POWERSMITHS

ES – Energy Station

(Power Distribution Unit - PDU)

CES - Compact Energy Station

(Compact Power Distribution Unit - PDU)

Equipped with

Cyberhawk - Power Monitor

Sub-Feed Monitor

Panelboard Monitor

Operation and Maintenance

Powersmiths International Corp.
10 Devon Road, Brampton, Ontario, Canada, L6T 5B5
www.powersmiths.com
Tel: 1-800-747-9627 / (1) 905 791-1493
Fax: 905 791 8870
email: info@powersmiths.com

Warranty & Limitation of Liability

For products and software that are sold or licensed by Powersmiths International Corp. ("**Powersmiths**") during the period from the date of purchase until the present, Powersmiths warrants to the original buyer:

(1) that this product (other than software) is substantially free from defects in materials and workmanship during the warranty period, which is 1 year from the date of purchase by the original buyer; and
(2) that the medium on which any purchased software ("Software") is provided is substantially free from defects in materials and workmanship for a period of 1 year from the date of purchase by the original buyer.

THE SOFTWARE ITSELF IS PROVIDED "AS IS" WITHOUT ANY WARRANTY OF ANY KIND.
POWERSMITHS' WARRANTY OBLIGATION IS LIMITED, AT POWERSMITHS' SOLE OPTION, TO EITHER A REFUND OF THE PURCHASE PRICE, CHARGE FREE REPAIR, OR REPLACEMENT OF A DEFECTIVE PRODUCT, WHICH IS RETURNED TO POWERSMITHS OR AN AUTHORIZED DISTRIBUTOR OF POWERSMITHS ("DISTRIBUTOR") WITHIN THE WARRANTY PERIOD.

THIS WARRANTY AND LIMITATION OF LIABILITY ("LIMITED WARRANTY") SHALL EXTEND ONLY TO THE ORIGINAL BUYER OR ORIGINAL END-USER CUSTOMER OF POWERSMITHS. THIS LIMITED WARRANTY SHALL NOT APPLY TO ANY PRODUCT THAT HAS BEEN SUBJECT TO ALTERATION, DAMAGE BY ACCIDENT, MISUSE, ABUSE, NEGLECT, OR A FAILURE TO FOLLOW POWERSMITHS' INSTRUCTIONS FOR OPERATION, MAINTENANCE AND REPAIR.

ONLY THE TERMS EXPRESSED IN THIS LIMITED WARRANTY SHALL APPLY AND NO PARTNER, DISTRIBUTOR, EMPLOYEE OR OTHER REPRESENTATIVE OF POWERSMITHS OR ANY OTHER ENTITY IS AUTHORIZED TO AMEND, MODIFY OR EXTEND THIS LIMITED WARRANTY IN ANY WAY.

To obtain warranty service, contact Powersmiths or send the product, with a description of the problem, transportation and insurance prepaid, to Powersmiths, 10 Devon Road Brampton, Ontario, Canada L6T 5B5. Powersmiths assumes no risk for loss or damage in transit. Following warranty repair, the product will be returned to the sender, transportation prepaid. If Powersmiths determines that the failure was caused by alteration, accident, misuse, abuse, neglect or a failure to follow Powersmiths instructions for operation, maintenance and repair, Powersmiths will provide an estimate of repair costs and a Purchase Order giving authorization for the repair and payment will be necessary prior to the commencement of the repair.

THIS LIMITED WARRANTY IS THE EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF NON-INFRINGEMENT AND THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE.
IN NO EVENT SHALL POWERSMITHS BE LIABLE TO THE ORIGINAL BUYER, THE ORIGINAL END-USER CUSTOMER OF POWERSMITHS, OR TO ANY OTHER PERSON OR ENTITY UNDER ANY LEGAL CLAIM OR THEORY (WHETHER BASED ON CONTRACT, INDEMNITY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHERWISE).

IN NO EVENT SHALL POWERSMITHS BE LIABLE TO THE ORIGINAL BUYER, THE ORIGINAL END-USER, OR TO ANY OTHER PERSON OR ENTITY FOR SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE, EXEMPLARY, LIQUIDATED OR CONSEQUENTIAL DAMAGES WHATSOEVER WITH RESPECT TO THIS PRODUCT INCLUDING BUT NOT LIMITED TO, BUSINESS INTERRUPTION, LOSS OF USE, WORK STOPPAGE, LOSS OF REVENUE OR PROFIT, LOSS OF GOODWILL, DATA LOSS, OR SYSTEM FAILURE OR MALFUNCTION IN CONNECTION WITH THE PURCHASE OR OPERATION OF THE PRODUCT, EVEN IF POWERSMITHS OR ANY OF ITS REPRESENTATIVES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

THE ORIGINAL BUYER OR ORIGINAL END-USER, AS THE CASE MAY BE, AGREES THAT IT HAS CAREFULLY REVIEWED THE TERMS OF THIS LIMITED WARRANTY PRIOR TO ITS PURCHASE OF THIS PRODUCT AND THAT THESE TERMS REFLECT A REASONABLE ALLOCATION OF RISK AND LIMITATION OF LIABILITY.

If any provision in this Limited Warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

This Limited Warranty and each of the documents contemplated by or delivered under or in connection with this Limited Warranty shall be governed by and construed in accordance with the laws of the Province of Ontario (and the laws of Canada applicable therein) without reference to its conflict of law principles and shall be treated in all respects as an Ontario contract. The parties to this Limited Warranty hereby irrevocably and unconditionally attorn to the exclusive jurisdiction of the courts of the Province of Ontario and all courts competent to hear appeals therefrom.

Safety Notice

A potential **Shock and Injury Hazard** exists when working on or around electrical systems which could lead to serious injury or even death. Only qualified competent personnel who have been trained in and are familiar with the **Risk of Electric Shock** and burns from **Plasma Arcs** should perform installation and maintenance on electrical systems. It is the sole **responsibility of the personnel** doing the work to be fully cognizant of all necessary safety regulations and procedures and **be familiar with the installation instructions detailed in this manual**.

FOR YOUR SAFETY**, IT IS IMPERATIVE THAT THE **POWER BE PROVEN DISCONNECTED** BEFORE ANY WORK ON OR PHYSICAL CONTACT TO ELECTRICAL CIRCUITS IS ATTEMPTED: **DO NOT ASSUME BUT CHECK** ACROSS THE LINES AND TO GROUND WITH AN APPROVED VOLTAGE INDICATING DEVICE AND ENSURE THAT THE POWER SOURCE(S) **DISCONNECTION DEVICES ARE LOCKED OUT.

***WHEN WORKING IN CLOSE PROXIMITY TO LIVE INSTALLATIONS** FOLLOW ALL SAFETY REQUIREMENTS DEFINED IN NFPA 70E OR CSA Z462 WHICH INCLUDES, BUT NOT LIMITED TO, THE USE OF PROTECTIVE EQUIPMENT (PPE: CLOTHING, INSULATED GLOVES, SAFETY GOGGLES, ETC.). IT FURTHER RECOMMENDED THAT ALL METALLIC OBJECTS (SUCH AS JEWELRY, WATCHES, CHAINS ETC.) BE REMOVED FROM THEIR PERSON.*

Symbols Used in this Manual

Risk of Electric Shock and/or ARC Flash Hazard: Life threatening voltages may be present with the risk of ARC Flash in the event of an inadvertent short circuit.

Caution: Cautionary notes for the installer or user as to the defined limits. See notes following the Caution symbol in the manual for instructions regarding particular caution notice.

Limits to use of this equipment

This equipment is rated for permanent connection to a low voltage power supply (208, 415, 480 or 600 volts). Note that power supply voltages are model specific; refer to the model specifications for voltage limits and for the installation and environmental category.

Devices and connections to the ancillary inputs and outputs (other than to external power) have specific limits with regard to voltages and isolation requirement; refer to relevant sections of this manual for limits and additional notes.

Table of Contents

List of Figures

List of Tables

1 Overview

The information in this manual describes the usage, operation, setup and maintenance of the Powersmiths Models ES (Energy Station) and CES (Compact Energy Station) generally known in the industry as PDUs (Power Distribution Units) with a general installation guideline given for reference only as a specific installation bulletin is normally provided with each unit.

Note: For specific Installation Instructions please refer to the Installation Manual shipped with each unit. Additional documents and setup software are referenced in this manual that are available for download at the company WEB site and also linked from the specific product sections; see www.powersmiths.com and under Products to Data Center Solutions.

1.1 Unit Descriptions

The Powersmiths Energy Stations (ESs) and Compact Energy Stations (CESs), commonly referred to as Power Distribution Units or PDUs, provide high density power distribution to server/computer type loads in an IT type environment and also industrial and test lab environments. ESs and CESs have an internal transformer for voltage transformation. They typically utilize Schneider (Square-D) Panelboards with 1, 2 or 3-pole breakers rated up to 100 Amps with a standard 10kAIC or 22kAIC rating (kVA size dependent) or optionally to 65kAIC rating. Sub-feed breakers are typically Schneider types but may also utilize ABB types for high density Sub-feed distribution. All Breakers are located behind lockable doors which may be optionally fitted with clear windows. Panelboard and Breaker wiring access are behind a bolted (or optionally hinged) panel. Standard Powersmiths units are designed for top or bottom wiring access with some exceptions. More specific unit descriptions follow under the relevant headings.

