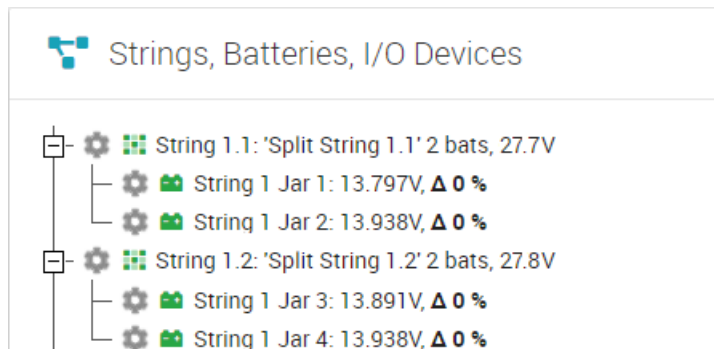
You can then work with the virtual strings in the same manner that you work with real physical port inputs.

6.1.3.4   App Controls

The "App Controls" pane contains options that can be selected to modify the operation of the app. It also contains information about the status of the app. Some controls are "persistent", meaning their setting will be preserved even if Site Viewer is shut down and restarted.
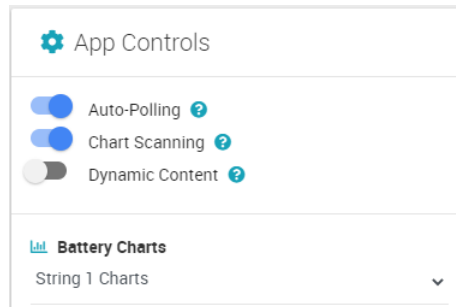
6.1.3.5   Charting Area Panes

The Charting Area panes provide graphs illustrating the current string voltages, admittances and temperatures cycled for each populated port, unless you have a single port selected in the App Controls pane. Hovering your mouse over any of the graph items provides the actual numeric value associated with the corresponding item. The graphs are color coded with status information, like the tree color coding.
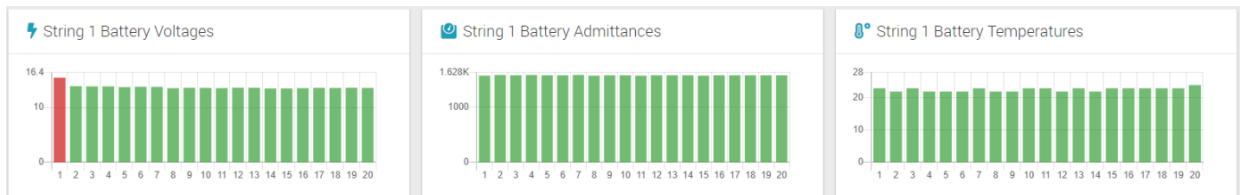
Chart scanning can be disabled using the App Controls pane.

6.1.4　Site Viewer Menu Bar

The menu bar provides access to specific functions and resources such as log file access, links to documentation, IP configuration, and so on.

Each menu item is described below.

File Menu

File > Print Screen - Prints the presently viewed screen to the default printer. For best results, use a color printer.

File > Log Files - Displays the list of log files for the SC4. These are .csv files which are readable, viewable, and graphable in any csv compatible spreadsheet program. Clicking on a file, downloads it to your browser's "Downloads" folder.

File > Manuals, Drivers & Utilities - Displays a list of documents and utility programs stored on the SC4's flash drive. Clicking on an item, downloads it to your browser's "Downloads" folder.

File > Site Viewer Manual – Launches the Site Viewer manual in a separate browser window.

View Menu

View > Classic Web Interface - Opens a new window that displays the SC4's Classic web pages. This requires certain ports to be open on your network as well as the Jave plug-in on your computer.

Resources Menu

This provides access to manuals and videos from the PBT web site. These will be the most up-to-date versions available. Requires internet access from your PC.

Setup Menu

This is a password protected area that allows you to change the IP address of the SC4. Contact your system administrator for access.

> **NOTE:** By default, the unit password is:
>
>   admin
>
> See SC4 Configuration Program for details on configuring the Site Controller password.

Help Menu

This provides access to the Site Viewer FAQ as well as the version of Site Viewer currently running.

6.1.4.1   Site Viewer IP Configuration

Choosing **Setup > IP Configuration** from the Site Viewer menu bar allows you to configure the IP settings of the connected SC4.

1. Choose **Setup > IP Configuration** from the Site Viewer menu bar. The Admin Password dialog box appears.

NOTE: By default, the unit password is:

`admin`

See <u>SC4 Configuration Program</u> for details on configuring the Site Controller password.

