# Cordex Controller Software Manual, Version 2.25

**User Manual**

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*Your Power Solutions Partner*

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# Version 2.25

**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.

## 1.2 Controller Overview

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

Ethernet capability supports the web interface, SNMP, as well as CAN bus communication with the Cordex rectifiers and other peripheral equipment.

### 1.2.1 User Interface (UI)

Located on the front panel of each CXCM (or CXCP or CXCR) model is a 160-x-160-pixel touch screen liquid crystal display (LCD) similar to that used in a personal digital assistant (PDA), see Figure 1. This graphical user interface (GUI) enables a person to interact with screen selectable items. The CXC will provide feedback during operation with different audible tones for alarms, invalid password, and menu navigation.

NOTE: Other models, such as the CXCI and CXCI+, only have a 4-digit display for monitoring system voltage and current. Without a touch screen display, system setup and management is performed exclusively with the web interface


**Figure 1 —** CXC models showing interface variations

### 1.2.2 Status LEDs

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

### 1.2.3 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. Software Features

The following highlights the latest features of the CXC software, and descriptions all the fixes incorporated since version 1.3.

## 2.1 Software Version 2.25

The following features/changes/updates have been incorporated into version 2.25 of the CXC software.

- Various LPS and eLimiter interface modifications including enhanced graphical interface and customer modifiable labels.
- SNMP Destinations now default to INFORM rather than TRAP.
- Inventory update is now a two step process with a warning indicating resetting of CAN communication.
- Add System Uptime as a controller signal.
- Added support for new ALPHA CAN devices
- Removed a conflict between Inverters and LPS' in the SNMP interface. This enhancement requires the use of the latest MIB (034-096-02_E_Alpha_System_Controller.zip) which can be downloaded from our website.
- Added a message to properly interpret an error code indicating Fan Speed Alarm from a rectifier.
- Enhanced diagnostics features to aid in trouble shooting

**Bug Fixes**

- Corrected a problem where the rectifier data used for the Phase Info was not correctly initialized if there was no rectifier in that slot.
- Add filter to the WEB UI so as to allow only legal HTML characters to be saved when entered into customer modifiable fields.
- Controller no longer overwrites IP address if it is part of a configuration file.
- Fixed a problem where the ADIO calibration did not work when there were more than 3 ADIO modules in the system.
- Corrected a problem where editing and saving the dynamic text could cause an improper controller shutdown
- Corrected the missing LCD label on the Battery Properties screen
- Correct Multi-language translations.
- Corrected a problem where a "Comms Lost" error could be reported in systems with a Pathfinder Rectifier.
- Corrected a problem where too many events occurring close together could cause the system to perform an improper controller shutdown.
- Corrected a problem where the full rectifier serial number was not being displayed.

**This software has been tested with the following browsers:**

- Internet Explorer versions: 7, 8, & 9 (needs to run in compatibility mode to display properly)
- Firefox versions: 12(need to use Internet Explorer "IE" Tab 2 to display properly)
- Chrome versions: 19(need to use IE Tab Multi "Enhance" to display properly)
- Safari: incompatible

## 2.2 New Features and Fixes: Software Versions 2.0 through 2.18

**Version 2.18**

- Corrected a number of issues which could cause an improper controller shutdown

### Version 2.17

- Corrected a number of issues which could cause an improper controller shutdown

### Version 2.16

- Added battery  probe fail temperature setting to the Configure Batteries page.
- Corrected a problem where closing the Clear Event Log popup would clear the event log

### Version 2.15

The following changes/updates have been incorporated into version 2.15 of the CXC software:

- Software Release BTldr 2.05 for CXC with new flash chips
- Corrected an issue where an invalid SNMP destination is defined a watchdog and may cause the system to restart.
- Corrected the display of data for the CXCI+ so that it no longer has three blank display modes.

### Version 2.14

The following changes/updates have been incorporated into version 2.14 of the CXC software:

- Correct temperature display in battery log
- Reduced memory usage allowing larger configuration files to be loaded. The new limit for configuration files is 140K bytes.
- Corrected a problem where the digital inputs could bounce and possibly cause ghost alarms or trigger equations.
- Fixed a very rare race condition specific to the CXCI and CXCM1 hardware where a relay that is normally energized was not consistently being set to its default (energized) position after a power cycle.
- Resolved a number of issues which were causing improper shutdowns under stress.
- Resolved an issue to correctly display the time zone adjustment on the WEB UI.
- Added an unknown alarm for the LPS36 to handle new alarms produced by ongoing development of the LPS36.
- Added some additional Chinese translations.
- Disabled the ability to alter the Rectifier Phase Mapping on the LCD screen. This must now be done using the WEB UI.

### Version 2.12

- Improved the accuracy of the analog signals
- Increased the size of buffers used for manipulating the configuration file.
- Improved the handling of the web pages so as to use less RAM..
- Corrected an issue with the Chinese language file.

### Version 2.10

The following changes/updates have been incorporated into version 2.10 of the CXC software:

- Support for Cordex HP LPS36 line power system modules
- Support for Cordex HP CXRF 48-2.4kW rectifier modules
- Controller hardware and software version information added to the factory information web page
- Announce message that will cause a router to update its address resolution tables when the IP Address is changed on the CXC
- Ability to save event/statistics/data logs as files to PC in CSV format
- Ability to clear the event log
- Password requirement when initiating a battery test or changing the battery charge state on the LCD

### Version 2.06

The following changes/updates have been incorporated into version 2.06 of the CXC software:

**SNMP Trap mapping errors** – a bug fix. VarBind (Variable Binding) values have been modified to match the MIB structure.

**Silence Buzzer Function under Global Alarm Configuration menu** – The operation of this function has been modified to meet the following requirements:

If Revert Relays is disabled and Silence Buzzer is enabled, then pressing ALCO will cause the buzzer to silence and not reset the relays. In addition if Enable ALCO Duration is set, the relays are not reset after the ALCO Duration times out.

**Rectifier Power Save Feature** – The rectifier power save feature now has the option to reduce shut-down and restart log entries to one every 24 hours.

**Alarm Tone Volume** – Enabling the Loud Buzzer, under the Global Alarm Configuration menu, increases the pitch and volume of the buzzer which sounds for major and minor alarms.

### Version 2.05

The following changes/updates have been incorporated into version 2.05 of the CXC software:

**Diagnostic Capture** – in the event of certain types of CXC crashes or "Improper Shutdowns", the software will now capture a diagnostic log of the system as it is shutting down. This log can be downloaded from the CXC web pages (**Logs and Files -> Retrieve Diagnostic File**) and sent to the Alpha technical support team.

**SNMP Trap** – allows users to set the value of a Custom Signal over SNMP. This custom signal can then be used in alarms and equations, and therefore trigger relays to toggle. It should be noted that the CXC will not maintain the value of a signal that has been set by SNMP during a reset. In order to accommodate customers who are already using the previously defined 10 Custom Signals, 10 additional Custom Signals were added, raising the total number of Custom Signals to 20.

**Updates to SNMP communities names and destination fields** – community and destination names can now be 31 characters long. In addition, 10 destination and community strings are allowed instead of 8.

**Email address maximum length fixed** – previously there was a bug which caused email addresses longer than 31 characters not to work for event notification. The CXC now allows email addresses up to 64 characters (63 + 1 for string termination character) as was intended. See section 10.3.3 for more information about sending notification emails from the CXC.

**Improper Shutdown caused by RS485 buffer** – a bug fix. In previous versions of the CXC, a problem with the RS485 interface caused occasional "Improper Shutdowns" of the unit. This problem has been solved in this release.

**Update from Argus logo to Alpha logo**.

**A new Bootloader, version 2.01, was released with CXC 2.05**. Upgrade to this Bootloader is recommended as it contains various bug fixes. The Bootloader can be upgraded via the CXC web pages by navigating to the **Controller -> Upgrade Bootloader** menu and following the instructions there.

### Version 2.04

The following changes/updates have been incorporated into version 2.04 of the CXC software:

- The battery log will be closed off when 96 hours has elapsed since the start of the recharge cycle. This is in addition to the existing functionality that closes off the log when the returned AH reaches 115% of the rated capacity during the recharge cycle.
- Improved response of charge current control when lithium-ion batteries are installed. Lithium-ion batteries are detected by scanning the battery information and looking for the keyword "lithium" or "li-ion" in the model comment fields.
- The rectifier start delay algorithm now allows a setting of 0 sec. instead of the former minimum of 1 sec.

### Version 2.0

The following changes/updates have been incorporated into version 2.0 of the CXC software:

- **Counters and Timers** – counters enable the Supervisor to monitor the number of times a particular event occurs. Timers are used to measure the amount of time since an event occurred or the amount of time between two events. These features are suitable for general-purpose signals that can be used in Custom Signal or Custom Alarm equations.
- **Dynamic Current Limit** – enables the Supervisor to change the battery current limit based on the status of a digital input; such as, when powering a system with a generator, to limit battery recharge current to prevent the generator from overloading. See Dynamic Charge Current Control (CCC) feature.
- **ALCO Enhancements** – enables the user to silence the alarms for a set duration (in minutes). The user may also enable or disable cutoff of each of the following when ALCO is pressed:
  - » Audible alarm
  - » Alarm relays
  - » E-mail
  - » SNMP
- **Printable Configuration (Config)** – enables the user to print the total CXC configuration (for a particular controller) via a Print button on the Logs&Files > Manage Configuration File page.
- **Equipment Inventory** – a new User Inventory page allows the user to enter up to twenty inventory items. Additionally, a System Inventory page enables the user to view a single list of all CAN connected devices, user inventory items and battery information items. Previously, devices would only be shown on the individual category pages; e.g., rectifiers connected shown on the Rectifier section.
- **SNMP Related Features**:

  *Add Trap Acknowledge (Inform)*: CXC will wait for SNMP Manager (software) to acknowledge that it has received a trap. If the manager does not acknowledge within a certain amount of time, the trap will be resent.

  *Timestamp Varbind*: Data added to the SNMP trap to indicate the time of the event that triggered the trap to be sent.

  *Alarm Trigger Varbind*: Data added to the SNMP trap that shows the analog value that triggered an alarm activation or deactivation.

  *Multiple Community Strings*: The user can enter more than one set of SNMP community strings. This is to permit multiple SNMP NMS programs, with different community strings, to connect to the CXC. A company with multiple NMS's, each in a different region, with a different community string, will find it easier to connect to the CXC from various places.
- **Static Calibration** – enables the Supervisor to calibrate Controller analog inputs and ADIO (except BCMC) analog inputs without the need for a live signal at the input; especially useful for calibrating current inputs for systems in the field.
- **Scheduler** – enables the Supervisor to use the system time and date as operands in custom alarm and signal equations.
- **Modbus® and SNMP** – additions were made for converter alarms and signals.

## 2.3 New Features and Fixes: Software Versions 1.3 through 1.97

### Version 1.97

**Cordex DC-DC Converter (CXD) Support** – enables Supervisor to configure converter settings, display and read analog values; similar to the system controller features applied to the Cordex rectifier series.

The converter defaults will be based on the system voltage if it is either 24 or 48Vdc.

Other features include:

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

### Version 1.95

- **Simplified BCT EQ Threshold** – from rate of change to an absolute current value. The BC Rate of Change setting used to be the rate of change of battery current in units of A/H. This setting has changed and is now BC Threshold in units of A.

### Version 1.93

- **ADIO Support for Cordex Battery Monitor System (BMS)** – enables connectivity with Alpha's new BCMC module – a Cordex Smart Peripheral – designed to monitor a number of voltages, currents and temperatures in battery strings via a number of remote devices that are managed through a ring data network. Configuration is performed in the signals section of the CXC's menus.

### Version 1.9

The following changes/updates have been incorporated into version 1.9 of the CXC software:

- **Web Interface** – provides more efficient access to software features. Speed/responsiveness has been improved over previous version (testing has shown up to four times faster). Each page can be accessed individually; for example, users with slow interfaces, such as modem, do not have to navigate to specific pages as before.
- **Modbus® Support** – enables CXC communication of alarms and live signals in RTU encoded data format using Modbus protocol (messaging structure developed by Modicon®) upon query via TCP to any Modbus supervisor or master.
- **Remote Battery Test Mode** – enables the Supervisor to define a condition (custom alarm) that will force a transition to battery test mode once the condition is met. BT mode stays active as long as the condition remains true. This feature is exclusive for the Cordex series of rectifiers.
- **ADIO Support for 4R/8D I/O Module** – allows configuration of this new module in the digital alarms or custom alarm sections of the menus; where the alarm condition can be associated with a digital input and mapped to a relay. The 4R/8D I/O module is a Cordex Smart Peripheral designed to expand the CXC I/O by four output relays and eight digital inputs.
- **Temp Comp in EQ Mode (enable/disable)** – allows the supervisor to enable or disable automatic battery temperature compensation in equalize mode independently from float mode.
- **Boost Mode** – 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.
- **Custom/User Alarms** – have increased in number from 5 to 20.
- **Battery Log** – 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.

### Version 1.8

The following changes/updates have been incorporated into version 1.8 of the CXC software:

- **Configuration File Enhancements** – enables the Supervisor to exclude settings and groups of settings when applying changes. A partial configuration file can be generated and sent to CXC (v1.81 above).
- **CXCI Modem Support** – enables connectivity to the CXCI's new front D-sub port with the Alpha modem and Alpha-supplied DB-9 cable.

### Version 1.7

The following changes/updates have been incorporated into version 1.7 of the CXC software:

- **12Vdc System Support** – enables the selection of system voltage as 12, 24, 48, 125 or 220Vdc.
- **Mixed Rectifier System** – enables the use of one type of Alpha Pathfinder model rectifier working in parallel with one type of Alpha Cordex model rectifier; e.g. PFM 48V-10kW with CXRF 48-3.6kW. The menu item Rectifier Protocol is no longer required and has been removed.
- **Safe Voltage** – enables the Supervisor to set the default system voltage (Safe Mode) in the event that communications to Cordex rectifiers should fail.

- **Site Number** – provides an additional line of text under Contact Information for convenient display of the Site Number.
- **Rectifier Report Enhancements** – provides new columns for device name and percentage of maximum output current (per rectifier).
- **Battery Information** – provides an additional window to enter/view the manufacturer's data for the batteries in the system; e.g., for inventory purposes.
- **Alarm Configuration Screen Enhancements** – provides a list of all alarms in one place (via web browser). The configuration of most alarms may be done on this one screen.
- **Alarm Tone** – enables the Supervisor to enable/disable the audible alarm buzzer (tone).
- Battery Test Alarm – provides a warning to indicate that a Battery Test is in progress.
- **Invalid Battery Voltage Alarm** – provides for indication of invalid battery charging voltage; e.g., in the event that the sense leads have become disconnected.
- **SNMP Enhancements** – provides SNMP/Severity level (numeric) and enables CXC supervisor to set the scheme.
- **AC Mains Voltage Correction** – provides the means to apply a correction factor to the reading coming from the rectifier.
- **ADIO Enhancements** – enables the Supervisor to configure individual signals for an ADIO (Analog Digital Input Output) Device; i.e., Cordex Smart Peripherals.
- **Custom Signal Units** – enables the Supervisor to set the units value for Custom Signals; e.g., V, AH, mm, etc.
- **LVD DOD Control** – enables the Supervisor to configure each LVD control for activation once the percentage of Depth of Discharge (DOD) has increased above a threshold.
- **SNMP Community Settings** – enables the Supervisor to configure CXC SNMP community settings.
- **SNMP Trap Recovery** – enables the CXC SNMP agent to hold traps in a buffer during a network block out.
- **Event Notifications** – **Multiple SNMP and SMTP Destinations** – enables the Supervisor to add up to eight (8) separate destinations for SNMP and SMTP dial-out or e-mail notifications.
- **Test Relays** – provides a message of warning to the CXC operator before allowing the toggling of an LVD relay and allows the user to cancel the operation.
- **Alpha MIB File Enhancements** – 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 compatible with already defined alarms and signals.
- **Log File Cleanup** – provides improved event log file management by filtering and condensing repetitive rectifier events on a daily basis. File retrieval has been updated for sorting by name and by chronological order. The display of log information has also been improved for ease of user navigation.
- **Passwords for Supervisor and User** – provides two levels of password protection – the same password cannot be used for both Supervisor and User.

### Version 1.6

The following changes/updates have been incorporated into version 1.6 of the CXC software:

- **CXCI Support** – enables connectivity with Alpha' new CXCI (controller used in small power Cordex integrated rectifier systems) where system setup is performed with the CXC web interface alone.
- **IP Address Reset** – provides a means to reset the IP address of a CXC without a touch screen display.
- **SNTP Support** – enables synchronization of device time with an external source (see www.NTP.org).
- **LCD Touch Screen Calibration** – enables user to fine-tune the accuracy of the touch screen on site.
- **Default Values for Dynamic (Editable) Text Files** – may be restored to factory settings.
- **Calibrate Analog Inputs** – feature has been improved for web interface.

### Version 1.5

The following changes/updates have been incorporated into version 1.5 of the CXC software:

- **Urgent AC Mains Fail Alarm** – provides indication of alarm condition. This major alarm has a time delay; the default activation value is ten (10) minutes.
- **AC Phase Voltage Measurement** – enables assignment (mapping) of rectifiers to a phase for individual phase voltage readings.
- **SNMP Trap Dial-out** – enables dialup connection from CXC to SNMP manager PC over intranet via corporate intranet RAS (remote access server) port. This setup is similar to an e-mail RAS client.

### Version 1.4

The following changes/updates have been incorporated into version 1.4 of the CXC software:

- **220Vdc System Support** – enables the Supervisor to select the system voltage as 24V, 48V or 220Vdc.
- **CAN Communications Protocol** – expanded to include Alpha's new Cordex Shunt Multiplexer.
- **Web Interface Additions** – provides submit (changes) button on top of every page, data logging, LVD countdown timer, and relay text labels can be edited.

### Version 1.3

The following changes/updates have been incorporated into version 1.3 of the CXC software:

- **Communications Protocol Selection** – enables the Supervisor to set the communications protocol for either the Cordex series (CAN) or Pathfinder series (RS-485).
- **E-mail** – enables communication of alarms via Ethernet or modem.
- **Enhancements to Battery Features** – enables live Battery Discharge parameters to be viewable via Battery Log.
- **Enhancements to Event Logging & Statistics** – provides tracking of several parameters on a daily basis, such as battery current information.
- **Equation Builder for Custom Alarms & Signals** – 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 Fan Fail) utilizing logical and arithmetic arguments that simulate the functionality of a programmable logic controller (PLC).
- **Modem Support** – expanded for web connections via PPP using modem (internal or external) with CXCP or CXCR models.
- **Third Language Support** – provides for multiple language files; which can be uploaded via web interface.

# 3. Quick Start

## 3.1 Applying Startup Power

1. Initiate startup routine by applying power to the CXC; e.g. close battery breaker or close converter and rectifier input and output breakers. The power module AC ON LED illuminates.

**NOTE:**

**The CXC will perform a short self-test as it boots up. Alarm alerts are normal. The LEDs perform a scrolling pattern to indicate there is activity. Please wait.**

2. Connect a laptop to the CXC controller with a network crossover cable.
3. Set Laptop IP Network settings (**Start > Control Panel**)
   - I**P address: 10.10.10.202**
   - **Subnet mask: 255.255.255.0**
4. Turn off Pop-up Blocker.
5. Set your IE browser to run in compatibility mode. Enter the IP address of the controller (**10.10.10.201**) in the web address bar.
6. If asked, allow MSXML to run. Message similar to this will display:
   "This website wants to run the following add-on, MSXML from Microsoft Corporation. If you trust the website and the add-on, click run."


7. Login to the CXC controller using the default supervisor password.
   - Username: your company name and your initials
   - Password: **1234**
8. Language selection: **English**
9. Set correct date and time (**Controller > Date & Time**).
10. Check and adjust alarms and control levels in the corresponding **Alarms** and **Controls** submenus.
11. Check and adjust group settings in the **Converters** and **Rectifiers** submenus; e.g. float, equalize voltage, etc.
12. Program the Batteries **Temp Comp** and **Auto Equalize** settings as needed.

## 3.2 Troubleshooting Tips

### 3.2.1 Converter and Rectifier Tips

The Cordex Converter (CXD) Rectifier (CXR) series modules are plug and play. When a CXD or CXR module is added to the system, the CXC will detect and update the inventory automatically.

If CXD or CXR module communication has failed or a module has been removed from the system, a **Rectifiers > Inventory Update** or a **System> Inventory Update** must be initiated manually.

If the Inventory Update fails:

- Check cable and connections.
- Check settings under **System Info > System Configuration** for correct voltage.

For the Pathfinder series of rectifiers, ensure that the:

- Rectifiers are in NORMAL OPERATING MODE
- REMOTE ACCESS is ENABLED
- REMOTE ADJUST is ENABLED
- BAUD RATE is set to 9600 baud

### 3.2.2 Cordex Controller Tips

Use the CXC LCD or web interface to ensure that the operating levels (e.g. input/output voltage, converter voltage, etc.) are within operating parameters of alarm and control thresholds.

# 4. Standard Features

The CXC provides centralized setup, control and monitoring of a communications power system.

## 4.1 Password Security

Two levels of password security are available: The default password for the Supervisor is (1234) and for the User is (5678):

- Supervisor has write access to all editable fields.
- User has permission to navigate through menus, but no changes are permitted.

The User password can only be changed by the Supervisor from the web interface (see 8.12.1).

## 4.2 Software Configuration Loading and Updates

Factory software updates and adjustments to the configuration file are available 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).

## 4.3 Mixed Rectifier System

All controllers 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 (section 6.7.2). In some cases, such as the battery test algorithm, the system functionality is limited to that of the Pathfinder rectifiers while the communications equals that of the Cordex controller.

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

## 4.4 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.

## 4.5 Power Save (see Power Save on page 64)

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 6.8.4.4.

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

The Power Save feature does not work with the Alpha RSM 48/100 series of rectifiers.

## 4.6 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 (6.8.1) or Equalize (6.8.2) mode.

Temperature inputs are available on the CXC for monitoring a battery string's temperature. 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.

### 4.6.1 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, every 60 seconds, 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.

### 4.6.2 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 Temp Comp 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 delayed 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 "8.5.2.2 Temperature Compensation" on page 69.

## 4.7 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.

### 4.7.1 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.

### 4.7.2 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.

### 4.7.3 Battery Current Termination (BCT) Equalize

The BCT Equalize feature provides an alternative method of ending the EQ mode early to prevent over-charging 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.

## 4.8 Battery State of Charge Estimation and Charge Current Control

The Battery Sate of Charge feature enhances CXC 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. The minimum charge current is limited by the minimum current that a rectifier can deliver.

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. Note that the minimum charge current is limited by the minimum current that a rectifier can deliver.

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 State of Charge feature is enabled and the battery is sourcing current to the load, a time estimate appears in the View Live 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 prediction improves as the battery undergoes more discharge cycles.

## 4.9 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 8.8.2.3.

## 4.10 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".

## 4.11 Statistics and Data Logging

The CXC is capable of recording different sets of data on a daily or on an "as configured" basis. These include analog statistics, battery log data, system events and user configurable data logs

These data sets are stored in persistent memory and can be accessed via a web interface (see Data Logging in Section 8.7.3). The logged data can be viewed in a web browser and the file can be save in a comma delimited format so it can automatically viewed in rows and columns in MS Excel. The data is stored on a first-in-first-out basis except for the event log which is sorted by date and time stamp.

### 4.11.1 Analog Statistics

Analog 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 |

### 4.11.2 Battery Log

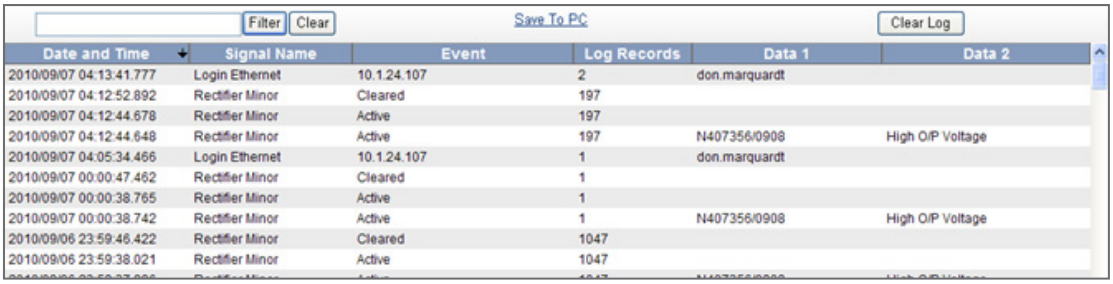
A maximum of 40 records can be logged for battery statistics and events. The Battery Log contains the following:

| | |
|---|---|
| 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. When the batteries have fully recharged the battery test ends and the information is logged as the top line in the historical portion of the battery log. 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.

### 4.11.3 Event Log

The CXC can record up to 500 events. Each event is stamped with the date and time. Multiple events are time stamped for the first daily occurrence and then the total is shown at the last daily occurrence.




| Date and Time | Signal Name | Event | Log Records | Data 1 | Data 2 |
|---|---|---|---|---|---|
| 2010/09/07 04:13:41.777 | Login Ethernet | 10.1.24.107 | 2 | don.marquardt | |
| 2010/09/07 04:12:52.892 | Rectifier Minor | Cleared | 197 | | |
| 2010/09/07 04:12:44.678 | Rectifier Minor | Active | 197 | | |
| 2010/09/07 04:12:44.648 | Rectifier Minor | Active | 197 | N407356/0908 | High O/P Voltage |
| 2010/09/07 04:05:34.466 | Login Ethernet | 10.1.24.107 | 1 | don.marquardt | |
| 2010/09/07 00:00:47.462 | Rectifier Minor | Cleared | 1 | | |
| 2010/09/07 00:00:38.765 | Rectifier Minor | Active | 1 | | |
| 2010/09/07 00:00:38.742 | Rectifier Minor | Active | 1 | N407356/0908 | High O/P Voltage |
| 2010/09/06 23:59:46.422 | Rectifier Minor | Cleared | 1047 | | |
| 2010/09/06 23:59:38.021 | Rectifier Minor | Active | 1047 | | |

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. If the system date/time is changed events may not display chronologically.

### 4.11.4 Data Logging

Data logging allows the user to perform complex/custom configurations of data gathered by the controller. Various ways of setting the log frequency/limit and start/stop triggers enables greater management of the events for collection. Data is stored in files showing the records associated with each for easy archiving and retrieval. File Save Option allows the supervisor to select a FIFO (first in first out) or “Stop when full” means of data collection. The controller supports up to 16 datalogs. Each one may have a different set of signal values and logging attributes. 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.

# 5. Overview of the LCD Screen

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

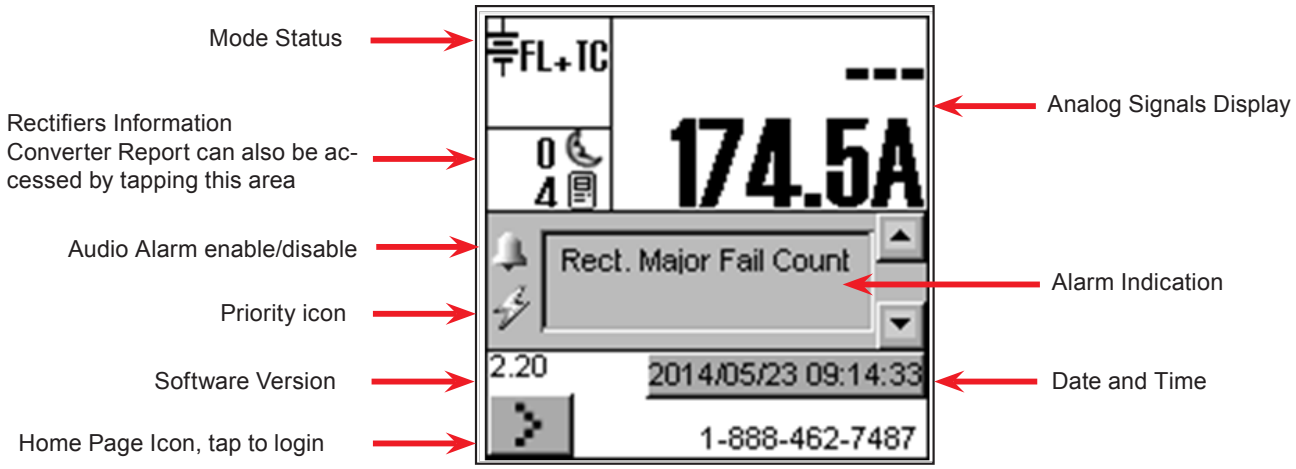



**Figure 3 —** CXC default operating screen

### 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.

## 5.1 LCD Adjustments

### 5.1.1 Contrast Adjustments

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.

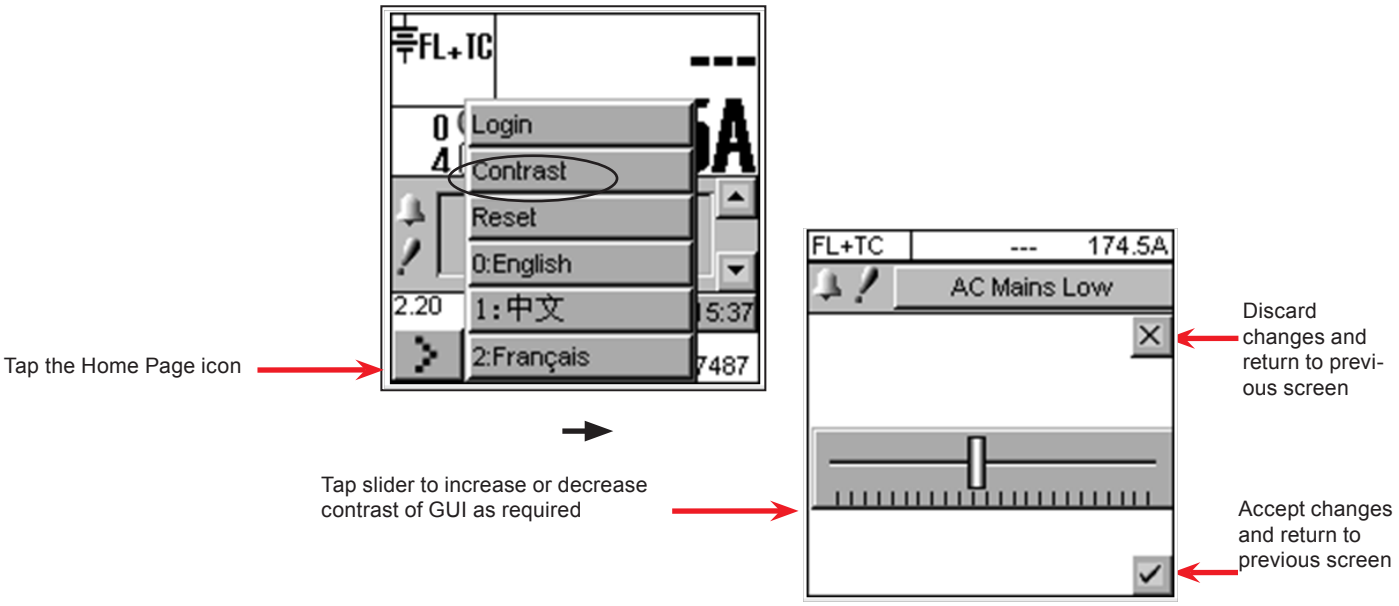


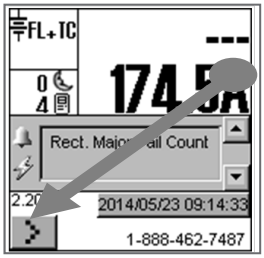

**Figure 2 —** Contrast adjustment pop-up window

### 5.1.2 LCD Touch Screen Calibration

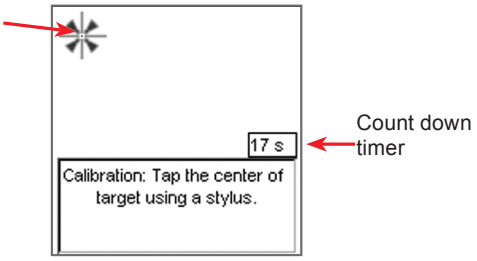
Perform the following steps to calibrate the touch screen from the home screen: Complete each step within 20 seconds or the calibration is ignored.

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

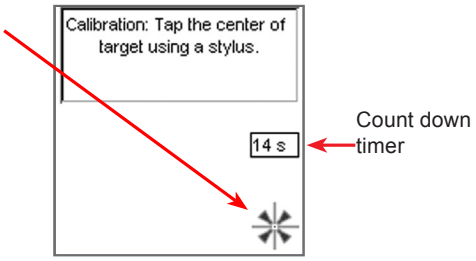
1. Perform a diagonal action or "swipe" from the top right area of the LCD to the bottom left area:




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:



## 5.2 Menu Navigation - LCD

Refer to Figure 6 for the LCD menu structure.

### 5.2.1 Login (password entry)

NOTE If the CXC is already accessed remotely, 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**.

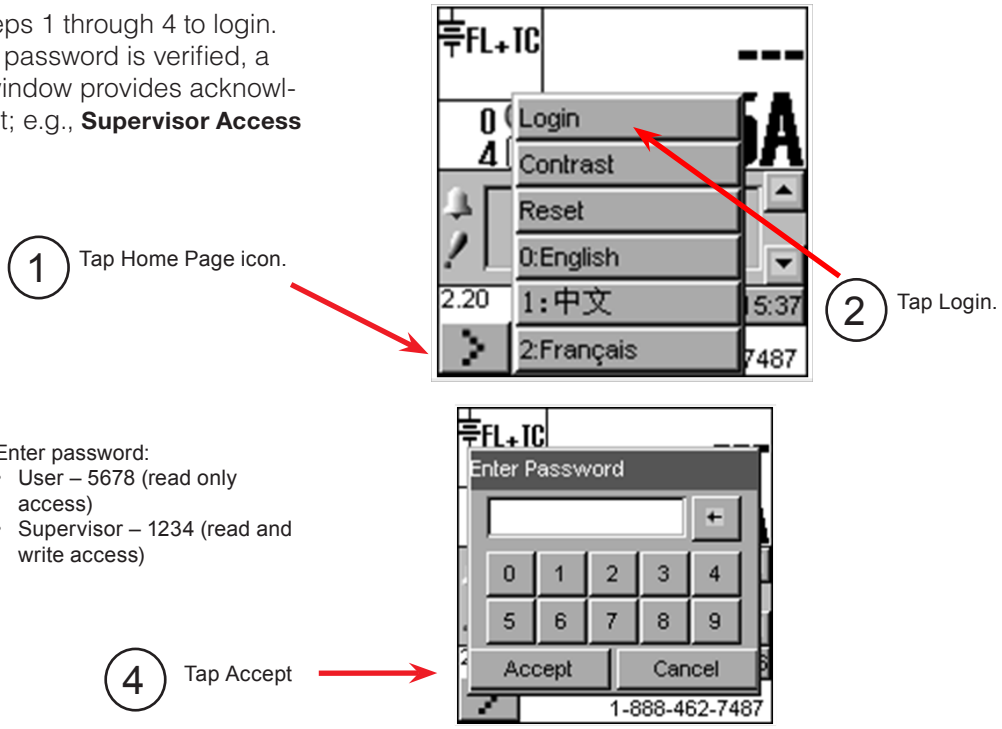



**Figure 4** — Login procedure

### 5.1.3 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 Figure 6 on page 29 for the complete LCD menu structure and Chapter 8 for a complete description of the menu options.

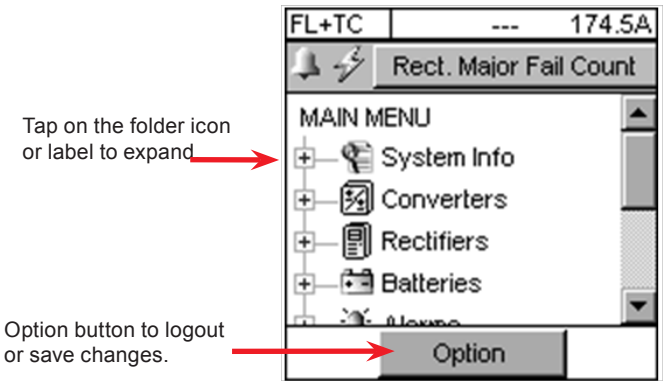



**Figure 5** — Menu navigation screen

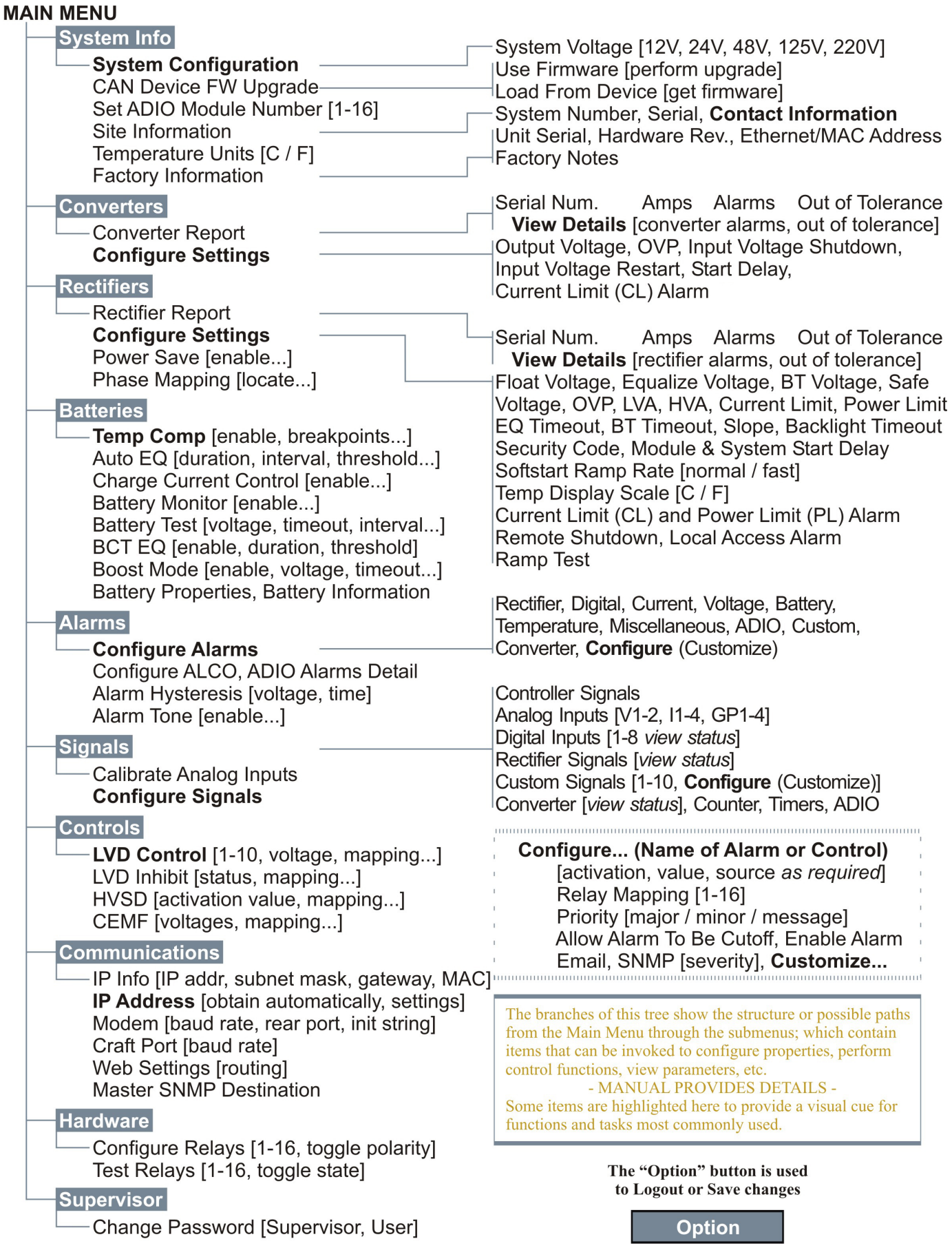



**Figure 6 —** LCD Menu structure

### 5.2.2 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.

### 5.2.3 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.

### 5.2.4 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.

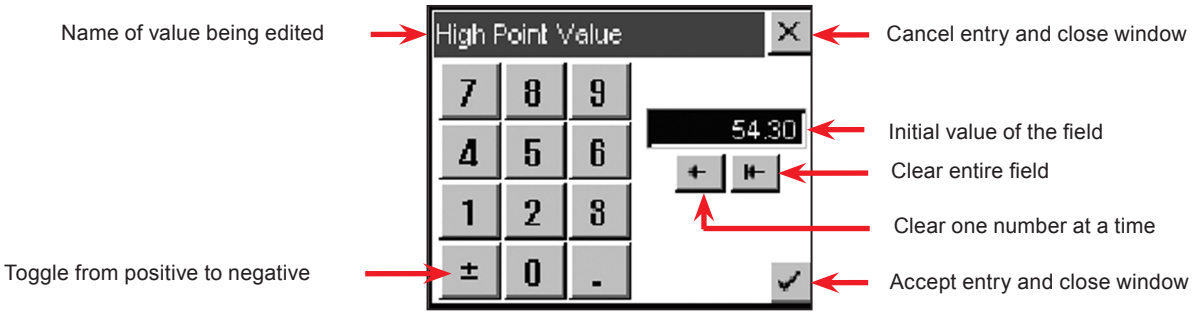



**Figure 7 —** Virtual numeric keypad pop-up window

# 6. Using the LCD Screen

This section briefly describes operation with an LCD interface.

## 6.1 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 screen shot of the home page. Use a stylus pen to activate navigate through the touch sensitive screens.