Units may be additionally supplied with configurations and options as defined by customer order requirements and the following descriptions cover a wide range of available configurations and options. For specific unit configuration please refer to the documentation package (Test Certificate, Installation Manual, Outline Drawing, Schematic) included with each unit or contact Powersmiths International Corp. for support with reference to the nameplate serial number.

1.1.1 Energy Station (ES)

The unit includes a very high efficiency isolation transformer with a K-Rating for Harmonic Loading and/or with specific transformer topologies harmonic correction for harmonics to the 13th where required.

Configurations may include (subject to order specification):

- Unit Power from 45kVA to 750kVA
- Transformer K-Rated or Harmonic Treatment Types (3rd, 9th, plus 5th and 7th for dual outputs, plus 11th and 13th for triple outputs)
- Protection: Electrostatic Shielding, Surge Protective Device (SPD), Emergency Power OFF (EPO)
- Output Voltages 208/120, 400/220, 480/277 Volts
- Isolated Grounding
- Input Breaker (may be mounted in remote panel)
- Distribution panels: 42 circuit @ 225A or 42/72/84 @ 400A with monitoring options
- Sub-feed distribution typically 225 or 400 Amps with monitoring option
- Power Monitoring (comprehensive Power/Power Quality Monitoring with Event records)
- HMI: Touch Screen ¼ VGA Display, Dynamic WEB pages (COMSERVER option)
- WEB Server for direct user access via a browser plus Modbus TCP and BACnet/IP gateways
- Access: Front only access for side by side mounting for significant floor space savings
- Shipping splits per specification

Note: Refer to the installation instructions included with the unit for as shipped configuration

1.1.2 Compact Energy Station (CES)

Compact Energy Stations (CESs) are similar to ESs in features and design but are available from 15 to 50kVA in a compact footprint (24” x 24”) as its name implies. . The unit includes an energy efficient isolation transformer which may be K-Rating for Harmonic Loading or harmonic correcting for heavy non-linear loads.

Configurations may include (subject to order specification):

- Unit Power 15 to 50 kVA max.
- Transformer K-Rated or Harmonic Treatment Types (3^{rd}, 9^{th})
- Protection: Electrostatic Shielding, Surge Protective Device (SPD), Emergency Power OFF (EPO)
- Output Voltages 208/120 or 400/220 Volts
- Isolated Grounds
- Input Breaker (may be mounted in remote panel)
- Distribution panels 42 circuits, side by side configuration
- Number of Distribution panels by specification to 2 maximum
- Power Monitor (comprehensive Power and Power Quality Monitoring with Event records)
- HMI: Touch Screen ¼ VGA Display, Dynamic WEB pages (COMSERVER option)
- WEB Server for direct user access via a browser plus Modbus TCP and BACnet/IP gateways
- Small Footprint: 24” x 24” (1 tile)
- Access: Front and one side (Front only access option to facilitate side by side mounting)

Note: Refer *to the installation instructions included with the unit for as shipped configuration*

1.2 The Power Monitor

The Power Monitor is based on the Powersmiths *Cyberhawk-300 (PMP-30,* Power Management Platform), which is a multi-function metering, monitoring and control device and is integrally integrated into the unit. The user interacts with the monitoring system via the graphic touch screen display or by an Ethernet connection through the internal WEB server if fitted (order option). Setup can also be done at the screen or remotely over an RS485 connection (or Ethernet if installed) using the Powersmiths Setup utility available on the company WEB site.

Panelboard and Sub-feed monitoring options are also available for total I/O monitoring.

1.2.1 Measurement Data

Measurement parameters for up to three Ports (normally 2-port unit, 3-port for dual outputs) include:

- Voltages, Currents (Line and Neutral), Frequency
- Power Factor (Total and Displacement), Distortion (THD & DIN), Crest and K-Factor
- Power (kW, kVA, kVAR), Energy (kWh, kVAh, kVARh)
- Total Demand (kWd, kVAd, kVARd, PFd, DPFd)
- Efficiency (Instantaneous, Demand and Average) – ESs and CESs only
- Temperatures (3 Transformer coils and Ambient)
- Ground Currents to 10 Amps and SPD (TVSS) transient current options
- Waveforms and Harmonics (Voltage and Current)
- Trend Logs for selected parameters 20 typical (option with WEB server)
- Panelboard Load Currents (additional option)

1.2.2 Alarms and Event Recording

The monitor includes an extensive list of monitored parameters for which set out of limit conditions may be set with a recorded time/date stamped event log. Events may also be programmed to initiate an output action (e.g. Relay output, Digital output or Horn) subject to set delays. Also included in the recorded events are Sags and Swells with full user control over set parameters.

Monitored conditions that can be set to trigger an Event* (Alarm) with Time/Date Stamps include:

- Voltages, High/Low
- Voltage, Sags/Swells (1/2 Cycle detection) with three independent detection blocks
- Voltage, Imbalance
- Phase, Loss
- Phase, Reversal
- Frequency, Out of Limit
- Currents, High (two levels) including Neutral
- Temperatures, High
- Distortion, High
- Digital Inputs
- Ground Current and Transient SPD Currents (options)

Note: The monitor is powered directly from the input source and has the capability to "ride-through" sags to < 50% of nominal and power outages of > 200ms to reliably record during extreme power quality anomalies.

1.2.3 Power Monitor Technical Specifications

Table 1-1: Table of Power Monitor Technical Specifications

Measurement:	
Ports:	1, 2 or 3 (configured for unit)
Configurations:	1-Φ D (2/3-wire, 1/2-CT) 3-Φ D (3-wire, 2-CT) 3-Φ Y (4-wire, 3-CT)
Voltage:	
Nominal:	480/600V or 208/120
Impedance:	5 M Ohms
Common Mode:	1,000 VAC
Protection:	Fused disconnect
Current:	
CT Input:	5A nom. 10 A max.
Burden:	1 VA max.
Accuracy:	
Voltage:	± 0.1% typical
Current:	± 0.1% typical
Frequency:	0.01Hz resolution (50/60Hz)
Sampling rate:	64 per cycle (V & I)
Power/Energy:	±0.5% (Class 0.5)
Neutral Current:	± 1% (derived)
Power Factor:	± 1% (PF & cos φ)
Distortion:	± 1% (THD & DIN)
Efficiency:	± 0.1% (in nom. range) (2 Port model only)
Drift:	< 0.01%/ ^{O}C
Computed:	
Resolution (ENOB): *(Effective No. Bits)*	13 (Voltage) 15 (Current)
Demand:	Block, Sliding Block
Power/Energy:	Per Phase and Total
Waveforms:	V & I (2 cycles)
Harmonics:	31Th (Numeric & Bar graph)
Power (operating):	
Source:	1-Φ or 3-Φ 50/60 Hz
Operating range:	-40% to +135% of nom.
Ride through:	> 200ms
Burden:	< 15W, 23VA
Relay Outputs:	
Number:	2 (independent)
Rating:	5A @ 250VAC/24VDC

Auxiliary Inputs:	
Digital::	4 (self-biased 24VDC)
Temperature:	4 (Type A Thermistors) 0 °C – 200°C
Human Interface:	
Standard:	¼ VGA Monochrome 3.8”
Options:	¼ VGA Monochrome 4.7”
	¼ VGA Color 4.7”
User Input:	Touch Screen
Menu:	Context sensitive
Events (Alarms)**:**	
Parameters:	11 (All Measurements)
Functions:	User Programmable
Data Logs (trends)*:*	
Parameters:	20 max.
Log interval:	1 minute min.
Log Time: *(20 parameters)*	1 month typ. @ 5 min. int. (circular buffer)
Memory:	
Events:	1,024 (circular buffer)
Energy Data:	NV RAM Fail safe (dual copy)
Set-up:	NV RAM
Firmware:	Flash based, Field upgradeable
Clock:	
Back-up:	Battery (replaceable)
Accuracy:	± 3 secs./day
Communication:	
RS485:	
Protocol:	Modbus RTU
Bit rate:	1.2 to 19.2 kB
Connection:	2-wire
Isolation:	1,500V
Ethernet:	(option)
Bit rate:	10/100 BaseT
Protocol:	TCP/IP, HTTP, Modbus TCP
Isolation:	1,500V
Remote User Access:	IE Browser

Table 1-2: Table of Power Monitor Event Operation

Table of Event Functions				
Parameter	**Threshold Conditions**	**Hysteresis**	**Delays**	**Event Log**
Over- Voltage	% Above Nominal per Port and per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Maximum Level
Under-Voltage	% Below Nominal per Port and per Phase	Percent Increase for recovery	Seconds	Trigger ON/OFF & Min./Max. level
Voltage Imbalance	Percent Deviation from average of all phases per Port	Percent Increase for recovery	Seconds	Trigger ON/OFF & Max. level
Phase Loss	% Deviation from Nominal for any or all phases per Port and per Phase	Percent Increase for recovery	Seconds	Trigger ON/OFF & Maximum level
Frequency	Upper/Lower Frequency Limits (global)	Frequency Limits	Seconds	Trigger ON/OFF Frequency with max./min.
Over Current Warning	Percent Above Nominal System Setting per Port and per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Maxi.level
Over Current	% Above Nominal System Setting per Port and per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Max. level
Neutral Over Current	% Above Nominal System Setting Port 1 & 2 only	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Max. level
Sags	% Below Nominal 3 Detection Per Phase Function Blocks for User Port assignment	Percent Increase for recovery	Number of ¼ Cycles	Trigger ON/OFF & Mini. level Note: Logged as Trip with a set delay
Swells	% Above Nominal 3 Detection Per Phase Function Blocks for User Port assignment	Percent Decrease for recovery	Number of ¼ Cycles	Trigger ON/OFF & Max. level Note: Logged as Trip with a set delay
Voltage THD	% Above Nominal System Setting Per Port and Per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Max. level
Over Temperature	Temperature Limits 3 sets (grouped) plus 1 ambient	Temperatures	Seconds	Trigger ON/OFF & Max. level
Analog	Analog Inputs	Absolute Value		
Note: All Events are logged with ON and OFF times and are user programmable for Logging, Horn and Output Actions				