2. Enter the administrative password for the SC4 in the field on the dialog box and then click **Enter**. The IPv4 Configuration dialog box appears.

3. Change the IP settings as desired.
4. Click **Enter**. The SC4 will reboot and restart with the selected settings in place.

SNMP

The Phoenix Broadband Battery Monitoring System provides an SNMP interface for third party software management. The advantage of our approach is that it allows operators to choose the software with which they wish to use as opposed to being locked into one software offering. Many operators will have their own SNMP management software and will want to integrate the controller into their existing network management infrastructure. SNMP is a well-known communication protocol which provides a standard interface to different management software platforms.

7.1   MIBs

All of the information presented on the Web pages and complete configuration capability is available from SNMP.

SNMP uses the standard UDP ports 161 and 162. If the device does not respond to SNMP Requests or does not appear to send Traps, confirm that these ports are not blocked or disabled in the setup of the Site Controller. See SC4 Configuration Program for details on configuring the Site Controller ports.

The Site Controller uses a combination of standard and proprietary MIBs which can be found at http://www.PhoenixBroadband.com/Downloads/MIBs/SiteController/SC3SiteControllerMIBS.zip. These MIBS can also be obtained at no charge by contacting Phoenix Broadband.

The Site Controller requires the following standard SNMP MIBS to compile the MIBs below:

- SNMP-FRAMEWORK-MIB

- SNMP-NOTIFICATION-MIB

- SNMP-TARGET-MIB

- SNMPv2-SMI

- SNMPv2-TC

- ENTITY-MIB

The Site Controller supports the following SNMP MIBS:

- SCTE 36 2002 (HMS028) Root MIB

- SCTE 37 2002 (HMS072) Tree MIB

- SCTE 38-1 (HMS026) Property MIB

- SCTE 38-11 (HMS-114) Headend Ident MIB

- SCTE 84-1 (HMS-111) HE Common MIB

- pbtRootMIB Phoenix Root MIB

- pbtBatteryAgentMIB Phoenix Battery Agent MIB

- pbtRemoteAgentMIB Phoenix Remote Agent MIB

- pbtEntityStatusMIB Phoenix Extensions to the Entity MIB

These MIBS should be compiled in the order listed.

The Battery Agent MIB contains tables of objects for each string and jar. These tables contain name, status, and control objects as well as all of the voltage admittance and temperature readings. All of the configurable objects are stored in Site Controller nonvolatile memory.

The digital alarms are configured using the discreteAlarmEnable object in the discretePropertyTable. There are two objects for each input. The first object (.1) is used to enable alarms on the low state of the input. The second object (.2) is used to enable alarms on the high state of the input. Each alarm can be set to one of 3 states Disabled(1), EnableMajor(2), or EnableMinor(3). Major Alarms appear in red on the Web page, and Minor Alarms appear in yellow.

The analog alarms are configured using the objects in the propertyTable. There are 4 objects to set the thresholds for each of the alarm capable object. Each alarm limit can be individually enabled or disabled.

7.2   Community Strings

The community strings are configured from the Telnet interface described in the configuration section of this document. The default community strings are set to "public".

If the device does not respond to SNMP Requests or does not appear to send Traps, confirm that the community strings are set properly in the SNMP Manager and that UDP ports 161 and 162 are not blocked.

7.3   Traps

Whenever an alarm occurs SNMP Traps are sent to up to 3 trap receivers. The Trap Destinations are configured from the telnet interface described earlier in this document. The traps are defined in the heCommonMIB. Each trap includes a text field that describes the trap.

7.4   MIB Browsers

SNMP devices are normally managed by a software system containing a SNMP Manager. The simplest method of evaluating SNMP operation is with a MIB Browser. A free evaluation version of a MIB browser can be downloaded from http://www.ndt-inc.com/SNMP/MIBrowser.html or http://www.mg-soft.com/download.html.

