Cordex Controller Software Manual, Version 3.1x

User Manual

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Cordex Controller Software Manual
Version 3.1x

This software is compatible with Expanded Memory CXC Controllers only.

NOTE:

Photographs contained in this manual are for illustrative purposes only. These photographs may not match your installation.

NOTE:

Operator is cautioned to review the drawings and illustrations contained in this manual before proceeding. If there are questions regarding the safe operation of this powering system, contact Alpha Technologies or your nearest Alpha representative.

NOTE:

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1. Introduction

1.1 Scope of the Manual

This document describes the software features, on-site setup, and operation of the Cordex System Controller (CXC) from Alpha Technologies. A basic understanding of Ethernet, TCP/IP, SNMP, RS-485, and CAN bus functionality is required.

Refer to the Installation manual for hardware details.

1.2 Software Overview

The CXC software enables control of an entire DC + AC power system via the CXC central touch screen user interface or web based monitoring and control interface. The software also allows the user to control temperature compensation, auto equalization, remote access, and battery diagnostics.

The CXC is an integrated Alpha Cordex Controller designed to provide universal control for Alpha Group products.

The CXC has Ethernet capability that supports a web interface and SNMP for customer access to the equipment it is monitoring.

The CXC also has a CAN bus for communication with the Cordex rectifiers and other peripheral equipment.

1.2.1 User Interface (UI)

Version 3.1x of the software is compatible with Expanded Memory CXC Controllers only. For each controller, a user can use either a touch screen or a web interface to set up and manage the system.

Remote communications over the web interface can be established with the step-by-step connection wizard available from the Alpha website (www.alpha.ca.ca) or refer to Chapter “9. Remote Communications” on page 104 for detailed instructions.

1.2.1.1 LED lights

Each CXC has three LEDs located on the front panel. These LEDs are used to display the alarm status of the power system, CXC progress and status during startup, and file transfers.

1.2.1.2 Alarm conditions

When an alarm occurs, an LED illuminates corresponding to the following system alarm status:

- Green – OK, no alarms present.
- Yellow – Minor alarm is present (no major alarms).
- Red – Major alarm is present.

Only one LED is illuminated at a time during alarm conditions.

2. Standard Features

The following are new features in Version 3.1x:

- Retrieve inverter history file—see 6.4.8.2)
- Inverter alarms reported in the Event log—see 6.4.8.1
- Synchronization of the real time clock of the inverter controller (T2S) with the Cordex controller RTC
- Support of new CXCi+ hardware

2.1 Password Security

NOTE:	Basic authentication is cached in Firefox and the Panel PC, so that the client is not prompted to re-enter the password again after logging out. Closing the browser clears the cache and prevents use by unathorized personnel.

Three levels of password security are available: Supervisor (1234), User (5678) and Viewer (0000). A Supervisor has write access to all editable fields. A User has permission to update inventory, make voltages changes and navigate through menus. A viewer can view all menus, but does not have permission to make any changes.

The User password can only changed by the Supervisor from the web interface (see 6.12.1). Viewer login is described in the next section.

2.1.1 Client Login Control

It is possible to have multiple users logged onto the controller. The following table shows the distribution of allowed logins. (Both a User and a Supervisor are considered to have write access and only one can be logged on at a time.)

Web Clients		**LCD Clients (Only 1 person can work with the LCD)**	
Number of Viewers	User or Supervisor	Number of Viewers	User or Supervisor
1-2	0	1	0
1-2	0	0	1**
1-2	1*	-	-
-	-	-	1**

*	A User or Supervisor login to the web interface prevents any logins at the LCD - a viewer currently logged on to the LCD will not be able to log back in if he logs off.
**	A User or Supervisor login to the LCD prevents any logins at the web interface- a viewer currently logged on to the web will not be able to log back in if he logs off.

2.2 Software Configuration Loading and Updates

Factory software updates and adjustments to the configuration file are possible through the Ethernet connection. The Supervisor can exclude settings and groups of settings when applying changes. A partial configuration file can also be generated and sent to the CXC (v1.81 and above).

2.3 Customizable User Interface

The web interface can be customized to remove web browser elements that are of no interest to the user. This menu for customizing the user interface is located in **Supervisor > Customize User Interface**. When a group is unchecked, all related UI elements are removed from the browser. This includes menu items, summary information in the View Live Status and signals and alarms.

2.4 Mixed Rectifier System

All controllers, except the CXCU, allow one type of Alpha Pathfinder model rectifier to work in parallel with one type of Alpha Cordex model rectifier, for example, a PFM 48V-10kW or PFM 48V-3kW with a CXRF 48-3.6kW. Another example is a PFM 24V-3kW with a CXRF 24-3.1kW. The load share of each rectifier is based on the percentage of the maximum output current of the rectifier; see Rectifier Report (4.7.2).

The Pathfinder rectifiers are not shown under Upgrade Firmware as that submenu applies to Cordex rectifiers and smart peripherals only.

2.5 Safe Voltage

The Safe Voltage is the voltage that the rectifiers default to if they lose communications with the controller.

The Supervisor can set the default system voltage (Safe Mode) that will be used if the communications to the Cordex rectifiers fails. This feature has a time delay that varies according to the rectifier. Most rectifiers will revert to Safe Mode after five (5) minutes. The rectifier manual lists the default parameters.

Note: In general, the open circuit voltage for VRLA batteries is determined to be a point where discharge or over charge will not occur.

2.6 Power Save

The Power Save feature enables the Supervisor to improve operational efficiency by running only the necessary number of rectifiers. For example, when the load is significantly less than the available system power, the controller shuts down one or more of the rectifiers so that the remaining rectifiers operate with greater efficiency at a higher current level. A short (one-minute) time delay or hysteresis is built in to avoid nuisance alarms and to prevent changes if the load is fluctuating.

With Power Save, rectifier usage rotates on a weekly basis to share the service time. Power Save comes into effect when a minimum discharge or load current (~2.5% of maximum current of one rectifier) is achieved. Battery charge current limit calculations are based on the rectifiers that are running.

The Power Save feature is suspended during Battery Test mode. See 4.12.4.

NOTE:	The **Remote Shutdown** setting must be enabled for the rectifier (see **Rectifiers > Configure Rectifiers**) to operate in Power Save.

2.7 Auto DC Priority

The inverters can be configured to automatically switch to DC Priority mode when a custom alarm is activated. The alarm could be triggered by a digital input such as a signal from an alternative energy source – a fuel cell for example that has just switched on.

When the custom alarm activates, the CXC automatically switches the Inverters to draw from DC power as much as possible. When the alarm is deactivated, the command is sent to return to AC Priority. (Custom alarms are configured from **Alarms-> Configure Alarms**.)

For more information, see section 6.4.7.

2.8 Battery Temperature Compensation

The automatic battery temperature compensation feature (Temp Comp or TC) works with Cordex series rectifiers that support CAN bus communications and Pathfinder series rectifiers that support RS-485 remote communications. Temp Comp may be active in either the Float (4.9) or Equalize (4.10) mode.

Temperature inputs are available on the CXC for monitoring a lead acid battery string. Temperature sensor readings can be displayed on the GUI in either the Celsius (°C) or Fahrenheit (°F) scales.

The CXC has the flexibility to display the breakpoints in voltage and temperature. The breakpoints can be entered as voltages or temperatures.

The detection of a thermal runaway is limited to a programmable Battery Over Temperature Alarm. The Supervisor can select the temperature that triggers an alarm.

2.8.1 Theory of Battery Temperature Compensation

The battery life expectancy and performance is directly related to the battery ambient temperature. The optimum battery temperature during operation is 25°C (77°F). Without compensation, battery life is seriously compromised at temperatures above 25°C, while battery performance is reduced below 25°C.

Adjusting the battery's float or equalize voltage to correspond with temperature fluctuations ensures maximum battery performance and life expectancy. With the CXC, this can be accomplished by using the software's built-in automatic temperature compensation function. This function adjusts the system voltage, ever 60 second, as the temperature changes and provides for a maximum voltage change of 0.1V over this interval.

Temp Comp occurs at standard rates commonly referred to as slope-compensation settings. For maximum performance, the battery slope compensation must be matched to the setting recommended by the battery manufacturer. Do not confuse this with the slope regulation, which refers to the process of regulating the current among a group of parallel-operating rectifiers.

The Temp Comp feature uses programmable breakpoints, which are the points that Temp Comp ceases. Further temperature decreases or increases do NOT increase or decrease the output voltage. This protects the connected load and battery from excessive voltages. As Temp Comp is active in either float or equalize mode, set breakpoints with this in mind.

When temperature compensation is enabled in Equalize Mode, the CXC uses the equalize voltage setting as the center point around which to make Temp Comp voltage adjustments.

When temperature compensation is enabled in Float Mode, the CXC uses the float voltage setting as the center point around which to make Temp Comp voltage adjustments.

2.8.2 Operation of Battery Temperature Compensation

The CXC can accommodate up to four sensors that monitor lead acid battery temperatures. If more than one sensor is used and the temperature readings are within 5°C (9°F) of one another, the temperature readings are averaged. If the reading differences exceed 5°C, a thermal runaway is assumed in one battery string and the reading changes from the average reading to the highest. If any reading suddenly jumps outside the normal range (i.e. leads are cut or opened), that reading is discarded and the associated Temp Sensor Fail alarm is activated. The temperature reading then returns to the average for the remaining sensors, or to the next highest reading.

Temp Comp has been programmed as a low priority item. All other commands and operations take precedence over Temp Comp. If a command is issued during a Temp Comp cycle, the cycle will be put on hold until the command is completed. If any operation is happening when the Temp Comp cycle occurs, the cycle is put on hold until the operation is completed. Temp Comp resumes when the command or operation completes. The Temp Comp feature can be enabled or disabled in the CXC Batteries menu ("6.5.1 Temperature Compensation" on page 50.

2.9 Battery Auto Equalization

Auto Equalize (Auto-EQ) is a protective feature designed to ensure optimal lead acid battery life and performance. With the CXC, auto equalize is used for two basic purposes: (1) for providing a quick battery recharge after an AC power failure, and (2) as a long-term battery maintenance feature.

Refer to the battery manufacturer's recommendations for equalization charging.

2.9.1 Battery Charge Auto Equalize

Battery Charge Auto Equalize can be used after a prolonged AC power failure when the battery voltage has decreased to a low level.

Once battery voltages have decreased below the auto equalize low voltage threshold, the CXC enters an armed mode. When AC power returns, the system voltage begins to increase and charges the batteries.

Once the system voltage increases to the high voltage threshold, the CXC enters the equalize mode and begins to equalize the battery charges for a period specified by the Supervisor in the AUTO-EQ DURATION submenu. This is done to ensure the EQ duration is not effectively reduced by the time it takes to recharge the battery to the nominal system voltage.

2.9.2 Periodic Auto Equalize

Periodic Auto Equalize can be used for maintaining the long-term integrity of a battery string. Over time, individual battery cell voltages may vary greatly. To ensure that the batteries remain in optimum condition, they should be equalize charged at regular intervals. The CXC enables the Supervisor to program the time between automatic equalize charging of the battery string in the AUTO-EQ INTERVAL submenu.

2.9.3 Battery Current Termination (BCT) Equalize

The BCT Equalize feature provides an alternative method of ending the EQ mode early to prevent overcharging of the battery. Once enabled, it is only active when the EQ mode is caused by a Charge Auto Equalize.

BCT EQ terminates the Charge Auto EQ when the battery current falls below the BC Threshold setting. Upon initial activation of the EQ mode that is triggered by the Charge Auto EQ feature, the CXC waits for one minute of system stabilization time before monitoring the battery current for BCT EQ. After one minute, the battery current is checked about once per second to see if the current has fallen below the BC Threshold.

When the battery current falls below the BC Threshold and remains below the threshold for three seconds, the EQ duration is replaced with the BCT duration. After this time, the system returns to FL mode.

2.10 Battery Monitor and Charge Current Control

The Battery Monitor feature enhances the CXC's capability to provide information about the battery to the user. Charge Current Control helps to increase battery longevity by keeping the battery current within specified limits.

Charge current to the battery during recharge is limited to a value that is programmed by the Supervisor. This value is derived from the battery manufacturer's specification sheet and entered by the Supervisor.

A battery run time prediction is performed while the battery is supplying power to the load. The CXC collects data to estimate the time it takes for the battery to be drained. If the Battery Monitor feature is enabled and the battery is sourcing current to the load, a time estimate appears in the Mode Status screen. A runtime estimate is also available in the Analog Signals display, which can be enabled for display status in **Signals > Configure Signals > Controller Signals**.

During an AC outage or Battery Test, the data is collected to calculate a capacity prediction. A capacity of 80% means that the battery is due to be replaced. The accuracy of this improves as the battery undergoes more discharge cycles.

2.11 Battery Test Scheduler

A battery test scheduler is built into the software. The test can be set to a frequency of a fixed number of days apart, or set to a specific day of the month.

2.12 Low Voltage Disconnect Operation

Whenever the system parameters require that the LVD be activated, a 60-second countdown and audible warning begins. When the countdown reaches zero, the LVD is activated. During this countdown, an icon on the GUI can be pressed to evoke a prompt to inhibit LVD controls – activated by entering the Supervisor password. There is a 10-minute time-out for this. See also LVD Inhibit 6.8.2.

2.13 Signals Management

The Supervisor can view and edit a signal equation for a selected signal. The Supervisor can also configure custom signals; properties can be modified or disabled as required. All signals in the system can be selected for a signal equation builder making it possible to combine logic conditions and analog values to generate an alarm.

The Supervisor can select which Temperature Sensor to enable for the Battery Temp Sensor Signal.

There are 20 Custom Signals which the user can set by either SNMP or using the equation builder. Note that for any particular signal, only one of these options can be selected. If the user chooses to set by SNMP, any equation associated with that signal will no longer be evaluated. Similarly, if a signal is selected to be set by equation, SNMP "sets" made to that signal will be ignored. Because SNMP only allows

integer values and the CXC may require numbers accurate to two decimal places, values are multiplied by 100 before sending over SNMP. So, for example, to set a signal to a value of “1”, the user should actually do an SNMP set with value “100”. Similarly, a signal with value “1” will be received by SNMP as “100” and should be divided by 100 to determine the actual signal value. Note also that since signal values are not saved over a CXC reset (but instead re-evaluated after reset), any value previously set by SNMP will be lost during reset and the signal will go back to value “0”

2.14 Statistics and Historical Data

The CXC is capable of tracking several statistical parameters on a daily basis: analog statistics, for example, and triggered items such as battery log and event log.

Data is stored in local memory and can be accessed via a web interface (see Data Logging in Section 6.7.3). The logged data is comma-delimited so it can automatically viewed in rows and columns in MS Excel. The data is stored on a first-in-first-out basis.

2.14.1 Analog Statistics

All statistics, to a maximum of 90 records (one per day) contain a time stamp and date. Daily analog statistics include the minimum, maximum and average of:

Load Voltage	Load Current
Battery Voltage	Battery Current
AC Mains	Battery Temperature
Total Rectifier Current	Average DC Voltage
Average AC Voltage	Number of Acquired Rectifiers
Number of Sourcing Rectifiers	Ten Custom Signals

2.14.2 Battery Log

A maximum of 40 records can be logged for battery statistics and events. The Battery Log contains the following:

Event Type	Capacity Rating
Battery Test Start Time	Depth of Discharge
Discharge Duration Time	Capacity
Amp Hours Delivered	Recharge Duration
Amp Hours Recharge Return	Peukert Number
1-5 Max. Midpoint Deviation Discharge	Data1
1-5 Max. Midpoint Deviation Recharge	Data2
Battery Current/Average Battery Current	Battery Temperature/Average Battery Temperature
Battery Voltage/Battery Test End Voltage	Open Circuit Voltage
Battery Test Result	

During a battery discharge, active battery log information is displayed in a row above the Battery Log. This information is then no longer available after the battery has finished recharging.

The Battery Log also provides support for very slow discharges. This is accomplished by saving intermediate battery log information in the event of controller power loss before battery recharge completes.

When a battery test (BT) is started remotely, the battery log shows **Remote BT** in the Event Type column.

2.14.4 Event Log

The CXC can record up to 500 events. Each unique event is stamped with the date and time. Multiple events are time stamped for the first daily occurrence and then the accumulated total is shown at the last daily occurrence of the event. Refer to Relay 7 in the following event log.

Some of the events include the following:

- All alarm events (activation and deactivation).
- Rectifier alarm details.
- Any change of state of the digital inputs.
- Other miscellaneous events; such as, rectifiers being turned off or on due to the Power Save feature.

Once the maximum number of events have been recorded, the oldest events are erased as new events are added.

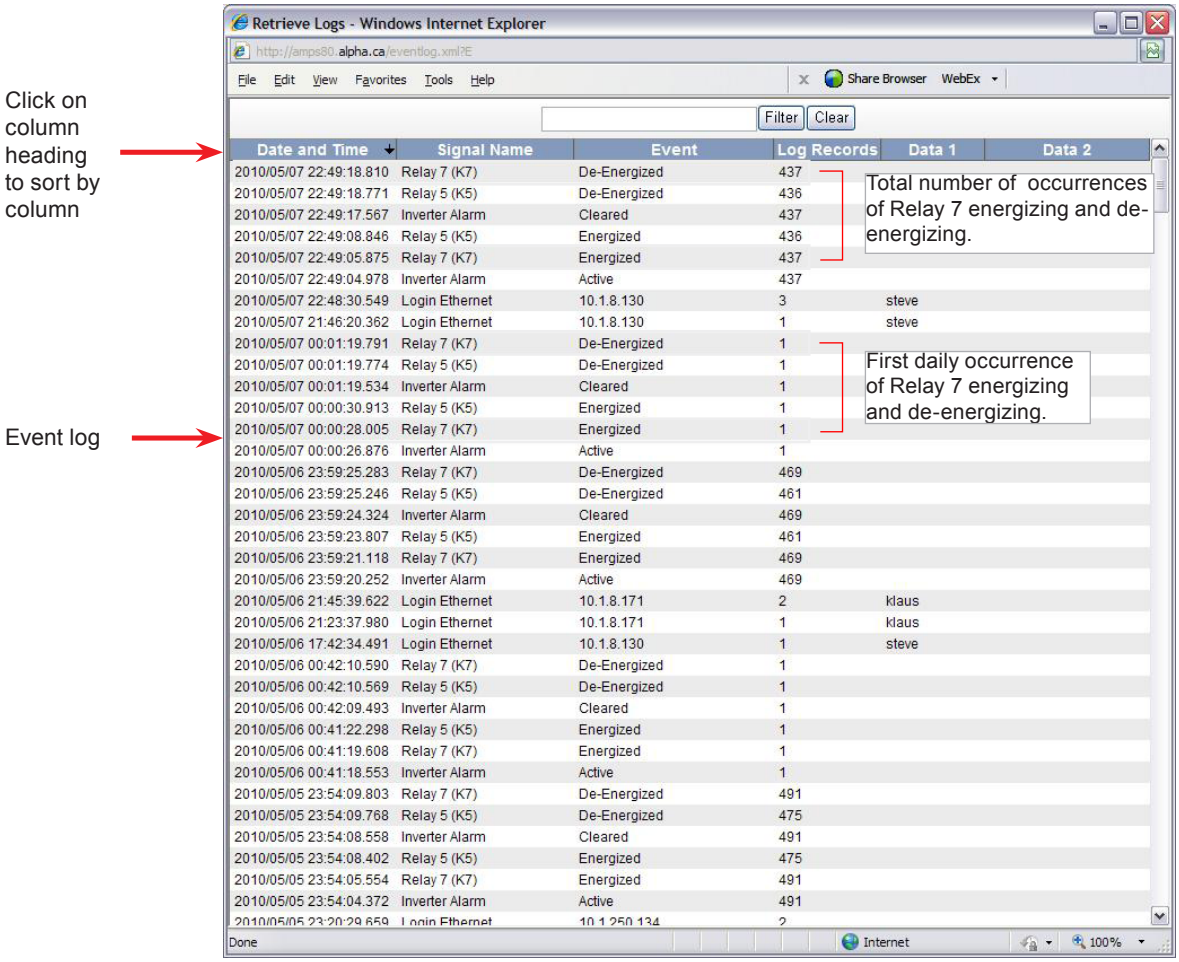


Figure 1 — Event Log

2.14.3 Data Logging

This feature of the CXC web interface allows the user to perform complex/custom configurations of the data gathered by the Alpha controller. Various ways of setting the log frequency/limit and start/stop triggers enables greater management of the events for collection.

The data is stored in files showing the records associated with each for easy archiving and retrieval. File Save Option enables a FIFO (first in first out) or “Stop when full” means of data collection.

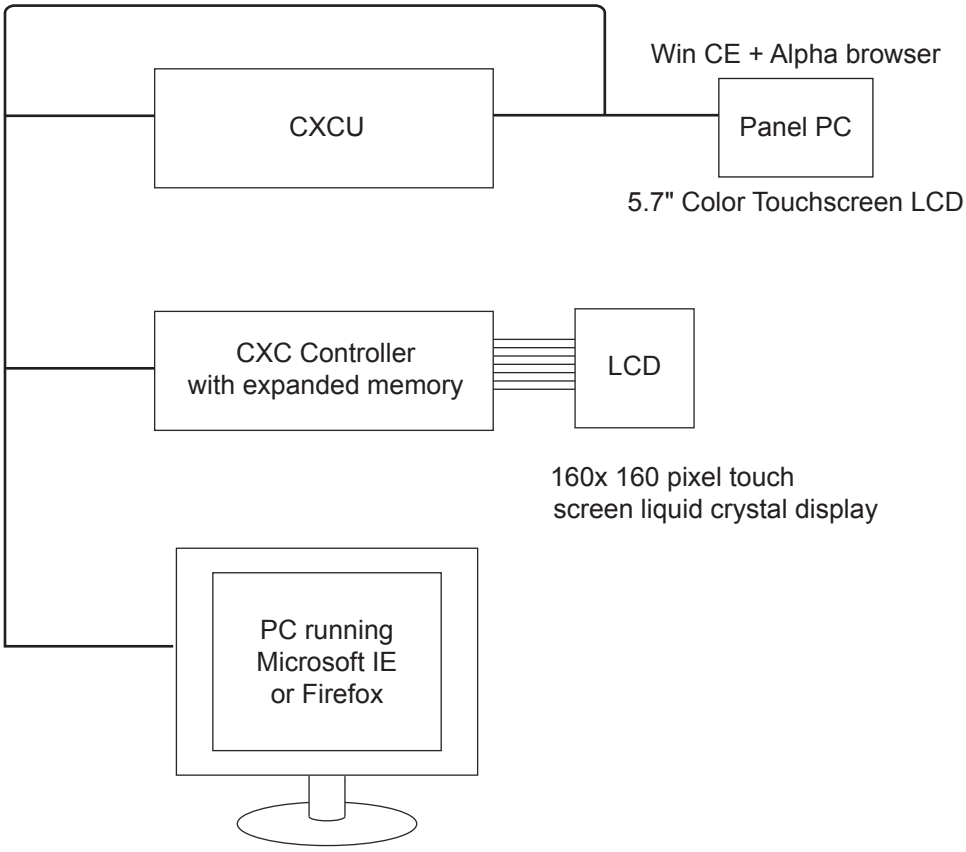
Recommended size is up to seven signals and a maximum one thousand entries, as very large log files may not be viewable. If the datalog screen comes up blank, the log is too large to be displayed.

3. User Interface Options

This chapter provides an overview of the following user interfaces:

- LCD
- Web interface

A user with a Supervisor access level can make changes to parameters. A user with a User access level can update inventory, make changes to system voltages and navigate through menus.



3.1 LCD Graphical User Interface

This interface is a 160 x 160 pixel touch screen with interactive hot spots that call forth more screens. The best tool for navigating these pages is a stylus (a small pen-shaped instrument). Make selections by tapping the stylus on the screen.

Auto-Logout Timeout

After 20 minutes of inactivity (no user input), the CXC automatically logs off the user. The CXC discards any unsaved changes made by the user while logged in the system and returns to Normal Operation mode. The access level is reset to the default user access and the screen continues to display live data.

Backlight Timeout

After one minute of inactivity (no user input), the CXC automatically turns off the LCD backlight.

3.2 Home Screen (Default Operating Screen)

On startup the home screen shown in 2.1 appears. This GUI displays system status information and monitors all input channels. See Chapter 4 for operating procedures with the LCD interface.

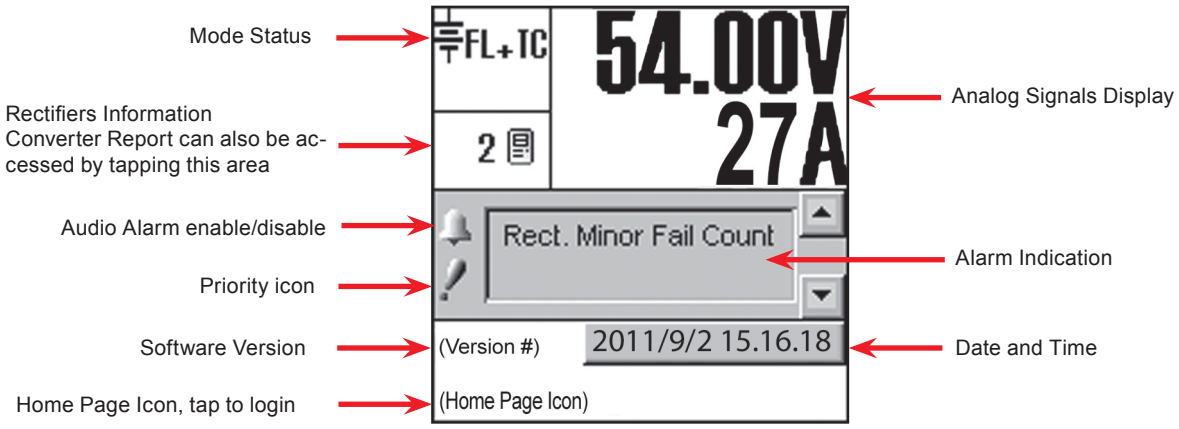


Figure 3 — CXC default operating screen

3.3 Contrast Adjustment of the GUI

Tap the Home page icon and then tap **Contrast** on the pop-up window. The following figure shows the contrast adjustment window. Use the slider on the GUI to adjust contrast as desired.

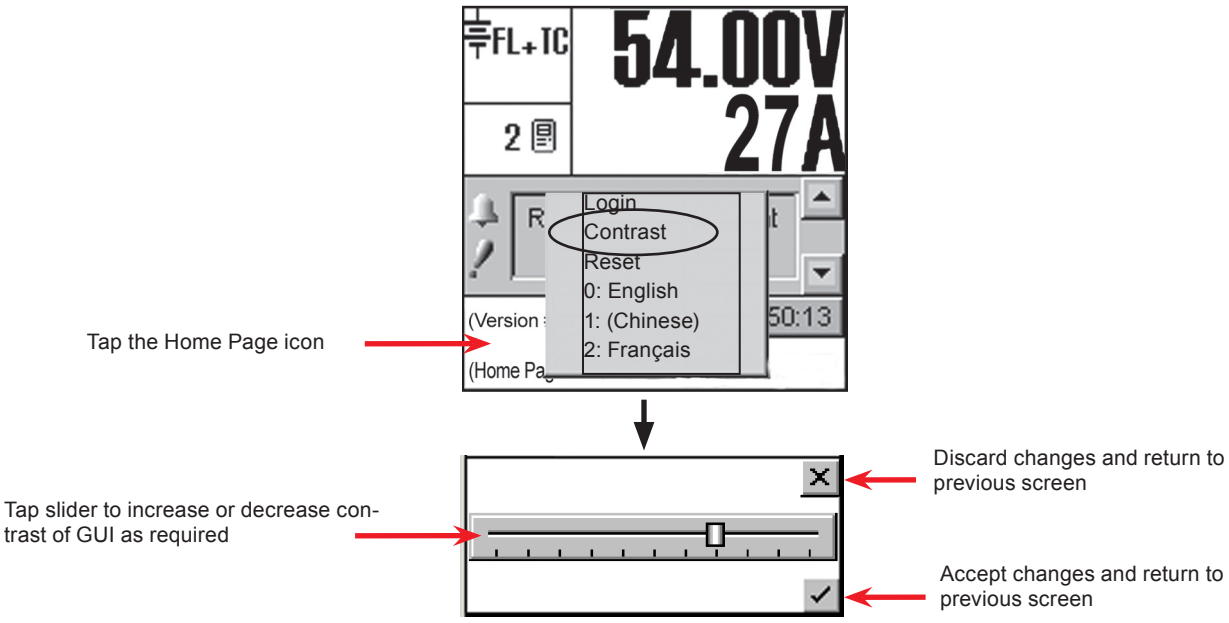


Figure 2 — Contrast adjustment pop-up window

3.4 Menu Navigation - LCD

Figure 7 illustrates the LCD menu structure.

3.4.1 Login (password entry)

NEW FEATURE	The new Client Login Control feature allows up to three logins (see the feature description in section 2.1). If the number of logins has reached the maximum, a pop-up window appears with the warning: **Another operator is currently logged in**.

Follow steps 1 through 4 to login. Once the password is verified, a pop-up window provides acknowledgement; e.g., **Supervisor Access Granted**.

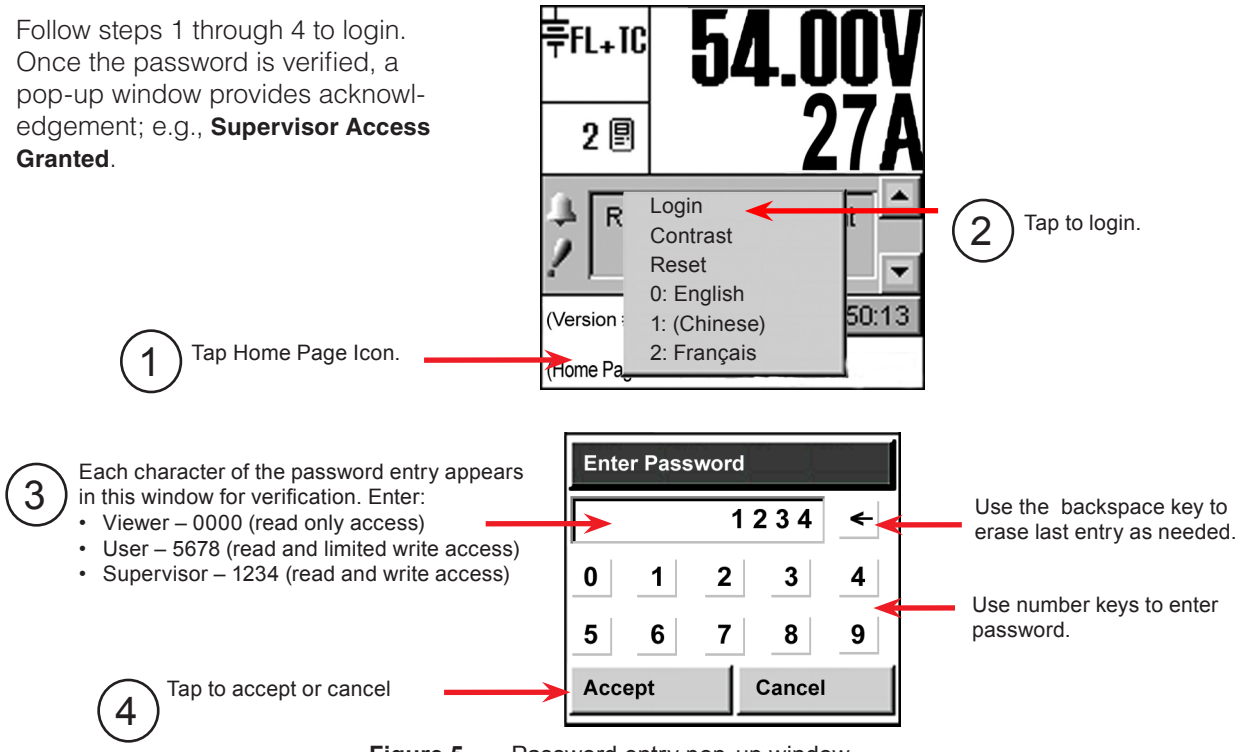


Figure 5 — Password entry pop-up window

3.3.1 Menu Navigation Overview

The MAIN MENU screen appears on login. The folders with a plus sign can be expanded to show the menu subcategories. See section 3.4.5 for the complete LCD menu structure and Chapter 6 for a complete description of the menu options.

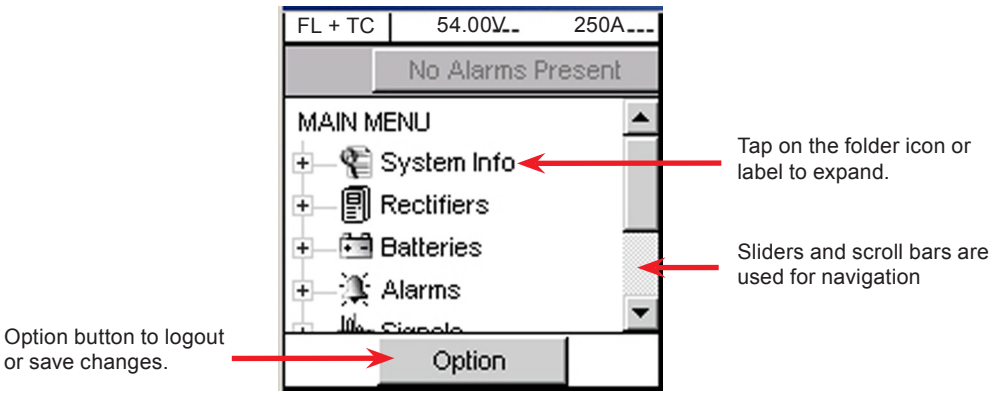


Figure 4 — Menu navigation screen

3.4.2 Changing and Saving Settings

1. When changes are complete, return to the MAIN MENU navigation screen and press the **OPTION** button to evoke the **SAVE/LOGOUT** pop-up window.
2. Select **SAVE** to save the new settings.
3. A pop-up window **Save Complete** confirms the selection (select the **X** icon to close the pop-up).

If no changes have been made, then saving in menu navigation results in a prompt (pop-up window): **There are no changes to save.**

In each case, tapping the **X** button clears the pop-up from the active area and remains in menu navigation. The Supervisor retains the security access level to continue making changes and does not return to the home page.

3.4.3 Logging Out

Tap the **Option** button to logout of the menu navigation screen (a pop-up window appears) and return to the home page.

If changes have been made, another pop-up window prompts the user with Save or Discard buttons. In either case, the active area returns to the home page and a pop-up window confirms the selection. Tapping the **X** button clears the pop-up from the active area.

3.4.4 Virtual Numeric Keypad

Whenever a numeric field is selected, a virtual numeric keypad appears (in a pop-up window) to enable editing of the value.

Tap the keypad to edit or enter a value. Use the virtual function buttons described below to navigate, cancel or accept.

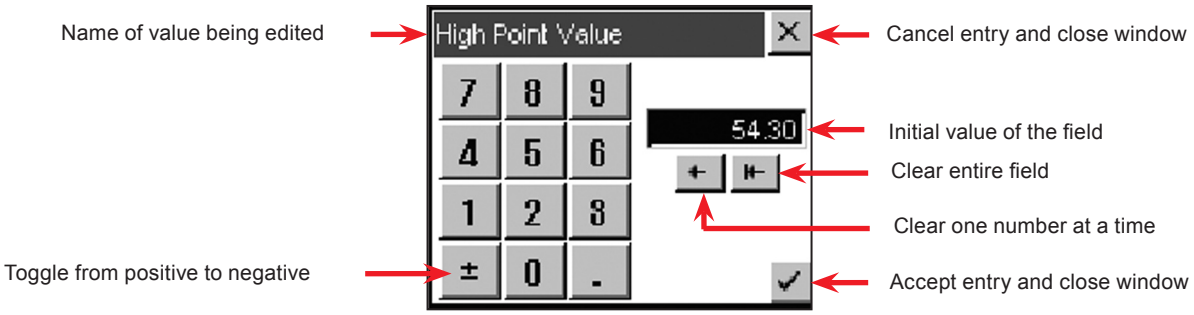


Figure 6 — Virtual numeric keypad pop-up window

3.4.5 LCD Menu Structure

Figure 7 shows the menu structure for all categories except the Inverter category which is listed below:

- AC Input Groups
- DC Input Groups
- AC Output Groups
- Auto DC Priority

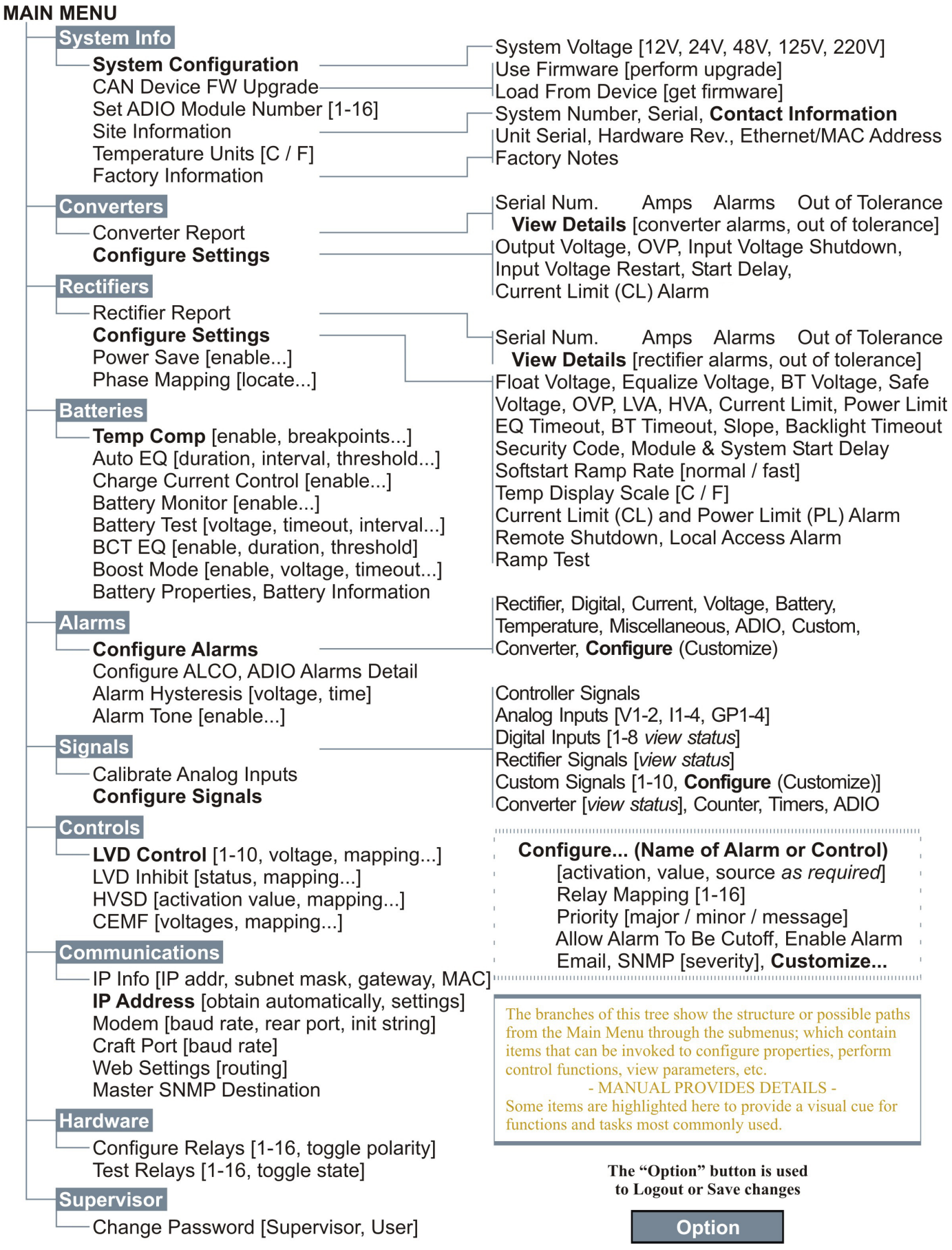


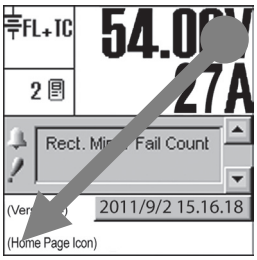
Figure 7 — LCD Menu structure

3.4.6 LCD Touch Screen Calibration

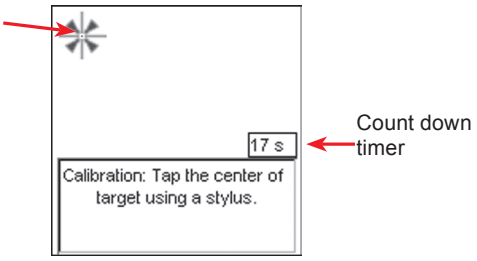
Perform the following steps to calibrate the touch screen from the home screen: Complete each step within 20 sec or the calibration is ignored.

Both the targets must be tapped correctly for the calibration to take effect to prevent the calibration from changing dramatically from the default.

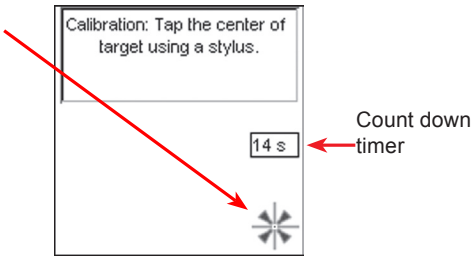
1. Perform a diagonal action or "swipe" from the top right area of the LCD to the bottom left area:



2. Tap on the center of the first target within 20 seconds to complete this step.



3. Tap on the center of the second target within 20 seconds to complete the calibration:



4. Operation using the LCD GUI

This chapter briefly describes operation with an LCD interface. The following steps are a summary of operating procedures on start up. The sections that follow expand on each of the steps

1. Initiate the startup routine by applying power to the CXC. (Close the battery breaker or close the converter and rectifier input and output breakers.)
2. The CXC performs a short self-test as it boots up. The scrolling pattern of the LEDs indicates activity. Alarm alerts are normal. Wait for the self-test to finish.
3. Check and adjust the alarms and control levels in the CXC submenus.
4. Check and adjust the group settings in the CONVERTERS and RECTIFIERS submenus. Parameters to be adjusted include float, equalize voltage, etc.
5. Verify the relevant COMMUNICATIONS settings.
6. Program the CXC relevant TEMP COMP and AUTO EQUALIZE settings.
7. Test the relevant relay OUTPUT ALARM\CONTROLS such as Major Alarm, CEMF, etc.

4.1 Start-up

When the CXC is powered-up or reset, it performs a 15 second self-test before displaying the Cordex logo and identification messages. The three front-panel LEDs illuminate temporarily, and then extinguish.

The Graphical User Interface (GUI) then displays system status information. Tap the active areas shown in the following screenshot of the home page. Use a stylus pen to activate navigate through the touch sensitive screens.

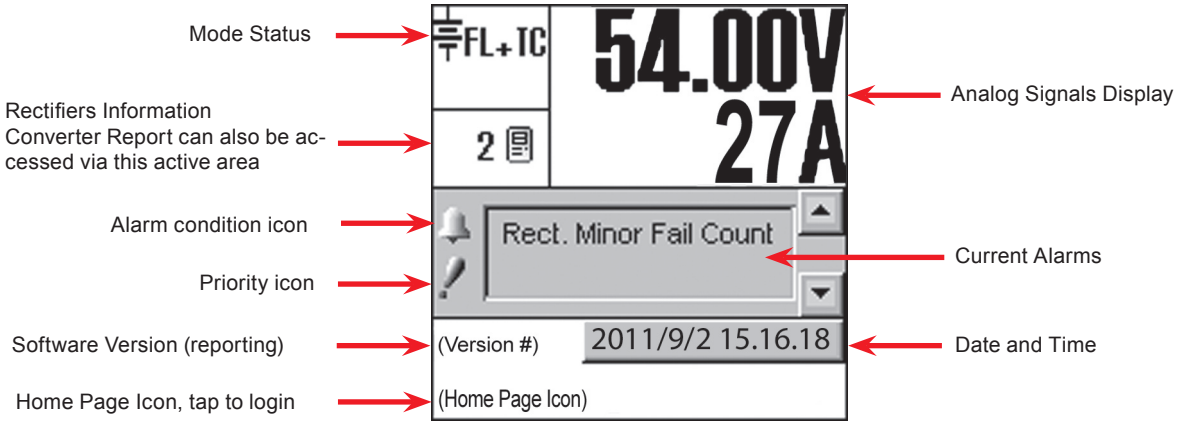


Figure 8 — CXC home page

4.2 Language Selection

The user can select English, or Chinese characters for the display of text labels and messages. Language files can be uploaded via web interface. The CXC can be set up for a maximum of three language files (two default plus one other) at one time pending availability.

Tap the Home page icon at the lower left of the home page and select language from the pop-up window shown in the following figure:

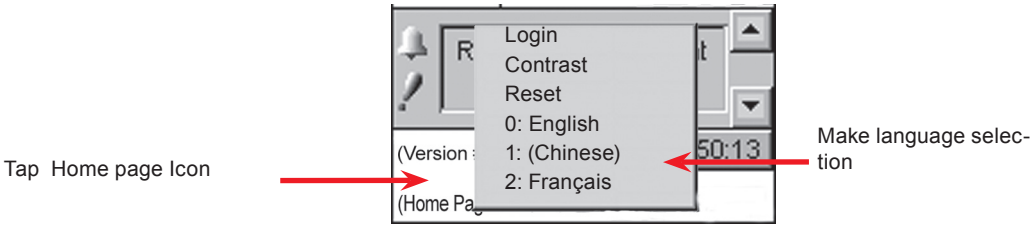


Figure 9 — Language selection on home page

4.3 Date and Time

To change the date and/or time, tap the area where the date and time are displayed on the home page (below the Alarm Indication). Tap the up/down arrows to change the date (year, month, day) and time (hour, minute, second) settings. tap this area of the screen to enter a new window of operation.

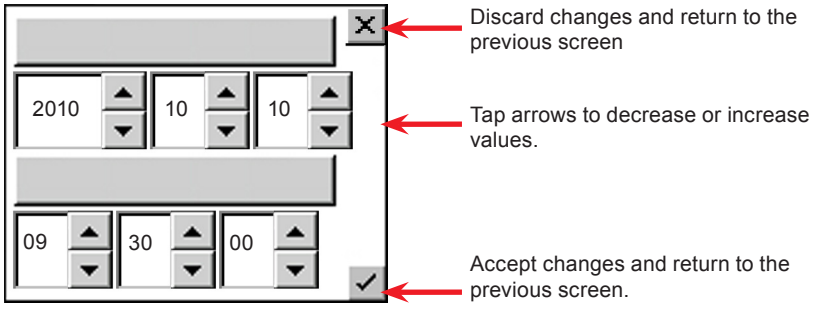


Figure 10 — Setting the Date and Time

All CXC models (except CXCi and CSCM1) provide battery backup of time and date.

With the web interface, SNTP (Simple Network Time Protocol)can be used to synchronize the CXC device time with an external source; i.e., the user's network.

4.4 Resetting and Powering Down

4.4.1 Reset

CAUTION!

During reset, the Controller may need to run a defragmentation cycle. Cycling of the LEDs on the controller front panel indicate that defragmentation is in progress. A full defragmentation can take up to 20 minutes to perform. DO NOT POWER DOWN the CXC during this time.

A reset enables the CXC to finish saving files to flash memory before a power down or restart.

1. Tap the Home page icon and then tap **Reset** on the pop-up window (see Figure 9. A new pop-up window alerts the user "You are about to perform a system reset."
2. To abort the operation, tap **Cancel** or the **X** button to clear the pop-up from the active area.
3. To proceed, tap **Accept** and a pop-up window notifies the user "Performing Reset, please wait…" This window is then replaced with a window showing a timer counting down from 60 seconds and a **Reset Now** button. A message will appear in this window to notify the user "It is now safe to reset the system".
4. Either tap the button or wait for the timer to count down and the operation proceeds automatically to completion.

The screen goes blank and the LEDs flash as the CXC performs a short self-test before returning to Normal operating mode.

4.4.2 Powering Down

To power down the system, complete steps 1 through 3 under Reset.

It is safe to power down when the message appears "It is now safe to reset the system."

4.5 Alarm Display and Configuration

If the Alarm Indication window in the home screen indicates an alert (such as an active alarm and the priority of the condition) tap the display area to enter a window of operation for alarm display and configuration.

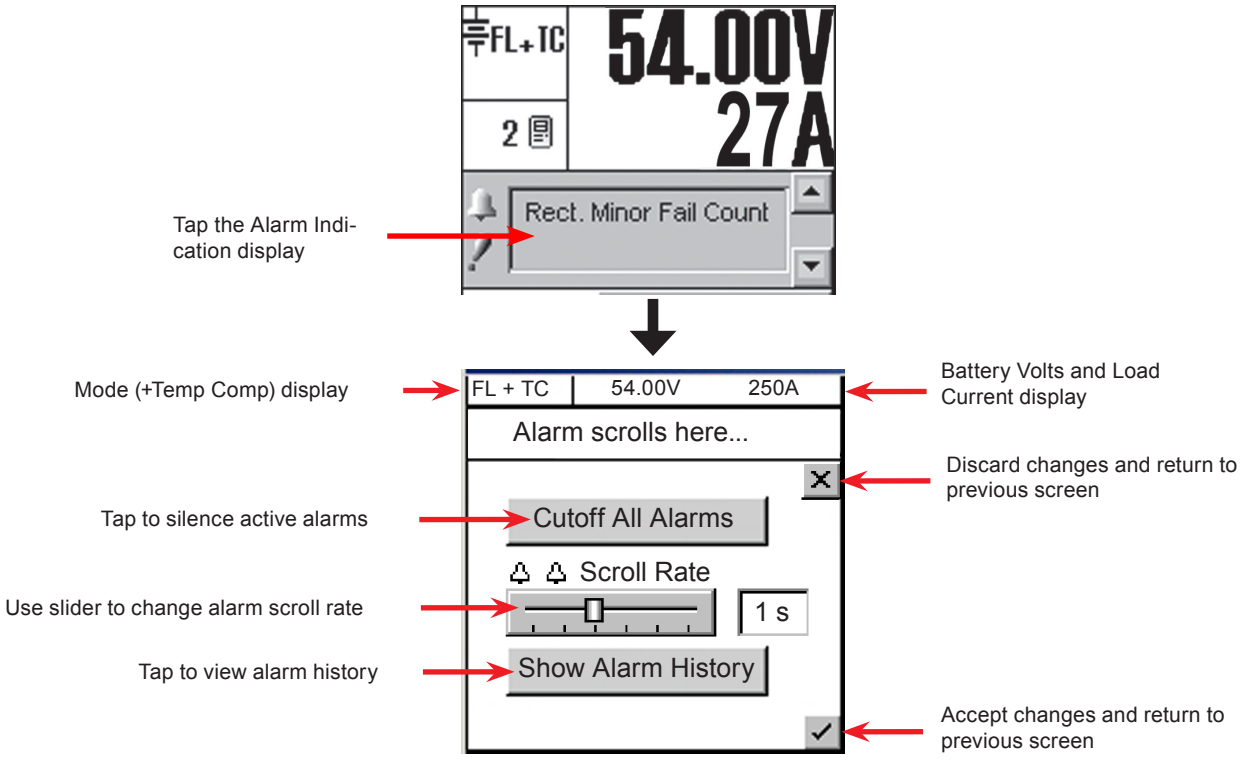


Figure 12 — Alarm indication display screen

4.5.1 Silence All Alarms

Tap **Cutoff All Alarms** button to silence active alarms. In addition, on any screen where the alarm indication is shown, tapping the alarm indication button displays a pull-down menu (Figure 11) for alarm cutoff (also known as ALCO, see 6.6.9):

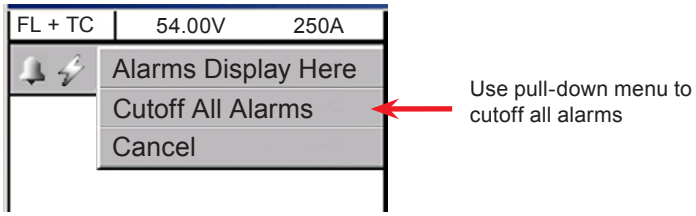


Figure 11 — Alarm cutoff pull-down menu

4.5.2 Alarm History

Tap **Show Alarm History** to link to another screen that lists past alarms. Two pull-down menus enable the user to select which alarms to display according to status and priority:

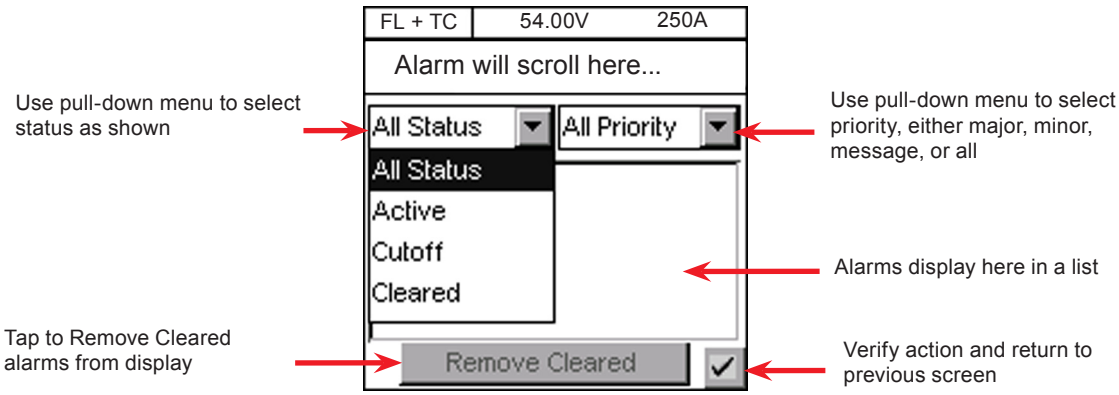


Figure 13 — Alarm History screen

4.5.3 Alarm Configuration

Login to the controller and select Alarms from the main menu (see section 3.4 for menu navigation). Examples of alarm settings are power system high/low voltage alarms, AC Mains high/low voltage alarms, supervisor programmable alarms and alarm tone enable (audible alarm buzzer). For details, see section 6.6.