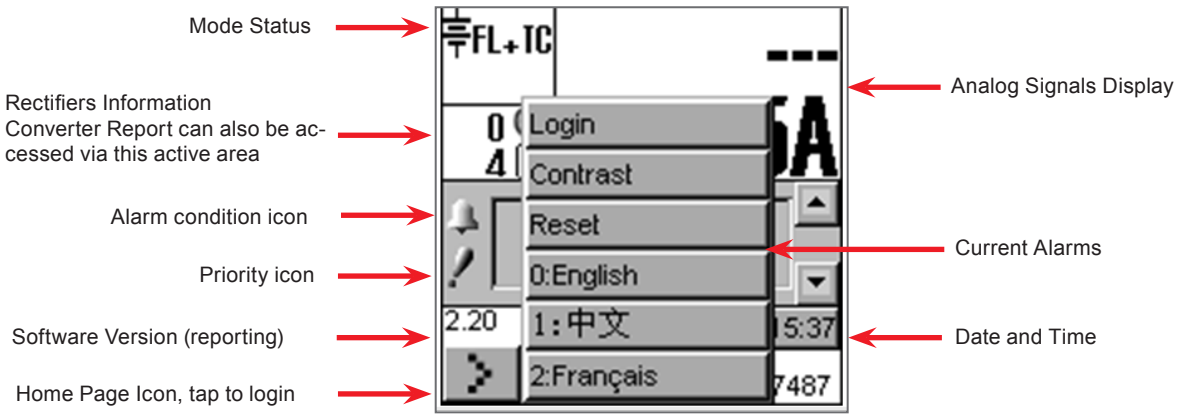



**Figure 8 —** CXC home page

## 6.2 Language Selection

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. Text labels and messages are displayed in the chosen language.

The CXC can be set up for a maximum of three language files (two default plus one other). Additional language files can be uploaded from a web interface.


**Figure 9 —** Language selection on home page

## 6.3 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.

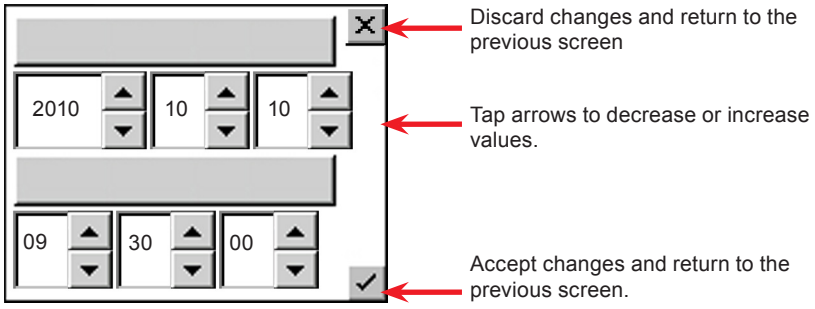



**Figure 10 —** Setting the Date and Time

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.

## 6.4 Resetting and Powering Down

### 6.4.1 Reset

**CAUTION!**

**During reset, the Controller may need to run a defragmentation cycle. Cycling of the LEDs on the front panel indicate that defragmentation is in progress. Full defragmentation can take up to 20 minutes. 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 display. A new pop-up window displays stating "You are about to perform a system reset."
2. To stop 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.

### 6.4.2 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."

## 6.5 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.

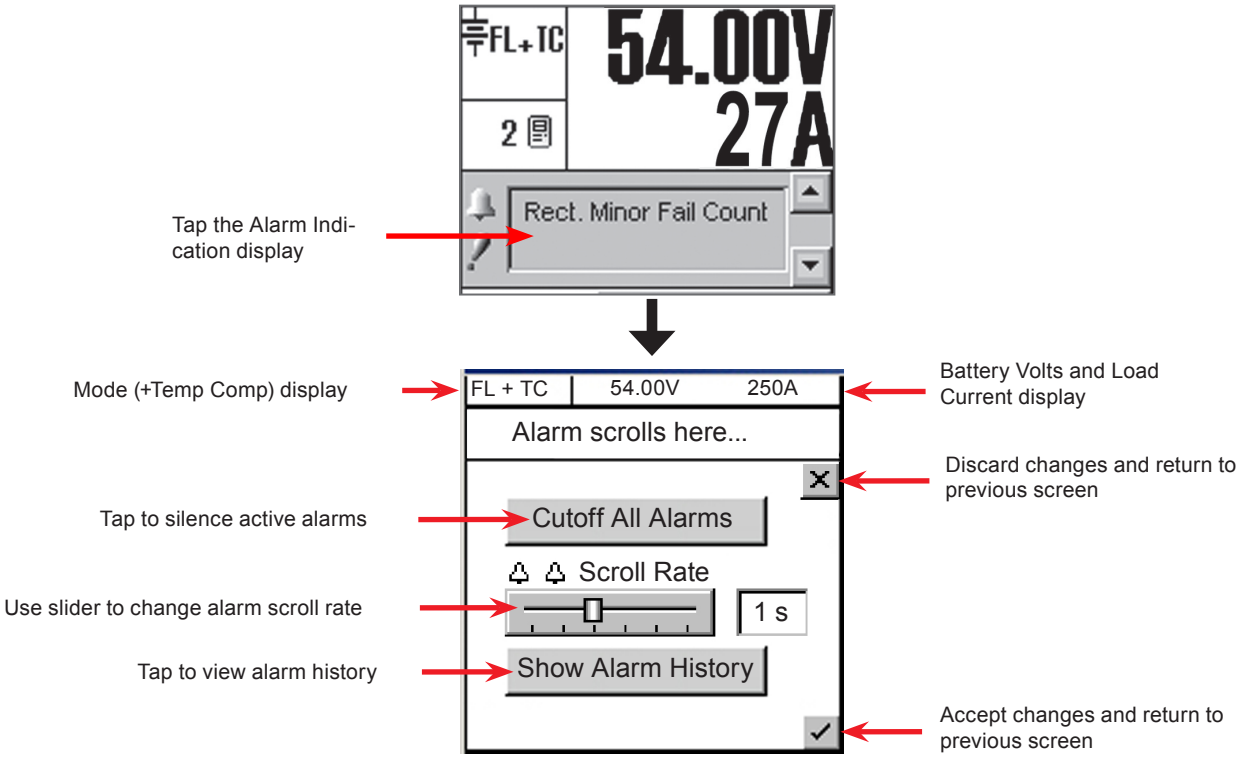



**Figure 12** — Alarm indication display screen

### 6.5.1 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):

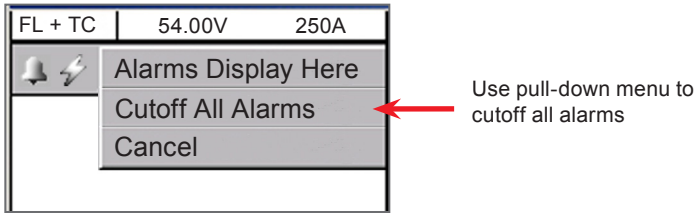



**Figure 11** — Alarm cutoff pull-down menu

### 6.5.2 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:

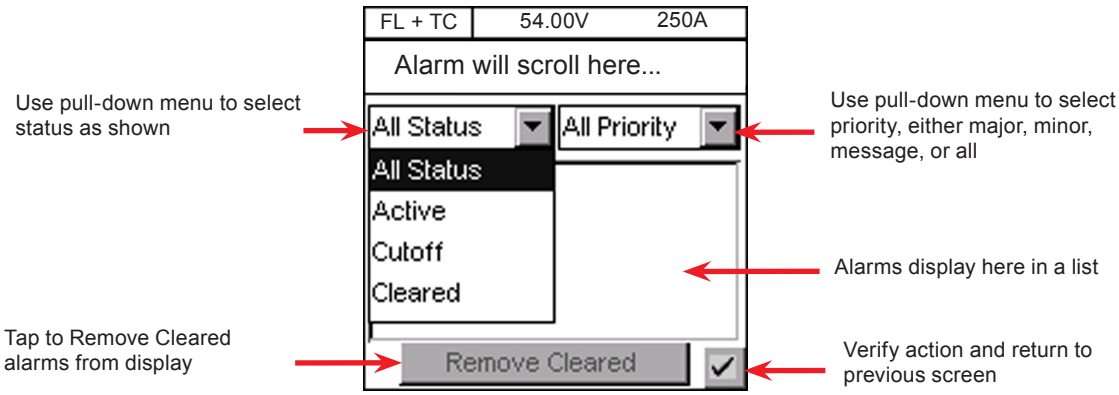



**Figure 13 —** Alarm History screen

### 6.5.3 Alarm Configuration

Login to the controller and select Alarms from the main menu (see section 5.2 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 8.6.

## 6.6 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).

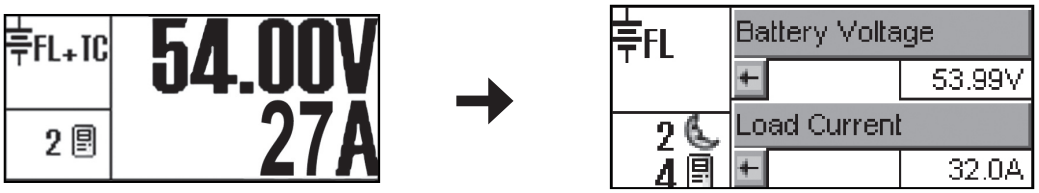



**Figure 14 —** Analog Signals display area of the home screen

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 5.2 for menu navigation). Section 8.7.2 has detailed instructions for reviewing and configuring signals.

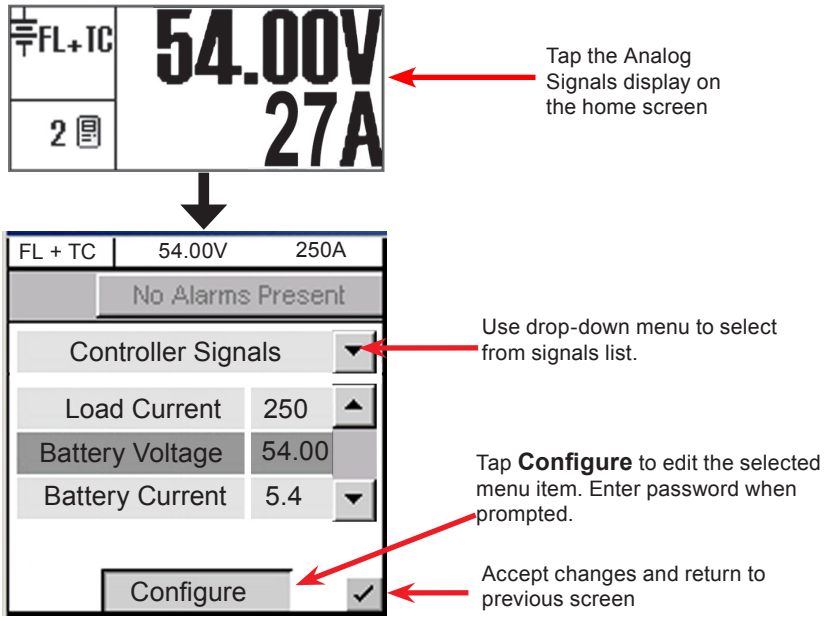



**Figure 15 —** Signals display screen

Use the pull-down menu to select one of the following signals. For more information refer “Signals” on page 88

| | |
|---|---|
| **Controller Signals** | Tap the Configure button to produce another window with a list of items to navigate. |
| **Analog Inputs** | Tap the Calibrate button to produce another window and list of items to navigate |
| **Digital Inputs** | Provides a list of digital inputs, see “Table C — Digital input channel assignments” on page 80. |
| **Rectifier Signals** | Provides a list of rectifier signals, see Table E on page 143. |
| **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 F on page 143. |
| **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. |

## 6.7 Rectifiers (and Converters) Information

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

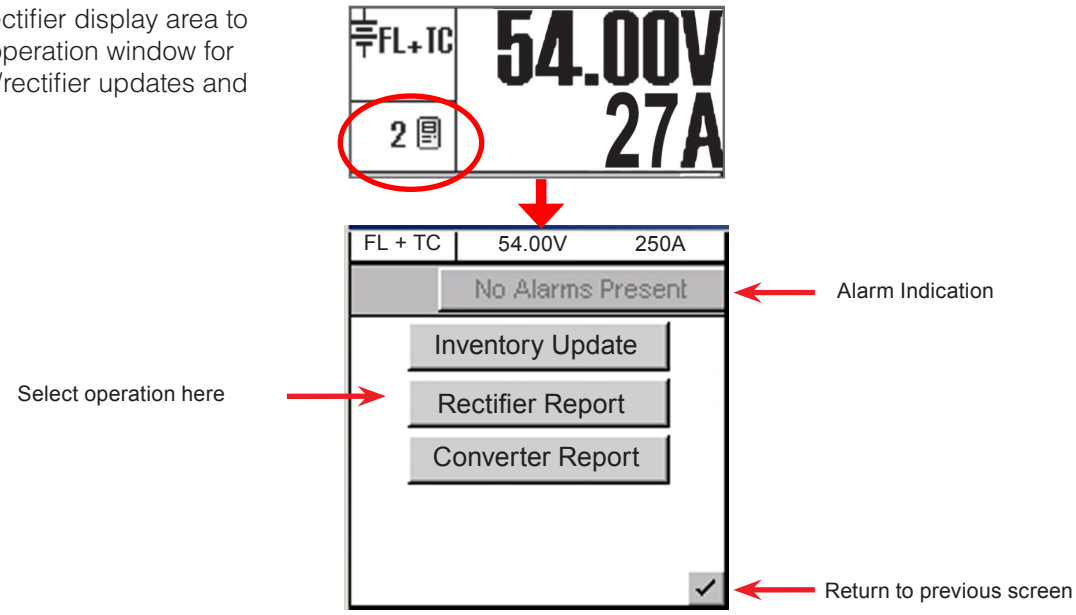



**Figure 16 —** Update (inventory) and report selection screen

### 6.7.1 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.

### 6.7.2 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).

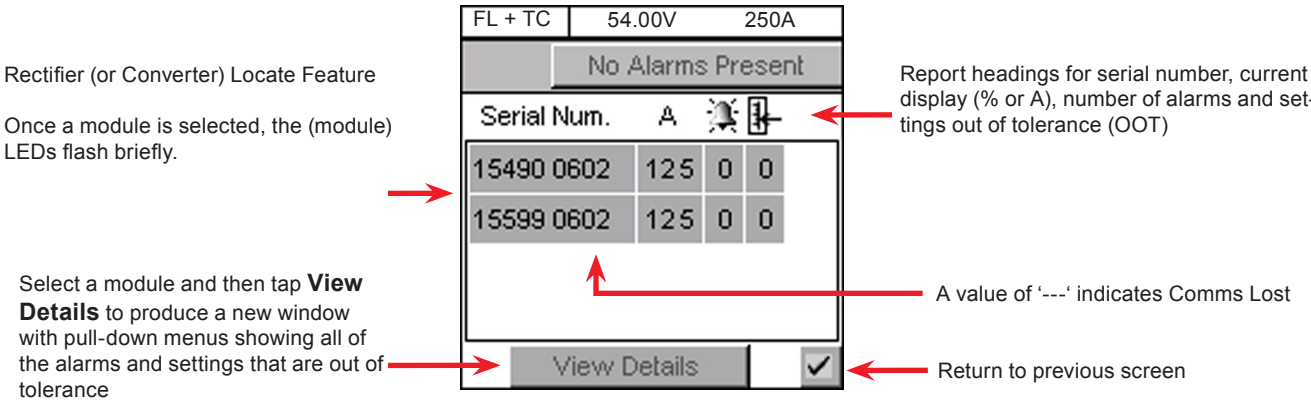



**Figure 17 —** Rectifier (or Converter) report screen

### 6.7.3 Basic Programming Example

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

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.

## 6.8 Mode Status and Temp Comp Indication

The CXC has four modes of operation: float (FL), equalize (EQ), boost (BST) and battery test (BT). The mode, along with temperature compensation (TC or Temp Comp) activation, is indicated in the top left “active area” of the GUI. The time duration, until the mode changes, will also be shown in that active area.

Tap this active area to enter a new screen, or window of operation, for mode selection, see below:

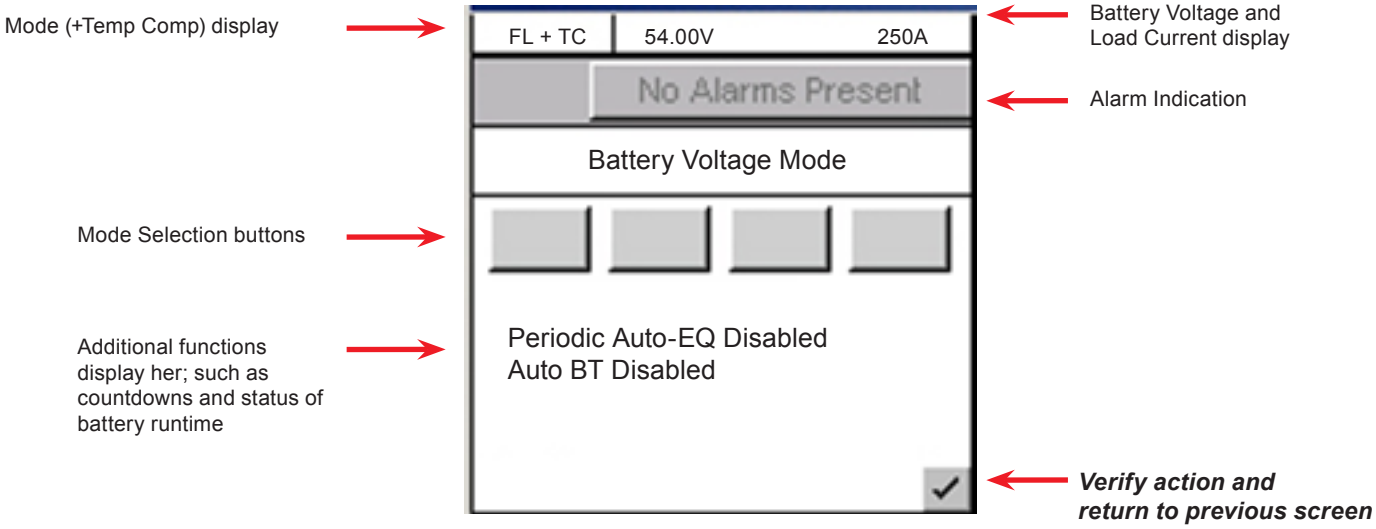



**Figure 18 —** Figure 7–Mode selection screen

### 6.8.1 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"Configure Settings (Main Menu > Rectifiers > Configure Rectifiers)" on page 61. Do not adjust the float voltage of the rectifiers when they are in Current Limit.

### 6.8.2 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 8.4.2 on page 61

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 8.4.2 on page 61 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 displays the time until FL mode in hours.

### 6.8.3 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.

### 6.8.4 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) |
| 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 8.5.3.5 on page 74 |
| Remote BT | The system also has the capability of a battery test being triggered remotely using a custom signal. |

#### 6.8.4.1 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.

#### 6.8.4.2 Tips on Using the BT Mode

Use Charge Current Control 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 (Figure 14 on page 34) 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 Controller Signals display; it 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 Controller Signals display at any time before, during or after the test.

### 6.8.4.3 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.

### 6.8.4.4 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.

### 6.8.4.5 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.

### 6.8.4.6 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.

### 6.8.4.7 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.

#### 6.8.4.8 Cancelling BT Mode

BT mode can be cancelled by changing mode to FL or EQ

#### 6.8.4.9 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.

#### 6.8.4.10 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.

# 7. Operation Using the Web

## 7.1 Communication Settings

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

1. Verify/ set CXC controller LCD network IP parameters:
   a. **IP address**: **10.10.10.201** (factory default)
   b. **Subnet mask**: **255.255.255.0**
2. Logout.
3. Connect a laptop to the CXC controller with a network crossover cable.
4. Laptop IP Network settings (Start > Control Panel):
   a. **IP address**: **10.10.10.202**
   b. **Subnet Mask**: **255.255.255.0**
5. Turn off Pop-up Blocker.
6. Set your IE browser to run in compatibility mode.
7. Enter the IP address of the controller (**10.10.10.201**) in the web address bar.
8. If asked, allow MSXML to run. Message similar to this will display:
   "This website wants to run the following add-on, MSXML from Microsoft Corporation. If you trust the website and the add-on, click run."


9. Login to the CXC controller.
   a. **Username**: your initials or other unique identifier
   b. **Password**: 1234
10. Language selection: **English**
11. Set correct date and time (Controller > Date & Time)

## 7.2 Login

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.

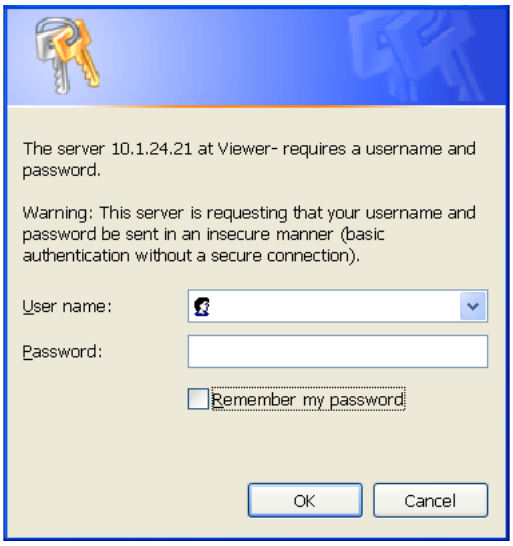



**Figure 19 —** Login Screen - Web Interface

**Default Passwords:**

| | |
|---|---|
| User | 5678 |
| Supervisor | 1234 |

A Supervisor can navigate through the menus and change values.

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

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).

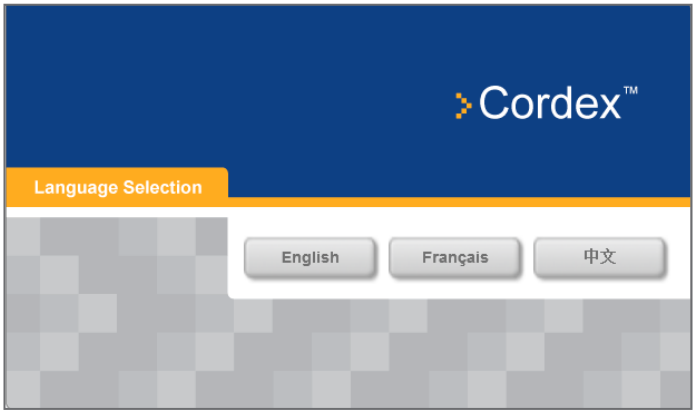



**Figure 20 —** Language Selection - Web Interface

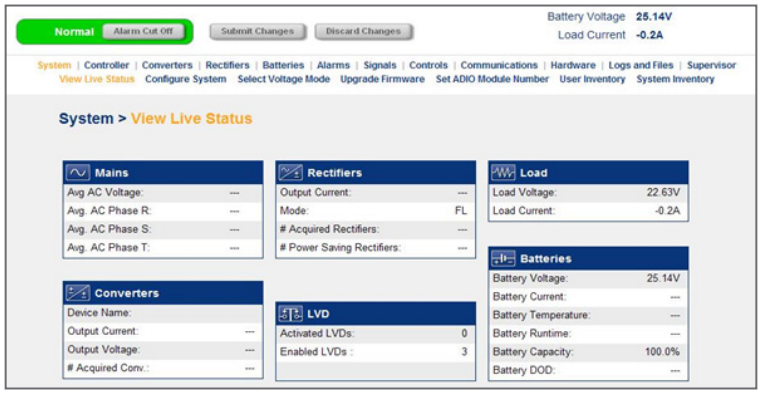
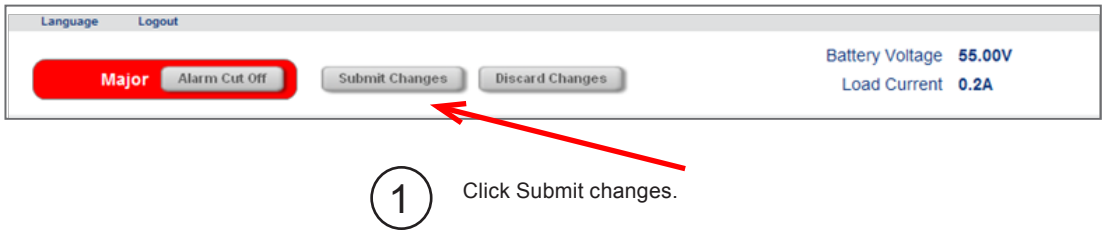



**Figure 21 —** Web Interface Window (sample home page)

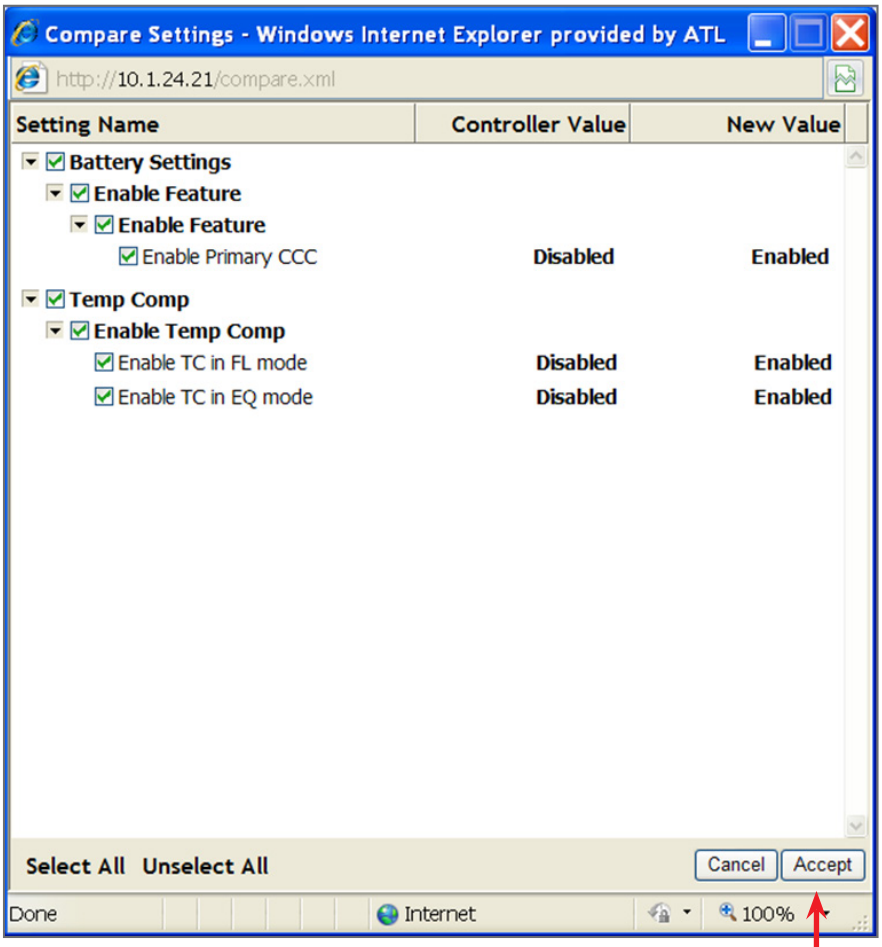
## 7.3 Saving Changes

The following two screens show the two steps required to save a change to the controller. This example shows a change to the battery settings and the Temp Comp. When setting up the controller you must save your changes for them to take effect and to be remembered when the system is restarted.

Clicking Submit Changes is required to save most changes to save them. Some are saved by clicking Apply or Save.




1 Click Submit changes.




2 Click **Accept**.

**Figure 22 —** Saving Changes - Web Interface

## 7.4 Alarm Display and Configuration

### 7.4.1 View Alarms

An Alarm summary is visible on the home screen. Use the up/ down arrows to scroll through the active alarms.

Click the link in the alarm summary box to display all alarms. Alternatively select **Alarms > View Live Status** from the main menu.

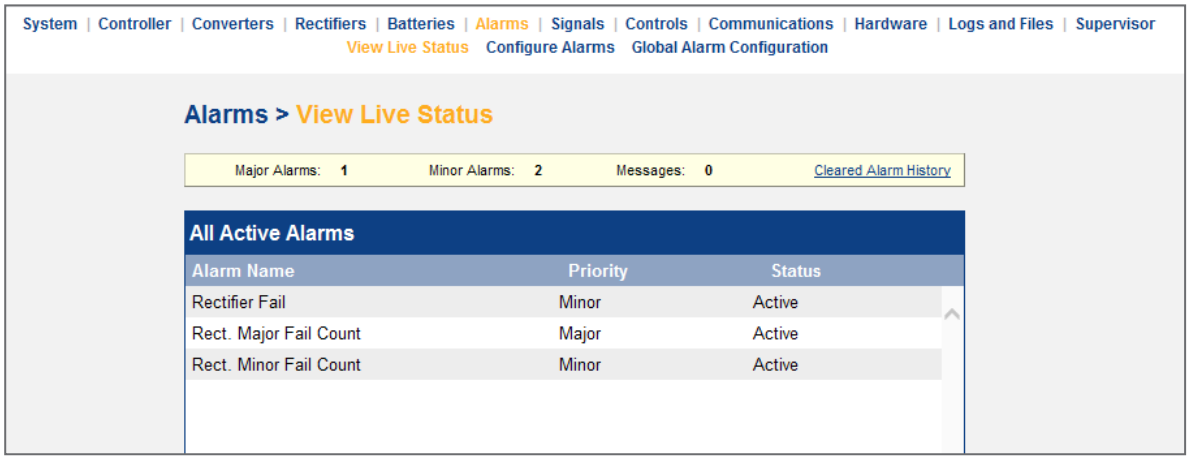



**Figure 23 —** Alarms - Home page

### 7.4.2 Alarm History

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

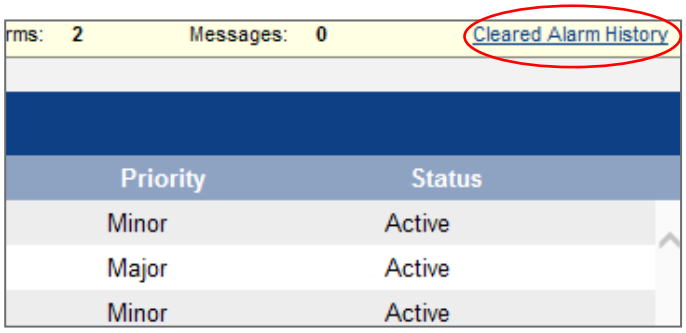



**Figure 24 —** Alarms history

### 7.4.3 Silence all Alarms

Click the Alarm Cutoff button 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.

## 7.5 Saving Configuration Files

Manage Configuration File menu allows you to either save the complete configuration or just the appropriate portions.

When all changes are made, select **Main Menu > Logs and Files > Manage Configuration File** to upload and save the configuration file for your controller.

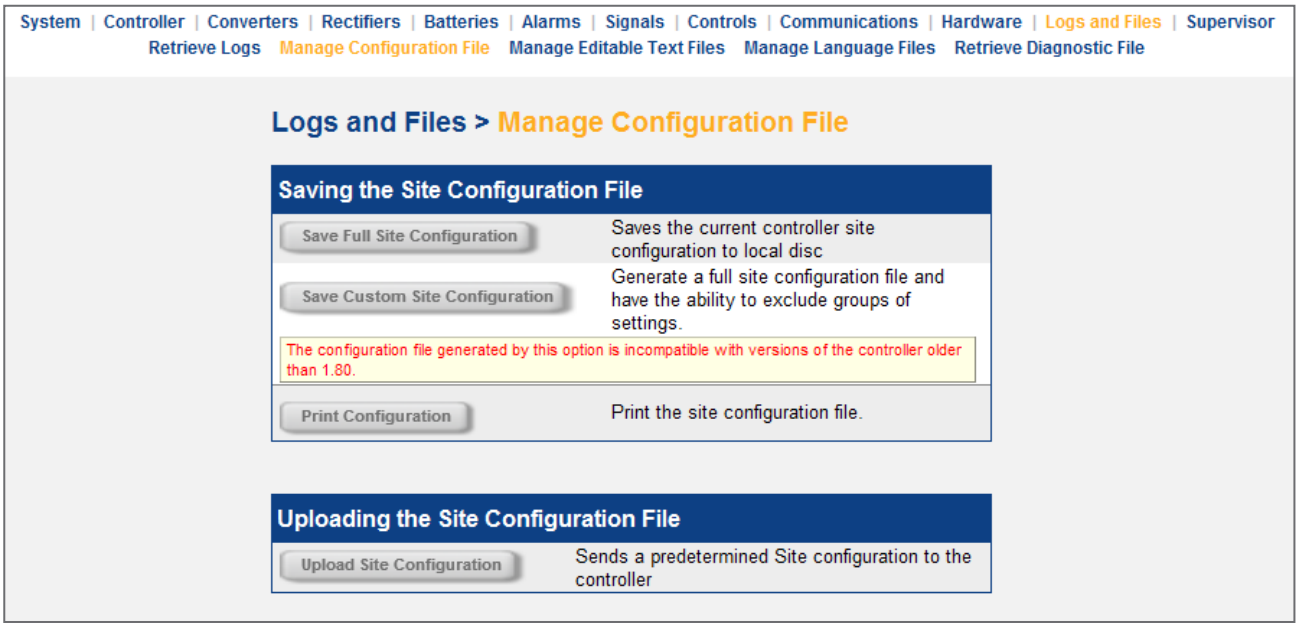



**Figure 25 —** Manage Configuration File – Web

## 7.6 Summary of Menu Navigation

**Table A — Web Interface Menu Structure**

| Menu | Sub-Menu | Menu | Sub-Menu |
|---|---|---|---|
| **System** | » View Live Status<br>» Configure System<br>» Select Voltage Mode<br>» Upgrade Firmware<br>» Set ADIO Number<br>» User Inventory<br>» System Inventory<br>» Inventory Update | **Controller** | » View Live Status<br>» Factory Information<br>» Date and Time<br>» Temperature Units<br>» Upgrade Software<br>» Upgrade Bootloader<br>» Reset |
| | | | |
| **Converters** | » View Live Status<br>» Configure Converters | **Rectifiers** | » View Live Status<br>» Configure Rectifiers<br>» Inventory Update<br>» Power Save<br>» Rectifier Phase Mapping |
| | | | |
| **Batteries** | » View Live Status<br>» Configure Batteries<br>» Battery Information | **Alarms** | » View Live Status<br>» Configure Alarms<br>» Global Alarm Configuration |
| | | | |
| **Signals** | » View Live Status<br>» Configure Signals<br>» Configure Data Logging<br>» ADIO Device Configuration | **Controls** | » View Live Status<br>» Configure Controls |
| | | | |
| **Communications** | » View Live Status<br>» Configure Communication Parameters<br>» Event Notification Destination<br>» SNMP Configuration | **Hardware** | » Configure Relays<br>» Test Relay<br>» Test Modem |
| | | | |
| **Logs and Files** | » Retrieve Logs<br>» Manage Configuration File<br>» Manage Editable Text Files<br>» Manage Language Files<br>» Retrieve Diagnostic Files | **Supervisor** | » Change Password |

# 8. System Menus

The CXC Controller has two different user interfaces. Once is web based (See Table A) and the other is LCD based (See Figure 6).

This chapter describes each of the menu items arranged as they appear based on the WEB interface. The LCD equivalents are added as appropriate throughout this section and if significantly different in appearance or functionality some details will be added

## 8.1 System

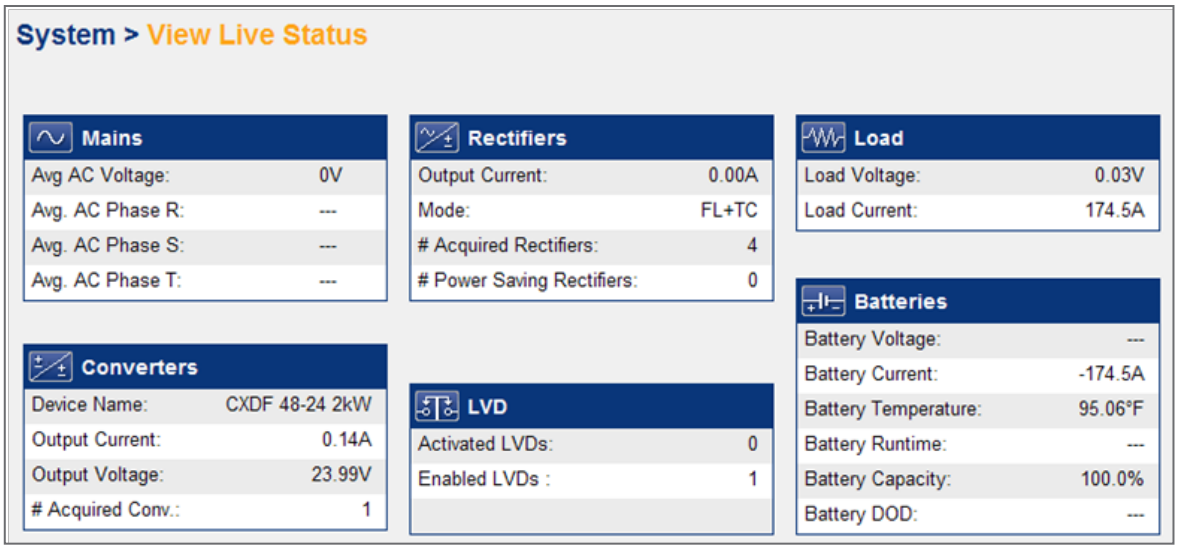
These menu items allow the user to view and change or configure, where appropriate, items that affect the overall system.


### 8.1.1 View Live Status (Web only)

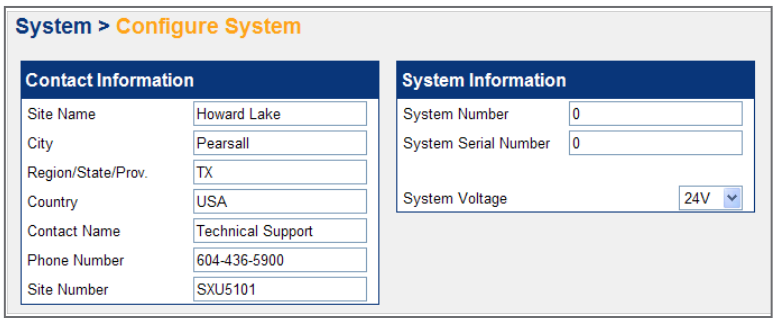
This displays the values of many system parameters important to the running of your Cordex System. These values are updated approximately once per second.

### 8.1.2 System Configuration

This sub-menu allows the user to enter contact information for this controller, and also allows the customer to select the System Voltage that is appropriate for their system.




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



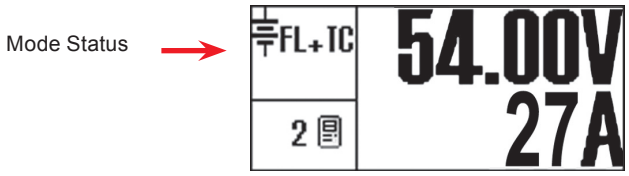
### 8.1.4 Select Voltage Mode

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 6.8.1 to 6.8.4 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.

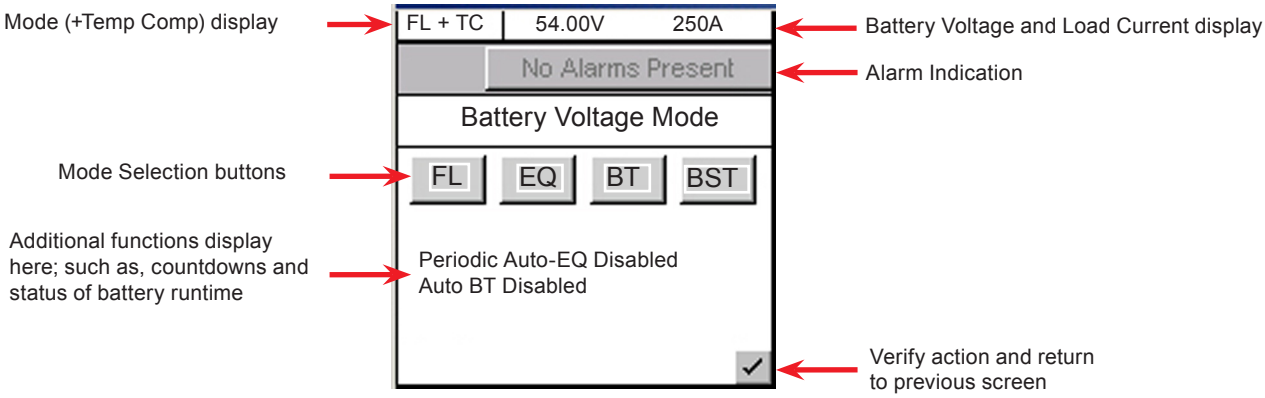



**Figure 26 —** Mode selection screen

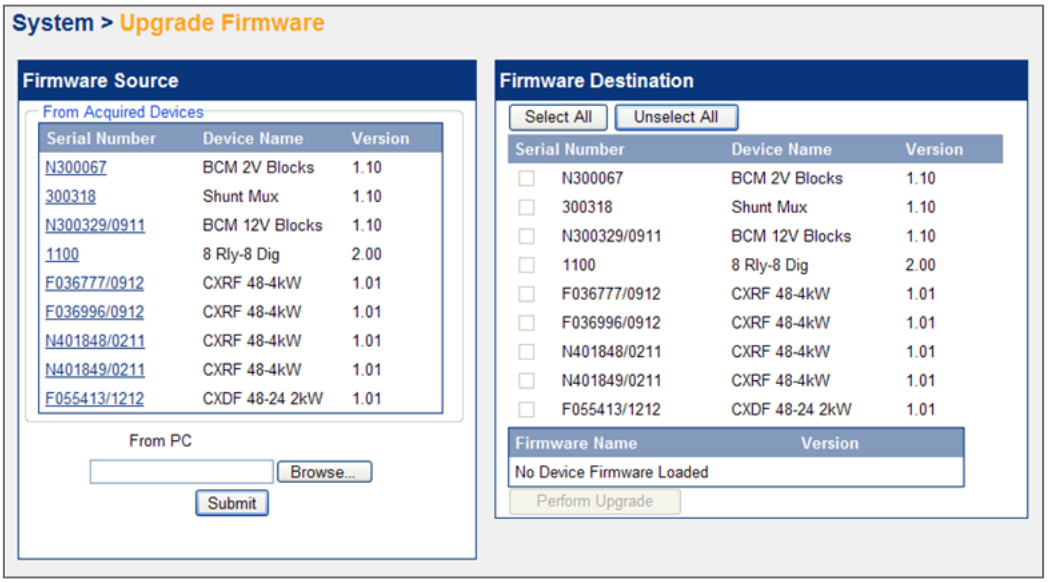
### 8.1.3 Upgrade Firmware (Cordex Series only)

Alpha may occasionally release new versions of the firmware that runs on Alpha devices. When a new version of the firmware is released it may be necessary to upgrade.