Retrieving Log Files

When using Site Viewer (see Site Viewer Web Page), you can retrieve log files from the SC4 as follows:

1. Choose **File > Log Files** from the Site Viewer menu bar. A list of log files for the SC4 is displayed. These are .csv files which are readable, viewable and graphable in any csv compatible spreadsheet program.
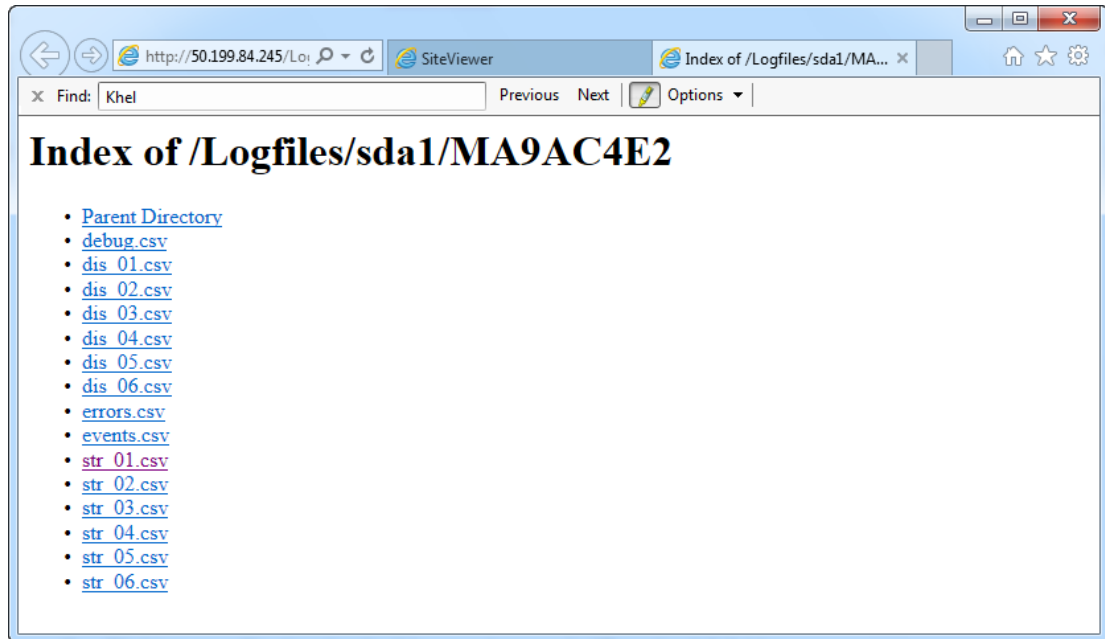
2. Clicking on a file allows you to open the file, or save it to your browser's "Downloads" folder.

Summary of Port Usage

The different features of this product use a variety of ports. The following table contains a summary of the port utilization.

Port	Protocol	Usage
21	UDP	FTP
22	SSH	SSH
25	TCP	SMTP – Sending email
80	TCP	HTTP – Web page
8081	TCP	HTTP – Web Sockets, web page real time data
502	TCP	ModBus
20000	TCP	DNP3
123	UDP	NTP – Time server
161	UDP	SNMP – Gets and Sets
162	UDP	SNMP - Traps
30705	UDP	Firmware Server

It may be necessary to request the network administrator to open some of these ports, in the firewall or router, for the associated feature to operate properly.

Resolving Common Problems

1. **Problem** – The Site Controller resets approximately once an hour. Background – The Site Controller updates its real time clock from a network time server approximately once per hour. If the site Controller is unable to communicate with the time server it will reset in an attempt to restore communications.

    a. **Solution** – First check if the Site Controller is getting the time by looking at the time display above the telnet setup menu. If the time is correct the Site Controller is communicating with the time server and the time server is not the cause of the resetting. If the time is incorrect verify that the time server IP addresses are correct and that port 123 is not being blocked by a firewall or router. Verify that the reset is being caused by no time server communications by setting the IP address of the first time server to zeros from the setup menu. This will disable the time server reset. Verify that the time server IP addresses are correct.

2. **Problem** – The Web page opens but does not connect to the Site Controller. No real-time information is displayed.

    a. **Solution** – This problem occurs when UDP port 30704 is blocked by a firewall or router in the network. The Java Applet running on the PC will send message to Site Controller UDP port 30704 to obtain the data required to update the Web pages. Consult with the IT department to determine where this port is being blocked. To verify the Web server in the Site Controller is functioning; set the Site Controller to a static IP address, and set your PC to this address +1. Connect the Site Controller Ethernet connection directly to the PC Ethernet connector using an Ethernet cable. If the Web page can be opened and updated when connected this way the Web Server is working properly and the problem is in the network.

3. **Problem** – Admittance measurement does not seem to update.

    a. **Solution** – By default, the SC4 will take new admittance measurements once every 24 hours (user configurable). If the admittance measurement is not updating, try the following: Set the baseline (initial cell admittance) to zero. This disables the baseline temporarily. Make another measurement. If the reading now populates the field, then re-instate the baseline. The controller will throw away measurements that are more than two times the initial jar admittance as a means of eliminating erroneous readings.