4.6 Signals Display

The Analog Signals display area on the home page shows two lines of text for system voltage and current by default. Tap this active area to decrease the font size and display four lines of text showing the system values and the corresponding labels. Tap the arrows beside the system values to return to the larger font of the normal (default) home page.

The large font reappears after 20 minutes of inactivity (no user input).

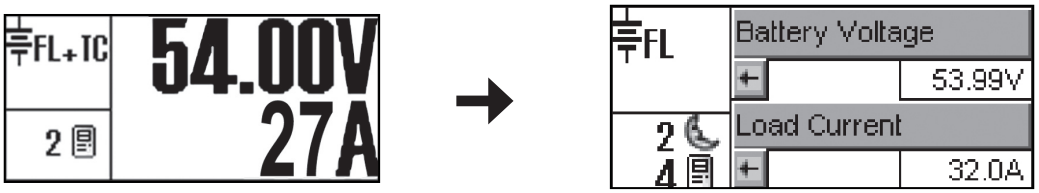


Figure 14 — Signal display area of the home screen

Tap the Analog Signals display on the home screen to enter an operation window for signals configuration. Or login to the controller and select Signals from the main menu (see section 3.4 for menu navigation). Section 6.7 has detailed instructions for reviewing and configuring signals.

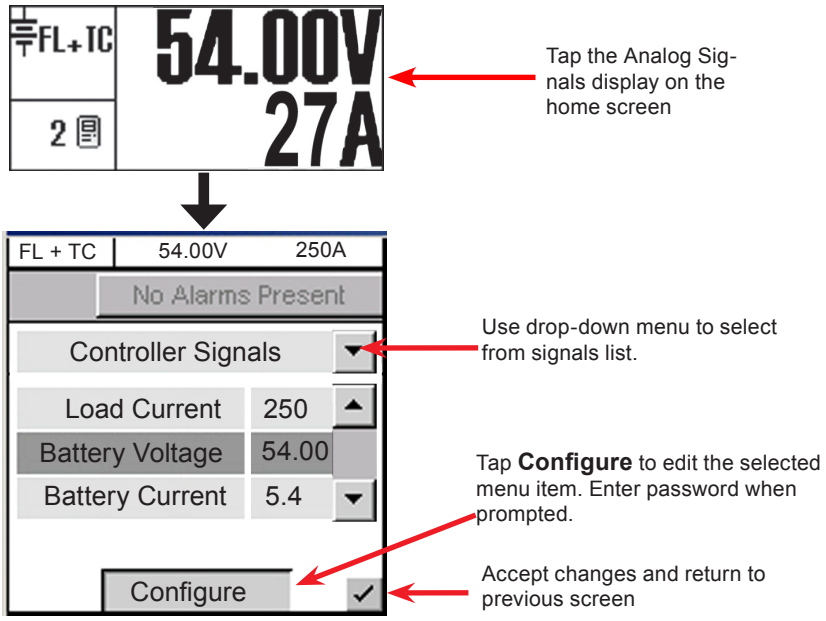


Figure 15 — Signals display screen

Use the pull-down menu to select one of the following signals:

Controller Signals	Tap the Configure button to produce another window with a list of items to navigate, see Section6.7.2.1
Analog Inputs	Tap the Calibrate button to produce another window and list of items to navigate, see Section 6.7.2.2.
Digital Inputs	Provides a list of digital inputs, see “Table D — Digital input channel assignments” on page 61.
Rectifier Signals	Provides a list of rectifier signals, see Table G on page 120.
Custom Signals	Tap the Configure button to produce another window and list of items to navigate.
Converter Signals	Provides a list of converter signals, see Table H on page 120.
Counter	Tap the Configure button to produce another window and list of items to navigate.
Timers	Tap the Configure button to produce another window and list of items to navigate.
ADIO Signals	Used to view live data from an ADIO device (i.e., Cordex Smart Peripherals) connected to the CXC. Refer to Section 6.7.2.6 on page 74, Example 4.

4.7 Rectifiers (and Converters) Information

Tap the rectifier display area to enter an operation window for converter/rectifier updates and reports.

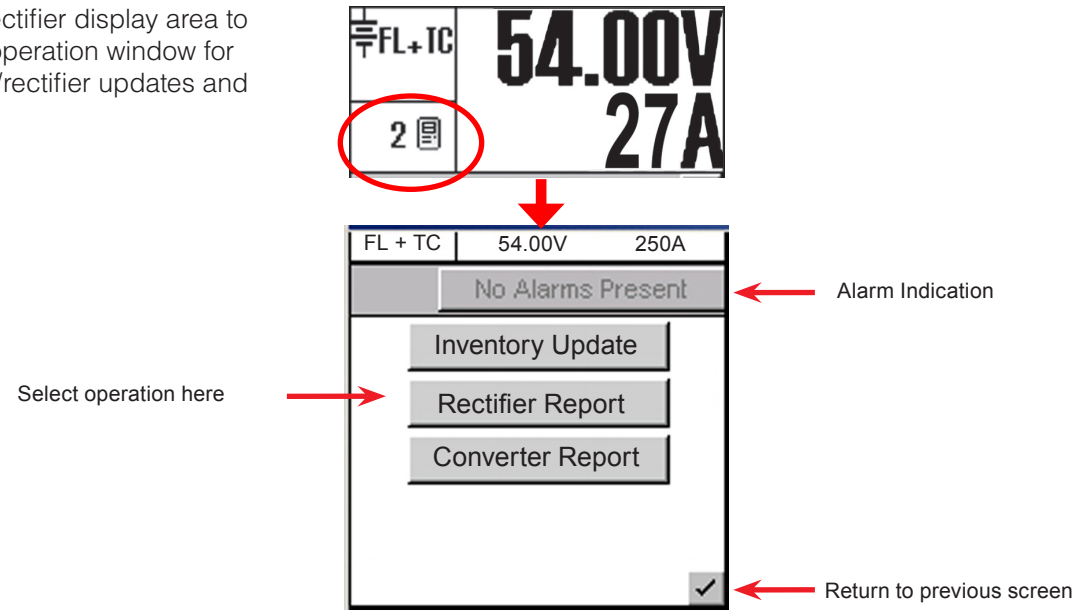


Figure 16 — Update (inventory) and report selection screen

4.7.1 Inventory Update

This button enables the user to re-acquire all the attached modules to the CXC and verify the existence of all connected modules.

Tapping this button updates the inventory and returns the user to the home page. A pop-up window appears over the home page to show a progress bar of the number of modules acquired during the update. Tapping the X button clears the pop-up from the active area.

Inventory update must be done whenever a module is removed from the system. The system is polled with respect to the following scenarios:

- Module has failed and is no longer able to communicate, or
- User has removed a module from the system.

4.7.2 Rectifier Report (Converter Report similar)

Tap the **Rectifier Report** button to generate a report of all acquired modules in the system.

A new operations window appears with a list of the rectifiers in the system. The first column lists the serial numbers of the modules. The report then displays the current output (A) of each module (or toggle for % of maximum output) and the number of active alarms. The right most column displays the number of settings out of tolerance (OOT per web interface).

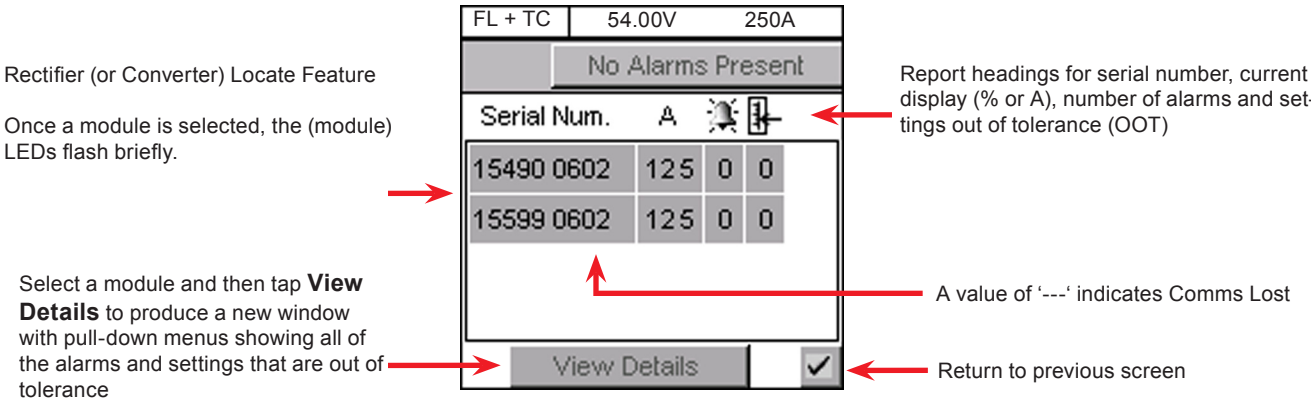


Figure 17 — Rectifier (or Converter) report screen

4.7.3 Basic Programming Example

For details of the settings in the RECTIFIERS\ CONFIGURE SETTINGS menu, see 6.3.2:

1. Use the navigation arrows to scroll to the item that is to be changed; e.g. FLOAT VOLTAGE.
2. Enter a new value using the CXC virtual numeric keypad, e.g., 54.00.

Download new settings to all connected rectifiers:

3. Click the check mark in the lower right hand corner to return to MAIN MENU navigation screen.
4. Press the OPTION button to evoke the SAVE/LOGOUT pop-up window.
5. Select SAVE to save the new settings or select LOGOUT to clear. A pop-up window appears to confirm the selection.

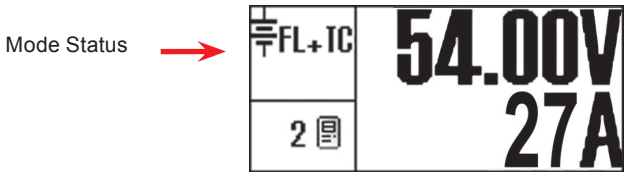
4.8 Voltage Mode Status and Temp Comp Settings

The Mode Status displays the current mode of operation:

- Float (FL)
- Equalize (EQ)
- Boost (BST)
- Battery test (BT)

The mode and temperature compensation (TC) appear in the upper left corner. The time duration, until the mode changes, may also appears in that active area.

Refer to sections 4.9 to 4.12 for a description of the voltage modes.



To change modes:

1. Tap the Mode Status active area to enter the mode selection screen.
2. In the screen that appears, tap the required mode button.
3. Tap the check mark button in the lower right corner to verify the selection and return to the previous screen.

The icon for the new mode now displays in the upper left corner of the GUI.

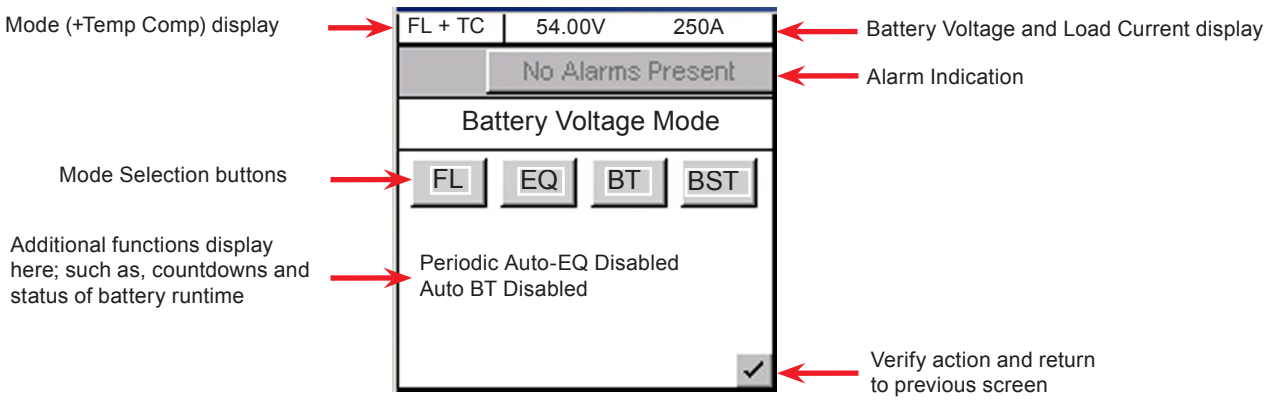


Figure 18 — Mode selection screen

4.9 Float (FL) Mode

FL is the CXC default mode at start up and during normal system operation. In this mode, the rectifier's charge (or output) voltage is driven by the float voltage setting found in the CXC Rectifiers menu, see 6.3.2. Do not adjust the float voltage of the rectifiers when they are in Current Limit.

4.10 Equalize (EQ) Mode

Use the equalize mode to equalize charge a battery string. In this mode, the rectifier's charge (or output) voltage is driven by the equalize voltage setting found in the CXC Rectifiers menu, see 6.3.2

A maximum time limit for equalize charging can be programmed to prevent accidental over-charge of a battery string. This limit is determined by the setting found in the EQ Timeout menu, see 6.3.2.10. Do not adjust the equalize level of the rectifiers while they are in Current Limit.

When operating in EQ mode, the text below the Mode Selection buttons (Figure 18) displays the time until FL mode in hours.

4.11 Boost (BST) Mode

This feature provides the supervisor with the means to equalize charge the battery at a higher voltage relative to the connected load. Activation is manual and certain conditions must be met to prevent damage to the load. A custom alarm must be created to include all the desired factors that must be taken into account before activating BST mode. This mode will then only be permitted if the alarm is false.

Once activated, BST mode concludes with a timeout or whenever the status of the custom alarm is true and reverts to FL mode. BST mode can also be cancelled if the conditions required to activate BST mode have changed.

4.12 Battery Discharge Test or Battery Test (BT) Mode

The battery discharge test is used to update the status of the lead acid battery capacity.

Manual Activation	Manually initiated (tap Mode Selection area and then BT button) (Figure 18)
Auto-BT Feature	BT can be set to run automatically on a periodic basis. The Supervisor can enable or disable the feature in (BATTERIES) BATTERY TEST\AUTO-BT menu. See section 6.5.4.

4.12.1 Definitions

- End/Terminal Voltage — The voltage at which the test ends.
- Timeout — The maximum time the test can run before it is aborted.
- Period in Days — The time between each Auto-BT.
- Battery On Discharge (BOD) Alarm — indicates the battery is discharging.

4.12.2 Tips on Using the BT Mode

Use Charge Current Control (6.5.2) to limit the battery recharge current to the battery manufacturer's specified maximum value.

The resultant battery capacity estimate will be more accurate if the test is started when the battery is fully charged. If a discharge has occurred within the last 96 hours, when a mode change to BT is selected, a dialog box will prompt the user to confirm the mode change.

During a test, the runtime hours are accessible through the Analog Signals display or Mode Status screen. The runtime hours reflect the time remaining in the test.

The runtime is displayed after the start of an outage and when a BOD condition is detected; i.e., battery is sourcing current and voltage is below open circuit.

When a test is started by the remote BT feature, the battery log will show "Remote BT" in the Event Type column.

The BT depth of discharge (DOD) can be accessed via the Analog Signals Display; provides an additional indication of test progress.

BT information is available via the CXC battery log web page when a test is in progress. In addition, the new battery capacity estimate can be accessed via the Analog Signals display at any time before, during or after the test.

4.12.3 BT Initiation

When the test begins, an entry is made in the event log. If enabled, an alarm provides a warning to indicate that a Battery Test is in progress.

The test will continue, depending on the type of rectifier in use, in accordance with the following algorithms (as applied to lead acid batteries):

Algorithm 1 — For rectifiers that support Battery Test (BT) mode:

1. A command is sent to put the rectifiers into BT mode.
2. BT mode runs for the period set as Timeout or until BT End Voltage is reached.

Algorithm 2 — For (Pathfinder) rectifiers that do not support BT mode:

1. Rectifiers are commanded to go to nominal voltage.
2. The rectifiers are periodically scanned to be sure that they do not begin sourcing current. When 3% DOD is reached and the rectifiers are still not sourcing current, the rectifiers are turned off.
3. The rectifier float setting is reset to the setting stored in the system controller.
4. When the system voltage reaches the end (termination) voltage or a timeout occurs, the system controller will command the rectifiers to turn ON and enter FL mode.

4.12.4 Activity During BT Mode

Temp Comp and Power Save features are suspended during a battery test.

When the battery is discharging, a BOD alarm is active.

During a test, the mode symbol in the upper left corner of the GUI updates to “BT.”

Runtime estimate begins at 3% DOD.

Capacity estimate also begins at 3% DOD, but is not stored unless DOD > 20%; the point at which reasonable accuracy can be assured.

4.12.5 AC Failure During BT Mode

If the AC fails during a battery test, the test will be aborted. This will place the rectifiers into a state that will enable them to resume providing power to the load when AC returns. If the Runtime is being displayed, it will continue to update.

4.12.6 Addition of Rectifiers During BT Mode

If rectifiers are added to the system when a battery test is active, they will be placed into the same state as the other rectifiers. They are:

- Placed into BT mode (for rectifiers that support BT mode), or
- Placed into remote shutdown, or
- Set to the same voltage as the other rectifiers.

4.12.7 Conditions to Watch for During BT Mode

If the voltage drops below 47 V before or when 3% DOD is reached, the test is aborted and the battery capacity is set to 0% (resulting in a Battery Capacity Low alarm). This provides an indication that the battery is very weak . The battery capacity must be manually reset to 100%, or to the percentage of expected battery capacity before the next battery test is started, in order for the battery monitor to again attempt to compute the battery capacity.

If rectifiers are seen to be sourcing current during the test and the battery ceases to be discharging, the test is aborted.

4.12.8 Cancelling BT Mode

BT mode can be cancelled by changing mode to FL or EQ (see section 4.8).

4.12.9 Battery Discharge Test Completion

The test is considered complete once the battery begins to charge. This could be due to the test ending from timeout, the system reaching the end (termination) voltage or an abort condition.

Once the battery begins to charge, the recharge cycle begins. Live battery recharge information is available from the battery log web page.

4.12.10 Remote BT Mode

This feature will force a transition to BT mode when a user-defined condition (custom alarm) is true.

When this condition is true, BT mode is entered regardless of the regular safety checks that are performed during manual or automatic changes to BT mode. BT mode stays active as long as the condition remains true.

A check box is used to enable/disable this feature. The default is disabled. If the condition is true and the check box is disabled, then the system will be put into FL mode.

If the condition becomes false, disabled, invalid, or the (assigned custom alarm) equation is empty, the system will be put into FL mode.

This feature is exclusive for the Cordex series of rectifiers. If Remote BT is active and a rectifier other than the Cordex series is added to the system then Remote BT will be aborted.

4.13 Communications

For the web interface, refer to Section 9.1 to set up network connections.

5. Operating with the Web and Panel PC Interface

5.1 Communication Settings

The web interface and panel PC are alike except for the communication settings to connect to the CXCU:

5.1.1 Web Interface

Refer to Section 9.1 to set up network connections between a remote PC and the CXC.

5.1.2 Panel PC

Direct Connection

For a direct connection to the CXCU, verify that you are using a cross over cable. Configure your local area network connection as follows:

1. Power up the panel PC.
2. Tap the Configuration (wrench) icon.
3. On the **IP Protocol Settings** tab, verify the following settings:
   a. **IP address** is **10.10.10.202**
   b. **Subnet Mask** is **255.255.255.0**
4. Make changes if necessary and click **Apply**.

NOTE: Changing the IP address of the Panel PC requires a restart of the Panel PC. A warning message appears below the screen.

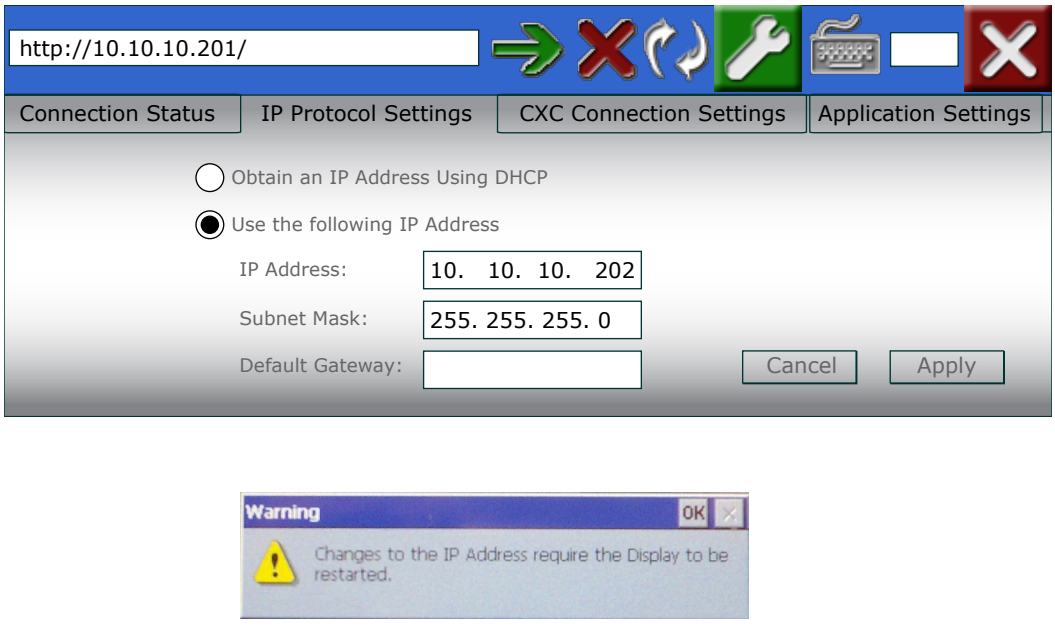


Figure 19 — Panel PC IP settings

5. In the **CXC Connection Settings** tab, verify the IP Address of the CXCU is **10.10.10.201**.
6. Tap **Navigate To**. The Home screen (Figure 21) appears.

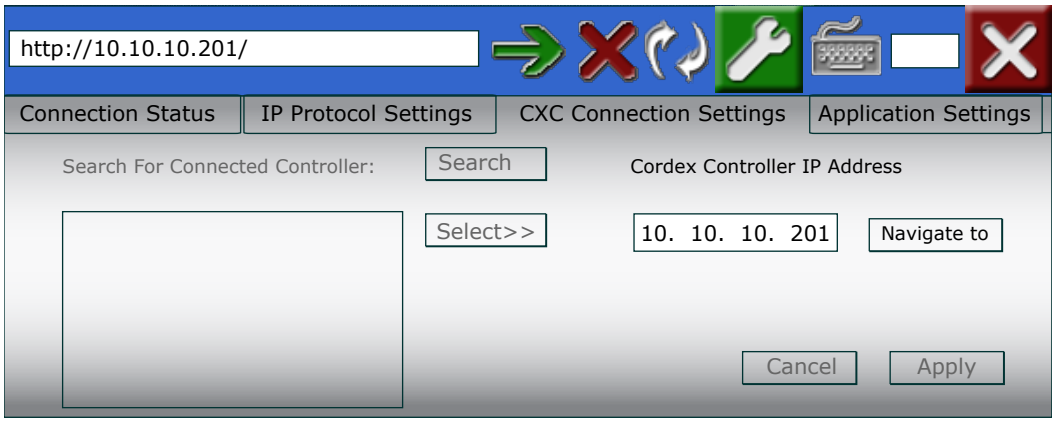


Figure 20 — Cordex Controller IP address

5.2 Getting Started

The following diagram shows navigation options available from the home page.

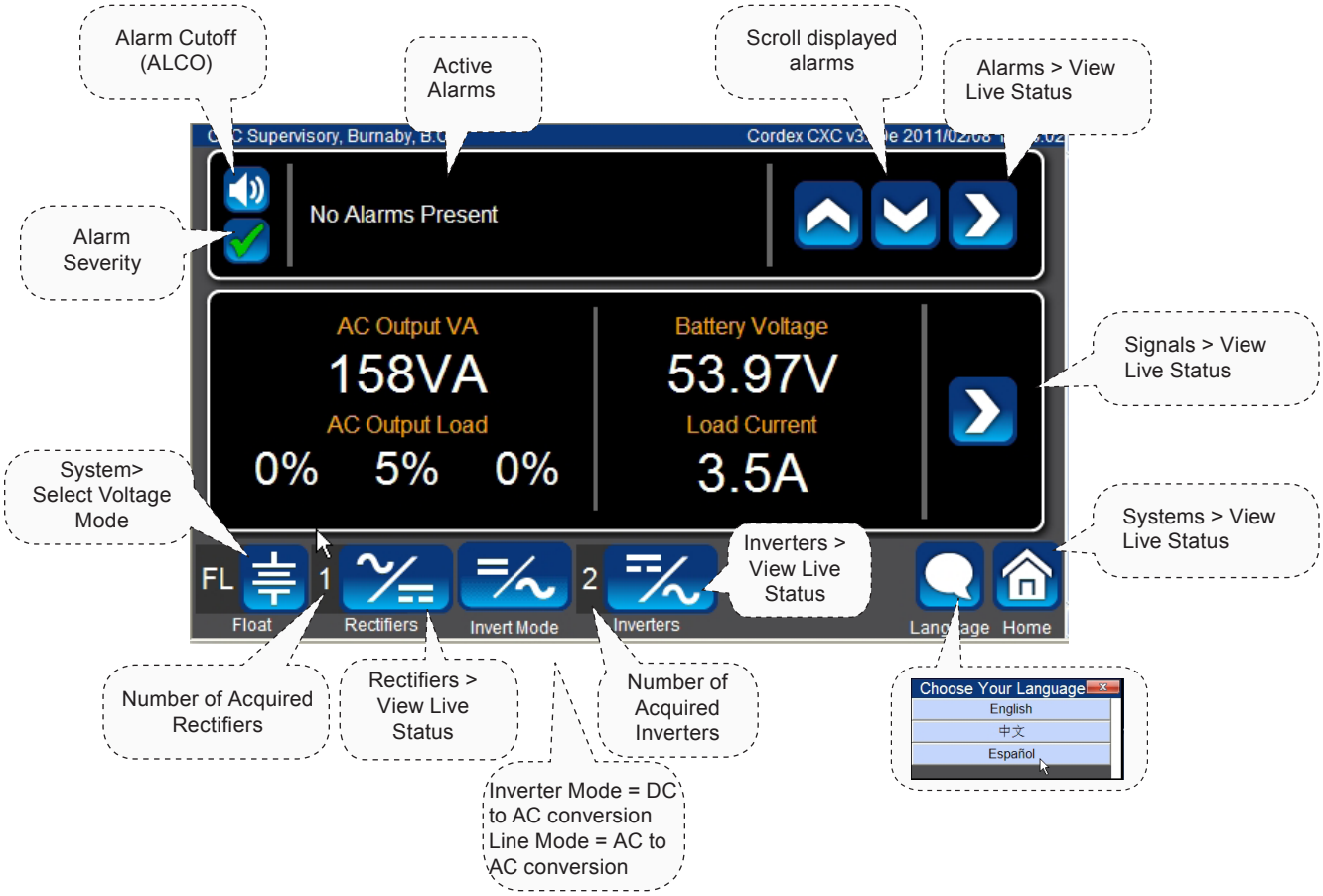


Figure 21 — Home Screen (Web Interface)

5.3 Login

CAUTION: Basic authentication is cached in Firefox and the Panel PC. You must close the browser window to clear password information and prevent unauthorized access.

Clicking any of the Home Screen icons, shown in 2.1, results in a login screen.

Login with your own name. Anyone denied access will know you're logged on and the time you spent logged in will show up in the events log.

Default Passwords:

Viewer	0000
User	5678
Supervisor	1234

Figure 22 — Login Screen - Web Interface

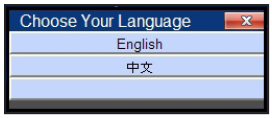
A Supervisor can both navigate through the menus and change values.

A User can navigate and change voltage modes (Main Menu > System > Select Voltage Mode).

A Viewer can navigate through the menus but can't make any changes.

5.4 Language Selection

Click the Language icon on the home page (2.1) and select a language from the list.



The CXC can be set up for a maximum of three languages (two defaults plus one other). Language files can be uploaded from www.alpha.ca (pending availability).

5.5 Saving Changes

The following two screens show the two steps required to save a change. (This example shows a change to the user interface.)

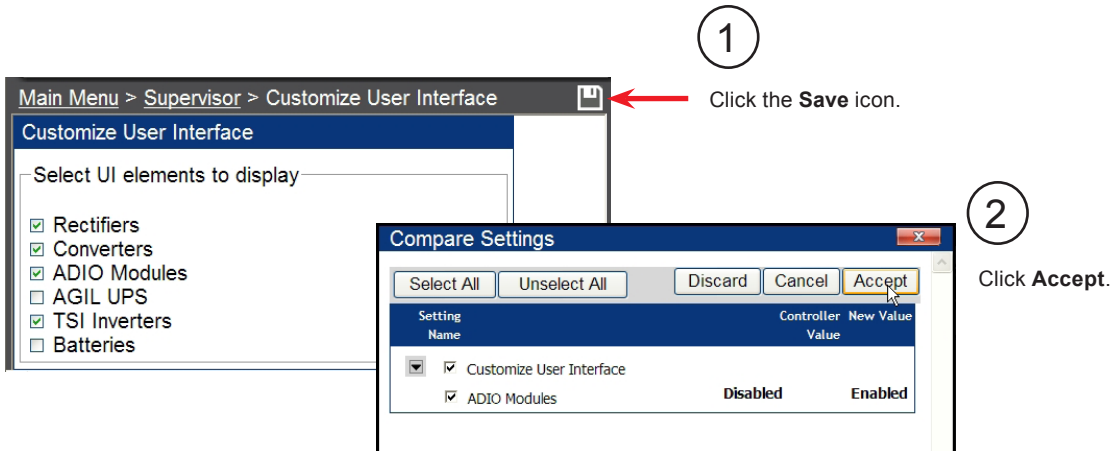


Figure 23 — Saving Changes - Web Interface

5.6 Date & Time

1. Select **Controller > Date and Time** from the main menu:
2. Fill in the date and time.Click the **Save** icon.

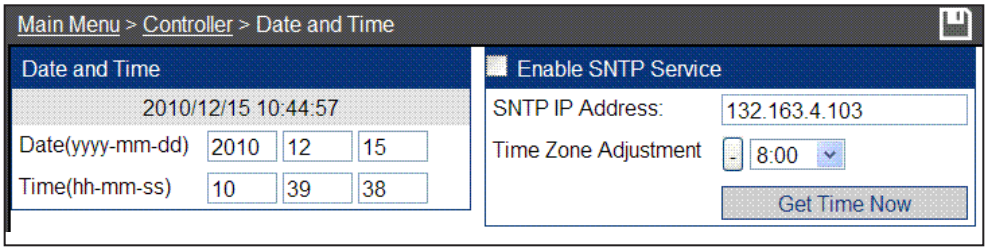


Figure 24 — Date & Time - Web Interface

5.6.1 Configuring SNTP (Simple Network Time Protocol) Service

1. On a laptop or PC, view Date and Time in the Control Panel. Use the pull-down menu to select the correct time zone. The Pacific time zone, for example, requires a time zone adjustment in the CXC of –8:00.
2. In the CXC GUI, select **Main Menu > Controller > Date and Time**. Click the **Enable SNTP Service** checkbox.
3. Enter the target IP Address for the SNTP source.
4. In the **Time Zone Adjustment** field, use the **+** or **-** button in addition to the pull-down menu to enter the time zone adjustment.
5. Click the Save icon and Accept the changes.
6. Click **Get Time Now** to synchronize.

5.7 Alarm Display and Configuration

5.7.1 View Alarms

Major alarms are visible on the home screen. Use the up/ down arrows to scroll through the active alarms.

Figure 25 — Alarms - Home page

Click the right most arrow on the home screen to display all alarms. Alternatively select **Alarms > View Live Status** from the main menu.

5.7.2 Alarm History

Select **Alarms > View Live Status** from the main menu. Then click **Cleared Alarm History**.

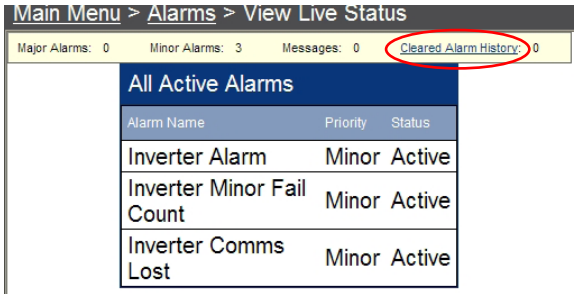


Figure 26 — Alarms history

5.7.3 Silence all Alarms

Click the speaker icon to acknowledge active alarms. This may silence the buzzer and revert the alarm relay to normal state depending on the global alarm configuration.

To configure global alarm parameters, select **Alarms > Global Alarm Configuration** from the main menu.

5.7.4 Configure Alarms

Select **Alarms > Configure Alarms** from the main menu. See section 6.6 for a description of the alarm parameters.

Ensure that the operating levels (e.g., input/output voltage, converter voltage, etc.) are within the operating parameters of the alarm and control thresholds.

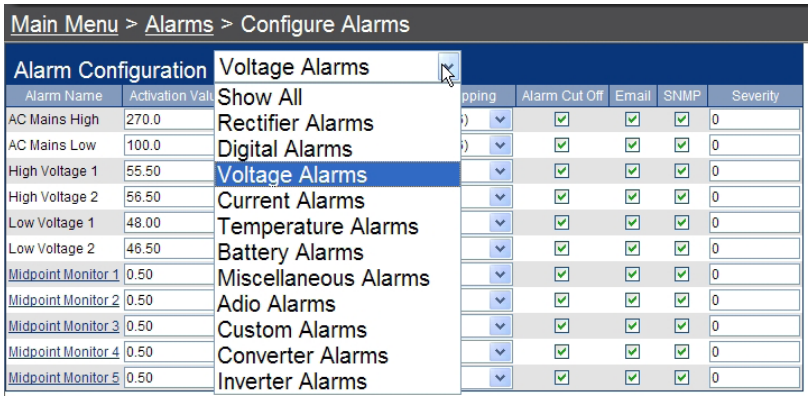


Figure 27 — Configure Alarms – Web Interface

5.8 Converters

Select **Converters > View Live Status** for status report and alarms.

Select **Converters > Configure Converters** to set the rectifier parameters. Refer to section 6.2for a description of the parameters.

5.9 Rectifiers

Select **Rectifiers > View Live Status** for status report and alarms.

Select **Rectifiers > Configure Rectifiers** to set the rectifier parameters. Refer to section 6.3 for a description of the parameters.

Other menu options are Inventory Update, Power Save and Rectifier Phase Mapping—all of which are described in section 6.3.

5.10 Inverters

Select **Inverters > View Live Status** for status report and alarms. Refer to Table A for menu options and section 6.4 for a description of the parameters.

5.11 Battery Mode and Temp Comp Settings

Select **System> Select Voltage Mode** to change voltage mode. Refer to section Figure 3 for a description of all battery parameters.

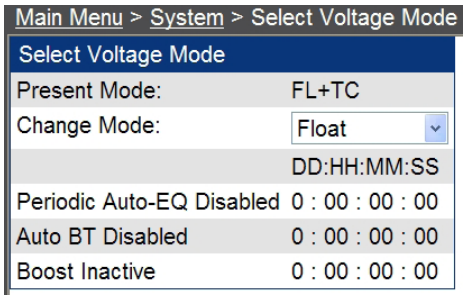


Figure 28 — Select Voltage Mode – Web Interface

5.12 Resetting the CXCU Controller

5.12.1 Soft Reset or Power Down

A soft reset enables the CXC to finish saving files to flash memory before a power down or restart.

From the main menu

To reset or power down the controller, select **Controller > Reset** from the main menu and wait for the **Reset Now** pop-up to appear.

CAUTION!

During reset, the Controller may need to run a defragmentation cycle. Cycling of the LEDs on the controller front panel indicate that defragmentation is in progress. A full defragmentation can take up to 20 minutes to perform. DO NOT POWER DOWN the CXC during this time.

From the controller front panel

The controller front panel has two reset buttons – both are recessed and require a stylus or pen to initiate the reset.

The upper reset button has two modes of operation. When pressed momentarily, the unit beeps twice and then the microprocessor resets. The LEDs flash as the CXC performs a selftest before returning to normal operating mode.

To reset the IP address, press and hold the front panel reset button for three seconds. The unit will beep three times, reset the IP address to 10.10.10.201 and disable DHCP. The settings are saved and the unit resets.

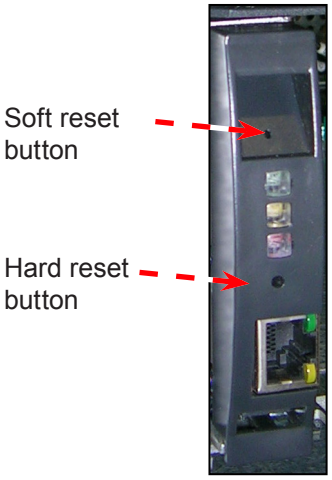


Figure 30 — CXCU controller

5.12.2 Hard Reset

If the controller is hung up, a hard reset can be initiated by pressing the lower reset button. No files are saved to flash memory.

5.13 Saving Configuration Files

When all changes are made, select **Main Menu > Logs and Files > Manage Configuration File** to save the configuration file:

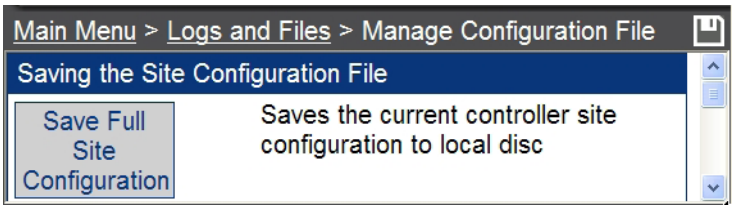


Figure 29 — Manage Configuration File – Web Interface

5.14 Summary of Menu Navigation

Table A — Web Interface Menu Structure			
Menu	**Sub-Menu**	**Menu**	**Sub-Menu**
System	» View Live Status » Configure System » Select Voltage Mode » Upgrade Firmware » User Inventory » System Inventory » Inventory Update	**Controller**	» View Live Status » Factory Information » Date and Time » Temperature Units » Upgrade Software » Upgrade Bootloader » Reset
Converters	» View Live Status » Configure Converters	**Inverters**	» View Live Status » View Group Status » Group Mapping » Set Inputs » Set Output » General Settings » Manage Config File » Auto DC Priority
Rectifiers	» View Live Status » Configure Rectifiers » Inventory Update » Power Save » Rectifier Phase Mapping	**Batteries**	» View Live Status » Configure Batteries » Battery Information
Alarms	» View Live Status » Configure Alarms » Global Alarm Configuration	**Signals**	» View Live Status » Configure Signals » Configure Data Logging
Controls	» View Live Status » Configure Controls	**Communications**	» View Live Status » Configure Communication Parameters » Event Notification Destination » SNMP Configuration
Hardware	» Configure Relays » Test Relay » Test Modem	**Logs and Files**	» Retrieve Logs » Manage Editable Text Files » Manage Configuration File » Manage Language Files
Supervisor	» Change Password » Customize User Interface		

6. System Configuration: Programming and Adjustments

The CXC menu structure (Figure 7) consists of two basic components: Menu Categories and Sub-Menu Items. This chapter describes each of the CXC menu items, including alarms, controls and configuration items. They are arranged, as they appear in the touch screen menus subject to product enhancements. Items specific to the CXC web interface are indicated separately.

6.1 System Info

This menu category consists of factory, site and system data. Information pertaining to the CXC, the related site and system can be accessed here. The Supervisor can set parameters; such as, system number (Figure 33), system serial number, and temperature display units (Figure 34).

Sub Menu	Action
System Configuration	System Voltage [12V, 24V, 48V, 125V, 220V]
CAN Device FW Upgrade	Use Firmware [perform upgrade] Load from Device (get firmware]
Set ADIO Module Number [1-16]	Select and map the order number in which CAN-enabled system devices, such as Battery Cell Monitor (BCM), are to appear in the CXC menus
Site Information	System Number, Serial Number, Contact Information
Temperature Units [C / F]	Selection of Centrigrade or Fahrenheit units
Factory Information	Unit Serial, Hardware Rev. Ethernet/ MAC Address Factory Notes

For the web interface, this section is divided into two separate menu items: System and Controller. The System menu allows configuration of the contact and system information, selection of the voltage mode, upgrading the firmware, and setting of the ADIO module number. See sections 6.1.1 through 6.1.4.

The Controller menu allows setting of the date and time (4.3), selection of temperature units (6.1.5), and display of factory information (6.1.6). In addition, the menu links are located here to upgrade the Boot-loader and Software. A remote reset of the CXC can also be commanded via a link on this page.

6.1.1 System Configuration

Use the pull-down menu to select the system voltage.

CAUTION: This item affects all system settings that pertain to the system voltage including LVD levels.

6.1.2 CAN Device Firmware (FW) Upgrade [Cordex Series only]

This menu item enables the Supervisor to select, transfer and upgrade firmware for the CAN-enabled system devices, such as Shunt Multiplexer (MUX) or CXRC rectifier shown in the following example:

1. Select **Load From Device** to see a list of Acquired Devices (or select the X icon to cancel entry and close window).
2. Select device from list. **Get Firmware** produces a message window prompting accept (or cancel).

   OR

   In the web interface, use the **Browse** button to select files from the PC.
3. Select **Accept** to proceed with firmware transfer. Select the X icon (in the message window) when transfer is complete.
4. Select **Use Firmware** to see a list of Upgrade Devices.
5. Use the check box to select/deselect device from list. **Perform Upgrade** produces a message window prompting accept (or cancel).
6. Select **Accept** to proceed with firmware upgrade. Rectifier LEDs flash in sequence to indicate data transfer. Select the X icon when the upgrade is complete.

7. Repeat the steps above choosing Shunt MUX as required.

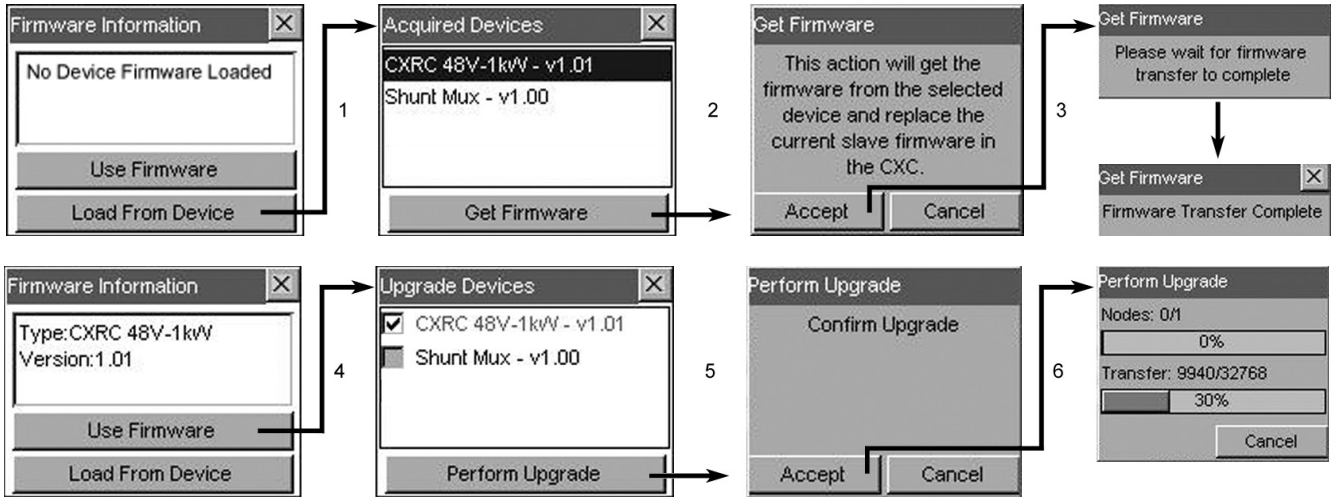


Figure 31 — Firmware upgrade procedure

6.1.3 Set ADIO Module Number

The Supervisor can select and map the order number in which CAN-enabled system devices, such as Battery Cell Monitor (BCM), are to appear in the CXC menus; shown in the examples below:

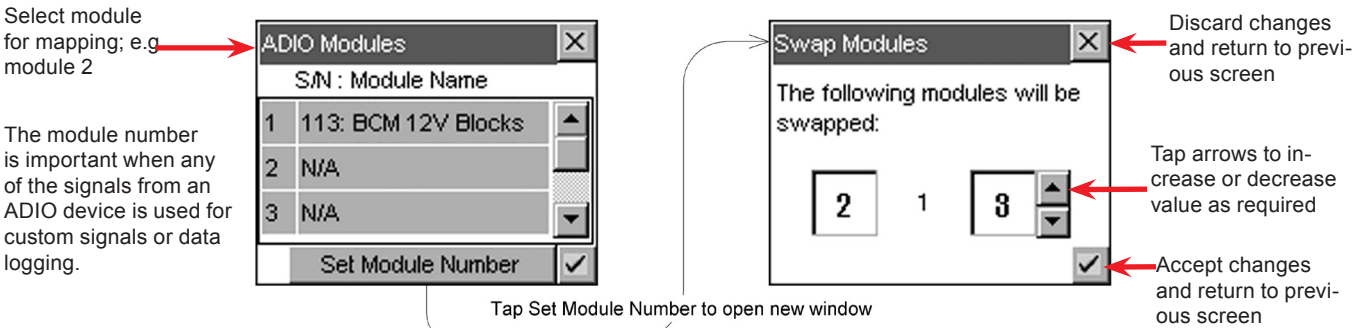


Figure 32 — ADIO Modules and Swap Modules windows

When replacing ADIO modules, assign the new identical device with the same ADIO module number of the old device. This numbering preserves the functionality of any equations that use signals originating on the old device.

6.1.4 Site Information

Identical fields exist in the LCD for the entry and display of site information.

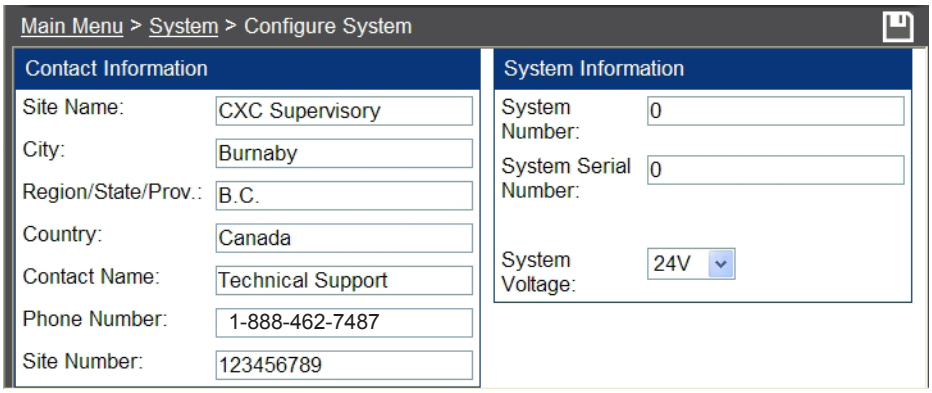


Figure 33 — Site Information and Contact Information windows – Web

6.1.5 Temperature Units

This menu item enables the Supervisor to select the temperature display units (Celsius or Fahrenheit).

For the web interface, select **Main Menu > Controller > Temperature Units**.

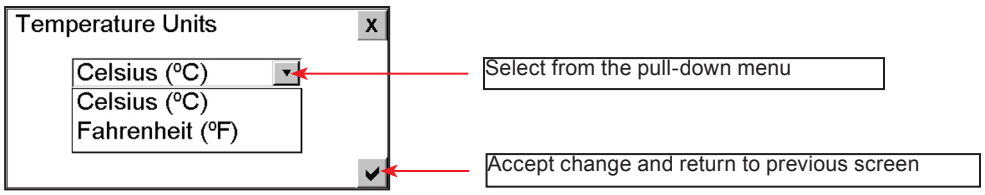


Figure 34 — Temperature Units selection window

6.1.6 Factory Information

The CXC factory unit default values are displayed here. Use the scroll bar to navigate the list of text items for viewing; i.e., Unit Serial, Hardware Rev., Ethernet/MAC Address and Factory Notes.

For the web interface, select **Main Menu > Controller > Factory Information**.

6.1.7 User Inventory (Web Interface Only)

This page enables the user to enter data for up to 20 inventory items. When entering data, the tab key may be used to move the cursor from one data entry box to the next. Figure 35 below:

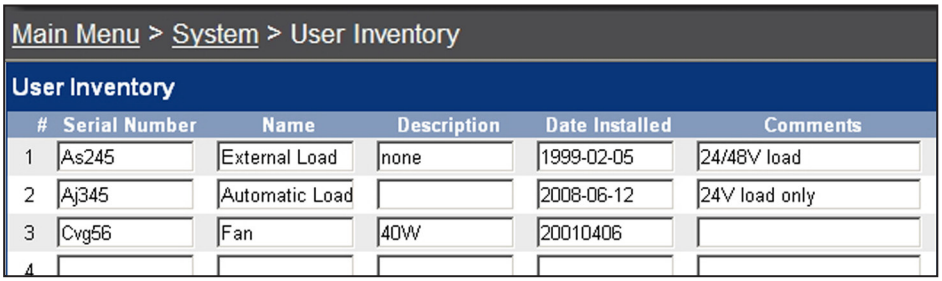


Figure 35 — User Inventory window (web interface only)

6.1.8 System Inventory (Web Interface Only)

This page enables the user to view a single list of all CAN connected devices, user inventory items, and battery information items. See Figure 36 below:

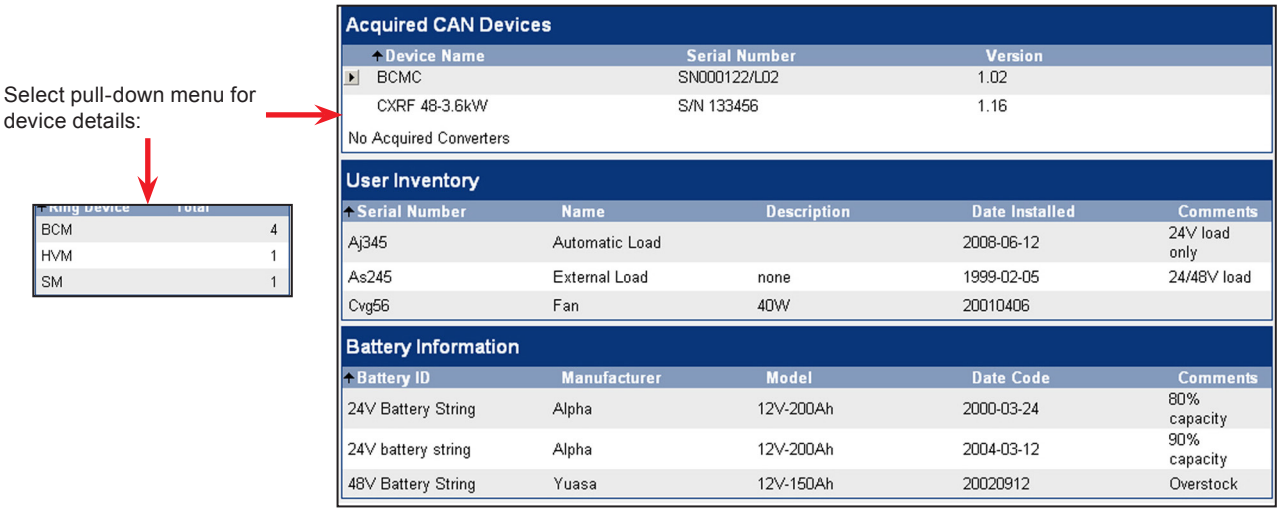


Figure 36 — System Inventory window (web interface only)

6.2 Converters

This menu category consists of converter alarms and controls. Parameters can be set/accessed such as output voltage, OVP, high/low voltage alarms, and start delay.

The converter defaults are based on the system voltage of either 24 or 48 VDC.

At present, the converter software does not support:

- Two types of converters simultaneously
- 12, 125, and 220 VDC systems.

Other features include:

Active voltage control	Inventory update
Converter locate	Loadsharing
Firmware upgrade	Major and minor alarms

6.2.1 Converter Report

This feature provides the user with a list report (see 4.7.2, Figure 17) of all acquired converters in the system. The first column lists the serial numbers of the converters. The report then displays the output current of each converter under the Amps column (or toggle for % of maximum output) and the number of active alarms under the Alarms column (if that converter is issuing an alarm). The right most column displays the number of settings out of tolerance.

Select a converter and tap **View Details** to produce another list showing details of the entire converter alarms and settings that are out of tolerance.

6.2.2 Configure Settings

This feature allows the user to configure settings (via menu items) for all of the acquired converters in the system; such as:

Output Voltage	Start Delay
OVP	Enable CL Alarm
Input Voltage Shutdown	Input Voltage Restart

6.3 Rectifiers

This menu category consists of rectifier alarms and controls. Parameters can be set/accessed such as float/equalize voltages, high/low voltage alarms, and start delay.

6.3.1 Rectifier Report

This feature provides a list report (see 4.7.2, Figure 17), of all acquired rectifiers in the system. The first column lists the serial numbers of the rectifiers. The report then displays the output current of each rectifier under the Amps column (or toggle for % of maximum output) and the number of active alarms under the Alarms column (if that rectifier is issuing an alarm). The right most column displays the number of settings out of tolerance (OOT per web interface).