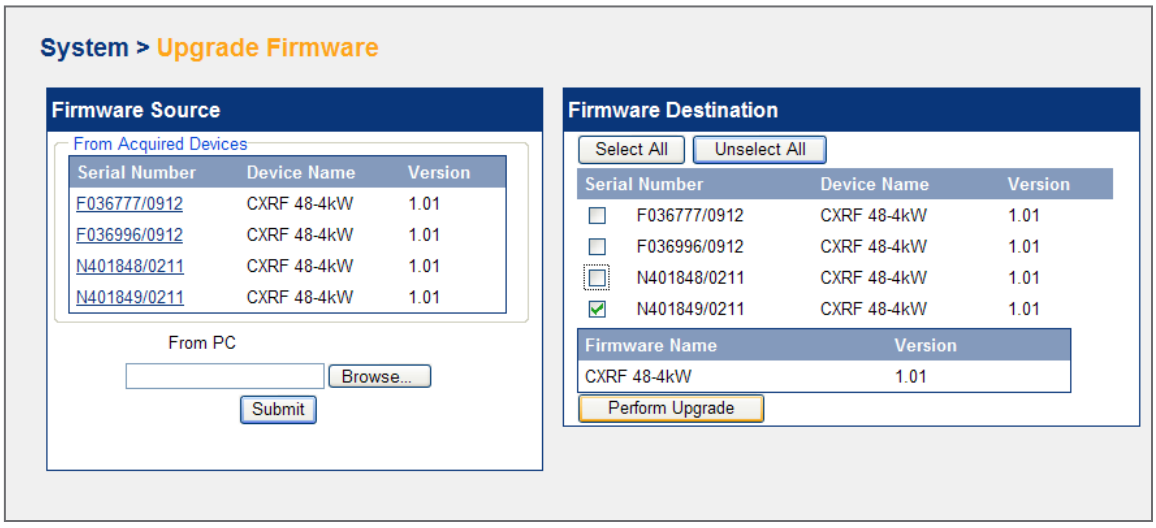
#### 8.1.3.1 Firmware Upgrade (Web)

The Web interface allows the Supervisor to select the firmware to be used for an upgrade either from an equivalent device in the system or from your PC.

1. Under the Firmware Source column click on either the Link in the Serial Number column, or click.




2. Browse and find the file you want to use.
3. Then under the Firmware Destination Column select the device(s) you want to upgrade and click Perform Upgrade.



### 8.1.4.1 Firmware Upgrade (LCD)

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.

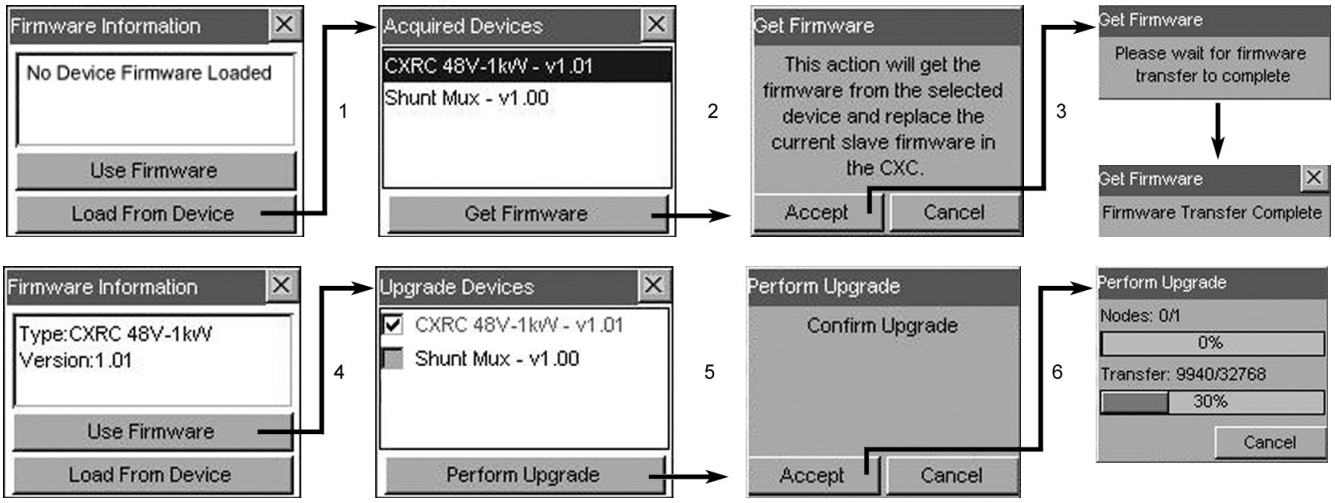



**Figure 27 —** Firmware upgrade procedure

### 8.1.5 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.

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.

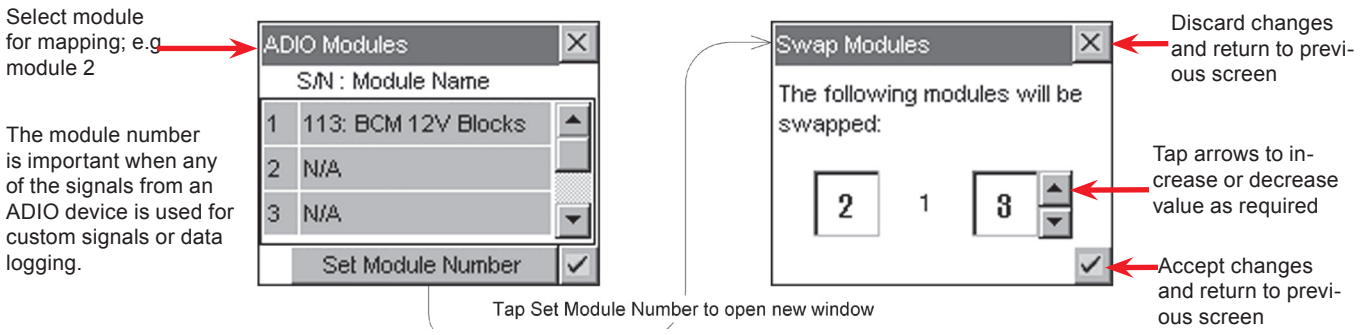
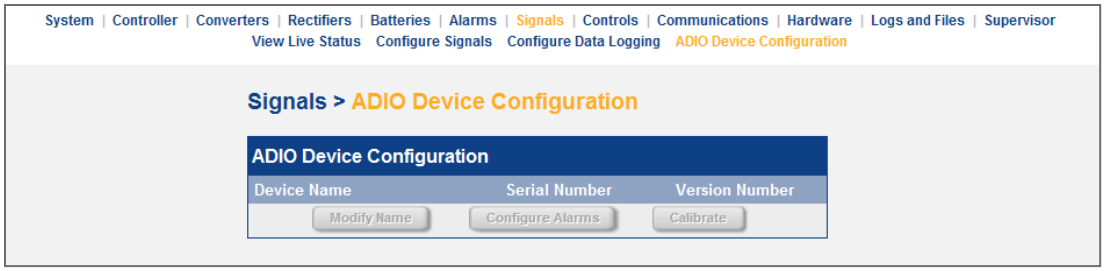
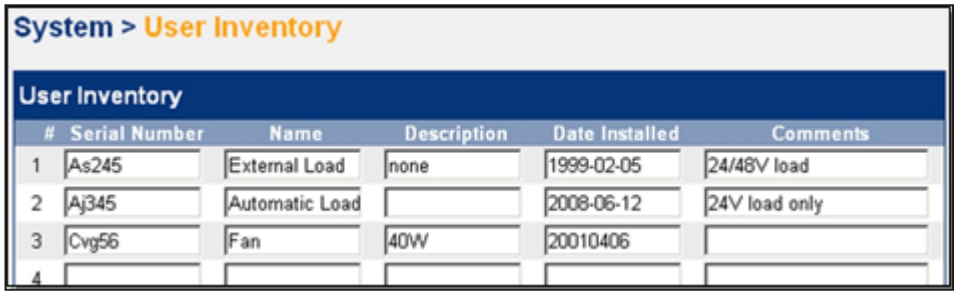



**Figure 28 —** ADIO Modules and Swap Modules windows




### 8.1.6 User Inventory (Web 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.



### 8.1.7 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.

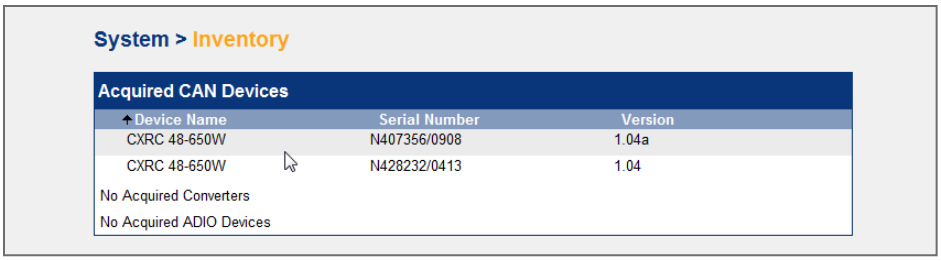



**Figure 29 —** System Inventory window (web only)

### 8.1.8 Inventory Update

When the Supervisor selects inventory update either on the System Menu or the Rectifiers menu the following warning appears. The Supervisor must click the Inventory Update button for the update to occur. Depending on the size of your system this may take a few minutes. The inventory update option will discard all CAN information and perform a search for all CAN devices. Note that during this search CAN communication with all these devices will be lost.

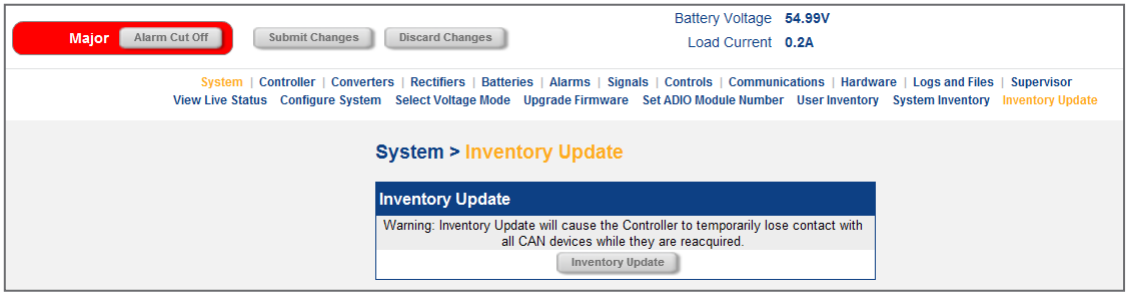



**Figure 30 —** Inventory Update window (web)

If new CAN devices are added to the system the software will identify them and add them to the system inventory.

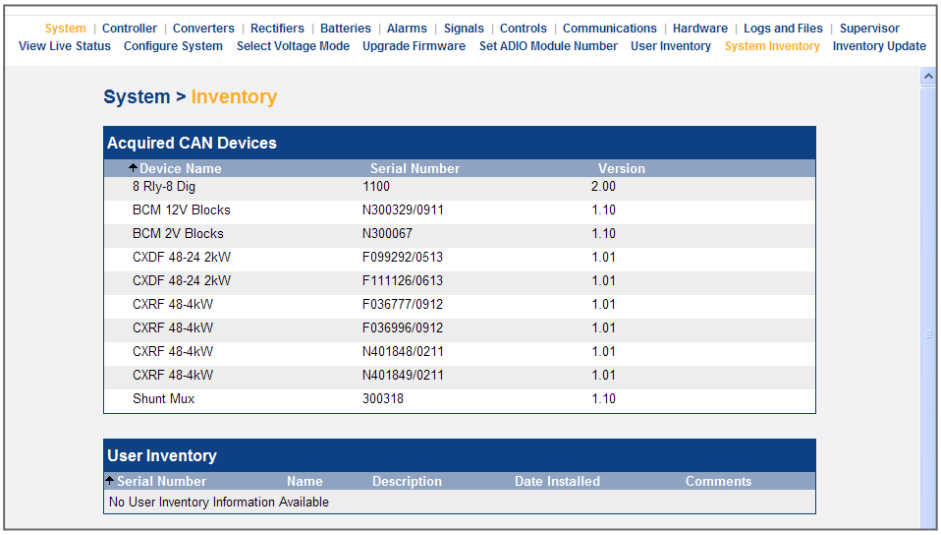
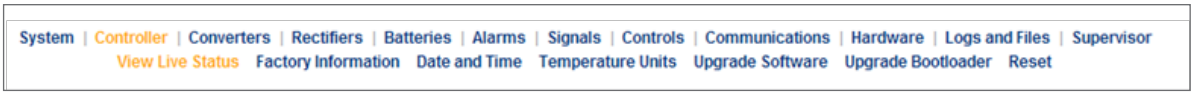



**Figure 31 —** System Inventory After Update

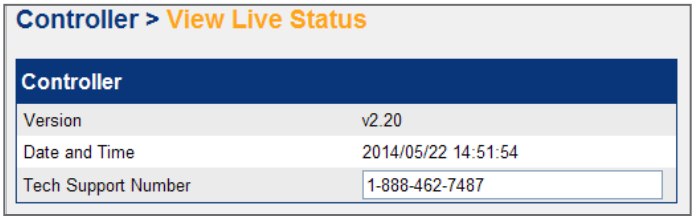
## 8.2 Controller

These menu items have primarily to do viewing and configuring value dealing with the CXC Controller



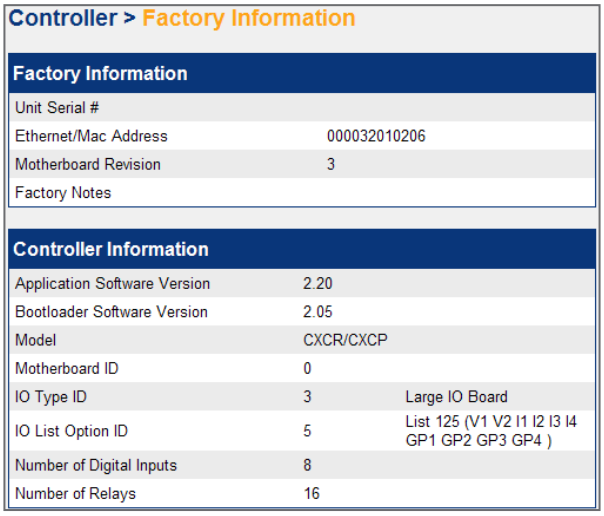

### 8.2.1 View Live Status

View Live Status displays the software version, date and time as well as the tech support number.



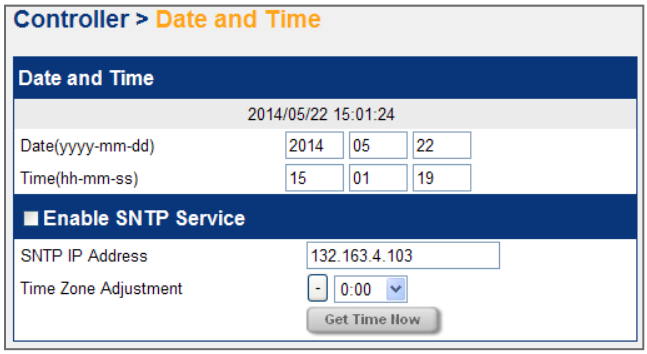

### 8.2.2 Factory Information

This displays information about the controller that was set at the factory or is intrinsic to the hardware. For the web interface, select **Main Menu > Controller > Factory Information**.




The CXC factory unit default values are displayed here. This includes: unit serial, controller hardware and software revision, Ethernet/MAC address, factory notes, motherboard ID, IO type and list types options as well as a number of digital inputs and relays.

### 8.2.3 Date & Time



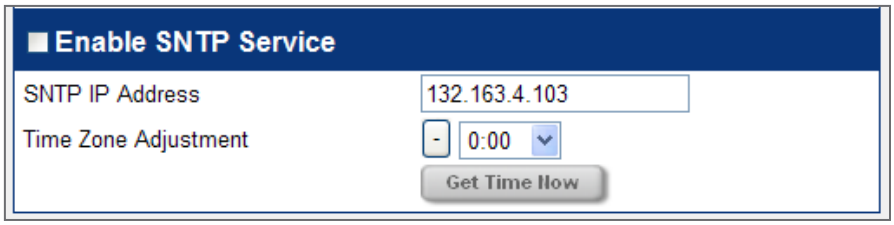

This screen allows the Supervisor to set the system date and time and to define an SNTP server.

### 8.2.3.1 Setting Date and Time

The date and time is a dynamic field. As you change the values on the screen the internal values are also changed. Note that an event will be added to the event log detailing the changes made.

### 8.2.3.2 Configuring SNTP 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. From the main menu in the CXC web GUI, select **Controller > Date and Time**. Select 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.

## 8.2.4 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**.

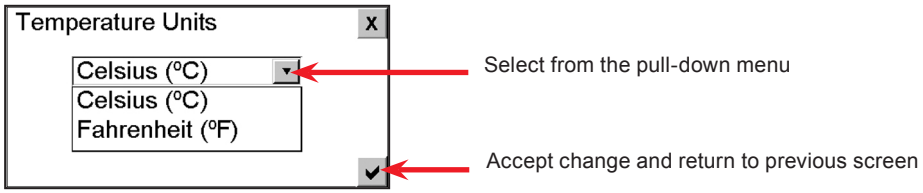
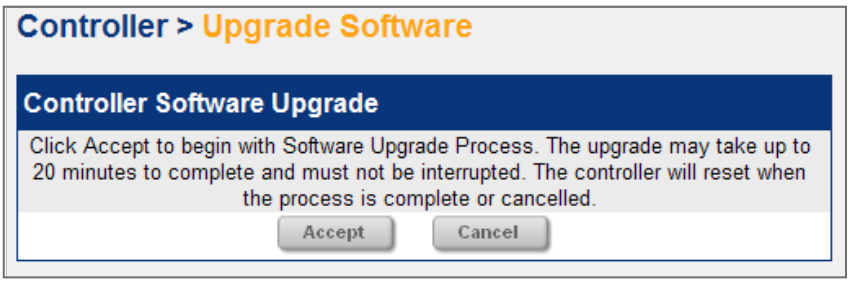



**Figure 32 —** Temperature Units selection window

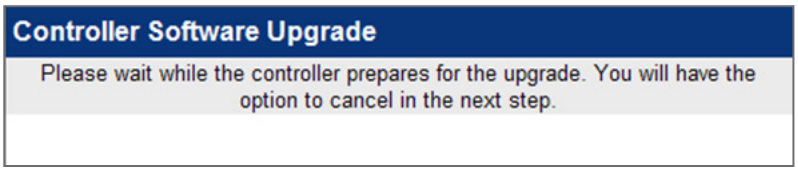
### 8.2.5 Upgrade Software (Web only)

This menu item is used to upgrade the controller software to a new version that Alpha may release from time to time. After clicking Upgrade software the following screen displays.

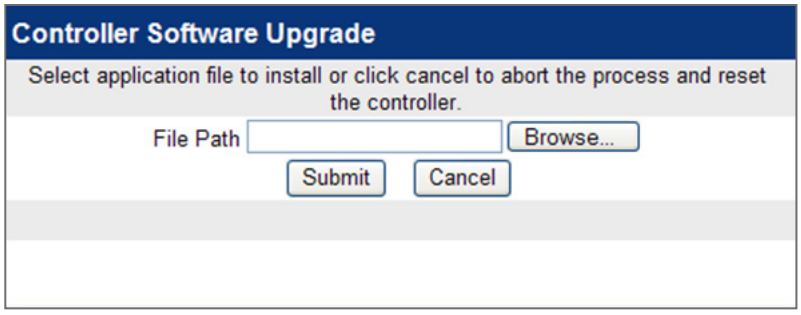
1. Click the Accept button to upgrade your software.



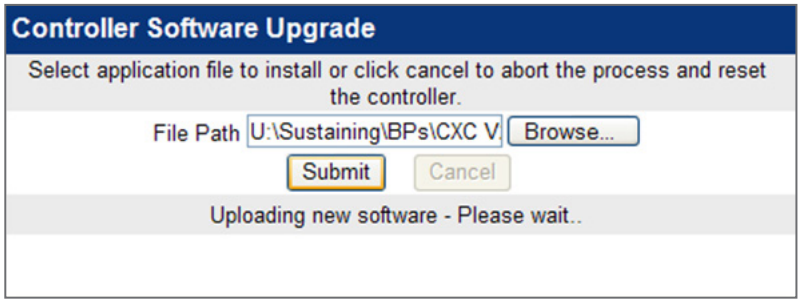

2. When you click the Accept button, the following Popup displays.



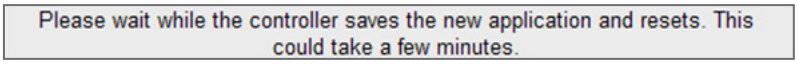

3. Once the Controller has finished preparation, and is ready to upload the new software version the following popup displays.




4. Browse to the file supplied by Alpha.
5. Select it, then click the Submit button. The following screen displays. If you cancel the system will reboot.




6. The controller will upload the file and saves the new version of the software, then reboot.
   If the controller needs to perform a flash defragmentation, this process could take up to 20 minutes.




7. When the software has been saved the following message displays.


It will take a few minutes for the controller software to load, and the system to be running normally.

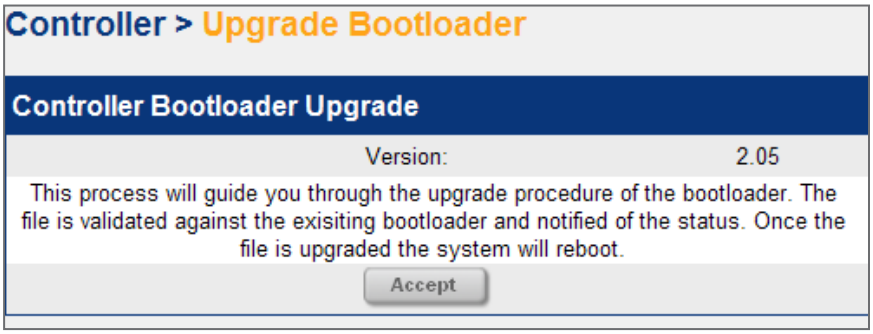
### 8.2.6 Upgrade Bootloader

This menu item is used when Alpha releases a new version of the Bootloader software. This software loads the controller program from flash when the power is turned on or if the system is reset.

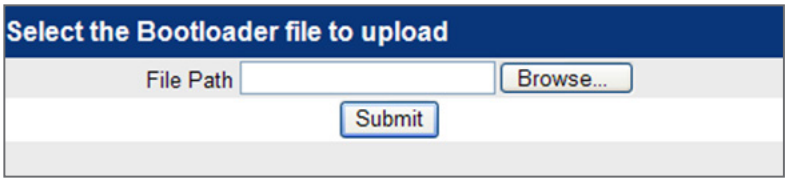
**CAUTION!**

**WARNING – This procedure must not be interrupted or your controller may need to be returned to the factory for repair.**

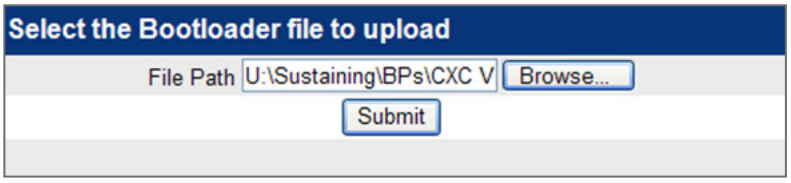
1. If you click on Upgrade Bootloader the following message displays.



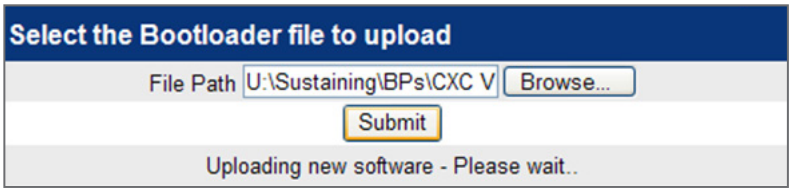

2. Click Accept and the following pop up displays.



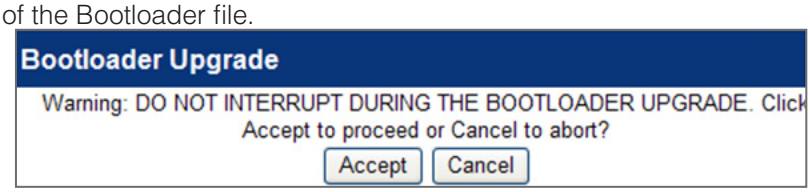

3. Click Browse to select the file Bootloader file. This file will have a ".bflt" extension



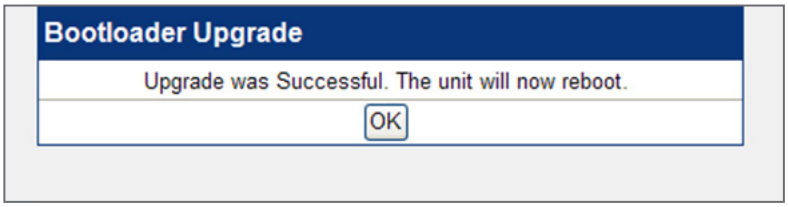

4. Click Submit.



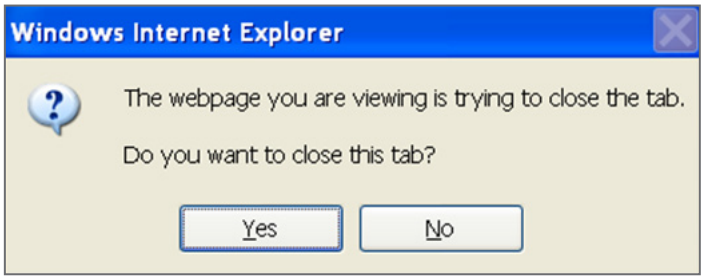

5. Once the Bootloader file has been validated the controller displays. If you click Cancel the controller will not upgrade the Bootloader, but it will reboot. If you click Accept, the Controller will install the new version of the Bootloader file.



6. When complete the following message displays.



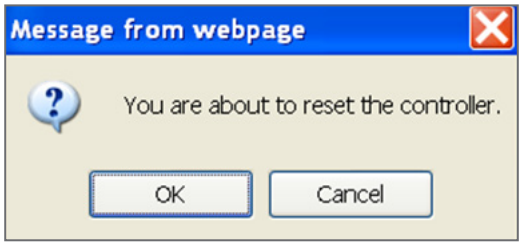

When you click on OK the controller will reboot. You may also see this message. Click Yes, then in a few minutes reopen your browser and navigate to your controller's IP Address.



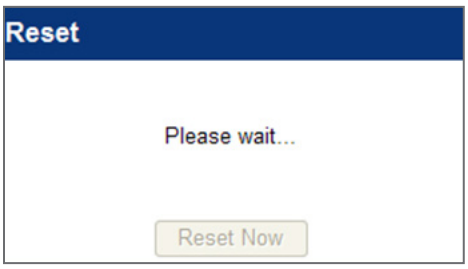

### 8.2.7 Reset

The last option on the Controller sub-menu is the option to Reset or Reboot the controller. You may want to do this if you need to remove power from the controller for maintenance. The controller will perform its cleanup process which will then allow you to either turnoff the power or perform a normal restart of the controller software.

To do this click on Reset on the sub-menu. The following displays.




If you click OK, the following appears, while the controller is in the process of preparing for shutdown.



Once it has completed its shutdown the following appears.

You may click on the reset now to reset the controller or if you are intending to power down the controller you may now do so without any adverse side effects


### 8.2.8 Upgrading The Controller - Overview

#### 8.2.8.1 Controller upgrade Using the Web

1. Connect your computer and Cordex Controller via the Internet, Intranet, or Ethernet.
2. Log into the Controller, from the **Main** Menu select the **Controller**.
3. First, perform a “soft reset” on the Controller. Select “Reset” and follow the prompts.
4. When the reset cycle is complete (may take up to 20 minutes if a defrag is needed), reconnect to the Controller and return to the **Controller** menu.
5. Select **Upgrade Software** and then click the Accept button.
6. Click **Browse** to find the .ezip(CXC) or .elfz(CXC+) file containing the new software.
7. Press Submit.
8. The software loads and then the controller restarts. Close the browser window when prompted.

#### 8.2.8.2 Controller Legacy Upgrade

Use the following procedure to upgrade versions of the controller application 1.xx and Bootloader 1.xx:

**To upgrade the Controller:**

1. Upgrade Bootloader to 2.02
2. Upgrade Software to 2.07
3. Upgrade Bootloader to 2.05
4. Upgrade Software to 2.15 or above

Version 2.02 and Software version 2.07 can be found under the Legacy, www.alpha.ca/web2/service-and-support/support/software-firmware-downloads

## 8.3 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 |

### 8.3.1 View Live Status

This feature provides the user with a list report 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.

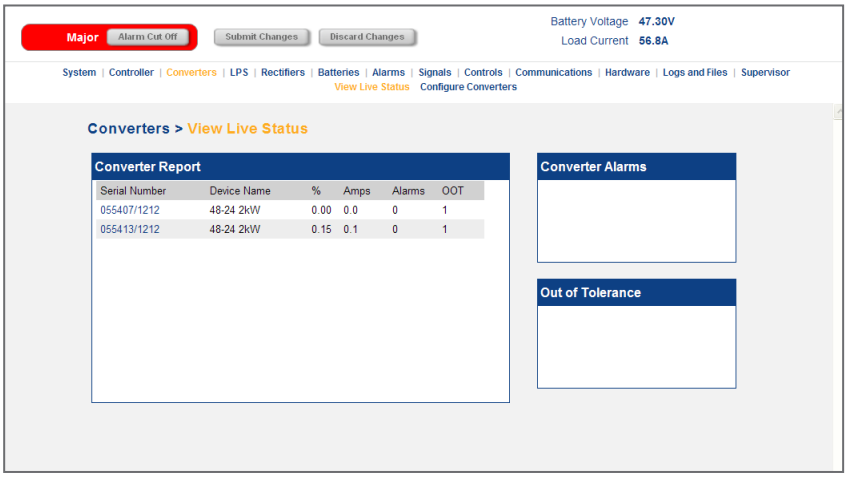
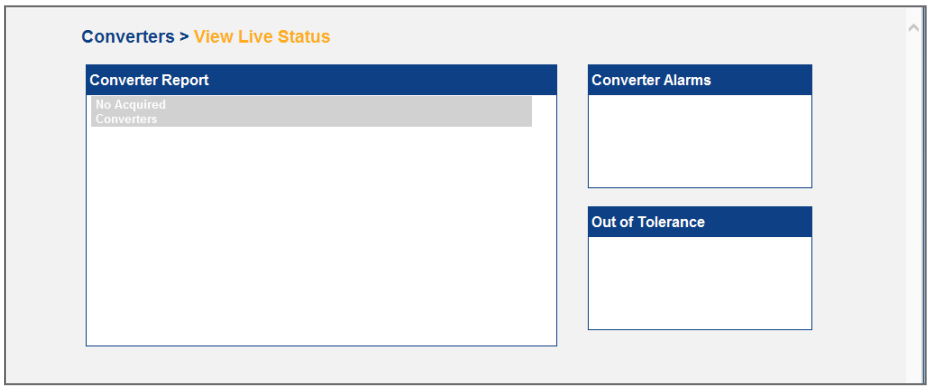


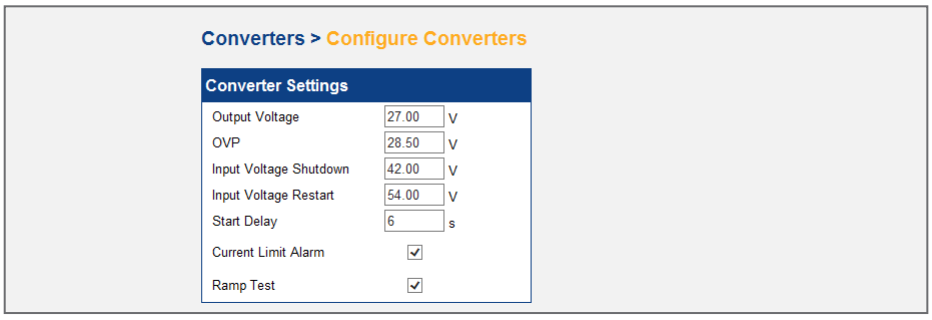

**Figure 33 —** Converters - View Live Status

### 8.3.2 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 | The voltage the converter will output |
| OVP | If output voltage exceeds this value the converter is disabled |
| Input Voltage Shutdown | If input voltage drops below this value the converter is disabled |
| Input Voltage Restart | If input voltage goes above this value enable the converter |
| Start Delay | When the system starts, delay this many seconds before starting the converter |
| Enable CL Alarm | Enable or disable the current limit alarm. When the converter has reached its maximum output current capacity, it raises the alarm |
| Ramp Test | Enable or disable ramp test. If the converter output current is below 2.5% of maximum, it will test its ability to output current by raising its output voltage slightly. If the current does not increase about 2.5% the module will indicate a fail alarm. If the load on the converter is below 5% of the maximum, Ramp Test should be disabled. Ramp test is only available for 24-48 volt converters running Version 1.0 of the firmware otherwise it is ignored. |



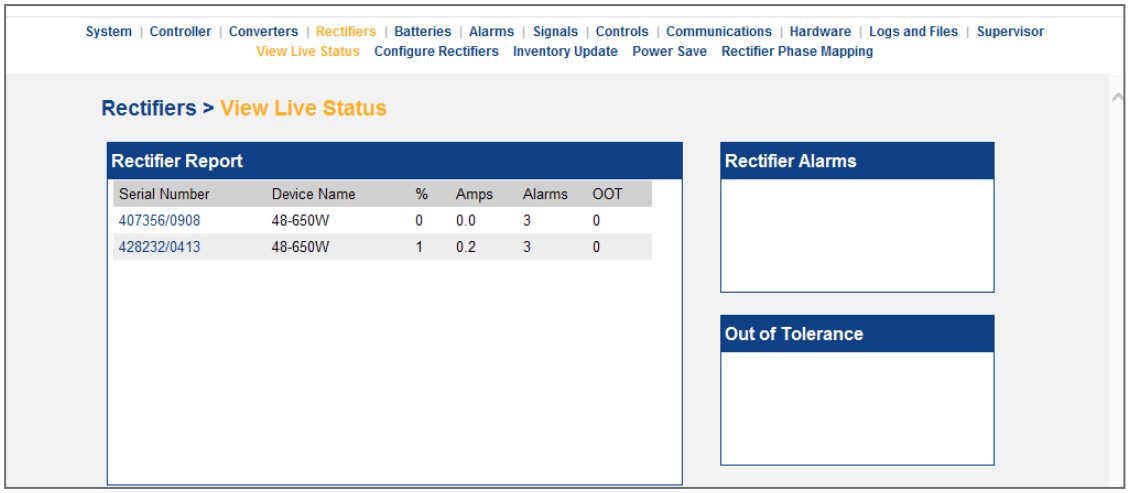
## 8.4 Rectifiers

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.

### 8.4.1 Rectifier Report

This feature provides a list report (see 6.7.2, 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.




### 8.4.2 Configure Settings (Main Menu > Rectifiers > Configure Rectifiers)

This feature allows the user to configure settings (via menu items) for all of the acquired rectifiers in the system. The menu items described in the following sections can be configured with the virtual numeric keypad or by toggling the listed item. For a basic programming example, see 6.7.3. Configure rectifiers web and LCD views follow.

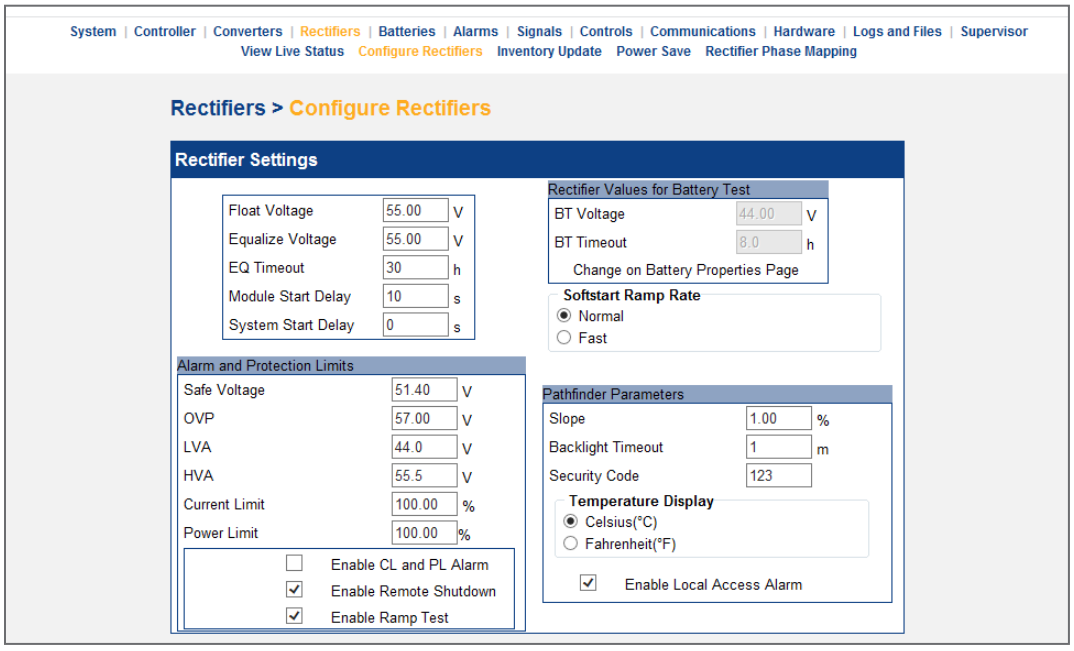



**Figure 34 —** Configure Settings (rectifiers) - Web

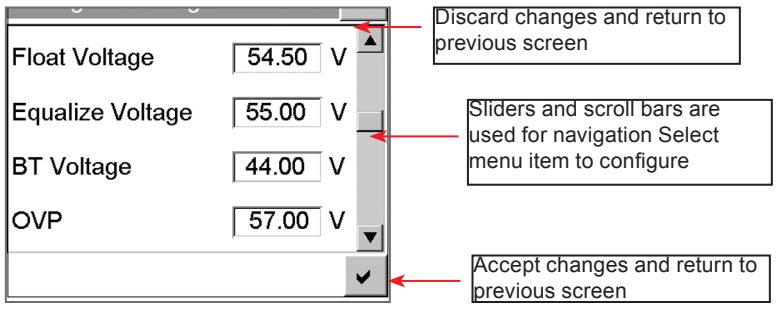



**Figure 35 —** Configure Settings (rectifiers) window - LCD

**Float (FL) Voltage**

Sets 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 operates in the float mode. This setting should have a minimum of LVD + 1 V and a maximum of OVP – 1 V.

**Equalize (EQ) Voltage**

Sets 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.

**Battery Test (BT) Voltage**

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

**OVP Voltage**

Program one OVP setting for all connected rectifiers. OVP will disable a rectifier that outputs an abnormally high voltage.

**Safe Voltage**

Sets the default system voltage (Safe Mode) in the event that communications to Cordex rectifiers should fail. See 4.4 for more details about this feature. Note that the minimum and maximum values for this are set by the rectifier and the controller values will be ignored if they are out of range.

See “Table E — Rectifier menu defaults” on page 143

**Low Voltage Alarm (LVA)**

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

**High Voltage Alarm (HVA)**

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.

**Current Limit (CL)**

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.

**Power Limit (PL)**

Sets the level as a percentage at which power limiting activates in all connected Cordex rectifiers.

**EQ Timeout**

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.

The value on the Configure rectifiers page is for the rectifiers, in case the controller stops working. The time on the battery config page is for the battery equalization timing for the controller.

**BT Timeout**

Sets the maximum duration of the Battery Test. Use a setting >= 1; otherwise, the CXC will report an **Out Of Tolerance** alarm.

**Slope (Pathfinder rectifiers only)**

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.

**Backlight Timeout (Pathfinder rectifiers w/LCD only)**

Sets the amount of time of GUI inactivity permitted before the rectifier automatically turns off the LCD backlight.

**Security Code (Pathfinder rectifiers w/LCD only)**

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

**Module Start Delay**

Sets 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 (255), the next rectifier in sequence will start its delay at one and increment again by the value specified in this menu item.

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

**System Start Delay**

Sets the amount of time, in seconds, before the stagger-start timer commences. See the previous section.

**Soft Start Ramp Rate**

Sets the soft start ramp rate (normal or fast). Rectifiers Systems with a normal ramp rate selected will ramp up to current limit in approximately 8 seconds. Those with a fast ramp rate ramp will take approximately 1 second. For systems without batteries, select the **Fast** setting.

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

Sets the temperature display scale (Celsius or Fahrenheit).

**Check to Enable**

- 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)

### 8.4.3 Power Save

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 4.5 for more details. The check box beside “Enable Voltage Regulation and Load Sharing for Rectifiers” should almost always be selected. The only time it should be disabled is on very large systems with two controllers controlling two sets of rectifiers that share the output bus. It may also be disabled if there Cordex and non-Cordex rectifiers that share the output bus.”