1.2.4 Panelboard (Load) Monitoring (option)

The Panelboard load monitoring option provides measurement and alarm functions for each individual output as follows:

- Currents for each load circuit
- Panelboard input measurement option (V, I, kW, kWh)
- User configurable for installed breaker (sizes)
- User settable Warning and Alarm thresholds with delays

1.2.5 Sub-feed Monitoring (option)

The Sub-feed monitoring option provides measurement functions for each sub-feed output as follows:

- Voltage and Currents (V & I) for each circuit
- Power quality (THD V & I)
- Powers and Demands (kW(d), kVA(d), kVAR(d))
- Energies (kWh, kVARh)

1.2.6 Data Logger for Trending (with WEB Server option)

The WEB Server provides a built-in data logger that has the ability to log user selected parameters in 1 minute plus increments in a circular butter. The logged file may be viewed as trend graphs in a WEB browser or downloaded to an Excel spreadsheet. This feature facilitates logging and validation for initial system commissioning from loading to transformer temperatures without external logging equipment.

Typically, logging of 20 parameters in 15 minute intervals will provide a useful logging period of about 6 weeks (fewer parameters or a longer period will increase this time). This logging period may be indefinitely extended using Powersmiths Windows on The World cloud based data base.

1.2.7 Inputs and Outputs

Two Digital Status inputs are available for specific user applications (e.g. checking status of a breaker) and will be internally wired per user requirements or wired out for external user application.

Four Temperature inputs are provided for temperature monitoring of each individual coil of the transformer and ambient.

A relay output is provided for Summary Alarm signaling and one reserved for unit shutdown on monitor control. An additional 4 relays are optionally available for remote signaling, control and protection based on the user's specification

1.2.8 Communication

The monitor supports MODBUS RTU over RS485 or Modbus TCP or BACnet/IP (option) over Ethernet (if so equipped). When equipped with the Powersmiths COMSERVER (WEB Server) all data may be viewed over an Ethernet connection using only a WEB Browser which facilitates convenient anytime anywhere access to all measurement parameters and recorded logs at a remote computer.

1.2.9 HMI and User Display

The unit interacts locally with the *"Touch Screen"* display, guided by the context sensitive menu and remotely over Ethernet using a standard IE Browser. The standard display is ¼ VGA 3.8" Monochrome screen with ¼ VGA 5.7" Monochrome or Color. Screen resolution in all cases is 320 pixels x 240 pixels. Note that the unit also includes provision for user assigned names for the measurements inputs including a field for location name. An audible Horn function is also provided silenced via the Display.

1.2.10 Menu Structure

Operation of the unit is driven by context sensitive Menu selections on the touch screen display making the unit very user friendly to operate. The setup menus are protected by password to prevent inadvertent changes or unauthorized tampering. An overview of the menu structure is shown below:

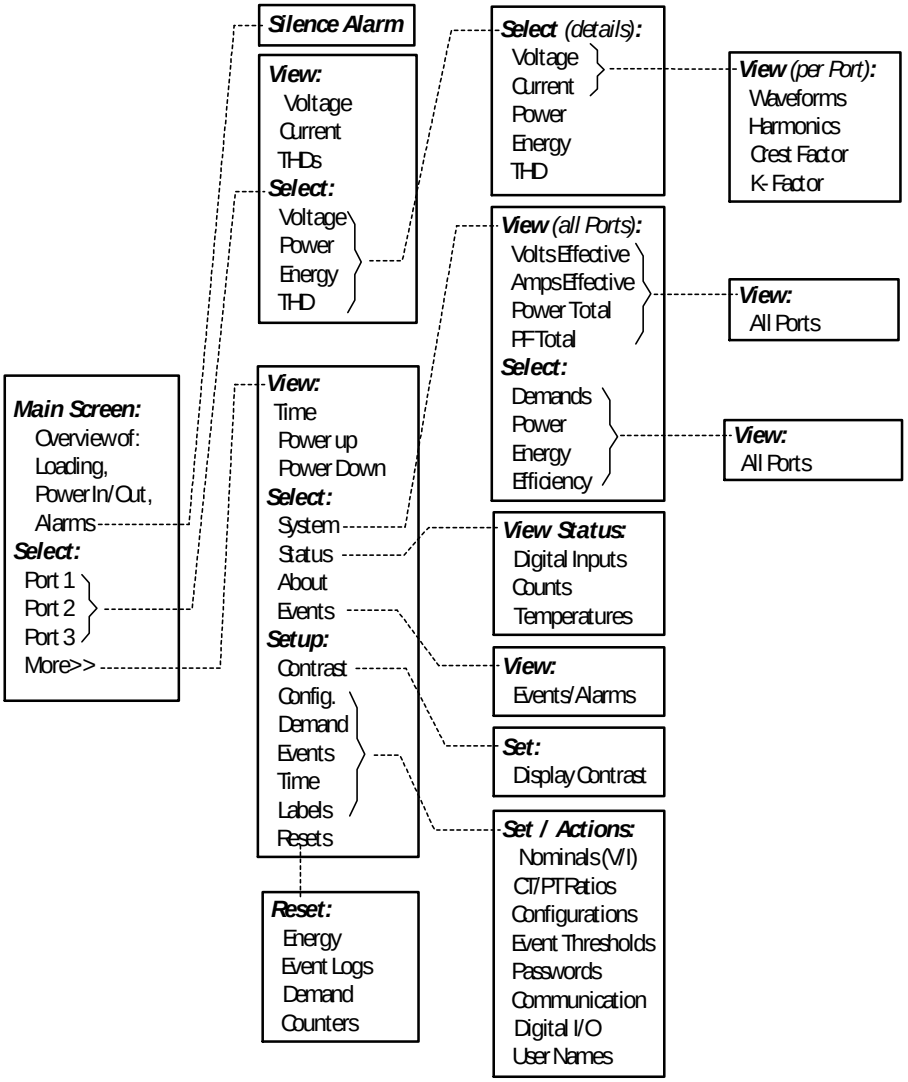


Figure 1-1: Menu Structure for all ¼ VGA Displays

2 Power Circuit – Operating Instructions

2.1 Startup Procedure

The following instructions assume that the unit has been installed and initially started up following the Installation Manual shipped with the unit. After the initial startup the following procedures can be used for normal operation.

2.2 Normal System Power-on

With the unit already in the off state:

- Open the panel door and ensure that all breakers are off including load breakers

  Note: Tripped breakers (caused for example by EPO operation) will need to be reset by forcing handle to open position first

- Energize unit main power at external power source
- Turn on main unit breaker
- Turn on Panelboard main breaker (not fitted in some CESs)
- Individually energize the loads in the desired sequence by turning on the specific lad breaker
- Close and lock (as desired) the panel door
- Repeat procedure for each Panelboard

2.3 Normal System Power-off

With the unit already in the normal on state:

- Open the door(s) to operate breakers at the first panel to be de-energized
- Power off the loads as required following the required sequence for an orderly shutdown
- Open the main Panelboard Breaker (not fitted in some CESs)
- Repeat procedure for each Panelboard
- Turn off main unit breaker
- De-energize unit main power at external power source

2.4 Emergency Power-Off (EPO)

The EPO function removes all power from the power circuits but leaves the internal monitor and display energized to record power the event and any power anomalies.

Note that this function is intended only for emergency operation and will result in an uncontrolled shutdown of all loads.

To operate:

- Lift protective cover over EPO button and depress
- To restore normal operation see “Normal System Power-on” above

Note that an EPO operation may be triggered by the Power Monitor based on customer programming (eg. Overvoltage, Over temperature, etc.).

Caution: Prior to any service operations please refer to section on service and refer all servicing to qualified personnel.

This page intentionally blank

3 Monitors - Operational Guide

Use of this operational guide assumes that the unit has been installed and setup with screen examples shown for the Color ¼ VGA screen.

3.1 Syntax

The following symbols are used in this manual:

⇒: Select and depress button (on Touch Screen)

Button identification with ID within box

Note: Where **Port 1**, **Port 2** or **Port 3** is *referenced, use the user assigned name instead for example* **Input**, **Output** *etc.*

Note that the Port names are user settable but the default names are used (i.e. Port 1, 2 or 3); substitute the user assigned name for 'Port 1" "Port 2" or "Port 3" where applicable.