Select a rectifier and tap **View Details** to produce another list showing details of the entire rectifier alarms and settings that are out of tolerance.

6.3.2 Configure Settings

This feature allows the user to configure settings (via menu items) for all of the acquired rectifiers in the system.

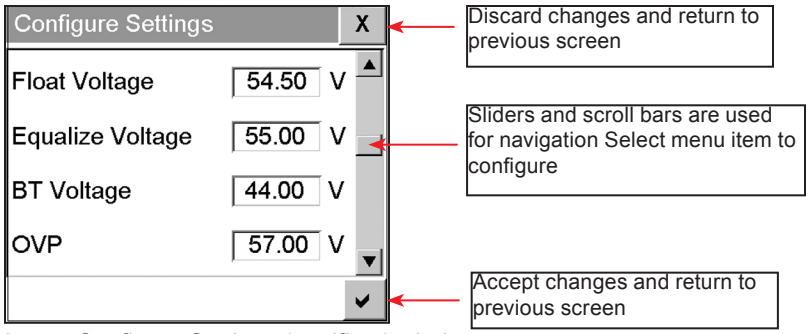


Figure 37 — Configure Settings (rectifiers) window

The menu items described below can be configured via a virtual numeric keypad ( ) or by toggling the listed item. For a basic programming example, see 4.7.3.

6.3.2.1 Float (FL) Voltage

The Supervisor can set the system BATTERY VOLTAGE (measured at an analog input channel) to the desired float voltage value. Float voltage charges the battery string and supplies the load. Normally, the power system will operate in the float mode. This setting should have a minimum of LVD + 1 V and a maximum of OVP – 1 V.

6.3.2.2 Equalize (EQ) Voltage

The Supervisor can set the system BATTERY VOLTAGE (measured at an analog input channel) to the desired equalize voltage value. Equalize voltage charges the battery string at a higher than normal voltage to either recharge batteries after a power failure or to balance individual cell voltages. Periodic equalizing of the battery string may be required to optimize battery performance and life. This setting should have a minimum of LVD + 1 V and a maximum of OVP – 1 V.

6.3.2.3 Battery Test (BT) Voltage

The Supervisor can set the Battery (Discharge) Test Voltage to the desired value during the test (mode). This setting should have a minimum of LVD + 1 V.

6.3.2.4 Safe Voltage

The Supervisor can set the default system voltage (Safe Mode) in the event that communications to Cordex rectifiers should fail. See 2.5 for more details about this feature.

6.3.2.5 OVP Voltage

The Supervisor can program one OVP setting for all connected rectifiers. OVP will disable a rectifier that outputs an abnormally high voltage.

6.3.2.6 Low Voltage Alarm (LVA)

The Supervisor can program one LVA setting for all connected rectifiers. LVA serves as a warning to the user indicating that output voltage is dropping.

6.3.2.7 High Voltage Alarm (HVA)

The Supervisor can program one HVA setting for all connected rectifiers.

HVA serves as a warning to the user indicating that output voltage is rising. This value should be less than the OVP setting in order for the HVA to work effectively.

6.3.2.8 Current Limit (CL)

This menu item sets the level as a percentage at which current limiting activates in all connected rectifiers. Current limiting is a primary response to output over current situations. If the output current on the rectifiers exceeds the current limit setting, their output voltage will automatically decrease but will maintain the current output at the current limit level. This prevents potential damage to the rectifiers.

If the CXC finds rectifiers in the system that cannot meet the default current limit value, the CXC will correct its default limit setting to match the rectifiers.

6.3.2.9 Power Limit (PL)

This menu item sets the level as a percentage at which power limiting activates in all connected Cordex rectifiers.

6.3.2.10 EQ Timeout

This menu item controls the maximum equalize time setting for all connected rectifiers. This control is designed to prevent accidental over-charge of the batteries. CXC will send the command to change the equalize time-out setting in all the rectifiers.

6.3.2.11 BT Timeout

This menu item controls the maximum duration of the Battery Test.

6.3.2.12 Slope (Pathfinder rectifiers only)

This menu item sets all connected rectifiers to the same slope adjustment value. Slope determines the regulation percentage of the current between rectifiers in a group. When load sharing is initialized, CXC will send commands to the rectifiers to try to adjust their output voltage within this slope range. The rectifiers should have their output voltage as close to being equal, in order to balance (or share) the load current between them.

6.3.2.13 Backlight Timeout (Pathfinder rectifiers w/LCD only)

This menu item controls the amount of time of GUI inactivity permitted before the rectifier automatically turns off the LCD backlight.

6.3.2.14 Security Code (Pathfinder rectifiers w/LCD only)

The Supervisor can program one security access code for all connected rectifiers. CXC logs in each of the rectifiers as Factory Access and sends the direct command to change the access code.

6.3.2.15 Module Start Delay

This menu item controls the stagger-start timer for all connected rectifiers.

With start delay, rectifiers start up in a time-delayed sequence. This prevents excessive loading of the AC source. For example, setting a start delay time of 5 seconds will cause rectifier#1 to start at 1 second, rectifier#2 at 5 seconds, rectifier#3 at 10 seconds, etc. In the case where the start delay exceeds the maximum range, the next rectifier in sequence will start its delay at zero and increment again by the value specified in this menu item.

When the rectifier Module Start Delay is set to 0 s, all the rectifiers start with a 0 sec delay.

6.3.2.16 System Start Delay

This menu item controls the amount of time, in seconds, before the stagger-start timer commences, see the previous section.

6.3.2.17 Soft Start Ramp Rate (Cordex rectifiers only)

The Supervisor can select the soft start ramp rate (normal or fast). Current limit ramps up at about t12%/sec during normal soft start and 100%/sec during fast.

For systems without batteries, select the Fast setting for the Soft Start Ramp Rate.

6.3.2.18 Temp Display Scale (Pathfinder rectifiers w/LCD only)

The Supervisor can select the temperature display scale (Celsius or Fahrenheit).

6.3.2.19 Check to Enable

The Supervisor can toggle (enable or disable) the following list of items:

- CL and PL Alarm
- Remote Shutdown (Cordex rectifiers only; affects operation of Power Save, see below)
- Local Access Alarm (Pathfinder rectifiers w/LCD only)
- Ramp Test (Cordex rectifiers only)

6.3.3 Power Save

The Supervisor can improve operational efficiency when conditions warrant by running only the necessary number of rectifiers. The remote shutdown setting (enable or disable) affects correct operation of the Power Save feature. See also 2.6 for more details.

6.3.3.1 Enable

The Supervisor can control the CXC Power Save feature.

6.3.3.2 Redundant Rectifiers

The Supervisor can specify the number of extra rectifiers to turn on.

6.3.3.3 Max (Maximum) Power Usage

The Supervisor can specify the percentage (of maximum power usage) per rectifier module used in the computation of the Power Save feature. This works to avoid rectifiers operating continuously at greater than the set limit (i.e. 95%) and going into current limit frequently due to load surges or power limit conditions; such as, low line voltage or high temperature.

6.3.3.4 Phase Mapping

The user can assign or map a rectifier per input signal for individual phase voltage readings:

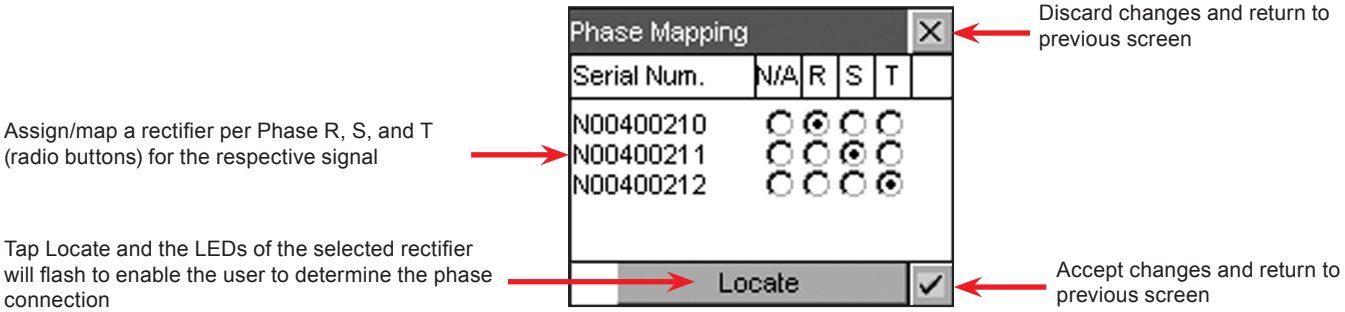
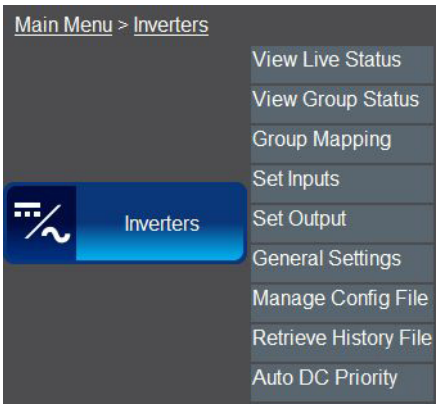


Figure 38 — Phase Mapping (rectifiers) window

6.4 Inverters

The inverter menus are only available from the controller web interface.

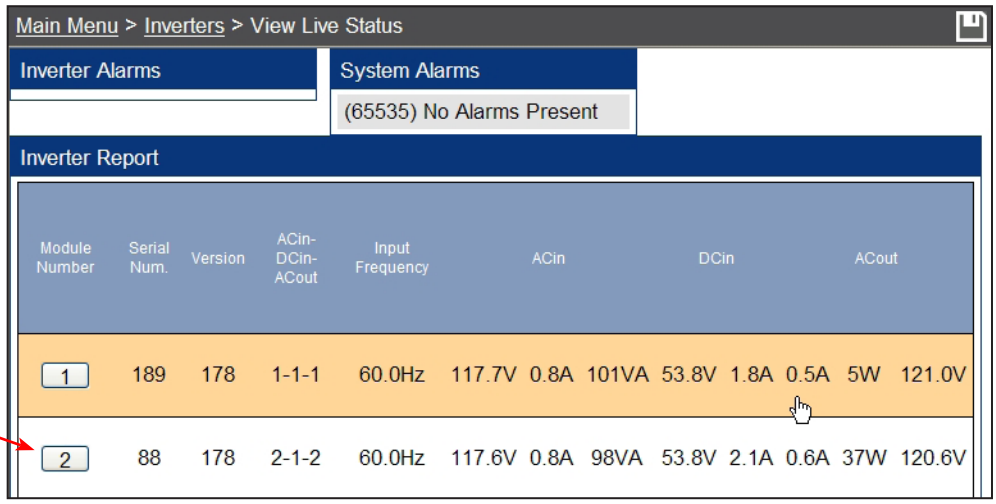


6.4.1 View live status

- Lists all the currently active inverter specific and system alarms. Table R provides a description of alarms and possible solutions.
- Lists of all acquired inverters in the system.
- Can be used to locate a physical rectifier in a shelf

The user can re-assign the inverter module number in the report, for example, to correspond with its physical location on the shelf.

Selecting a module number that is already used will swap the two modules.



Select a row to send a locate command. The inverter module LEDs will blink momentarily

Figure 39 — View live status web interface

Ensure phases are configured correctly before mapping inverters in the new groups and turning them on.

6.4.2 Group Mapping and View Group Status

Configuration of AC Input Groups

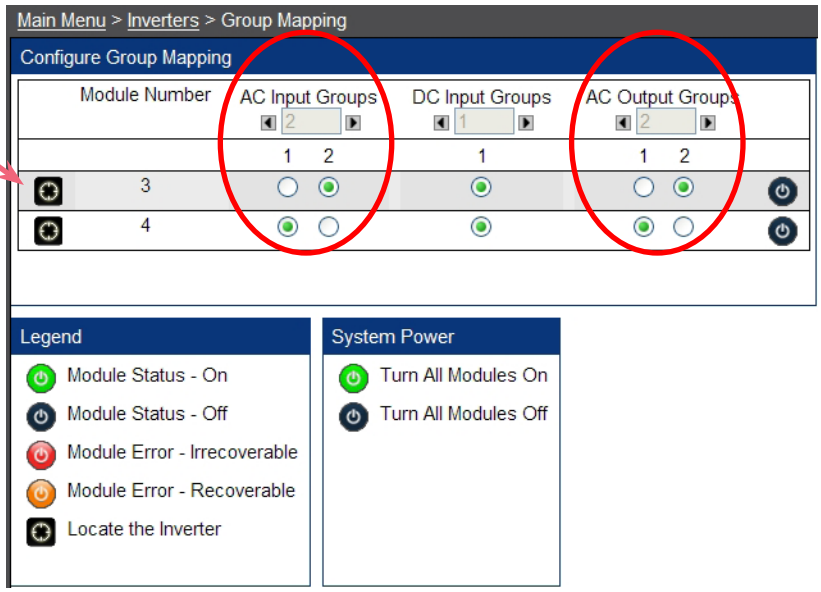
Use this interface to assign inverters to input phases (**Inverters > Group Mapping**).

The logical approach is to match the configuration of inverters in the **AC Input Groups** to the configuration of inverters in the **AC Output Groups** as shown in Figure 40.

The **AC Output Groups** of an inverter in the **ON** state cannot be changed. The radio buttons for that inverter AC output group remain disabled until the inverter is turned **OFF**. All inverter modules can be turned **ON** or **OFF** simultaneously with the button under the **System Power** heading.

The number of columns increase when groups are added and decrease when groups are removed. Adding/removing groups (columns) may take a few seconds to update the screen. Changing the radio buttons (rows) will also take time to apply the changes; for example, approximately two seconds for one inverter and up to ten seconds for the maximum 32 inverters.

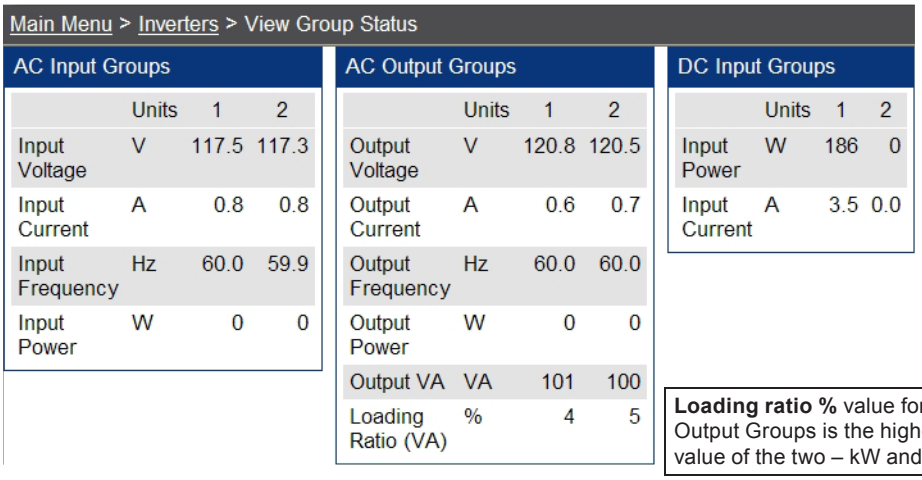
Clicking the black **Flash Module Light** icon to the left of the module number causes the LEDs on the inverter module to blink briefly.



green
black
red
orange

Figure 40 — Group mapping interface

The groups of inverters can then be monitored as a unit in the **View Group Status** screen.



Loading ratio % value for AC Output Groups is the higher value of the two – kW and kVA.

Figure 41 — Monitoring AC Input Groups, AC Output Groups and DC Input Groups

Configuration of DC input Groups

The configuration of the DC input to the inverters provides several different ways to monitor DC input power and input current.

For bulk monitoring, assign all inverters to DC Input Group 1.

For a system with two or more battery strings, refer to the power system manual for specific configuration details.

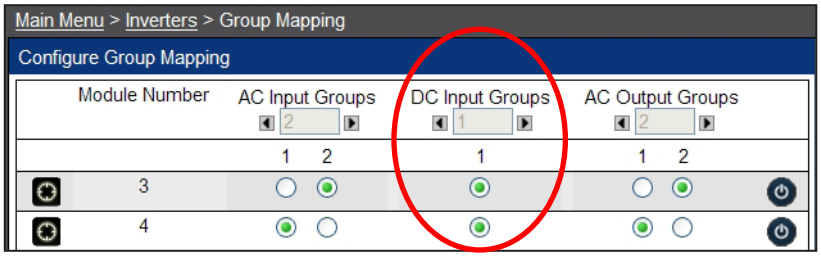


Figure 42 — DC Input Groups

6.4.3 Set Output

Set the number of inverters in each phase of your system. Match the AC input phase to the corresponding AC output phase.

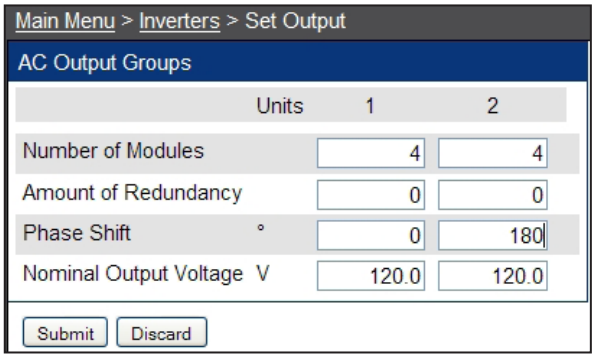


Figure 43 — Set Output (Split Phase System)

1. **Number of Modules:** Enter the total number of inverter modules that will be installed for that phase.
2. **Redundancy:** Enter the number of inverter modules that will provide redundant power for that phase (used to provide system warnings).
3. **Phase Shift**: Enter the phase shift for each output group in your system configuration

	1	2	3
Single phase °	0	N/A	N/A
Split phase (120/240 V) °	0	180	N/A
2-pole (120/208) °	0	120	N/A
3-phase (120/208 V) °	0	120	240

4. **Nominal Output Voltage**: Enter **120** for all phases.
5. Press **Submit**.

CAUTION!

The value entered in the Nominal Output Voltage field can change the actual AC output voltage of the inverters. Setting this value to anything other than 120 V will render the UL/CSA approval invalid.

6.4.4 General Settings

The following table describes some of the less obvious fields in the General Settings menu:

Table B — General Settings Parameters

Field	Values	Description
ACin Mode	Normal (default), Safe	Normal running in AC/AC mode. Safe: ACin inlet relay is open and so the system is insulated from the Mains.
Short Circuit Voltage Threshold	20 to 100 Vac, default: 80 Vac	Minimum voltage threshold where module considers that output is in short circuit.
Short Circuit Hold Time	0.1 to 600 sec, default: 60 sec	Time duration when the module tries to eliminate the short-circuit existing on the output. When this time expires and the voltage is less than the Short Circuit Voltage Threshold, the module stops.
Booster 10 x line	(0 : OFF, 1 : ON)	The Booster option generates a current of 10 x line for 20ms in case of short-circuit.
Max current (as percentage of nominal current).	100-110%	
Max power (as percentage of nominal current).	100-110%	
Max Overload Duration	0 to 15 (default) sec	Maximum time duration when the module can run with overload
Synchronization Tracking Speed	-2 very fast -1 fast 0 normal (default) 1 slow 2 very slow	Speed with which the module tries to synchronize ACout

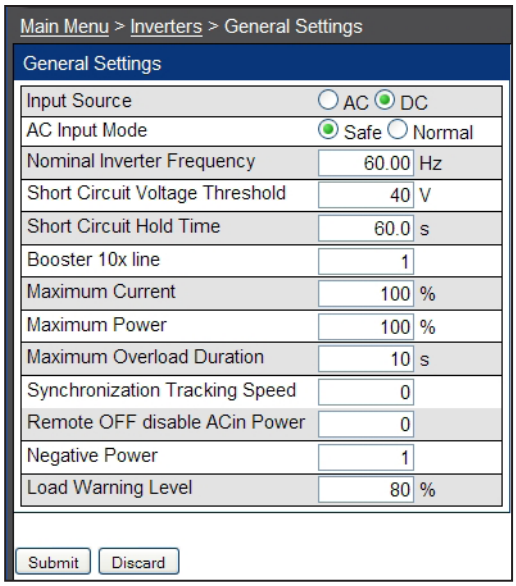


Figure 44 — Inverters – General Settings

6.4.5 Set Inputs

This submenu enables the supervisor to set the AC and DC input parameters shown in the following screen capture:

Select **Submit** to save changes. Select **Discard** to discard all changes made (including invalid settings).

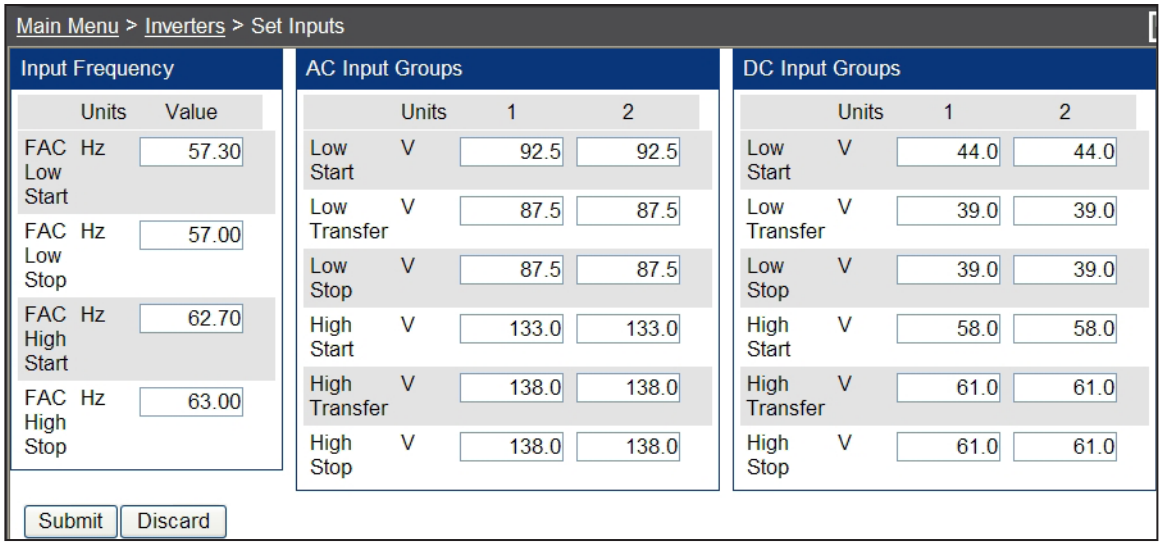


Figure 46 — Set input window

6.4.6 Manage Configuration File

The inverter settings have their own configuration file and are not part of the full site configuration file. Refer to factory default tables: Table P, Table Q, and Table R.

1. To transfer Inverter Settings to another system, first save the inverter configuration file to a local disc (**Main Menu > Inverters > Manage Config File**).
2. Then upload the file to the system at another site.

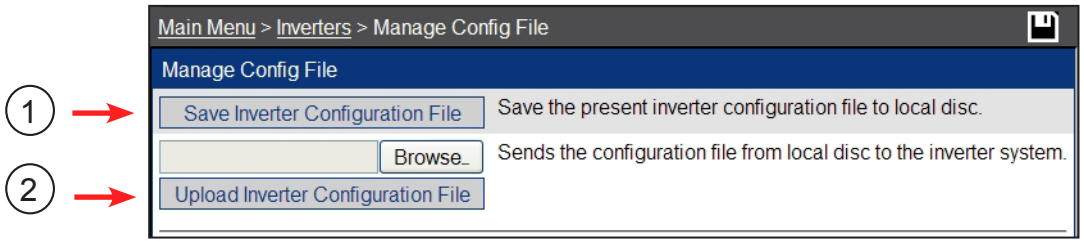


Figure 45 — Inverters – Manage Configuration File

WARNING: Modifying the configuration settings, using a text editor, can have dire consequences and should be undertaken by advanced users only.

6.4.7 Auto DC Priority

The inverters can be configured to switch to DC Priority mode when a custom alarm is tripped. The alarm can be triggered by a digital input such as a signal from an alternative energy source – a fuel cell perhaps that has just switched on.

When the custom alarm activates, the CXC automatically switches the inverters to draw from DC power as much as possible. When the alarm is deactivated, the command is sent to return to AC Priority. (Custom alarms are configured from **Alarms-> Configure Alarms**.)

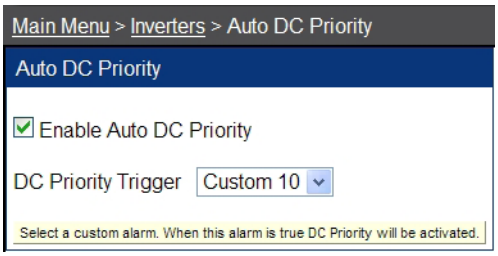


Figure 47 — Inverters – Auto DC Priority

If the inverters are in DC Priority with the alarm still active, disabling Auto DC Priority does not cause the inverters to revert to AC. (In addition, this action blocks the alarm input so the inverters will never automatically revert to AC.)

The correct approach is to switch the **Input Source** manually to **AC** in **Inverters > General Settings**. The manual setting overrides the Auto DC Priority setting.

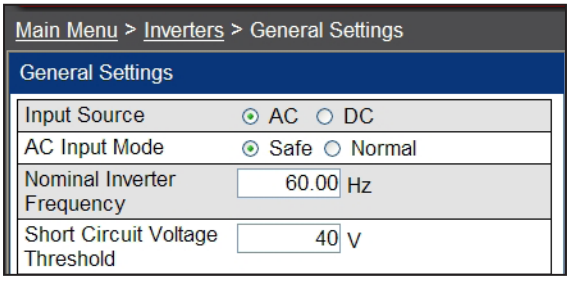


Figure 48 — Inverters – Auto DC Priority

6.4.8 Inverter Alarms

NOTE:

The real time clock of the inverter controller (T2S) is synchronized with the Cordex controller RTC.

6.4.8.1 Event log reporting

Alarms reported by T2S are reported in the event logs.

Event Log

2012/03/23 10:46:00.623	Inverter Module Alarm	Cleared	1	1: SN 56	(75) Booster Not Ready
2012/03/23 10:45:57.020	Inverter Module Alarm	Active	1	1: SN 56	(75) Booster Not Ready
2012/03/23 10:45:57.013	Inverter Module Alarm	Cleared	1	1: SN 56	(74) Imminent Start
2012/03/23 10:45:49.927	Inverter Module Alarm	Cleared	1	1: SN 56	(83) Manually OFF
2012/03/23 10:45:49.920	Inverter Module Alarm	Active	1	1: SN 56	(74) Imminent Start
2012/03/23 10:45:33.005	Relay 4 (K4)	Energized	1		
2012/03/23 10:45:29.993	Inverter Alarm	Active	1		
2012/03/23 10:45:29.986	Inverter Module	Active	1	1: SN 56	(83) Manually OFF

Figure 49 — T2S alarms in event logs

6.4.8.2 Retrieve Inverter History File

Inverter history files can be used by Alpha service people to troubleshoot inverter alarms. The submenu **Retrieve History File** opens a page with a **Save Inverter History File** button to download the inverter alarm history file to a local drive.

Figure 50 — Retrieve alarm history file

6.5 Batteries

This menu category consists of battery controls. Parameters can be set/accessed, such as automatic temperature compensation, auto equalize and battery current limit.

See Chapter 2 Standard Features for an explanation of temperature compensation and lead acid battery auto equalization.

The descriptions in this section apply to both the LCD interface and the Web interface. For the web, select **Main Menu > Batteries > Configure Batteries**.

6.5.1 Temperature Compensation

The Battery Properties section (6.5.7) must be completed to enable this feature.

Enable — Automatic battery temperature compensation can be enabled in equalize mode independently from float mode.

Upper/Lower Breakpoints — Temperature at which automatic voltage changes in the system will cease. There are voltage and temperature values for both breakpoints (upper and lower).

Battery Properties (LCD only) — The **Battery Properties** button at the bottom of the window links to the Battery Properties window. The return path is to this Temp Comp window.

Batteries > Configure Batteries

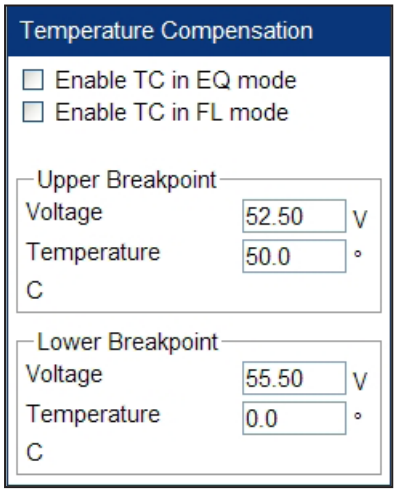


Figure 51 — Temperature Compensation – Web

6.4.9 Auto Equalize

EQ Duration — Duration of the auto equalize cycle, in hours.

The duration setting is also used in manual equalize mode. Consult the battery manufacturer for suggested duration of equalize charge cycles.

Periodic Auto-EQ

Enable	Controls the CXC periodic auto equalize feature.
Interval	Time between auto equalize charging of the battery string in days. Consult the battery manufacturer for suggested equalize charge-time interval.

Charge Auto-EQ

Enable	Controls the Charge Auto Equalize features.
Activation (High Voltage) Threshold	Voltage at which the auto equalize charging activates.
Arming (Low Voltage) Threshold	Voltage at which the auto equalize charging arms.

Battery Properties (LCD only) — The **Battery Properties** button at the bottom of the Auto Equalize window links to the Battery Properties window (see 6.5.7). The return path is to the Auto Equalize window.

6.5.2 Charge Current Control (CCC)

Use Charge Current Control to limit the battery recharge current to the battery manufacturer's specified maximum value. The Battery Properties section (6.5.7) must be completed to enable the Charge Current Control feature.

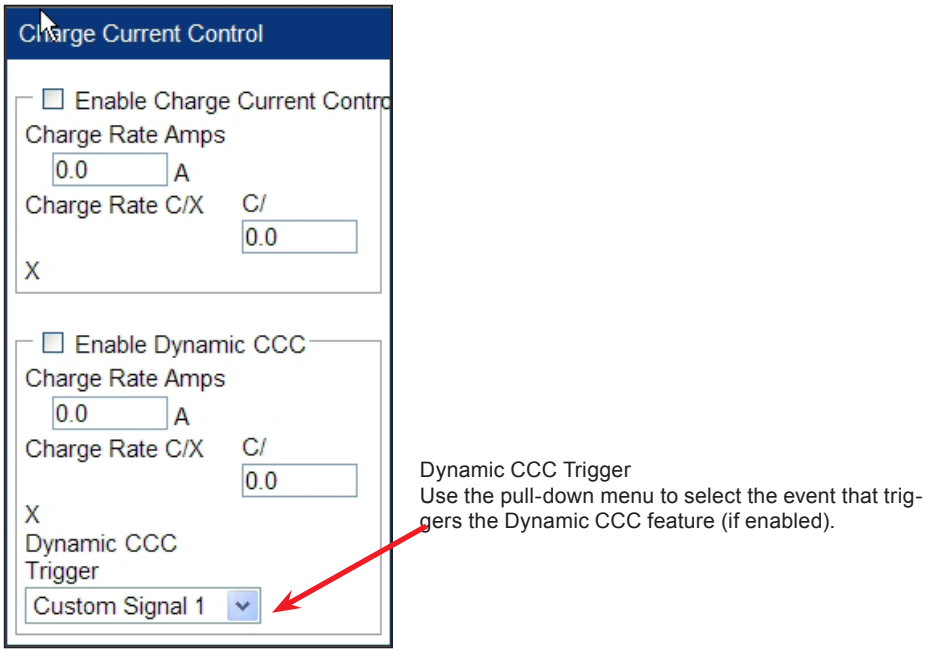


Figure 52 — Charge Current Control – Web

Enable	Activiates the Charge Current Control (CCC) feature.
Charge Rate Limit	Amount of current that goes into the battery, which is dependent upon parameter **Capacity Rating (C)** – see 6.5.7. The Charge Rate amount is represented in amps (X) or as a C/X value (Capacity Rating/Charge Rate Amps). The Charge Rate Amps is recalculated if the Charge Rate C/X value or the Capacity Rating is modified.
Enable Dynamic CCC	A separate set of Charge Rate Limit values can be input for the Dynamic CCC feature.
Battery Properties (LCD only)	The **Battery Properties** button at the bottom of the window links to the Battery Properties window (see 6.5.7). The return path is to the Charge Current Control window.

6.5.3 Battery Monitor

The Battery Properties section (6.5.7) must be completed to enable this feature.

Load Type	Select the type of load on the system: constant power, current, or resistive. This is used for battery capacity calculations.
Disconnect Voltage	The disconnect voltage should be set to the value of the LVD that will disconnect the battery from the load. The Battery Runtime algorithm uses this value to calculate the hours remaining during an AC outage.
Reset Battery Monitor	The Battery Monitor should be reset when installing new or different batteries.
Battery Properties (LCD only)	The **Battery Properties** button at the bottom of the window links to the Battery Properties window (see 6.5.7). The return path is to the Battery Monitor window.

6.5.4 Battery (Discharge) Test

The Battery Test (BT) is used to update the status of the battery capacity. It can be set to run automatically or can be initiated manually (via the Mode Selection button). See 4.12 for more details.

BT End Voltage

BT Termination Voltage: Controls the end (or termination) voltage of the BT; +0.5 V above Rectifier BT Voltage is recommended.

Rectifier BT Voltage: Identical to the field of the same name in the Rectifier configuration settings in 6.3.2 – a change in one alters the other. The Supervisor can set the Rectifier BT Voltage to the desired value during the test (mode). This setting should have a minimum of LVD + 1 V.

Rectifier BT Timeout: Identical to the field of the same name in the Rectifier configuration settings in 6.3.2 – a change in one alters the other. Controls the duration of the Battery Test.

Auto BT

Set the **Interval** time, in days, between automatic battery tests.

Scheduled BT

Use the **Configure Schedule** button to set up a schedule.

Remote BT Mode

This feature will force a transition to BT mode when a user-defined condition (custom alarm) is true.

Remote BT (Custom 1-20): This menu item enables the Supervisor to assign a Custom Alarm number between 1 and 20. (Refer to 6.6.3 to configure custom alarms.)

NOTE: This feature is exclusive to the Cordex series of rectifiers. If Remote BT is active and a rectifier other than the Cordex series is added to the system then Remote BT will be aborted.

Battery Properties (LCD only)

The **Battery Properties** button at the bottom of the window links to the Battery Properties window (see 6.5.7). The return path is to the BT window.

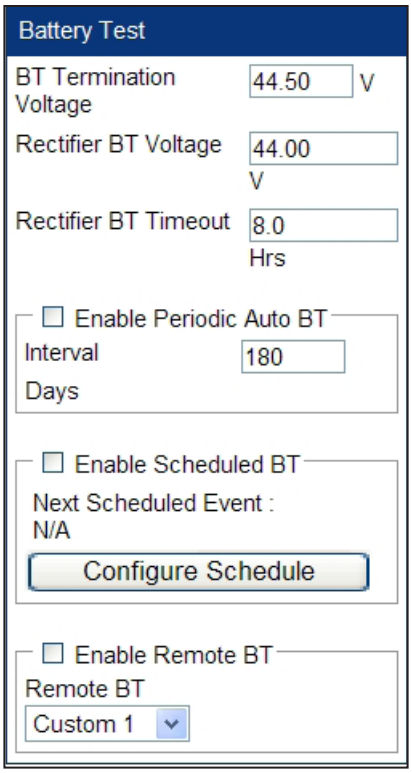


Figure 53 — Battery Test - Web

6.5.6 Battery Current Termination (BCT) Equalize

Refer to Section 2.9.3 for an overview of this feature.

Since the BC Threshold is in amps, it has to be set with caution as the battery current input has limited accuracy. If it is too low, the threshold may never be reached. The threshold should be at least twice as large as the jitter on the battery current input. If this limitation forces the threshold to be set higher than desired, the BCT Duration can be increased slightly to compensate.

Enable	Sets the CXC BCT Equalize feature
Duration	Duration of the BCT Equalize function in hours
BC Threshold	Threshold (in amps) for the battery charging current that will trigger the BCT Equalize function
Battery Properties (LCD only)	The **Battery Properties** button at the bottom of the window links to the Battery Properties window (see 6.5.7). The return path is to the BCT Equalize window.

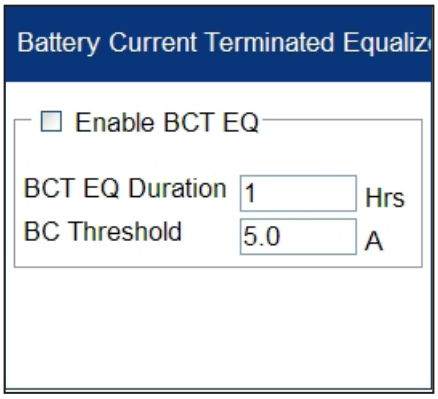


Figure 54 — Battery Current Termination – Web

6.5.5 Boost (BST) Mode

This feature provides the supervisor with the means to equalize charge the battery at a higher voltage relative to the connected load. The transition to BST mode occurs when a user-defined condition (custom alarm) is false.

NOTE: Activation is manual and certain conditions must be met to prevent damage to the load.

A custom alarm must be created to include all the desired factors that must be taken into account before activating BST mode. This mode is only permitted if the alarm is false.

Once activated, BST mode concludes with a timeout or whenever the status of the custom alarm is true and reverts to FL mode. BST mode can also be cancelled if the conditions that are required in order to activate BST mode have changed.

Enable	Sets the CXC Boost Mode feature
Voltage	Deviation of the Boost Mode voltage
Timeout	Duration of the Boost Mode
Inhibit	Assign a Custom Alarm number between 1 and 20. (Refer to 6.6.3 to configure custom alarms.)
Battery Properties (LCD only)	The **Battery Properties** button at the bottom of the window links to the Battery Properties window (see 6.5.7). The return path is to the Boost Mode window.

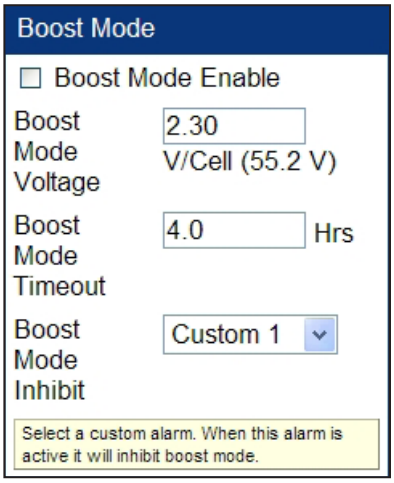


Figure 55 — Boost Mode – Web

6.5.7 Battery Properties

The Battery Properties window contains information provided by the battery manufacturer. This data is used by the Charge Current Control, Battery Monitor, and Temperature Compensation features.

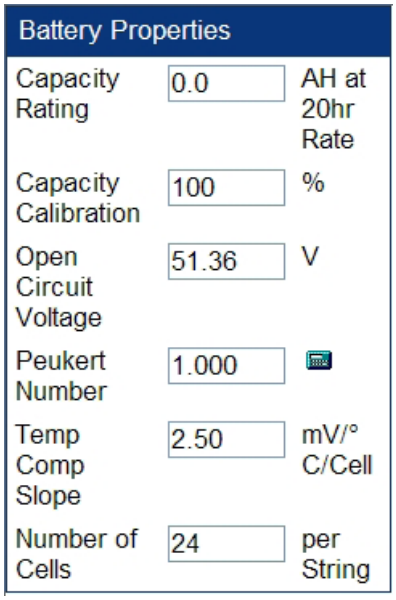


Figure 57 — Battery Properties - Web

Capacity Rating (20-Hour Rate) Specified total capacity of the battery string (derived from battery manufacturer's specifications and should correspond to the C/20 Capacity if possible). This value is used in the calculations for charge current control function and capacity estimation.

NOTE: If multiple strings are used, this value represents the total combined capacity of all battery strings summed together.

Capacity Calibration A value that effectively "calibrates" the Battery Capacity. This is necessary when the batteries are first commissioned and whenever an independent test is done to measure the battery's capacity.

Open Circuit Voltage Sets the open circuit voltage (derived from battery manufacturer's specifications).

Peukert Number The Peukert number relates to the internal resistance of a battery and provides an indication (inversely) of the expected capacity; that is, a lower number is better.

This number can be entered in two ways. If the battery manufacturer has supplied a Peukert number, then it can be entered as a simple, one step numeric entry.

If a Peukert number is not available, it must be calculated. This multi-step process involves entering four numbers derived from battery manufacturer's specifications. Resulting Peukert number should be above 1.000 and below 2.000.

Peukert Calculator To calculate the Peukert number the Supervisor must enter unique values for Peukert Time 1 and Peukert Time 2 and the corresponding discharge current for each. This information is taken from the battery specification sheet. Typically, time values of two hours and twenty hours provide the necessary data for the Peukert number calculation.

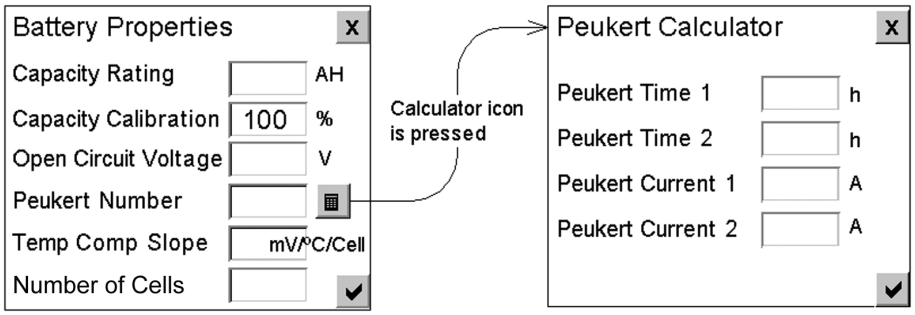


Figure 56 — Battery Properties and Peukert Calculator windows

Temp Comp Slope Desired temperature compensation slope

Number of Cells Number of battery cells per string

6.5.8 Battery Information

The web interface provides a window to enter/view the manufacturer's data for the batteries in the system; e.g., for inventory purposes. When entering data, the tab key can be used to move the cursor from one data entry box to the next data entry box. See Figure 58.

This information is separate from the battery properties (see previous section) used for the existing battery management features of the CXC. The data must be obtained from the battery supplier and entered by the CXC Supervisor.

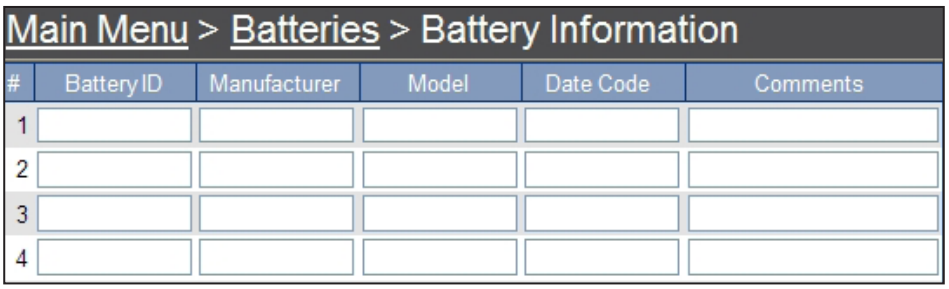


Figure 58 — Battery Information web interface window

6.5.9 Battery Test Scheduler

This feature is only compatible with CXCM2e, CXCM4e, and other future "e" (Expanded Memory) CXC controllers.

Click **Batteries > Configure Batteries**. The **Battery Test** window appears.

If neither of the two options is selected, no battery tests will be performed at a selected interval .

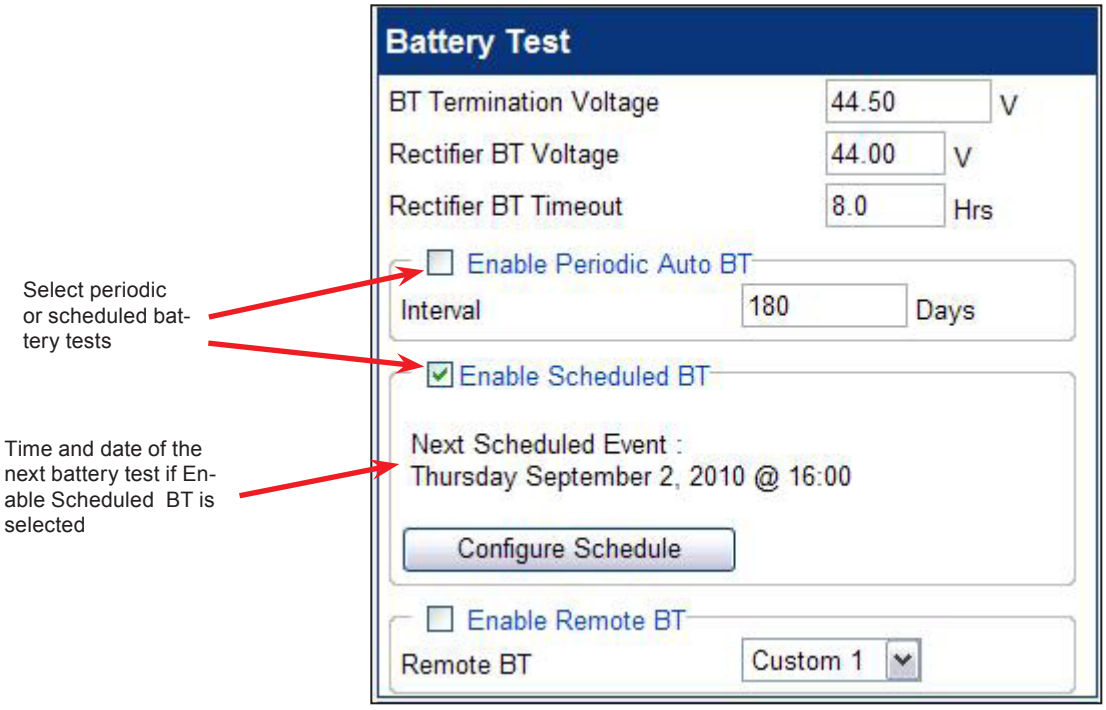


Figure 59 — Battery Test Scheduler

Enable Periodic BT

Set the time interval in days between battery tests.

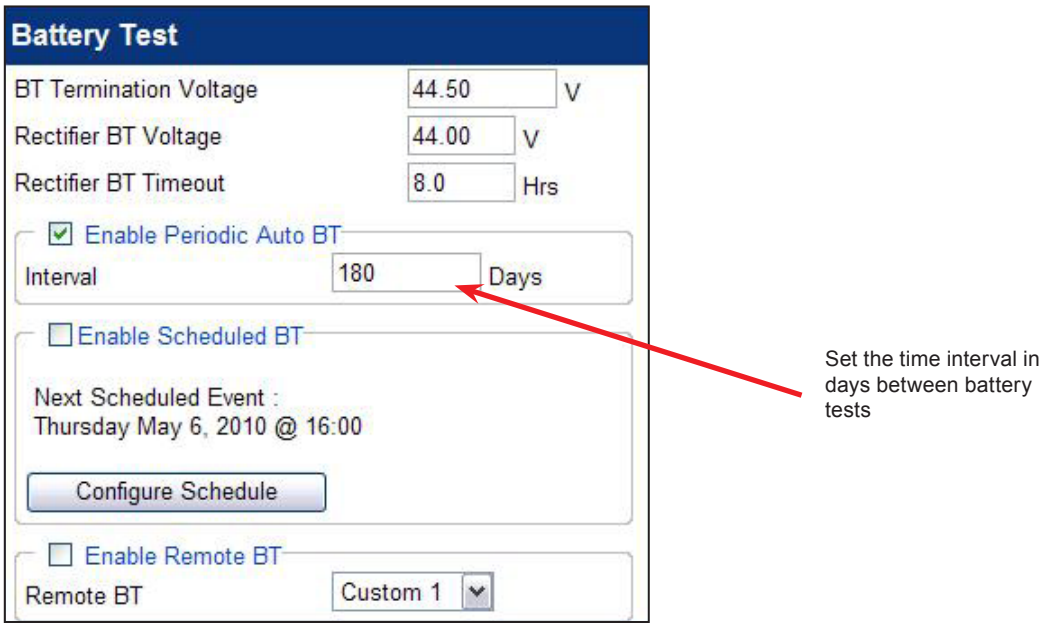


Figure 61 — Periodic Battery Testing

Enable Scheduled BT

Click the **Enable Scheduled BT** checkbox. Click **Configure Schedule** to set the time and dates for future battery tests.

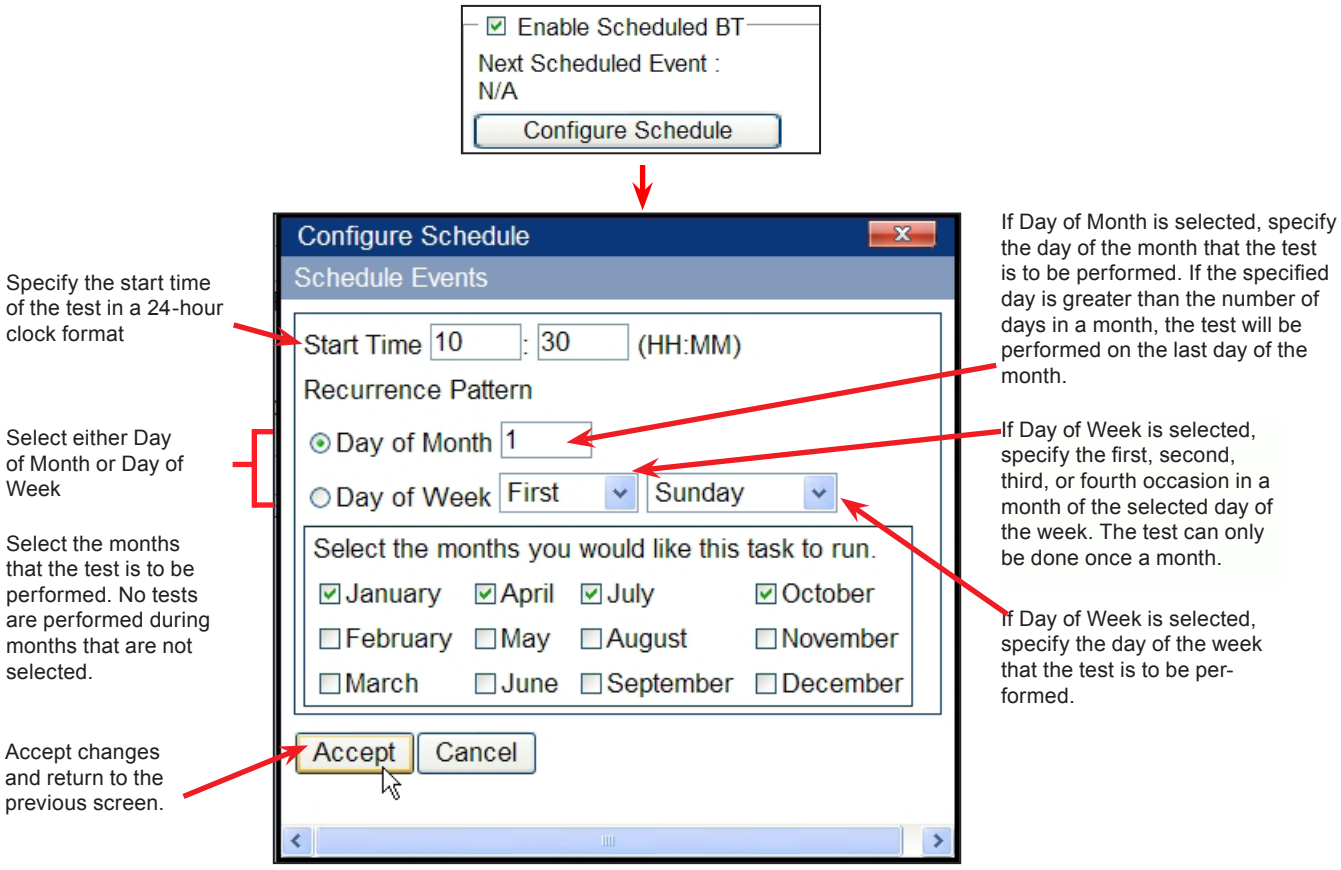


Figure 60 — Scheduled Battery Testing

6.6 Alarms

This menu category consists of power system alarms. Parameters can be set/accessed such as power system high/low voltage alarms, AC Mains high/low voltage alarms, Supervisor programmable alarms and alarm tone enable (audible alarm buzzer).

All voltage-related alarms (HVA 1 and 2, LVA 1 and 2) are based on voltage readings taken from the analog input channel for the power system's BATTERY VOLTAGE.

See Table J for factory default settings.

6.6.1 Alarm Icons

LCD Symbol	Alarm	Web Symbol
	Active alarm condition.	
	Alarm condition that has been silenced	
	Power system Major Alarm	
	Power system Minor Alarm	
	No Alarms	
	A power system Message alert.	
	Rectifier Information accompanied by the number of rectifiers in the system	
	Power Save feature enabled and active accompanied by the number of rectifiers shut down	

6.6.2 Definitions

Major — Alarm conditions that are serious or an immediate threat to service. The red front panel LED illuminates and the Major Alarm icon displays on the GUI

Minor — Alarm conditions of a less serious nature or not an immediate threat to service. The yellow front panel LED illuminates and the Minor Alarm icon displays on the GUI.

Message — Non-audible, non-priority alert. No change in LED activity and the Message icon displays on the LCD GUI. The Supervisor can define the condition(s) and set relays to change.

Rectifier Major Fail Count — Number of rectifiers that are in a fail condition resulting in a major alarm or an immediate threat to service. Adjust this setting in the **Rect. Major Fail Count** alarm submenu.

Rectifier Minor Fail Count — Number of rectifiers that are in a fail condition resulting in a minor alarm or a non-immediate threat to service. Adjust this setting in the **Rect. Minor Fail Count** alarm submenu.