#### 8.4.3.1 Enable Power Save

Enables the CXC Power Save feature.

##### Limit Power Save Log

The logging of events in **Power Save Restart** and **Power Save Shutdown** are limited to one every 24 hours.

##### Redundant Rectifiers

Specify the number of extra rectifiers to turn on.

##### Max (Maximum) Power Usage

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.

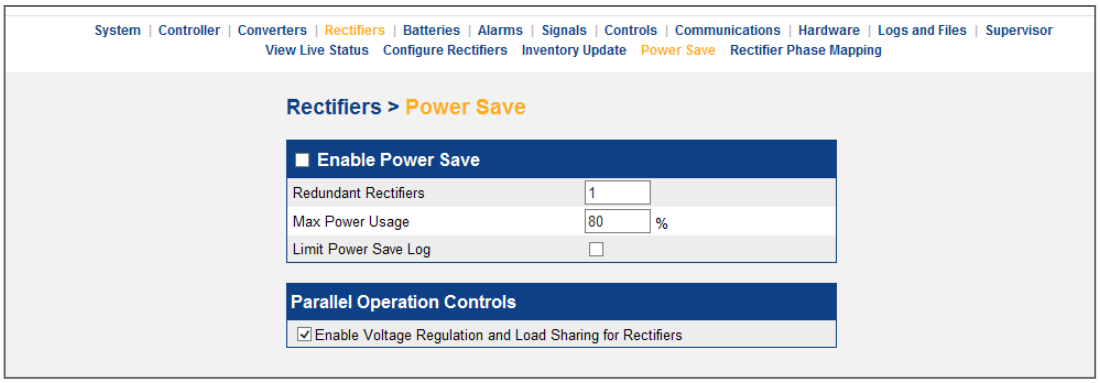



**Figure 36 —** Power Save options - Web

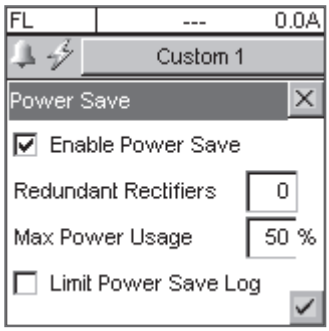



**Figure 37 —** Power Save options - LCD

### 8.4.3.2 Parallel Operation Controls (Web only)

In most cases the **Enable Voltage Regulation and Load Sharing for Rectifiers** checkbox should be selected. This allows the controller to adjust the rectifier output voltage in response to fluctuations in the load and to adjust how much current each rectifier is supplying in order to keep all rectifiers output current approximately equal.

There are two instances when it may need to be disabled. The first is necessary, the second is optional.

1. The **Enable Voltage Regulation and Load Sharing for Rectifiers** checkbox **must** be cleared on very large systems with two controllers that are controlling two sets of rectifiers which share the output bus.
2. The **Enable Voltage Regulation and Load Sharing for Rectifiers** checkbox may be cleared if there are Cordex and non-Cordex rectifiers that share the output bus.

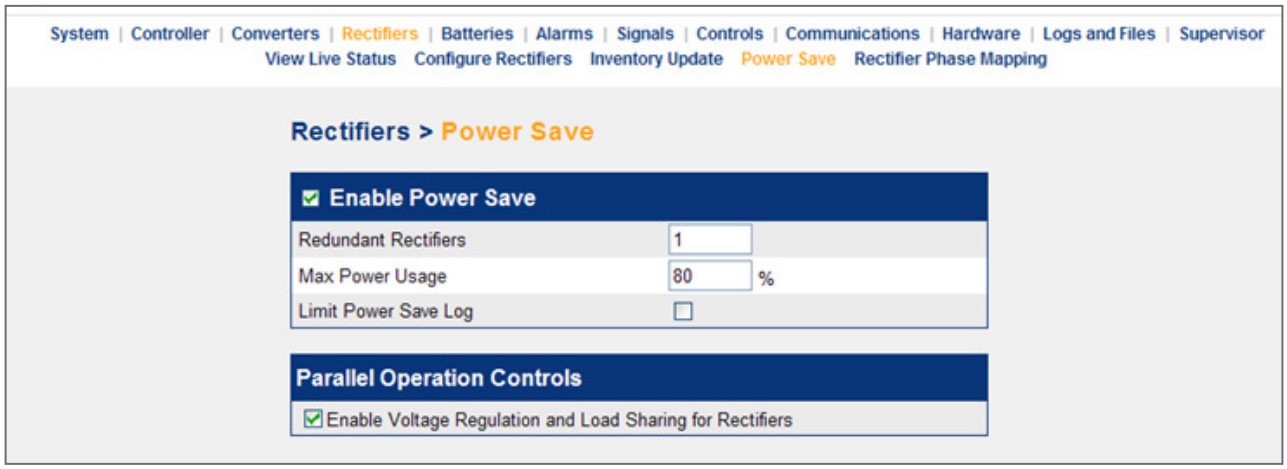



**Figure 38 —** Enable voltage regulation and load sharing checkbox

### 8.4.4 Phase Mapping

The user can assign or map a rectifier per input signal for individual phase voltage readings: Parallel Operation Controls (Web only) - The check box beside “Enable Voltage Regulation and Load Sharing for Rectifiers” should almost always be checked. The only time it should be disabled is on very large systems with two controllers controlling two sets of rectifiers that share the output bus. It may also be disabled if there are Cordex and non-Cordex rectifiers that share the output bus.”

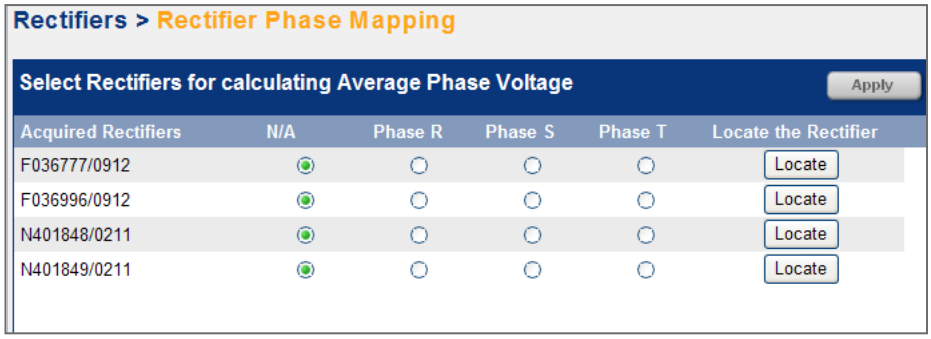



**Figure 39 —** Phase Mapping (rectifiers) window Web

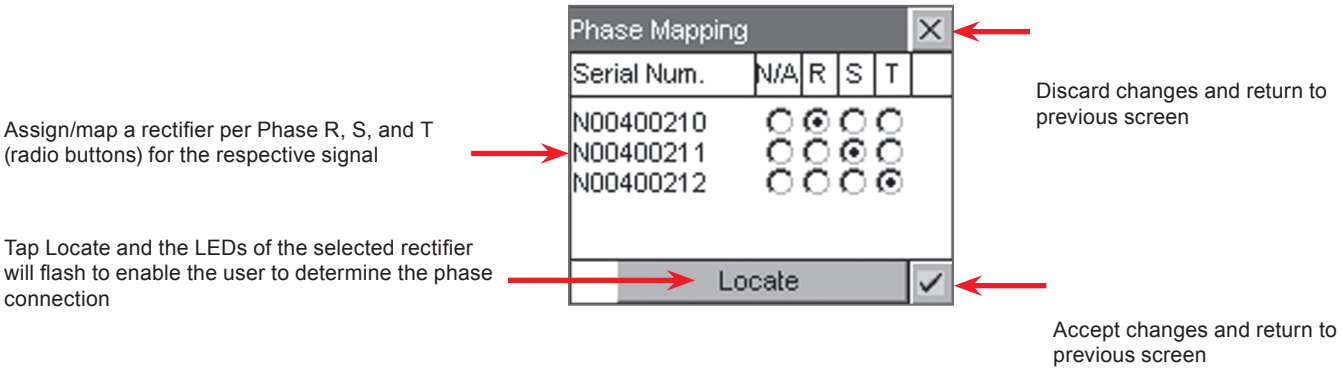



**Figure 40 —** Phase Mapping (rectifiers) window LCD

## 8.5 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 4 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**.

### 8.5.1 View Live Status

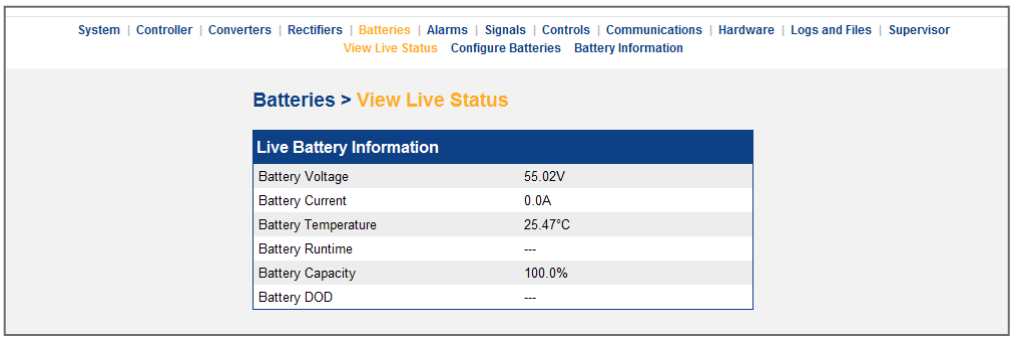



**Figure 41 —** Batteries - View Live Status

## 8.5.2 Configure Batteries

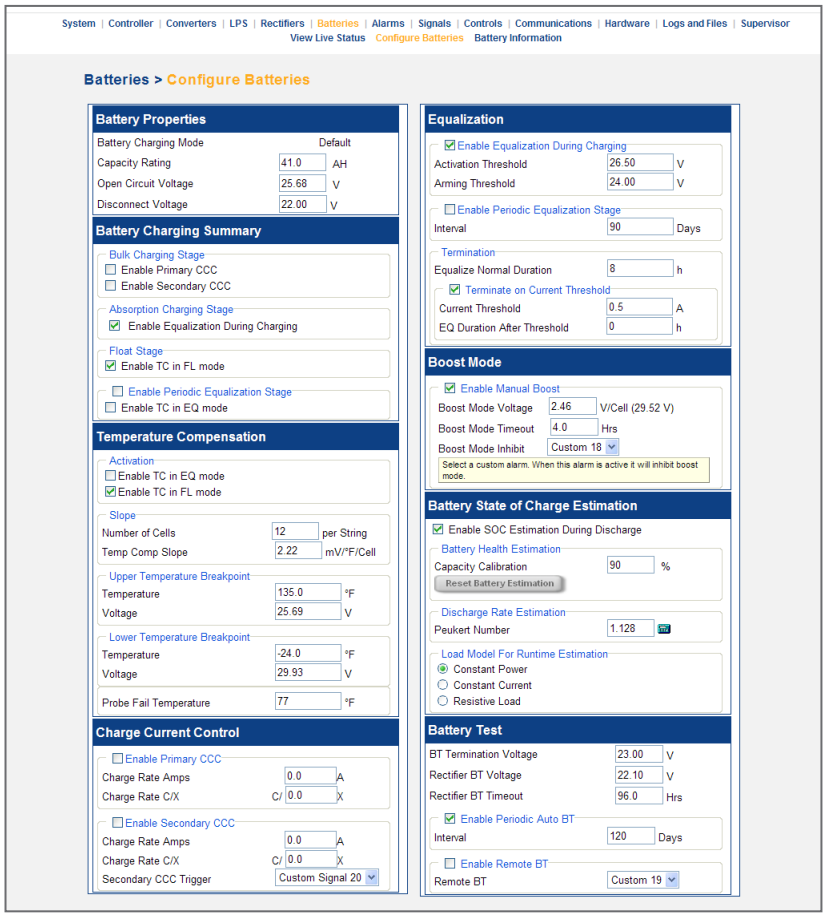



**Figure 42 —** Configure Batteries page

### 8.5.1.1 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.

**Capacity Rating (20-Hr Rate)**

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. The value 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 (LCD)**

The Peukert exponent 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 can be entered in two ways. If the battery manufacturer has supplied a Peukert exponent, then it can be entered. If a Peukert exponent is not available, it must be calculated.

This multi-step process involves entering four numbers derived from the battery manufacturer's specifications. The resulting Peukert exponent should be above 1.000 and below 2.000.

**Peukert Calculator (LCD)**

To calculate the Peukert exponent 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 20 hours provide the necessary data for the Peukert exponent calculation.

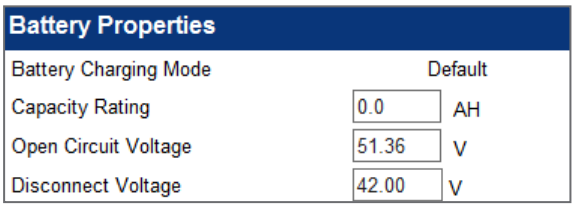



**Figure 44 —** Battery Properties - Web

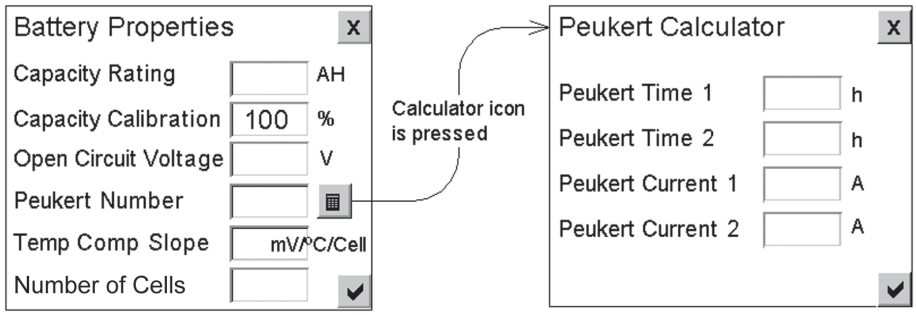
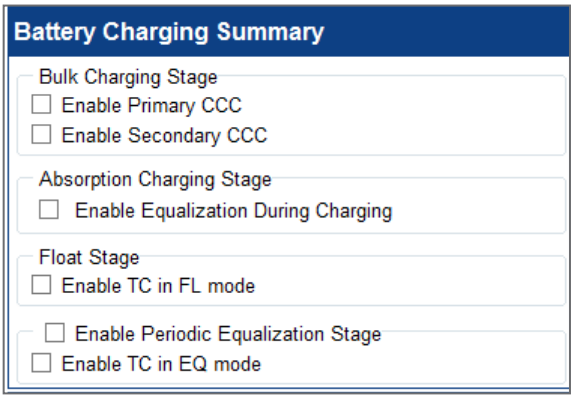



**Figure 43 —** Battery Properties and Peukert Calculator windows

### 8.5.2.1 Battery Charging Summary

This section allows the supervisor to enable/disable battery charging characteristics.

Each of these options is also available from other sections of the configure batteries screen.



### 8.5.2.2 Temperature Compensation

The Battery Properties section (8.5.2) must be completed to enable this feature.

**Batteries > Configure Batteries**

| | |
|---|---|
| **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). **Upper Breakpoint** refers to the higher temperature at which automatic voltage changes will cease. **Lower Breakpoint** refers to the lower temperature. Reversing these (placing the lower temperature as the Upper Breakpoint and the higher temperature as the **Lower Breakpoint** will not work |
| **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. |
| **Probe Fail Temperature** | This parameter allows the user to set a temperature value to be used for temperature compensation calculations should the system detect that one or more of the temperature signals has failed. The default value is 25 C(80f) |
| **Temp Comp Slope** | Desired temperature compensation slope |
| **Number of Cells** | Number of battery cells per string |

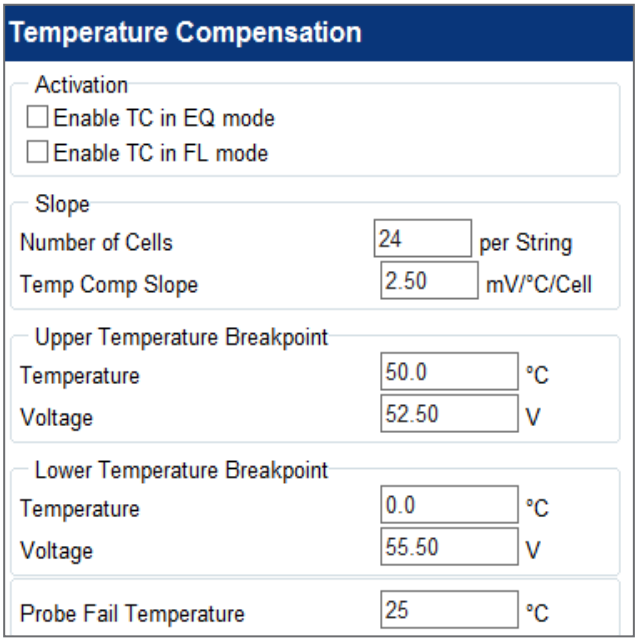



**Figure 45 —** Temperature Compensation – Web

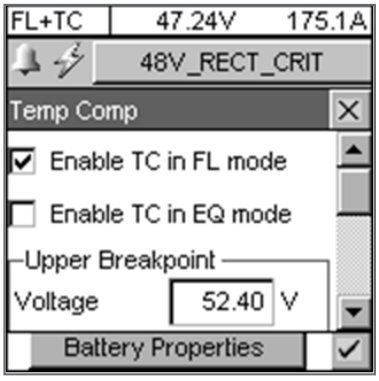



**Figure 46 —** Temperature Compensation - LCD

### 8.5.3 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 (8.5.2) must be completed to enable the Charge Current Control feature.

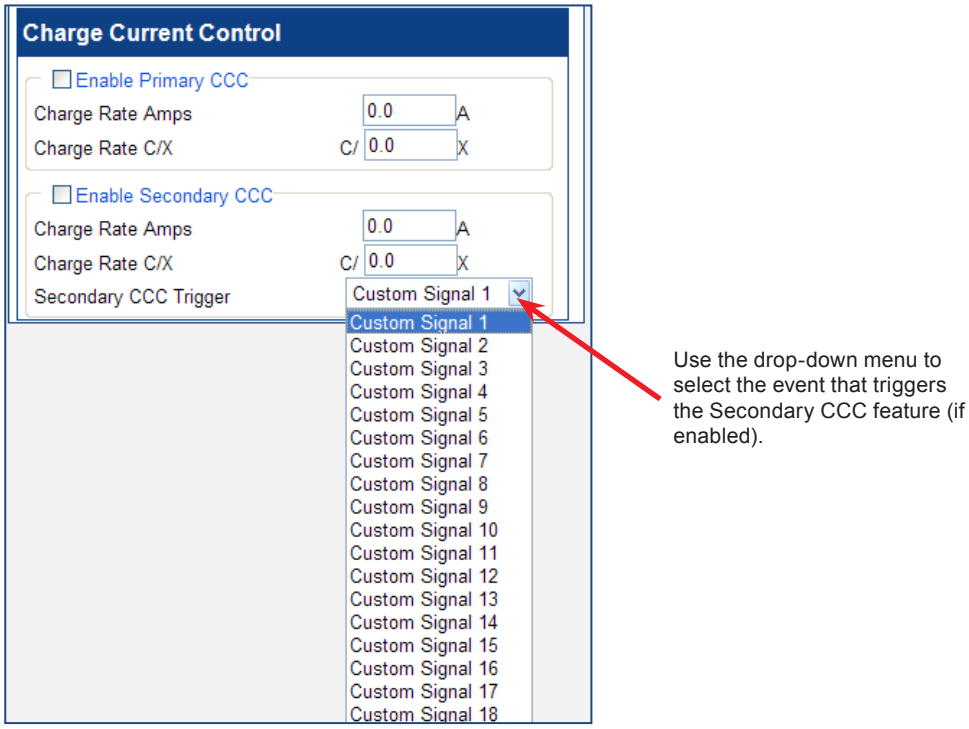



**Figure 47 —** Charge Current Control – Web

**Enable Primary CCC** — Activates the Charge Current Control (CCC) feature.

**Charge Rate Limit (LCD)** — This menu item enables the Supervisor to program the amount of current that goes into the battery and is dependent upon the Supervisor-entered parameter Capacity Rating (C). The Charge Rate amount is represented in asmp (X) or as a C/X value (Capacity Rating/Charge Rate Amps).

The values of Capacity Rating on the Battery Properties screen, and Charge Rate Amps and Charge Rate C/X on the Charge Current Control screen are inter-related and need to be consistent.

The Charge Rate Amps is recalulated if the Chare Rate C/X value or the Capactiy Rating is modified.

**Charge Rate Amps** — The values of Capacity Rating on the Battery Properties screen and Charge Rate Amps and Charge Rate C/X on the Charge Current Control screen are interrelated and need to be consistent.

**Charge Rate C/X** — The Charge Rate Amps is recalculated if the Charge Rate C/X value or the Capacity Rating is modified.

**Enable Secondary CCC** — A separate set of Charge Rate Limit values can be input for the Secondary CCC feature.

### 8.5.3.1 Equalization

Equalization is used to charge the batteries optimally. Consult the battery manufacturer for suggested values for equalization.

Current Threshold Equalize (BCT) – This option allows the controller to terminate equalize based on battery current. Note that the Current Threshold 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 EQ Duration can be increased slightly to compensate.

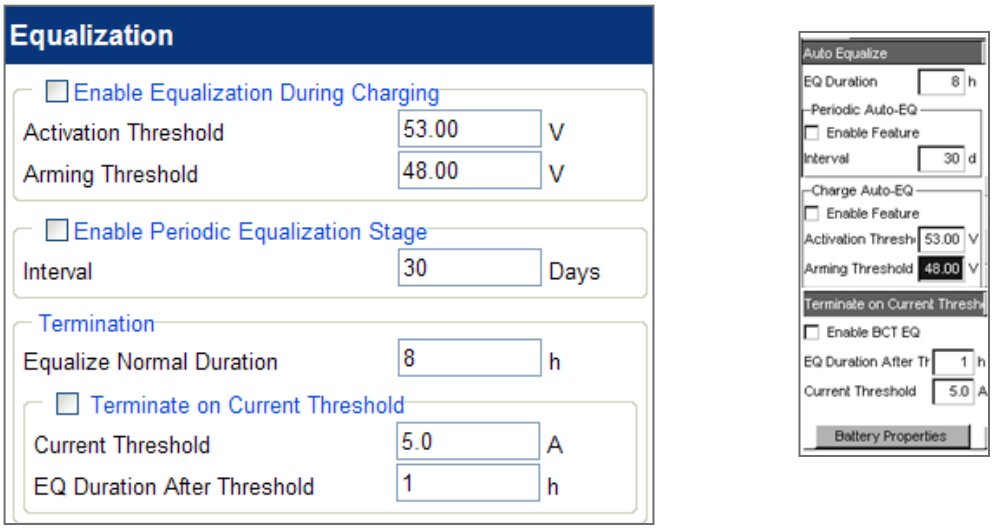



**Figure 48 —** Equalization – Web and LCD

| Web Label | LCD Label | Purpose/Description |
|---|---|---|
| **Enable Equalization During Charging** | **Charge Auto-EQ: Enable Feature** | Enable/Disable Equalization During Charging |
| Activation Threshold | **Activation Threshold** | Voltage at which the auto equalize charging activates |
| Arming Threshold | **Arming Threshold** | Voltage at which the auto equalize charging arms |
| **Enable Periodic Equalization Stage** | **Periodic Auto-EQ: Enable Feature** | Enable/Disable Periodic auto equalization |
| Interval | **Interval** | Time between the auto-equalize charging of the battery string (in days). |
| **Termination** | **na** | |
| Equalize Normal Duration | **EQ Duration** | Duration of the equalization cycle. This is used for both manual and auto equalize modes. |
| **Terminate on Current Threshold** | **Enable BCT EQ** | Enable/Disable Equalize termination based on battery current. |
| Current Threshold | **Current Threshold** | Threshold (in Amps) for the battery charging current that will trigger the BCT Equalize function |
| EQ Duration After Threshold | **EQ Duration After Threshold** | Duration of the BCT equalize function in hours. |
| **na** | **Battery Properties** | This button can be clicked to return to the battery properties window |

### 8.5.3.2 Battery Monitor

The Battery Properties section (8.5.2) must be completed to enable this feature.
(Web: **Main Menu > Batteries > Configure Batteries**)

| | |
|---|---|
| **Enable SOC Estimation** | Activates the Battery Monitor feature and the Battery Log feature. |
| **Load Type (LCD)** | Select the type of load on the system: constant power, current, or resistive. The load type is used for battery capacity calculations. |
| **Disconnect Voltage (LCD)** | Set the disconnect voltage 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 Estimation** | 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 8.5.2). The return path is to the Battery Monitor window. |

### 8.5.3.3 Boost Mode

This feature provides 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** | Activates the 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 8.6.2 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 8.5.2). The return path is to the Boost Mode window. |

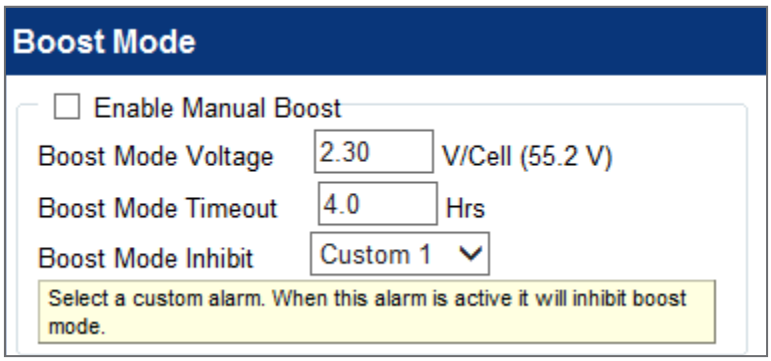



**Figure 49 —** Boost Mode – Web

### 8.5.3.4 Battery State of Charge Estimation

This section allows the supervisor to set parameters that are used to calculate battery runtime and estimate state of charge.

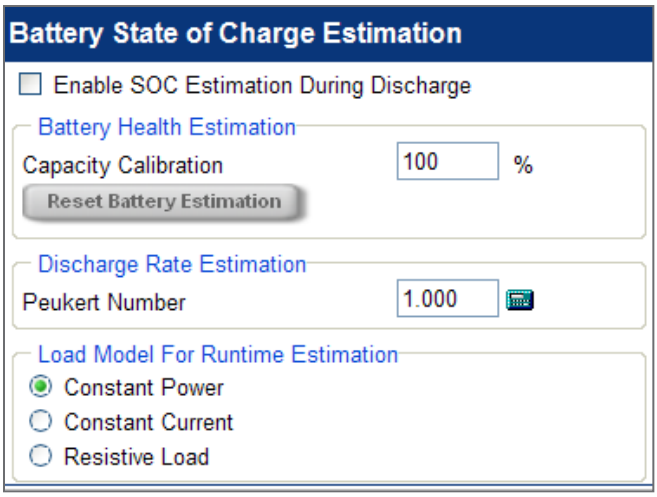



**Figure 50 —** Battery State of Charge Estimation - Web

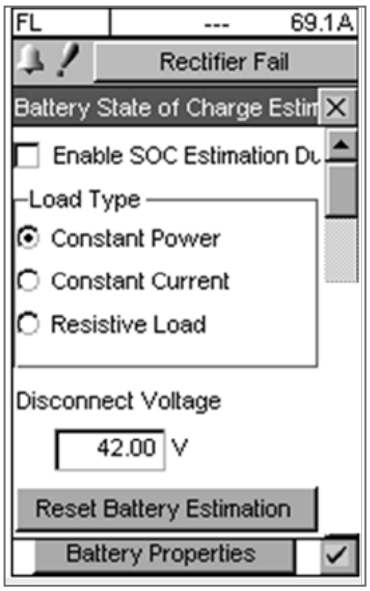



**Figure 51 —** Battery State of Charge – LCD

#### Battery Health Estimation

Capacity Calibration – This value is used by the battery runtime calculations. It must be reset if batteries are changed, or if the system goes through a partial discharge.

Peukert Number – For the Peurkert Exponent see section”8.5.2 Configure Batteries” on page 67.

### 8.5.3.5 Battery 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 6.8.4 for more details.

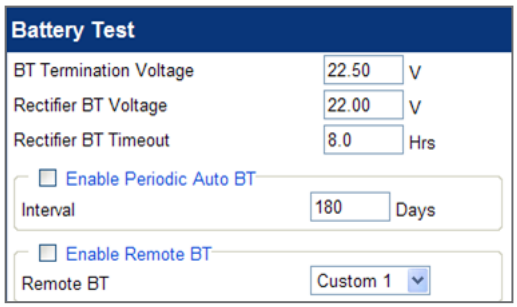



**Figure 52 —** Battery Test - Web

**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 – 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 – a change in one alters the other. Controls the duration of the Battery Test.

**Auto BT**

**Enable** the feature and then set the **Interval** time, in days, between automatic battery tests.

**Remote BT Mode**

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

**Remote BT (Custom 1-20)**: Use this menu item to assign a **Custom Alarm** number between 1 and 20. (Refer to 8.6.3.7 on page 81 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 8.5.2). The return path is to the BT window.

## 8.5.4 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 53.

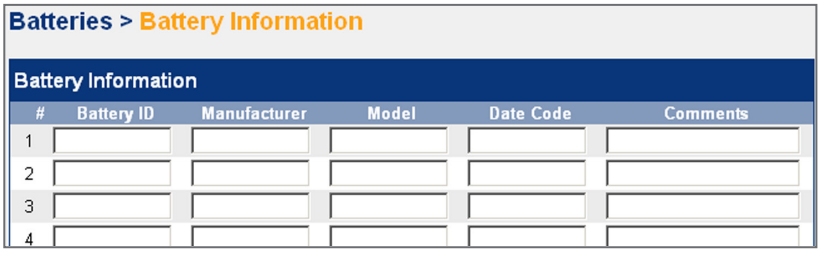



**Figure 53 —** Battery Information - Web

## 8.6 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 DC 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 H for factory default settings.

### Alarm Icons

| LCD Symbol | Alarm |
|---|---|
|  | Active alarm condition. |
|  | Alarm condition that has been silenced |
|  | Power system Major Alarm |
|  | Power system Minor Alarm |
|  | 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 |

### 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 6.5.1) will silence all ALCO enabled alarms and may change relay state. For controls, the relay does not change state – only the audible alert is silenced. |

### Using Relays with Alarms

Each Relay can be mapped to one active Control (LVD) or to one or more Alarms. When a relay is mapped to an active Control, it cannot be mapped to any other Alarm or to another active Control. For example: To use a relay currently assigned to LVD-1 for another purpose, it must first be unassigned from LVD-1 before being assigned to another Control or one (or more) Alarms.

Any alarm (even multiple alarms) can be mapped to any relay that is not currently assigned to a Control."

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

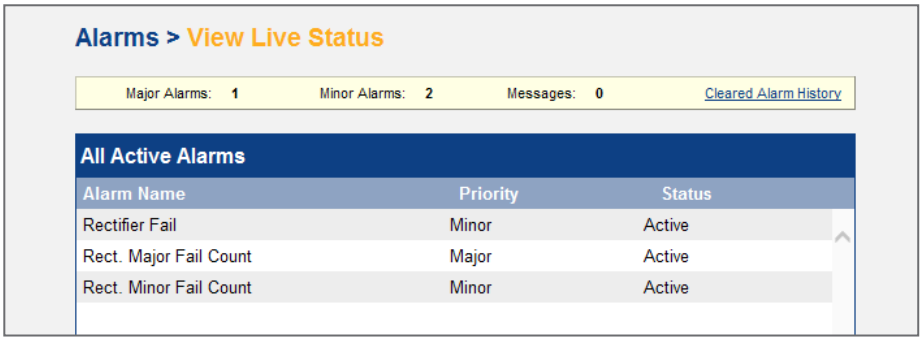
Table B summarizes the default output channel assignments. The number of relays available depends on the type of CXC Controller installed.

**Table B — 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) |

### 8.6.1 View Live Status

This screen displays a summary count of alarms as well as a list of all active alarms. It also allows the user to click the “Cleared Alarm History” and see all cleared alarms.



## 8.6.2 Configuring Alarms- LCD

### LCD Interface

From the MAIN MENU screen tap **Alarms**. The pull-down menu lists the alarm categories shown in ADIO and Converter Alarms.

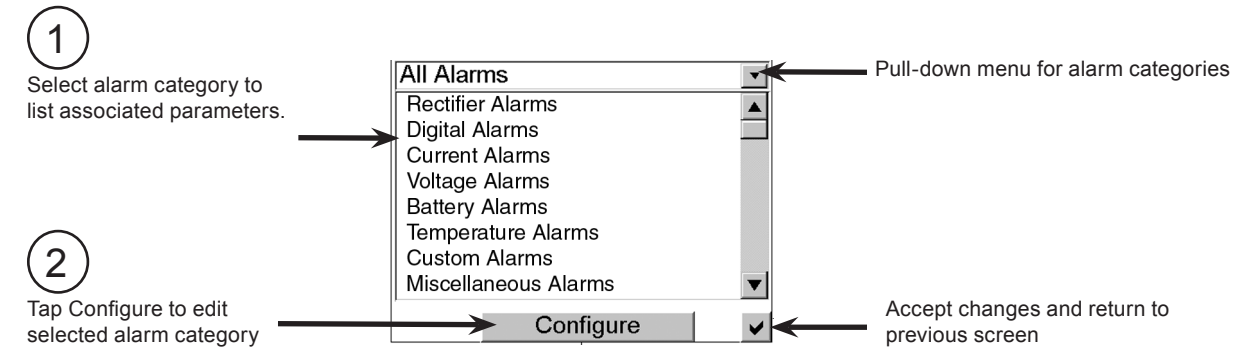



**Figure 54 —** Alarms > Configure Alarms

A new window appears with the following parameters:

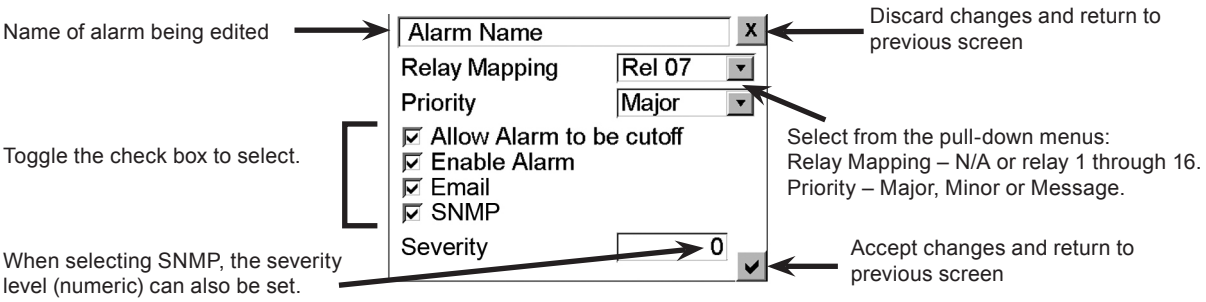



**Figure 55 —** Edit Alarm Parameters (Example)

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. The following list 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.

### 8.6.3 Configuring Alarms – Web

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.

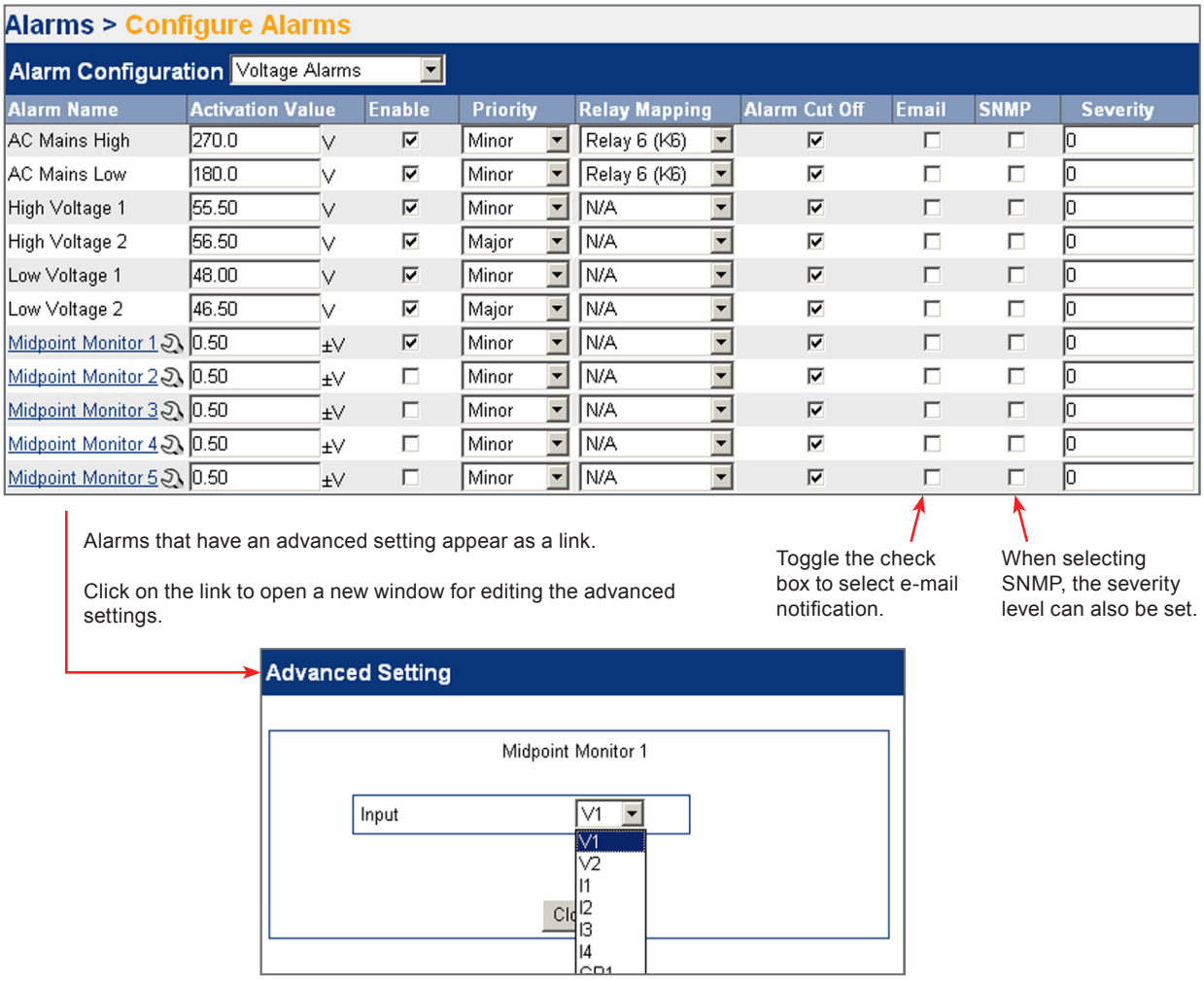



**Figure 56 —** Configure Alarms Example – Web Interface

### 8.6.3.1 Rectifier Alarms

**Rectifier Fail** — Sets an alarm condition for an 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. The default activation value is 1.

**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 4.1).

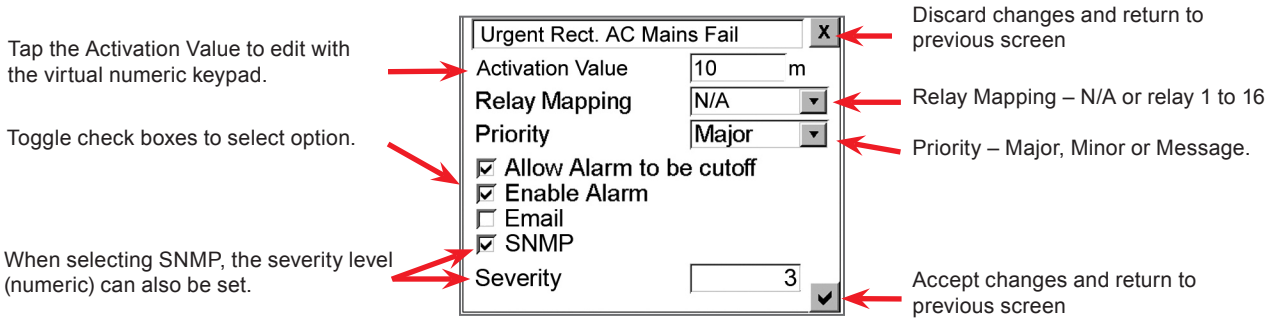



**Figure 57 —** Configure Urgent AC Mains Fail example - LCD

### 8.6.3.2 Digital Alarms

Six of the digital channels have been assigned default functions, while two are unassigned. All of these assignments may be changed if desired. Table C summarizes the digital channel assignments.

Note that the number of digital inputs varies with the model of the controller.

**Table C — 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 29, or in the web interface go to **Main Menu > Signals > View Status**.

### 8.6.3.3 Current Alarms

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

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

### 8.6.3.4 Voltage Alarms

**AC Mains High** — Activates an alarm when the AC exceeds the input to the power system. The message **AC MAINS HIGH** displays.

**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.

**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.

**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.

**Midpoint Monitor [1-5]** — Activates alarm when voltage reading (1 through 5) exceeds the specified range. For example: If the activation value is 1.00, then the actual range that the controller operates with is from -0.50V to +0.50V. The message **MIDPOINT MONITOR 1** (or 2-5) displays.

### 8.6.3.5 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. |

### 8.6.3.6 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. |

### 8.6.3.7 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 9.2 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.