3.2 The Touch-Screen Display

The meter may be provided with one of three touch-screen displays depending on the option selected at the time of ordering:

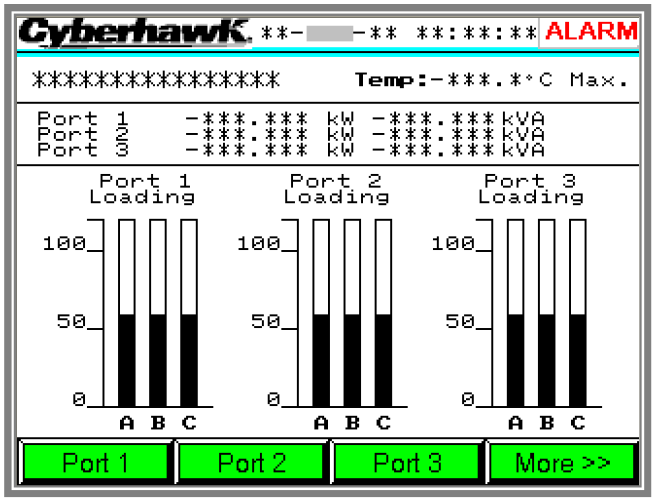
- ¼ VGA 3.8" Monochrome with 320 x 240 pixel resolution (standard)
- ¼ VGA 5.7" Monochrome with 320 x 240 pixel resolution (option)
- ¼ VGA 5.7" Color with 320 x 240 pixel resolution (option)

The user interacts with the unit via the menu driven context sensitive graphic "Touch Screen" display making it extremely simple to operate.

The **More>>** buttons selects more menus and the **Back** button takes the user back one screen at a time. Specific descriptions are given for each screen type.

3.3 Main Screens

The main screen shows an overview of the loading and the main electrical power parameters.



Status: Time/date, Active Alarm

Model Info and Temperature

Total kW and kVA (per Port)

Percent loading (at left)

Menu Selections

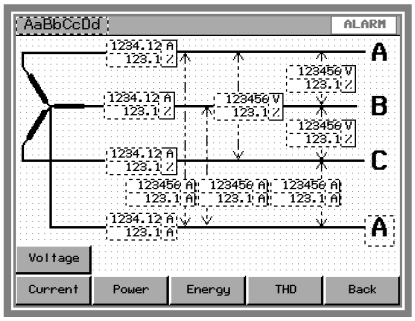
Figure 3-1: Main (default) screen for a dual output ES (two bar graphs for standard output)

Note: **Port 1** **Port 2** and **Port 3** *are the default names and may be changed by the user.*

3.3.1 Accessing Data at the Display

⇒ **[Port 1/2/3]** *or user assigned name*

Summary screen: voltages, L-L and L-N, and line currents together with the V & I THD for each in a diagrammatic form with further selections for tabulated details.



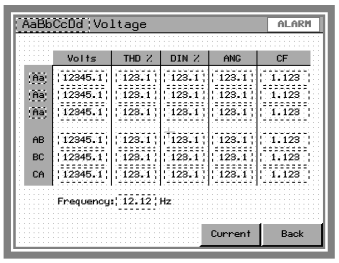
⇒ **Voltage** Voltages L-L & L-N, THD/DIN, CF

⇒ **Current** Line Currents, THD/DIN, CF

⇒ **Power** Powers: kW, kVA, kVAR, PF, DPF

⇒ **Energy** Energies: kWh, kVARh, kVAh

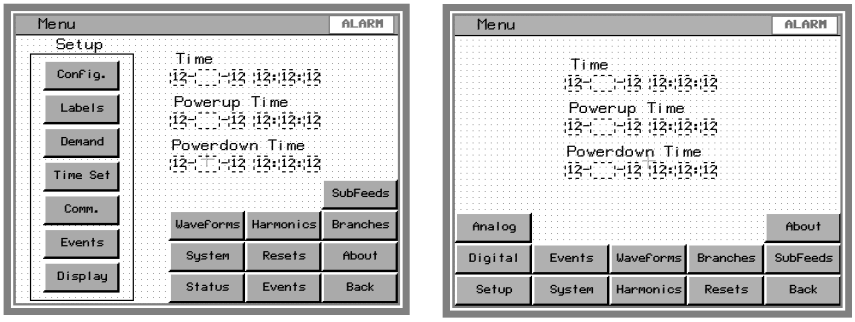
⇒ **THD** Voltage, Current THD, Phase Angles, CF



Typical data screen shown for "Voltage" selection

3.3.2 Expanded Menus

⇒ **More** For expanded menu selections shown below for current and prior versions:.



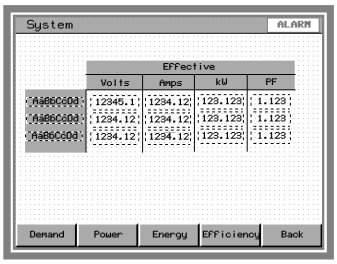
Note: Screen also shows current time and last power up and power down time

Figure 3-2: Expanded Menus; illustrations show both older and newer (right) style

⇒ **Back** to return to the prior screen

3.3.2.1 System Summary and Overview

⇒ **System** Summary of System data: Effective Volts and Currents, Total kW, Total PF

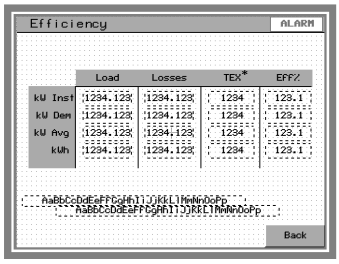


⇒ **Demands** System (Effective) Demands

⇒ **Power** System (Effective) Powers

⇒ **Energy** System (Effective) Energies

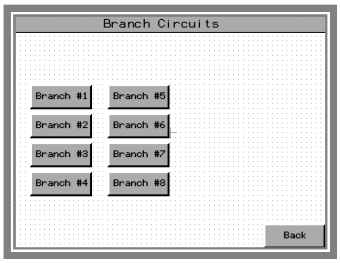
⇒ **Efficiency** System Efficiencies (typical screen shown)



Note: Efficiency is calculated based on Ports assigned as inputs or outputs and calculated as Output divided by Input x 100

3.3.2.2 Branches (Branch Circuits) or Sub-feed

Note: The Branch Circuit monitor may be applied for high density Sub-feeds as set by the factory

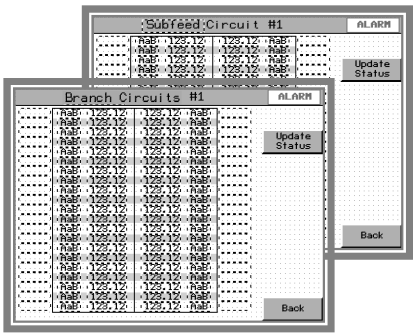


⇒ **Branches** or **Subfeeds** For Branch Circuits or Sub-feed (when the function is switched) : Select the branch/sub-feed to be view; displays the individual branch currents

⇒ **Branch #x** or **Subfeeds** to access selected Circuit

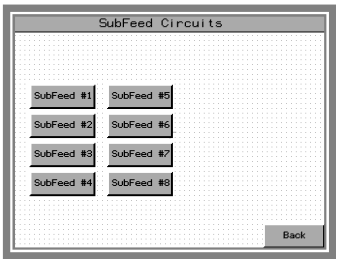
⇒ **Back** to select another Circuit

⇒ **Update Status** to check for circuit status (eg. Warnings or Alarms)



Note: The displays illustrations opposite shows both functions, Branches and Sub-feed applications

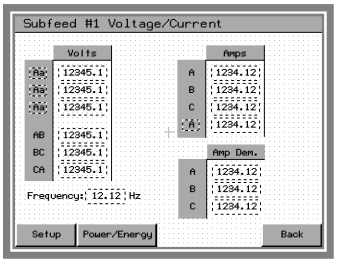
3.3.2.3 Sub-Feeds (if fitted)



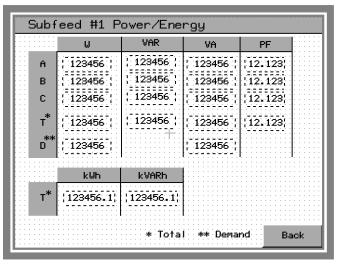
⇒ **Subfeeds** For Sub-feeds: Select Sub-feed circuit to view; Voltages, currents and current demands are displayed

⇒ **Subfeed #x** to access selected (x) Sub-feed Circuit

⇒ **Back** to select another Sub-feed Circuit etc.