Rectifier Minor Alarm — Alarm condition detected in a rectifier but not considered an immediate threat to the operation of that rectifier.

Rectifier Fail Alarm — Alarm condition detecting an actual rectifier failure.

ALCO — Alarm cutoff (see Section 4.5.1) may silence all ALCO enabled alarms and may change relay state. For controls, the relay does not change state – only the audible alert is silenced.

6.6.3 Configuring Alarms

LCD Interface

From the the MAIN MENU screen (2.1) tap Alarms. The pull-down menu lists the alarm categories shown in 2.1 as well as ADIO and Converter Alarms.

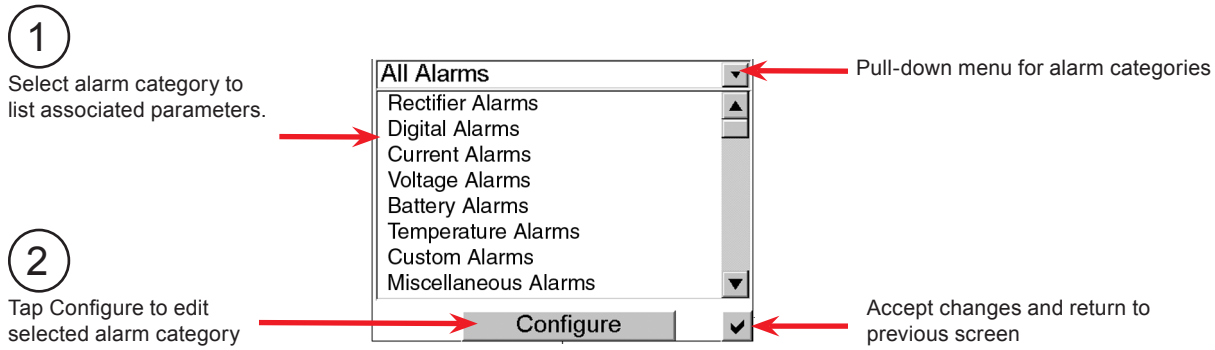


Figure 62 — Alarms > Configure Alarms

A new window appears with the folllowing parameters:

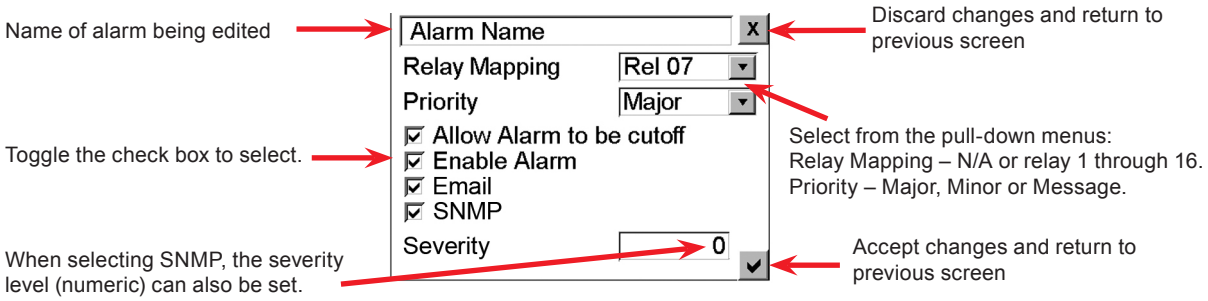


Figure 63 — Edit Alarm Parameters (Example

Alarms cannot be mapped to a relay unless the alarm is enabled. Disabling an alarm that is mapped to a relay will free up that relay.

In the LCD screen, relays already in use have a tilde “~” character beside the relay number.

Some parameters are factory set and are not displayed under the Configure window for all alarms. Here are some of the additional parameters the Supervisor can expect to encounter:

Activation — Select from the pull-down menu; e.g., High or Low.

Activation Value — Tap on the number to edit via a virtual numeric keypad.

Equation — Tap Customize to edit (via Custom Alarms window).

Source — Select from the pull-down menu; e.g., Dig1 through Dig8.

Configuring Alarms – Web Interface

The web interface provides a list of all configurable alarms (**Main Menu > Alarms > Configure Alarms**). Most alarms can be configured on this screen. The alarm names that appear as a link have additional settings.

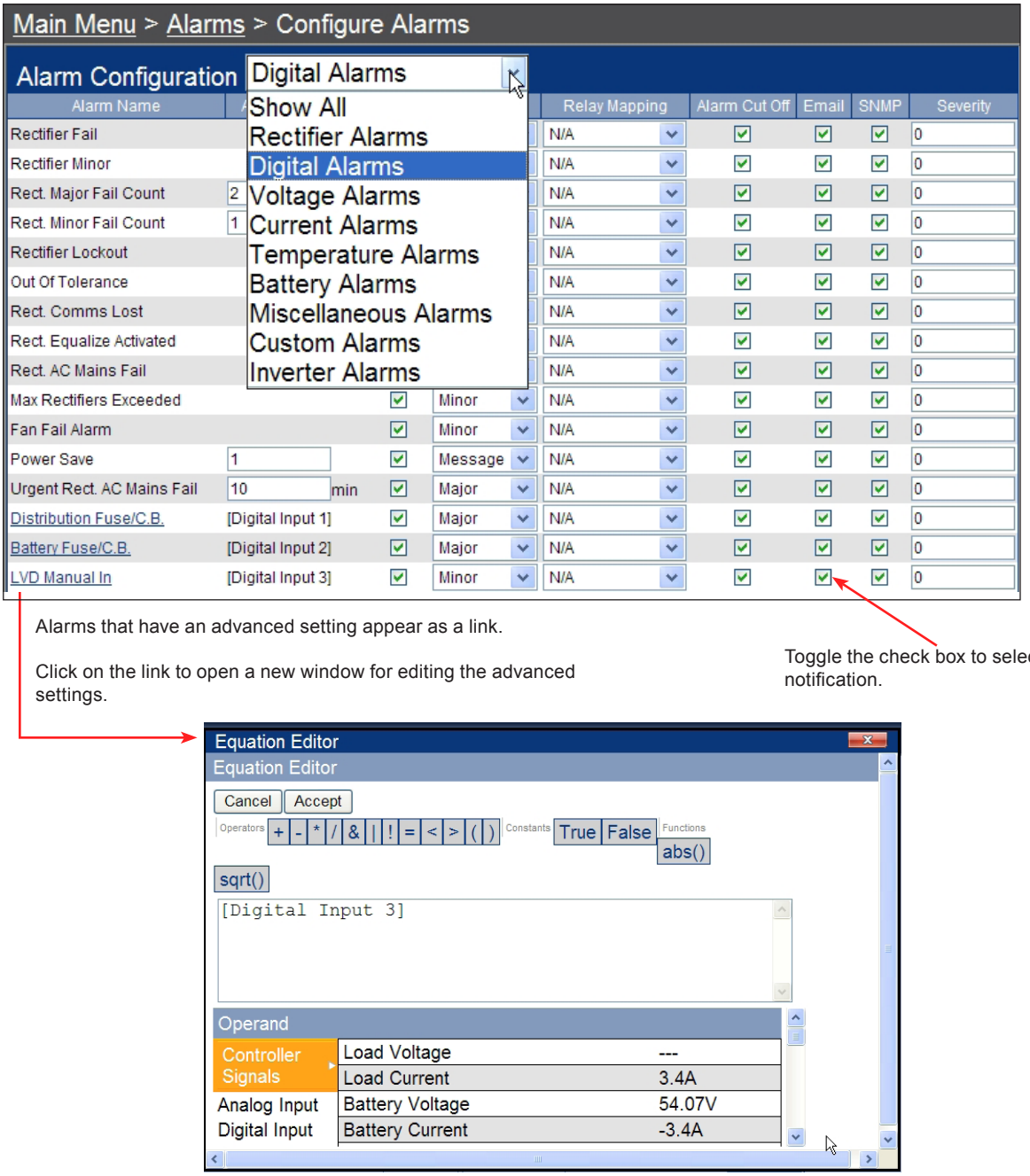


Figure 64 — Configure Alarms Example – Web Interface

6.6.3.1 Overview of Output Relay Channels and Configuration

One active control can be mapped for each of the relays; for example, Relay 1 can be unassigned from LVD 1 then remapped as an alarm relay.

Any alarm (even multiple alarms) can be mapped to any unoccupied relay.

Figure 3 summarizes the output channel assignments:

Table C — Output channel assignments

Channel Description	Factory Default Designation
Relay 1	LVD 1
Relay 2	LVD 2
Relay 3	LVD 3
Relay 4	POWER SYSTEM MINOR ALARM
Relay 5	POWER SYSTEM MAJOR ALARM
Relay 6	AC MAINS HIGH/LOW ALARM
Relay 7	RELAY 7 (Unassigned)
Relay 8	RELAY 8 (Unassigned)
Relay 9 – 16	…(Unassigned)

6.6.4 Examples of Alarm Categories

6.6.4.1 Rectifier Alarms

Rectifier Fail — Sets an alarm condition for a true or actual rectifier failure. The activation value is factory set.

Rectifier Minor — Sets an alarm condition for a minor rectifier failure; i.e., an alarm condition detected in a rectifier, but one that is not considered an immediate threat to the operation of that rectifier. The activation value is factory set.

Rect. Major Fail Count — Sets the total number of rectifier fail alarms that trigger the rectifier major alarm. The activation value must be greater than or equal to the number entered for the minor rectifier fail count alarm.

Rect. Minor Fail Count — Sets the total number of rectifier fail alarms that trigger the rectifier minor alarm. The activation value must be less than or equal to the number entered for the major rectifier fail count alarm.

Rectifier Lockout (Pathfinder series only) — Sets an alarm condition when a Pathfinder series rectifier lockout is detected. The activation value is factory set.

Out of Tolerance — Sets an alarm condition when a rectifier out of tolerance is detected. The activation value is factory set.

Rect. Comms Lost — Sets an alarm condition when rectifier communications is lost. The activation value is factory set.

Rect. Equalize Activated — Sets an alarm condition when a rectifier in EQ mode is detected. The activation value is factory set.

Rect. AC Mains Fail — Sets an alarm condition when a rectifier AC mains fail is detected. The activation value is factory set.

The activation value for AC Mains Fail detection is determined to be when the number of rectifiers in AC Fail divided by the number of rectifiers acquired is greater than or equal to 90%.

Max Rectifiers Exceeded — Sets an alarm condition when the maximum number of rectifiers is exceeded. The activation value is factory set.

Fan Fail Alarm (for Fan Cooled Systems)

Triggers an alarm when a fan fail (speed error or failed fan) condition has occurred in any of the rectifiers in the system.

- The Fan Fail Alarm is true when the CXC receives a Fan Fail or Fan Speed Error alarm from any rectifier.
- The Fan Fail Alarm is cleared when all Fan Fail and Fan Speed Error alarms are cleared from all the rectifiers.
- Each time that the Fan Fail Alarm goes on/off, the event is logged in the Event History. Since it is a rectifier alarm, up to nine rectifiers (up to 27 fan fail alarms) that are in alarm are logged. If more than nine rectifiers are in alarm an additional entry is made indicating the total number of rectifiers in alarm.

The activation value is factory set.

Power Save

Sets an alarm condition when a rectifier is in Power Save mode. The activation value is factory set.

Urgent AC Mains Fail

Sets a major alarm condition when the Rectifier AC Mains Fail alarm has been active for a period of time; the default activation value is ten (10) minutes (see 2.1).

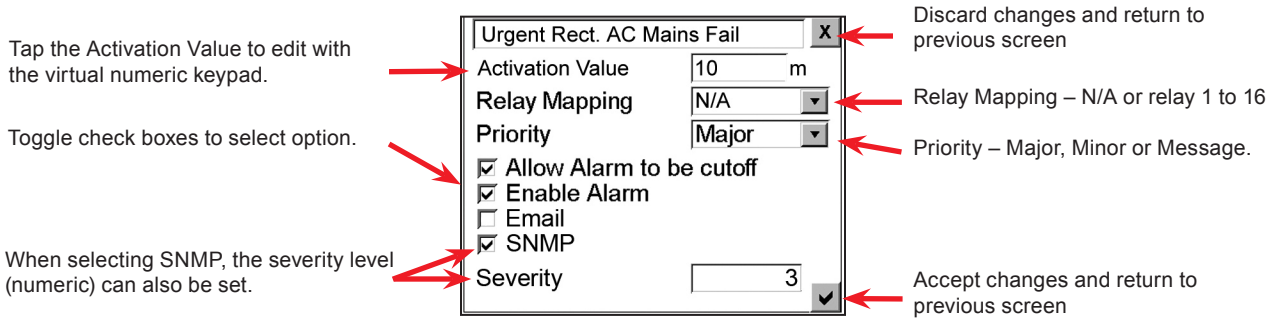


Figure 65 — Configure Urgent AC Mains Fail Example

6.6.4.2 Digital Alarms

Each digital input channel is designed to detect zero-system voltage (i.e. off/on) signal. Six of the digital channels have assigned functions, while two are unassigned. Table D summarizes the digital channel assignments.

Note that the number of digital inputs varies with hardware. the CXCU and CXCI, for example, have six only.

Table D — Digital input channel assignments

Channel Description	Factory Default Designation
DIG1 (D1 on PCB)	Distribution Fuse/Circuit Breaker
DIG2 (D2 on PCB)	Battery Fuse/Circuit Breaker
DIG3 (D3 on PCB)	LVD Manual In
DIG4 (D4 on PCB)	LVD Manual Out
DIG5 (D5 on PCB)	Converter Fail
DIG6 (D6 on PCB)	Converter I/P Breaker Trip
DIG7 (D7 on PCB)	Digital 7 (unassigned)
DIG8 (D8 on PCB)	Digital 8 (unassigned)

Digital events occurring on one of the digital inputs can be programmed to the output alarm relays using the programming feature for the relay contact similar to analog alarms.

The status of each digital input is visible under the Signals menu; see “LCD Menu structure” on page 17, or in the web interface go to **Main Menu > Signals > View Status**.

6.6.5 Menu Items for Configuring Alarms Associated with Each Analog Input

6.6.5.1 Current Alarms

Battery Current High — Setting for the battery amps alarm. When the total current to the battery exceeds this setting, the alarm is activated and the message **BATTERY CURRENT HIGH** is displayed on the GUI.

Load Current High — Setting for the load amps alarm. When the current to the load has exceeded this setting, an alarm is activated and the message **LOAD CURRENT HIGH** is displayed on the GUI

6.6.5.2 Voltage Alarms

AC Mains High — Activates an alarm when the AC exceeds the specified setting. The message **AC MAINS HIGH** displays on the GUI.

AC Mains Low — Activates an alarm when the AC input to the power system falls below the specified setting. The message **AC MAINS LOW** displays on the GUI.

High Voltage [1-2] — Activates an alarm when the power system DC voltage exceeds the specified value. The message **HIGH VOLTAGE 1 (or 2)** displays on the GUI.

Low Voltage [1-2] — Activates an alarm when the power system DC voltage falls below the specified value. The message **LOW VOLTAGE 1 (or 2)** displays on the GUI.

Midpoint Monitor [1-5] — Activates an alarm when the voltage reading (1 through 5) exceeds the specified setting (from the midpoint). The message **MIDPOINT MONITOR 1** (or 2-5) displays on the GUI.

6.6.5.3 Battery Alarms

Battery Runtime Low — Allows specification in hours when the battery runtime alarm will activate with respect to the hours remaining in the battery runtime prediction.

Battery Capacity (Remaining) Low — Allows specification of the battery capacity alarm trigger point as a percentage. When the capacity of the battery is depleted to this specified value, the capacity alarm is activated.

Battery Overtemp — Activates an alarm when the specified temperature is reached.

Battery On Discharge — Activates an alarm when the battery is on discharge; e.g., during AC Fail or BT mode.

Battery Test — Activates an alarm when the Battery Test is in progress.

Boost Mode — Activates an alarm when BST mode is activated.

6.6.5.4 Temperature Alarms

Temp Sensor Fail [1-4] — Activates an alarm when any temperature sensor fails

TC Sensor Fail — Activates an alarm when a sensor, enabled for Temp Comp, fails

6.6.5.5 Miscellaneous Alarms

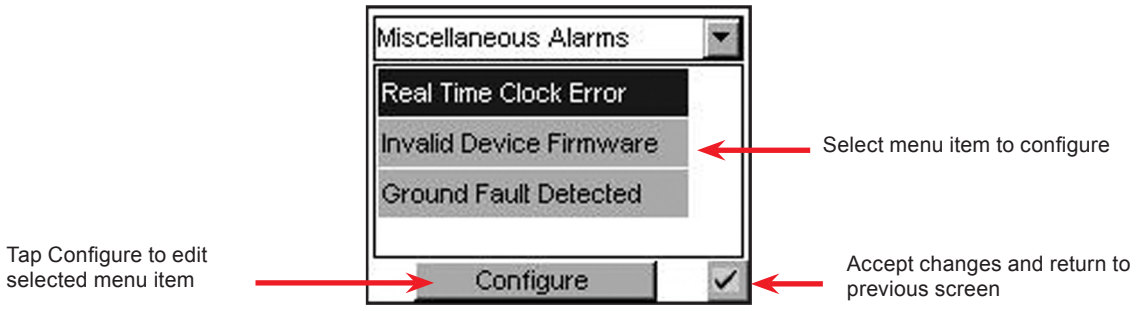


Figure 66 — Miscellaneous Alarms Categories – LCD

Alarm Configuration — Miscellaneous Alarms

Alarm Name	Activation Value	Enable	Priority	Relay Mapping	Alarm Cut Off	Email	SNMP	Severity
Real Time Clock Error		☑	Minor	N/A	☑	☑	☑	0
Invalid Device Firmware		☑	Minor	N/A	☑	☑	☑	0
Ground Fault Detected	5 ±mA	☑	Minor	N/A	☑	☑	☑	0
Improper Controller Shutdown		☐	Minor	N/A	☑	☑	☑	0
Invalid Battery Voltage		☑	Minor	N/A	☑	☑	☑	0
System Major		☑	Major	Relay 5 (K5)	☑	☑	☑	0
System Minor		☑	Minor	Relay 4 (K4)	☑	☑	☑	0

Figure 67 — Miscellaneous Alarms Categories – Web

Real Time Clock Error — Activates an alarm when any change to the CXC clock occurs due to a battery failure or the real time clock itself failing. The alarm also becomes active whenever the date is before Jan. 1, 2000 or after Dec. 31, 2030.

Invalid Device Firmware — Activates an alarm if the firmware of a device (e.g. Cordex rectifier) has become corrupt and is no longer functioning.

Ground Fault Detected (High Voltage CXC only) — Activates an alarm when the specified ground fault is detected. The default value is +/-5 mA.

Improper Controller Shutdown — Sets an alarm if the controller resets unexpectedly.

Invalid Battery Voltage — Activates an alarm when the charging voltage is invalid; e.g., in the event that the sense leads have become disconnected. The alarm activates when the charge volts signal drops below 5 V and halts all control of the system that relies on this signal. If activated (enabled) an entry is made in the event log.

System Major — The Supervisor can map a relay to the power system major alarm, which is activated if there are one or more active MAJOR alarms. A pull-down menu with scroll bars can be used for navigation.

System Minor — The Supervisor can map a relay to the power system minor alarm, which is activated if there are one or more active MINOR alarms. A pull-down menu with scroll bars can be used for navigation.

6.6.5.6 ADIO Alarms

The Supervisor can configure the alarms associated with each ADIO device. Events occurring on one of the inputs can be programmed to the output alarm relays using the programming feature for the relay contacts similar to other alarms.

View the device status under the ADIO Alarms Detail menu, see 6.6.6.

6.6.5.7 Custom Alarms (1-20)

The Supervisor can program 20 separate alarm-triggering equations into the CXC software. The equations can reference any combination (up to 16) of the analog inputs, digital inputs, virtual inputs, and alarms (such as Fan Fail) utilizing logical and arithmetic arguments that simulate the functionality of a programmable logic controller (PLC). See also 7.2 Equation Builder Keypads.

Signal and a Numeric Value Selected

For example, one signal (V1) and a numeric value (53.50) can be selected to trigger the Custom1 alarm when [V1] > 53.50. The first operand chosen (top pull-down menu) is Analog Inputs. The next pull-down menu shows that the Supervisor must select from a list of inputs of that type. An operator is selected from the virtual keypad. The keypad is then changed to numeric in order to enter a numeric value to complete the equation. At any time, you can select the **X** icon to cancel the entry and close the window.

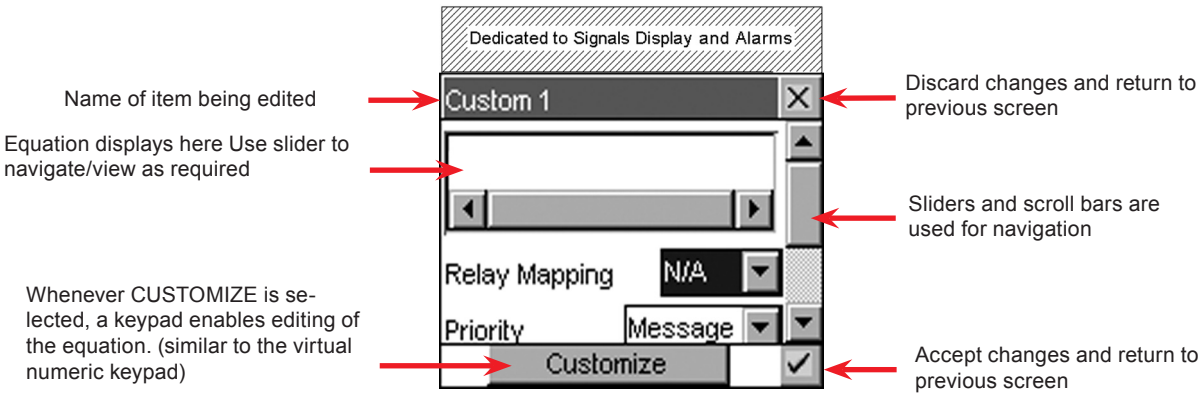


Figure 68 — Custom Alarm screen

Refer to Figure 68 while completing the following steps to program an alarm-triggering equation (in this case, when the signal V1 exceeds 53.50):

1. Select **Customize**
2. Inside the first window shown after Customize is selected, is the equation building area, numeric keypad and other function keys. Select **[Op]** for operand (pull-down menu of alarms, signals, etc.).
3. Use pull-down menus to locate **Analog Inputs** and **V1**.
4. **V1** appears in the equation building area.
5. Select the **Sym** key and an arithmetic symbols/ logic operator (e.g., >).
6. Select **123** to return to numeric keypad. Enter value (e.g. 53.50) to complete the equation.
7. When the equation is complete, select the check mark icon (in the lower right corner) to accept changes and return to previous window.

The previous notes correspond to the numbers in the sequence of figures below:

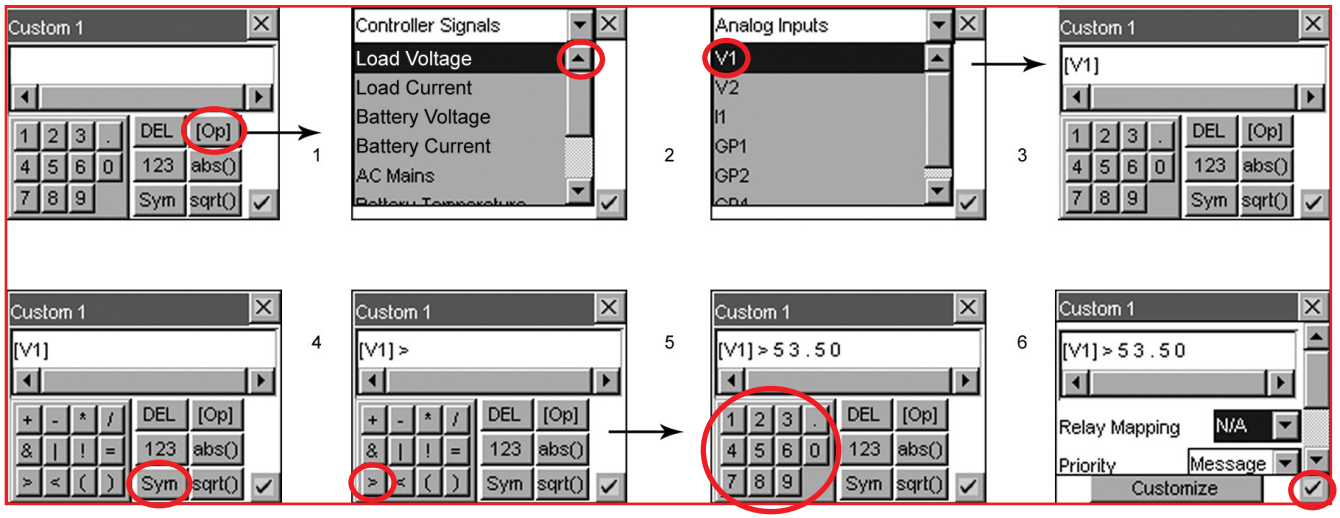


Figure 69 — Customize Alarm example

Equations (from actual customer configurations)

Example 1: Add More Rectifiers Alarm

The function of the following equation is to activate a custom alarm when load increases to a point where redundancy is compromised, but before any rectifiers go into power limit.

Enter the equation taking into consideration logic operators and the number and type of brackets used:

[Load Current] > ((([# Acquired Rectifiers]-1)*37)-5.5)

Where 1 is the number of redundant rectifiers, 37 is the max output current of a single rectifier (Cordex HP 2.0kW in this example) before going into power limit (2 kW PFM), and 5.5 is the number of excess amps in the system required for battery float charging, LVD coils or anything that draws current from the rectifiers that is not the load.

Example 2: Generator ON/OFF Control

The function of the following equations establish a pair of custom alarms that activate one relay to start a secondary generator and another relay that stops the generator.

2a) Custom Alarm A to start a secondary generator:

((V2 <= 46) & (D8 = 0) & (D7 = 0)) | (V2 < 44.5)

When the battery is discharged (system voltage (V2) is less than 46V) and primary (D7) and secondary (D8) generators are not on, OR system voltage is very low, activate. This alarm is exclusively mapped to a relay that is used to start the secondary generator.

2b) Custom Alarm B to stop a secondary generator:

((I2 <= 6) & (V2 > 53) & (D8=1)) | (D7= 1)

When a battery is charged (battery current (I2) is low and system voltage (V2) is near normal) OR primary (D7) generator is on, activate. This alarm is exclusively mapped to a relay that is used to stop the secondary generator.

Example 3: AC Voltage Reading in Mixed Rectifier Systems

The following scenario involves a CXC controlling Pathfinder 10 kW rectifiers and Cordex 3.6 kW rectifiers in a system with 277 Vac. The CXC will compute the average AC reading of all rectifiers (for the AC MAINS HIGH/LOW alarms). In a PFM-CXR system, it may be desirable to have a separate AC alarm for each rectifier type.

To create separate alarms, first use the rectifier Phase Mapping feature (6.3.3.4) to assign each group of rectifiers to a different phase. The three individual phase voltages will no longer apply; instead, the average of the AC input voltage on each system is given.

Next, disable the regular AC alarms (6.6.5.2).

Finally, create custom alarms using the average phase voltages. Here is one possible equation:

([Average AC Phase R] < 240) | ([Average AC Phase R] > 300)

Scheduler Usage

The controller has basic scheduling capability that is implemented by using a System Time or System Date signal in any customizable equation; used to trigger external events on a timely basis, whether daily or at a specific date.

This is accomplished by using the System Time or System Date signal as an operator in a Custom Alarm equation, which has been configured to change the state of a relay output. The equation can include any other signals such as battery current or voltage for more advanced control. The System Time or System Date signal can only be used with the following operators: ">", "<", and "=".

The formats used for the Time and Date Operands are very specific and must match exactly in order for an equation to be valid. For the System Time the format is <<hh.mm.ss>> and for System Date the format is <<20YY.MM.DD>>. The "20" prefix for the year is what distinguishes the date from the time so it must not be omitted when entering a Date Operand.

Example 1: The following equation in a Custom Alarm causes the alarm to be true for ten seconds (10 s) at 2:35 AM:

[System Time (HH.MM.SS)] > <<02.35.00>> & [System Time (HH.MM.SS)] < <<02.35.10>>

If the alarm is mapped to a relay, the relay will activate for 10 sec.

Example 2: Another example activates the alarm daily at 23:59:45 and clears when the battery voltage is less than 46 V. This is the equation for the alarm named Custom 2:

(([System Time (HH.MM.SS)] > <<23.59.45>>) | ([Custom 2] > 0)) & ([Battery Voltage] > 46)

Note the term: ([Custom 2] > 0). This is to latch the alarm ON since the term: ([System Time (HH.MM.SS)] > <<23.59.45>>) will evaluate to false once the midnight rollover* (<<00.00.00>>) happens.

*Midnight Rollover is described with an example in 6.7.2.7.

Example 3: We can use the previous example along with a Counter to set the alarm to activate every three days. These are the equations for Counter 1:

Count Event "[System Time (HH.MM.SS)] > <<01.00.00>>"

Reset Event "[Counter 1]>2"

The will cause Counter 1 to count once daily at 01.00.00. When the count gets to three, it is immediately reset back to zero. So, every third day, the count returns to zero.

Our Custom 2 alarm equation can now be:

(([System Time (HH.MM.SS)] > <<23.59.45>>) | ([Custom 2] > 0)) & ([Battery Voltage] > 46) & ([Counter 1] = 0)

The resulting behavior will be similar to that in Example 2, except the alarm will only activate once every 3 days.

The following sub-section describes the converter alarms menu headings and the associated items.

6.6.5.8 Converter Alarms

Converter Fail

This menu item enables the Supervisor to set an alarm condition for a true or actual converter failure. The activation value is factory set.

Converter Minor

This menu item enables the Supervisor to set an alarm condition for a minor converter failure; i.e., an alarm condition detected in a converter, but one that is not considered an immediate threat to the operation of that converter. The activation value is factory set.

Conv. Major Fail Count

This menu item enables the Supervisor to set the total number of converter fail alarms that will trigger the CXC converter major alarm. The activation value must be greater than or equal to the total number entered for the minor converter fail count alarm.

Conv. Minor Fail Count

This menu item enables the Supervisor to set the total number of converter fail alarms that will trigger the CXC converter minor alarm. The activation value must be less than or equal to the number entered for the major converter fail count alarm.

Conv. Out of Tolerance

This menu item enables the Supervisor to set an alarm condition when a converter out of tolerance is detected. The activation value is factory set.

Conv. Comms Lost

This menu item enables the Supervisor to set an alarm condition when converter communications is lost. The activation value is factory set.

Conv. Input Voltage Fail

This menu item enables the Supervisor to set an alarm condition when a converter input voltage fail is detected. The activation value is factory set.

The activation value for Input Voltage Fail detection is determined to be when the number of converters in Input Voltage Fail divided by the number of converters acquired is greater than or equal to 90%.

Conv. Fan Fail

The purpose of this feature is to enable the CXC to trigger the alarm when a fan fail (speed error or failed fan) condition has occurred in any of the converters in the system.

The Fan Fail Alarm is true when the CXC receives a Fan Fail or Fan Speed Error alarm from any converter.

The Fan Fail Alarm is cleared when all Fan Fail and Fan Speed Error alarms are cleared from all the converters.

Each time that the Fan Fail Alarm goes on/off, the “event” is logged in the Event History. Since it is a converter alarm, up to nine converters (up to 27 fan fail alarms) that are in alarm will be logged. If more than nine converters are in alarm an additional entry will be made indicating the total number of converters in alarm.

The activation value is factory set.

Conv. Load Current High

This menu item enables the Supervisor to program the setting for the converter load amps alarm. When the current to the load has exceeded this setting, an alarm is activated and the message CONV. LOAD CURRENT HIGH is displayed on the GUI.

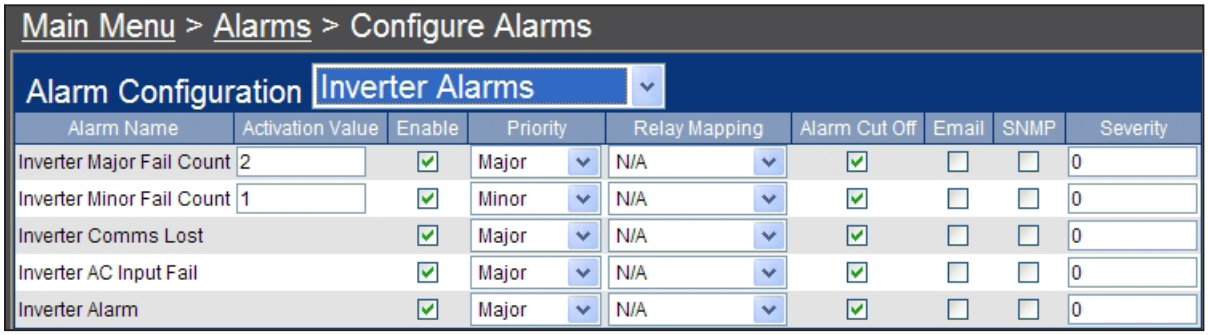
Conv. Low Output Voltage

When the converter’s output voltage falls below the Supervisor-specified value, the alarm is activated and the message CONV. LOW OUTPUT VOLTAGE is displayed on the GUI.

Conv. High Output Voltage

When the converter’s output voltage exceeds the Supervisor-specified value, the alarm is activated and the message CONV. HIGH OUTPUT VOLTAGE is displayed on the GUI.

6.6.5.9 Inverter Alarms



The Supervisor can enable an inverter alarm for any of the following conditions:

Alarm Name	Alarm Condition
Inverter Major Fail Count	Number of failed Inverters equals or exceeds a user configured threshold
Inverter Minor Fail Count	Number of failed Inverters equals or exceeds a user configurable threshold
Inverter Comms Lost	Controller loses communications with any one inverter. The number of inverters must be correctly identified in the Set Output menu.
Inverter AC Input Fail	Main AC input of the inverter is lost
Inverter Alarm	Any individual or system alarm is detected

6.6.6 ADIO Alarms Detail

6.6.6.1 View Details

This menu item enables the user to select an ADIO device (i.e., Cordex Smart Peripheral) that is connected to the CXC and view the alarms with respect to: Cell Deviation, Current, Voltage, Temperature, and Comms.

6.6.7 Alarm Hysteresis

6.6.7.1 Voltage

Voltage Hysteresis applies only to Voltage Alarms (6.6.5.2). This value is the voltage range where the alarm can clear or activate. For example, if the low voltage alarm activates at 43.00 V, having a voltage hysteresis of 0.50 V means it will clear when the voltage reaches 43.50 V.

6.6.7.2 Time

Time Hysteresis is the amount of time in seconds that the condition has to be true before the alarm is enunciated. In the example above, if the value of time hysteresis is 5 seconds, the voltage must be below 43.00 V for at least 5 seconds before the alarm is activated. Similarly, to clear the alarm, the voltage must be above 43.50 V for 5 seconds.

This feature is used only for the following:

- Current, Voltage, Battery, and Temperature alarms
- HVSD and CEMF controls.

6.6.8 Alarm Tone

This feature is found under the Global Alarm Configuration menu (submenu of Alarms) and the tone is enabled by default. The Supervisor can enable/disable the audible alarm buzzer (tone).

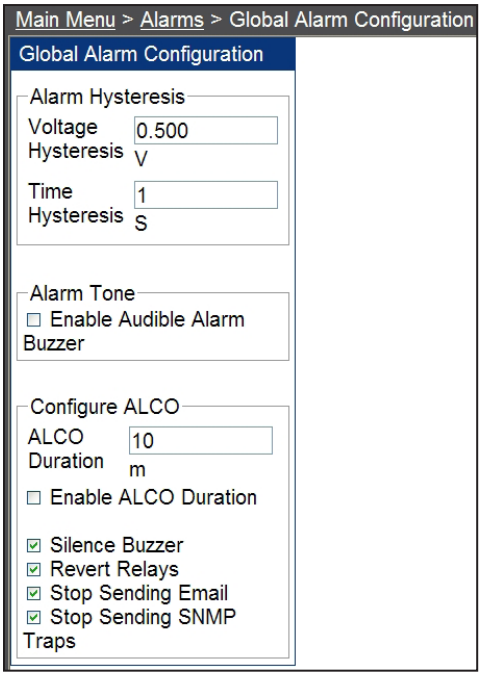


Figure 70 — Global Alarm Configuration – Web

6.6.9 Configuring ALCO

This feature is found under the Global Alarm Configuration menu (submenu of Alarms), see Figure below:

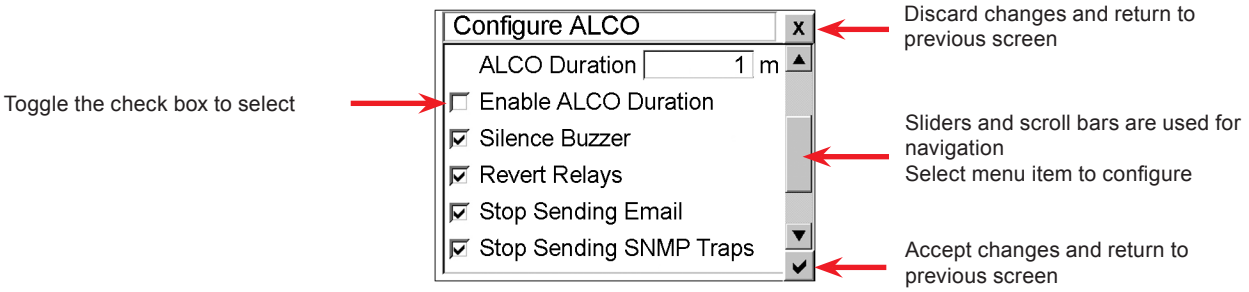


Figure 71 — Configure ALCO – LCD

ALCO Duration	Duration in minutes, that all ALCO enabled alarms are affected by the parameters set for this feature. (For LCD interface, tap on the number to edit via a virtual numeric keypad.)
Enable ALCO Duration	Activates the ALCO Duration feature.
Silence Buzzer	Diables the audible alerts for ALCO enabled alarms.
Revert Relays	Activating ALCO for the alarm will revert the relay status to its normal state.
Stop Sending Email	Stops transmission of Email communications
Stop Sending SNMP Traps	Stops transmission of SNMP traps. SNMP still works, but is no longer sending traps.

6.7 Signals

This menu category consists of system identifiers and calibration controls. Parameters can be set/accessed such as controller signals, rectifier signals, analog and digital inputs. With the web interface, data logging can be configured.

6.7.1 Calibrate Analog Inputs

This menu item provides a direct link to the Analog Inputs menu heading; which may also be accessed via the menu item Configure Signals, see 6.7.2.

6.7.1.1 Overview of Analog Input Channels

The majority of the CXC analog input channels are each designed to accept a specific input signal.

2.1 summarizes the analog input channel assignments; which may vary depending on the hardware configuration (list options):

√	=	Installed
BiV	=	-60 V to +60 V
I	=	-50 mV to +50 mV
T	=	-55ºC to +100ºC (powered)
V	=	0 to 60 V
X	=	Not Installed

Table E — Analog input channel assignments

Channel Assignment	List Option							CXCU
	120	121	122	123	124	125	129	
V1	√	√	√	√	√	√	√	X
V2	√	√	X	√	√	√	√	√
GP1	T1	T1	T1	T1	V3	T1	T1	T1
GP2	T2	T2	T2	T2	V4	T2	T2	T2
GP3	X	T3	X	T3	V5	BiV	T3	X
GP4	BiV	T4	BiV	T4	T1	BiV	T4	X
I1	√	√	√	√	√	√	√	√
I2	X	√	X	X	X	√	√	X
I3	X	X	X	X	X	√	√	X
I4	X	X	X	X	X	√	√	X

6.7.1.2 Calibration of Analog Input Channels

Calibrate the selected channel by setting the high point or low point or both as shown in the following example. For static calibration, refer to the next section.

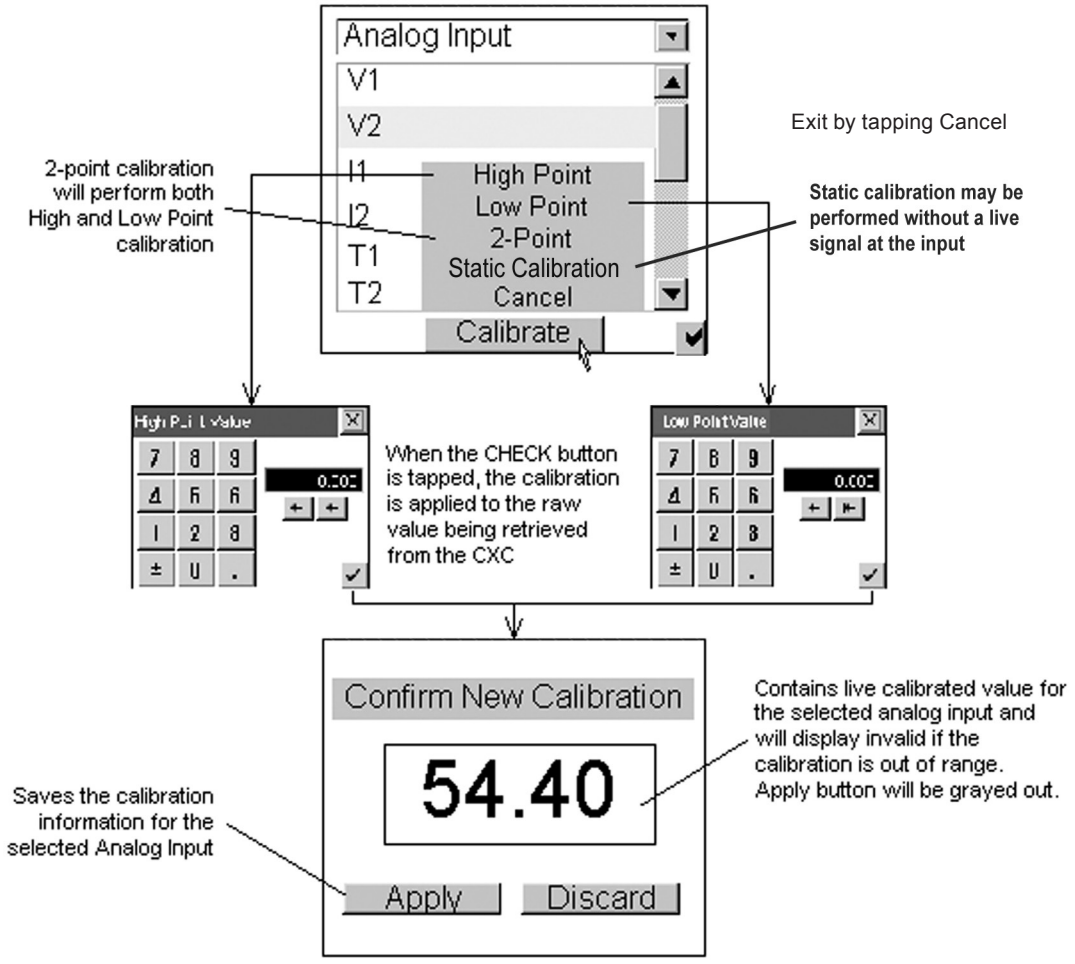


Figure 72 — Analog Inputs calibration example (Signals > Calibrate Analog Inputs)

A more detailed procedure can be found on the Alpha website (www.alpha.ca) under **Technical Documentation > Misc Documents > Method of Procedure**.

Static Calibration

Static calibration enables the Supervisor to calibrate controller analog inputs without the need for a live signal at the input. This is especially useful for calibrating current inputs for systems in the field. See the following figures.

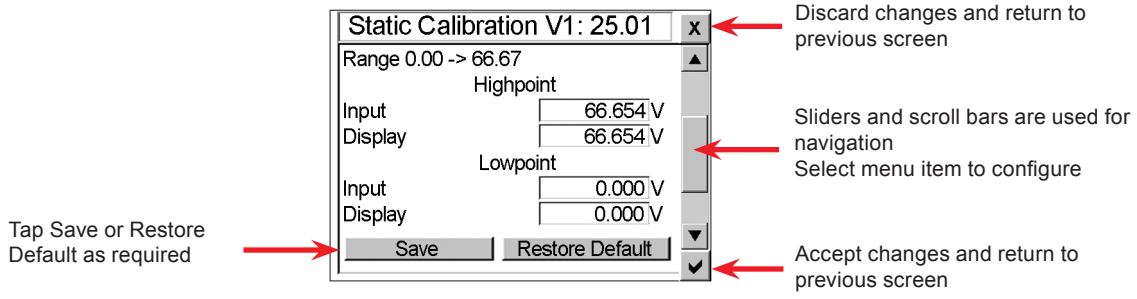


Figure 73 — Static calibration – LCD interface

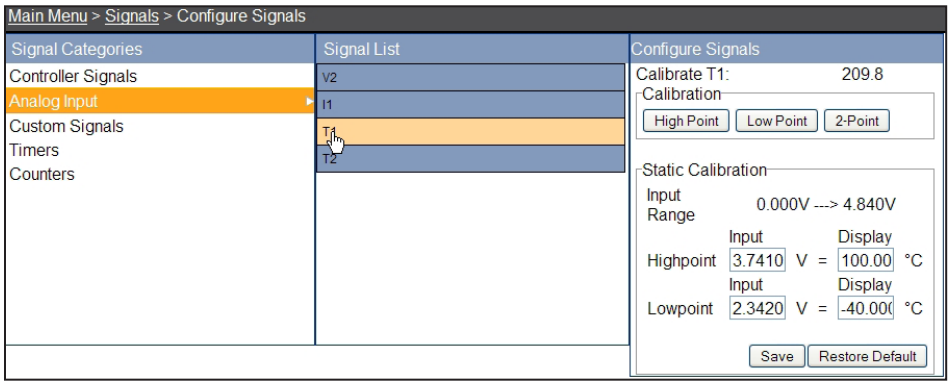


Figure 74 — Static calibration – web interface

6.7.2 Configure Signals

This menu item allows the Supervisor to configure Controller Signals (and Analog Inputs described above). The status of Digital Inputs and Rectifier Signals can also be viewed under this menu (LCD interface only).

6.7.2.1 Controller Signals

Use the Controller Signals menu to access/ edit items such as load current and battery temperature. See 2.1 (to enable Battery sensors.) Once a menu item is selected, tap the **Configure** button to produce another window and list of items to navigate and edit. See examples on the next page.

Definitions

Load Voltage	Discharge voltage.
Load Current	Discharge current.
Battery Voltage	Charge or system voltage.
Battery Current	Charge current.
AC Mains	Average rectifier input voltage. AC Correction appears when AC Mains is selected.
Total Rectifier Current	Sum of rectifier output currents.
Battery Temperature	Average of enabled sensors (if temperature sensors agree within 5%) or the peak value of enabled sensors (if temperature sensors do not agree within 5%).
Battery Run Time	Estimated time remaining before LVD.
Battery Capacity	A battery's estimated ability to store charge.
Battery Depth of Discharge	Estimate of the energy removed from a battery during a discharge in %.
Converter Load Voltage	Converter output voltage.
Converter Load Current	Converter output current.

The following table summarizes the default controller signal equations:

Table F — Controller signal default definitions

Controller Signals	Signal Equations
Load Voltage	[V1]
Load Current	[I1]
Battery Voltage	[V2]
Battery Current	[Total Rectifier Current] – [Load Current]

6.7.2.2 Analog Inputs

Refer to section 6.7.1 for an overview of analog input channels.

6.7.2.3 Digital Inputs

Select this heading from the pull-down menu to access a list of all the existing digital channels, see 6.6.4.2 for Alarms. The status of the channel, high or low, is displayed in the column next to the channel name. (Web: Main Menu > Signals > View Live Status)

6.7.2.4 Rectifier Signals

Select this heading from the pull-down menu to access a list of all the existing rectifier signals. The status of the signal is displayed in the column next to the signal name.

AC Mains Voltage Correction – provides the means to apply a correction factor to the reading coming from the rectifier. Each AC input phase and the combined average AC voltage have correction factors.

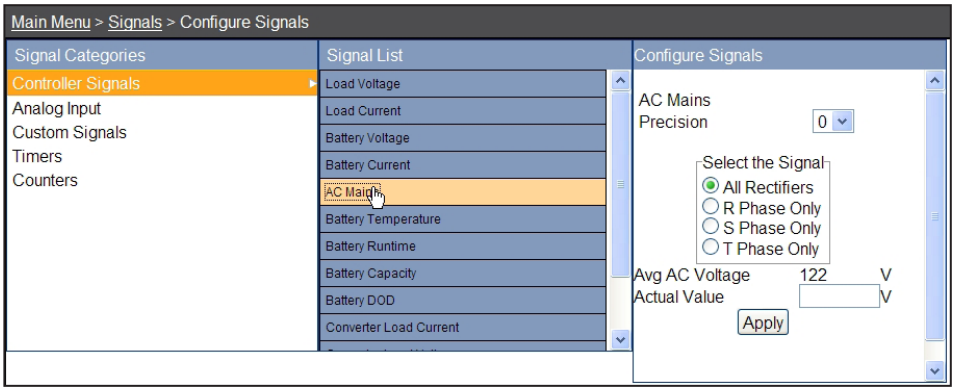


Figure 75 — AC mains voltage correction via web interface

6.7.2.5 Custom Signals

NEW FEATURE	This software version includes an additional 10 custom signals for a total of 20. See "2.13 Signals Management" on page 75.

For the web interface, select the unit text string from the drop down menu that represents the units value, e.g., ±V, AH, mm, etc.

Select Set by SNMP or Set By Equation.

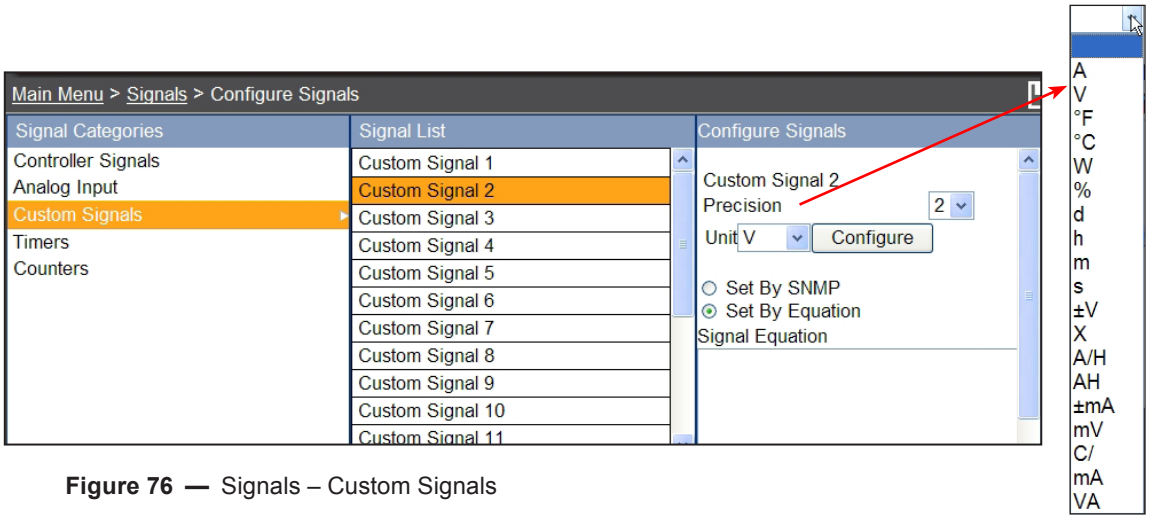


Figure 76 — Signals – Custom Signals

6.7.2.6 Examples of Signal Configuration and Customization

Example One – Configure Signal and Customize Signal Equation

Select Custom Signal from the list and then tap the **Configure** button to produce another window and list of items to navigate.

Use the pull-down menu to set the decimal precision or tap Customize to build a signal equation similar to the equation shown in 6.6.5.7 Custom Alarms. See also 7.2 Equation Builder Keypads.

NOTE: Once a signal equation has been built – it can be edited or disabled – it cannot be removed.

Example Two – Configure AC Mains

Use the pull-down menu to set the decimal precision as shown in the following example:

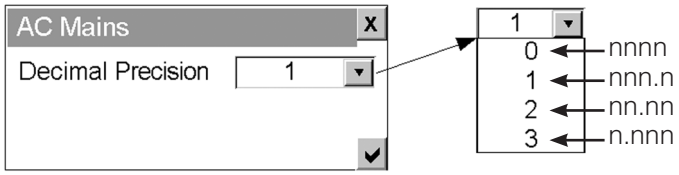


Figure 79 — Controller Signals configuration example two (set decimal precision)

Example Three – Configure (Battery Temperature sensors)

Use the pull-down menu to set the decimal precision and tap/toggle the check boxes to enable sensor(s) for battery temperature as shown in the following example:

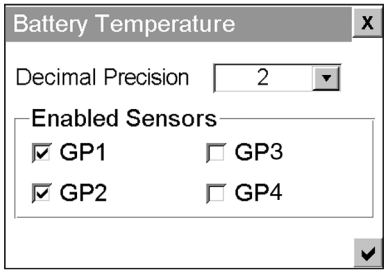


Figure 77 — Controller Signals configuration example three (enable temperature sensors)

Example Four – Configure ADIO01 (Shunt MUX)

Configure the input range of each of 16 channels for the Cordex Shunt MUX as follows:

1. Select channel (CH15 in the example below) and then **Configure**.
2. The window changes to show a list (for review) of the input range of each channel. Multiple channels can be selected for the new value. Select channels and then **Set Range** to configure (or select the √ icon to accept the list and return to the previous window).
3. The virtual numeric keypad enables editing of the input range. Select the X icon to return to the previous window or select the √ icon to accept the new setting.