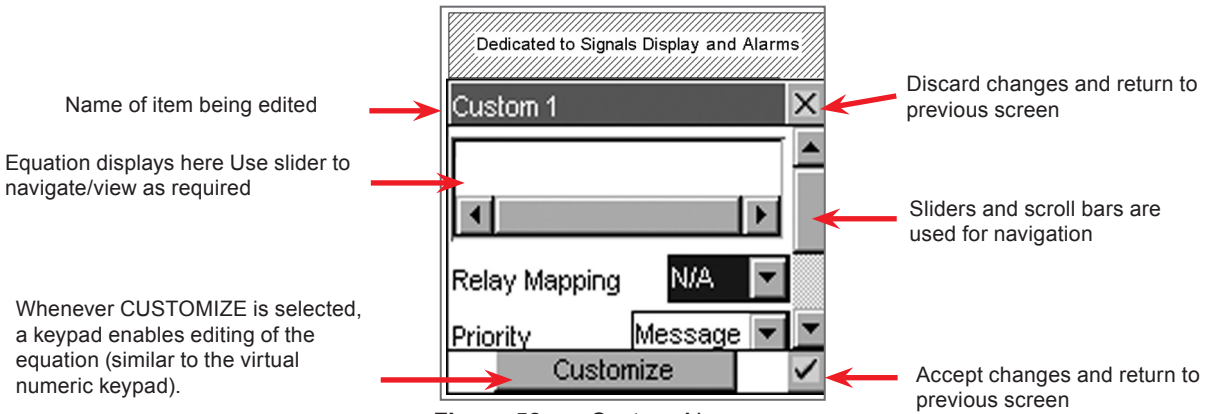



**Figure 58 —** Custom Alarm screen

Refer to Figure 54 while completing the following steps to program an alarm-triggering equation (in this example, 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:**

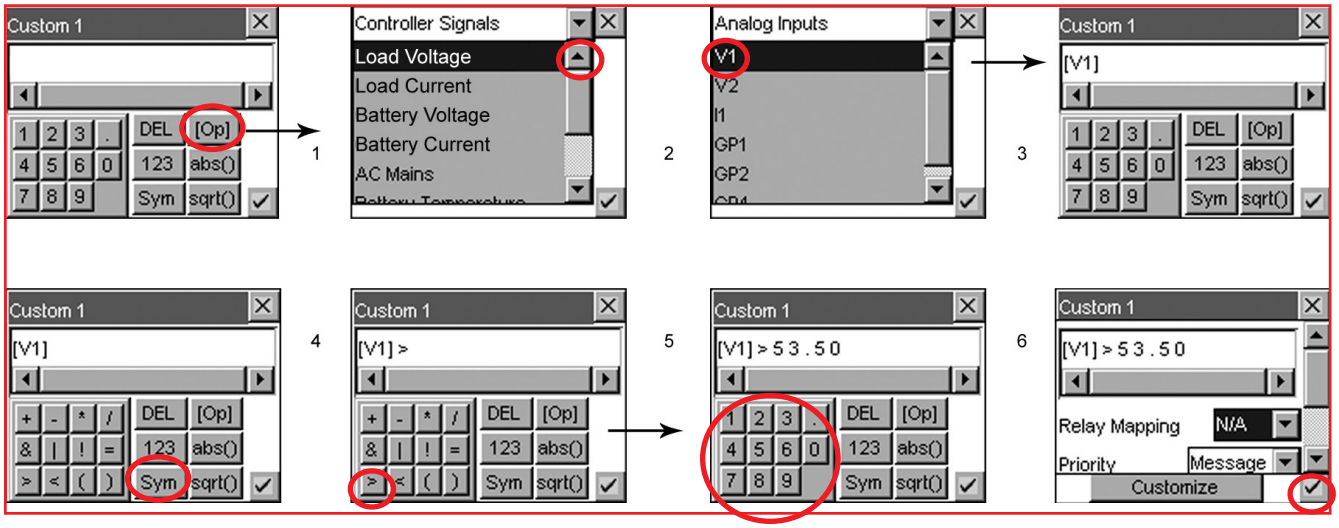



**Figure 59 —** Customize Alarm example - LCD

**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 ( ) 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 (8.6.3.4).

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.

**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.

### 8.6.3.8 Miscellaneous Alarms

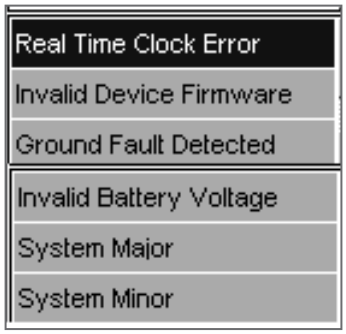



**Figure 60 —** Miscellaneous Alarms Categories – LCD

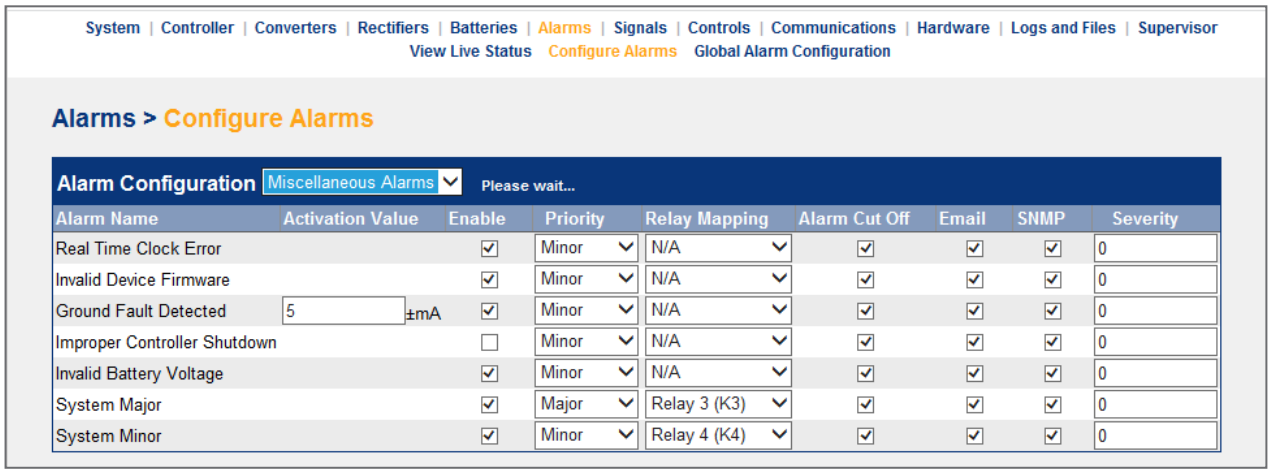



**Figure 61 —** Miscellaneous Alarms Categories – Web

**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.

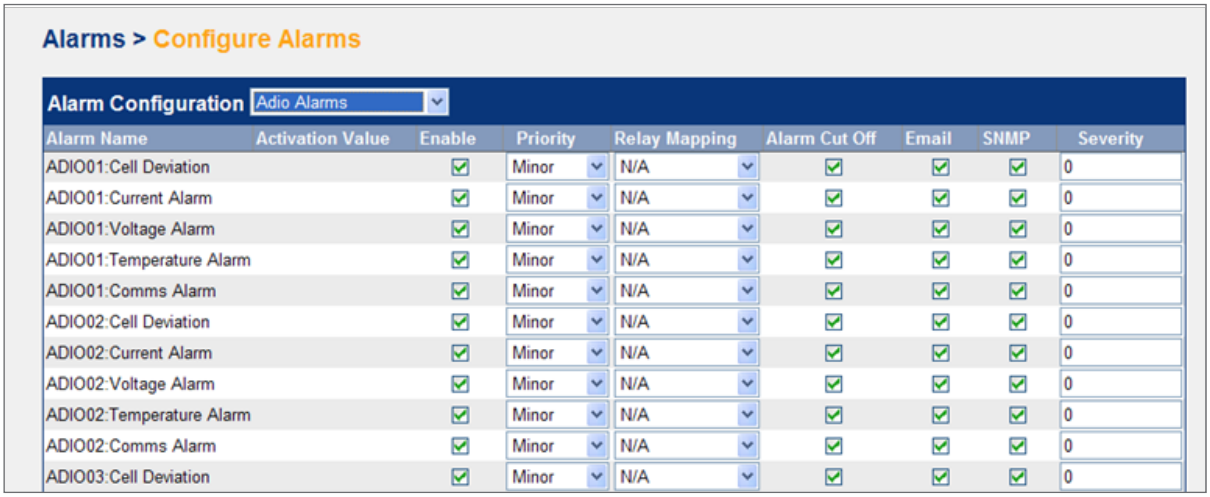
**System Major** — The Supervisor can map a relay to the power system major alarm, which is activated if there are one or more active MAJOR alarms. A pull-down menu with scroll bars can be used for navigation.

**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.

## 8.6.3.10 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.




## 8.6.3.9 Converter Alarms

### Converter Fail

This menu item enables the Supervisor to set an alarm condition for an 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.

## 8.6.4 ADIO Alarms Detail (LCD only)

### 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.

## 8.6.5 Global Alarm Configuration

This section describes the alarm configuration parameters that are applicable to all alarms. The Web interface has all the parameters on a single screen and for the LCD the configuration values are available on 3 separate screens. Configure ALCO, Alarm Hysteresis, and Alarm Tone.

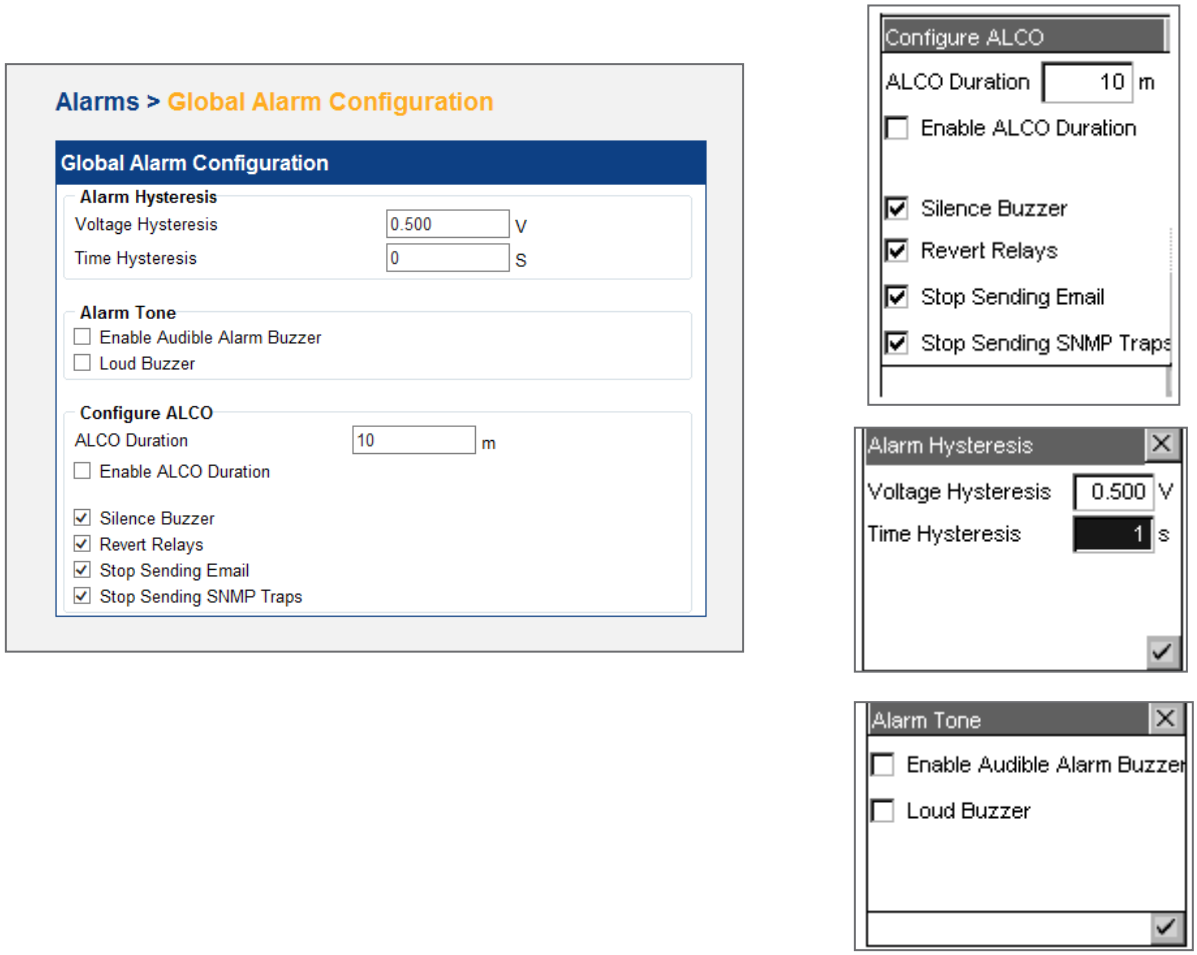



**Figure 62 —** Global Alarm Configuration - Web and LCD

### Alarm Hysteresis

This feature is used only for Current, Voltage, Battery, and Temperature alarms HVSD and CEMF controls.

- Voltage Hysteresis - applies only to Voltage Alarms (7.5.5.2). 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.
- Time Hysteresis - 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.

### Alarm Tone

This feature is found under the Alarms > Global Alarm Configuration menu and the tone is enabled by default. The Supervisor can enable/disable the Audible Alarm Buzzer (tone). Enabling the Loud Buzzer option increases the pitch and volume of the buzzer.

### Configure ALCO

This feature is found under the **Alarms > Global Alarm Configuration** menu.

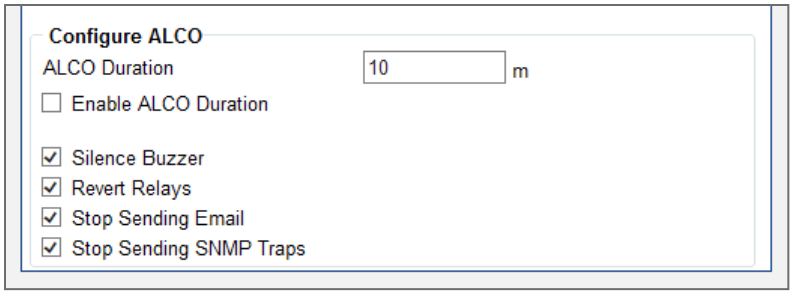



**Figure 63 —** Configure ALCO – Web

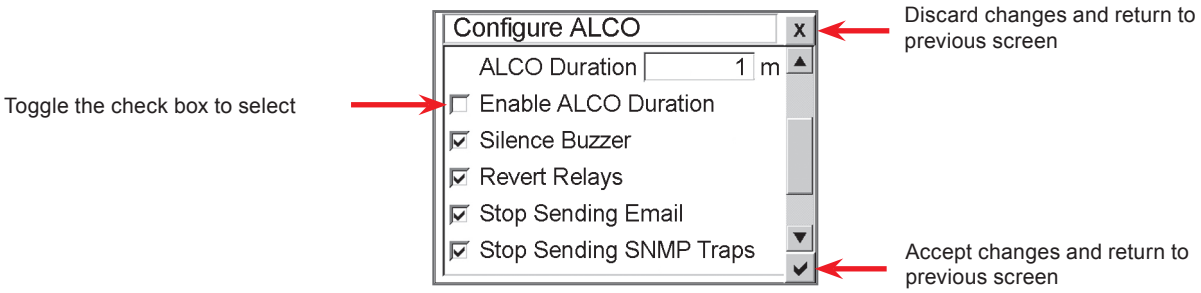


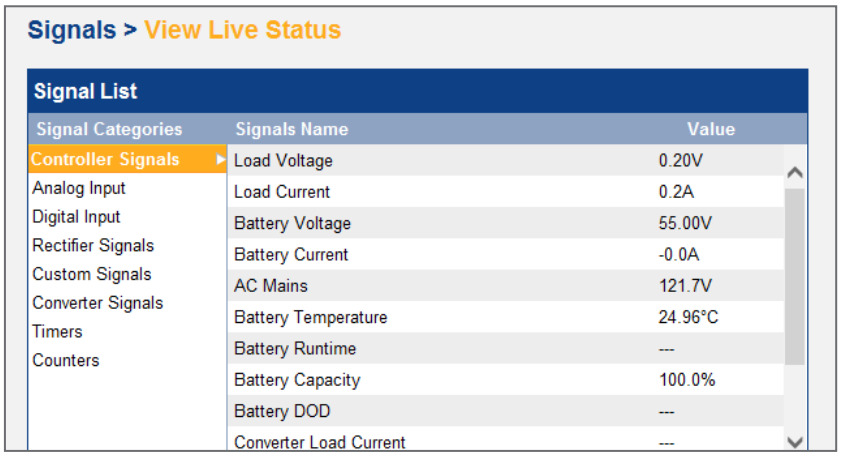

**Figure 64 —** Configure ALCO – LCD

| | |
|---|---|
| **ALCO Duration** | Duration in minutes that affected alarms, those with cutoff allowed, remain cutoff when ALCO (Alarm Cutoff) is activated. (For the LCD interface, tap on the duration number shown to edit via a virtual numeric keypad.) |
| **Enable ALCO Duration** | Activates the ALCO Duration feature. |
| **Silence Buzzer** | Disables 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 associated with Alarms that are cutoff when ALCO is activated. New alarms triggered after ALCO is activated will send SNMP traps. |

## 8.7 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.

### 8.7.1 View Live Status




### 8.7.2 Configure Signals

This menu item allows the Supervisor to configure Controller Signals (and Analog Inputs described in the previous section). The status of Digital Inputs and Rectifier Signals can also be viewed under this menu (LCD interface only). With the LCD, this menu category consists of system identifiers and calibration controls. The web interface adds the ability to “View Live Status”, “Configure Data Logging” and “ADIO Device Configuration”, set or access parameters such as controller signals, rectifier signals, analog and digital inputs.

#### 8.7.2.1 Controller Signals

Use the Controller Signals menu to access/ edit items such as load current and battery temperature. 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 signals cannot be configured.

| | |
|---|---|
| **System Time (HH. MM.SS)** | The current time as set from Controller>Set Date Time |
| **System Date (YYYY. MM.DD)** | The Current date as set from Controller>Set Date Time |
| **System Uptime** | The length of time in seconds since the controller has been restarted |

The following table summarizes the default controller signal equations:

| Table D — Controller signal default definitions | |
|---|---|
| **Controller Signals** | **Signal Equations** |
| Load Voltage | [V1] |
| Load Current | [I1] |
| Battery Voltage | [V2] |
| Battery Current | [Total Rectifier Current] – [Load Current] |
| AC Mains | See section 7.6.2.4 |
| Battery Temperature | See section 7.6.2.6 Example 3. |
| Battery Runtime | Not Configurable except for decimal resolution |
| Battery Capacity | Not Configurable except for decimal resolution |
| Battery DOD | Not Configurable except for decimal resolution |
| Converter Load Current | [Total Conv. Current] |
| Converter Load Voltage | [Total Conv. Voltage] |
| [Avg Conv. Output Voltage] | [Avg Conv. Output Voltage] |

### 8.7.2.2 Analog Inputs

This menu item will display a list of all the existing analog input channels.

#### Definitions

The majority of the CXC's analog input channels are each designed to accept a specific input signal, where:

√ = Installed

BiV = -60V to +60V

I = -50mV to +50mV

T = -55 C to +100 C (powered)

V = 0 to 60V

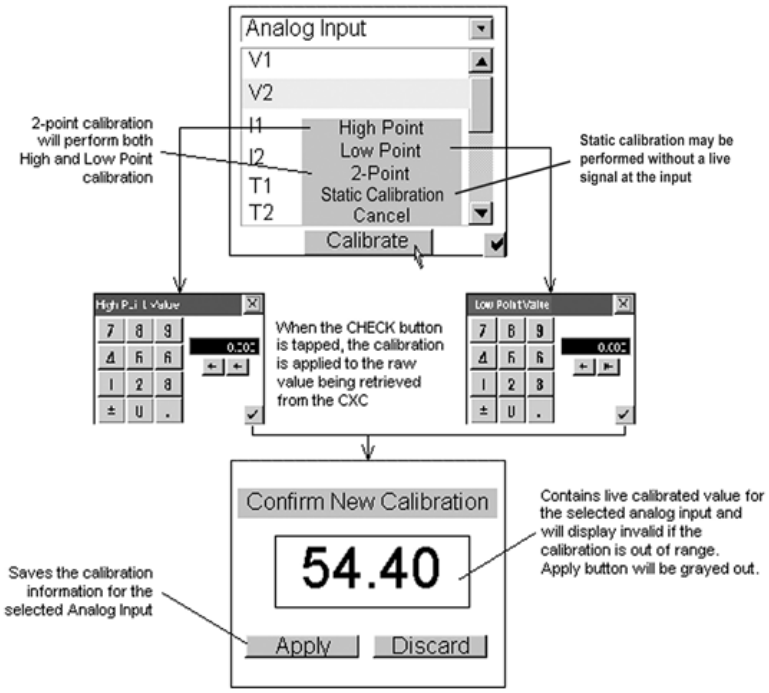
X = Not Installed

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

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

#### Calibration

From this pop-up window, the Supervisor can calibrate the selected channel by setting the high point or low point or both as shown in the following example:




Tap to Cancel or proceed through the screens. Apply or Discard the calibration information as needed. A more detailed method of procedure can be found at www.alpha.ca. under Support.

### 8.7.2.3 Digital Inputs

Select this heading from the pull-down menu to access a list of all the existing digital channels, see 8.6.3.2 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**) Depending on which controller you are using you may not see "Digital Inputs" under the Configure Signals menu.

### 8.7.2.4 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.

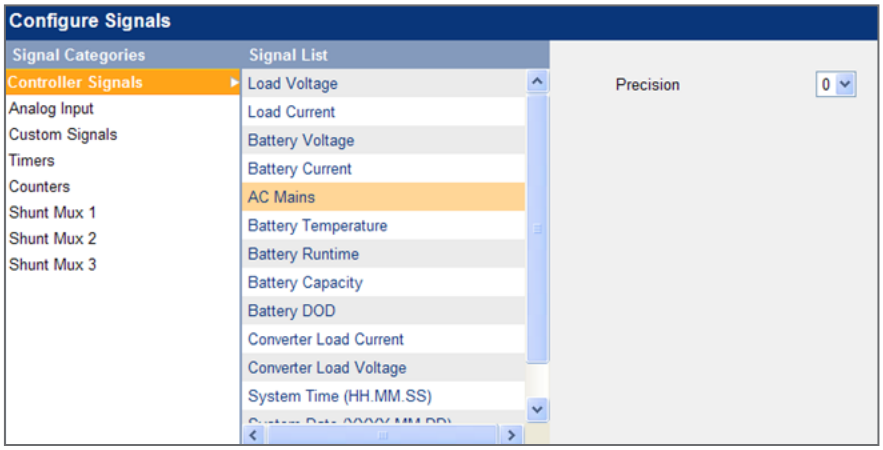



**Figure 65 —** AC mains voltage correction via web interface

### 8.7.2.5 Custom Signals

NEW FEATURE This software version includes an additional 10 custom signals for a total of 20. Custom signals can use other signals to form equations.

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.

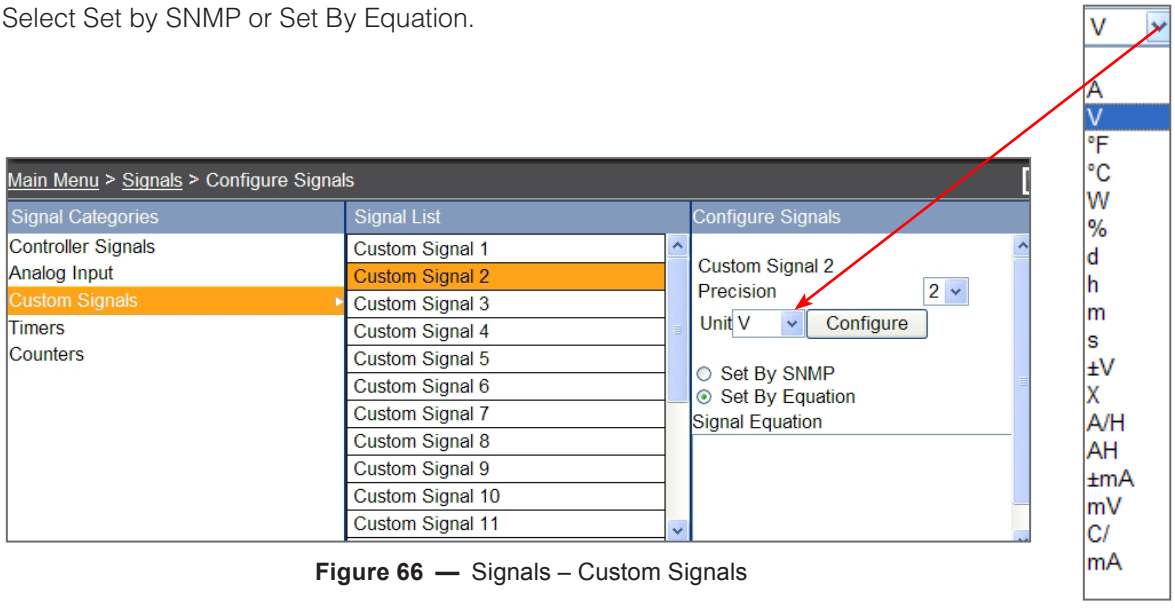



**Figure 66 —** Signals – Custom Signals

### 8.7.2.6 Converter Signals

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

- 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

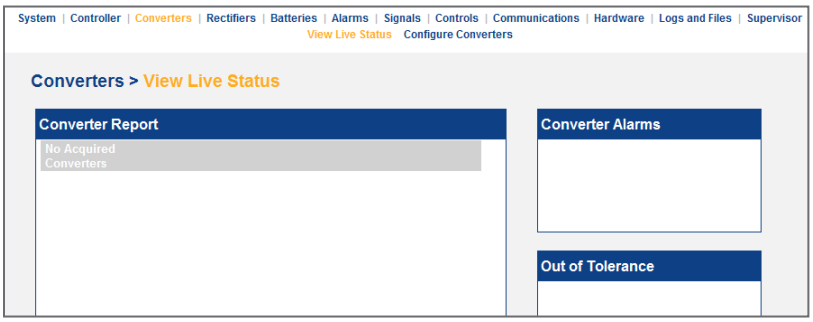



**Figure 67 —** Converter Signals - Web view

#### 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.

#### 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.

### 8.7.2.7 Counters

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.

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

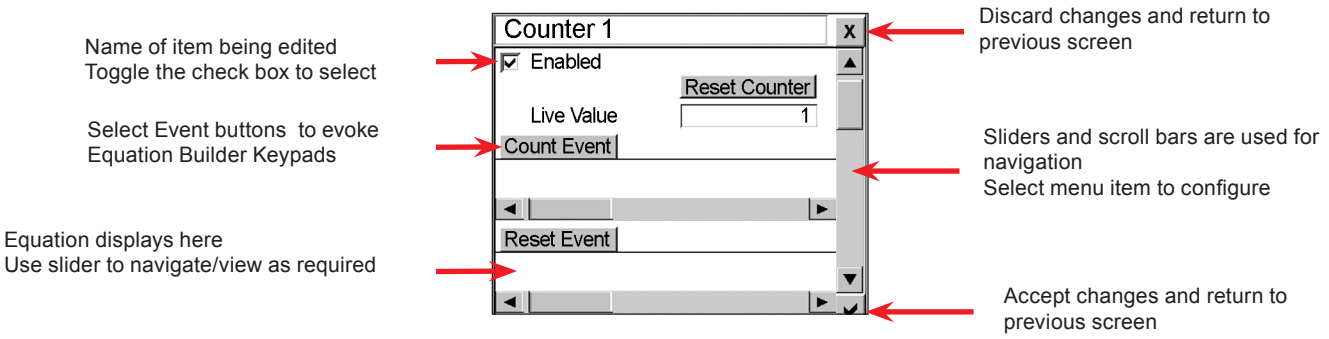



**Figure 69 —** Counter access window

| | |
|---|---|
| **Enable:** | Check to activate the counter. |
| **Live Value:** | Current count value. The reset button sets the value to 0. |
| **Count Event:** | 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:** | Trigger condition that sets the Count value back to 0. |

### 8.7.2.8 Timers

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

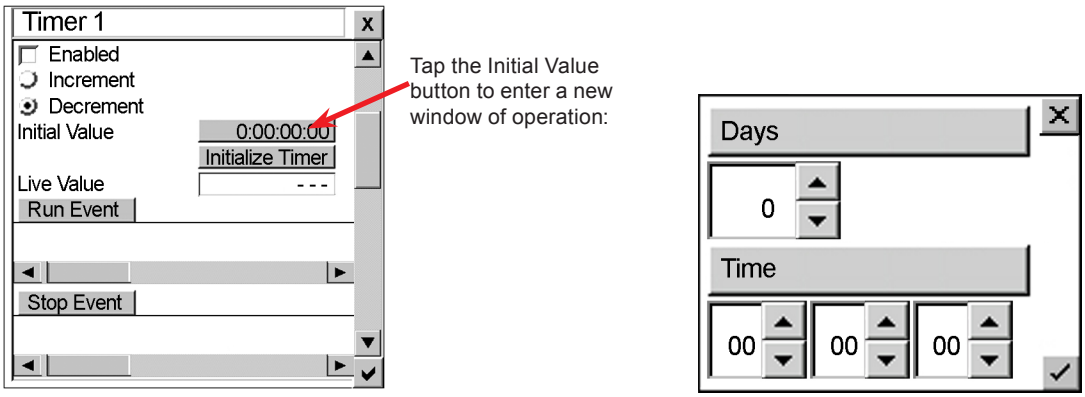



**Figure 68 —** Timers access windows

| | |
|---|---|
| **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. |
| **Live 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. |

The Timer values themselves can be used in equations. They can monitor each other. Any timers that are based on edge detection may not start if the controller is restarted. If there is a need for this functionality use the System Uptime signal

### 8.7.2.9 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:

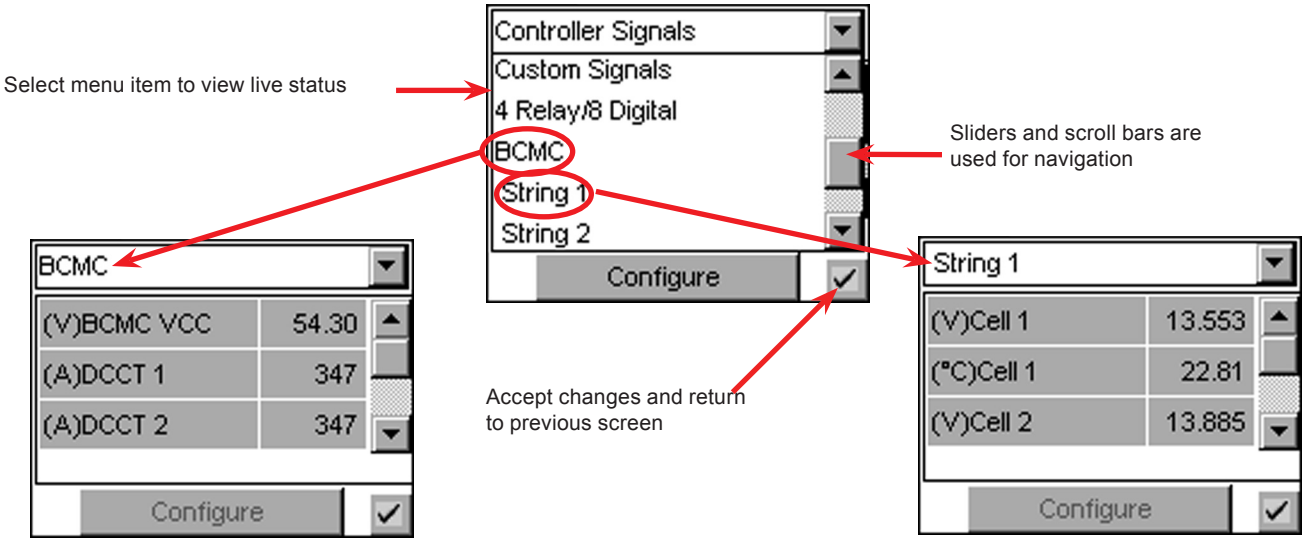



**Figure 70 —** ADIO live information windows

### 8.7.2.10 Alpha ADIO Devices

Alpha CAN Devices can be attached via the CAN cable to your controller. Both the name in the "Signal Category" (e.g. BCM 12V Blocks) and the name in the "Signal List" (e.g. S1:AMPS) can be modified from the "**Signals>ADIO Device Configuration**". These names are saved on the device when you click "Apply Changes" not as part of the main configuration file

The "BCMC", "BCM 12 Volt Blocks", "Shunt Mux" and "BCM 2 Volt Blocks" devices can have their range configured. In order to change the range of one or more signals select those you want to change, modify the "Range" and click "Apply".

BCMC Configuration screen – There are 4 signals in the signal list. Each BCMC can have 4 strings which can have their range set separately.

**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:

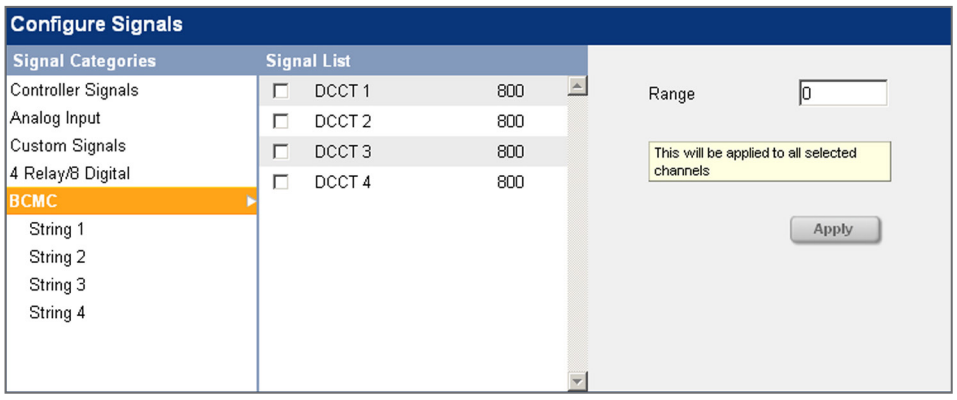



**Figure 71 —** BCMC configuration example one (set DCCT range in Amps)

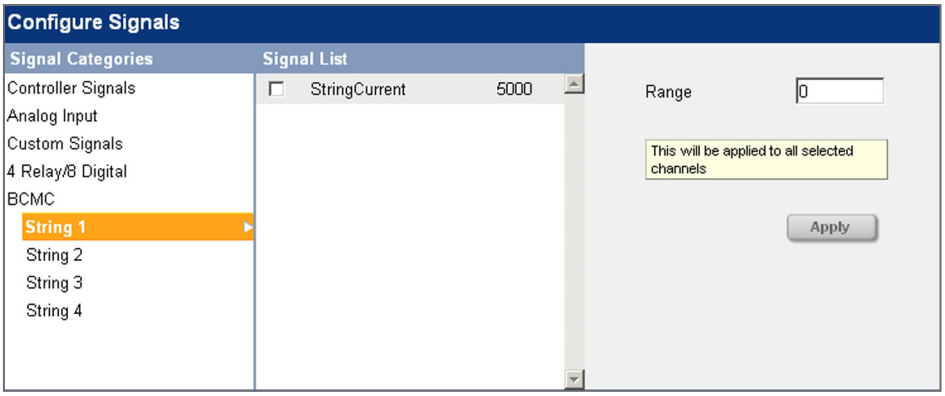



**Figure 72 —** BCMC configuration example two (set String Current range in Amps)

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.

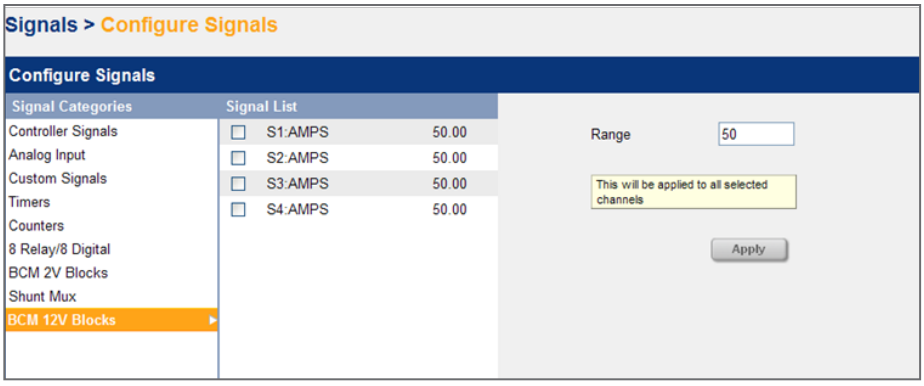



**Figure 73 —** BCM 12 Volt Blocks Configuration Screen

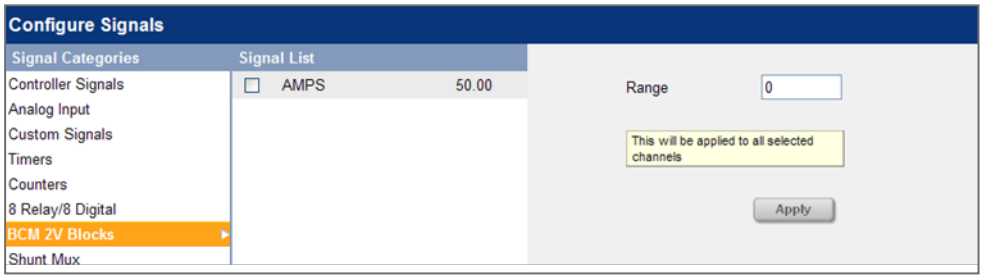



**Figure 74 —** BCM 2 Volt Blocks Configuration Screen

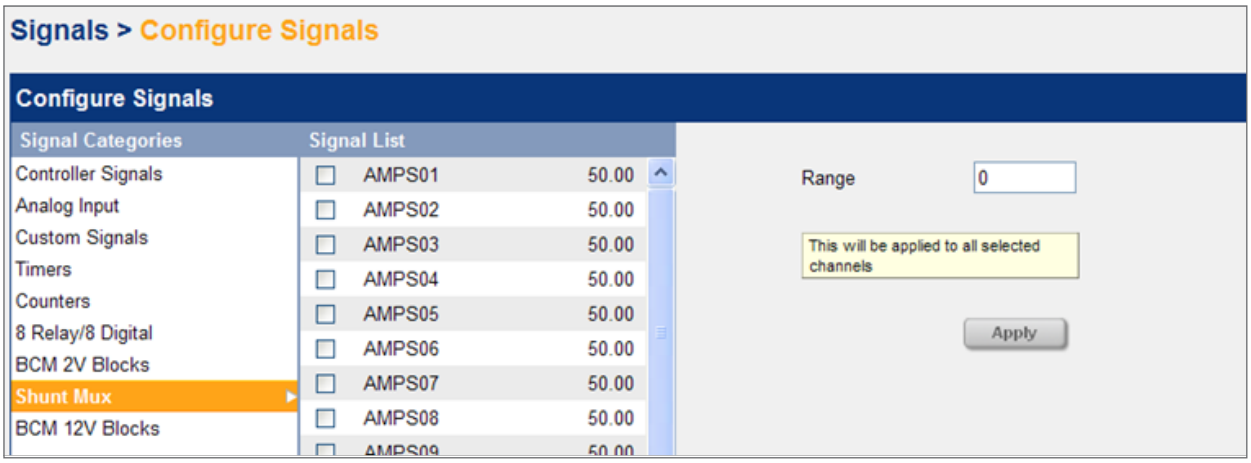



**Figure 75 —** Shunt Mux - There are 16 signals in the signal list.

Note: There are no configurable signals for the 8 Relay Digital.