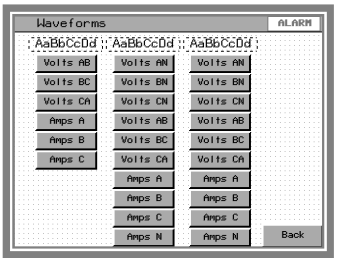


⇒ **Power/Energy** Select to view Powers, Energy and Power Factors



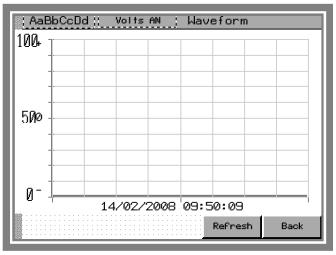
3.3.2.4 Waveforms

⇒ **Waveforms** Display voltage or current waveforms with Crest Factor and K-Factor; select desired parameter to view



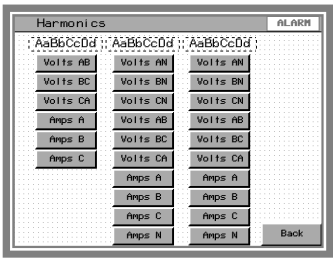
⇒ **Refresh** *to view waveform or to refresh view*

Note: Operates as waveform capture trigged by refresh key

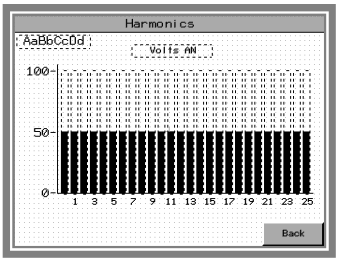


3.3.2.5 Harmonic Spectrum

⇒ **Harmonics** for Bar graphs of harmonic magnitudes up to the 31th harmonic, ; select desired parameter to view



⇒ **Data** for Harmonic numeric data

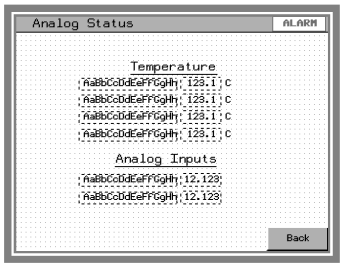


3.3.2.6 Analogs (Auxiliary Analog Inputs)

This menu displays the data read by the auxiliary Analog Inputs such as Temperatures (Transformer and Ambient), Ground Current or SPD (TVSS) Transient Currents, if fitted.

⇒ **Analog** to read Temperatures and Auxiliary analog inputs

Note: Displayed names are user assignable but typically temperatures are given for Coils 1, 2, & 3 of the transformer and Analog Inputs are typically Ground Current and SPD (TVSS) Transient Currents.

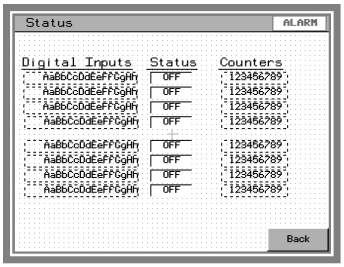


3.3.2.7 Digital (Digital Inputs)

⇒ **Status** for Status of the Digital Inputs:

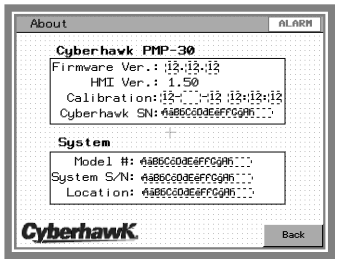
- Status Digital Inputs
- Digital Input Counts

Note: The names are user assignable but typically Digital Inputs 1 & 2 are used for User Building Alarms,; 3 & 4 for SPD (TVSS) when fitted and 5 – 8 are optional digital input expansion.

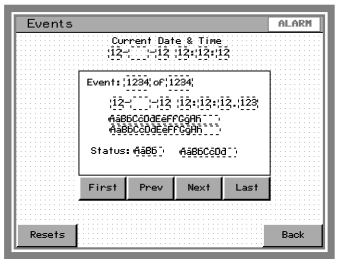


3.3.2.8 About Screen

⇒ **About** Displays relevant information about the Firmware and HMI Versions, Calibration Date and Serial Number



3.3.2.9 Event Logs



⇒ **Events** List of all events (Alarms)

⇒ **First** ⇒ **Prev** ⇒ **Next** ⇒ **Last** to scroll the event list

⇒ **Resets** for quick access to “Resets” screen (see “Resets” following)

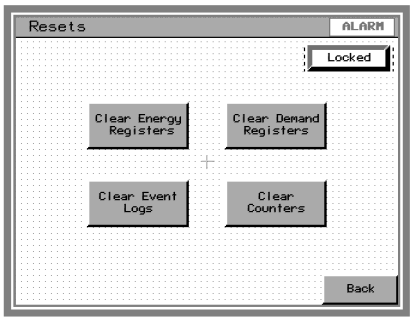
3.4 Active Alarms and Horn Silence

A current active Alarm (generated by an Event), is indicated by a visual **Alarm** button on the left corner of the display.

To silence the Horn at the Screen:

⇒ **Alarm** flashing red at top right

3.5 Resets



⇒ **Resets** and unlock unit by entering a valid password

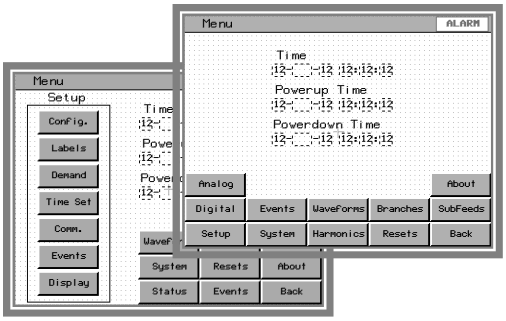
⇒ **Clear Energy Registers**

⇒ **Clear Demand Registers**

⇒ **Clear Event Logs**

⇒ **Clear Counters**

3.6 Basic Setup Parameters



The following instructions cover some basic setups. Please refer to the section on “Setup” for full details.

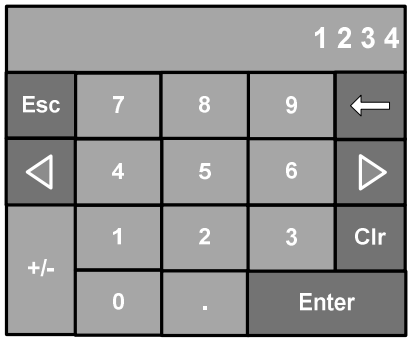
⇒ **More>>** to access to setup menu (left column)

⇒ **Setup** in newer versions

Select the required function from the main menu *(note screen version differences)*.

3.6.1 Popup Keyboard

A numeric or alpha-numeric popup keypad is presented on the screen for operator entry as required.



⇒ **####** punch in required number on the keyboard

⇒ **Enter** to enter

⇒ **►** or **◄** to position cursor

⇒ **←** for backspace

⇒ **+/-** for negative/positive sign

⇒ **Clr** to clear data

⇒ **Esc** to exit keyboard

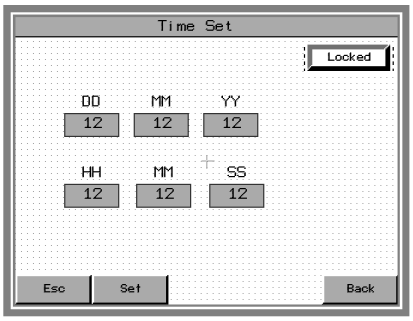
3.6.2 Password Entry

The following setups will require a valid password entry as follows:

⇒ **Locked** from the setup parameter (top right of screen)

⇒ **####** Enter a valid password (default “0”) using the pop-up keyboard & ⇒ **Enter**

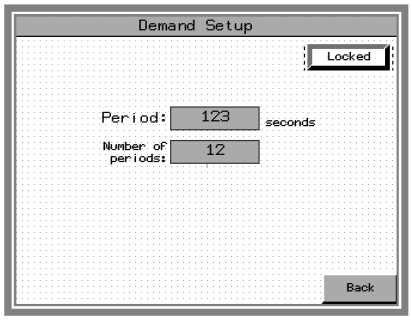
3.6.3 Time Set



⇒ **Time Set** to set time

- ⇒ **xx** field and enter value with pop-up keyboard
- ⇒ **ESC** to escape keyboard
- ⇒ **Set** to enter set values
- ⇒ **ESC** to abort
- ⇒ **Back** for prior setup screen

3.6.4 Demand Period Set



⇒ **Demand**

Period ⇒ #### in seconds using pop-up keyboard

Number of Periods ⇒ #### using pop-up keyboard

Note: Typical sliding block: Period = 60 secs; Number of Periods = 15

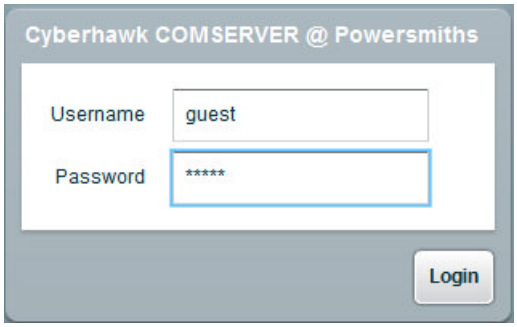
3.6.5 Screen Contrast

⇒ **Display** to set screen contrast & ⇒ **Brightness**

Adjust the ⇒ **Brightness** and ⇒ **Contrast** using the ▲▼buttons for best view ability