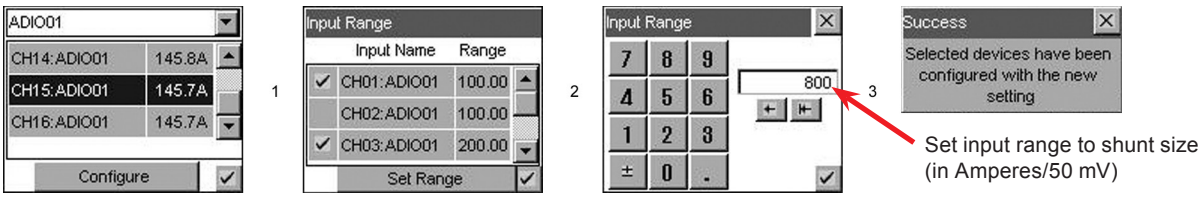
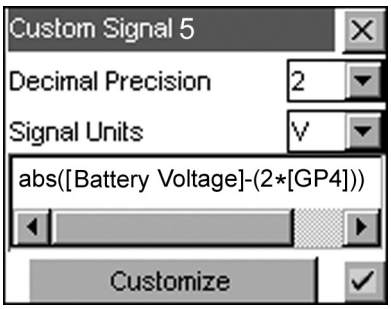


Figure 78 — Controller Signals configuration example four (configure input range for Shunt MUX channels)

A message will indicate that the selected devices have been configured with the new setting. Select the X icon to return to the first window.

Example Five – Midpoint Voltage Error

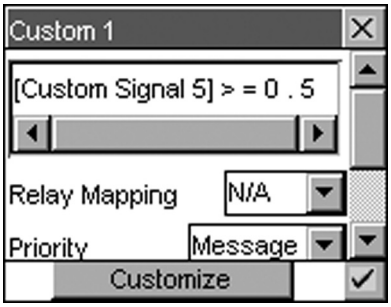
The following is an example of a Custom Signal configured for an analog input (GP4) reading the midpoint voltage of the battery (or system). A Custom Alarm is then configured to track the signal deviations.



For the Custom Signal equation, the midpoint voltage of the battery (from GP4) is doubled and then subtracted from the total voltage reading provided by the Battery Voltage signal. An absolute value yields a positive integer.

Figure 80 — Controller Signals configuration example five (part one).
Configure custom signal for input reading midpoint voltage

To customize, review 7.1 Advanced Programming Example and 6.6.5.7 Custom Alarms. The text labels can be edited using the web interface of the CXC and are provided here as default labels for demonstration purposes only.



For the Custom Alarm equation, the Custom Signal is compared to the maximum* allowable voltage deviation in battery string halves. In this example a message is recorded when the midpoint voltage is in error.

* Some fine-tuning may be required to obtain the ideal setting that is sensitive enough to detect a 'bad' cell and will not produce false alarms.

Figure 81 — Controller Signals configuration example five (part two).
Configure custom alarm for input reading error

6.7.2.7 Midnight Rollover

The Scheduler (see Scheduler Usage and Custom Alarm examples above) functionality is simple. It tests to see if the System Time is greater than the time entered by the user. This means that at midnight, 00.00.00, the user time is always greater than the System Time.

Example

So how can the scheduler be set up to ensure that this midnight rollover does not cause a problem with any Custom Signal that uses the System Time? In real life, you might want to trigger a generator and keep it on for some amount of time regardless of the midnight rollover.

These sample equations configure Custom Signal 1 to remain on for about 30 sec even if midnight rollover occurs.

Custom Signal 1 Equation:

([System Time (HH.MM.SS)] > <<23.59.55>> | [Custom Signal 1]) & ([Timer 1] < 29)

Timer 1 Equations:

Run Event: [System Time (HH.MM.SS)] > <<23.59.55>>

Stop Event: [Timer 1] >30

By this example, we see Custom Signal 1 go to 1.00 at 5 seconds to midnight, then go to 0.00 at about 25 seconds after midnight. This behavior repeats daily.

6.7.2.8 Converter Signals

Use to view the status of all acquired converters in the system; including but not limited to:

Total Conv. Current

Avg Conv. Output Voltage

Total Conv. Input Current

Acquired Conv.

Failed Conv.

Conv. Minor Alarm

Conv. In Comms Lost

Conv. Input Voltage Failed

Out Of Tolerance Conv.

Conv. In Current Limit

Conv. Fan Failed

Converter Load Voltage

Converter Load Current

The existing Controller Signals category now includes signals for Converter Load Voltage and Converter Load Current; by default, Average Conv. Output Voltage and Total Conv. Output Current are used respectively.

Re-configurable System Load Current and System Battery Voltage

For converter shelves that do not have any Cordex rectifiers in the system, the system Load Current can be re-configured to display the total converter output current and the system Battery Voltage can be re-configured to display converter output voltage; the signals can also be renamed (see “6.12.2 Customize User Interface” on page 97).

Recommendation For Converter Redundancy

A redundant converter in a system will allow one converter to be shut down while the other converters supply power to the load; e.g., during firmware upgrade.

6.7.2.9 Inverters

The Signals submenu enables the user to access inverter signals for all of the acquired inverters in the system. The following signals can be used for logging and equation building.

AC Output VA

Input Source Ratio (%AC)

AC Output Power

DC Input Currnet

Acquired Inverters

Inverters in Comms Lost

Minor Alarm Inverters

Major Alarm Inverters

Failed Inverters

6.7.2.11 Counters

Select this heading from the pull-down menu to access individual counters.

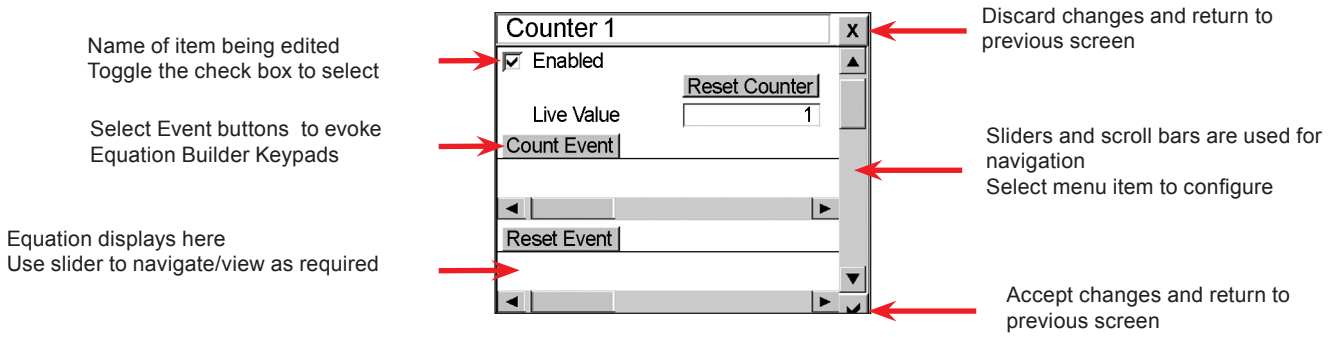


Figure 83 — Counter access window

Summary: The Counter feature allows the tracking of event occurrences for any signal that the controller software can monitor as an equation. Any signal that is viewable through the equation builder is available.

Enable: Check the Enable checkbox to activate the counter.

Line Value: Current count value. The reset button sets the value to 0.

Count Event: The Count Event is an equation entry indicating the condition to count. This equation is used to detect transitions. For example, if the equation is set to [AC Main] > 24, the counter triggers when the voltage moves from 24 volts or less to above 24 volts.

Reset Event: The Reset Event is the trigger condition that sets the Count value back to 0.

General Note: The Counter values themselves can be used in equations. They can monitor each other.

6.7.2.10 Timers

Select this heading from the pull-down menu to access individual timers.

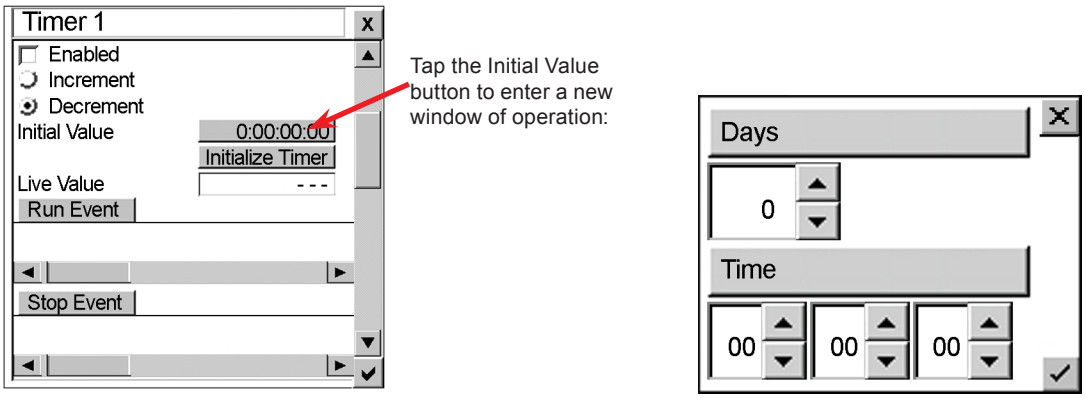


Figure 82 — Timers access windows

Enable: Check the Enable checkbox to activate the timer.

Increment/Decrement: This indicates whether the timer counts up or down from the initial value.

Initial Value: Set the starting value for the time. The time format is shown above the fields as DDDD:HH:MM:SS, which means 4 digits for days, 2 digits for hours, minutes, and seconds.

Line Value: Current time value for the timer

Run Event: Trigger equation indicating a timer start

Stop Event: Trigger equation indicating a timer stop

Note (Run/Stop): The Run Event acts as a level detector if the Stop Event is left empty. With a set Stop Event, the Run Event acts as an edge detector where a transition causes the timer to start, but the same event in the reverse direction does not cause the timer to stop. This allows the Run and stop events to be completely separate and unrelated events.

General Note: The Timer values themselves can be used in equations. They can monitor each other.

6.7.2.12 ADIO Signals

Select this heading from the pull-down menu to access individual signals for an ADIO (Analog Digital Input Output) Device; i.e., Cordex Smart Peripherals.

ADIO Live Status – is displayed via another link/window for the device, if so equipped:

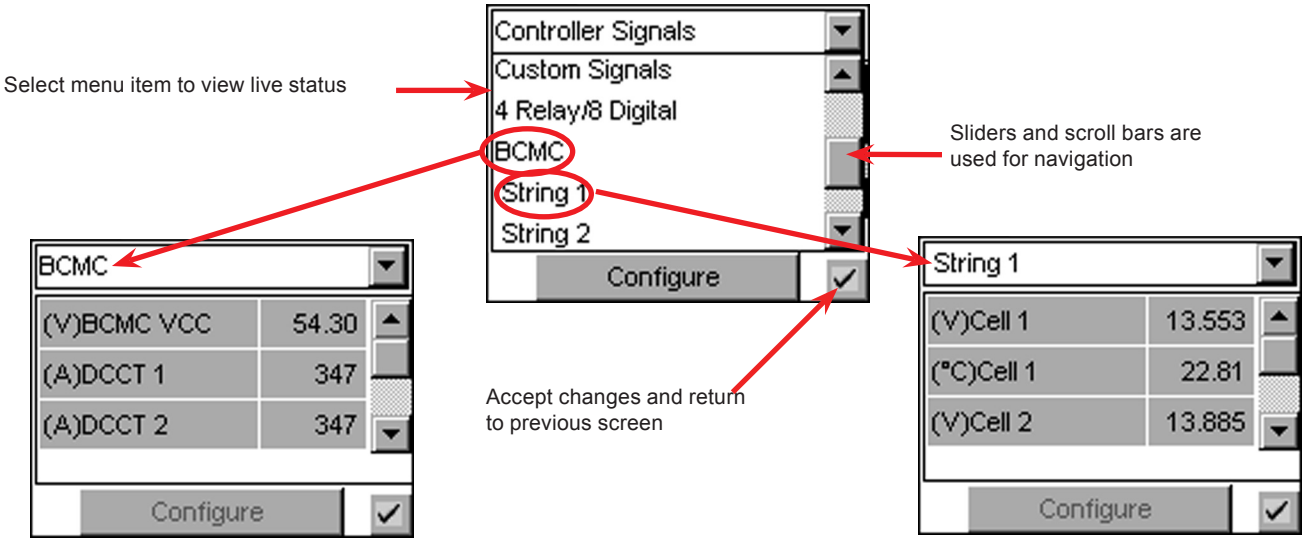
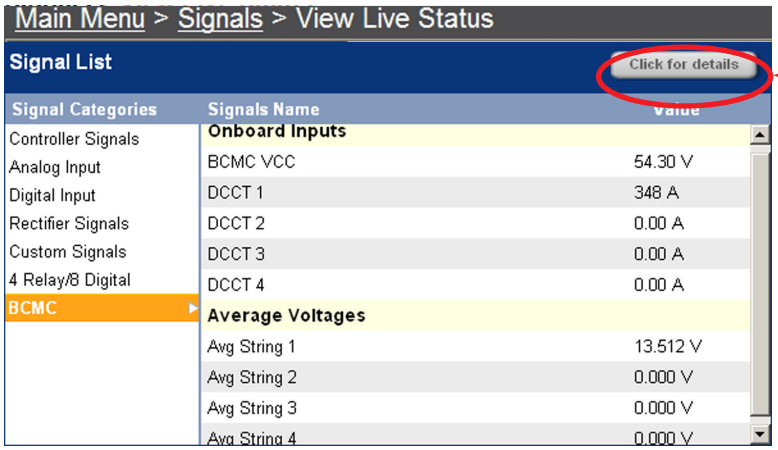


Figure 84 — ADIO live information windows

View Live Status (Web Interface) – ADIO live information is displayed via another link/window for the device, if so equipped:



When the BCMC (if so equipped) is selected from the Signal List, a new button/ link provides access to a more comprehensive view of the BCMC parameter/status.

Figure 85 — View Live Status (Signals) web interface window

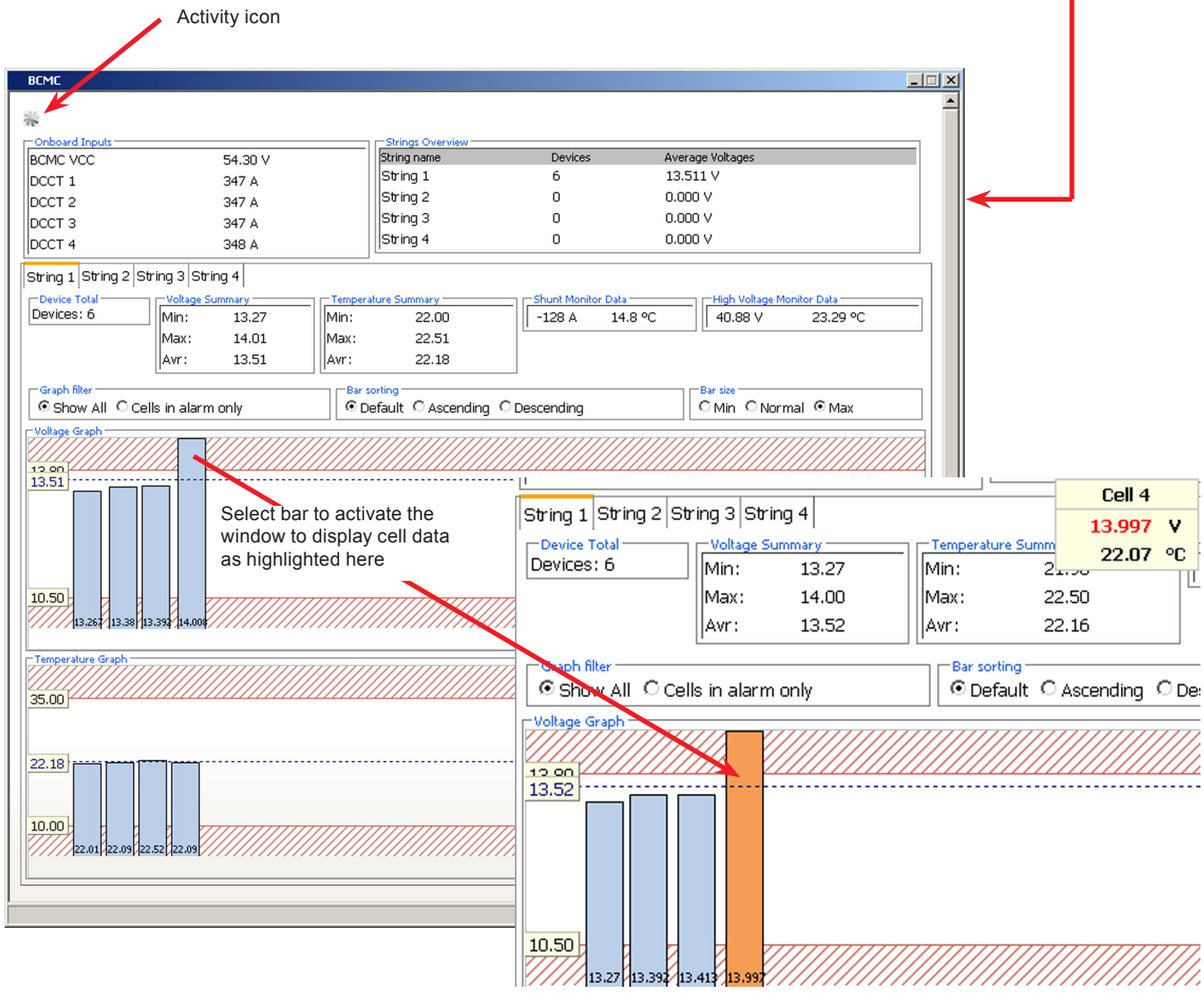
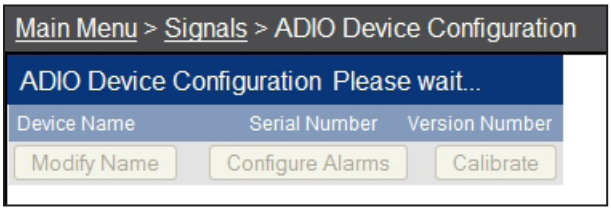


Figure 86 — Detailed status view and bar graph (BCMC only) web interface window

ADIO Configure Signals – enables the Supervisor to input a value for a range to apply to all selected channels. In this case, the BCMC if so equipped:



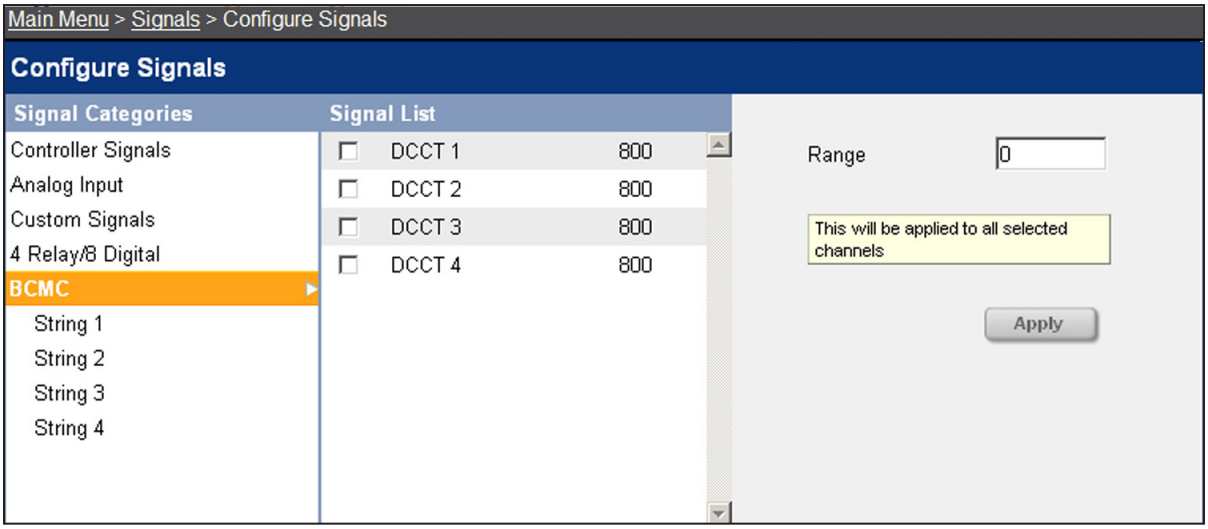


Figure 87 — BCMC configuration example one (set DCCT range in Amps)

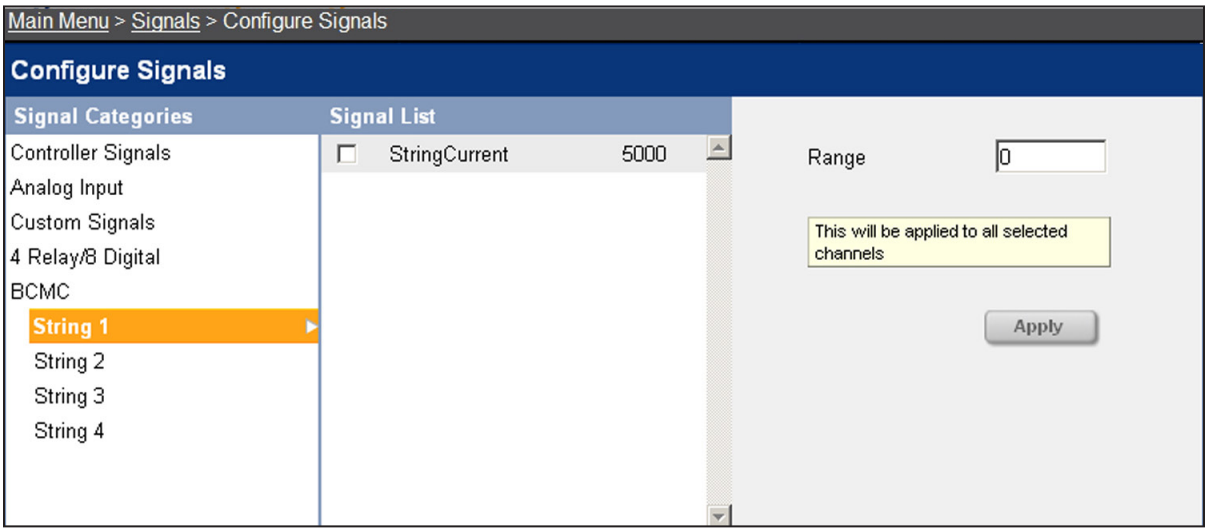


Figure 88 — BCMC configuration example two (set String Current range in Amps)

ADIO Static Calibration (Web Interface Only) – enables the Supervisor to calibrate ADIO (except BCMC) analog inputs without the need for a live signal at the input. This is similar to Static Calibration for controller analog inputs described previously.

6.7.3 Data Logging (Web Interface Only)

6.7.3.1 Configure Data Logging

From the main menu, select **Signals > Configure Data Logging**.

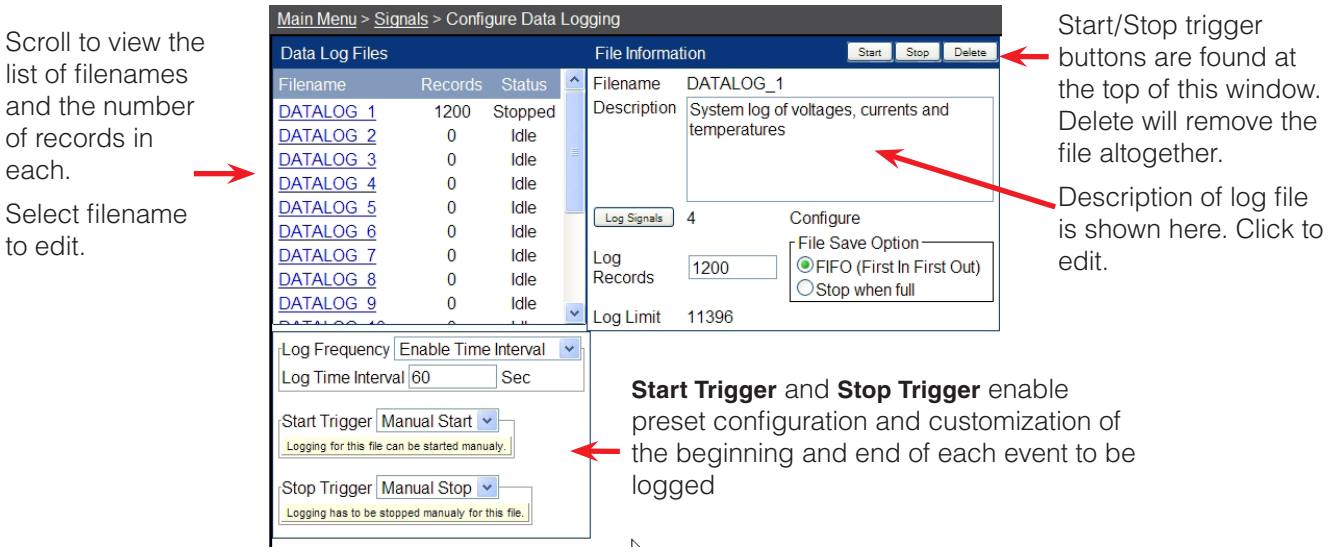


Figure 90 — Configure Data Logging web interface window

1. Click on a data logging signal filename, e.g., DATALOG_1, under Data Log Files.
2. Click **Log Signals** in the center of the screen.
3. In the **Signal List** window that appears, browse through the signals and alarms and enable data logging by checking the **Enable Logging** checkbox.
4. Click **Apply**.

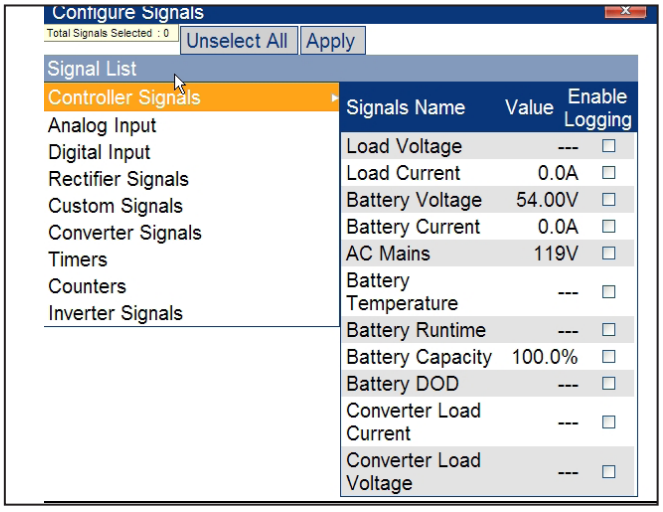


Figure 89 — Enable Signals for Data Logging web interface window

5. Enter a number that is less than the Log Limit in the **Log Records** field
6. Select a trigger event from the drop down menu for **Start Trigger**.
7. Click the **Save** icon at the top of the screen and click **Accept**.
8. In the **Data Log Files** window, click the data log filename again and click **Start**.
9. Go to Logs & Files and at the bottom select the data logging signal used from the drop down menu and then click **Data Log**.

Definitions

Data Log Files – this list shows the filename (up to 16) and the number of records associated with each. Select the filename to display and edit the information in the adjacent window.

File Information – description and status of the log file is shown here.

Log Records is the number of records to be saved in the log file. Click on the value to edit.

Log Limit changes depending on the number of signals selected and the number of records in the other log files.

NOTE:	Recommended size is up to seven signals and a maximum one thousand entries, as very large log files may not be viewable. If the datalog screen comes up blank, the log is too large to be displayed.

File Save Option enables a FIFO (first in first out) or "Stop when full" means of data collection.

Log Signals allows selection of log signals from a list (max. 32) See Figure 89.

Log Frequency – determines how often the data is collected. The default time interval is 60 seconds and the range is from ten to 86,400 seconds (24 hours). An interval may also be set based upon when a selected signal changes by the Delta Level; click on the value to edit.

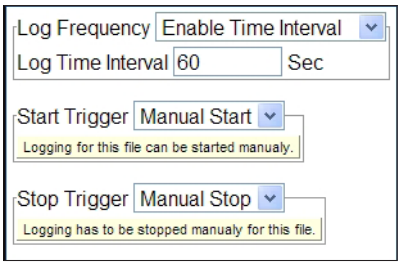
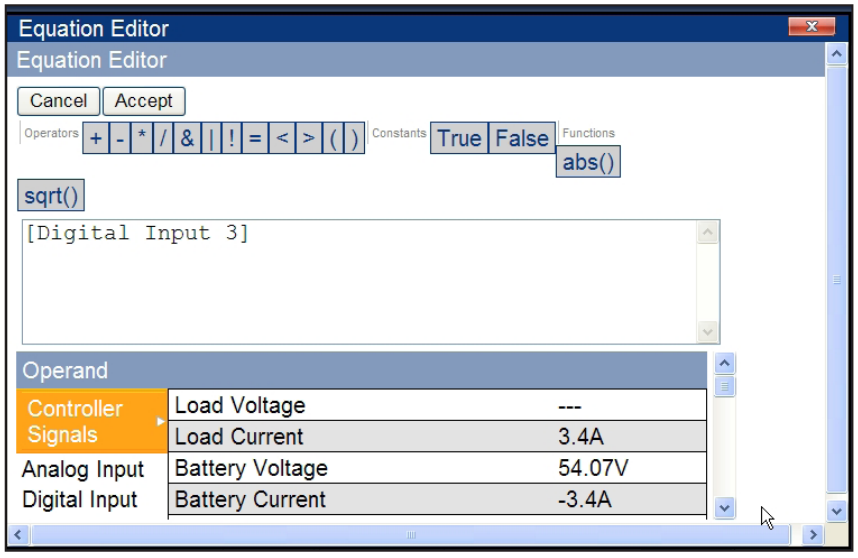


Figure 92 — Log Frequency

Start Trigger – enables data collection to be started manually, by event or by time. For example, select Customize to edit/build an equation from the list of operands (alarms and signals) and operators (arithmetic and logic):



Mathematical operators

+	Add
-	Subtract
*	Multiply
/	Divide

Logical operators:

&	AND
|	OR
!	NOT TRUE
=	EQUAL TO, compare for equality
<	LESS THAN
>	GREATER THAN
(	OPEN PARENTHESIS, used with a close parenthesis to set apart arguments to a mathematical function
)	CLOSE PARENTHESIS, see open parenthesis; used to clarify the order of operations

Figure 91 — Alarm Equation web interface window

Stop Trigger – enables data collection to be stopped manually, by event or by time. For example, to specify a period of time when data collection is allowed, select Duration and click on the values (Hrs, Min, Sec) to configure.

After configuring a Data Log, click the **Save** icon to accept (save) the changes.

6.7.3.2 Starting/Stopping of Data Logging

MANUALLY: Press the **Start** button at the top of the **Configure Data Logging** page (see Figure 90). A message window prompts to start logging data for the selected file. Under **Data Log Files**, displayed next to the log filename, the number of records starts incrementing. Under File Information, the status indicates the log file is running. To discontinue logging, press **Stop**; the status changes to stopped.

BY EVENT OR BY TIME: The start of data logging can be triggered by an event such as the generator switching on (see "6.7.3.6 Example Three – Generator Voltage" on page 86). If a time is specified in the **Stop** trigger **Duration** field, the datalog automatically stops logging at the end of the duration.

NOTE:	If the Start Trigger is still TRUE at the end of the duration, the datalog immediately starts logging again for another duration period.

6.7.3.3 Retrieve Logs

From the main menu, select **Logs & Files > Retrieve Logs.**

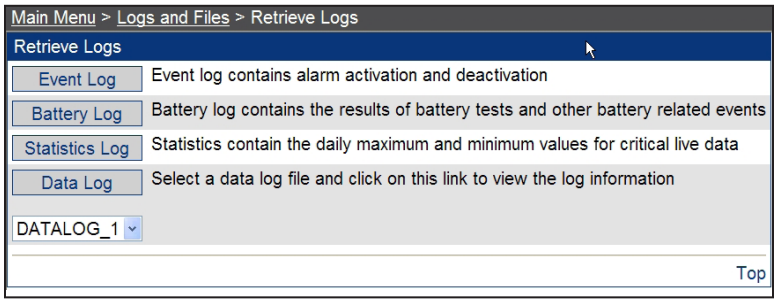


Figure 93 — Retrieve Logs web interface window

Select the log file from the drop-down menu and click **Data Log** to view the log information.

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CXCDATALOG_1

Date & Time	Midpoint Voltage	Load Current	Battery Voltage	Battery Current	AC Mains	Battery Temperature	Battery Runtime	Battery Capacity	Battery DOD	Digital_input_1
2007/07/01 10:15:24	28.25	5.30	55.04	0.41	208.85	22.30		22.28	23.87	0.00
2007/07/01 10:05:24	28.18	5.30	55.04	0.43	210.43	22.30		22.28	23.87	0.00
2007/07/01 9:55:24	28.13	5.30	55.04	0.46	209.69	22.30		22.28	23.87	0.00
2007/07/01 9:45:24	28.18	5.30	55.02	0.53	208.53	22.30		22.28	23.87	0.00
2007/07/01 9:35:24	28.10	5.30	55.04	0.55	210.11	22.14		22.28	23.87	0.00
2007/07/01 9:25:24	28.04	5.30	55.04	0.58	209.48	22.14		22.28	23.87	0.00
2007/07/01 9:15:24	27.97	5.30	55.04	0.67	208.11	22.14		22.28	23.87	0.00
2007/07/01 9:05:24	27.89	5.30	55.04	0.82	209.58	22.14		22.28	23.87	0.00

Figure 94 — Sample (data) log information web interface window

The date and time is recorded for every data sample. Up to 32 signals can be selected per log file. The text (rows and columns) can be copied and pasted into a spreadsheet program for analysis; e.g., graphing.

6.7.3.4 Example One – Logging Three Phase Voltage Input (Rectifier System)

The following is an example of a Data Log configured to monitor the voltage input for a two phase rectifier system.

1. From the web interface, select **Signals > Configure Data Logging**.
2. Under **Data Log Files**, select an unused log file to edit.
3. Enter a filename description under **File Information**.
4. Enter the number of **Log Records** you want to keep and select **FIFO** as the **File Save Option**.
5. Under **Start Trigger** and **Stop Trigger**, select **Manual** for each.
6. Under **Log Frequency**, select **Enable Time Interval** and enter 600 seconds (10 minutes).

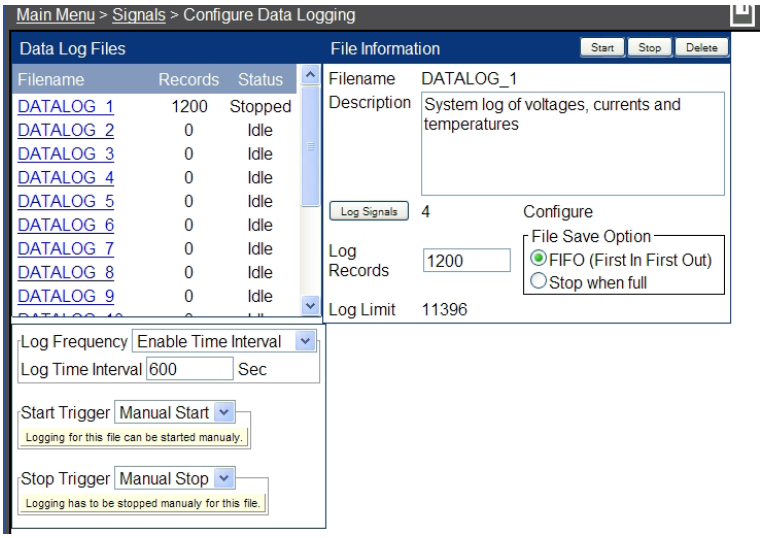


Figure 95 — Configure (Signals) Data Logging web interface window, example one

7. Click the **Log Signals** button to select the rectifier signals for logging.
8. Select **Rectifier Signals** from the Signal List in the Configure Signals window.
9. Scroll down and check each phase box as shown.

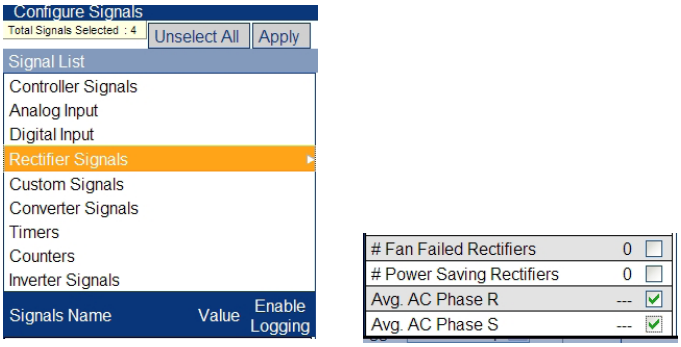


Figure 96 — Enable (Rectifier) Signals for Data Logging

10. Click the **Apply** tab (to accept changes and return to Configure Data Logging window).
11. Click the **Save** icon to save the changes and click Accept when prompted.
12. Start the log by clicking the **Start** button located next to the File Information heading (see Figure 95. Once the data has collected for the desired interval, return to this window and click the **Stop** button.
13. Select **Logs & Files > Retrieve Logs**. Select the file name from the pull-down menu and then select **Data Log** to view the log information in a new window. Copy and paste the data into a spreadsheet application for analysis.

6.7.3.5 Example Two – Battery System

The following is an example of a Data Log configured to monitor the battery voltage, current, temperature and other parameters for a battery system.

1. From the web interface, select **Signals > Configure Data Logging**.
2. Under **Data Log Files**, select an unused log file to edit.
3. Enter a filename description under **File Information**.
4. Enter the number of **Log Records** you want to keep and select **FIFO** as the **File Save Option**.
5. Under **Start Trigger** and **Stop Trigger**, select **Manual** for each.
6. Under **Log Frequency**, select **Enable Signal Interval**.

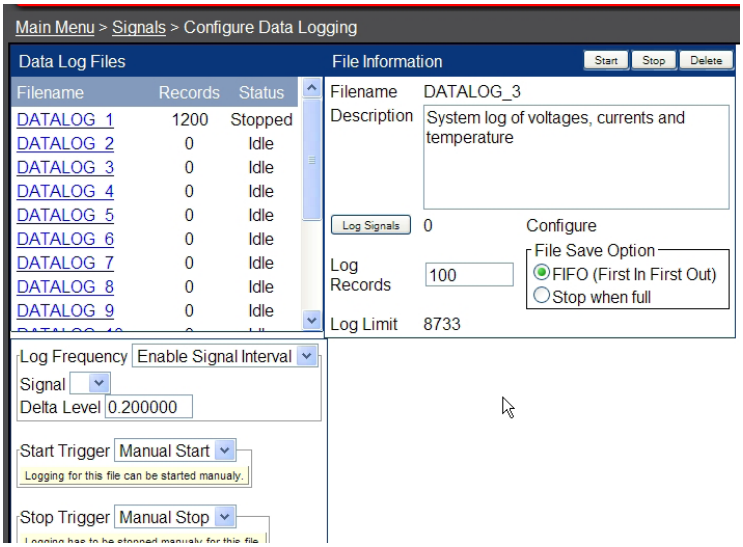


Figure 97 — Configure (Signals) Data Logging web interface window, example two

7. Click the **Log Signals** button to select the battery signals for logging.
8. Select **Controller Signals** from the Signal List in the Configure Signals window.
9. Scroll down and check each battery signal as shown.

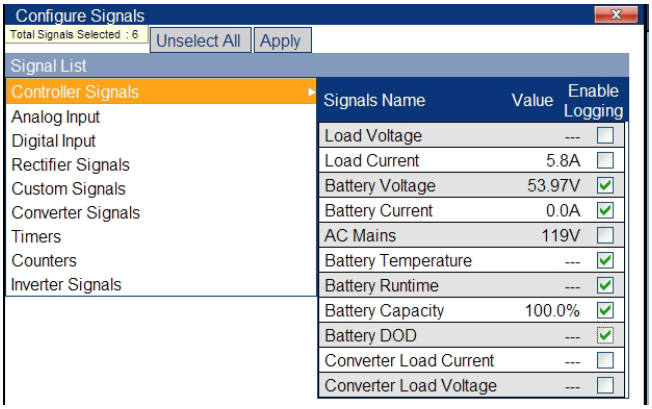


Figure 98 — Enable (Controller) Signals for Data Logging web interface

10. Select **Apply** (to accept changes and return to Configure Data Logging window).
11. Click the **Save** icon to save the changes and click **Accept** when prompted.
12. Start the log by clicking the **Start** button located next to the File Information heading (see Figure 90). Once the data has collected for the desired interval, return to this window and click the **Stop** button.
13. Select **Logs & Files > Retrieve Logs**. Select the file name from the pull-down menu and then select **Data Log** to view the log information in a new window. Copy and paste the data into a spreadsheet application for analysis.

6.7.3.6 Example Three – Generator Voltage

The following is an example of a Data Log configured to monitor the input voltage of a system when a generator is activated (for emergency backup power). In this example, the data starts logging when the digital input signal from the generator switches on and stops once the data has collected for one hour.

1. From the web interface, select **Signals > Configure Data Logging**.
2. Under **Data Log Files**, select an unused log file to edit.
3. Enter a filename description under **File Information**.
4. Enter the number of **Log Records** you want to keep and select **FIFO** as the **File Save Option**.
5. Under **Start Trigger,** select **Event**.
6. Click **Customize**.
7. In the Equation Editor, select the digital input that indicates the generator is activated.
8. Click **Accept** (In the Configure Data Logging window, the Digital Input # appears under **Start Trigger**).

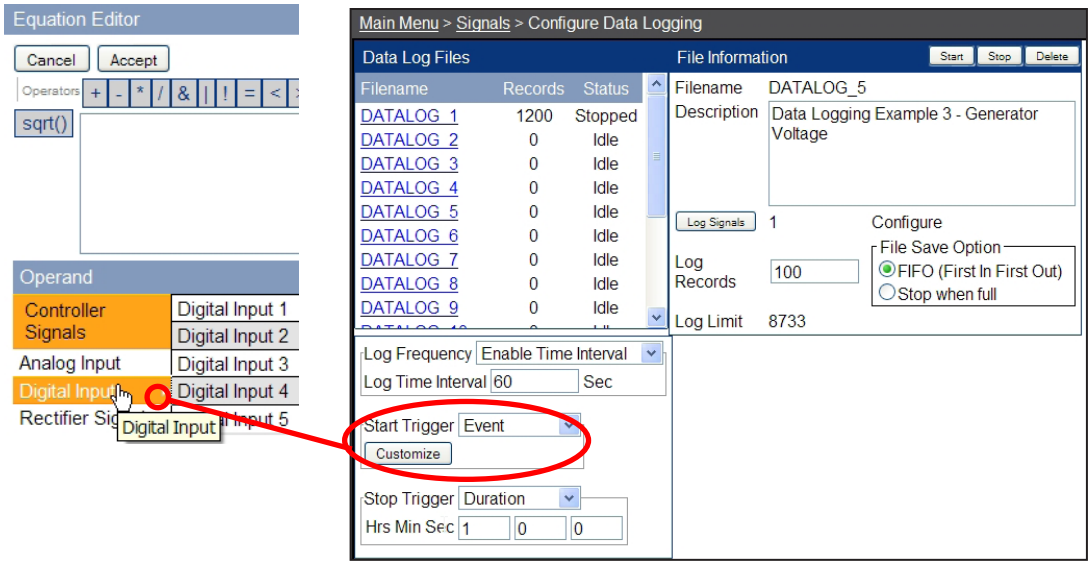


Figure 99 — Configure (Signals) Data Logging web interface window, example three

9. Under **Stop Trigger**, select **Duration** and enter one hour.
10. Under **Log Frequency**, select **Enable Time Interval**. Click the **Log Signals** button to select the rectifier signals for logging.
11. Select **Rectifier Signals** and scroll down and check the signal shown.
12. Select **Apply** (to accept changes and return to Configure Data Logging window).
13. Click the **Save** icon to save the changes and click **Accept** when prompted.
14. The log starts when the digital input signal from the generator switches on and lasts one hour.
15. Select **Logs & Files > Retrieve Logs**. Select the file name from the pull-down menu and then select **Data Log** to view the log information in a new window. Copy and paste the data into a spreadsheet application for analysis.

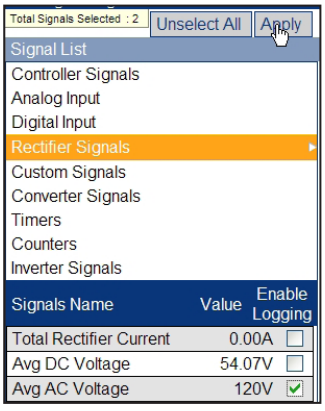


Figure 100 — Enable(Rectifier) Signals for Data Logging

6.7.4 ADIO Device Configuration (Web Interface Only)

The Supervisor can modify the name of the signal or configure an alarm for the selected item. Some examples are shown below.

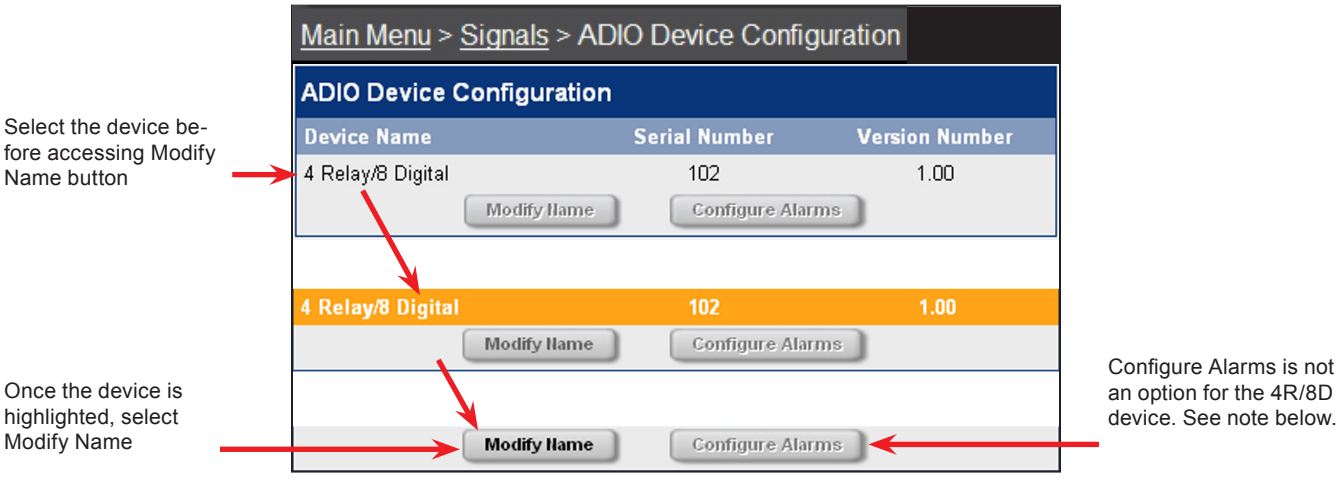


Figure 101 — ADIO Device Configuration web interface window (showing 4R/8D device)

NOTE:	Alarm configuration/programming for the 4R/8D device is in the custom alarm sections of the menus; where the alarm condition can be associated with a digital input and mapped to a relay.

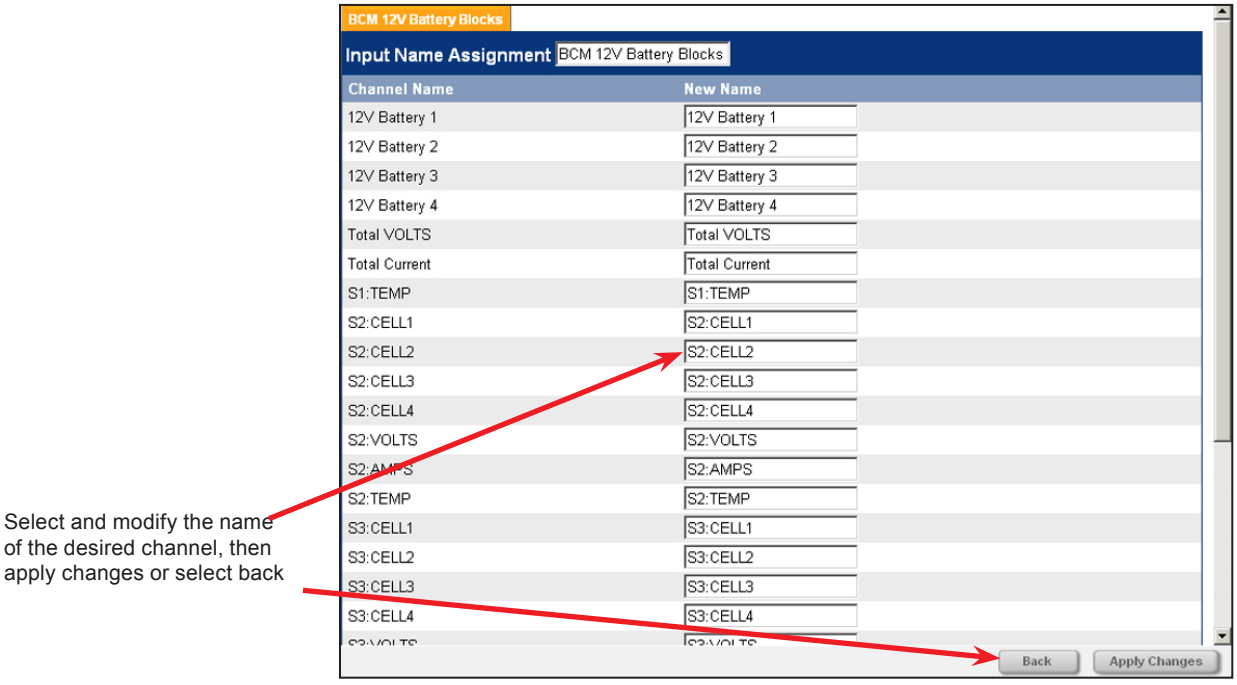


Figure 102 — Input Name Assignment web interface window (showing 4R/8D device)

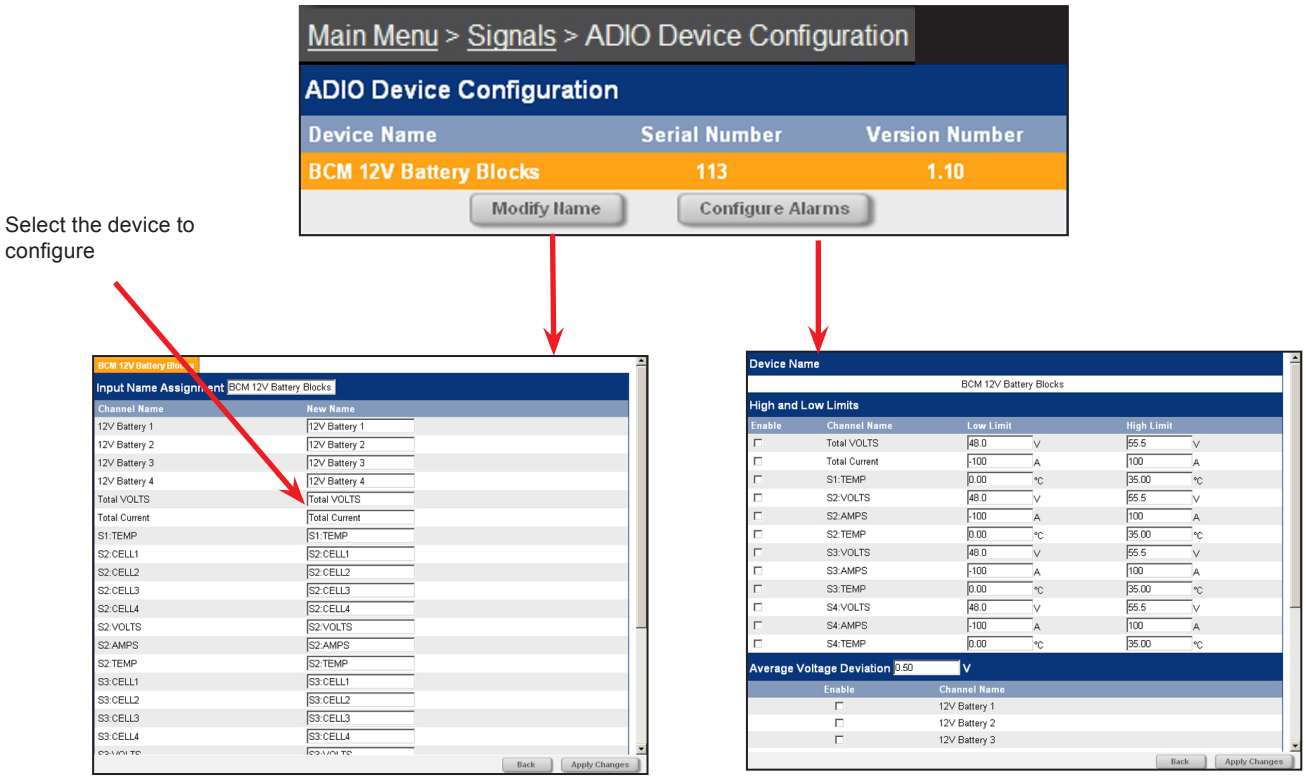


Figure 103 — ADIO device configuration examples (showing BCM device)

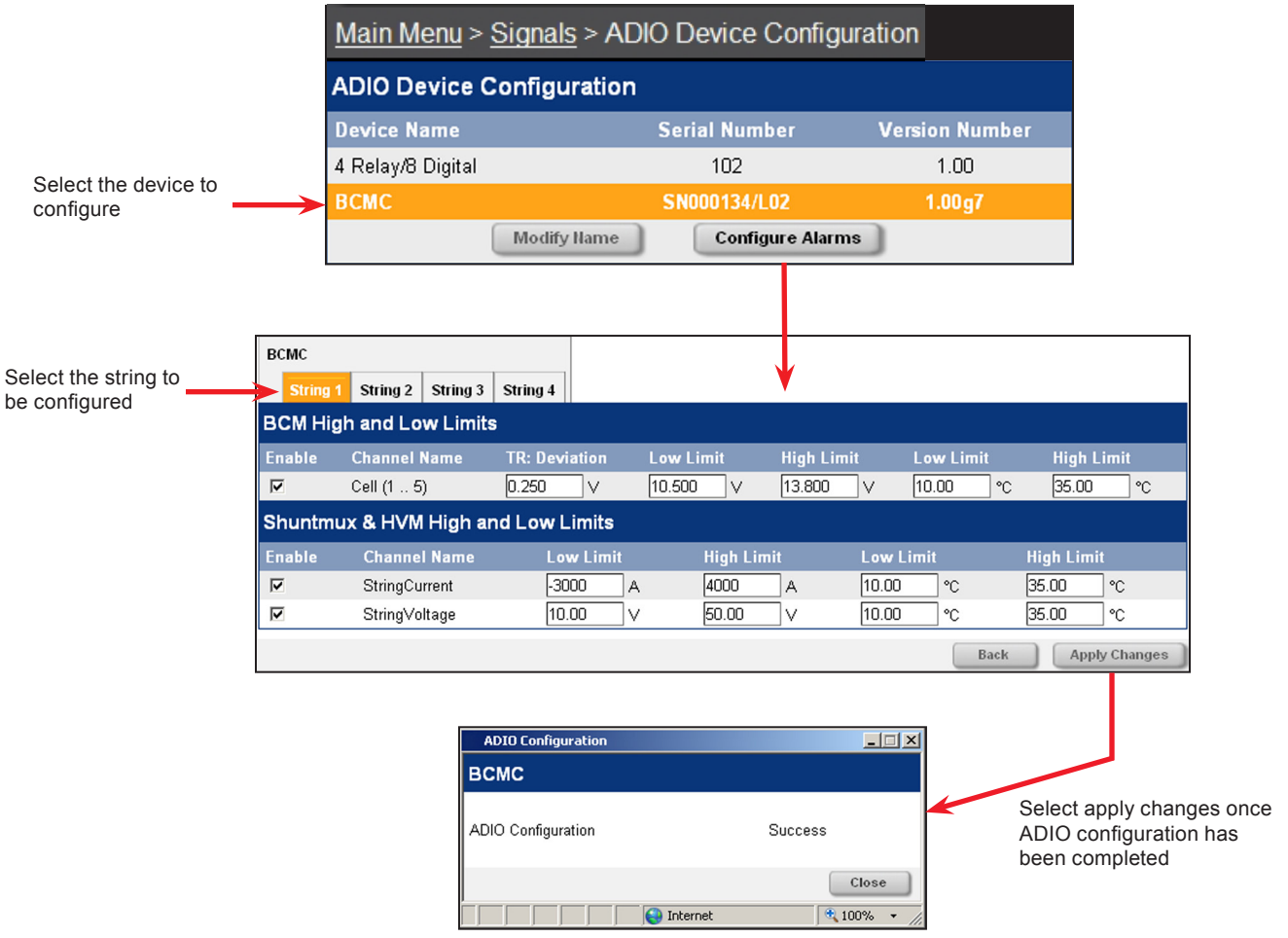


Figure 104 — ADIO device configuration examples (showing BCMC device)

6.8 Controls

This menu category consists of power system controls. Parameters can be set/accessed such as low voltage disconnect (LVD), high voltage shutdown (HVSD), and counter electromotive force (CEMF) in/out. Many of the parameters are similar to the items found in 6.6.3 Configure Alarms, such as, relay mapping and alarm priority. Some parameters are not displayed under the Configure window for all controls. The following are some of the additional parameters the Supervisor can expect to encounter:

Activation Timer — For LVD countdown timer (activation), tap on the number to edit via a virtual numeric keypad. Use with caution. Refer to the following section LVD Control.