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

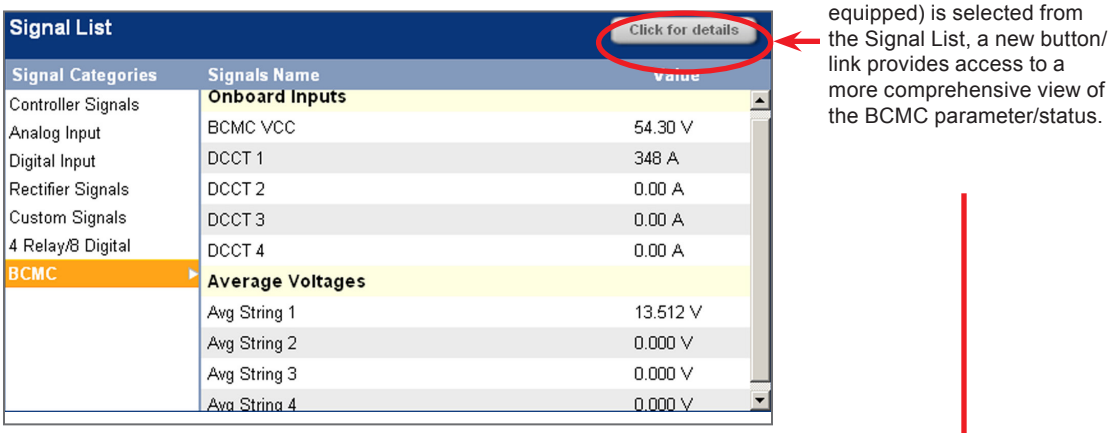



**Figure 76 —** View Live Status (Signals) web interface window

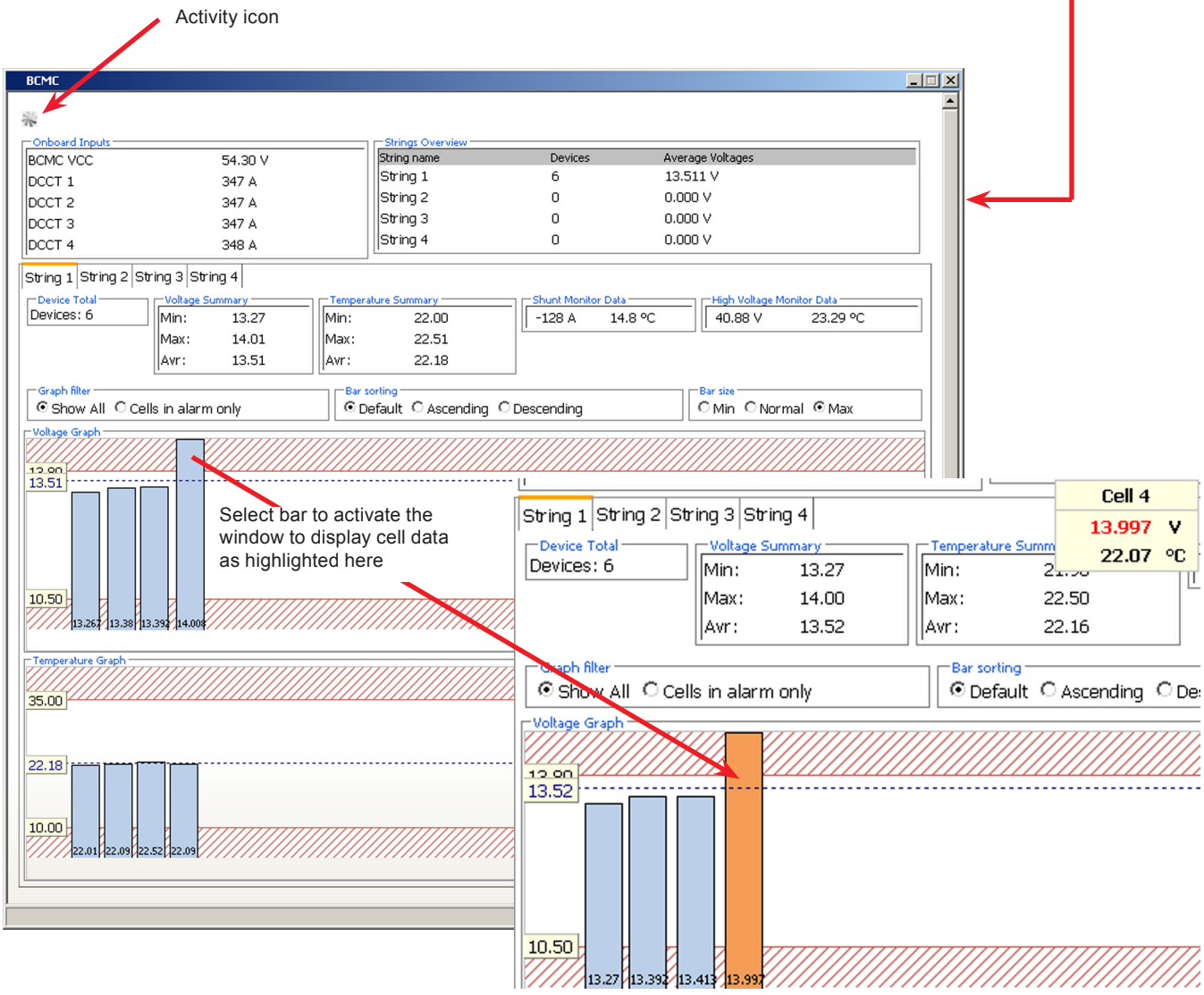
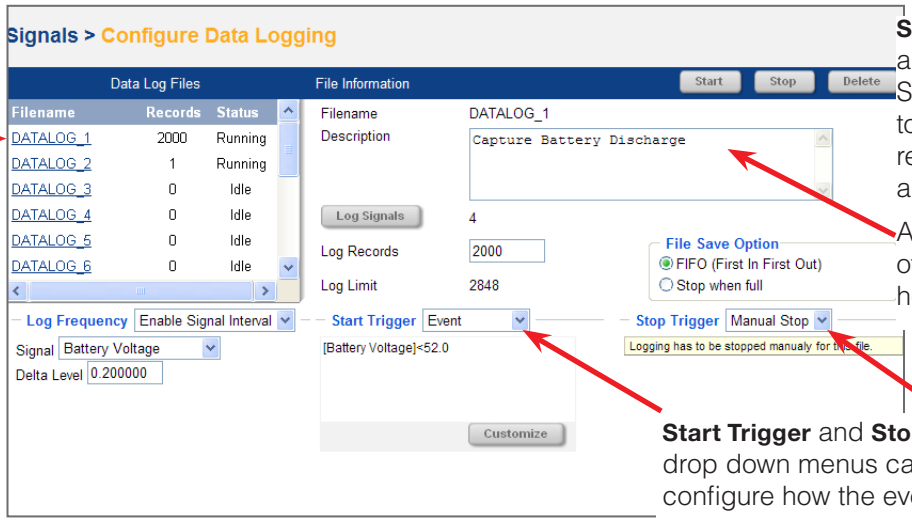



**Figure 77 —** Detailed status view and bar graph (BCMC only) web interface window

## 8.7.3 Data Logging (Web Interface Only)

### 8.7.3.1 Configure Data Logging

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




Scroll to view the list of filenames, the number of records and status.

Select a filename to edit the Data Log

**Start** and **Stop** buttons are used if the Start/ Stop trigger is set to manual. **Delete** removes the log altogether.

An editable description of the log file displays here. Click to edit.

**Start Trigger** and **Stop Trigger** drop down menus can be used to configure how the event is triggered.

**Figure 79 —** 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**.

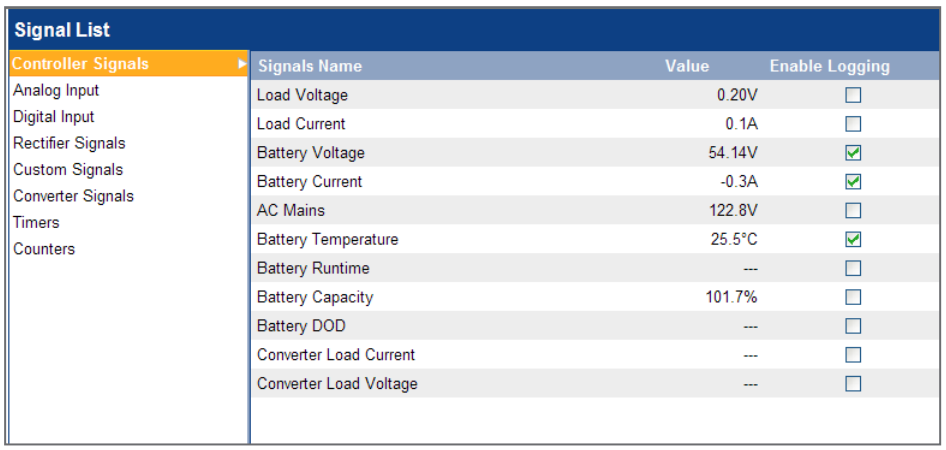



**Figure 78 —** Enable Signals for Data Logging web interface window

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. To view of save the data in a Data Log file, go to Logs & Files and at the bottom select the data logging file wanted 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 (maximum 32)—see Figure 78.

**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 can also be set based upon one of the selected signals change by the Delta Level; click on the Delta level value to edit.

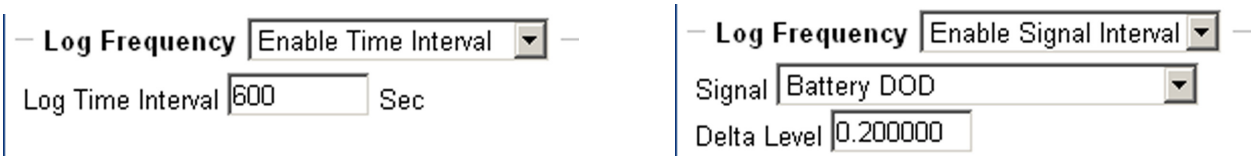
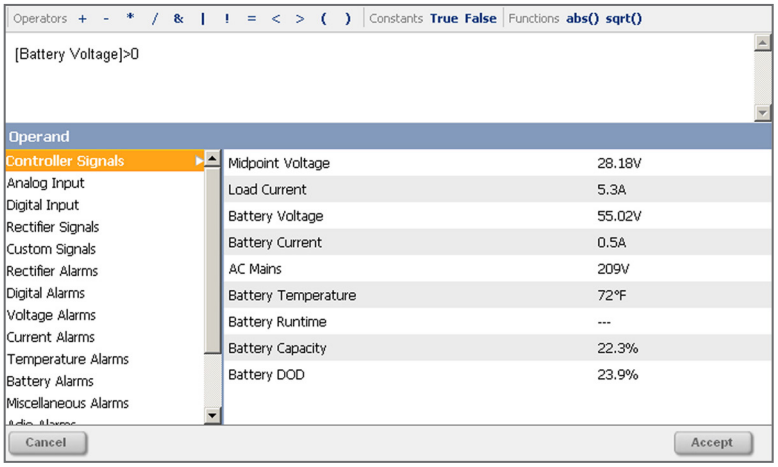



**Figure 81 — Log Frequency enabling time interval or signal interval**

**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 80 —** 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.

### 8.7.3.2 Starting/Stopping of Data Logging

**MANUALLY**: Press the **Start** button at the top of the **Configure Data Logging** page (see Figure 79). 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 “8.7.3.6 Example Three – Generator Voltage” on page 104). 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.

### 8.7.3.3 Retrieve Logs

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

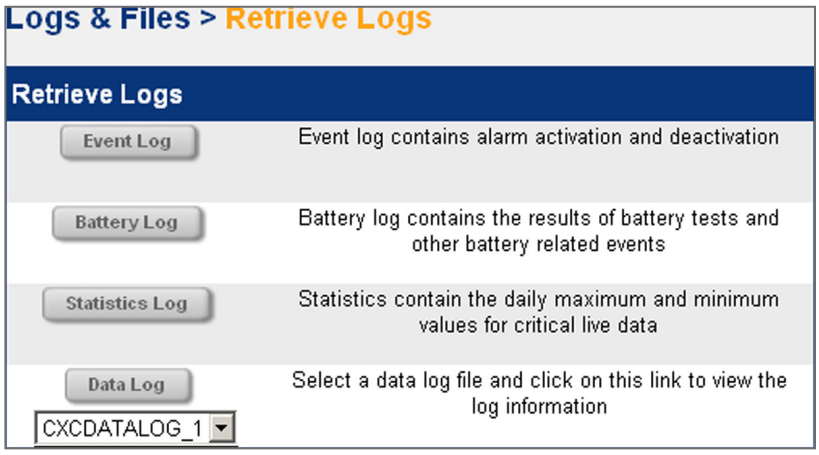



**Figure 82 —** Retrieve Logs web interface window

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 83 —** 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.

### 8.7.3.4 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 three 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 in the **Description** field.
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).

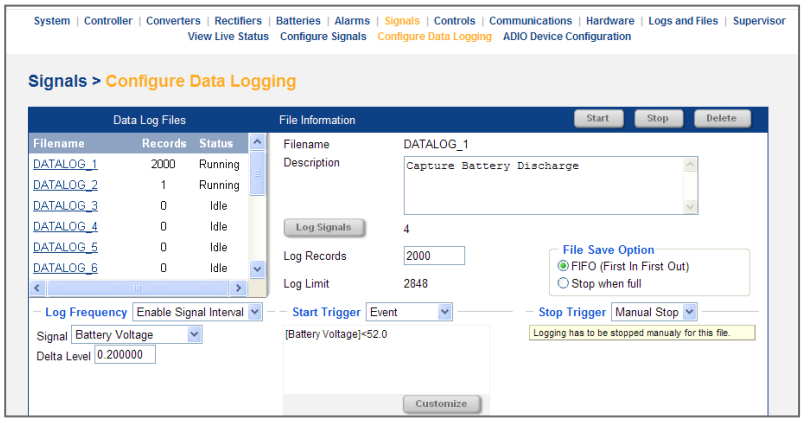



**Figure 84 —** Configure (Signals) Data Logging web interface window, example one

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.

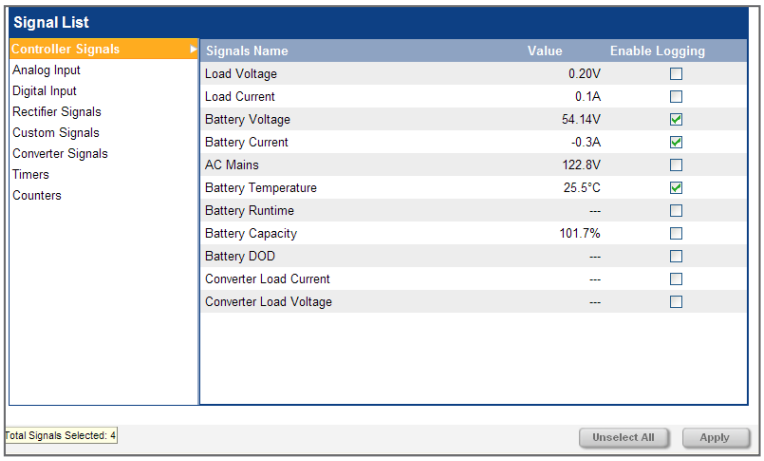



**Figure 85 —** Enable (Rectifier) Signals for Data Logging

10. Click the **Apply** button (to accept changes and return to Configure Data Logging window).
11. Once the Data Log is configured, select **Submit Changes** to save the changes.
12. Start the log by clicking the **Start** button located next to the File Information heading (see Figure 84. Once the data has collected for the desired interval, return to this window and click the **Stop** button.
13. Select **Logs and 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.

### 8.7.3.5 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**.

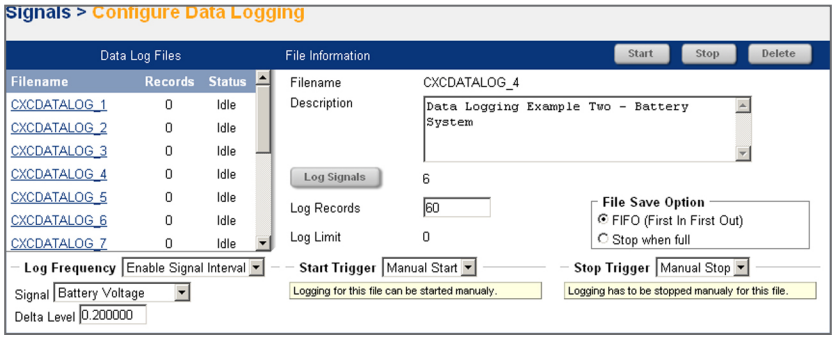



**Figure 86 —** Configure (Signals) Data Logging web interface window, example two

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.

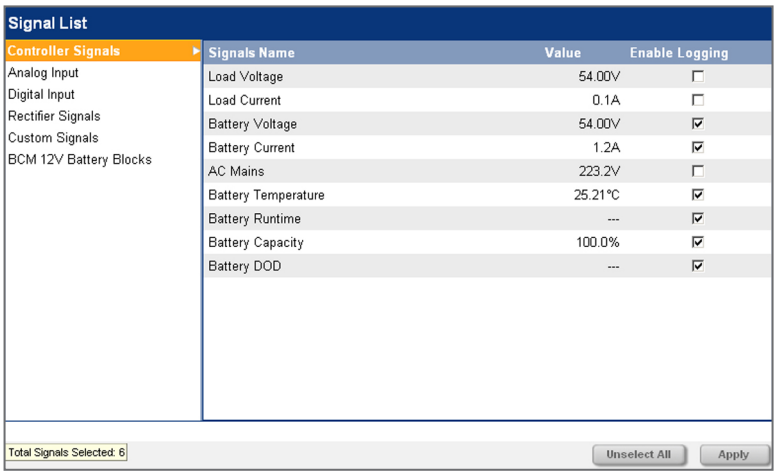



**Figure 87 —** Enable (Controller) Signals for Data Logging web interface

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 79). 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.

### 8.7.3.6 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**).

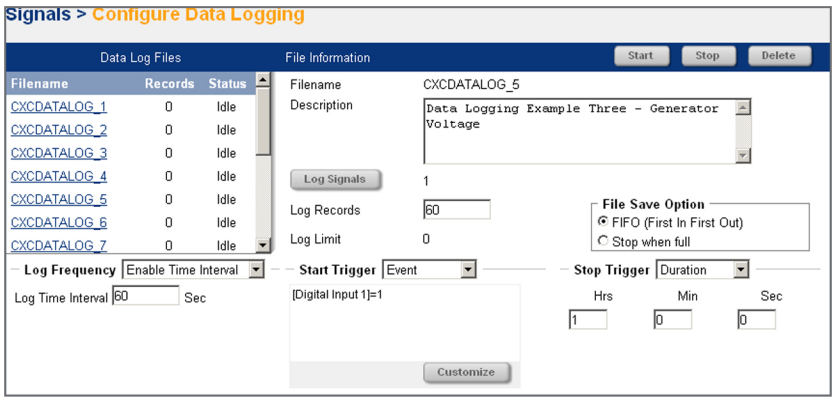



**Figure 88 —** Configure (Signals) Data Logging web interface window, example three

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 signals shown in Figure 89.
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.

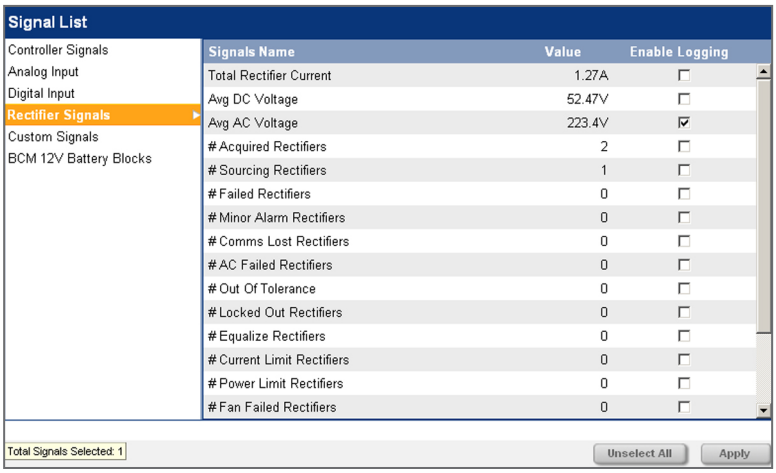



**Figure 89 —** Enable (Rectifier) Signals for Data Logging

## 8.7.4 ADIO Device Configuration (Web Only)

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

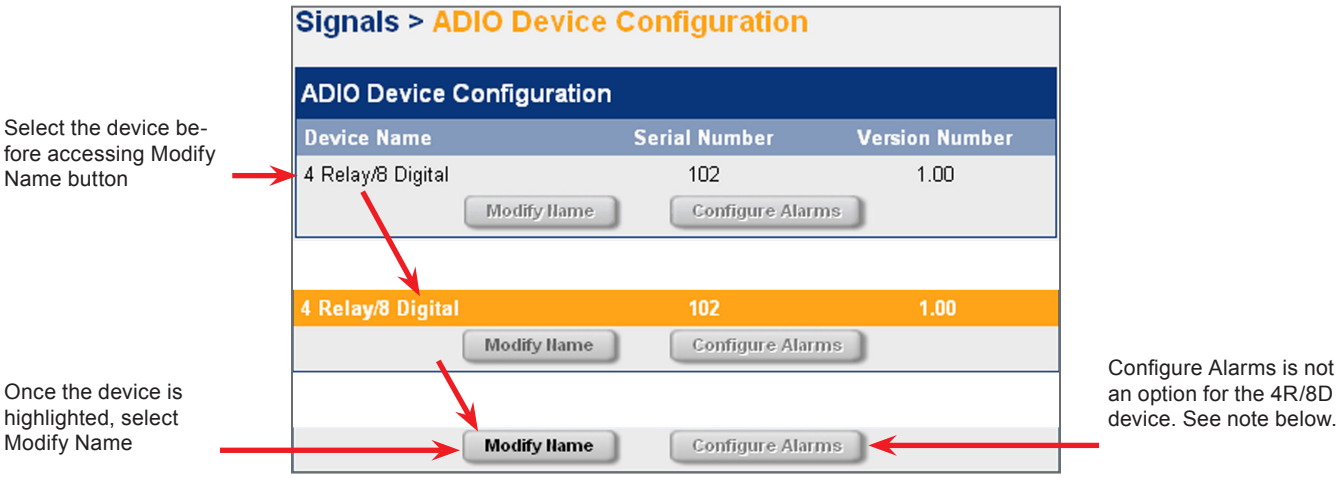



**Figure 90 —** ADIO Device Configuration web interface window (showing 4R/8D device)

**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.

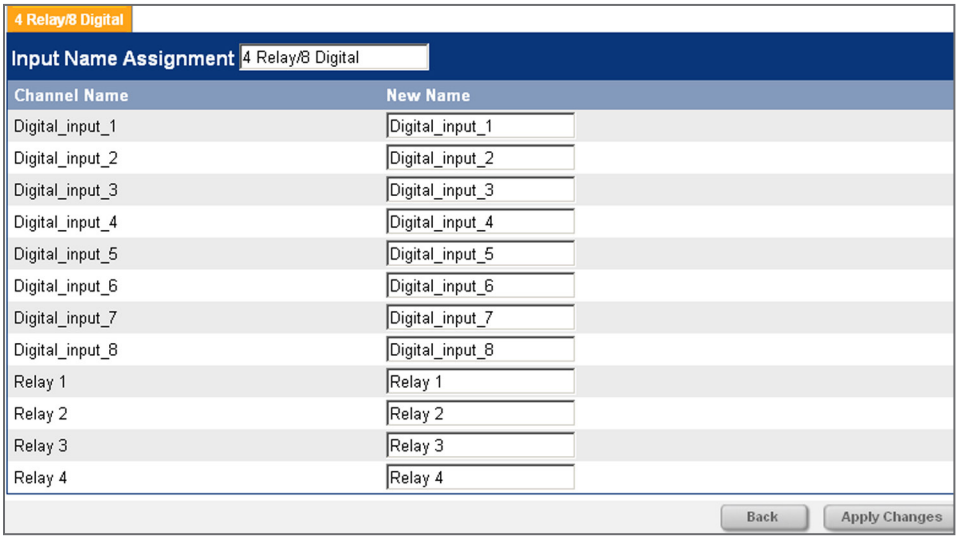



**Figure 91 —** Input Name Assignment web interface window (showing 4R/8D device)

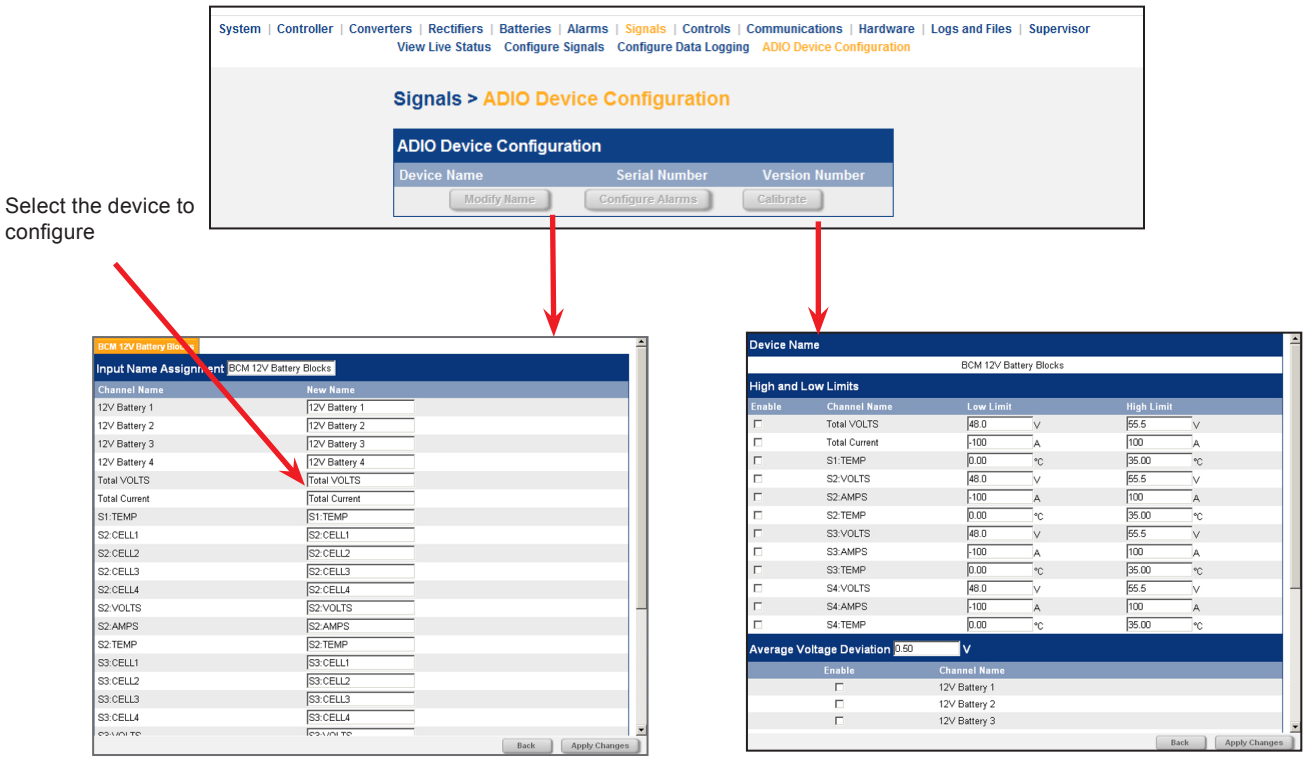



**Figure 92** — ADIO device configuration examples (showing BCM device)

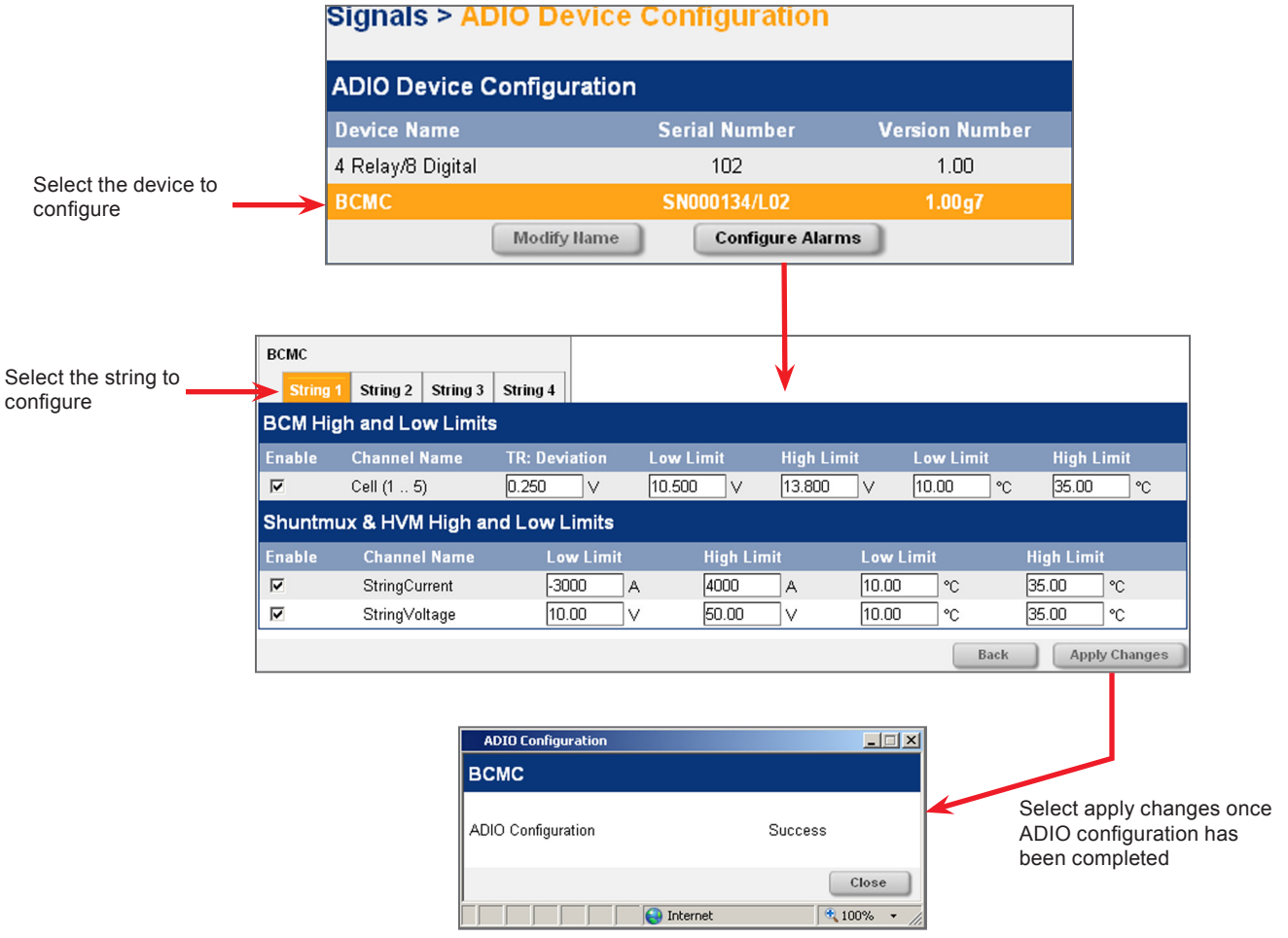



**Figure 93** — ADIO device configuration examples (showing BCMC device)

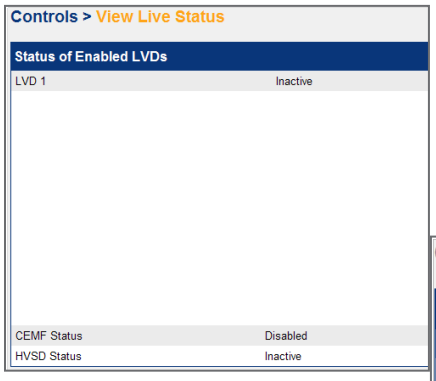
## 8.8 Controls

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 8.6.2 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 parameters in addition to those found in 8.6.2:

### 8.8.1 View Live Status

This screen displays the live status of the controls. Note that only LVDs that are enabled will show on the screen.

The second screen shows the current configuration values and allows the user to configure the controls much the same as the LCD interface as described in the following sections.




### 8.8.2 Configure Controls

The web screen (shown in the previous figure) allows the supervisor to configure the LVD in the same was as the LCD display. This section describes configuration, assuming that the LCD is being used.

**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.

#### 8.8.2.1 LVD Control (USE WITH CAUTION)

**Caution**: **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.**

The Supervisor can program connect/disconnect settings to govern the operation of ten separate LVD controls. The LVD is activated when the Disconnect 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.

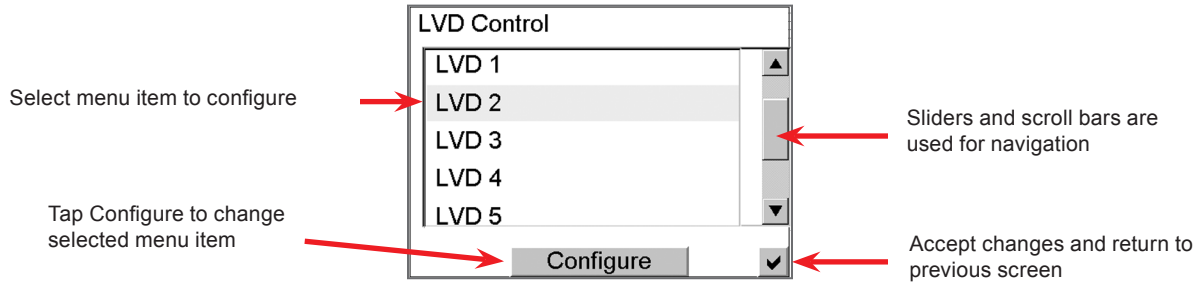



**Figure 94 —** LVD Control window

Tap “Configure” to enter a new window of operation for the item selected. In this new window, shown in Figure 95, the Supervisor can set the following parameters:

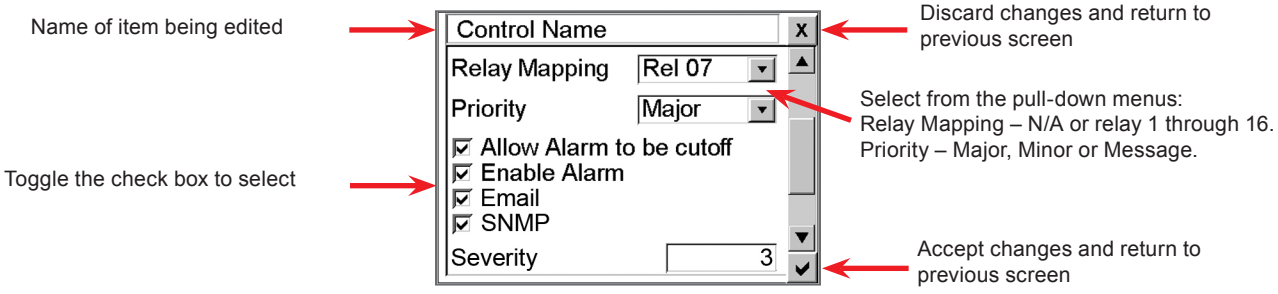



**Figure 95 —** Configure (item selected) sample window

#### 8.8.2.2 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.

#### 8.8.2.3 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.). 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. When this timer expires, 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.

#### 8.8.2.4 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.

#### 8.8.2.5 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.

- 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.
- 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.

## 8.9 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 “11. Remote Communication” on page 127.

### 8.9.1 Viewing Live Status (Web Interface Only)

Click **Communications > View Live Status** to display the status of the Cordex controller ports. Figure 96 shows a sample set of values.

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

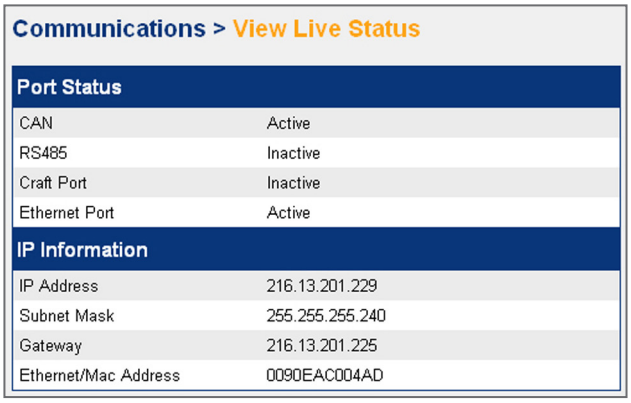



**Figure 96 —** Port Status and IP Information window

### 8.9.2 Configuring Communication Parameters

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

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

#### 8.9.2.1 Ethernet

Use this section to change the IP address, Subnet Mask and the gateway as necessary for the CXC controller to function on your network. See section 10 on page 123 for more information.

**NOTE:**

**IMPORTANT: After the IP address, Subnet Mask or Gateway for your controller is changed, when using the web interface you need to click the submit changes button. The controller displays a popup warning that these changes take effect immediately. If you click OK, the differences screen displays which shows what has changed. If these changes are acceptable you must check the box beside "IP Information" to confirm the changes. Click "Accept" or if you do not want the changes click "Cancel".**

**NOTE:**

**IMPORTANT: After the IP address has been changed from the web interface you will need to close your browser window and then open it using the new IP address.**

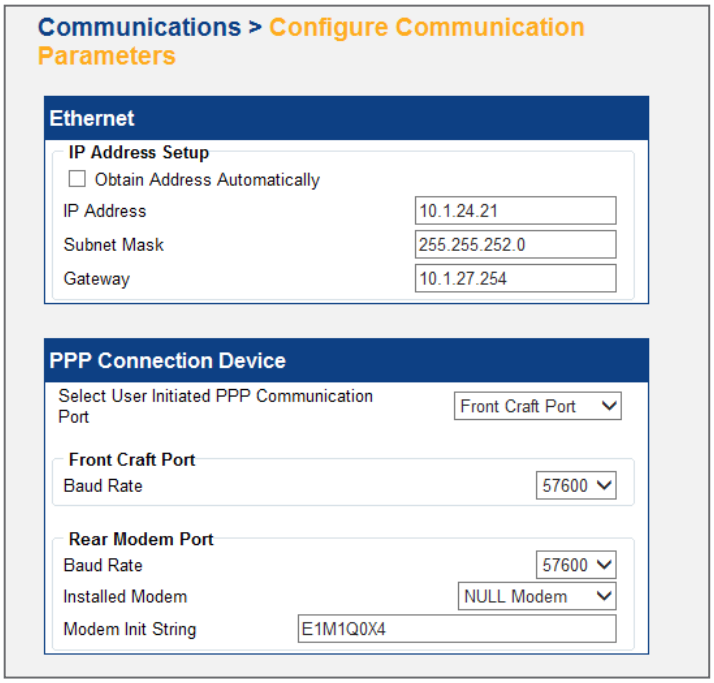



**Figure 97** — Configure Communications Parameters window

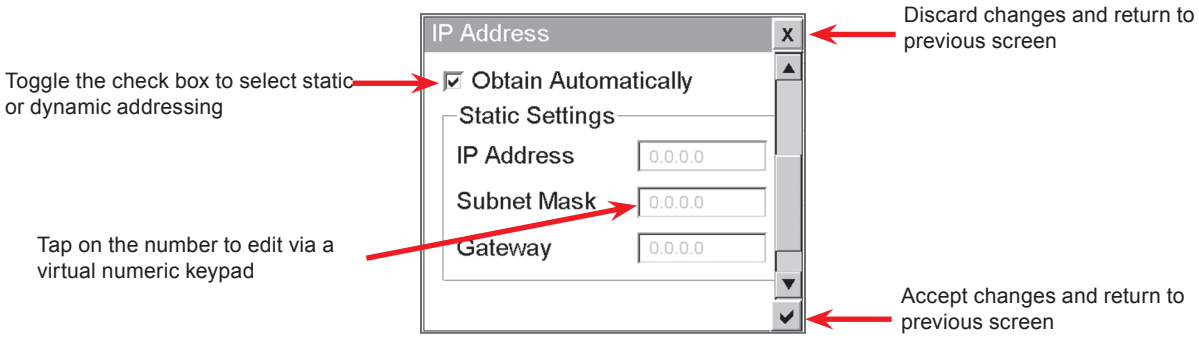



**Figure 98** — IP Address window

## NOTE:

**Controller IP Address Reset and Startup: This feature enables the user to reset the IP address of the controller on Cordex controllers that have only a 4-digit display.**

The reset button located on the Controller's front panel is for restarting the microprocessor. When pressed momentarily, the unit beeps twice then resets. The front-panel LED's will illuminate temporarily, but will extinguish after the system has finished its 15-second self-test.

To reset the IP address, press and hold the front panel reset button for three seconds. The unit will beep three times, IP will be reset (to 10.10.10.201) and DHCP will be disabled. The settings will be saved and the unit will then reset.

There is also a "hard" reset button located on the side. Pressing this button will reset the CXC but will not affect any settings; has the same functionality as the reset button on a CXC with a touch screen LCD.

The Controller, upon startup , will set the time based on the following priorities:

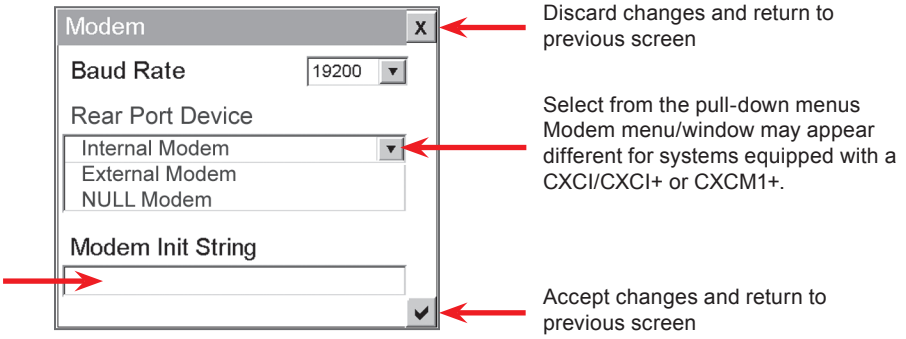
1. Attempt to synchronize with the NTP server (see www.NTP.org), otherwise:
2. Retrieve the last time stamp from the Event Log, otherwise:
3. Retrieve the last time stamp from the Statistics Log, otherwise:
4. Set the time to 2005-01-01 midnight (if the above methods fail).

### 8.9.2.3 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 11.2. The **Modem Init String** is also displayed here.

#### LCD Interface

See 10.3 for modem compatibility. See Table J for factory defaults (baud rate and initialize string). Modem baud rate is initialized to the value stored in the settings file on start up.




#### Web Interface: Communications > Configure Communication Parameters

**NOTE**: Although the Cordex modem is universal, in some cases it may be necessary to include a Country Code with the Modem Init String. Consult the support section of the manufacturer's website (multitech.com) for the latest country code approvals and for more information regarding AT commands.

If the Modem Init String is edited, save the settings:

1. **Logs and Files > Manage Configuration File**.
2. Click **Submit Changes**.
3. Click **Accept** to download the setting to the CXC on the compare window.