⇒ **OK** or ⇒ **Cancel** then ⇒ **To Run Mode** when complete

3.7 Network Access

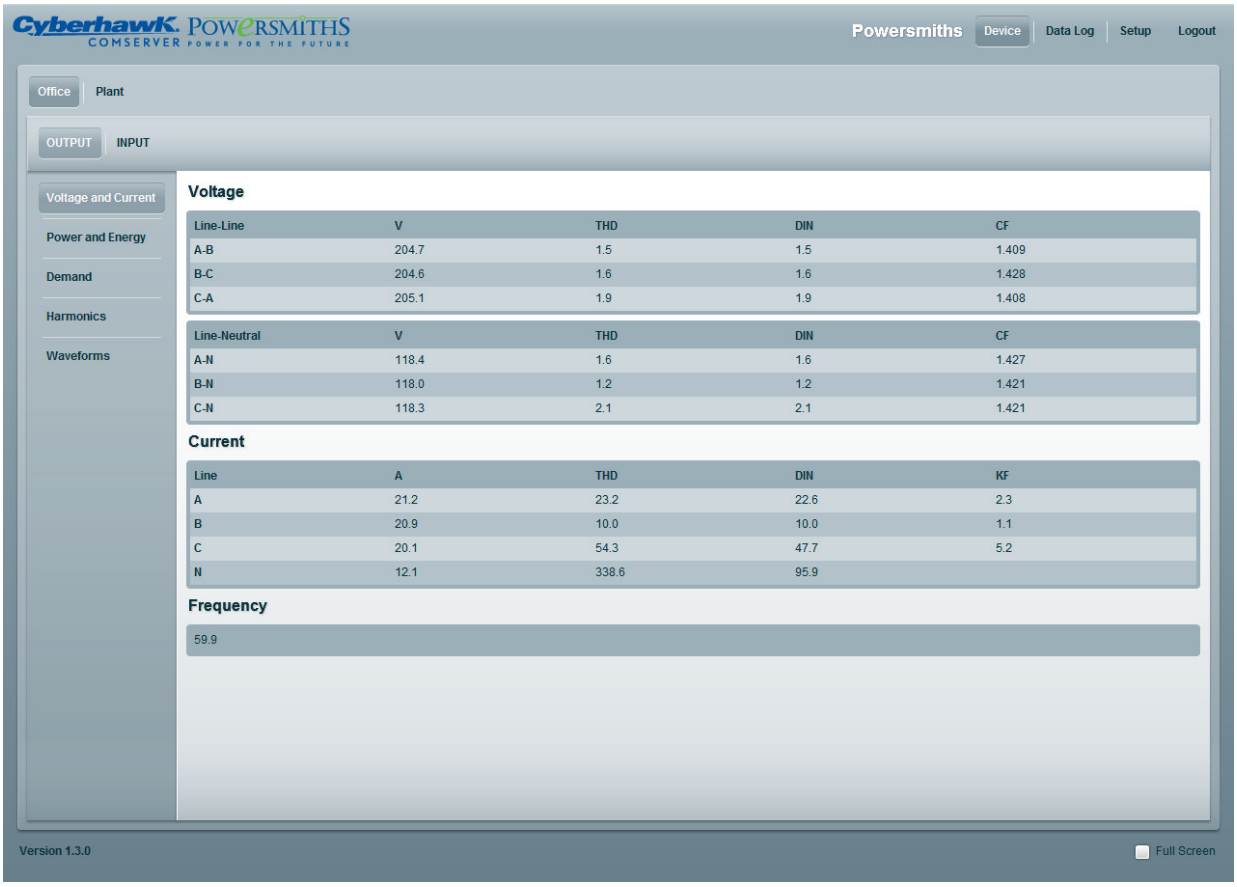


On PC, WEB Browser such as Internet Explorer or Firefox and in the address bar type:

[http://*.***.***.***]**
(the user assigned Cyberhawk Ethernet address)
⇒ User name: ***guest***; Password: ***guest*** in dialog box displayed
Select from displayed menu
Note: Setup requires logging in as an administrator

Alternatively use the Powersmiths Network Utility to locate all Powersmiths connected network devices and follow on screen instructions (see COMSERVER Manual for more details).

When logged in a typical browser screen will be as shown below:



This page intentionally blank

4 Power Monitor Setup

The monitor is factory programmed for the as wired power circuit configuration and with default settings for the Port names and the event log thresholds which may be changed by the user. A record of the setup values is usually packed with the unit in the test certificate. The user may reprogram the unit at the touch screen or by using the *Cyberhawk* Setup Utility software utility available from www.powersmiths.com under Products and Data Center Solutions and select downloads (select Cyberhawk Setup Utility). This utility operates over RS232, RS485 or over Ethernet

Note: To program over RS485 a USB to RS485 dongle may be required available for computer suppliers or Powersmiths. Also programming over Ethernet a key file is required directly by request to Powersmiths (for security reasons)

4.1 General Setup Procedures

The following are a list of parameters that are user settable under password protection:

- Unit/Port Names/Labels
- System Parameters (Voltage, Current, Port(s) Configuration)
- PT/CT Ratios and Correction factors
- Time and Date
- Events (Alarms) with output actions
- Demands
- Passwords
- Communication Parameters
- Screen Contrast
- Analogs
- Sub-feeds and Panelboards
- User assigned names for Ports, Digital I/Os and Unit ID
- Unit IP address*
- Logging parameters*

**Note: Refer to Powersmiths COMSERVER Manual and Powersmiths Network Setup utility available from www.powersmiths.com/download.*

4.1.1 Setup Note

Setup of the main Power, Sub-feed and Panelboard monitors using the Powersmiths and Third party Setup Utilities is preferable as it is quicker, easier and provides a means to save the record of the 'Setup' but note that it is the only means for the Panelboard setup due to its complexity (many circuits).

4.2 Setup at the Screen

The Power Monitor and Sub-feed monitor may be user programmed at the local display but it is recommended that any major programming be done using the available software setup utilities described in the appendix. Note that the Panelboard monitor can only be programmed using the available setup software utility.

A commissioning chart is available from Powersmiths for the user to record the changed or set values.

4.2.1 Operational Notes

The following syntax is used in this manual:

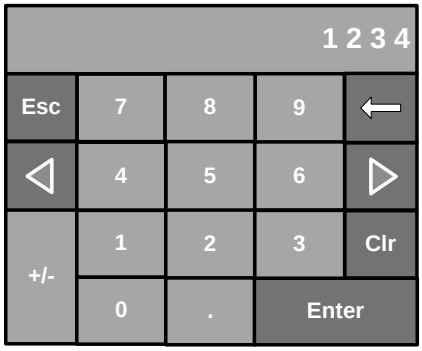
⇒: Select and depress button (on Touch Screen)

⇒ [####] data field to be changed/entered

[****] Key identification with ID within box

Note: Where the default names, eg. **Port 1**, **Port 2** or **Port 3** are *referenced, substitute the user assigned name (eg. Input, Output, etc.) where applicable.*

A numeric or alpha-numeric popup keypad is presented on the screen for operator entry as required when the field to be changed is touched ⇒ **####** .



⇒ **#** enter digits

⇒ **Enter** to enter data

⇒ **►** or **◄** to position cursor

⇒ **←** for backspace

⇒ **+/-** for negative sign

⇒ **Clr** to clear data

⇒ **Esc** to exit keyboard

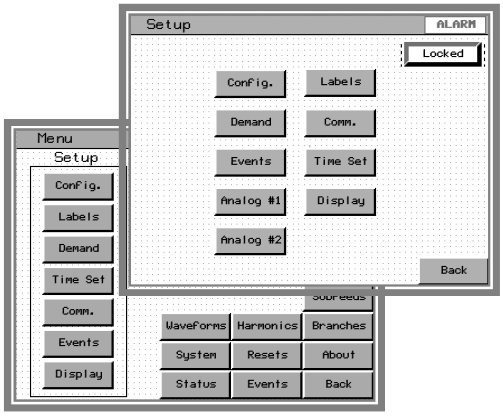
Note: The unit cannot normally be 'unlocked' without a valid password. Please contact the factory for password recovery if the password is locked.

4.2.2 Setup Functions

To access setup:

⇒ **More>>** ⇒ **Setup** to access to setup menu (left column for prior versions)

Under the setup label is a list of setup parameters as follows:



⇒ **Config.** to configure meter for system

⇒ **Labels** for user assigned names

⇒ **Demand** to set demand periods

⇒ **Comm.** to set communication parameters and to change the password

⇒ **Events** to setup event parameters

⇒ **Time Set** to set time

⇒ **Analog #1** or **Analog #2** to setup Analog Inputs

⇒ **Display** to set screen contrast (password not required)

With the exception of the Display contrast, all setup parameters require a valid password.

4.2.3 Password Entry

Setup requires login with a valid 4-digit password (**"0"** is factory default). The login status is indicated by the **Locked** / **Unlocked** flags displayed in the top right corner of the screen; automatic logout occurs in thirty (30) minutes, if no user activity is detected.