There are three possible triggers for opening the LVD, one of which is that loss of AC mains immediately starts the activation timer, if it is enabled, and the LVD will open at the timeout point.

DOD Activation — For LVD control, tap on the number (% of DOD) to edit via a virtual numeric keypad.

Disconnect Voltage, Connect Voltage — for each LVD (1-10), tap on the number(s) to edit via a virtual numeric keypad.

Inhibit Status — For LVD Inhibit, select from the pull-down menu; e.g., Inactive or Active. Selection will be in effect real-time and not saved.

Activation Value — For HVSD, tap on the number to edit via a virtual numeric keypad.

Bypass Voltage, In-Circuit Voltage — For CEMF, tap on the number(s) to edit via a virtual numeric keypad.

6.8.1 LVD Control (USE WITH CAUTION)

WARNING: The LVD feature controls a high capacity relay that disconnects the load during extremely low voltage conditions — such as a deep discharge of the batteries during an AC fail — and automatically reconnects the load once AC power returns. Discharging the battery down to an extremely low voltage can cause damage to the load and the battery. Having multiple LVDs will provide the capability of load shedding; where the least critical loads are disconnected first.

With the CXC, the Supervisor can program connect/disconnect settings to govern the operation of ten separate LVD controls. The LVD is activated when the Activation Voltage or the Activation Time is reached; whichever comes first. The LVD also extends an alarm signal and a message will display on the GUI.

Under this window of operation, there is a list of menu items (tap to select) with scroll bars for navigation.

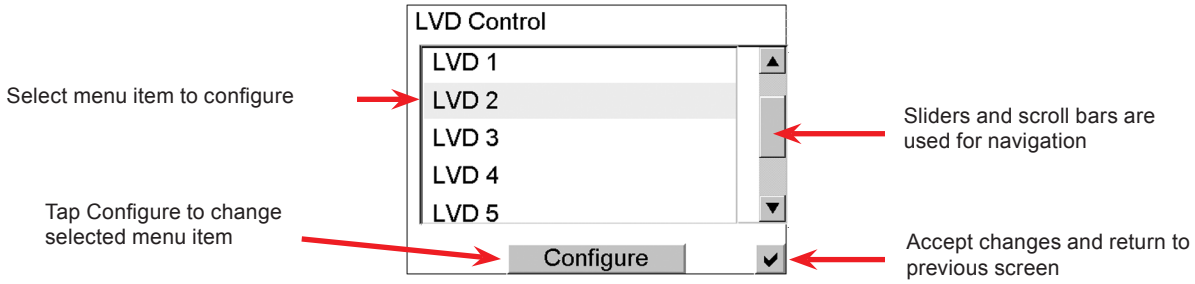


Figure 105 — LVD Control window

Tap “Configure” to enter a new window of operation for the item selected. In this new window, shown below, the Supervisor can set the following parameters:

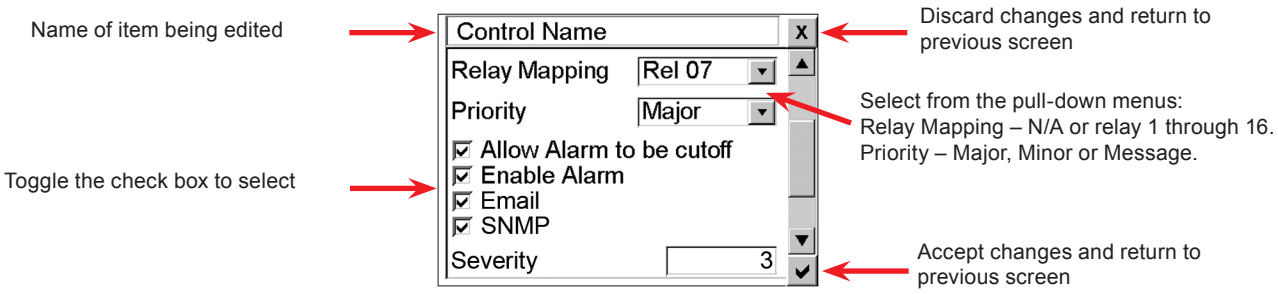


Figure 106 — Configure (item selected) sample window

6.8.1.1 DOD Activation

This menu item (LVD DOD Control) allows the Supervisor to configure each LVD control for activation once the percentage of Depth of Discharge (DOD) has increased above a threshold. This control works in conjunction with the existing LVD countdown timer and the disconnect voltage. Whichever programmable parameter is met first, the LVD will be activated. Typically, LVD DOD control is needed when ac mains fails, battery monitor is enabled, battery has discharged for more than one (1) minute and DOD has risen above the threshold. If DOD activates LVD, then the low voltage connect (LVC) causes reconnect.

6.8.2 LVD Inhibit

The LVD Inhibit feature provides the means to temporarily prevent all LVD controls from activating without disabling the LVDs altogether, see example below. The Supervisor will then have 10 minutes to assess and correct the condition(s) causing the LVD activation.

This menu item differs from other controls in that it cannot be disabled; “Enable Alarm” is grayed out. With that exception, the remainder of the configuration is similar to all other controls (relay mapping, etc.), see Figure 81 above. It is logged in an identical manner, except that the only possibilities are ACTIVE and INACTIVE. Selection will be in effect real-time and not saved – resets on power off.

Operation Example:

1. LVD condition occurs.
2. Audible alert sounds and a pop-up window will appear on the GUI prompting the user to “Inhibit LVDs.”
3. For up to 60 seconds, LVD Inhibit may be evoked by the Supervisor. A password prompt (with counter) will appear as required.
4. Selecting “Cancel” will reset the 60-second countdown; otherwise, if this time should expire, the LVD Control will proceed to disconnect the load as configured.
5. Once evoked, LVD Inhibit control, now ACTIVE, will prevent LVD controls from activating for 10 minutes.
6. LVD condition is corrected by Supervisor or LVD Inhibit may be evoked again.
7. Once LVD condition is corrected, LVD Inhibit must be reset manually as required.

6.8.3 HVSD

This menu item enables the Supervisor to program the setting for a HVSD control, which energizes a relay that can shut down one or more rectifiers when the output voltage exceeds the Activation Value. The output from HVSD relay is connected to the Remote Shutdown input on the rectifier cabinet. An alarm is also activated and the message HIGH VOLTAGE SHUTDOWN will display on the CXC’s GUI.

6.8.4 CEMF

The CEMF Cell is a stand-alone panel; which is used to reduce the load voltage (by up to 3.0Vdc) to protect sensitive loads from high voltages during battery equalize and float cycles.

6.8.4.1 Bypass Voltage

This menu item enables the Supervisor to set the voltage breakpoint to close the CEMF relay and bypass the CEMF cell (or diode); to directly connect the load to the rectifiers without voltage drops.

6.8.4.2 In-Circuit Voltage

This menu item enables the Supervisor to set the voltage breakpoint to open the CEMF relay and connect the CEMF cell (or diode); to give the appropriate voltage drop to protect the load connected to the rectifiers.

6.9 Communications

This menu category consists of rectifier and power system communications controls. Parameters can be set/accessed such as the web interface (e.g. IP address), and baud rates.

For a detailed description of the communication settings, refer to Chapter “9. Remote Communications” on page 104.

6.9.1 Viewing Port Status (Web Interface Only)

Click **Communications > View Live Status** to display the status of the Cordex controller ports.

Main Menu > Communications > View Live Status

Port Status		IP Information	
CAN:	Active	IP Address:	10.1.12.81
RS485:	Inactive	Subnet Mask:	255.255.252.0
Craft Port:	Inactive	Gateway:	10.1.15.254
Ethernet Port:	Active	Ethernet/Mac Address:	0090EAC0CDE6

Figure 108 — Port Status and IP Information window

6.9.2 Viewing IP Information

In the web interface, click **Communications > View Live Status** to view the current IP information. Figure 108 shows the CXC factory unit default values.

In the LCD interface, use the scroll bars to display the same items: IP address, Subnet Mask, Gateway and Ethernet/MAC Address.

6.9.3 Modifying the IP Address

In the web interface, click **Communications > Configure Communication Parameters**.

In the LCD interface select, the **Communications** menu and **IP Address**.

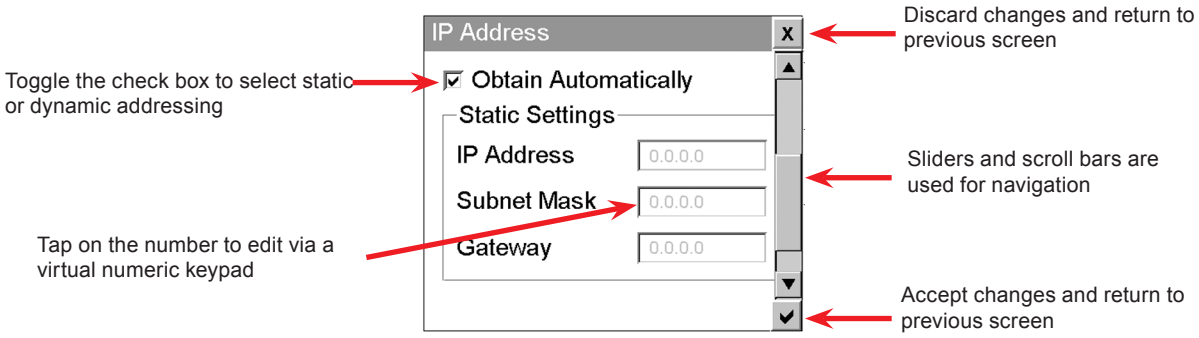


Figure 107 — IP Address window

6.9.3.1 IP Address Reset

This feature applies to the CXCI and CXCU, which have a front panel reset button.

To reset the IP address, press and hold the front panel reset button for three seconds. The unit beeps three times, IP is reset (to 10.10.10.201) and DHCP (Dynamic Host Configuration Protocol) is disabled. The settings are saved and the unit then reboots/resets.

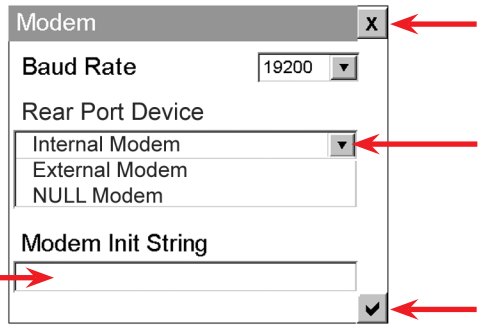
NOTE: Pressing the reset button momentarily restarts the microprocessor without resetting the IP address.

6.9.8 Configuring the Point to Point Protocol (PPP) Connection Device

The Supervisor can set the baud rate and the CXC rear port device (Internal / External / NULL modem). For more information on PPP, refer to section 9.2.

LCD Interface

See 8.3 for modem compatibility. See Table L for factory defaults (baud rate and initialize string). Modem baud rate is initialized to the value stored in the settings file on start up.



Discard changes and return to previous screen

Select from the pull-down menus Modem menu/window may appear different for systems equipped with a CXCI

Factory setting is displayed here and may be edited via the web interface

Accept changes and return to previous screen

Web Interface

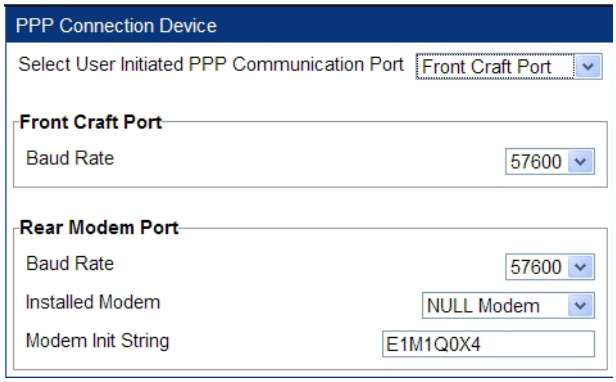
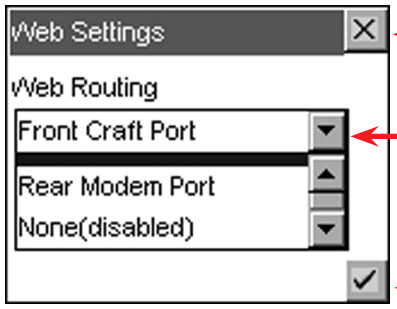


Figure 109 — Point to Point Protocol Connection Device

6.9.4 Web Settings

The Supervisor can set the port routing for the CXC web interface (accessed via PPP for modem).



Discard changes and return to previous screen

Select from the pull-down menu

Accept changes and return to previous screen

Figure 110 — Web Settings window

6.9.5 Master SNMP Destination (Web Interface Only)

See 10.3.3.1.

6.9.6 SNMP Multiple Community Names (Web Interface Only)

See 10.3.1.

6.9.7 Event Notification Destination (Web Interface Only)

See 10.3.3.

6.10 Hardware

This menu category consists of output relay configuration and testing. See also 6.6.3.1 for an overview.

6.10.1 Configure Relays

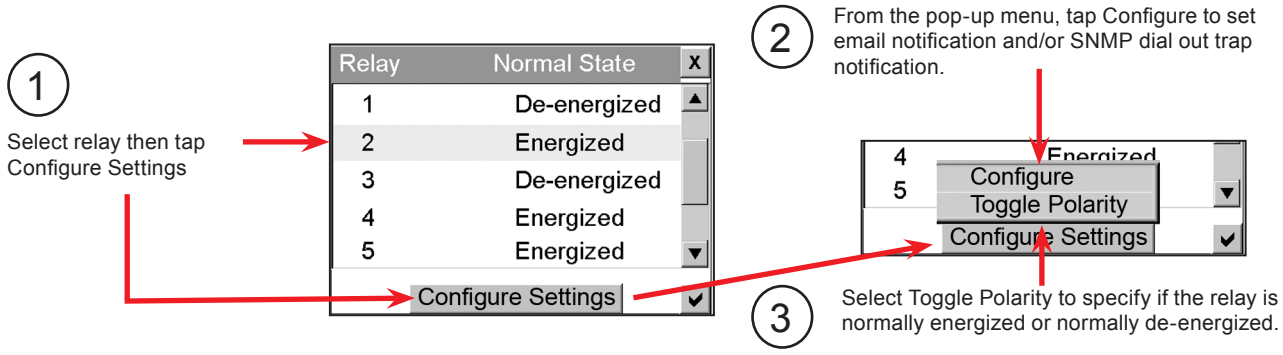


Figure 111 — Configure Relays – LCD

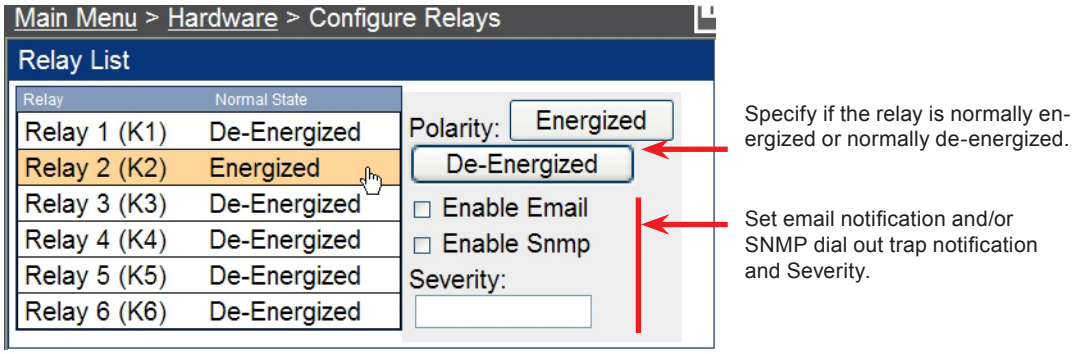


Figure 112 — Configure Relays – Web

6.10.2 Test Relays

From this menu the Supervisor can toggle the state of a relay to verify its condition. Change of state is temporary as all relays return to their default states after leaving this menu. (Note, the web interface is similar in operation: Main Menu > Hardware > Test Relays)

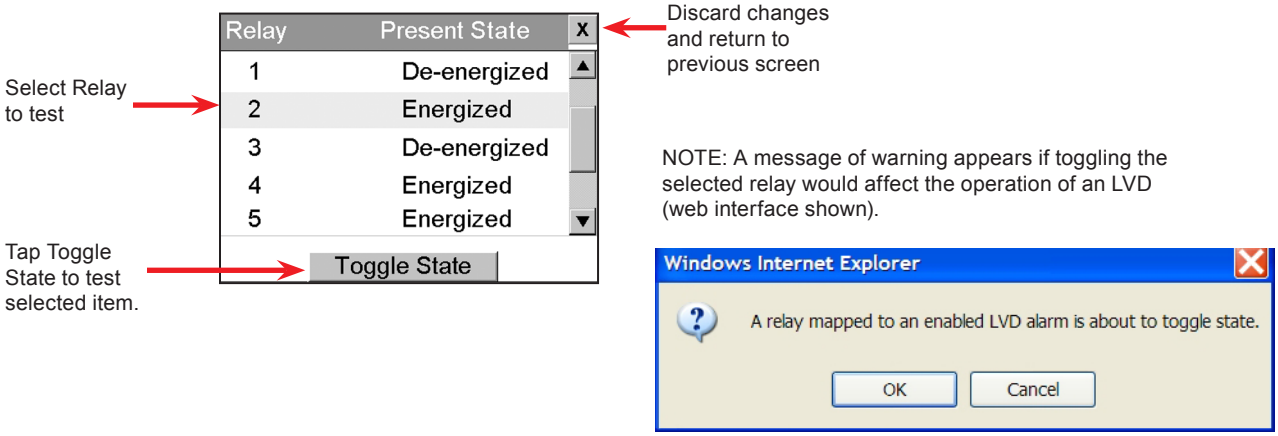


Figure 113 — Test Relays – LCD

6.10.3 Test Modem (Web Interface only)

See Table C.

6.11 Logs & Files (Web Interface only)

This menu category consists of retrieving logs for event, battery, statistics and data; and managing files for configuration, dynamic (editable) text, and language.

6.11.1 Retrieve Logs

See also 6.7.3.3 (under Data Logging).

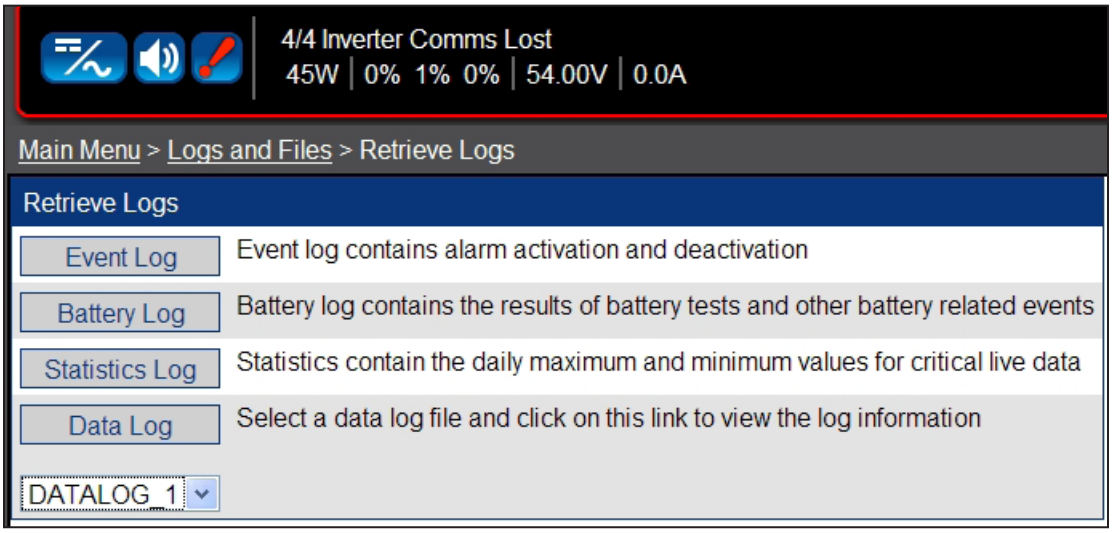


Figure 114 — Retrieve Logs web interface window

6.11.2 Manage Configuration File

The Supervisor can exclude settings and groups of settings when applying changes. A partial configuration file can also be generated and sent to the CXC (v1.81 and above).

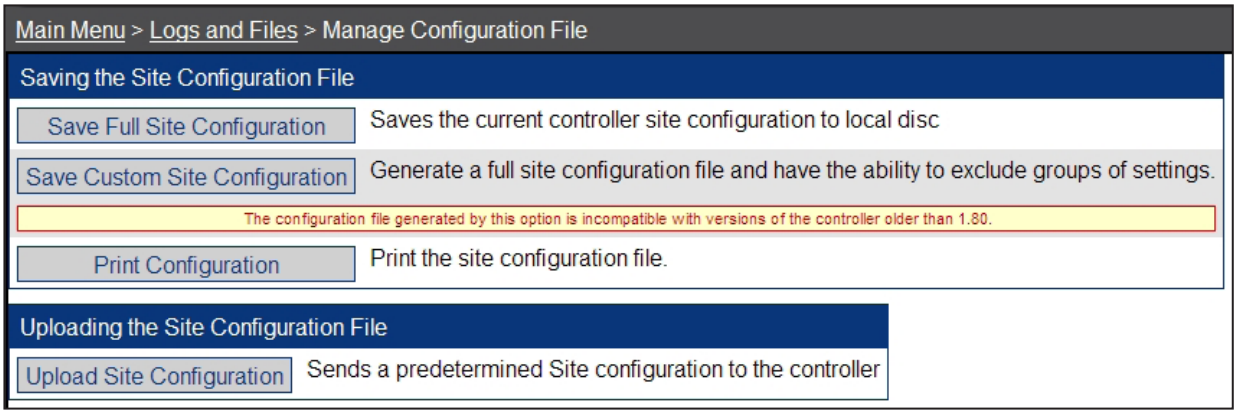


Figure 115 — Manage Configuration File web interface window

6.11.2.1 Printing Custom Site Configuration

CAUTION: BY DEFAULT THE BROWSER WILL PRINT OUT ALL SETTINGS REQUIRING APPROXIMATELY 50 LETTER SIZE PAGES.

Click the **Print Configuration** button for a standard print dialog window. Right-click in the window showing the settings and be careful to then select **Print Preview**.

Continue with the page setup and print dialog as required. You may reduce the page range or print to PDF if your workstation is configured to do so.

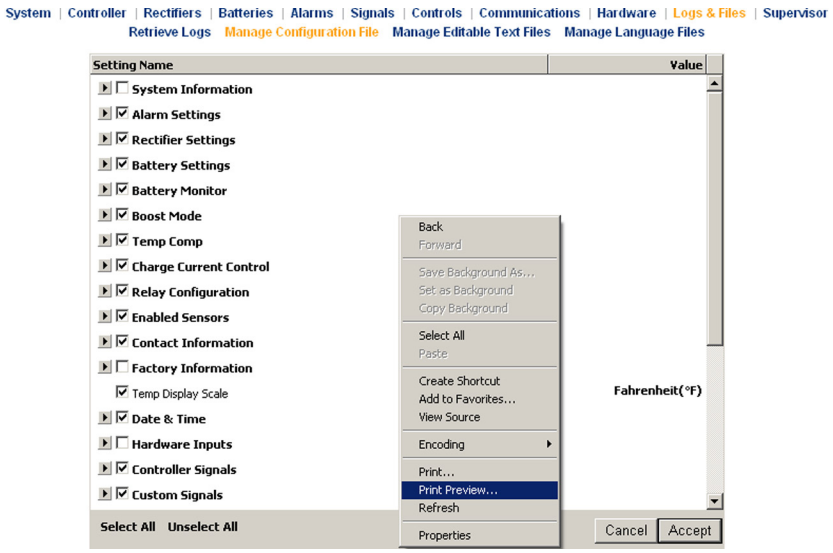
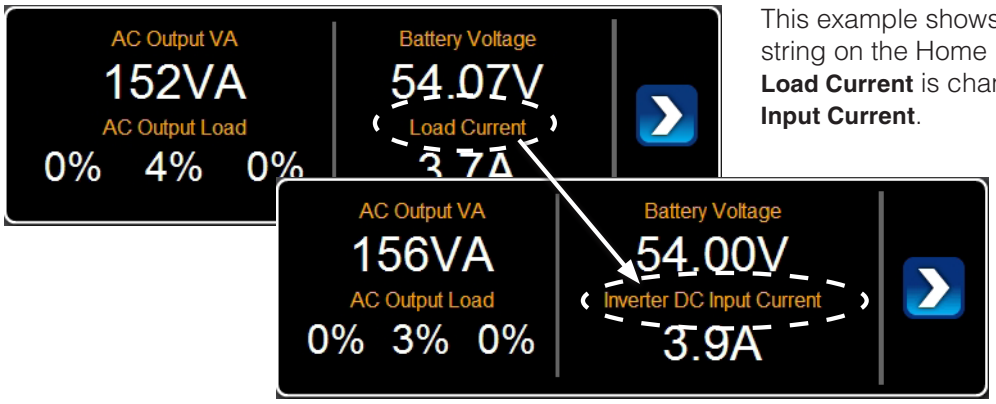


Figure 116 — Logs & Files "Print Preview" (web interface)

6.11.3 Manage Dynamic (Editable) Text Files

To customize alarm, signal and relay labels for your specific application, select **Logs and Files > Manage Editable Text Files** to change the text strings.



This example shows how to revise a text string on the Home page: the signal label **Load Current** is changed to **Inverter DC Input Current**.

1. Choose the label category from the Text Editing drop-down menu.
2. Locate the text string on the left and edit it in the box on the right.
3. Click the Save icon and Accept the change in the pop-up window.

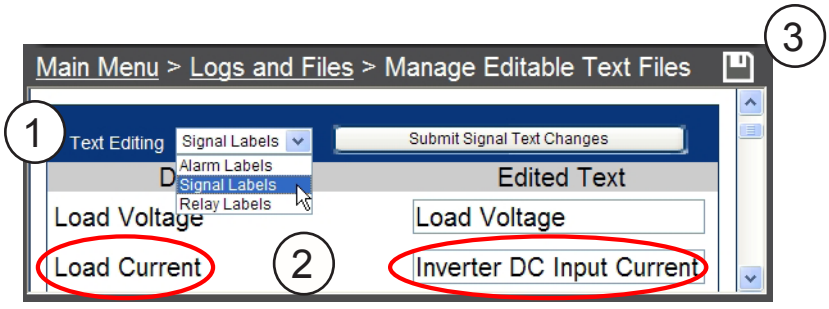


Figure 117 — Manage Editable Text Files

6.11.4 Manage Language Files

Language files can be uploaded via the web interface. The CXC can be set up for a maximum of three language files (default plus two others) at one time.

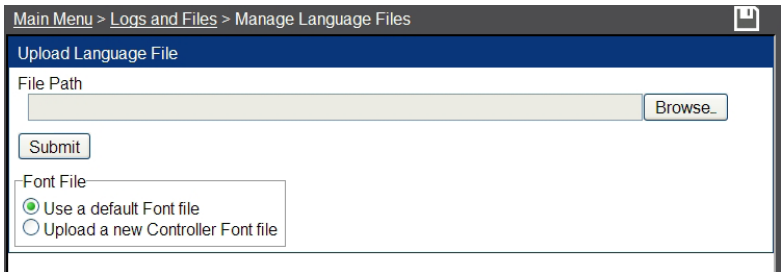


Figure 120 — Manage Language Files web interface window

6.12 Supervisor

This menu category displays only when a Supervisor is logged in. The web interface enables two levels of password protection: User and Supervisor. The same password cannot be used for both.

6.12.1 Change Password

This menu item enables the Supervisor to change the password. Tap to proceed. A pop-up window for new password entry is presented, as shown below:

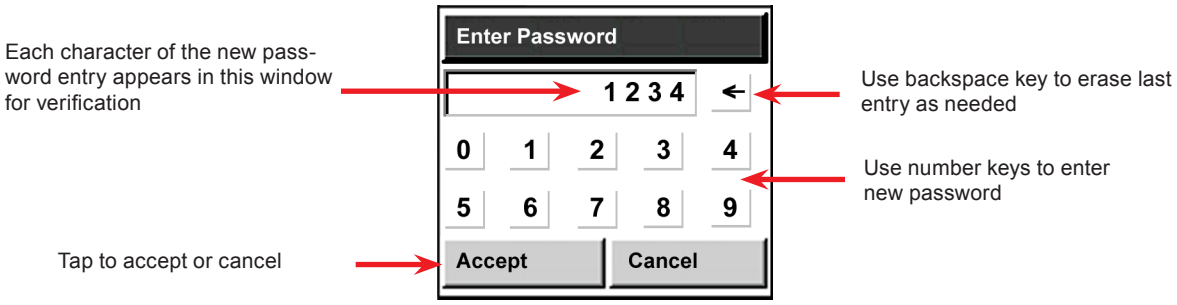


Figure 118 — Change password pop-up

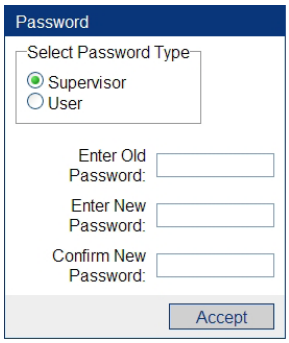


Figure 119 — Change password web interface

6.12.2 Customize User Interface

To remove web browser elements do not apply to your application, select **Supervisor->Customize User Interface**. When a group is unchecked, all related UI elements are removed from the browser.

For the changes to take effect, submit the changes (**Save** and **Accept**) and then refresh the browser.

The following example shows the removal of the ADIO Modules.

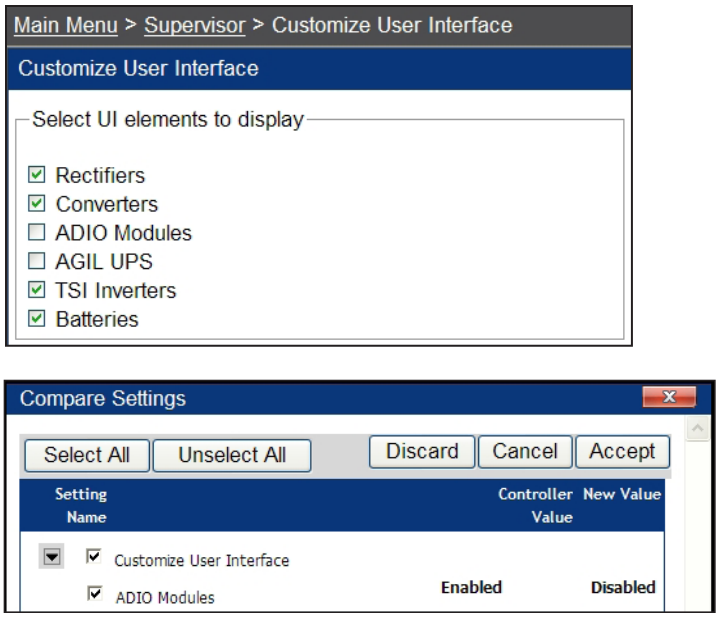


Figure 121 — Customize User Interface - remove ADIO Modules

7. Advanced Programming

7.1 Example: Customize

When configuring Alarms (Section 6.5.3), Signals (6.6.2), or Controls (6.7), an option to CUSTOMIZE will be presented at the bottom of the screen, see Figure 95 below. This enables the Supervisor to program separate triggering equations into the CXC software. The equations may reference any combination (up to 16) of the analog inputs, digital inputs, virtual inputs, and alarms (such as Load Voltage shown below) utilizing logical and arithmetic arguments that simulate the functionality of a programmable logic controller (PLC).

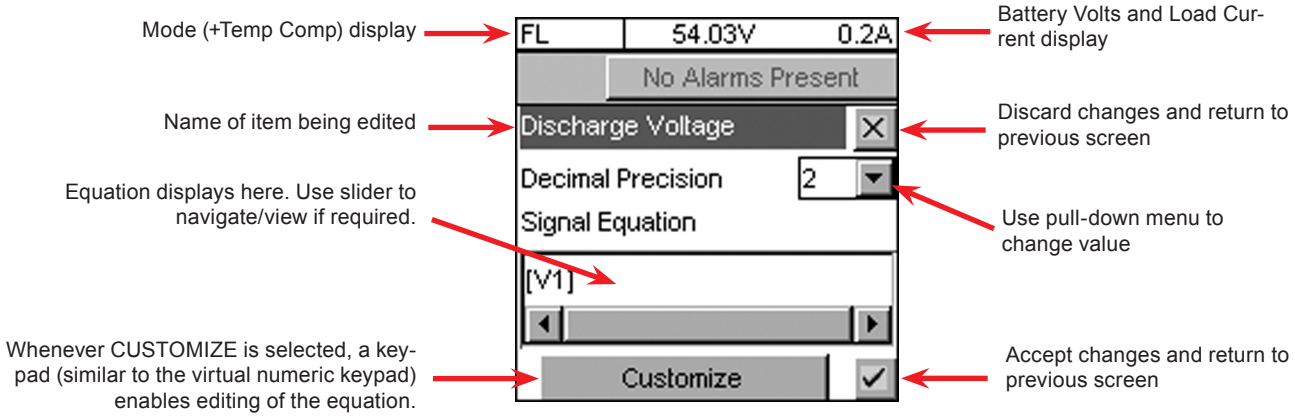


Figure 122 — Screen showing example of item to be edited/customized

7.2 Equation Builder Keypads

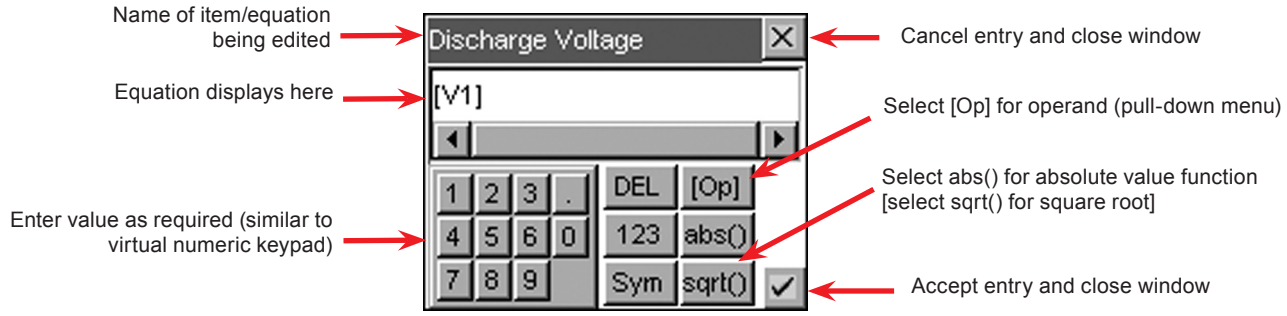


Figure 123 — Equation builder keypad pop-up window

Tap to edit or enter a value. Use the virtual function buttons described above to navigate, cancel or accept.

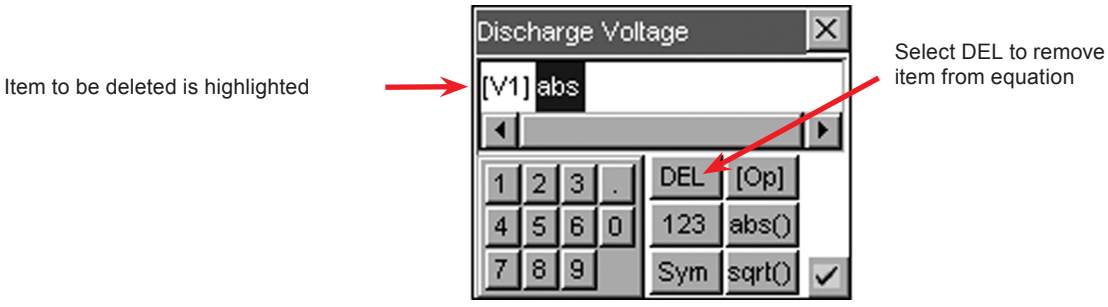


Figure 124 — Equation builder keypad delete key

Mathematical operators:

+ = Add

- = Subtract

* = Multiply

/ = Divide

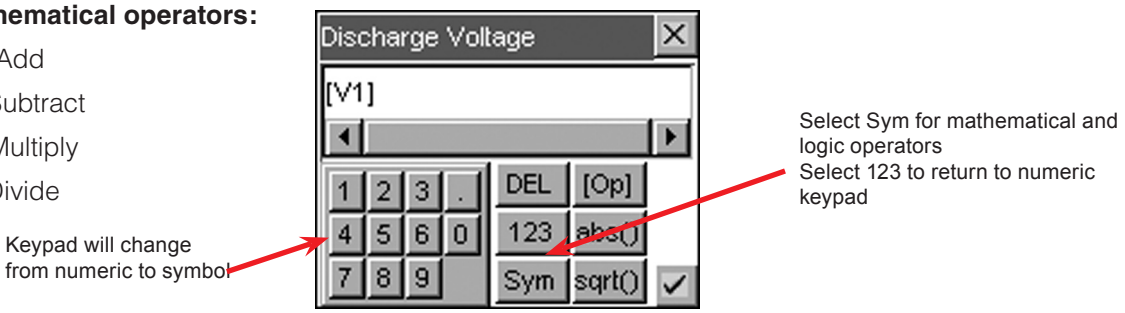


Figure 125 — Equation builder keypad symbol key

Mathematical operators

+	Add
-	Subtract
*	Multiply
/	Divide

Logical operators:

&	AND
|	OR
!	NOT TRUE
=	EQUAL TO, compare for equality
<	LESS THAN
>	GREATER THAN
(	OPEN PARENTHESIS, used with a close parenthesis to set apart arguments to a mathematical function
)	CLOSE PARENTHESIS, see open parenthesis; used to clarify the order of operations

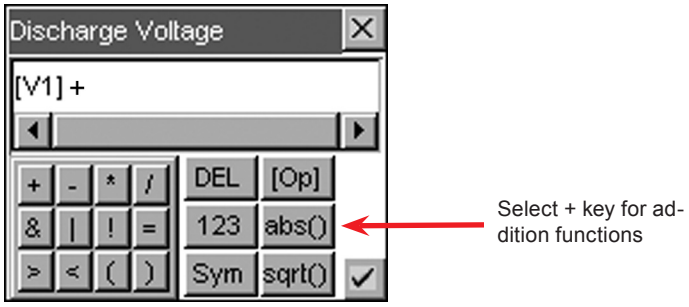


Figure 126 — Equation builder keypad function keys

7.3 Tips on Programming

Square parenthesis [ ] are reserved for CXC signal names.

Use only round parenthesis ( ) for manipulating the order of operations in an equation.

The counters will increment approximately every half-second by default. A cascading counter can be written to create a longer time between increments.

Here is a delay counter for AC fail alarm. The “AC Fail Delay” works by counting up from 0 to 30 when Rect. AC Mains Fail alarm is true. When Rect. AC Mains Fail is false it will count down to 0.

[AC Fail Delay] + (([AC Fail Delay] < 30) * [Rect. AC Mains Fail]) - (([AC Fail Delay] > 0) * ![Rect. AC Mains Fail])

Here is a custom signal set up to filter the battery voltage. "Filtered Battery Voltage" is the custom signal name:

(([Filtered Battery Voltage] * 15) + [Battery Voltage]) / 16

8. CXC Communications Menu Parameters

This chapter provides definitions regarding Ethernet, IP Addresses, and CXC communications (port) configurations.

8.1 Ethernet Port Configuration

8.1.1 About IP Addresses

IP stands for Internet Protocol. Every device on an IP-based LAN or WAN network (including the CXC controller, as well as PCs, and routers) requires an IP address to uniquely identify the source node or destination node for packets sent across the network. This applies to WAN and LAN connections. There are two ways of assigning an IP address to a network device: Static IP Address and Dynamic IP Address.

8.1.1.1 Static IP Address

A static IP address is a fixed IP address that the user assigns manually to the CXC or to a PC or any other device on the network. This address remains valid until the user disables it, thus ensuring that the device will always have that same IP address until the user changes it. Check with the LAN administrator to see if they have allocated a Static or Dynamic IP address for the CXC on the network.

8.1.1.2 Dynamic IP Address

A dynamic IP address is one that is automatically assigned to any device on the LAN network. This address is called “dynamic” because it is only temporarily assigned to the CXC, PC or other network device. After a certain time, it expires and may change. If a PC logs onto the network (or the Internet) and its dynamic IP address has expired, the DHCP server (see below) will assign it a new dynamic IP address.

DHCP Server (8.1.1.5) may choose to assign the same IP address every time based on the MAC address.

8.1.1.3 Subnet Mask

The Subnet Mask (also known as the Network Mask) determines which portion of an IP address is the network portion, which portion is the host portion, and directs the CXC regarding communications via the Default Gateway (8.1.1.4).

If not connected to CXC via crossover, hub, or switch, then misconfigured subnet and gateway will result in the inability to communicate with the CXC.

8.1.1.4 Default Gateway

This IP address should be the IP address of the gateway device that enables contact between the CXC and the remote network or host. If the destination node is not in the local sub network, the protocol is sent to the default gateway (and may not be required for a small network).

8.1.1.5 DHCP (Dynamic Host Configuration Protocol) Servers

A DHCP server can automatically assign a new IP address to the CXC (or any other network device that uses dynamic IP addressing). In this case, the CXC is called the DHCP client. DHCP frees the administrator from having to assign an IP address manually every time a new user is added to the network. A DHCP server is usually a dedicated network device such as a router or firewall.

By default, the CXC is configured to enable the DHCP client (the “Obtain Address Automatically” checkbox is selected). If the DHCP Client is enabled, then the DHCP server automatically provides the Subnet Mask and Default Gateway parameters. If the DHCP client is disabled (clear checkbox for “Obtain Address Automatically”) then it is possible to explicitly specify the Subnet Mask and Default Gateway.

8.1.2 IP Information

Displays the CXC current IP Address Settings for the LCD menu. Scroll bars enable the user to navigate the list of text items for viewing; i.e., IP Address, Subnet Mask, Gateway, and Ethernet/MAC Address.

For the web interface, the current IP Address Settings are found by clicking **Communications > View Live Status**.

8.1.3 Configuring IP Address Settings

This section discusses how to change CXC communications parameters in the IP Address section of the menu (or web interface). See 6.8.3 and Figure 83. To save changes, refer to Section 4.9.

8.1.3.1 Obtain Address Automatically

Selecting this checkbox enables the CXC to obtain an IP address automatically from a DHCP server at system boot-up. (if checked it will enable the DHCP client protocol.)

8.1.3.2 Static Settings

All three fields in this area are only enabled if the “Obtain Address Automatically” checkbox is not selected.

IP Address

This field is the Static IP Address to use for the CXC device. The format of the IP address must be a so-called “dotted quad” – that is a series of 4 values in the range 0-255 each separated by a period. For example, an example of a dotted quad would be: “192.168.1.23”.

An incorrect example would be: “213.12.24.264” (264 is outside the range 0-255).

The rules and restrictions for valid IP addresses are beyond the scope of this manual. Check with the LAN administrator for details.

Subnet Mask

This field contains the dotted quad for the static Subnet Mask for the CXC.

Gateway

This field contains the dotted quad to specify the gateway to use for routing packets if the destination IP address is not local.

8.2 PPP Connection Devices

One of two PPP Connection devices can be selected from a pull-down menu for HTTP web server connection: Front Craft Port or Rear Modem Port (Figure 100). PPP connections over serial ports are mutually exclusive to each other.

The PPP connection for HTTP web server connection has no effect on enabling the HTTP web server for the Ethernet port. The HTTP web server for the Ethernet port cannot be disabled.

8.2.1 Front Craft Port

The front craft port does not support modem connection. For most CXC models, it is used with NULL modem connection for HTTP web server connection.

CAUTION!

For a CXCI controller, do not connect anything other than the Alpha modem and Alpha-supplied DB-9 cable to the D-sub port on the front.

8.2.2 Rear Modem Port

Three choices are available from the **Installed Modem** pull-down menu:

- Internal Modem
- External Modem
- NULL Modem

When connection is established, the HTTP web server, SMTP outbound email notification and/or SNMP dial out trap notification can be delivered through PPP.

Modem Init String needs to be specified in order to initiate external (remote) modem connection.

To save changes, click the **Save** icon.

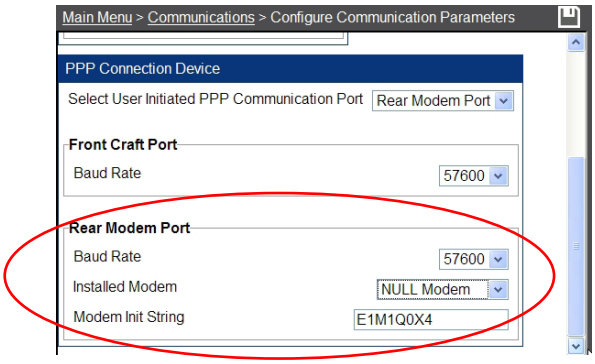


Figure 127 — PPP Connection Device web interface window

8.3 Rear Port Configuration

This section provides information on setting up and configuring the rear port modem device (or a direct null modem serial cable connection) with the CXC to provide inbound web server support and/or outbound e-mail alarm support and/or SNMP trap dial-out support. To save changes, refer to Section 4.9.

The Alpha Cordex Controller (CXC, Alpha P/N 018-557-20 or 018-587-20) supports connection to one of the following:

- Alpha-supplied internal modem daughter board module (via rear RJ-11 jack), or
- External AT-class V.34 or V.90 modem (via rear RS-232 serial port with DB-9 connector), or
- Null modem direct cable connection (either front or rear RS-232 serial port) to a computer running Windows 2000.

8.3.1 Internal Modem Support

The V.90 internal modem (Alpha P/N #707-329-20) module requires the CXC to be supplied with List Option 101 (modem module supporting global usage); which includes the List Option 95 Communications Board assembly.

8.3.2 External Modem Support

The CXC also supports the use of a standard external AT-class V.34 or V.90 modem (e.g. US Robotics Sportster 33.6 or similar). The external modem must be connected by a standard DB-9 straight through serial cable to the rear RS-232 serial port (requires the CXC to be supplied with the List Option 95 Communications Board assembly).

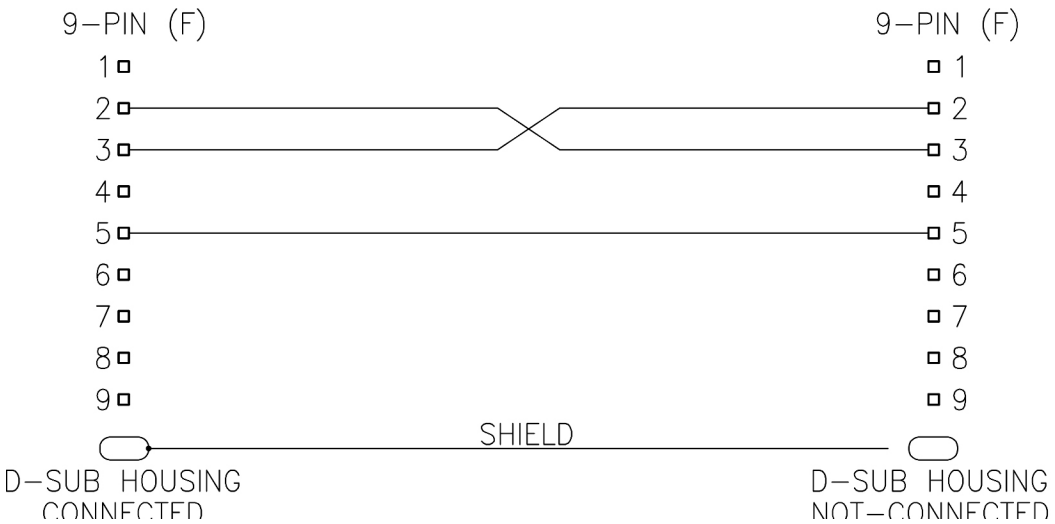
8.3.3 Null Modem Direct Cable Connection Support

The CXC supports the use of a direct DB-9 null modem cable connection to a computer running Windows®. The null modem cable is connected to either the front panel RS-232 serial craft port interface or rear RS-232 serial port interface (requires the CXC to be supplied with the List Option 95 Communications Board assembly).

A null modem cable connection to the front port typically requires just a simple three-wire null modem cable (TxD, RxD and GND) for terminal emulation access (Alpha diagnostics usage). However, for a fully functional Windows® PPP web connection for TCP/IP, the Windows® serial driver on the computer connecting to the CXC requires a standard null modem cable.

CAUTION!

For a CXCI controller, do not connect anything other than the Alpha modem and Alpha-supplied DB-9 cable to the D-sub port on the front.



PIN No.	SIGNAL
1	DCD
2	RD
3	TD
4	DTR
5	SIG GND
6	DSR
7	RTS
8	CTS
9	N/C

Figure 128 — RS-232 null modem cable pinouts

9. Remote Communications

The instructions provided in this chapter should enable the user to establish remote communications with the CXC. The communications protocol supports a web interface. All CXC models can be set up, monitored and tested with an Ethernet 10/100 Base-T either locally or remotely. Local connection is also possible with a PPP serial data connection. The installation manual describes some standard scenarios.

NOTE: A step by step connection wizard – provided to establish remote communications with the CXC – is available via the Alpha website (www.alpha.ca). The wizard does not work in Windows Vista or Windows 7.

9.1 Establishing a Network Connection via a Crossover Cable

Laptop

1. Connect the network crossover cable between the host computer (e.g. laptop) and the Cordex controller.
2. In Windows®, select the Start menu, Control Panel, and then select Network Connections.
3. Right-click on the icon for the Local Area Connection (to be used by the laptop computer) and then select Properties.
4. Make sure Internet Protocol (TCP/IP) is checked; highlight it and then select Properties.
5. Check the radio button beside Use the Following IP Address and enter or verify the following information:

   IP address: 10.10.10.202

   Subnet mask: 255.255.255.0
6. Click OK to close each window opened thus far.