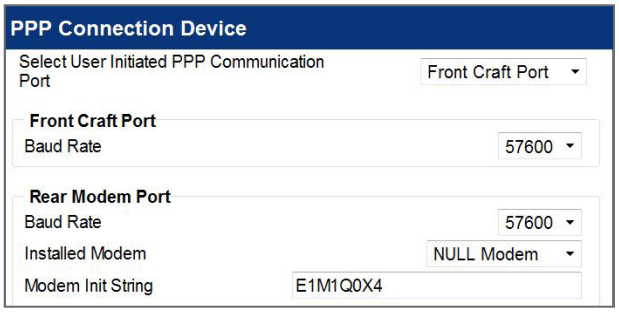



**Figure 99 —** Point to Point Protocol Connection Device

### 8.9.2.2 Web Settings

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

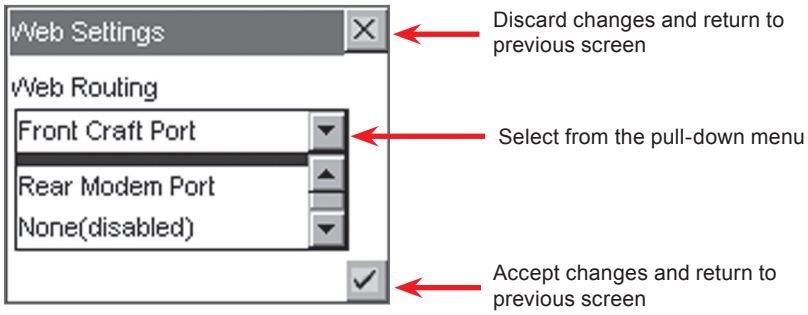


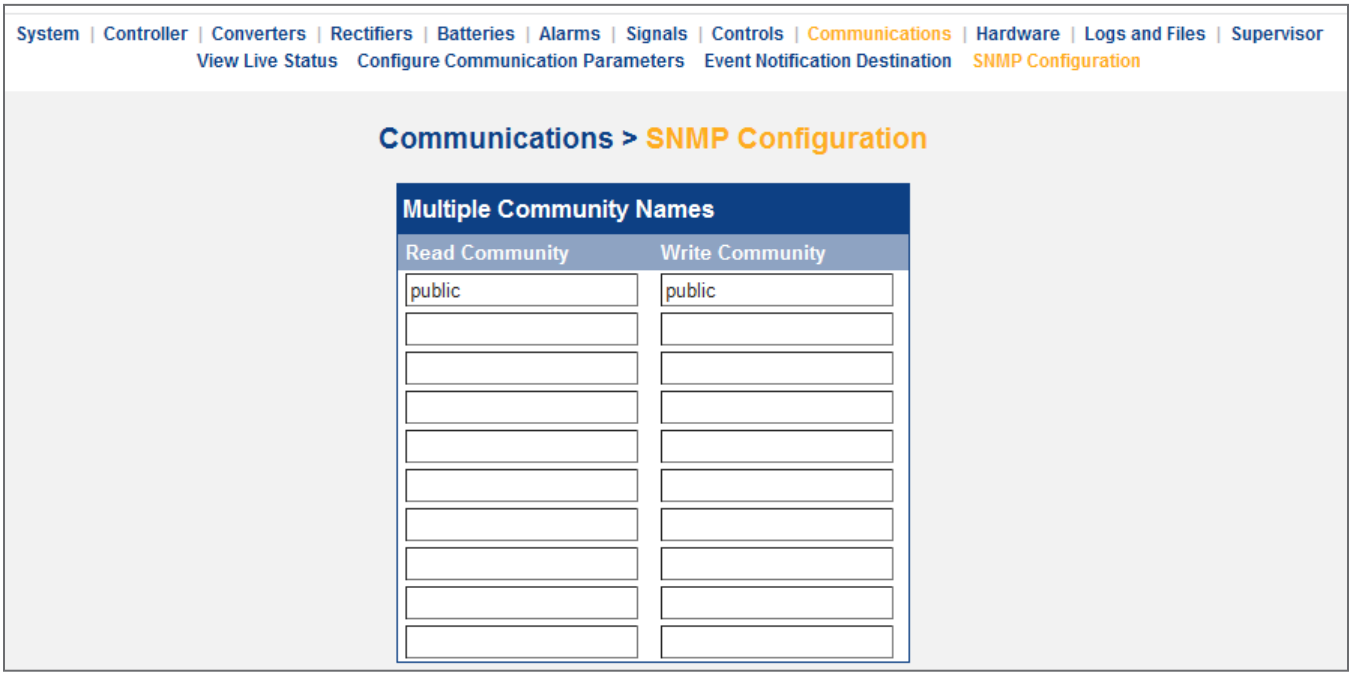

**Figure 100 —** Web Settings window

### 8.9.3 Event Notifications (Web Only)

This screen allows the user to define SNMP event notification destinations. For more detailed information on SNMP, see section 12.

### 8.9.4 SNMP Configuration

This screen allows the user to define a number of SNMP community strings so that multiple NMS can connect to the controller. For more information, see section 12.3.1 on page 139.



## 8.10 Hardware

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

### 8.10.1 Configure Relays

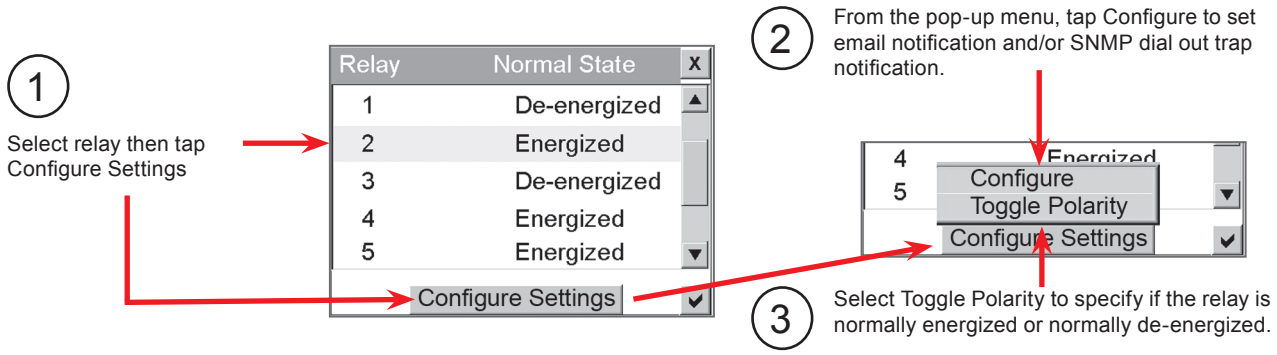



**Figure 101** — Configure Relays – LCD

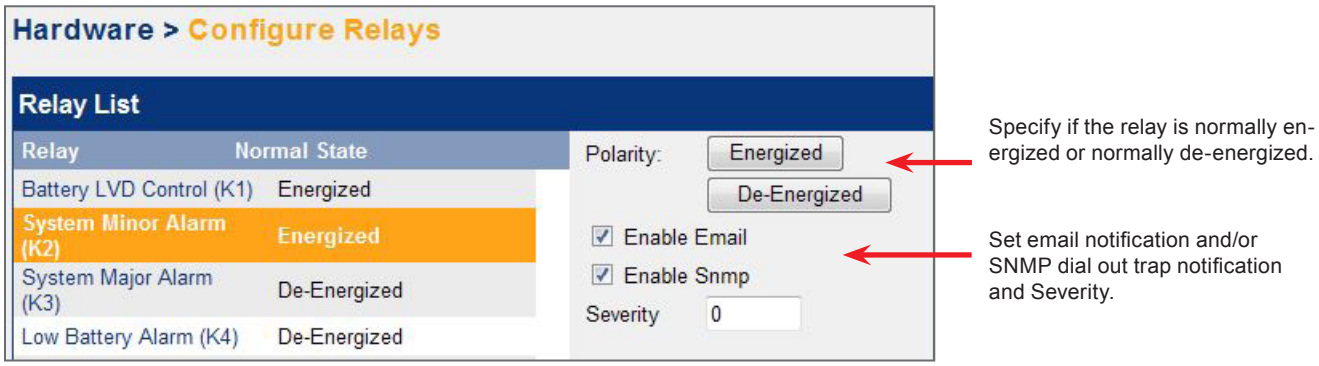



**Figure 102** — Configure Relays – Web

### 8.10.2 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**.)

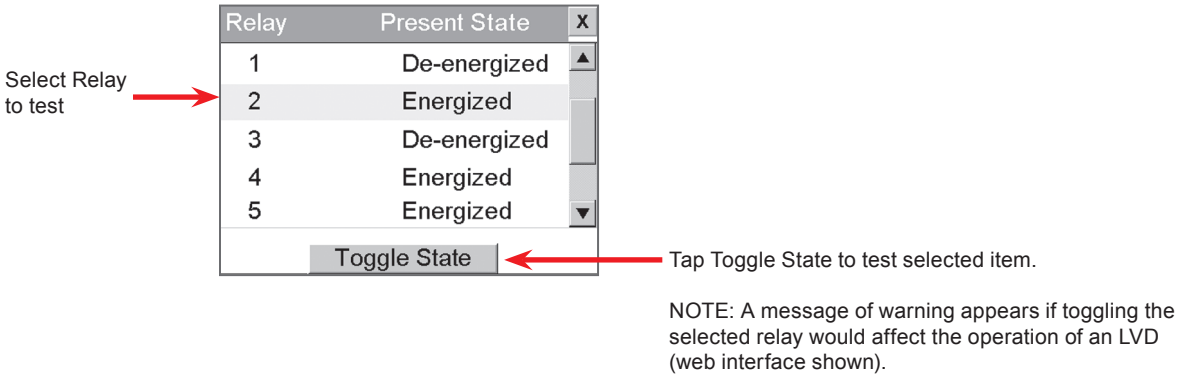



**Figure 103** — Test Relays – LCD

### 8.10.3 Test Modem (Web Interface only)

See section 11.3.3 on page 135

## 8.11 Logs and 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.

### 8.11.1 Retrieve Logs

This screen allows the user to retrieve, display and save, log files from flash memory. If the user chooses to save the filed they will be prompted for a file name. The log files are stored in CSV format and can be exported and viewed in a spreadsheet program. See also 8.7.3.3 (under Data Logging).

- Event Log - Records a variety of events that occur in the system
- Battery Log - Contains a one line summary of each battery test run
- Statistics Log - Contains a daily maximum and minimum values for critical live data
- Data Log - Contains values collected as per user defined characteristics

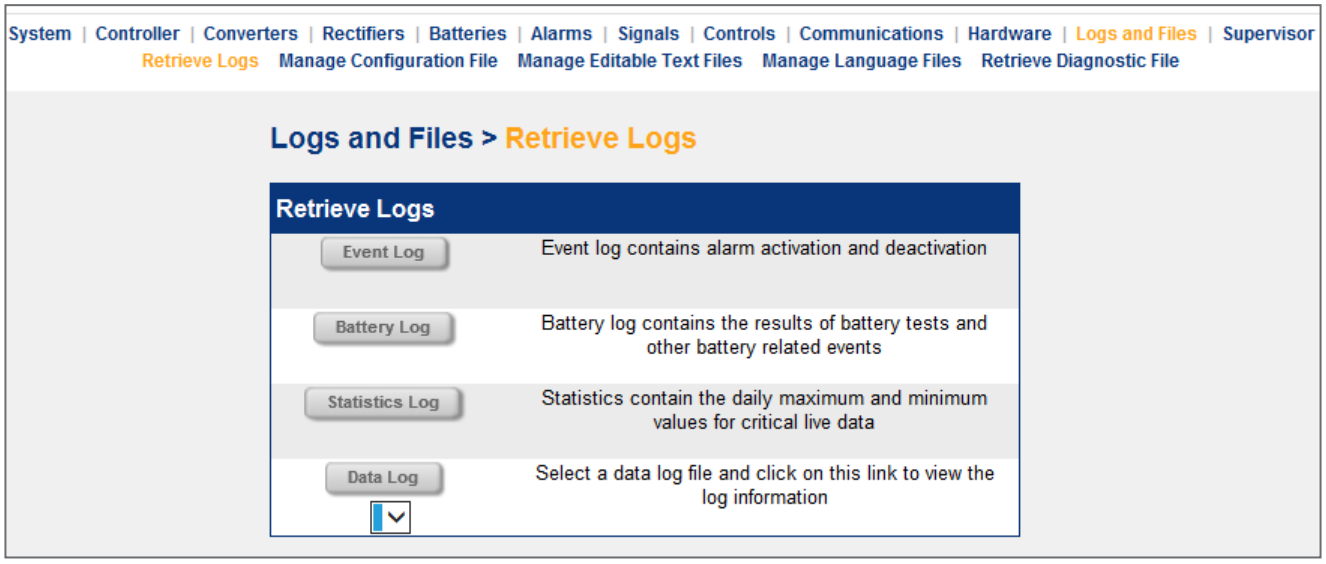



**Figure 104 —** Retrieve Logs web interface window

### 8.11.2 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).

This screen allows the user to save or print the current configuration. The “Save Custom Site Configuration” feature allows the user to exclude portions of the configuration (V1.81 and above).

When the user chooses to “Upload site configuration” the system will display the differences between the current configuration and the new configuration. The user can exclude/disable changes as necessary before accepting the new configuration.

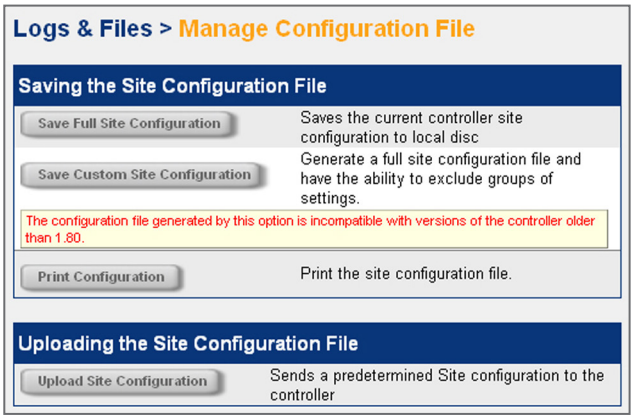



**Figure 105 —** Manage Configuration File web interface window

### 8.11.2.1 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.

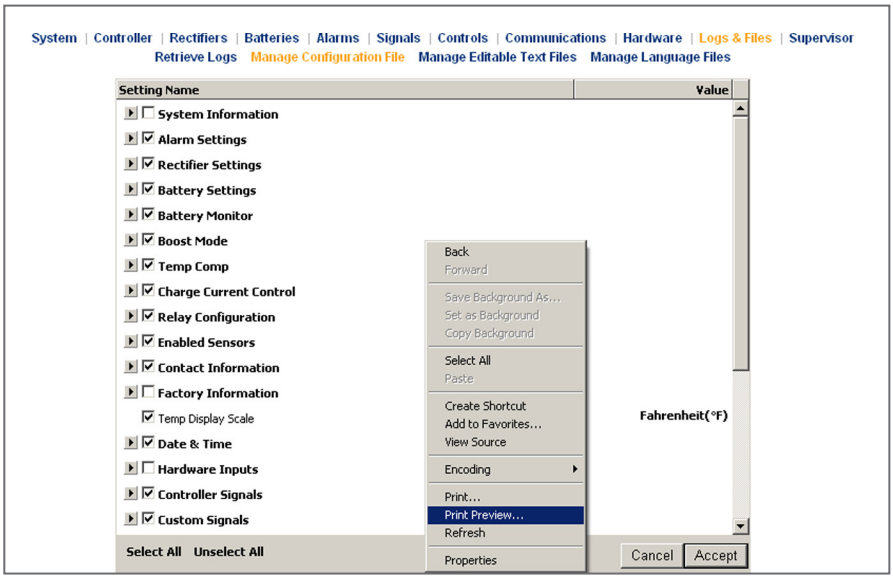



**Figure 106 —** Logs & Files “Print Preview” (web interface)

## 8.11.3 Manage Editable Text Files

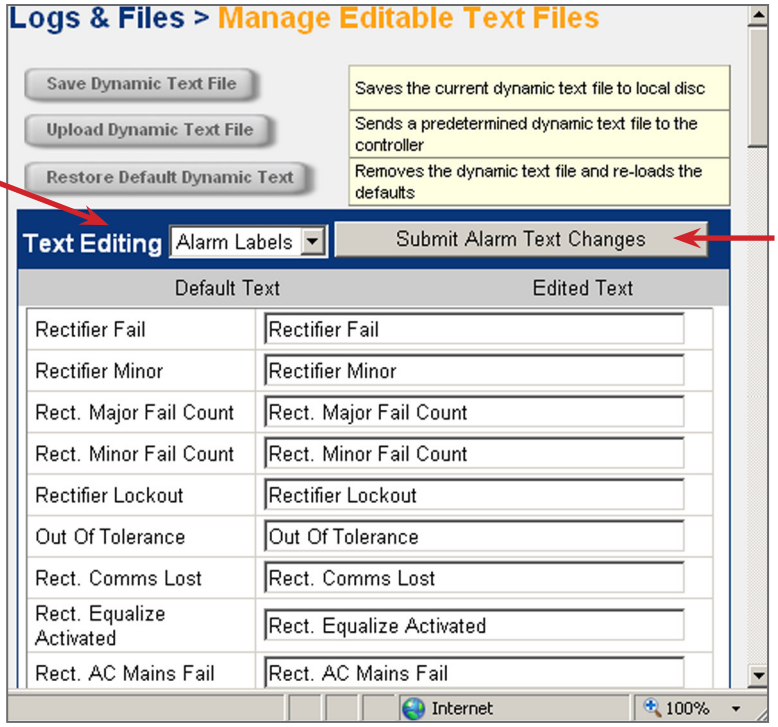
To customize alarm, signal and relay labels for your specific application, select **Logs and Files > Manage Editable Text Files** to change the text strings.

There are three different categories of Dynamic text, Alarm Labels, Signal Labels and Relay Labels. If you select a different set of labels, the text in the submit button changes.

After you make the changes to a category, click **Submit Text changes**.

NOTE: If you have never made any changes to labels and click “Save Dynamic Text” you will get a message from the controller saying “File Not Found”.

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 **Submit Alarm Text Changes.**
4. Click **Save Dynamic Text File,** which saves the file with a .tfg extension.




For dynamic text files, use this submit button.

**Figure 108 —** Manage Editable Text Files

## 8.11.4 Manage Language Files

Language files can be uploaded via the web interface. The CXC can manage three language files at one time. By default the CXC manages English and Chinese. The user will use this screen to load a third language file if required. They are available on the Alpha website under Service and Support.

### Font File

When loading a new language file leave the “Use a default font file” button selected. If Alpha releases a new language file which requires a different font file, then that release will contain both the language and font files. The readme file for that specific release will instruct the supervisor to select the “Upload a new controller font file” button and then browse to the font file supplied by Alpha and upload it followed by loading the new language file.

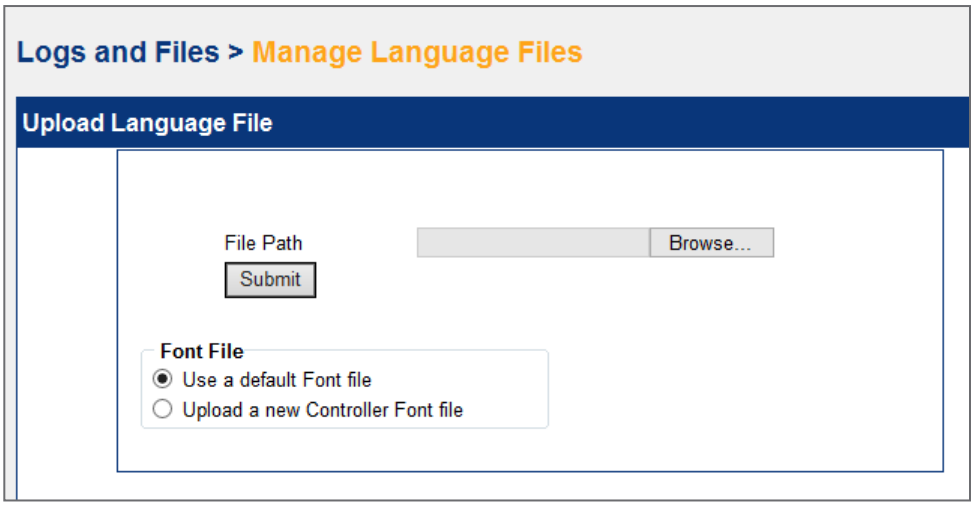


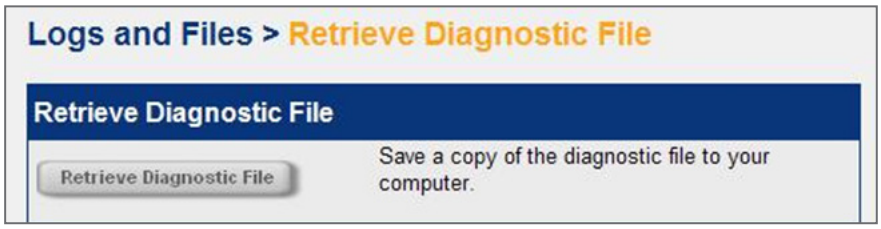

**Figure 107 —** Manage Language Files web interface window

### 8.11.5 Retrieve Diagnostic File

Diagnostic information about the system is saved in a file in the event of an Improper Shutdown. This information can be downloaded at a later time and sent to Alpha Technical Support to help analyze the problem that occurred. No configuration is required for this feature to function.

To send a diagnostic file to Alpha, download it from the **Logs and Files -> Retrieve Diagnostic File** menu.

Note that only one diagnostic file is saved on the CXC system. When downloading the diagnostic file only the information about the latest error is retrieved. Therefore, it is important to save the file as soon as possible after an error has occurred. Otherwise, the file may be overwritten by a subsequent Improper Shutdown.




## 8.12 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.

### 8.12.1 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:

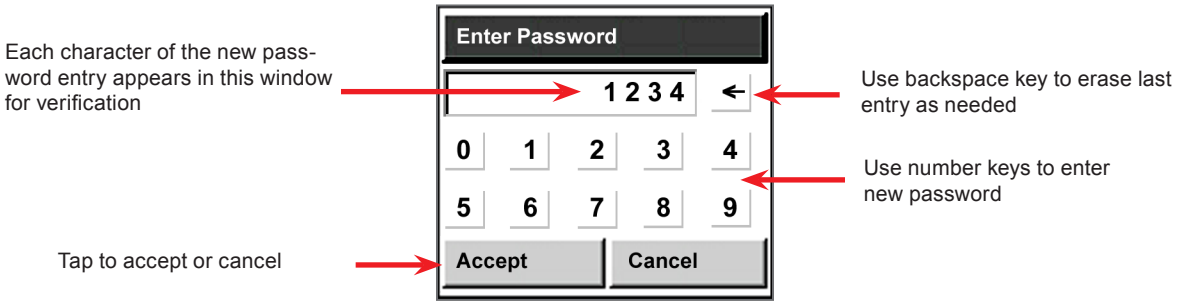



**Figure 109 —** Change password pop-up

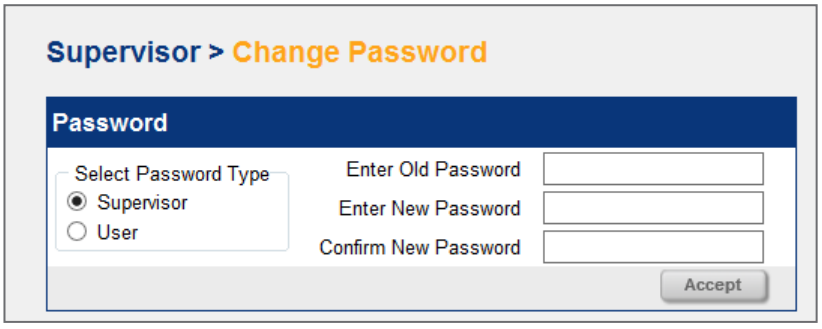



**Figure 110 —** Change password web interface

# 9. Advanced Programming

## 9.1 Example: Customize

When configuring Alarms (Section 8.6.2), Signals (8.7.2), or Controls (8.8), an option to CUSTOMIZE is presented at the bottom of the screen (Figure 111). The customize option gives the ability to program separate 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 using logical and arithmetic operators that simulate the functionality of a programmable logic controller (PLC). The customizing of Load Voltage is shown in Figure 111.

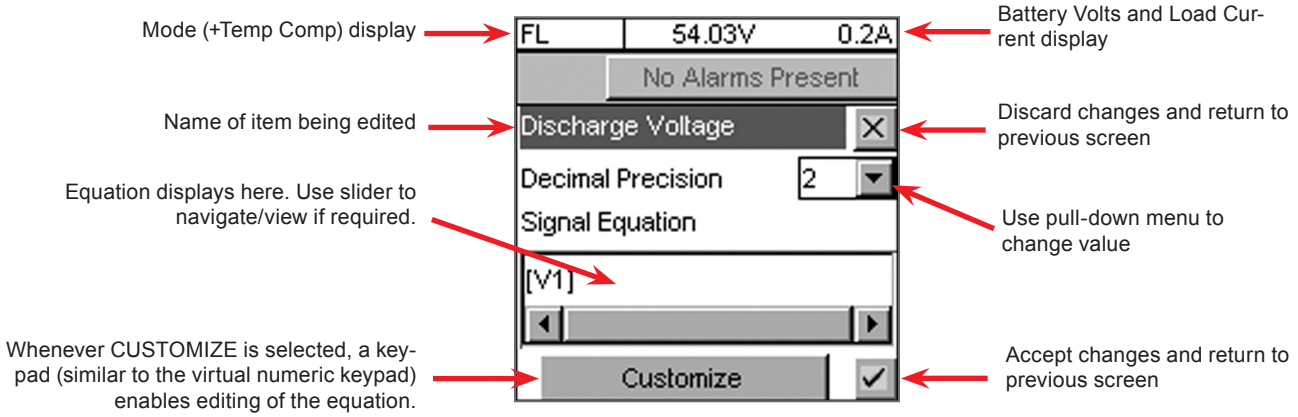



**Figure 111** — Screen showing example of item to be edited/customized

## 9.2 Equation Builder Keypads

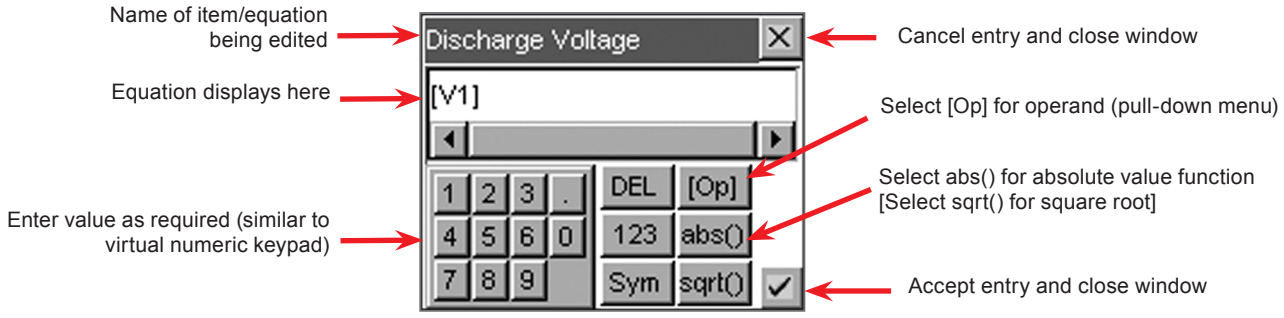



**Figure 112** — Equation builder keypad pop-up window

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

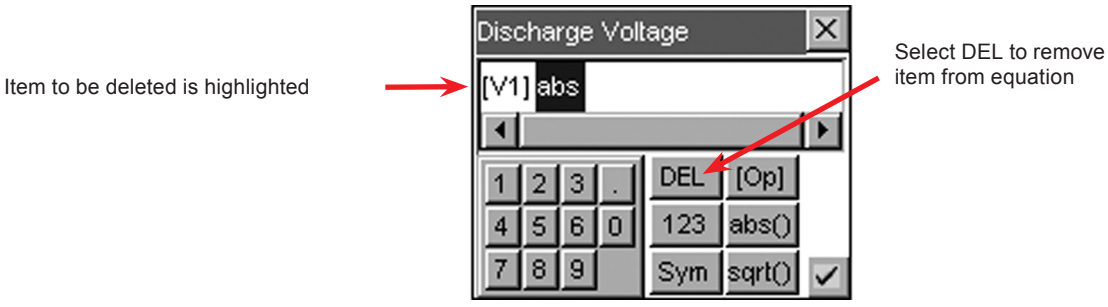



**Figure 113** — Equation builder keypad delete key

**Mathematical operators:**

+ = Add

- = Subtract

* = Multiply

/ = Divide

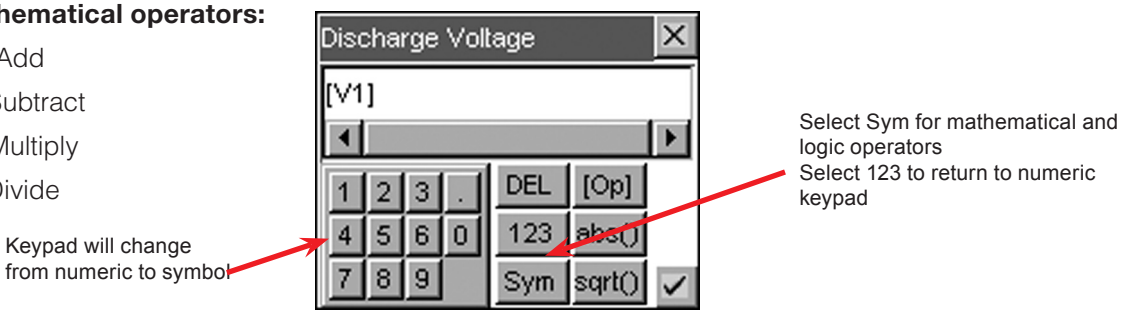



**Figure 114 —** Equation builder keypad symbol key

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 |

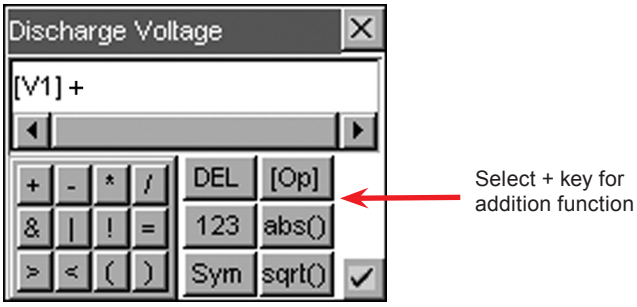



**Figure 115 —** Equation builder keypad function keys

## 9.3 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

### 9.3.1 Examples of Signal Configuration and Customization

**Example One – Configure Signal and Customize Signal Equation**

From this window, the Supervisor can configure the selected signal. Use the pull-down menu to set the decimal precision or tap Customize to build a signal equation similar to the equation shown in Custom Alarms. See also Equation Builder Keypads.

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

### Example Two – Configure AC Mains

From this window, the Supervisor can configure the AC Mains signal. Use the pull-down menu to set the decimal precision as shown in the following figure:

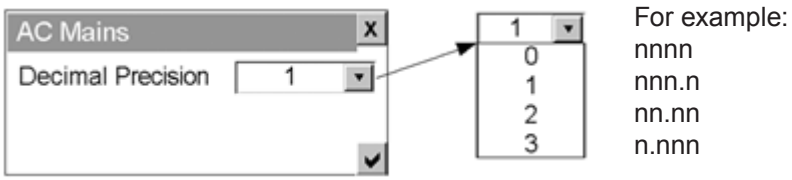



**Figure 116 —** Controller Signals configuration example (set two decimal precision)

### Example Three – Configure (Battery Temperature sensors)

From this window, the Supervisor can configure the Battery Temperature signal and 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:

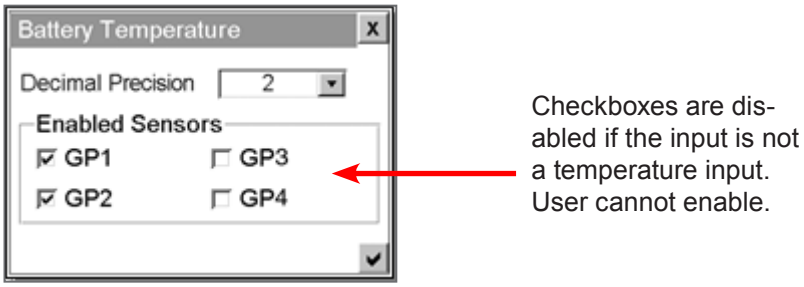



**Figure 117 —** Controller Signals Configuration example (enable temperature sensors)

### Example Four – Configure ADIO01 (Shunt MUX)

Under the menu item Configure Signals, the Supervisor can configure the input range of each of 16 channels for the Cordex Shunt MUX.

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.

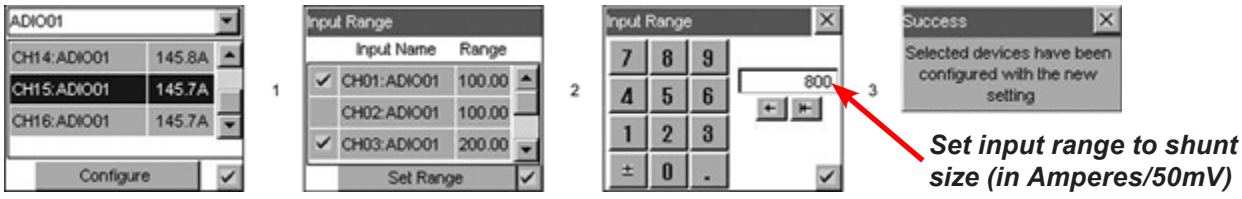



**Figure 118 —** Configure input range for shunt mux. channels)

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.

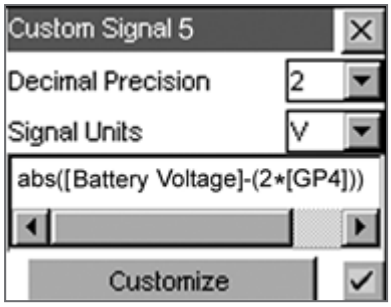



**Figure 119 —** Configure custom signal for input reading midpoint voltage (part 1)

**NOTE:**

**The text labels may 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.

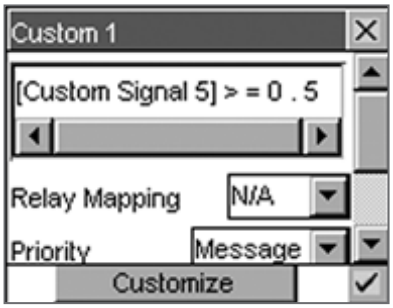



**Figure 120 —** Configure custom alarm for input reading error (part 2)

### 9.3.2 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 will always be greater than the System Time.

Example

So how can the scheduler be set up to ensure that this midnight rollover will 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 will configure Custom Signal 1 to remain on for about 30s 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 will repeat daily.

# 10. CXC Communications Menu Parameters

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

## 10.1 Ethernet Port Configuration

### 10.1.1 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.

#### 10.1.1.1 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.

#### 10.1.1.2 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 will assign it a new dynamic IP address.

**NOTE**: The DHCP Server may choose to assign the same IP address every time based on the MAC address.

#### 10.1.1.3 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.

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

#### 10.1.1.4 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).

#### 10.1.1.5 DHCP (Dynamic Host Configuration Protocol) Servers

A DHCP server can automatically assign a new IP address to the CXC. 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.

### 10.1.2 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**.

### 10.1.3 Configuring IP Address Settings

This section discusses how to change CXC communications parameters in the IP Address section of the menu (or web interface).

#### 10.1.3.1 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.)

#### 10.1.3.2 Static Settings

The three fields in this area are 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 is “192.168.1.23”.

An incorrect example is “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.

## 10.2 PPP Connection Devices

For HTTP web server connection, select **Front Craft Port** or **Rear Modem Port** from the pull-down menu (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.

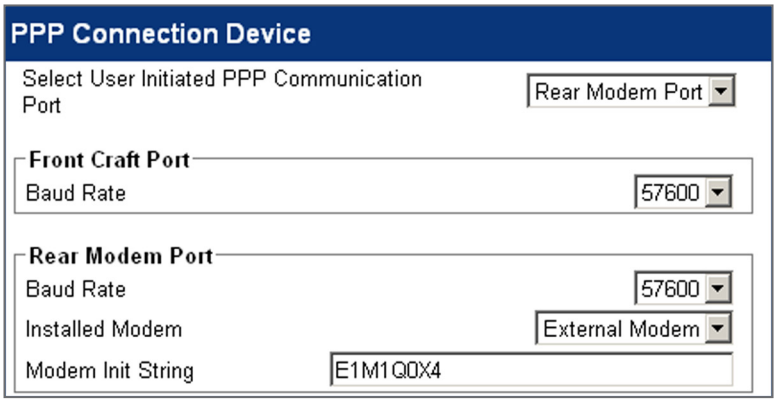



**Figure 121 —** PPP Connection Device web interface window

## 10.3 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 or CXCM1 controller, do not connect anything other than the Alpha modem and Alpha-supplied DB-9 cable to the D-sub port on the front.**

### 10.3.1 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.

## 10.4 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.

The Alpha CXCR/CXCP Controllers (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.

### 10.4.1 Internal Modem Support

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

### 10.4.2 External Modem Support

The CXCR/CXCP 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).

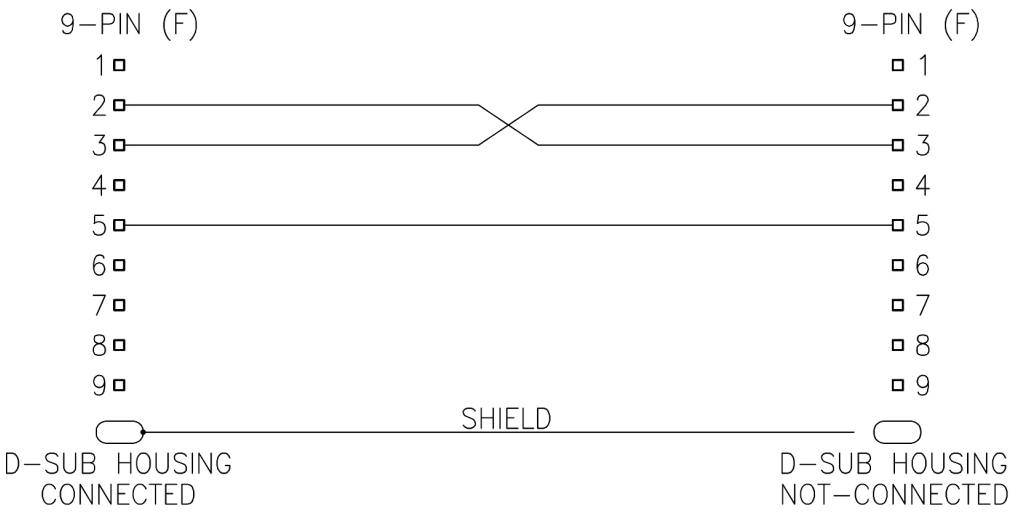
### 10.4.3 Null Modem Direct Cable Connection Support

The CXCR/CXCP supports the use of a direct DB-9 null modem cable connection to the computer. 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 PPP web connection for TCP/IP, the 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 122 —** RS-232 null modem cable pinouts

# 11. Remote Communication

The communications protocol supports a web interface. All CXC models can be set up, monitored and tested with an Ethernet 10/100Base-T either locally or remotely. Local connection is also possible with a PPP serial data connection.

## 11.1 Establishing a Network Connection via Ethernet

**Laptop**

1. Connect the Ethernet cable between the host computer (e.g. laptop) and the Cordex controller.
2. From the Start menu, click Control Panel, and then select Network and Internet.
3. Right-click the icon for the Local Area Connection, 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** (8.5).
9. Enter or verify the following information (clear **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 7.
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 6.4. To confirm the reset, tap on **ACCEPT** and then **REBOOT NOW**.
15. Once the CXC has rebooted, launch a browser window 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.

### 11.1.1 Support for CXC with No LCD Display

Some CXCs 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 preceding section.

Reboot the CXC: 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 re-boots/resets.

Perform steps 14 through 16 in the preceding section.

## 11.2 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). Example below.

### 11.2.1 Starting Networking Wizard

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

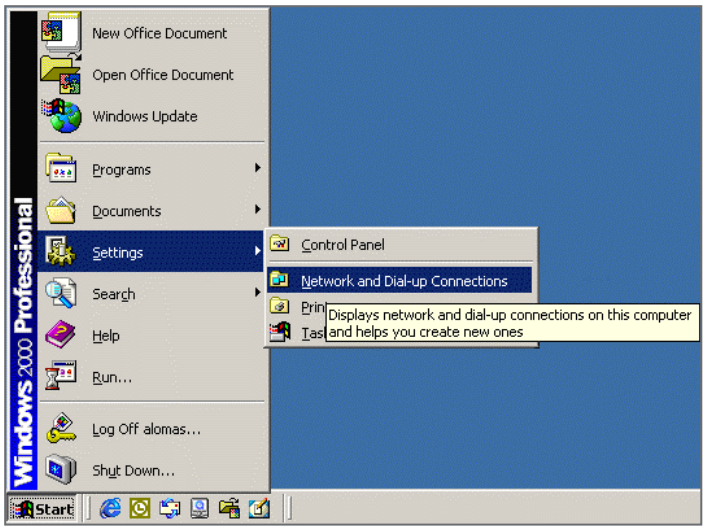



**Figure 123 —** Starting networking wizard

A new window opens, similar to Figure 124. Double-click the **Make New Connection** icon to start the Network Connection Wizard.