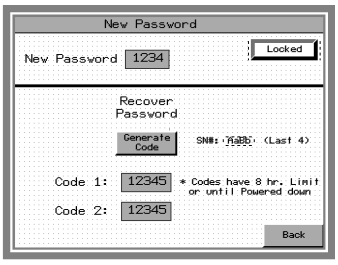
⇒ **Locked** from the setup parameter (top right of screen) which will change to **Unlocked**

⇒ **####** Enter password (default "**0**") in the pop-up keyboard & ⇒ **Enter** and **Unlocked** is displayed

⇒ **ESC** to return to the prior setup screen without entering a password

4.2.4 Change Password and Password Recovery

⇒ **Comm.** & ⇒ **Set Password** to change password (under communication screen)



⇒ #### Enter the new password

4.2.4.1 Password Recovery

From Change Password screen

⇒ **Generate Code** and record S/N, Code 1 and Code 2

Contact the factory and provide the S/N, Code 1 and Code 2 numbers. Recovery codes will be provided which when entered will reset the password to "0". *Note: Recovery codes expire in eight (8) hours.*

4.2.5 Config: Configuration of System Parameters

System configuration is set under the "Config." menu selection

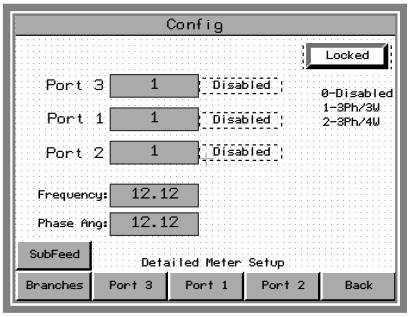
Note that the unit would have been factory configured for the application prior to shipment and should not normally be changed in the field but described for reference only:

- System Parameters (Nominal Voltage and Current)
- Measurement Port Configuration (3-wire or 4-wire)
  - Port 1: 3 or 4-wire (normally applied to output)
  - Port 2: 3 or 4-wire (normally applied to output 2 for dual output systems)
  - Port 3: 3-wire (normally applied to input)
- PT entered as Primary and Secondary Volts
- CT Ratios entered as nominal primary to :5 (eg. 200:5)
- PT/CT Correction Factors
- Sub-feeds
- Panelboards
- Analogs (from external transducers such as Ground Current or Transient Current)

Note that these values are provided for reference only should not be changed as they are specific to the system configuration of the unit.

⇒ **Config.** To enter system configuration

4.2.5.1 Port Types



Port 3: ⇒ # Port type or disabled

Port 1: ⇒ # Port type or disabled

Port 2: ⇒ # Port type or disabled

Frequency: ⇒ # 50 or 60 Hz

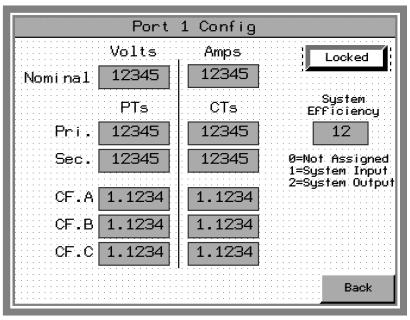
Phase angle: ⇒ # CT phase shift correction

Note: Phase compensation for external CTs is entered in degrees with limits at ± 3.0000 degrees (typical 0.3 deg. For Class 0.3 CTs)

Cycle Power to effect changes

Note: These changes only take effect after a Meter restart (power cycled ON/OFF by temporarily interrupting the mains power or by opening and closing the internal fused disconnects)

4.2.5.2 Port Settings



Port 1 is described below, but repeat for other ports as required.

Nominal volts ⇒ [####] enter nominal system voltage (eg. 208, 400, 415, 480, 600)

Nominal Amps ⇒ [####] enter nominal system line current calculated as follows:

3-Phase systems: $I = \frac{S}{\sqrt{3}.V_L}$ *Where S is the Total Power of the system in rated VA*

System Efficiency: ⇒ [####] to assign port as an Input or Output for efficiency calculations.

4.2.5.3 PT Ratios and Correction Factors

*Note: **PT data must be entered even if there are no PTs** installed in the system, where the primary and secondary voltages are **set to the nominal system voltages** for the Port*

Primary PTs (Pri. PTs): ⇒ [####] enter the nominal PT primary voltage

Note: Enter Nominal System Voltage when no PTs are fitted

Secondary PTs (Sec. PTs): ⇒ [####] enter the nominal PT secondary voltage

Note: Enter Nominal System Voltage when no PTs are fitted

Correction Factor PTs (CT. A/B/C PTs): ⇒ [####] enter the correction factor for each PT with reference to the PT phase as applicable

Note: Enter 1.0000 if not known or not applicable. The limit for values entered is 1.1000 maximum. to 0.9000 minimum. When using 3-wire configurations, enter correction factors only for the two phases where the PTs are installed with the remaining phase set at 1.0000.

4.2.5.3.1 CT Ratios and Correction Factors

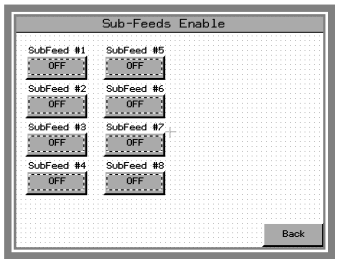
Primary CTs (Pri. CTs): ⇒ [####] enter the nominal CT primary current

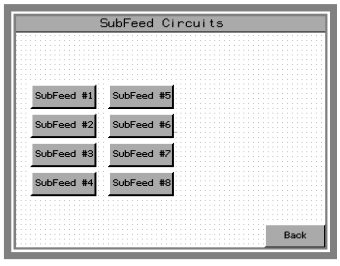
Secondary CTs (Sec. CTs) set by default to 5 Amps

Correction Factor CTs (CT. A/B/C PTs): ⇒ [####] enter the correction factor for each CT with reference to the CT phase as applicable

Note: Enter 1.0000 if not known or not applicable. The limit for values entered is 1.1000 maximum to 0.9000 minimum. When using 3-wire configurations, enter correction factors only for the two phases where the CTs are installed with the remaining phase set at 1.0000.

4.2.5.4 Sub-feed Setup





Sub-feed monitoring is made active as follows:

⇒ **Subfeeds** to enable

Subfeed #1: ⇒ **ON** or ⇒ **ON** to enable/disable

Repeat for Sub-feed #2 - #8

Sub-feed setup is under the data viewing menu but will not be visible if not made active. From the

⇒ **More>>** menu

⇒ **Subfeeds** Select Sub-feed circuit #x

⇒ **Subfeed #x** to access selected (1-8) Sub-feed Circuit

⇒ **Setup** to set the following (for each sub-feed):

*⇒ **Current Ratio** #### to set CT current ratio (Ratio is primary current/secondary; eg. 200:5 yield current ratio of 40)

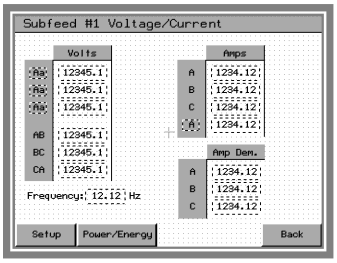
*⇒ **Voltage Ratio** #### to set PT ratio (default = 1; no PTs)

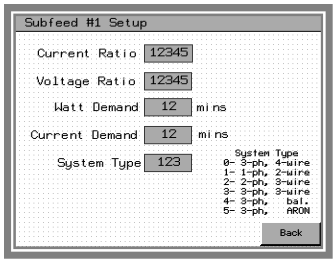
*⇒ **System Type** #### system type; see screen for system types (default 0 for 3-ph 4-wire)

**Note: Factory setting that should not be changed.*

⇒ **Watt Demand** #### demand time in minutes (default = 15 mins)

⇒ **Current Demand** #### demand time in minutes (default = 15 mins)





4.2.5.5 Branch and Sub-Feed Circuit Enable

Branch Circuit Monitoring is implemented by a third party monitor supplied by Veris Industries and is applied mainly for Branch Circuit monitoring of distribution Panelboards but also applied to high density Sub-feeds. Branch Circuit monitoring is made active as follows:

⇒ **Branches** to enable

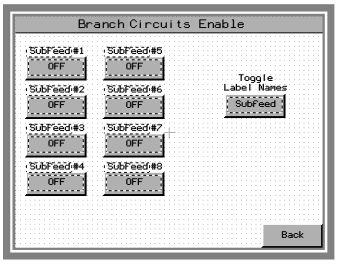
Branch #1: ⇒ **OFF** to enable or ⇒ **ON** to disable

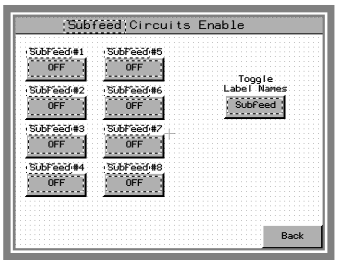
Repeat for Branches #2 - #8

⇒ **Subfeed** to switch the Label from “Branch” to Subfeed”.

Note: Switching the label to “Subfeed” disables the normal Sub-feed (above) access.

Note: Setup for Branch Circuit Monitoring is by PC Software only due to the complexity of setting up such a multiplicity of circuits; see Appendix 3.

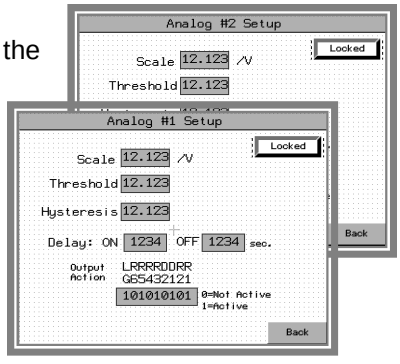




4.2.6 Analog Setup

The Analog inputs are used to monitor additional functions via transducers external to the monitor. Setting up the analog inputs from the “Setup” menu *(Note: Labels/units are set under labels)*:

Note: The following information is provided for reference only as this function will be factory set.



⇒ **Analog #1** to access setup

⇒ **Scale** to set the scaling factor in unit per volt (eg. 1000 which could represent say 1000 mA per Volt).