CXC LCD

7. Login to the CXC: First, tap on the home page icon at the bottom left corner of the LCD touch screen and select **LOGIN**. Next, enter the password **1234** and tap on **ACCEPT**. Last, close the message window (access granted to the controller).
8. On the main menu, scroll down and tap on **Communications** and then tap on **IP Address** (6.5).
9. Enter or verify the following information (uncheck **Obtain Automatically** if necessary):

   IP address: 10.10.10.201 (factory default)

   Subnet mask: 255.255.255.0

   To change a number, tap on the numeric field to edit via the virtual numeric keypad, see Figure 6.
10. Select the √ icon to accept the new setting and return to the previous menu.
11. Return to the MAIN MENU navigation screen and press the **OPTION** button to evoke the **SAVE/LOGOUT** pop-up window.
12. Select **SAVE** to save the new settings. A pop-up window will appear to confirm the selection (select the **X** icon).
13. Select the **OPTION** button again and choose **LOGOUT**.
14. Tap on the home page icon at the bottom left corner of the LCD touch screen and select **RESET**, see Section 4.4. To confirm the reset, tap on **ACCEPT** and then **REBOOT NOW**.
15. In Windows®, once the CXC has rebooted, launch Internet Explorer® 8 or greater and enter the IP address of the CXC (10.10.10.201) in the address bar. Under **Tools\Internet Options\Security**, add the logon address of the CXC to the Trusted Sites.
16. If the connection was successful, the password prompt will appear. Enter your name in the USER NAME field and the default PASSWORD (1234). Select **OK** to proceed to the language selection window.

9.1.1 Support for CXC with No LCD Display

Some CCXs have a 4-digit display or no LCD for system monitoring. System setup and management is performed exclusively from the web interface. To establish remote communications, begin setup as follows:

Perform steps 1 through 6 in the preceeding section.

Reboot the CXC (see 6.9.3.1): press and hold the front panel reset button for three seconds. The unit beeps three times, IP is reset (to 10.10.10.201) and DHCP is disabled. The settings are saved and the unit then reboots/resets.

Perform steps 14 through 16 in the preceeding section.

9.2 PPP Serial Data Connection

The user must set up a “direct cable connection” for the workstation to be connected (with a null modem cable) to the CXC Craft port (address 10.10.10.203). Follow the example below, shown for Windows® 2000 (and similar in Windows® XP).

9.2.1 Starting Networking Wizard

Select **Start** menu, **Settings**, and then select **Network and Dial-Up Connections**:

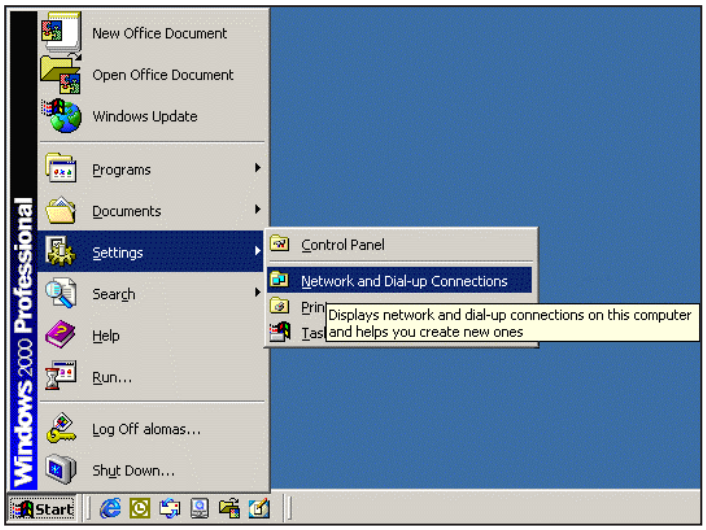


Figure 129 — Starting networking wizard

A new window opens, similar to Figure 130. Double-click the **Make New Connection** icon to start the Network Connection Wizard.

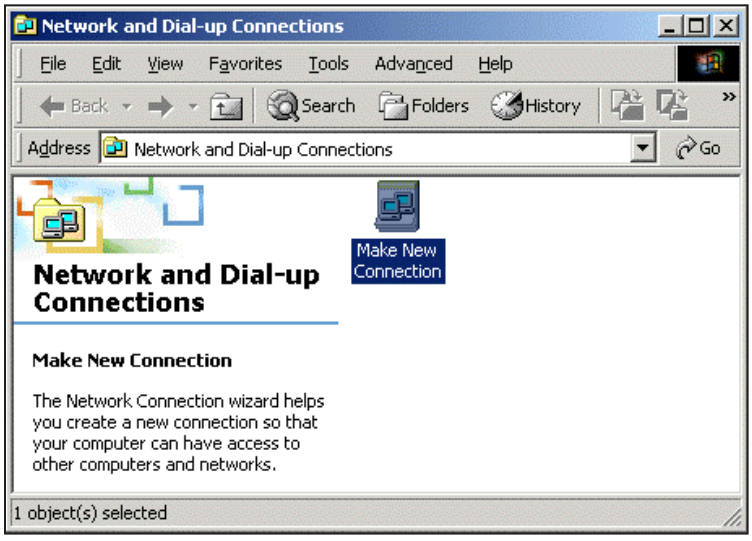


Figure 130 — Make New Connection icon

9.2.2 Network Connection Wizard

This wizard is used to create several different types of connection, so it is important to follow the steps carefully. The first page is merely a welcome screen. Select NEXT to continue.

On the page shown below, select CONNECT DIRECTLY TO ANOTHER COMPUTER and then select NEXT to continue.

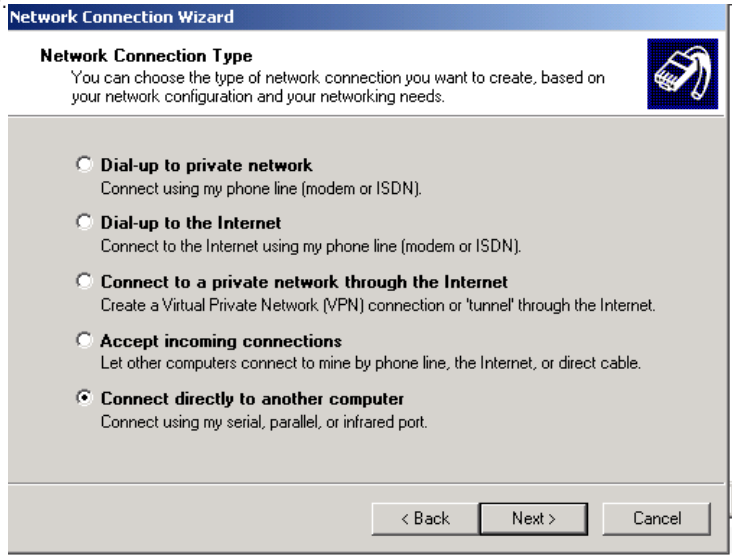


Figure 131 — Network Connection Type

Host or Guest? Page

Select GUEST, and then select NEXT to continue.

Select a Device Page

Select COMMUNICATIONS PORT COM1 or COM2, and then select NEXT to continue.

Connection Availability Page

Select FOR ALL USERS, and then select NEXT to continue.

Connection Name Page

Type a name for the connection in the COMPUTER NAME box.

Complete this section of the installation by selecting FINISH.

See next image (DIRECT CONNECTION icon is highlighted):

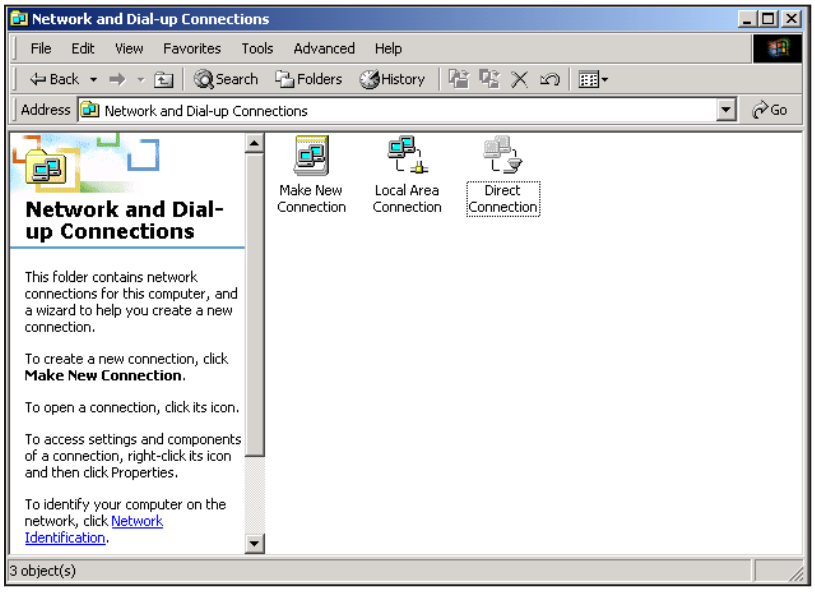


Figure 132 — Direct Connection icon

9.2.3 Direct Connection Properties

Right-click on the DIRECT CONNECTION icon to verify the properties of the new connection as follows:

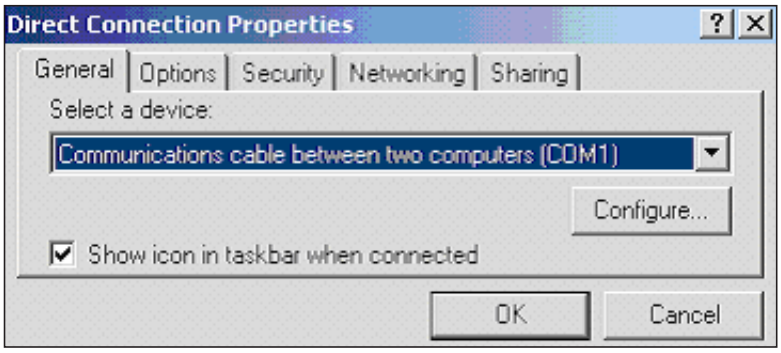


Figure 133 — Direct Connection Properties

General Tab

Select a device COMMUNICATIONS CABLE BETWEEN TWO COMPUTERS…

as shown above.

Options Tab

Uncheck PROMPT FOR NAME…

Security Tab

Check TYPICAL (RECOMMENDED SETTINGS) and select ALLOW UNSECURED PASSWORD.

Networking Tab

Select PPP type. Ensure component TCP/IP is checked and uncheck all others.

Sharing Tab

No changes are required.

9.2.3.1 Modem Configuration

Under the General tab of the Direct Connection properties click on the CONFIGURE button to open the Modem Configuration window and set the COM port speed to match with the server's baud rate; typically 57600 bps as below:

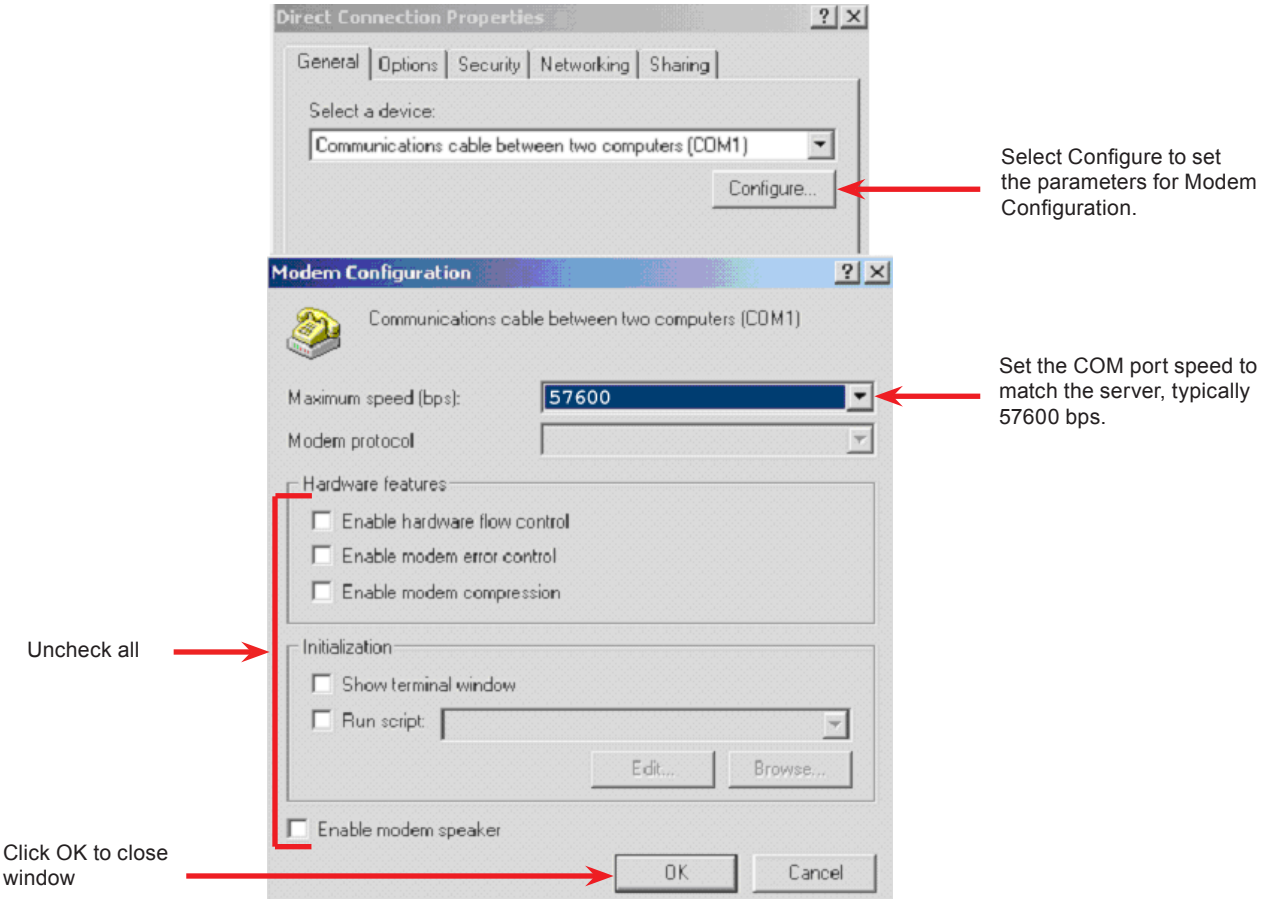


Figure 134 — Configuration

9.2.4 Phone and Modem Options

Select **Start** menu and then **Control Panel**. Open **Phone and Modem Options** to check the speed of the COM port as shown below:

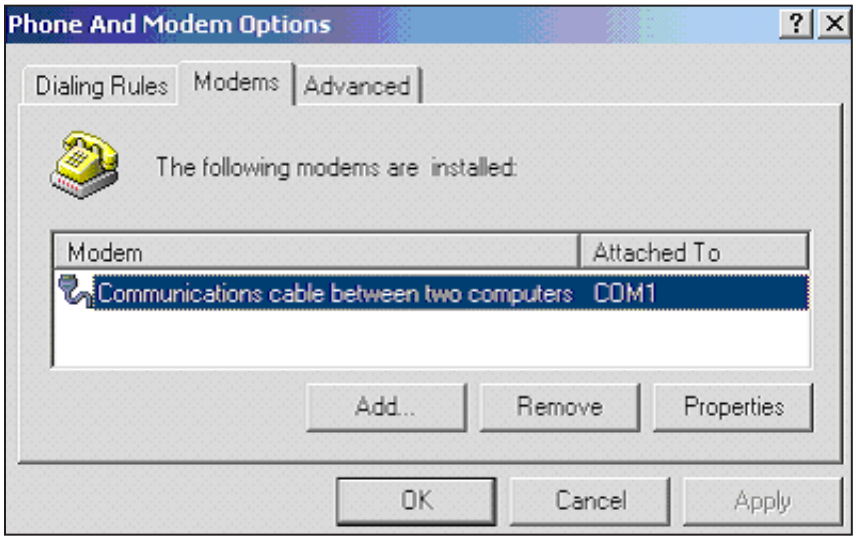


Figure 135 — Phone and Modem Options

Select PROPERTIES and verify Maximum Port Speed (determined previously) as shown below:

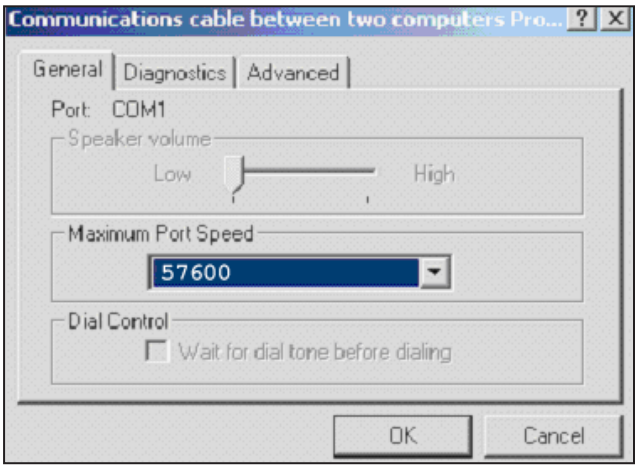


Figure 136 — Properties

Select OK to close each of these windows.

9.2.5 Connect Direct Connection

Select **START > Control Panel**, and then select **NETWORK AND DIAL-UP CONNECTIONS** as before. Select **DIRECT CONNECTION** to open the password entry window shown below:

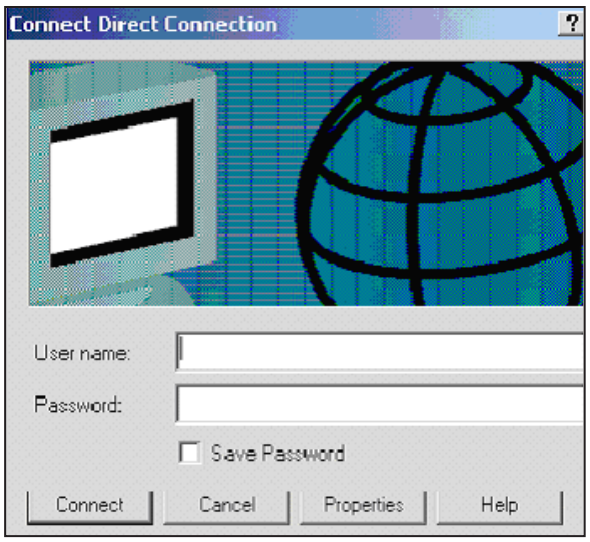


Figure 137 — Connect Direct Connection (password entry)

Select **CONNECT** to continue. A Connection Complete dialog box should be presented as below:

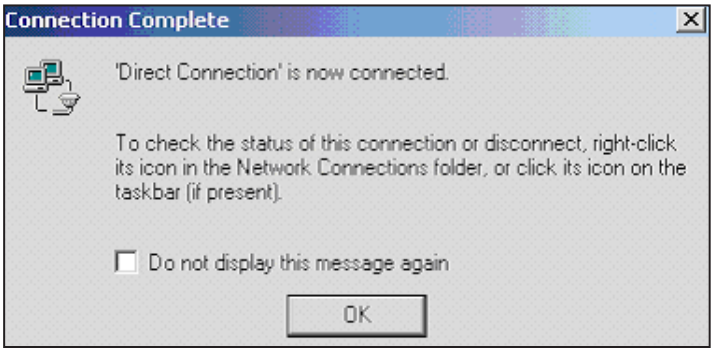


Figure 138 — Connection Complete (message)

Select **OK** to continue.

9.2.6 Dial the Modem and Connect to the CXC

1. Once the connection is established (icon in bottom right tray), right click on the icon
2. Select Status
3. Click on the Details tab
4. Use the Server IP address for the web address
5. The Server IP address default is '10.10.10.203' (as shown below)
6. Access the CXC via Internet Explorer® 6 or up.

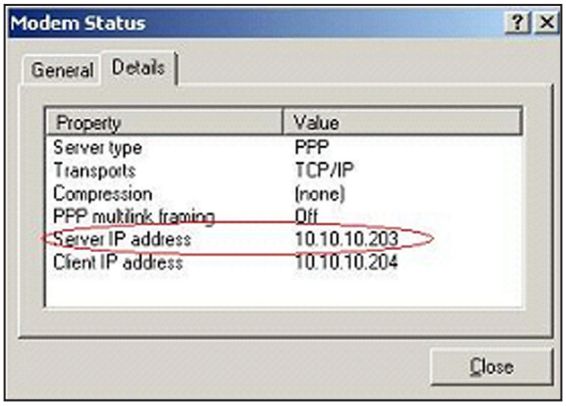
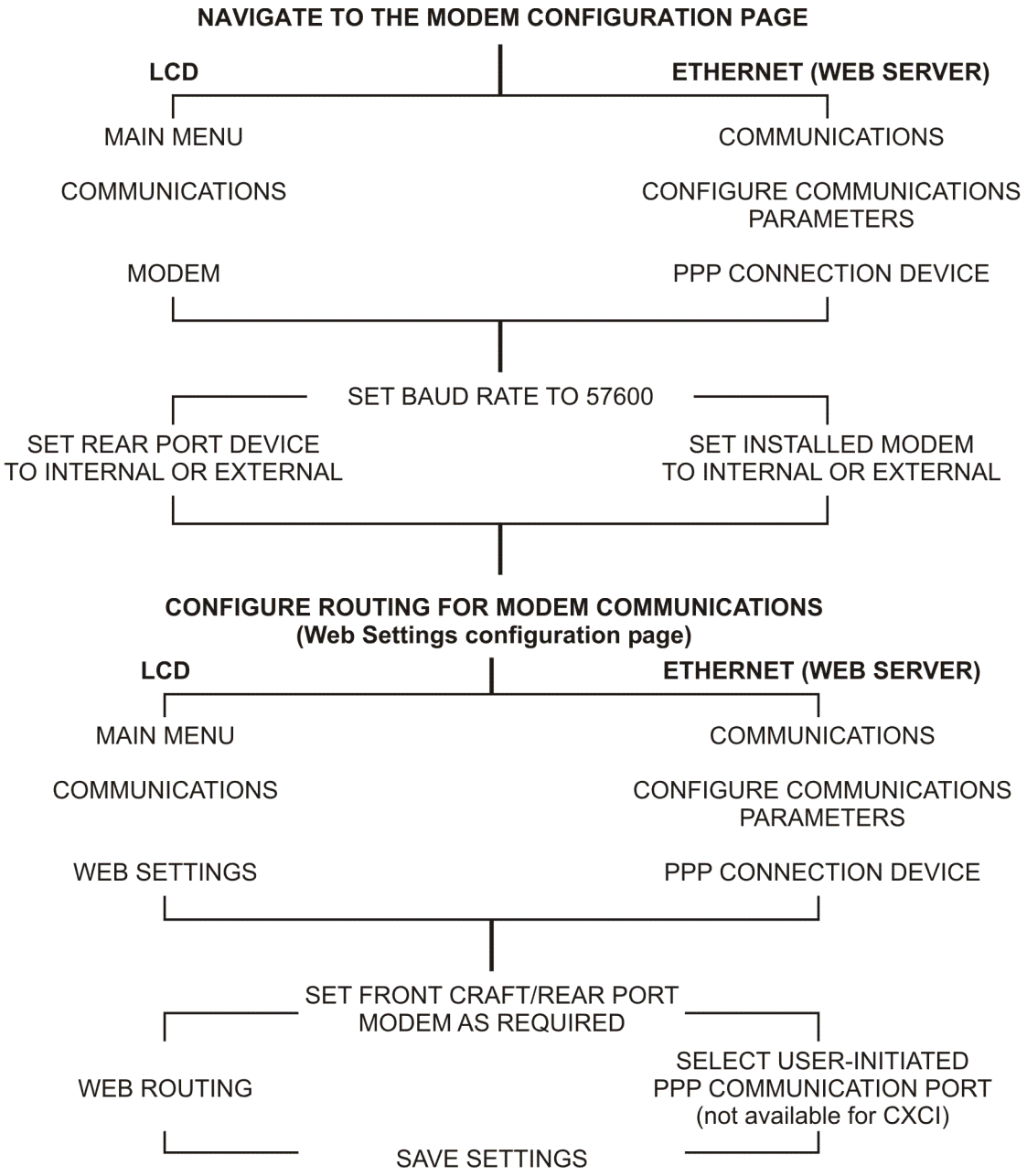


Figure 139 — Modem Status

9.3 Modem Connection

9.3.1 Controller Setup



To set the modem number of rings, edit the MODEM INIT STRING; for example: E1MIQ0X4S0=N, where N is the number of rings. Recommended value is 1 to 5.

9.3.2 Computer Setup

1. In Windows® 2000, select **START > SETTINGS**, and then select **NETWORK AND DIAL-UP CONNECTIONS**.
2. Double-click the **MAKE NEW CONNECTION** icon to start the Network Connection Wizard.
3. Select **DIAL-UP TO PRIVATE NETWORK**. Note: Some systems may come up with another pop-up selection for modem or infrared port. Modem should be selected.
4. Enter the phone number for the Cordex (this field can be blank and the phone number may be entered in the pop-up connection window, see note below).
5. Select **FOR ALL USERS** or **ONLY FOR MYSELF** as required. Then select **NEXT** to continue.
6. Select a Unique name for the Cordex connection; for example, “SiteName CXC.modem.” Then select **FINISH** to continue.
   NOTE: A dialup connection interface may appear. (If not, enter the phone number as in step 4. If in Step 5, **FOR ALL USERS** was selected, then there is no need to enter user name and password. Leave these two fields blank.)
7. Select **PROPERTIES**. Ensure the correct modem appears under **CONNECT USING**. Then select **CONFIGURE** to continue.
8. Change **MODEM SPEED (BPS)** to 57600. Deselect all **HARDWARE FEATURES** and select **OK** to continue.
9. Select the **NETWORKING** tab (Dial-up Connection Properties window).
10. Select **Internet Protocol (TCP/IP)**. Then select **PROPERTIES** to continue.
11. Select **OBTAIN IP ADDRESS AUTOMATICALLY** and select **OK** to continue.

Launch Internet Explorer® version 8.0 or greater to access the Cordex web interface. Type the address http://10.10.10.203 into the URL section.

9.3.3 CXC Modem Test Feature (via Web interface only)

This feature is a modem dial out test and can only be done using the web interface with Ethernet (Local or Remote) connection. Refer to the controller setup and computer setup above.

1. Connect the computer modem to a phone jack.
2. Establish connection between controller and computer and launch the CXC user web interface.
3. Once the connection is established, navigate to **Hardware > Test Modem** (Figure 112).
4. Enter the **Telephone Number**.
5. Click **Test Modem** to initiate test.

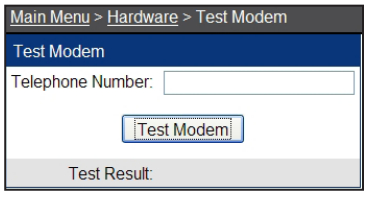


Figure 140 — Test Modem web interface

10. Simple Network Management Protocol (SNMP)

10.1 Overview

SNMP was developed in 1988 as an operating system for the management of the data flow from a series of remote information generators, or Agents, connected to a central computer, or Manager, by way of a network. The software installed in the Agent (whether it is supplied by Alpha or customer supplied) uses SNMP to translate the data stream into a format that can be readily downloaded by the client's network to the Manager computer located at the customer's Central Office used as a hub for the network. Each Agent collects data from a source, translates that data into the SNMP format and then transmits the translated data, when requested, to the Manager computer.

In the case of a network of Alpha Power Systems, the data stream from an individual power plant is developed through the CXC System Controller, which directly interfaces with that power system. This data stream is referred to as the Management Information Base or MIB (see 10.2).

An SNMP Agent may have a number of simple messages that can be sent directly towards the retrieval of single or multiple object variables or to establish the value of a single variable. The Alpha SNMP Agent software employs an event notification called a “Trap” to the management system to identify the occurrence of conditions that exceed a predetermined value such as an alarm event. Trap Protocol Data Units (PDUs) have the following format:

Enterprise – identifies the type of object causing the trap

Agent Address – IP address of agent that sent the trap

Generic Trap ID – the common standard traps

Specific Trap ID – proprietary or enterprise trap

Time Stamp – when trap occurred in time ticks

10.1.1 Outline of the SNMP Protocol

- Each SNMP managed object belongs to a community.
- Network Management Station (NMS) may belong to multiple communities.
- A community is defined by a community name, which is an Octet String with 0 to 255 octets in length.
- Each SNMP message consists of three components:

1. Version number
2. Community name
3. Data - a sequence of PDUs associated with the request.

10.1.2 Underlying Communication Protocols

SNMP assumes that the communication path is a connectionless communication sub-network. In other words, no prearranged communication path is established prior to the transmission of data. As a result, SNMP makes no guarantees about the reliable delivery of the data. Although in practice most messages get through, and those that don't can be retransmitted. The primary protocols that SNMP implements are the User Datagram Protocol (UDP) and the Internet Protocol (IP). SNMP also requires Data Link Layer protocols such as Ethernet or Token Ring to implement the communication channel from the management to the managed agent.

SNMP's simplicity and connectionless communication also produce a degree of robustness. Neither the manager nor the agent relies on the other for its operation. Thus, a manager may continue to function even if a remote agent fails. When the agent resumes functioning, it can send a trap to the manager, notifying it of its change in operational status. The connectionless nature of SNMP leaves the recovery and error detection up to the Manager computer and even up to the Agent.

10.1.3 Typical UDP Transport

- Agent listens on UDP port 161.
- Responses are sent back to the originating NMS port from a dynamic port, although many agents use port 161 also for this target.
- Maximum SNMP message size is limited by maximum UDP message size; i.e. 65507 octets.
- All SNMP implementations have to receive packets at least 484 octets in length.
- Some SNMP implementation will (incorrectly or not) handle packets exceeding 484 octets.
- Asynchronous Traps are received on port 162 of the NMS.
- UDP is more suitable than TCP when dynamic route changes occur often; e.g., when there are problems in the network.
- UDP packets minimize the demands placed on the network (no resource tied up as with connection mode).
- Agent and NMS are responsible for determining error recovery.

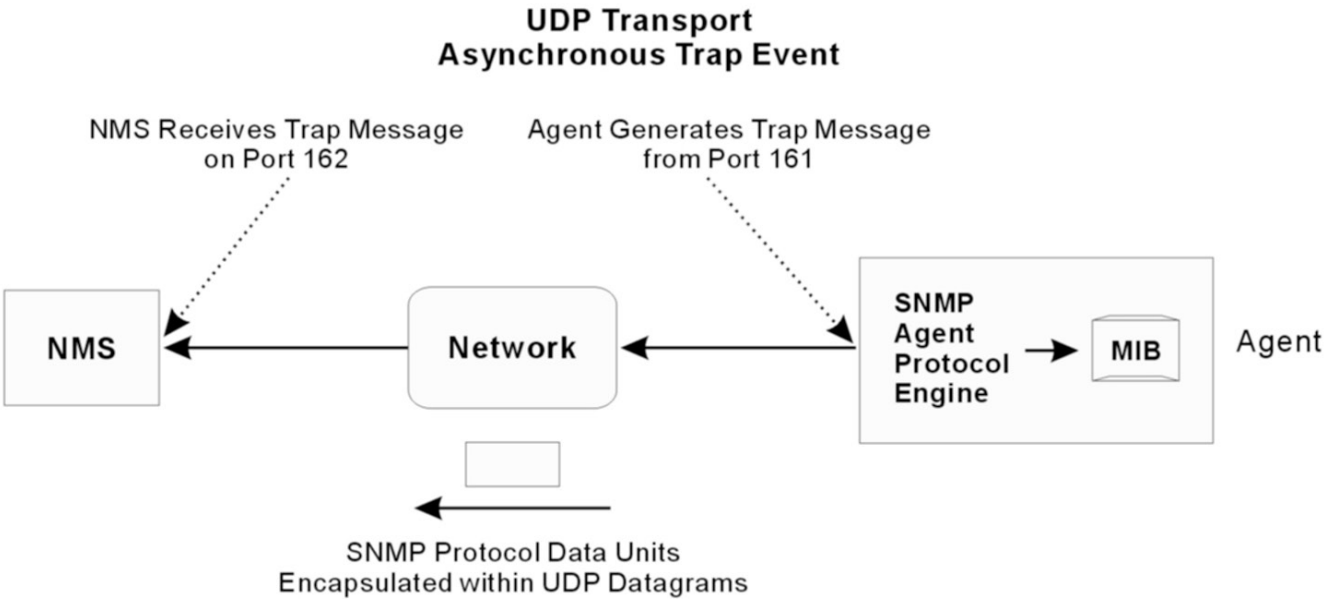


Figure 141 — UDP transport (trap event)

SNMP is transport independent (although the original design was connectionless transport function, which corresponds to the UDP protocol) and can be implemented on other transports as well:

- TCP (Connected approach)
- Direct mapping onto Ethernet MAC level
- Encapsulation onto X25 protocol
- Encapsulation onto an ATM Cell

10.1.4 Variable Binding (VarBind)

A VarBind is a sequence of two specific fields, an Object Identifier (ID) and the value for/from that Object ID. A VarBindList is a simple list of these pairings.

The following screen capture shows the Event Properties employed.

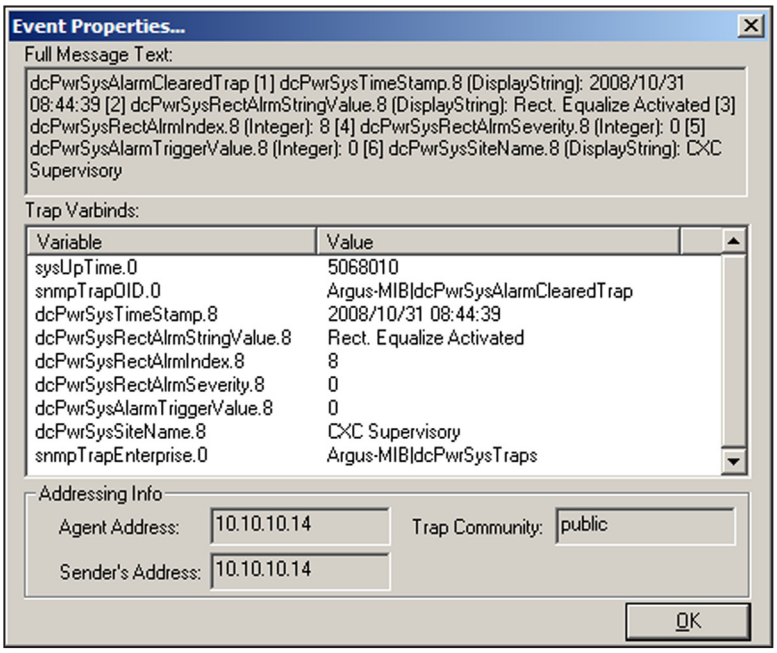


Figure 142 — VarBinds

10.2 Network Manager MIB Files

The SNMP network manager requires the following files: 1) Alpha_System_Controller.MIB, 2) MIB_ii.MIB, 3) SMI.MIB, and TSI_Module_MIB_for_CXC.MIB.

To obtain MIB files, logon to www.alpha.ca/downloads and select software (under Support on the home page). The MIB variables (in the file Alpha.MIB) are as follows:

- System Variables (voltage, current, major and minor alarms)
- System Strings (site name, contact number, system type, serial number, software version , etc.)
- Traps (Alarm Active, Alarm cleared, Relay, COM OK, Startup, Shutdown, etc.)
- Output Table (Relays, Analog Outputs)
- Alarm Table (12 subcategories, including rectifier alarms, voltage alarms, battery alarms, etc.
- Inputs Table (7 subcategories, including digital inputs, controller inputs, custom inputs)
- External Controls – Resync Alarms
- Varbind Name Reference (Alarm Trigger Value, Timestamp)

The Alpha MIB file provides separate object identifier (OID) for active and cleared alarm traps.

Alarm status and signals are reconstructed into tables and sub tables to allow for future expansion while remaining backward compatibility with already defined alarms and signals. See Section 10.3.

10.2.1 SNMP Set and Get Commands

All values from the MIB can be retrieved over SNMP using SNMP set commands. Most values are read-only and cannot be set over SNMP. The exceptions to this are:

- Resync Alarms command, which can be set by sending an SNMP set command to the External Controls “Resync Alarms” OID.
- Custom Input signals, which can be set by sending an SNMP set command to the Inputs Table Custom Input OID for the particular signal which should be set. For more information, see the Custom Signals section Figure 62.

10.3 Communication Configuration

SNMP Communication Configuration is only accessible via the web interface.

Select **Communications** > **SNMP Configuration** from the CXC web interface.

10.3.1 SNMP Multiple Community Names

This menu item enables the User to configure multiple CXC SNMP community settings for get (read) and set (write). This is to permit multiple SNMP NMS programs, with different community strings, to connect to the CXC.

Before this feature, the CXC had one set of community strings, which meant that any NMS that tried to connect to the CXC must be a match.

Now, a company with multiple NMSs, each in a different region, with a different community string, will find it easier to connect to the CXC from various places.

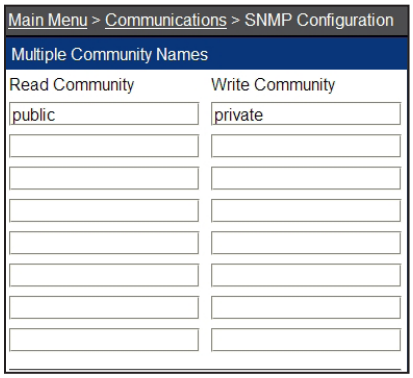


Figure 143 — SNMP Community Name web interface window

10.3.2 SNMP Trap Recovery

The SNMP Trap Recovery only works if the master NMS destination is configured. Master NMS destination can be selected from Master SNMP Destination pull-down menu (see next section—Event Notification)

This feature enables the CXC SNMP agent to hold traps in a buffer during a network block out period. The master network management station (NMS) must be monitoring (polling) the SNMP agent in order for the agent to resend the traps after the network connection has again been established.

The following items along with any item from the Alpha MIB will reset the poll timer:

- sysDescr.0
- sysContact.0
- sysName.0
- sysLocation.0

An ICMP echo request packet or “ping” is used to determine whether a trap may be received (recovered) by the SNMP client. Once successful, the trap is sent.

The time-out before failure of a ping is eight seconds.

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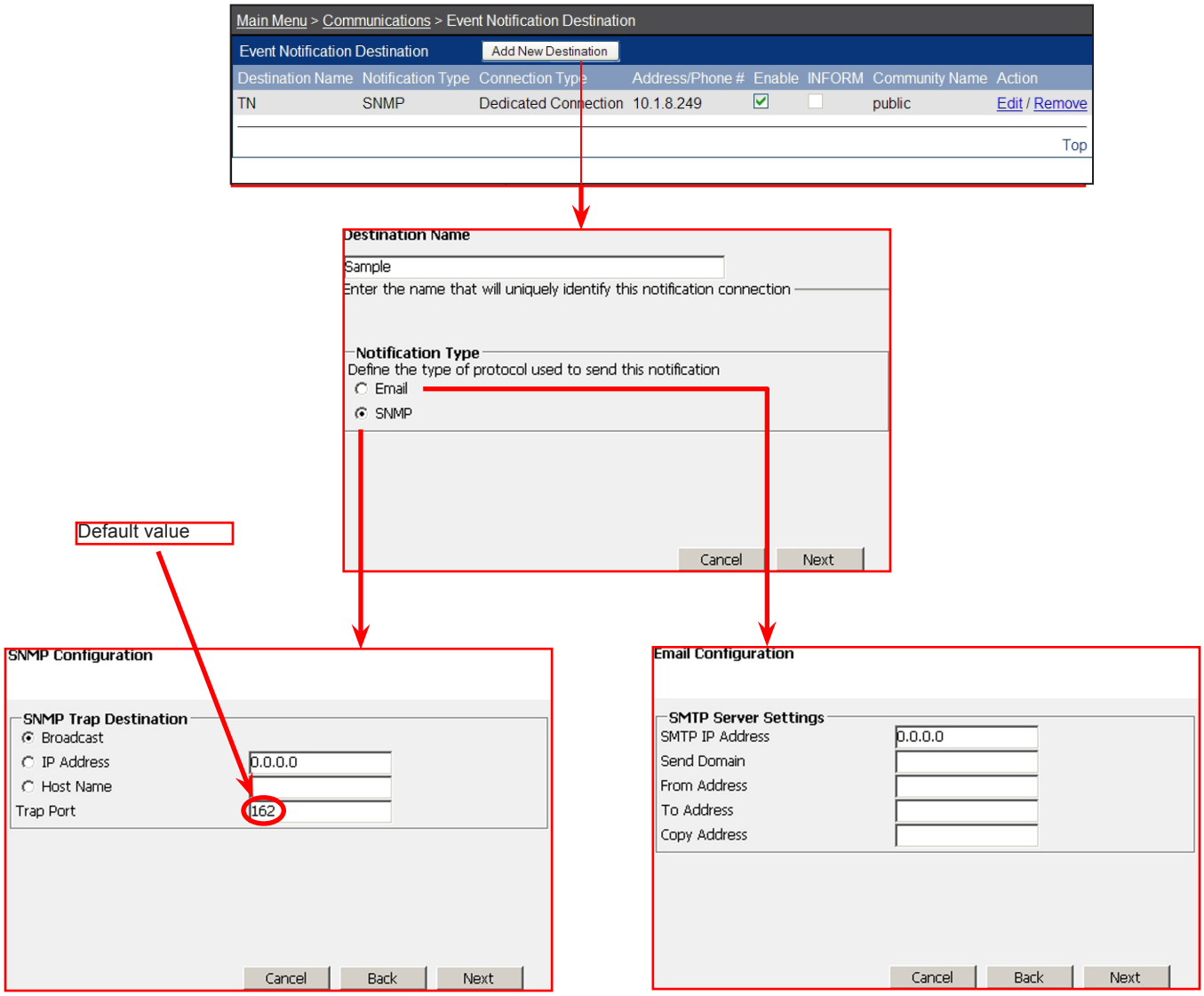
10.3.3 Event Notification Destination – Multiple SNMP and SMTP Destinations

The Supervisor can add up to eight (8) separate destinations for SNMP and SMTP dial-out of e-mail notifications. A wizard is provided to assist the Supervisor with the addition of new destinations. See the following example.

Login credential information must be provided by your network administrator.



For SNMP Configuration:

Select **Broadcast** if CXC is located in the same segment as NMS. IP Address is not required. Broadcast cannot be used as master.

Select **IP Address** if value is known for NMS. This is the recommended setup selection for SNMP destination configuration.

Select **Host Name** if CXC has a fully qualified domain name that can be resolved by a DNS server. IP address must be obtained automatically from DHCP server.

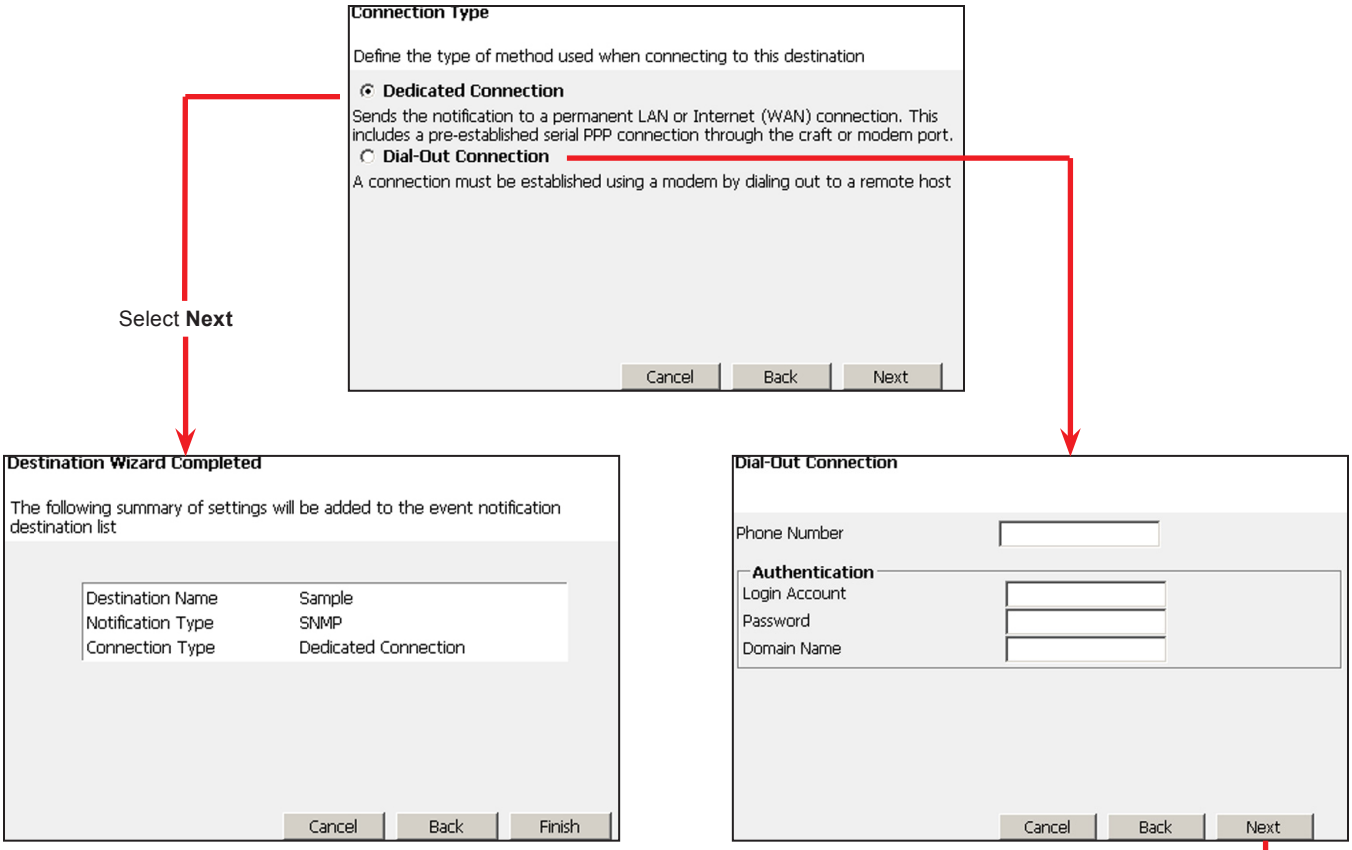
Select **Next** to proceed with the wizard for new destination.

For Email Configuration:

Enter SMTP IP Address unless **Host Name** is preferred (Dedicated Connection only).

Send Domain is optional for SMTP “hello” packet and may be left blank.

Enter **From Address** and **To Address**. **Copy Address** is optional.



For SNMP Configuration, **Dedicated Connection** is the default selection of Connection Type:

- Information for Destination was established in the configuration window.

For Email Configuration:

- Enter **SMTP IP Address** unless already established in the configuration window.
- Select **Host Name** if CXC has a fully qualified domain name that can be resolved by a DNS server. IP address must be obtained automatically from DHCP server.

Enter login credential information as provided by your network administrator.

For Dial-Out Connection:
Enter phone number of the remote connecting modem.

Enter login credential information as provided by your network administrator. Domain name is only required if the CXC dials out to a RAS server.

Click **Finish** to complete the destination wizard setup and return to the Event Notification Destination window.

10.3.3.1 Master SNMP Destination

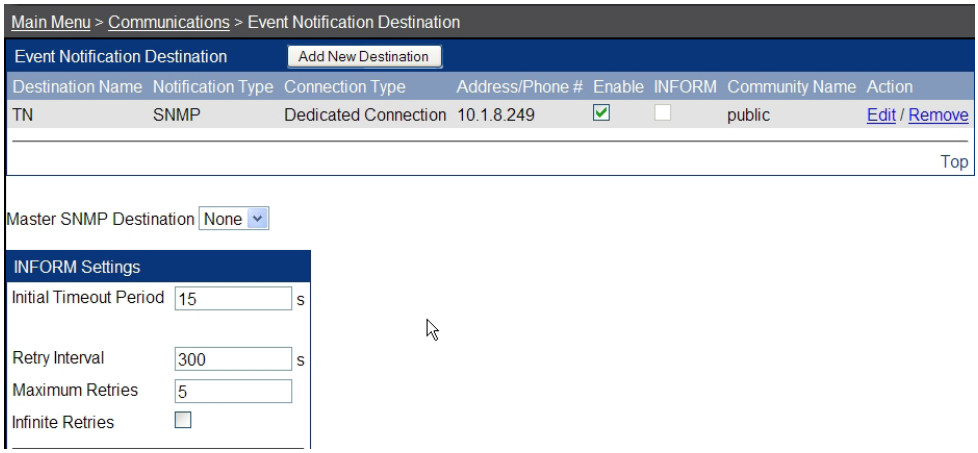
This menu item enables the Supervisor to set a NMS destination as master.

Select from the pull-down menu.

Select **None** if SNMP connection is by dial-out or no trap recovery (after network block out) is required. This is the default to be backward compatible with legacy CXC trap notification method.

10.3.3.2 Inform Settings (Trap Acknowledge)

INFORM is similar to a Trap message; it has a response from the Network Management Software (NMS) to the SNMP Agent.



The Master Destination is a mechanism that was implemented to secure communications to an NMS by ensuring that a certain number of Traps reach their destinations.

INFORM no longer needs the Master Destination item but requires a response from the NMS or it will retry the message.

NOTE: These items are exclusive to one another. If **only** INFORMS are used, **do not** set a Master Destination.