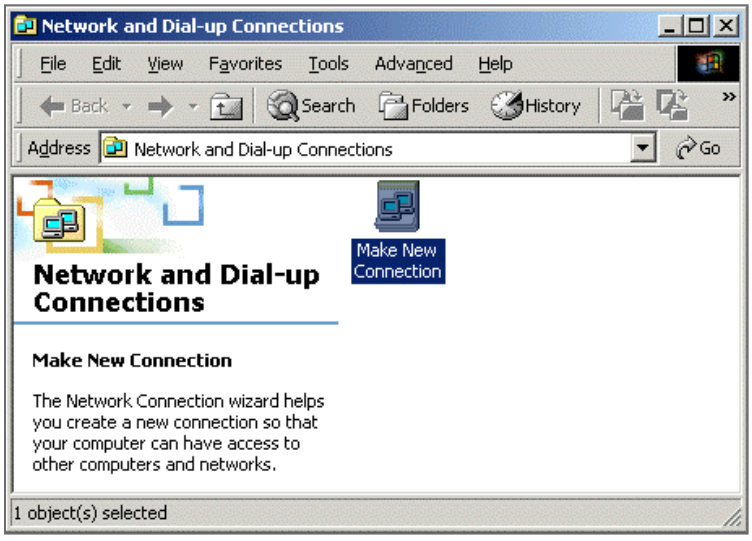



**Figure 124 —** Make New Connection icon

## 11.2.2 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.

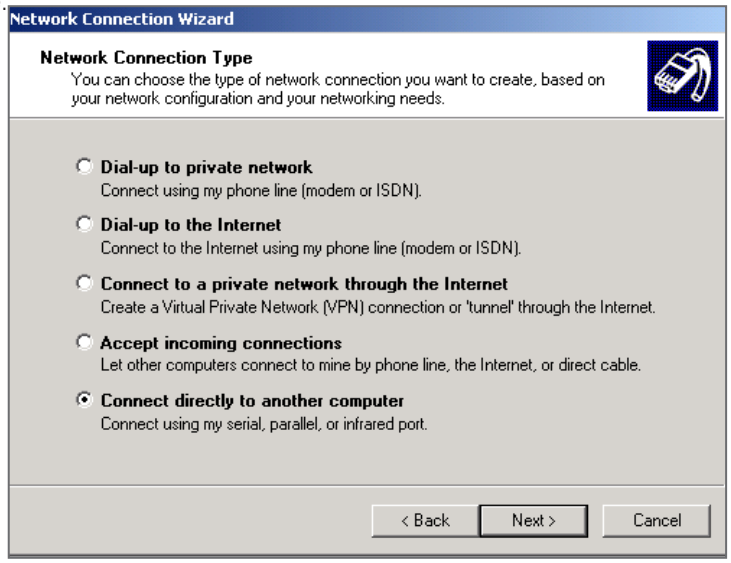



**Figure 125 —** Network Connection Type

### 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):

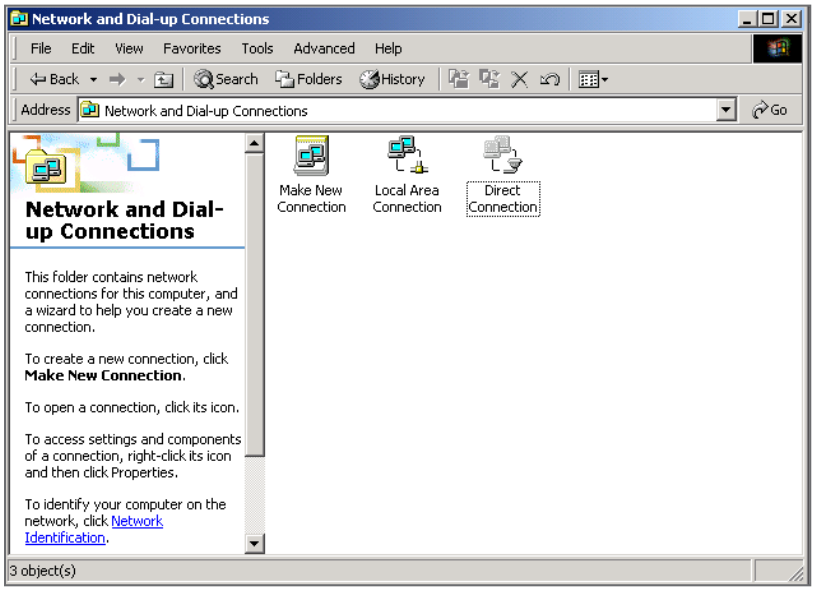



**Figure 126 —** Direct Connection icon

### 11.2.3 Direct Connection Properties

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

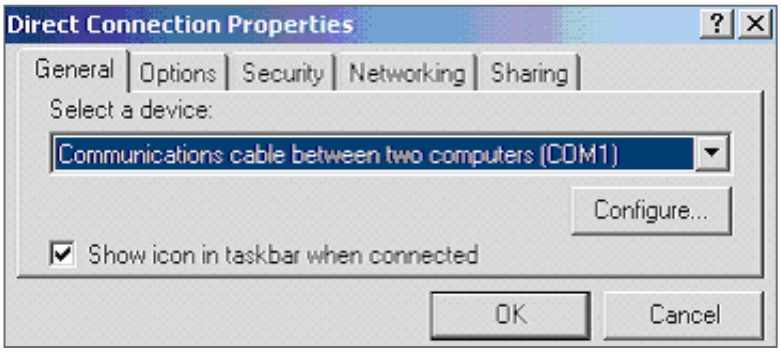



**Figure 127 —** Direct Connection Properties

**General Tab**

Select a device Communications cable between two computers [COM1], as shown above.

**Options Tab**

Uncheck PROMPT FOR NAME

**Security Tab**

Check TYPICAL (recommended setting) 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.

#### 11.2.3.1 Modem Configuration

Under the General tab of the Direct Connection Properties, click the Configure button to open the Modem Configuration window and set he COM port speed to match with the server's baud rate; typically 57600 as shown in the following figure.

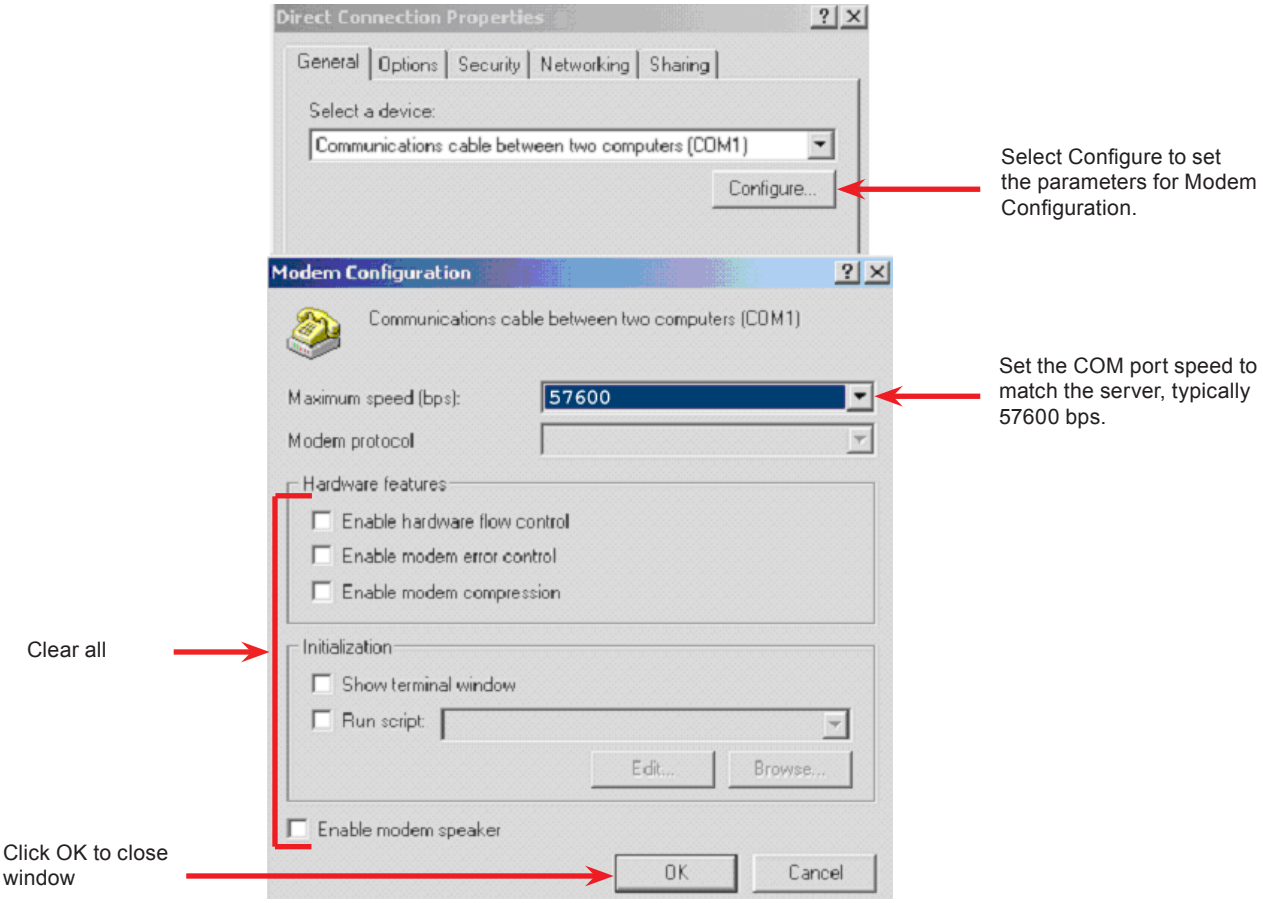



**Figure 128 —** Configuration

## 11.2.4 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:

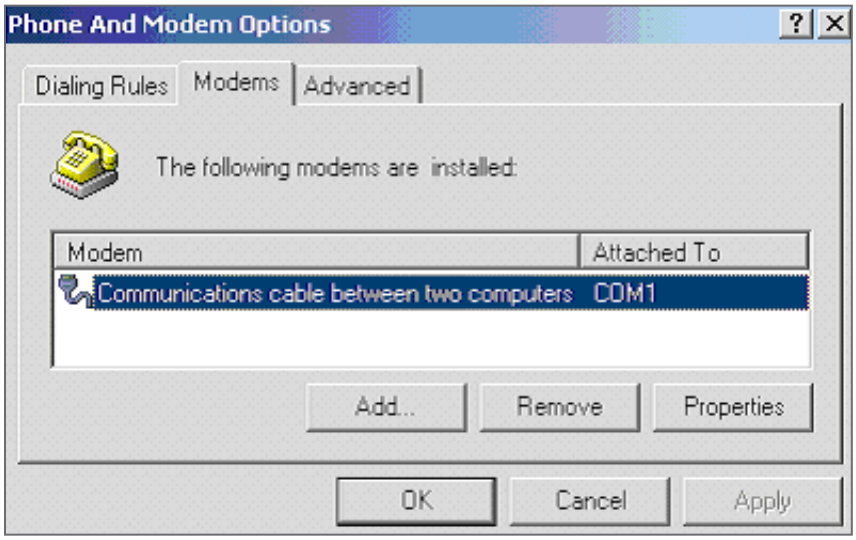



**Figure 129 —** Phone and Modem Options

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

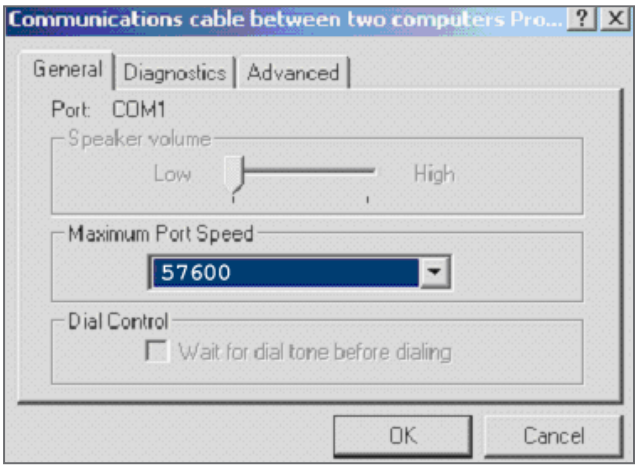



**Figure 130 —** Properties

Select OK to close each of these windows.

### 11.2.5 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:

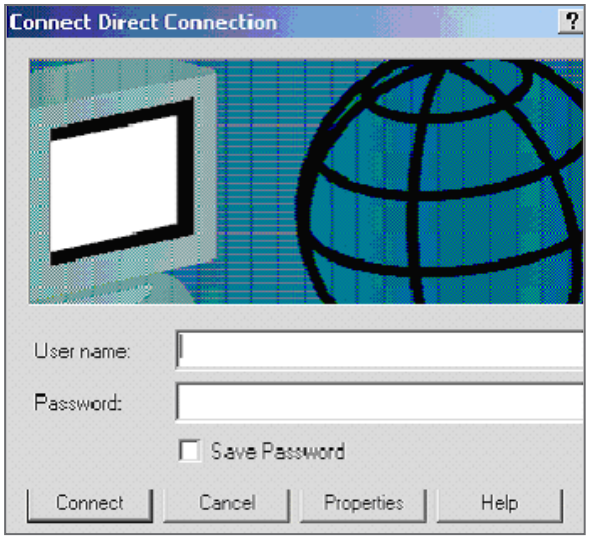



**Figure 131 —** Connect Direct Connection (password entry)

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

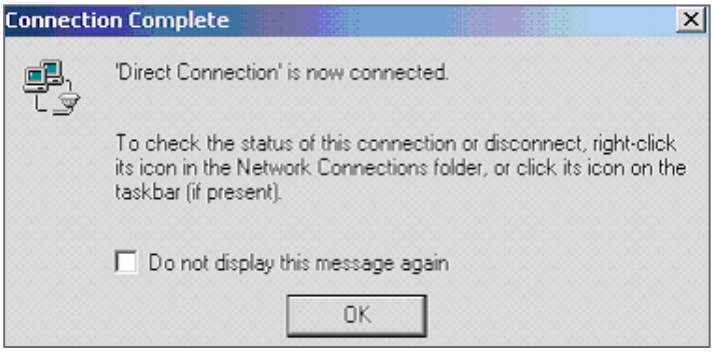



**Figure 132 —** Connection Complete (message)

Select **OK** to continue.

### 11.2.6 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.

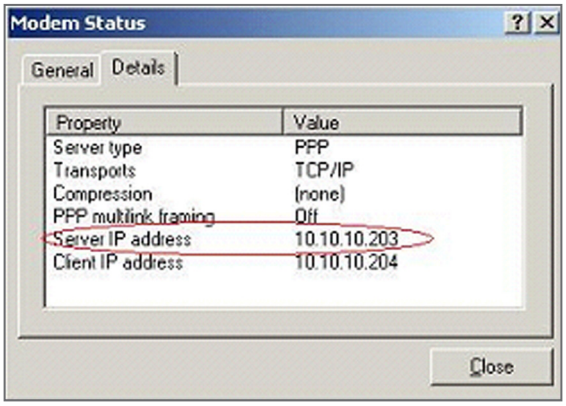
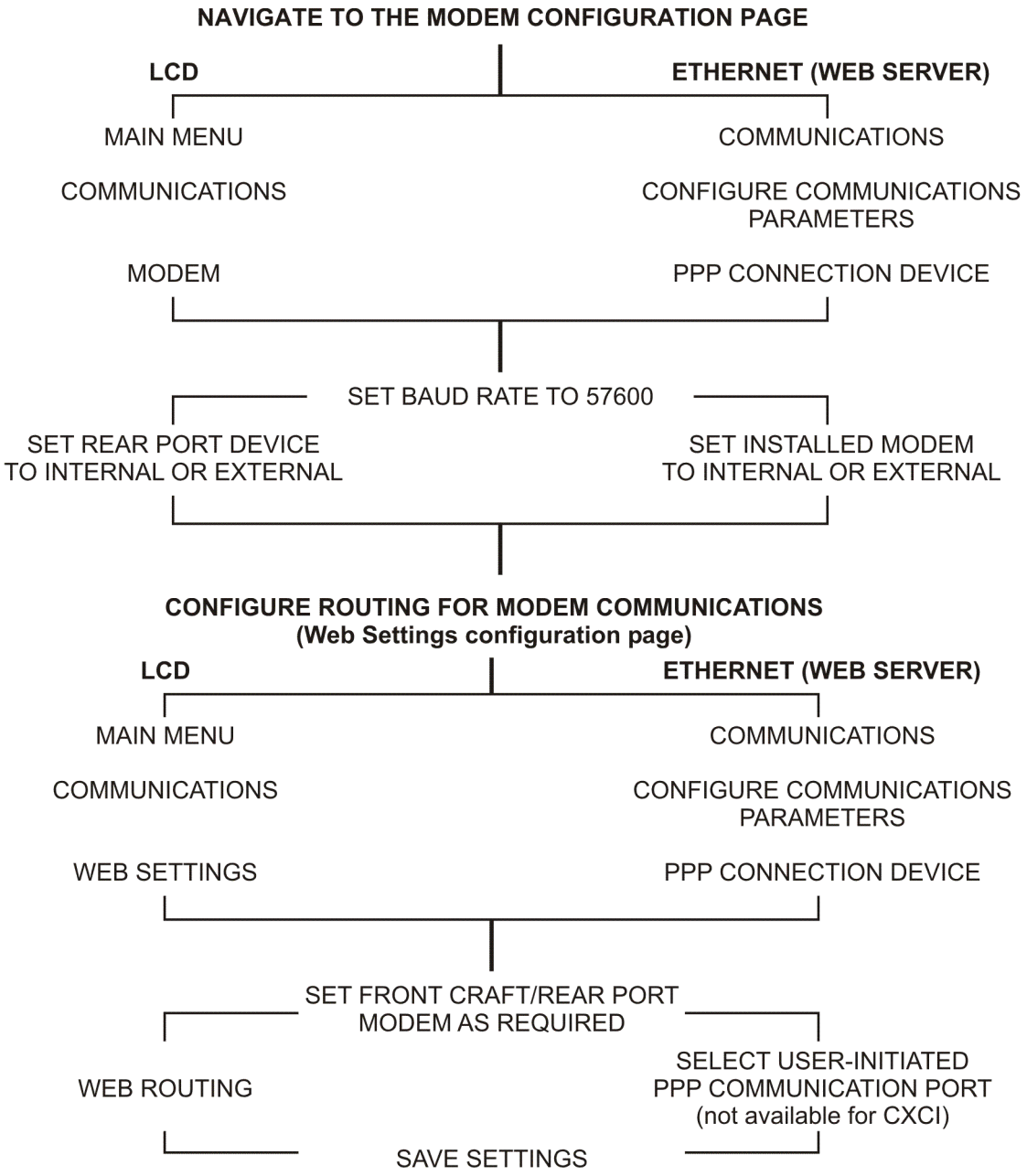



**Figure 133 —** Modem Status

## 11.3 Modem Connection

### 11.3.1 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.

### 11.3.2 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.

### 11.3.3 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.

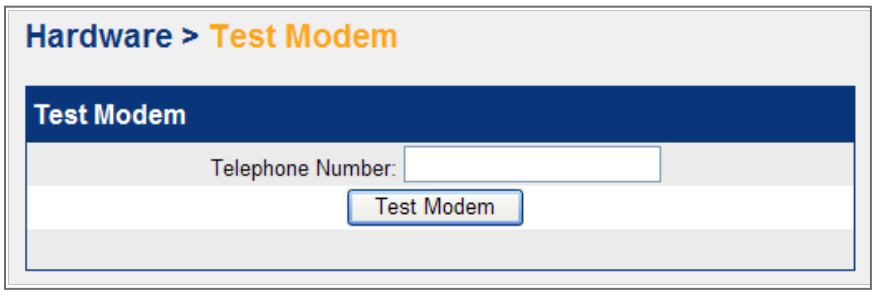



**Figure 134 —** Test Modem web interface

# 12. Simple Network Management Protocol (SNMP)

## 12.1 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 (MIB).

An SNMP Agent can 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.

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

### 12.1.1 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.

### 12.1.2 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.

The simplicity and connectionless communication of SNMP 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.

### 12.1.3 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.

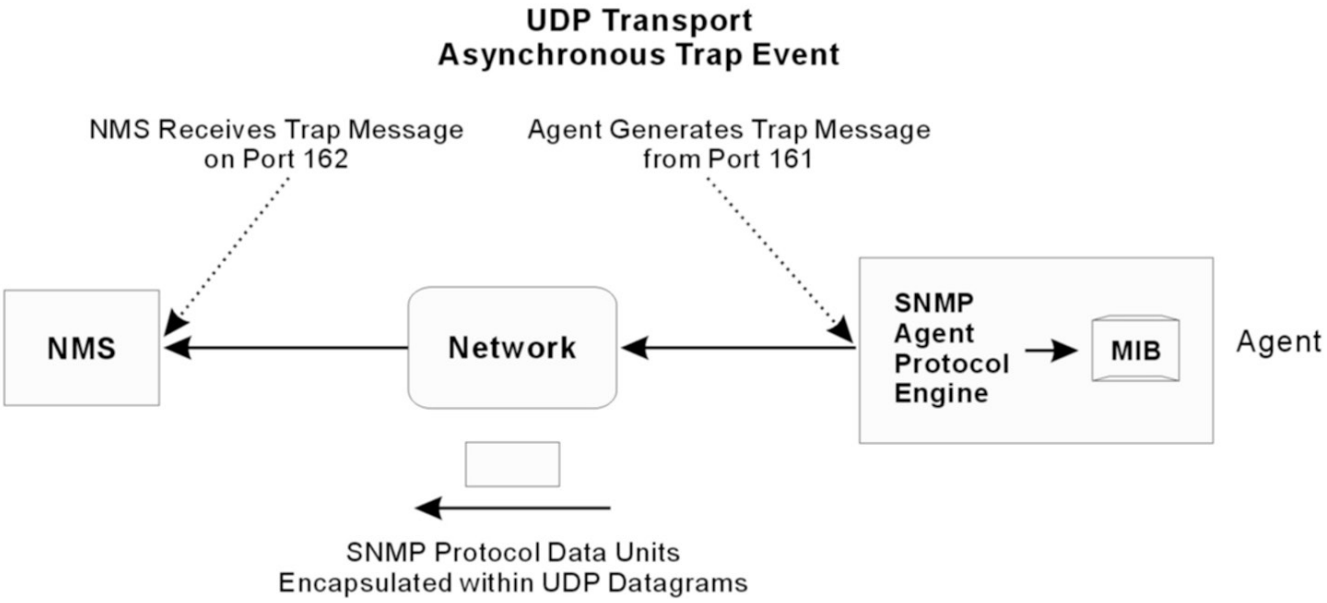



**Figure 135 —** UDP transport (trap event)

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

### 12.1.4 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.

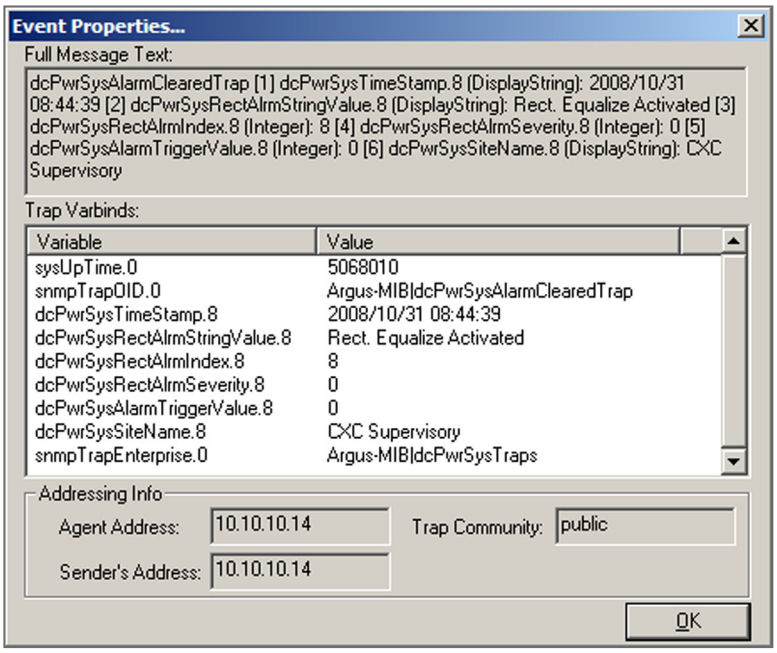



**Figure 136 —** VarBinds

## 12.2 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 compatible with previously defined alarms and signals.

### 12.2.1 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.

## 12.3 Communication Configuration

SNMP Communication Configuration is only accessible via the web interface.

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

### 12.3.1 SNMP Multiple Community Names

This menu item enables a user to configure multiple CXC SNMP community settings for get (read) and set (write). This is to permit multiple SNMP Network Management Software (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.

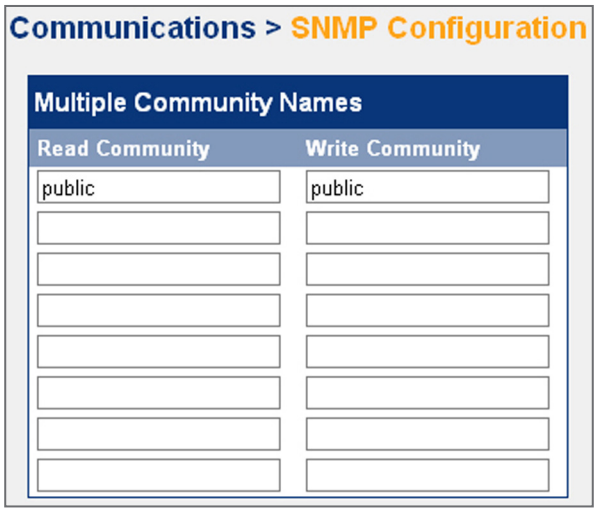



**Figure 137 —** SNMP Community Name web interface window

### 12.3.2 SNMP Trap Recovery

The SNMP Trap Recovery only works if the master NMS destination is configured. Master NMS destination can be selected from the Master SNMP Destination pull-down menu. (See next section 12.3.3 on page 140.)

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

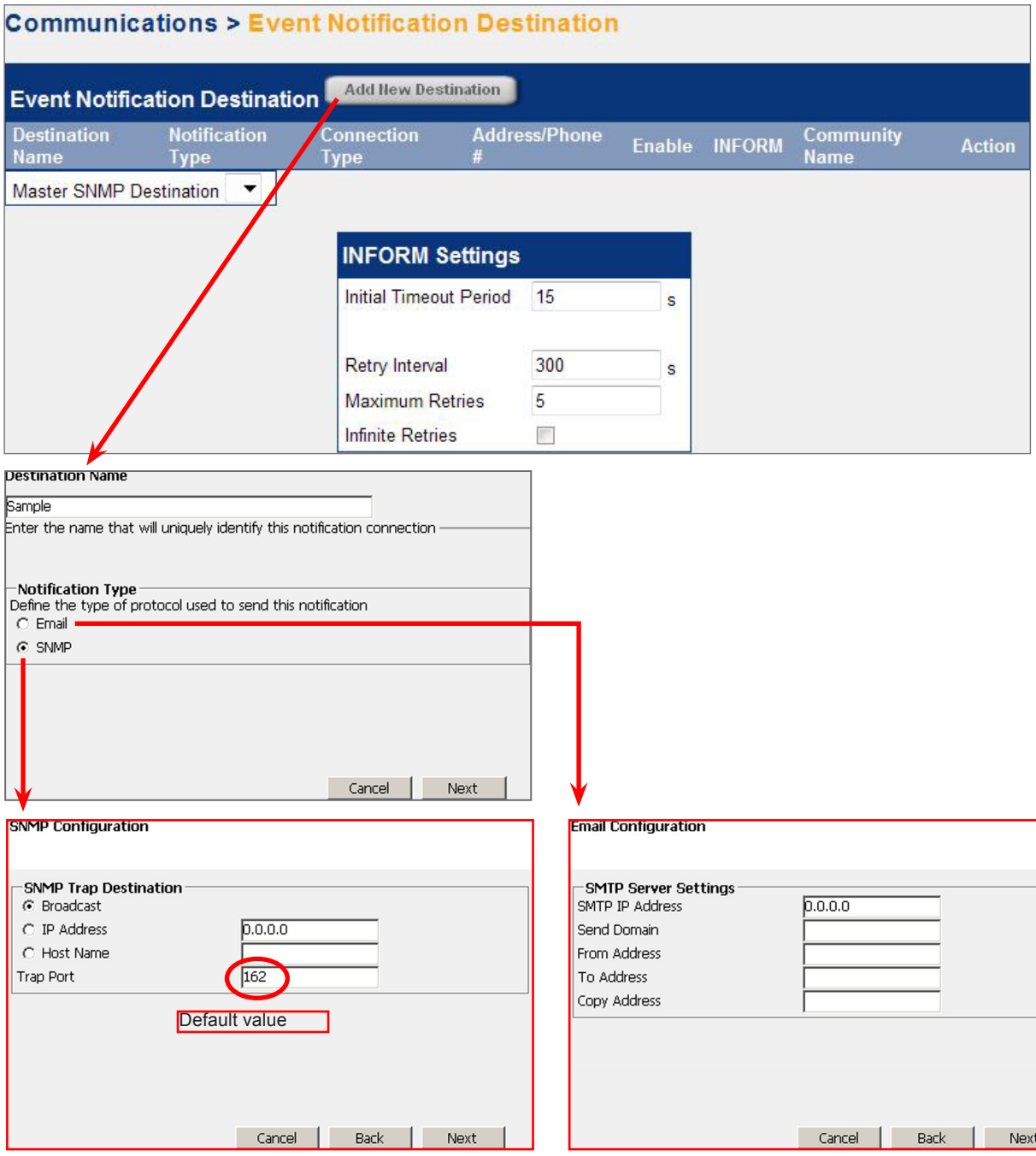
An ICMP echo request packet or “ping” is used to determine whether a trap may be received (recovered) by the SNMP client. Once successful, the trap is sent.

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

### 12.3.3 Event Notification Destination – Multiple SNMP and SMTP Destinations

The Supervisor can add up to 10 separate destinations for SNMP and SMTP dial-out of e-mail notifications. The following example, provides help to **Add New Destination**.

Login credential information must be provided by your network administrator.




**For SNMP Configuration:**

Select **Broadcast** if the 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.

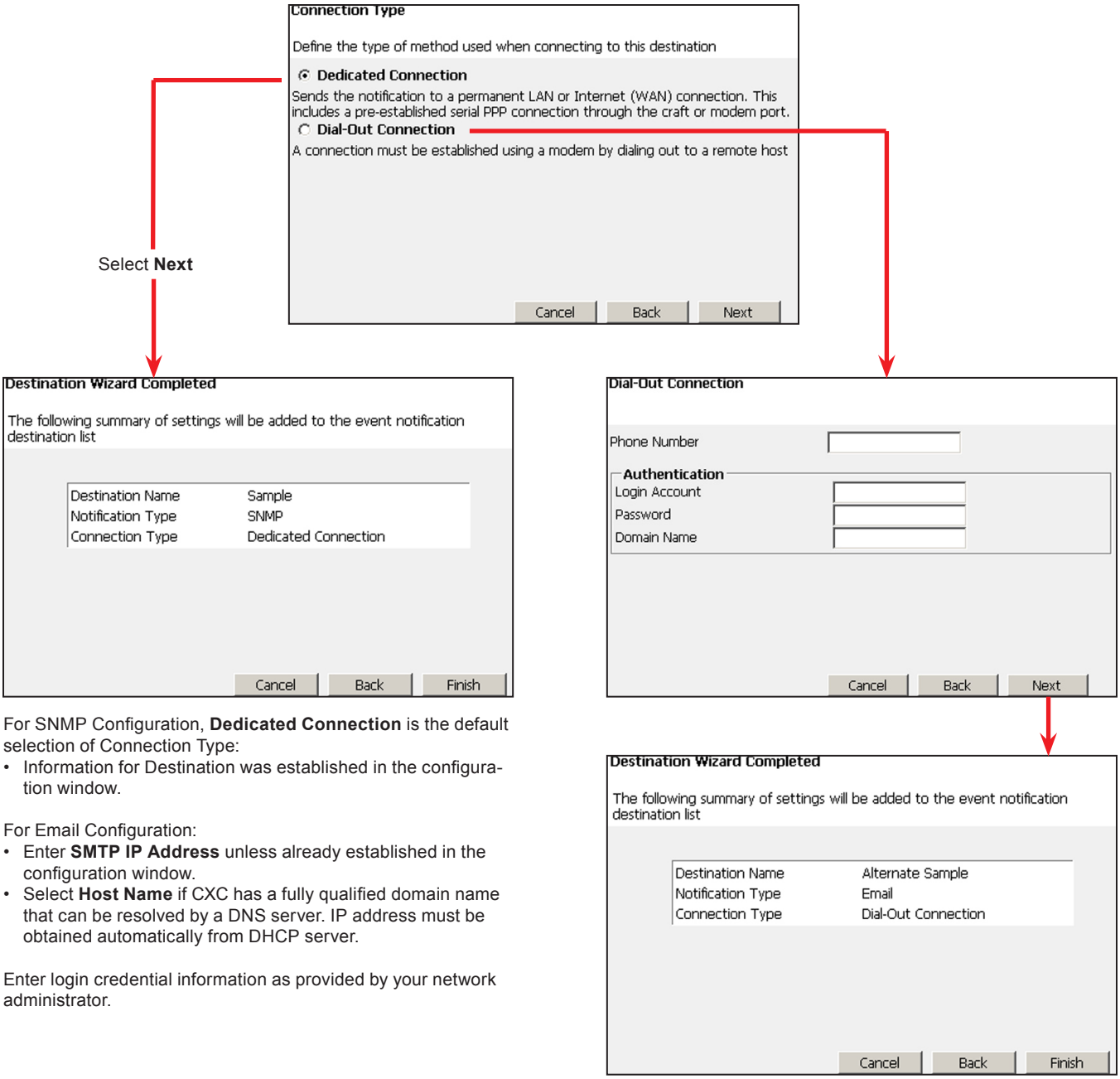
**For Email Configuration:**

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

**Send Domain** is optional for SMTP "hello" packet and can be left blank.

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

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




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

- Information for Destination was established in the configuration window.

For Email Configuration:

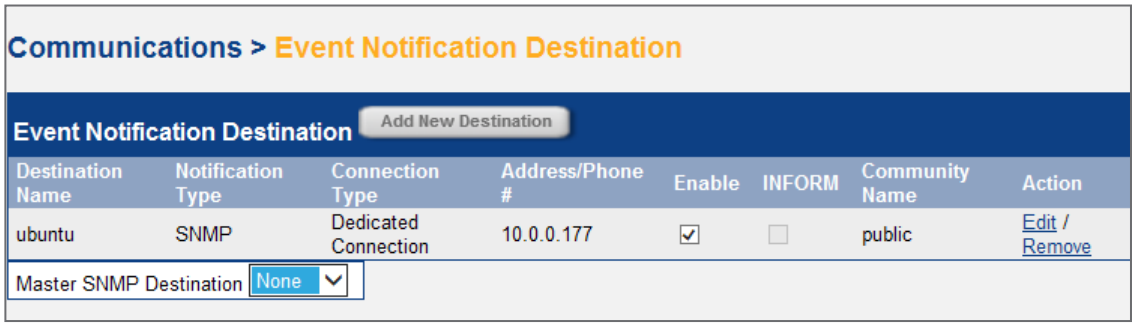
- Enter **SMTP IP Address** unless already established in the configuration window.
- Select **Host Name** if CXC has a fully qualified domain name that can be resolved by a DNS server. IP address must be obtained automatically from DHCP server.

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.



### 12.3.3.1 Master SNMP Destination

This menu item enables the Supervisor to set a Network Management Software destination as master.

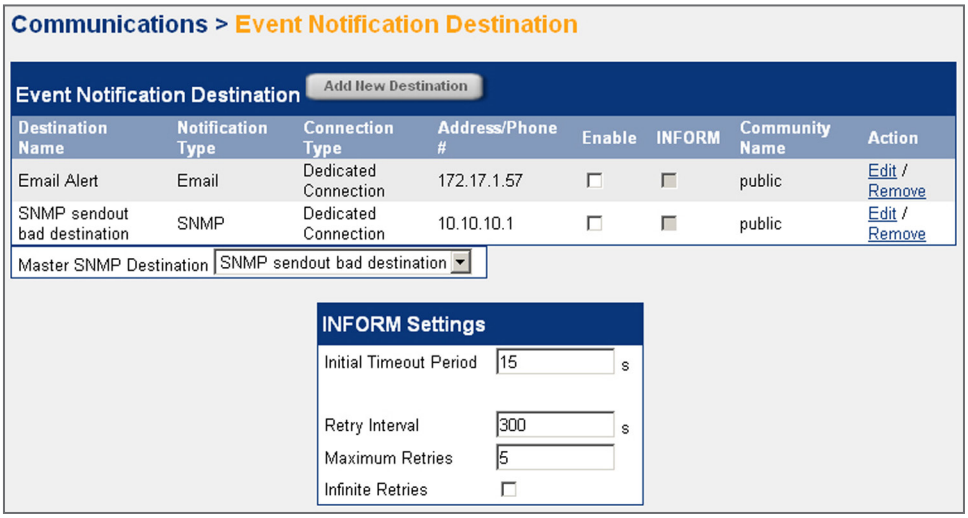
Select from the pull-down menu.

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.

**NOTE**: Master SNMP Destination should NOT be set if using **INFORM Settings**.

### 12.3.3.2 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.

Each INFORM outbound message no longer needs the Master Destination item but requires an acknowledgement 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.

# 13. Factory Ranges and Defaults

| Table E — Rectifier 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 | 1-9999999999 | 11.50V | 22.00V | 44.00V | 106.33V | 187.00V |
| OVP | 0-9999999999 | 14.25V | 29.00V | 57.00V | 137.75V | 242.25V |
| Safe Voltage | Minimum and maximum values are set by the rectifier and the controller values are ignored if they are out of range | 12.85V | 25.7V | 51.40V | 118.9V | 218.5V |
| 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 F — 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 G — 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 H — 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 | Minor | | | | |
| 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 I — 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 J — 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 K — Hardware menu defaults | | |
|---|---|---|
| **Submenu Item** | **Programmable Range** | **Default Setting** |
| Configure Relays (1–16) | Energized/De-Energized | De-Energized |

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

| Table M — 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 |

# 14. 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 N — 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 O — 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 O — 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 P — 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 P — 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 Q — 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 R — 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) |
| 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) |

| Table R — CXC Modbus PDU address definition for function code 0x03 (read holding registers) | | | |
|---|---|---|---|
| **PDU Address** | **Variable Name** | **Variable Description** | **Number of Bytes** |
| 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) |
| 0x0116 | Signal_11_In_Signal_Table_4 | Custom Signal 11 (x100) | 4 (signed int_32) |
| 0x0118 | Signal_12_In_Signal_Table_4 | Custom Signal 12 (x100) | 4 (signed int_32) |
| 0x011A | Signal_13_In_Signal_Table_4 | Custom Signal 13 (x100) | 4 (signed int_32) |
| 0x011C | Signal_14_In_Signal_Table_4 | Custom Signal 14 (x100) | 4 (signed int_32) |
| 0x011E | Signal_15_In_Signal_Table_4 | Custom Signal 15 (x100) | 4 (signed int_32) |
| 0x0120 | Signal_16_In_Signal_Table_4 | Custom Signal 16 (x100) | 4 (signed int_32) |
| 0x0122 | Signal_17_In_Signal_Table_4 | Custom Signal 17 (x100) | 4 (signed int_32) |
| 0x0124 | Signal_18_In_Signal_Table_4 | Custom Signal 18 (x100) | 4 (signed int_32) |
| 0x0126 | Signal_19_In_Signal_Table_4 | Custom Signal 19 (x100) | 4 (signed int_32) |
| 0x0128 | Signal_20_In_Signal_Table_4 | Custom Signal 20 (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) |

| Table S — CXC Modbus PDU address definition for function code 0x03 (read holding registers) | | | |
|---|---|---|---|
| **PDU Address** | **Variable Name** | **Variable Description** | **Number of Bytes** |
| 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) |
| 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 T — 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 |

# 15. Troubleshooting

| Table U — Troubleshooting guide | |
|---|---|
| **Symptom** | **Solution** |
| Rectifier Communications Lost (RECT COMMS LOST) | Check RS-485 or CAN cable connections for breaks and loose contacts.<br>Ensure all rectifiers are secured and tightly screwed in to the shelf.<br>Perform “Inventory Update” (from RECTIFIERS menu). |
| Rectifier Lockout (RECT LOCKOUT) | Pathfinder rectifier modules with LCD option:<br>Check if any rectifiers menu has been accessed. Rectifier must be in normal operation mode. Perform “Inventory Update.”<br>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.<br>If it is in current limit, percentage may be too low.<br>Ensure all parameters are properly set.<br>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.<br>Ensure the Baud rate is set to match.<br>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).<br>Ensure polarity of relay is set correctly (from HARDWARE menu).<br>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.<br>Check the rectifier sending the alarm for specific alarm condition.<br>Perform “Rectifier Report” (from RECTIFIERS menu). |
| New Rectifier Has Not Been Acquired | Ensure all rectifiers are secured and tightly screwed in to the shelf.<br>Perform “Inventory Update” (from RECTIFIERS menu).<br>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).<br>Reboot CXC after changing IP settings: select Reset from the Option button and save settings if prompted.<br>Use a straight-through cable for network connection.<br>Use a cross-over cable only when connecting directly to a PC.<br>Try pinging the CXC IP address to verify connectivity.<br>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® or other compatible browser. |
| 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.<br>Use the slider on the GUI to adjust contrast as desired.<br>Tap the check mark to complete adjustment. |
| Automatically being logged out of multiple CXC sessions. | This is a known issue with CXC controllers and IE7. They clear the session cookie within the entire browser so if you are logged in to any website relying on cookies for session management they will be cleared. Upgrading to IE8 will fix the problem as Microsoft introduced something called Loosely-Coupled IE (LCIE) which works on session sharing across TAB and new instances. |

| | |
|---|---|
| Customer saves a config file which has several blank fields (for example Battery Information), then puts data into these fields, then reloads the previous config file and the fields are not blank. | These fields need to be changed by the user to be blank. The config file is in XML format. This means that if a field is blank, then no value is saved as part of the config file. When the “old” config file is loaded, these fields cannot be updated as there is no data in the file. This affects “System>User Inventory”, “Batteries>Battery Information” and “Communications>SNMP Configuration” |
| CXC spontaneously logging out or other application being logged out when CXC user logs out. | Use Explorer 8. This is a known issue caused by how CXC controllers control logging in/out. They clear the session cookie within the entire browser so if you are logged in to any website relying on cookies for session management they will be cleared. In IE-8 a fix has been made to optimize browser performance by introducing something called Loosely-Coupled IE (LCIE) which works on session sharing across TAB and new instances. |
| Inconsistent ADIO Inventory. | If an ADIO module is removed from the system and you need to see a valid listing of the remaining ADIO modules do the following:<br>1. Power cycle all the ADIO modules.<br>2. Do an “Inventory Update” |

# 16. Alpha Conventions

## 16.1 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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