11. Factory Ranges and Defaults

Table G — Rectifiers menu defaults						
Submenu Item	Programmable Range	Default Setting				
		12Vdc	24Vdc	48Vdc	125Vdc	220Vdc
Float (FL) Voltage	0-9999999999	13.50V	27.00V	54.00V	130.50V	229.5V
Equalize (EQ) Voltage	0-9999999999	13.75V	27.50V	55.00V	132.92V	233.75V
Battery Test (BT) Voltage	0-9999999999	11.50V	22.00V	44.00V	106.33V	187.00V
OVP	0-9999999999	14.25V	29.00V	57.00V	137.75V	242.25V
LVA	0-9999999999	11.00V	22.00V	44.00V	106.33V	187.00V
HVA	0-9999999999	14.00V	28.00V	55.50V	134.13V	235.88V
Current Limit (CL)	0-9999999999	100%				
Power Limit (PL)	0-9999999999	100%				
Equalize Timeout	0-9999999999	30 hours				
Battery Test Duration	0-9999999999	8.0 hours				
Slope (Adjust)	0-9999999999	1.00%				
Backlight Timeout	0-32767	1 minute				
Security Code	0-32767	123				
Module Start Delay	0-32767	1 second				
System Start Delay	0-32767	0 seconds				
Soft Start Ramp Rate	Normal/Fast	Normal				
Temp Display Scale	Celsius/Fahrenheit	Celsius				
Current/Power Limit Alarm	Enable/Disable	Disable				
Remote Shutdown	Enable/Disable	Enable				
Local Access Alarm	Enable/Disable	Enable				
Ramp Test	Enable/Disable	Enable				
Power Save	Enable/Disable	Disable				
Redundant Rectifiers	0-32767	1				
Maximum Power Usage	0-32767	80%				

Table H — Converters menu defaults			
Submenu Item	Programmable Range	24V–48V Defaults	48V–24V Defaults
Output Voltage	0-9999999999	54.00V	27.00V
OVP	0-9999999999	57.00V	28.50V
Input Voltage Shutdown	0-9999999999	21.0V	42.0V
Input Voltage Restart	0-9999999999	25.0V	50.0V
Start Delay	0-32767	1 second	
Current Limit (CL) Alarm	Enable/Disable	Enable	

Table I — Batteries menu defaults							
Submenu Item		Programmable Range	Default Setting				
			12Vdc	24Vdc	48Vdc	125Vdc	220Vdc
Capacity Rating		0-9999999999	0.0 AH				
Capacity Calibration		0-9999999999	100%				
Open Circuit Voltage		0-9999999999	12.84V	25.68V	51.36V	124.12V	218.28V
Peukert Number		0-9999999999	1.000				
Peukert Time 1		0-9999999999	0 hours				
Peukert Time 2		0-9999999999	0 hours				
Peukert Current 1		0-9999999999	0A				
Peukert Current 2		0-9999999999	0A				
Temp Comp Slope		0-9999999999	2.50mV/ºC				
Charge Current Control		Enable/Disable	Disable				
Charge Rate Amps		0-9999999999	0.0A				
Charge Rate C/X		0-9999999999	0.0				
Battery Monitor		Enable/Disable	Disable				
Load Type		Power/Current/Resist	Power				
Disconnect Voltage		0-9999999999	10.50V	21.00V	42.00V	101.50V	178.50V
Battery Test (BT) End Voltage		0-9999999999	11.63V	22.50V	44.50V	107.54V	189.13V
Periodic Auto BT		Enable/Disable	Disable				
Auto BT Interval		1-32767	180 days				
Auto Equalize Duration		1-32767	8 hours				
Periodic Auto Equalize (EQ)		Enable/Disable	Disable				
Auto EQ Interval		1-32767	30 days				
(Battery) Charge Auto EQ		Enable/Disable	Enable				
Activation Threshold (Auto EQ HV)		0-9999999999	13.25V	26.50V	53.00V	128.08V	225.25V
Arming Threshold (Auto EQ LV)		0-9999999999	12.00V	24.00V	48.00V	116.00V	204.00V
Temp Comp (Interval fixed at 60 sec)		Enable/Disable	Disable				
Upper Breakpoint	Voltage	0-9999999999	13.13V	26.25V	52.50V	126.88V	223.13V
	Temperature	-99999999 to 9999999999	50ºC				
Lower Breakpoint	Voltage	0-9999999999	13.88V	27.75V	55.50V	134.13V	235.88V
	Temperature	-99999999 to 9999999999	0ºC				
Battery Current Termination (BCT) EQ		Enable/Disable	Disable				
BCT EQ Duration		0-65536	1 hour				
BC Threshold		0.1-999999999	5.0A				
Boost (BST) Mode		Enable/Disable	Disable				
BST Mode Voltage (V/cell)		0-9999999999	2.30	2.30	2.30	2.30	2.30
BST Mode Timeout		1-32767	4 hours				
BST Mode Inhibit		Custom 1 – 20	Custom 1				

Table J — Alarms menu defaults						
Submenu Item	Programmable Range	Default Setting: Priority, Activation Value				
		12Vdc	24Vdc	48Vdc	125Vdc	220Vdc
Rectifier Fail	Major/Minor/Message	Minor				
Rectifier Minor	Major/Minor/Message	Minor				
Rect. Major Fail Count	Major/Minor/Message	Major, 2				
Rect. Minor Fail Count	Major/Minor/Message	Minor, 1				
Rectifier Lockout	Major/Minor/Message	Minor				
Out of Tolerance	Major/Minor/Message	Minor				
Rect. Communications Lost	Major/Minor/Message	Minor				
Rect. Equalize Activated	Major/Minor/Message	Minor				
Rect. AC Mains Fail	Major/Minor/Message	Minor				
Max. Rectifiers Exceeded	Major/Minor/Message	Minor				
Fan Fail Alarm	Major/Minor/Message	Minor				
Power Save	Major/Minor/Message					
Distribution Fuse (Digital 1)	Major/Minor/Message	Minor, High				
Battery Fuse (Digital 2)	Major/Minor/Message	Major, High				
LVD Manual In (Digital 3)	Major/Minor/Message	Minor, High				
LVD Manual Out (Digital 4)	Major/Minor/Message	Major, High				
Converter Fail (Digital 5)	Major/Minor/Message	Minor, High				
Conv. I/P Breaker Trip (Digital 6)	Major/Minor/Message	Major, High				
Digital 7-8	Major/Minor/Message	Message, High				
Battery Current High	Major/Minor/Message	Major, 100A				
Load Current High	Major/Minor/Message	Major, 1000A				
AC Mains High	Major/Minor/Message	Minor, 270V	Minor, 270V	Minor, 270V	Minor, 270V	Minor, 270V
AC Mains Low	Major/Minor/Message	Minor, 180V	Minor, 180V	Minor, 180V	Minor, 180V	Minor, 180V
High Voltage 1	Major/Minor/Message	Minor, 14.00V	Minor, 28.00V	Minor, 55.50V	Minor, 134.13V	Minor, 235.88V
High Voltage 2	Major/Minor/Message	Major, 14.25V	Major, 29.00V	Major, 56.50V	Major, 136.54V	Major, 240.13V
Low Voltage 1	Major/Minor/Message	Minor, 12.00V	Minor, 24.00V	Minor, 48.00V	Minor, 116.00V	Minor, 204.00V
Low Voltage 2	Major/Minor/Message	Major, 11.62V	Major, 23.25V	Major, 46.50V	Major, 112.38V	Major, 197.63V
Midpoint Monitor 1-5	Major/Minor/Message	Minor, 0.50V				
Battery Runtime Low	Major/Minor/Message	Minor, 3 hours				
Battery Capacity Low	Major/Minor/Message	Minor, 80%				
Battery Overtemp	Major/Minor/Message	Minor, 40ºC				
Battery On Discharge	Major/Minor/Message	Major				
Temp Sensor 1-5 Fail	Major/Minor/Message	Message				
TC Sensor Fail	Major/Minor/Message	Message				
Miscellaneous/Real Time Clock Error	Major/Minor/Message	Minor				
Custom 1-20	See 6.5.3.10	Message				
Relay Mapping System Major	See 6.5.3.8	Major, Relay 5				
System Minor	See 6.5.3.8	Minor, Relay 4				

Table K — Controls menu defaults						
Submenu Item	Programmable Range	Default Setting				
		12Vdc	24Vdc	48Vdc	125Vdc	220Vdc
LVD 1	0-9999999999	10.5V	21.00V	42.00V	101.50V	178.50V
LVC 1	0-9999999999	12.5V	25.00V	50.00V	120.83V	212.50V
Alarm Priority	Major/Minor/Message	Major				
Relay Mapping	1-16 or N/A (mapping disabled)	1				
Control	Check = enable LVD control	Checked				
Alarm cutoff	Check = allow alarm to be cutoff	Not checked				
LVD 2	0-9999999999	10.5V	21.00V	42.00V	101.50V	178.50V
LVC 2	0-9999999999	12.5V	25.00V	50.00V	120.83V	212.50V
Alarm Priority	Major/Minor/Message	Major				
Relay Mapping	1-16 or N/A (mapping disabled)	2				
Control	Check = enable LVD control	Checked				
Alarm cutoff	Check = allow alarm to be cutoff	Not checked				
LVD 3	0-9999999999	10.5V	21.00V	42.00V	101.50V	178.50V
LVC 3	0-9999999999	12.5V	25.00V	50.00V	120.83V	212.50V
Relay Mapping	1-16 or N/A (mapping disabled)	3				
Control	Check = enable LVD control	Checked				
Alarm cutoff	Check = allow alarm to be cutoff	Not checked				
LVD 4-10	0-9999999999	10.5V	21.00V	42.00V	101.50V	178.50V
LVC 4-10	0-9999999999	12.5V	25.00V	50.00V	120.83V	212.50V
Alarm Priority	Major/Minor/Message	Major				
Relay Mapping	1-16 or N/A (mapping disabled)	N/A				
Control	Check = enable LVD control	Not checked				
Alarm cutoff	Check = allow alarm to be cutoff	Not checked				
LVD Inhibit (Status)	Active/Inactive	Inactive				
Alarm Priority	Major/Minor/Message	Major				
Relay Mapping	1-16 or N/A (mapping disabled)	N/A				
Alarm cutoff	Check = allow alarm to be cutoff	Not checked				
High Volt. Shutdown	0-9999999999	14.25V	29.50V	58.00V	140.17V	246.50V
Alarm Priority	Major/Minor/Message	Major				
Relay Mapping	1-16 or N/A (mapping disabled)	N/A				
Control	Check = enable LVD control	Not checked				
Alarm cutoff	Check = allow alarm to be cutoff	Not checked				
CEMF In-circuit Voltage	0-9999999999	13.70V	27.40V	54.80V	132.43V	232.90V
Bypass Voltage	0-9999999999	13.55V	27.10V	54.20V	130.98V	230.35V
Alarm Priority	Major/Minor/Message	Major				
Relay Mapping	1-16 or N/A (mapping disabled)	N/A				
Control	Check = enable LVD control	Not checked				
Alarm cutoff	Check = allow alarm to be cutoff	Not checked				

Table L — Communications menu defaults		
Submenu Item	**Programmable Range**	**Default Setting**
IP Address	Check = obtain automatically	Not checked, 10.10.10.201
Subnet Mask	0.0.0.0 – 255.255.255.255	255.255.255.0
Gateway	0.0.0.0 – 255.255.255.255	10.10.10.1
Modem Rear Port Device	Internal/External/NULL	NULL
Baud Rate	9600 – 57600 baud	19200 baud
Enable Callback	Check = enable	Not checked
Modem Init String	Consult factory	A0 S1 B3 &F2
Craft Port Baud Rate	9600 – 57600 baud	57600 baud
RAS Client Settings Phone Number	64 characters maximum	N/A
Login Account	64 characters maximum	N/A
Domain Name	64 characters maximum	N/A
Password	64 characters maximum	N/A
Web Settings Routing	Front Craft Port, Rear Modem, None	Front Craft Port
SMTP Server Settings IP Address	64 characters maximum	N/A
Send Domain	64 characters maximum	N/A
From Address	64 characters maximum	N/A
To Address	64 characters maximum	N/A
Copy Address	64 characters maximum	N/A

Table M — Hardware menu defaults		
Submenu Item	**Programmable Range**	**Default Setting**
Configure Relays (1–16)	Energized/De-Energized	De-Energized

Table N — Supervisor menu defaults		
Submenu Item	**Programmable Range**	**Default Setting**
Supervisor Access Code	Energized/De-Energized	De-Energized
0-9999999999	1234	

Table O — Signals menu defaults		
Submenu Item	**Programmable Range**	**Default Setting**
Load Voltage (V1)	Decimal precision: 0-3	2
Load Current (I1)	Decimal precision: 0-3	1
Battery Voltage (V2)	Decimal precision: 0-3	2
Battery Current (I2)	Decimal precision: 0-3	1
AC Mains	Decimal precision: 0-3	1
Battery Temperature	Decimal precision: 0-3	2
Temp Comp Sensor 1	Enable/Disable	Disable
Temp Comp Sensor 2	Enable/Disable	Disable
Temp Comp Sensor 3 (GP1)	Enable/Disable	Disable
Temp Comp Sensor 4 (GP2)	Enable/Disable	Disable
Battery Runtime	Decimal precision: 0-3	2
Battery Capacity	Decimal precision: 0-3	1
Battery Depth of Discharge (DOD)	Decimal precision: 0-3	1
Analog Inputs	See 6.6.1.1	
N/A		
Digital Inputs (1-8)	High/Low	Low
Rectifier Signals	See Menu Tree	N/A
Custom Signals (1-20)	Decimal precision: 0-3	2
Signal Units	A, V, W, ºC (ºF)	V
Set by SNMP	Enabled/Disabled	Disabled
Set by Equation	Enabled/Disabled	Enabled

The inverter configuration file is actually one big file, but is presented here as Table P, Table Q, and Table R for clarity.

Table P — Inverter Global Settings		
Submenu Item	**Default Setting**	**Units**
Number of module in phase 1	10	
Number of module in phase 2	10	
Number of module in phase 3	10	
Number of module in phase 4	0	
Number of module in phase 5	0	
Number of module in phase 6	0	
Number of module in phase 7	0	
Number of module in phase 8	0	
Amount of redundancy in phase 1	0	
Amount of redundancy in phase 2	0	
Amount of redundancy in phase 3	0	
Amount of redundancy in phase 4	0	
Amount of redundancy in phase 5	0	
Amount of redundancy in phase 6	0	
Amount of redundancy in phase 7	0	
Amount of redundancy in phase 8	0	
Number of DC input groups	1	
Number of AC input groups	3	

Table Q — Inverter Parameters		
Submenu Item	**Default Setting**	**Units**
Input Source (AC : 0 DC : 100)	0	%
ACin Mode (0 : normal 1 : Safe)	0	
Walk-in Mode (0 : NO 1 : YES)	0	
Number of phases	1	
Mode (0 : star 1 : triangle)	1	
Free running Frequency	60.0	Hz
Short Circuit Voltage Threshold	80	V
Short Circuit Hold Time	60.0	s
Booster 10xlin (0 : OFF 1 : ON)	1	
Max current (pc of nominal curr)	150	%

Table Q — Inverter Parameters		
Submenu Item	**Default Setting**	**Units**
Max power (pc of nominal power)	150	%
Max Overload Duration	15	s
Synchronisation Tracking Speed	0	
Remote OFF disable ACin Power	0	
Negative Power (0 : OFF 1 : ON)	1	
External Clock (0 : NO 1 : YES)	0	
OUT 1 : phase shift	0	deg
OUT 1 : Nominal Output Voltage	120.0	V
OUT 2 : phase shift	120	deg
OUT 2 : Nominal Output Voltage	120.0	V
OUT 3 : phase shift	240	deg
OUT 3 : Nominal Output Voltage	120.0	V
OUT 4 : phase shift	0	deg
OUT 4 : Nominal Output Voltage	120.0	V
OUT 5 : phase shift	0	deg
OUT 5 : Nominal Output Voltage	120.0	V
OUT 6 : phase shift	0	deg
OUT 6 : Nominal Output Voltage	120.0	V
OUT 7 : phase shift	0	deg
OUT 7 : Nominal Output Voltage	120.0	V
OUT 8 : phase shift	0	deg
OUT 8 : Nominal Output Voltage	120.0	V
DC 1 : Vdc_in Low Start	49.0	V
DC 1 : Vdc_in Low Transfer	42.0	V
DC 1 : Vdc_in Low Stop	42.0	V
DC 1 : Vdc_in High Start	61.0	V
DC 1 : Vdc_in High Transfer	62.0	V
DC 1 : Vdc_in High Stop	62.0	V
DC 2 : Vdc_in Low Start	49.0	V
DC 2 : Vdc_in Low Transfer	42.0	V
DC 2 : Vdc_in Low Stop	42.0	V
DC 2 : Vdc_in High Start	61.0	V
DC 2 : Vdc_in High Transfer	62.0	V

Table Q — Inverter Parameters		
Submenu Item	**Default Setting**	**Units**
DC 2 : Vdc_in High Stop	62.0	V
DC 3 : Vdc_in Low Start	49.0	V
DC 3 : Vdc_in Low Transfer	42.0	V
DC 3 : Vdc_in Low Stop	42.0	V
DC 3 : Vdc_in High Start	61.0	V
DC 3 : Vdc_in High Transfer	62.0	V
DC 3 : Vdc_in High Stop	62.0	V
DC 4 : Vdc_in Low Start	49.0	V
DC 4 : Vdc_in Low Transfer	42.0	V
DC 4 : Vdc_in Low Stop	42.0	V
DC 4 : Vdc_in High Start	61.0	V
DC 4 : Vdc_in High Transfer	62.0	V
DC 4 : Vdc_in High Stop	62.0	V
DC 5 : Vdc_in Low Start	42.0	V
DC 5 : Vdc_in Low Transfer	39.0	V
DC 5 : Vdc_in Low Stop	39.0	V
DC 5 : Vdc_in High Start	61.0	V
DC 5 : Vdc_in High Transfer	62.0	V
DC 5 : Vdc_in High Stop	62.0	V
DC 6 : Vdc_in Low Start	42.0	V
DC 6 : Vdc_in Low Transfer	39.0	V
DC 6 : Vdc_in Low Stop	39.0	V
DC 6 : Vdc_in High Start	61.0	V
DC 6 : Vdc_in High Transfer	62.0	V
DC 6 : Vdc_in High Stop	62.0	V
DC 7 : Vdc_in Low Start	42.0	V
DC 7 : Vdc_in Low Transfer	39.0	V
DC 7 : Vdc_in Low Stop	39.0	V
DC 7 : Vdc_in High Start	61.0	V
DC 7 : Vdc_in High Transfer	62.0	V
DC 7 : Vdc_in High Stop	62.0	V
DC 8 : Vdc_in Low Start	42.0	V
DC 8 : Vdc_in Low Transfer	39.0	V
DC 8 : Vdc_in Low Stop	39.0	V
DC 8 : Vdc_in High Start	61.0	V
DC 8 : Vdc_in High Transfer	62.0	V
DC 8 : Vdc_in High Stop	62.0	V
AC : Fac_in Low Start	47.3	Hz

Table Q — Inverter Parameters		
Submenu Item	**Default Setting**	**Units**
AC : Fac_in Low Stop	47.0	Hz
AC : Fac_in High Start	62.7	Hz
AC : Fac_in High Stop	63.0	Hz
AC 1 : Vac_in Low Start	92.5	V
AC 1 : Vac_in Low Transfer	87.5	V
AC 1 : Vac_in Low Stop	87.5	V
AC 1 : Vac_in High Start	133.0	V
AC 1 : Vac_in High Transfer	138.0	V
AC 1 : Vac_in High Stop	138.0	V
AC 2 : Vac_in Low Start	92.5	V
AC 2 : Vac_in Low Transfer	87.5	V
AC 2 : Vac_in Low Stop	87.5	V
AC 2 : Vac_in High Start	133.0	V
AC 2 : Vac_in High Transfer	138.0	V
AC 2 : Vac_in High Stop	138.0	V
AC 3 : Vac_in Low Start	92.5	V
AC 3 : Vac_in Low Transfer	87.5	V
AC 3 : Vac_in Low Stop	87.5	V
AC 3 : Vac_in High Start	133.0	V
AC 3 : Vac_in High Transfer	138.0	V
AC 3 : Vac_in High Stop	138.0	V
AC 4 : Vac_in Low Start	92.5	V
AC 4 : Vac_in Low Transfer	87.5	V
AC 4 : Vac_in Low Stop	87.5	V
AC 4 : Vac_in High Start	133.0	V
AC 4 : Vac_in High Transfer	138.0	V
AC 4 : Vac_in High Stop	138.0	V

Table R — Inverter Alarm Codes			
Alarm Type		**Cause**	**Solution**
T2S Event			
226	NO TRANSMISSION	Alarm from the T2S - does not see any TSI- all modules - system alarm or when the T2S does not see one of the modules	Replace defective inverter or adapt configuration
227	DIG INP1 FAILURE	Digital input has changed status	Check device connected on input digital
228	DIG INP2 FAILURE	Digital input has changed status	Check device connected on input digital
229	REDUNDANCY LOST	Lost of inverter redundancy	Replace defective inverter or adapt configuration
230	REDUND + 1 LOST	Lost of inverter redundancy + 1 inverter	Replace defective inverter(s) or adapt configuration
231	SYS SATURATED	Load of system greater than the preset value	Reduce load or add inverter on the system, or change the alarm level trigger.
232	MAIN SOURCE LOST	Priority source lost (depends on the configuration AC/AC or Online)	1) In AC/AC configuration: Reconnect AC IN or check configuration or check live value. 2) In Online configuration: Reconnect DC or check configuration or check level voltage
233	SEC SOURCE LOST	Secondary source lost (depends on the configuration AC/AC or Online)	1) In ONLINE configuration: Reconnect AC IN or check configuration or check live value. 2) In AC/AC configuration: Reconnect DC or check configuration or check level voltage
234	T2S BUS FAIL	The communication bus to T2S has failed	Hardware problem. Replace T2S
235	T2S FAILURE	T2S has failed	Hard ware problem. Replace T2S
236	T2S STARTED	T2S has started	
237	LOG CLEARED	T2S has cleared the log	
238	CONFIG MODIFIED	Configuration is modified	
239	NEW MOD DETECTED	One more module is plugged	
240	DATE & TIME MOD	Date and time are modified	
241	CFG READ IN MOD	T2S has read the CFG	
242	LOG NEARLY FULL	This item will be set as, No alarm, Minor or major alarm. (see configuration file)	Clear log file
243	T2S FLASH ERROR	Flash of T2S is corrupt and has failed	Hardware problem. Replace T2S

12. Modbus® Communications Protocol

This feature enables CXC communication of alarms and live signals using Modbus protocol (messaging structure developed by Modicon®.

A message is encoded in Remote Terminal Unit (RTU) data format and is communicated upon query via Transmission Control Protocol (TCP) to any Modbus supervisor or master. Reference: Modbus application protocol specification v1.1a (www.Modbus-IDA.org).

The CXC acts as a server on Ethernet networks known as Modbus TCP RTU: TCP/IP over Ethernet, default TCP port = 502. The server is always up and running when CXC starts up; ready to respond to a client query.

CXC communications cannot be configured as Modbus gateway, to behave as both server and client at the same time, and does not support Modbus Plus high speed token passing network.

Modbus protocol offers service specified by function codes (see tables provided). A function code is an element of a Modbus request/reply Protocol Data Unit (PDU). The CXC supports the following:

- 0x01 (Read Coils): Read CXC relay status bits,
- 0x02 (Read Discrete inputs): Read alarm tables status bits,
- 0x03 (Read Holding registers): Read CXC live signals from signals tables,
- 0x04 (Read Input registers): Read CXC relay or alarm table status registers.

Table S — Table N–CXC Modbus PDU address definition for function code 0x01 (read coils)

PDU Address	Variable Name	Variable Description	Response Data Format
0x0001	Relay1_Status_Bit	Relay 1 (K1)	BINARY
0x0002	Relay2_Status_Bit	Relay 2 (K2)	BINARY
0x0003	Relay3_Status_Bit	Relay 3 (K3)	BINARY
0x0004	Relay4_Status_Bit	Relay 4 (K4)	BINARY
0x0005	Relay5_Status_Bit	Relay 5 (K5)	BINARY
0x0006	Relay6_Status_Bit	Relay 6 (K6)	BINARY
0x0007	Relay7_Status_Bit	Relay 7 (K7)	BINARY
0x0008	Relay8_Status_Bit	Relay 8 (K8)	BINARY
0x0009	Relay9_Status_Bit	Relay 9 (K9)	BINARY
0x000A	Relay10_Status_Bit	Relay 10 (K10)	BINARY
0x000B	Relay11_Status_Bit	Relay 11 (K11)	BINARY
0x000C	Relay12_Status_Bit	Relay 12 (K12)	BINARY
0x000D	Relay13_Status_Bit	Relay 13 (K13)	BINARY
0x000E	Relay14_Status_Bit	Relay 14 (K14)	BINARY
0x000F	Relay15_Status_Bit	Relay 15 (K15)	BINARY
0x0010	Relay16_Status_Bit	Relay 16 (K16)	BINARY

Table T — CXC Modbus PDU address definition for function code 0x02 (read discrete inputs)			
PDU Address	**Variable Name**	**Variable Description**	**Response Data Format**
0x0001	Alarm1_In_Alarm_Table_1_Status_Bit	Rectifier Fail	BINARY
0x0002	Alarm2_In_Alarm_Table_1_Status_Bit	Rectifier Minor	BINARY
0x0003	Alarm3_In_Alarm_Table_1_Status_Bit	Rect. Major Fail Count	BINARY
0x0004	Alarm4_In_Alarm_Table_1_Status_Bit	Rect. Minor Fail Count	BINARY
0x0005	Alarm5_In_Alarm_Table_1_Status_Bit	Rectifier Lockout	BINARY
0x0006	Alarm6_In_Alarm_Table_1_Status_Bit	Out Of Tolerance	BINARY
0x0007	Alarm7_In_Alarm_Table_1_Status_Bit	Rect. Comms Lost	BINARY
0x0008	Alarm8_In_Alarm_Table_1_Status_Bit	Rect. Equalize Activated	BINARY
0x0009	Alarm9_In_Alarm_Table_1_Status_Bit	Rect. AC Mains Fail	BINARY
0x000A	Alarm10_In_Alarm_Table_1_Status_Bit	Max Rectifiers Exceeded	BINARY
0x000B	Alarm11_In_Alarm_Table_1_Status_Bit	Fan Fail Alarm	BINARY
0x000C	Alarm12_In_Alarm_Table_1_Status_Bit	Power Save	BINARY
0x000D	Alarm13_In_Alarm_Table_1_Status_Bit	Urgent Rect. AC Mains Fail	BINARY
0x0041	Alarm1_In_Alarm_Table_2_Status_Bit	Distribution Fuse	BINARY
0x0042	Alarm2_In_Alarm_Table_2_Status_Bit	Battery Fuse	BINARY
0x0043	Alarm3_In_Alarm_Table_2_Status_Bit	LVD Manual In	BINARY
0x0044	Alarm4_In_Alarm_Table_2_Status_Bit	LVD Manual Out	BINARY
0x0045	Alarm5_In_Alarm_Table_2_Status_Bit	Converter Fail	BINARY
0x0046	Alarm6_In_Alarm_Table_2_Status_Bit	Conv. I/P Breaker Trip	BINARY
0x0047	Alarm7_In_Alarm_Table_2_Status_Bit	Digital 7	BINARY
0x0048	Alarm8_In_Alarm_Table_2_Status_Bit	Digital 8	BINARY
0x0081	Alarm1_In_Alarm_Table_3_Status_Bit	Battery Current High	BINARY
0x0082	Alarm2_In_Alarm_Table_3_Status_Bit	Load Current High	BINARY
0x00C1	Alarm1_In_Alarm_Table_4_Status_Bit	AC Mains High	BINARY
0x00C2	Alarm2_In_Alarm_Table_4_Status_Bit	AC Mains Low	BINARY
0x00C3	Alarm3_In_Alarm_Table_4_Status_Bit	High Voltage 1	BINARY
0x00C4	Alarm4_In_Alarm_Table_4_Status_Bit	High Voltage 2	BINARY
0x00C5	Alarm5_In_Alarm_Table_4_Status_Bit	Low Voltage 1	BINARY
0x00C6	Alarm6_In_Alarm_Table_4_Status_Bit	Low Voltage 2	BINARY
0x00C7	Alarm7_In_Alarm_Table_4_Status_Bit	Midpoint Monitor 1	BINARY
0x00C8	Alarm8_In_Alarm_Table_4_Status_Bit	Midpoint Monitor 2	BINARY
0x00C9	Alarm9_In_Alarm_Table_4_Status_Bit	Midpoint Monitor 3	BINARY
0x00CA	Alarm10_In_Alarm_Table_4_Status_Bit	Midpoint Monitor 4	BINARY
0x00CB	Alarm11_In_Alarm_Table_4_Status_Bit	Midpoint Monitor 5	BINARY
0x0101	Alarm1_In_Alarm_Table_5_Status_Bit	Battery Runtime Low	BINARY
0x0102	Alarm2_In_Alarm_Table_5_Status_Bit	Battery Capacity Low	BINARY
0x0103	Alarm3_In_Alarm_Table_5_Status_Bit	Battery Overtemp	BINARY
0x0104	Alarm4_In_Alarm_Table_5_Status_Bit	Battery On Discharge	BINARY
0x0105	Alarm5_In_Alarm_Table_5_Status_Bit	Battery Test Alarm	BINARY

Table T — CXC Modbus PDU address definition for function code 0x02 (read discrete inputs)			
PDU Address	**Variable Name**	**Variable Description**	**Response Data Format**
0x0141	Alarm1_In_Alarm_Table_6_Status_Bit	Temp Sensor 1 Fail	BINARY
0x0142	Alarm2_In_Alarm_Table_6_Status_Bit	Temp Sensor 2 Fail	BINARY
0x0143	Alarm3_In_Alarm_Table_6_Status_Bit	Temp Sensor 3 Fail	BINARY
0x0144	Alarm4_In_Alarm_Table_6_Status_Bit	Temp Sensor 4 Fail	BINARY
0x0145	Alarm5_In_Alarm_Table_6_Status_Bit	TC Sensor Fail	BINARY
0x0181	Alarm1_In_Alarm_Table_7_Status_Bit	Custom 1	BINARY
0x0182	Alarm2_In_Alarm_Table_7_Status_Bit	Custom 2	BINARY
0x0183	Alarm3_In_Alarm_Table_7_Status_Bit	Custom 3	BINARY
0x0184	Alarm4_In_Alarm_Table_7_Status_Bit	Custom 4	BINARY
0x0185	Alarm5_In_Alarm_Table_7_Status_Bit	Custom 5	BINARY
0x0186	Alarm6_In_Alarm_Table_7_Status_Bit	Custom 6	BINARY
0x0187	Alarm7_In_Alarm_Table_7_Status_Bit	Custom 7	BINARY
0x0188	Alarm8_In_Alarm_Table_7_Status_Bit	Custom 8	BINARY
0x0189	Alarm9_In_Alarm_Table_7_Status_Bit	Custom 9	BINARY
0x018A	Alarm10_In_Alarm_Table_7_Status_Bit	Custom 10	BINARY
0x018B	Alarm11_In_Alarm_Table_7_Status_Bit	Custom 11	BINARY
0x018C	Alarm12_In_Alarm_Table_7_Status_Bit	Custom 12	BINARY
0x018D	Alarm13_In_Alarm_Table_7_Status_Bit	Custom 13	BINARY
0x018E	Alarm14_In_Alarm_Table_7_Status_Bit	Custom 14	BINARY
0x018F	Alarm15_In_Alarm_Table_7_Status_Bit	Custom 15	BINARY
0x0190	Alarm16_In_Alarm_Table_7_Status_Bit	Custom 16	BINARY
0x0191	Alarm17_In_Alarm_Table_7_Status_Bit	Custom 17	BINARY
0x0192	Alarm18_In_Alarm_Table_7_Status_Bit	Custom 18	BINARY
0x0193	Alarm19_In_Alarm_Table_7_Status_Bit	Custom 19	BINARY
0x0194	Alarm20_In_Alarm_Table_7_Status_Bit	Custom 20	BINARY
0x01C1	Alarm1_In_Alarm_Table_8_Status_Bit	Real Time Clock Error	BINARY
0x01C2	Alarm2_In_Alarm_Table_8_Status_Bit	Invalid Device Firmware	BINARY
0x01C3	Alarm3_In_Alarm_Table_8_Status_Bit	Ground Fault Detected	BINARY
0x01C4	Alarm4_In_Alarm_Table_8_Status_Bit	Improper CXC Shutdown	BINARY
0x01C5	Alarm5_In_Alarm_Table_8_Status_Bit	Invalid Charge Voltage	BINARY
0x01C6	Alarm6_In_Alarm_Table_8_Status_Bit	System Major	BINARY
0x01C7	Alarm7_In_Alarm_Table_8_Status_Bit	System Minor	BINARY
0x0201	Alarm1_In_Alarm_Table_9_Status_Bit	LVD 1	BINARY
0x0202	Alarm2_In_Alarm_Table_9_Status_Bit	LVD 2	BINARY
0x0203	Alarm3_In_Alarm_Table_9_Status_Bit	LVD 3	BINARY
0x0204	Alarm4_In_Alarm_Table_9_Status_Bit	LVD 4	BINARY
0x0205	Alarm5_In_Alarm_Table_9_Status_Bit	LVD 5	BINARY
0x0206	Alarm6_In_Alarm_Table_9_Status_Bit	LVD 6	BINARY
0x0207	Alarm7_In_Alarm_Table_9_Status_Bit	LVD 7	BINARY

Table T — CXC Modbus PDU address definition for function code 0x02 (read discrete inputs)			
PDU Address	**Variable Name**	**Variable Description**	**Response Data Format**
0x0208	Alarm8_In_Alarm_Table_9_Status_Bit	LVD 8	BINARY
0x0209	Alarm9_In_Alarm_Table_9_Status_Bit	LVD 9	BINARY
0x020A	Alarm10_In_Alarm_Table_9_Status_Bit	LVD 10	BINARY
0x020B	Alarm11_In_Alarm_Table_9_Status_Bit	CEMF Control	BINARY
0x020C	Alarm12_In_Alarm_Table_9_Status_Bit	HVSD Control	BINARY
0x020D	Alarm13_In_Alarm_Table_9_Status_Bit	LVD Inhibit	BINARY
0x0241	Alarm1_In_ Alarm _Table_10_Status_Bit	ADIO_1_Cell Deviation	BINARY
0x0242	Alarm2_In_ Alarm _Table_10_Status_Bit	ADIO_1_Current Alarm	BINARY
0x0243	Alarm3_In_ Alarm _Table_10_Status_Bit	ADIO_1_Voltage Alarm	BINARY
0x0244	Alarm4_In_ Alarm _Table_10_Status_Bit	ADIO_1_Temperature Alarm	BINARY
0x0245	Alarm5_In_ Alarm _Table_10_Status_Bit	ADIO_1_Comms Alarm	BINARY
0x0246	Alarm6_In_ Alarm _Table_10_Status_Bit	ADIO_2_Cell Deviation	BINARY
0x0247	Alarm7_In_ Alarm _Table_10_Status_Bit	ADIO_2_Current Alarm	BINARY
0x0248	Alarm8_In_ Alarm _Table_10_Status_Bit	ADIO_2_Voltage Alarm	BINARY
0x0249	Alarm9_In_ Alarm _Table_10_Status_Bit	ADIO_2_Temperature Alarm	BINARY
0x024A	Alarm10_In_ Alarm _Table_10_Status_Bit	ADIO_2_Comms Alarm	BINARY
0x024B	Alarm11_In_ Alarm _Table_10_Status_Bit	ADIO_3_Cell Deviation	BINARY
0x024C	Alarm12_In_ Alarm _Table_10_Status_Bit	ADIO_3_Current Alarm	BINARY
0x024D	Alarm13_In_ Alarm _Table_10_Status_Bit	ADIO_3_Voltage Alarm	BINARY
0x024E	Alarm14_In_ Alarm _Table_10_Status_Bit	ADIO_3_Temperature Alarm	BINARY
0x024F	Alarm15_In_ Alarm _Table_10_Status_Bit	ADIO_3_Comms Alarm	BINARY
0x0250	Alarm16_In_ Alarm _Table_10_Status_Bit	ADIO_4_Cell Deviation	BINARY
0x0251	Alarm17_In_ Alarm _Table_10_Status_Bit	ADIO_4_Current Alarm	BINARY
0x0252	Alarm18_In_ Alarm _Table_10_Status_Bit	ADIO_4_Voltage Alarm	BINARY
0x0253	Alarm19_In_ Alarm _Table_10_Status_Bit	ADIO_4_Temperature Alarm	BINARY
0x0254	Alarm20_In_ Alarm _Table_10_Status_Bit	ADIO_4_Comms Alarm	BINARY
0x0255	Alarm21_In_ Alarm _Table_10_Status_Bit	ADIO_5_Cell Deviation	BINARY
0x0256	Alarm22_In_ Alarm _Table_10_Status_Bit	ADIO_5_Current Alarm	BINARY
0x0257	Alarm23_In_ Alarm _Table_10_Status_Bit	ADIO_5_Voltage Alarm	BINARY
0x0258	Alarm24_In_ Alarm _Table_10_Status_Bit	ADIO_5_Temperature Alarm	BINARY
0x0259	Alarm25_In_ Alarm _Table_10_Status_Bit	ADIO_5_Comms Alarm	BINARY
0x025A	Alarm26_In_ Alarm _Table_10_Status_Bit	ADIO_6_Cell Deviation	BINARY
0x025B	Alarm27_In_ Alarm _Table_10_Status_Bit	ADIO_6_Current Alarm	BINARY
0x025C	Alarm28_In_ Alarm _Table_10_Status_Bit	ADIO_6_Voltage Alarm	BINARY
0x025D	Alarm29_In_ Alarm _Table_10_Status_Bit	ADIO_6_Temperature Alarm	BINARY
0x025E	Alarm30_In_ Alarm _Table_10_Status_Bit	ADIO_6_Comms Alarm	BINARY
0x025F	Alarm31_In_ Alarm _Table_10_Status_Bit	ADIO_7_Cell Deviation	BINARY
0x0260	Alarm32_In_ Alarm _Table_10_Status_Bit	ADIO_7_Current Alarm	BINARY
0x0261	Alarm33_In_ Alarm _Table_10_Status_Bit	ADIO_7_Voltage Alarm	BINARY

Table T — CXC Modbus PDU address definition for function code 0x02 (read discrete inputs)			
PDU Address	**Variable Name**	**Variable Description**	**Response Data Format**
0x0262	Alarm34_In_ Alarm _Table_10_Status_Bit	ADIO_7_Temperature Alarm	BINARY
0x0263	Alarm35_In_ Alarm _Table_10_Status_Bit	ADIO_7_Comms Alarm	BINARY
0x0264	Alarm36_In_ Alarm _Table_10_Status_Bit	ADIO_8_Cell Deviation	BINARY
0x0265	Alarm37_In_ Alarm _Table_10_Status_Bit	ADIO_8_Current Alarm	BINARY
0x0266	Alarm38_In_ Alarm _Table_10_Status_Bit	ADIO_8_Voltage Alarm	BINARY
0x0267	Alarm39_In_ Alarm _Table_10_Status_Bit	ADIO_8_Temperature Alarm	BINARY
0x0268	Alarm40_In_ Alarm _Table_10_Status_Bit	ADIO_8_Comms Alarm	BINARY
0x0269	Alarm41_In_ Alarm _Table_10_Status_Bit	ADIO_9_Cell Deviation	BINARY
0x026A	Alarm42_In_ Alarm _Table_10_Status_Bit	ADIO_9_Current Alarm	BINARY
0x026B	Alarm43_In_ Alarm _Table_10_Status_Bit	ADIO_9_Voltage Alarm	BINARY
0x026C	Alarm44_In_ Alarm _Table_10_Status_Bit	ADIO_9_Temperature Alarm	BINARY
0x026D	Alarm45_In_ Alarm _Table_10_Status_Bit	ADIO_9_Comms Alarm	BINARY
0x026E	Alarm46_In_ Alarm _Table_10_Status_Bit	ADIO_10_Cell Deviation	BINARY
0x026F	Alarm47_In_ Alarm _Table_10_Status_Bit	ADIO_10_Current Alarm	BINARY
0x0270	Alarm48_In_ Alarm _Table_10_Status_Bit	ADIO_10_Voltage Alarm	BINARY
0x0271	Alarm49_In_ Alarm _Table_10_Status_Bit	ADIO_10_Temperature Alarm	BINARY
0x0272	Alarm50_In_ Alarm _Table_10_Status_Bit	ADIO_10_Comms Alarm	BINARY
0x0273	Alarm51_In_ Alarm _Table_10_Status_Bit	ADIO_11_Cell Deviation	BINARY
0x0274	Alarm52_In_ Alarm _Table_10_Status_Bit	ADIO_11_Current Alarm	BINARY
0x0275	Alarm53_In_ Alarm _Table_10_Status_Bit	ADIO_11_Voltage Alarm	BINARY
0x0276	Alarm54_In_ Alarm _Table_10_Status_Bit	ADIO_11_Temperature Alarm	BINARY
0x0277	Alarm55_In_ Alarm _Table_10_Status_Bit	ADIO_11_Comms Alarm	BINARY
0x0278	Alarm56_In_ Alarm _Table_10_Status_Bit	ADIO_12_Cell Deviation	BINARY
0x0279	Alarm57_In_ Alarm _Table_10_Status_Bit	ADIO_12_Current Alarm	BINARY
0x027A	Alarm58_In_ Alarm _Table_10_Status_Bit	ADIO_12_Voltage Alarm	BINARY
0x027B	Alarm59_In_ Alarm _Table_10_Status_Bit	ADIO_12_Temperature Alarm	BINARY
0x027C	Alarm60_In_ Alarm _Table_10_Status_Bit	ADIO_12_Comms Alarm	BINARY
0x027D	Alarm61_In_ Alarm _Table_10_Status_Bit	ADIO_13_Cell Deviation	BINARY
0x027E	Alarm62_In_ Alarm _Table_10_Status_Bit	ADIO_13_Current Alarm	BINARY
0x027F	Alarm63_In_ Alarm _Table_10_Status_Bit	ADIO_13_Voltage Alarm	BINARY
0x0280	Alarm64_In_ Alarm _Table_10_Status_Bit	ADIO_13_Temperature Alarm	BINARY
0x0281	Alarm65_In_ Alarm _Table_10_Status_Bit	ADIO_13_Comms Alarm	BINARY
0x0282	Alarm66_In_ Alarm _Table_10_Status_Bit	ADIO_14_Cell Deviation	BINARY
0x0283	Alarm67_In_ Alarm _Table_10_Status_Bit	ADIO_14_Current Alarm	BINARY
0x0284	Alarm68_In_ Alarm _Table_10_Status_Bit	ADIO_14_Voltage Alarm	BINARY
0x0285	Alarm69_In_ Alarm _Table_10_Status_Bit	ADIO_14_Temperature Alarm	BINARY
0x0286	Alarm70_In_ Alarm _Table_10_Status_Bit	ADIO_14_Comms Alarm	BINARY
0x0287	Alarm71_In_ Alarm _Table_10_Status_Bit	ADIO_15_Cell Deviation	BINARY
0x0288	Alarm72_In_ Alarm _Table_10_Status_Bit	ADIO_15_Current Alarm	BINARY

Table T — CXC Modbus PDU address definition for function code 0x02 (read discrete inputs)			
PDU Address	**Variable Name**	**Variable Description**	**Response Data Format**
0x0289	Alarm73_In_ Alarm _Table_10_Status_Bit	ADIO_15_Voltage Alarm	BINARY
0x028A	Alarm74_In_ Alarm _Table_10_Status_Bit	ADIO_15_Temperature Alarm	BINARY
0x028B	Alarm75_In_ Alarm _Table_10_Status_Bit	ADIO_15_Comms Alarm	BINARY
0x028C	Alarm76_In_ Alarm _Table_10_Status_Bit	ADIO_16_Cell Deviation	BINARY
0x028D	Alarm77_In_ Alarm _Table_10_Status_Bit	ADIO_16_Current Alarm	BINARY
0x028E	Alarm78_In_ Alarm _Table_10_Status_Bit	ADIO_16_Voltage Alarm	BINARY
0x028F	Alarm79_In_ Alarm _Table_10_Status_Bit	ADIO_16_Temperature Alarm	BINARY
0x0290	Alarm80_In_ Alarm _Table_10_Status_Bit	ADIO_16_Comms Alarm	BINARY
0x0040 *(X-1)	Alarm1_In_Alarm_Table_X_Status_Bit	Read alarm1 status bit in alarm table X	BINARY
AX	AlarmAX_In_Alarm_Table_X_Status_Bit	Read alarmAX status bit in alarm table X	BINARY

Table U — CXC Modbus PDU address definition for function code 0x03 (read holding registers)			
PDU Address	**Variable Name**	**Variable Description**	**Number of Bytes**
0x0001	Signal_Tables_Total	Read number of signal tables (S) (S<=0x3F)	2
0x0002	Signals_Total_In_Signal_Table_1	Read number of signals in signal table 1 (S1) (S1<=0x20)	2
0x0003	Signals_Total_In_Signal_Table_2	Read number of signals in signal table 2 (S2) (S2 <=0x20)	2
0x0001 + S	Signals_Total_In_Signal_Table_S	Read number of signals in signal table 2 (SS) (SS <=0x20)	2
0X0042	Signal_1_In_Signal_Table_1	Digital Input 1	4 (signed int_32)
0X0044	Signal_2_In_Signal_Table_1	Digital Input 2	4 (signed int_32)
0X0046	Signal_3_n_Signal_Table_1	Digital Input 3	4 (signed int_32)
0X0048	Signal_4_In_Signal_Table_1	Digital Input 4	4 (signed int_32)
0X004A	Signal_5_In_Signal_Table_1	Digital Input 5	4 (signed int_32)
0X004C	Signal_6_In_Signal_Table_1	Digital Input 6	4 (signed int_32)
0X004E	Signal_7_In_Signal_Table_1	Digital Input 7	4 (signed int_32)
0X0050	Signal_8_In_Signal_Table_1	Digital Input 8	4 (signed int_32)
0x0082	Signal_1_In_Signal_Table_2	Load Voltage (x100)	4 (signed int_32)
0x0084	Signal_2_In_Signal_Table_2	Load Current (x100)	4 (signed int_32)
0x0086	Signal_3_In_Signal_Table_2	Battery Voltage (x100)	4 (signed int_32)
0x0088	Signal_4_In_Signal_Table_2	Battery Current (x100)	4 (signed int_32)
0x008A	Signal_5_In_Signal_Table_2	AC Mains (x100)	4 (signed int_32)
0x008C	Signal_6_In_Signal_Table_2	Battery Temperature (x100)	4 (signed int_32)
0x008E	Signal_7_In_Signal_Table_2	Battery Runtime (x100)	4 (signed int_32)
0x0090	Signal_8_In_Signal_Table_2	Battery Capacity (x100)	4 (signed int_32)

Table U — CXC Modbus PDU address definition for function code 0x03 (read holding registers)			
PDU Address	**Variable Name**	**Variable Description**	**Number of Bytes**
0x0092	Signal_9_In_Signal_Table_2	Battery DOD (x100)	4 (signed int_32)
0x0094	Signal_10_In_Signal_Table_2	Converter Load Current (x100)	4 (signed int_32)
0x0096	Signal_11_In_Signal_Table_2	Converter Load Voltage (x100)	4 (signed int_32)
0x0098	Signal_12_In_Signal_Table_2	System Voltage Mode (0-float, 1-equalize)	4 (signed int_32)
0x00C2	Signal_1_In_Signal_Table_3	Total Rectifier Current (x100)	4 (signed int_32)
0x00C4	Signal_2_In_Signal_Table_3	Average DC Voltage (x100)	4 (signed int_32)
0x00C6	Signal_3_In_Signal_Table_3	Average AC Voltage (x100)	4 (signed int_32)
0x00C8	Signal_4_In_Signal_Table_3	Number of Acquired Rectifiers	4 (signed int_32)
0x00CA	Signal_5_In_Signal_Table_3	Number of Sourcing Rectifiers	4 (signed int_32)
0x00CC	Signal_6_In_Signal_Table_3	Number of Failed Rectifiers	4 (signed int_32)
0x00CE	Signal_7_In_Signal_Table_3	Number of Minor Alarm Rectifiers	4 (signed int_32)
0x00D0	Signal_8_In_Signal_Table_3	Number of Comm. Lost Rectifiers	4 (signed int_32)
0x00D2	Signal_9_In_Signal_Table_3	Number of AC Failed Rectifiers	4 (signed int_32)
0x00D4	Signal_10_In_Signal_Table_3	Number of Out of Tolerance	4 (signed int_32)
0x00D6	Signal_11_In_Signal_Table_3	Number of Locked Out Rectifiers	4 (signed int_32)
0x00D8	Signal_12_In_Signal_Table_3	Number of Equalize Rectifiers	4 (signed int_32)
0x00DA	Signal_13_In_Signal_Table_3	Number of Current Limit Rectifiers	4 (signed int_32)
0x00DC	Signal_14_In_Signal_Table_3	Number of Power Limit Rectifiers	4 (signed int_32)
0x00DE	Signal_15_In_Signal_Table_3	Number of Fan Failed Rectifiers	4 (signed int_32)
0x00E0	Signal_16_In_Signal_Table_3	Number of Power Saving Rectifiers	4 (signed int_32)
0x00E2	Signal_17_In_Signal_Table_3	Average AC Phase R (x100)	4 (signed int_32)
0x00E4	Signal_18_In_Signal_Table_3	Average AC Phase S (x100)	4 (signed int_32)
0x00E6	Signal_19_In_Signal_Table_3	Average AC Phase T (x100)	4 (signed int_32)
0x0102	Signal_1_In_Signal_Table_4	Custom Signal 1 (x100)	4 (signed int_32)
0x0104	Signal_2_In_Signal_Table_4	Custom Signal 2 (x100)	4 (signed int_32)
0x0106	Signal_3_In_Signal_Table_4	Custom Signal 3 (x100)	4 (signed int_32)
0x0108	Signal_4_In_Signal_Table_4	Custom Signal 4 (x100)	4 (signed int_32)
0x010A	Signal_5_In_Signal_Table_4	Custom Signal 5 (x100)	4 (signed int_32)
0x010C	Signal_6_In_Signal_Table_4	Custom Signal 6 (x100)	4 (signed int_32)
0x010E	Signal_7_In_Signal_Table_4	Custom Signal 7 (x100)	4 (signed int_32)
0x0110	Signal_8_In_Signal_Table_4	Custom Signal 8 (x100)	4 (signed int_32)
0x0112	Signal_9_In_Signal_Table_4	Custom Signal 9 (x100)	4 (signed int_32)
0x0114	Signal_10_In_Signal_Table_4	Custom Signal 10 (x100)	4 (signed int_32)
0x0040 * S	Signal_1_In_Signal_Table_S	Read Signal 1 in Signal table S (x100)	4 (signed int_32)
0x0040 * S + ((SS-1) *2)	Signal_SS_In_Signal_Table_S	Read Signal SS in Signal table S (x100)	4 (signed int_32)
0x0182	Signal_1_In_Signal_Table_5	Timer 1	4 (signed int_32)
0x0184	Signal_2_In_Signal_Table_5	Timer 2	4 (signed int_32)
0x0186	Signal_3_In_Signal_Table_5	Timer 3	4 (signed int_32)
0x0188	Signal_4_In_Signal_Table_5	Timer 4	4 (signed int_32)

Table U — CXC Modbus PDU address definition for function code 0x03 (read holding registers)			
PDU Address	**Variable Name**	**Variable Description**	**Number of Bytes**
0x018A	Signal_5_In_Signal_Table_5	Timer 5	4 (signed int_32)
0x018C	Signal_6_In_Signal_Table_5	Timer 6	4 (signed int_32)
0x018E	Signal_7_In_Signal_Table_5	Timer 7	4 (signed int_32)
0x0190	Signal_8_In_Signal_Table_5	Timer 8	4 (signed int_32)
0x0192	Signal_9_In_Signal_Table_5	Timer 9	4 (signed int_32)
0x0194	Signal_10_In_Signal_Table_5	Timer 10	4 (signed int_32)
0x01C2	Signal_1_In_Signal_Table_6	Counter 1	4 (signed int_32)
0x01C4	Signal_2_In_Signal_Table_6	Counter 2	4 (signed int_32)
0x01C6	Signal_3_In_Signal_Table_6	Counter 3	4 (signed int_32)
0x01C8	Signal_4_In_Signal_Table_6	Counter 4	4 (signed int_32)
0x01CA	Signal_5_In_Signal_Table_6	Counter 5	4 (signed int_32)
0x01CC	Signal_6_In_Signal_Table_6	Counter 6	4 (signed int_32)
0x01CE	Signal_7_In_Signal_Table_6	Counter 7	4 (signed int_32)
0x01D0	Signal_8_In_Signal_Table_6	Counter 8	4 (signed int_32)
0x01D2	Signal_9_In_Signal_Table_6	Counter 9	4 (signed int_32)
0x01D4	Signal_10_In_Signal_Table_6	Counter 10	4 (signed int_32)

Table V — CXC Modbus PDU address definition for function code 0x04 (read input registers)			
PDU Address	**Variable Name**	**Variable Description**	**Response Data Format**
0x0001	Relays_Total (Y)	Read number of relays	BINARY
0x0002	Total_Active_Alarms (Z)	Read total active alarms	BINARY
0x0003	System_Major_Alarm	Read system major alarm status	BINARY
0x0004	System_Minor_Alarm	Read system minor alarm status	BINARY
0x0011	Alarm_Tables_Total (X)	Read number of alarm tables (X<=0x1E)	BINARY
0x0012	Alarms_Total_In_Alarm_Table _1 (A1)	Read number of alarm in alarm table 1 (A1 <= 0x3F)	BINARY
0x0013	Alarms_Total_In_Alarm_Table _2 (A2)	Read number of alarm in alarm table 2 (A2 <= 0x3F)	BINARY
0x0011 + X	Alarms_Total_In_Alarm_Table _X (AX)	Read number of alarm in alarm table X (AX <= 0x3F)	BINARY
0x0031	Number_of_Active_Alarms_In_Alarm_table _1	Read number of active alarms in alarm table 1	BINARY
0x0032	Number_of_Active_Alarms_In_Alarm_table _2	Read number of active alarms in alarm table 2	BINARY
0x0031 + (X-1)	Number_of_Active_Alarms_In_Alarm_table _X	Read number of active alarms in alarm table X	BINARY

13. Trouble-shooting

Table W — Trouble-shooting guide	
Symptom	**Solution**
Rectifier Communications Lost (RECT COMMS LOST)	Check RS-485 or CAN cable connections for breaks and loose contacts. Ensure all rectifiers are secured and tightly screwed in to the shelf. Perform “Inventory Update” (from RECTIFIERS menu).
Rectifier Lockout (RECT LOCKOUT)	Pathfinder rectifier modules with LCD option: Check if any rectifiers menu has been accessed. Rectifier must be in normal operation mode. Perform “Inventory Update.” Set all rectifiers for Remote Access enabled and Remote Adjust Access enabled.
Rectifier Out Of Tolerance (OUT OF TOLERANCE)	Check all settings in RECTIFIERS menu; e.g., float voltage, equalize voltage, etc. If it is in current limit, percentage may be too low. Ensure all parameters are properly set. Return to menu navigation, press OPTION and then select SAVE.
No Communications at RS-232 Port	Set web routing to Front Craft Port in the web settings option of the COMMUNICATIONS menu. Ensure the Baud rate is set to match. Ensure you are using a null modem cable.
Relays Not Triggering During Alarm Condition	Ensure alarm condition is mapped to a relay (from ALARMS menu). Ensure polarity of relay is set correctly (from HARDWARE menu). Ensure Cutoff All Alarms has not been selected.
Rectifier Minor/Major Alarm	Ensure system load is at least 5% of the current rating of the power modules used in the system or a battery is connected. Check the rectifier sending the alarm for specific alarm condition. Perform “Rectifier Report” (from RECTIFIERS menu).
New Rectifier Has Not Been Acquired	Ensure all rectifiers are secured and tightly screwed in to the shelf. Perform “Inventory Update” (from RECTIFIERS menu). Perform “Rectifier Report” (from RECTIFIERS menu) to confirm acquisition.
Unable to communicate with CXC via the Ethernet port	Ensure IP settings are correct (from COMMUNICATIONS menu). Reboot CXC after changing IP settings: select Reset from the Option button and save settings if prompted. Use a straight-through cable for network connection. Use a cross-over cable only when connecting directly to a PC. Try pinging the CXC IP address to verify connectivity. Contact your IT department to ensure both the CXC and PC can actually communicate across the network.
Web interface loads but shows no live data	Ensure you are using the latest version of Internet Explorer®.
Data logging will not start/stop	Start/stop logging equations should not be true at the same time.
Screen is too bright/dim	Tap the Alpha icon and select Contrast from the pop-up window. Use the slider on the GUI to adjust contrast as desired. Tap the check mark to complete adjustment.

14. Alpha Conventions

14.1 Acronyms and Definitions

AC	Alternating current
ADIO	Analog-digital input-output
ALCO	Alarm cutoff
ATM	Asynchronous Transfer Mode; e.g. ATM cell
BCT	Battery current termination
BOD	Battery on discharge
BT	Battery test (or test mode)
CAN	Controller Area Network
CEMF	Counter electro-motive force
CX	Cordex series; e.g. CXC for Cordex System Controller
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
DOD	Depth of discharge
EQ	Equalize (mode or voltage)
FL	Float (mode or voltage)
GUI	Graphical user interface
HVA	High voltage alarm
HVSD	High voltage shutdown
ICMP	Internet control message protocol
IP	Internet Protocol
LCD	Liquid crystal display
LED	Light emitting diode
LVA	Low voltage alarm
LVC	Low voltage connect
LVD	Low voltage disconnect
MAC	Media Access Control; e.g. MAC address
MIB	Management Information Base
MUX	Multiplexer
OVP	Over-voltage protection
PDA	Personal digital assistant
PPP	Point to Point Protocol
RAS	Remote access server
SCI	Serial Communication Interface
SNMP	Simple Network Management Protocol
TCP/IP	Transmission Control Protocol/ Internet Protocol
Trap	Event notification

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Power