⇒ **Threshold** #### enter value on popup keyboard

⇒ **Hysteresis** #### enter value on popup keyboard

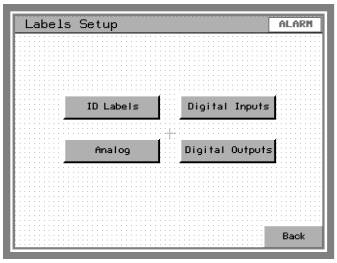
⇒ **Delay On** #### enter value in seconds on popup keyboard (default 1 secs.)

⇒ **Delay Off** #### enter value in seconds on popup keyboard (default 1 secs.)

⇒ **Output Action** ######### **(**Analog 1 & 2**)** and enter string for required action in popup keyboard (default: 100000000). *Refer to the following section on Events for a full description on Output Action.*

4.2.7 Labels

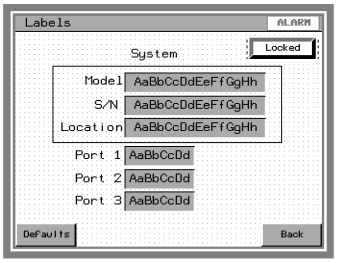
The Names (Labels) may be assigned to Meter Ports, Digital Inputs and Outputs in alpha numeric format; this provides a more user-friendly interaction with the unit.



⇒ **Labels** and select from:

- ID Labels
- Digital Inputs
- Analog
- Digital Outputs

4.2.7.1 Enter ID Labels



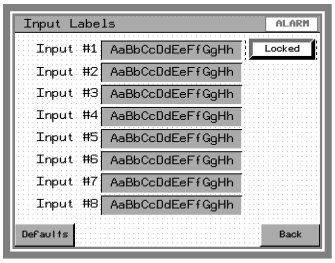
⇒ **ID Labels** and enter Labels/Names for:

- Model (Factory Predefined)
- Serial Number (S/N: Factory Pre-assigned)
- Location (user Assigned)
- Port 1 (typically “OUTPUT”)
- Port 2 (typically “Output 2” when used)
- Port 3 (typically “INPUT”)

⇒ *********** field and enter alpha-numeric Label

Note: Defaults may be loaded with the ⇒ **Defaults** *button*

4.2.7.2 Digital Input Labels

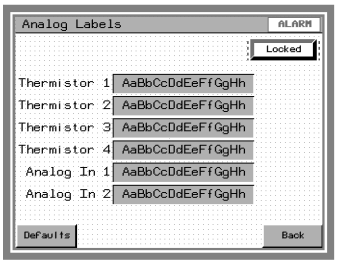


⇒ **Digital Inputs** and enter Labels/Names for Inputs 1 - 8

⇒ *********** field and enter alpha-numeric label up to 16 characters.

Note: Defaults may be loaded with the ⇒ **Defaults** *button*

4.2.7.3 Analog input Labels



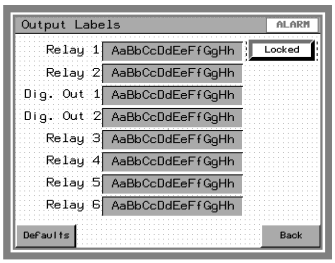
⇒ **Analog** and enter Labels/Names for the Analog Inputs as follows:

- Thermistor 1 – 3 (default “Coil 1 -3” respectively)
- Thermistor 4 (default “Ambient”)
- Analog 1 (default “Analog input 1”)
- Analog 2 (default “Analog Input 2”)

⇒ *********** field for each label in turn and enter alpha-numeric label up to 16 characters.

Note: Defaults may be loaded with the ⇒ **Defaults** *button*

4.2.7.4 Digital Output Labels



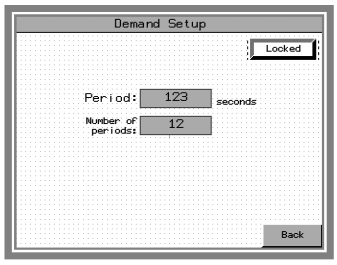
⇒ **Digital Outputs** and enter Labels/Names for:

- Relay 1 (Default: Summary Alarm)
- Relay 2 (Default: Shutdown)
- Dig. Out 1 (Default: Horn)
- Dig. Out 2 (not normally used)
- Relay 3 – Relay 6 (not normally fitted)

⇒ #### field and enter alpha-numeric Label

Note: Defaults may be loaded with the ⇒ **Defaults** *button*

4.2.8 Demand Period Set



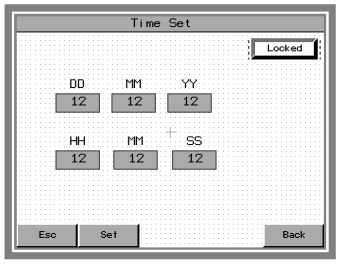
⇒ **Demand**

Period ⇒ #### in seconds using pop-up keyboard

Number of Periods ⇒ #### using pop-up keyboard

Note: Typical sliding block: Period = 60 secs; Number of Periods = 15

4.2.9 Time Set



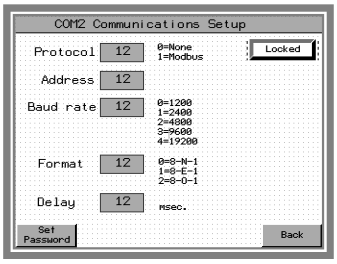
⇒ **Time Set** to set time

- ⇒ **xx** field and enter value with pop-up keyboard
- ⇒ **ESC** to escape keyboard
- ⇒ **Set** to enter set values
- ⇒ **ESC** to abort
- ⇒ **Back** for prior setup screen

4.2.10 COM1 Communication

COM1 Port is used for internal communication and can only be set using the service port or by communication over COM2.

4.2.11 COM2 Communication



⇒ **Comm.** to set communication parameters for COM2 Port

Protocol: ⇒ **xx** field and enter value with pop-up keyboard

Address: ⇒ **xx** field and enter value (range 1 – 247)

Baud Rate: ⇒ **xx** field and enter value (1,200, 2,400, 9,600, 19,200 baud)

Format: ⇒ **xx** field and enter value (Number of bits (8): Start bit, Parity, Stop bit); see table opposite.

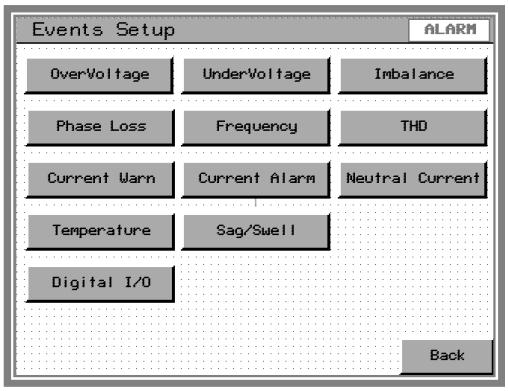
Delay (response): ⇒ **xx** field and enter value (default 10 ms)

Data Format Table		
Format	**Description**	**Entry**
8 N 1	8 Bits / No Parity / 1 Stop Bit (default)	**0**
8 E 1	8 Bits / Even Parity / 1 Stop Bit	**1**
8 O 1	8 Bits / Odd Parity / 1 Stop Bit	**2**

4.2.12 Events (Alarms)

Event programming is available ⇒ **More>>** and under **Setups** ⇒ **Events**. The following Parameters are monitored and are user programmable for threshold and for Alarm action with user settable delays.

Programmable Event Parameters are as follows:



- Over Voltage (per Port/phase/line)
- Under Voltage (per Port/phase/line)
- Voltage Imbalance (per Port)
- Phase Loss (per Port/line)
- Frequency (Global)
- Over Current Warning (per Port/line)
- Over Current (per Port/line)
- Over Current Neutral (per 4-wire Port)
- Over Temperature (3 Inputs plus 1 Ambient)
- Sags and Swells (per Port/line for Delta and Port/phase for Wye)
- Digital Input Alarms (4 Digital plus 4 with I/O, EPO activation)
- Phase Rotation (per Port and part of digital alarms)
- Analog 1 & 2 Inputs (see Analog Setup)

Events may be programmed to generate the following actions as follows:

- Log Event with Date/Time
- Operate Relay Outputs (Alarm and/or Control)
- Operate Horn
- Operate Digital Outputs

Other Events generated and logged by the unit but are not user programmable include:

- Power Down
- Restart
- Logs Cleared
- Battery (clock) Low

4.2.12.1 General Event Setup Procedures

Events may be programmed to make them active and for the output action required, the default state is off (disabled). Event setup follows the following sequence:

- Thresholds
  - Set the Thresholds and Hysteresis for the Event (alarm)
- Delay
  - Set Delay On Off times
- Output Actions
  - Set the required output actions including Logs and Outputs

4.2.12.2 Event Output Action Programming

Note: This is a general note on Output programming (Relays and Digital Outputs) which is applicable to all Event setups so it is covered prior. Relays 3 – 6 are optional and not generally installed.

The output actions of an Event are user set as a digital string (9 bits) and entered by inputting a series of ones (1) (to enable) and zeros (0) (to disable). It is recommended that the digital string be worked out and jotted down on a piece of paper prior to entry. As example the string {100000101} programs the unit to log events and operate the horn output (D1) and the Relay R1. The table below lists the programmable outputs:

Table 4-1: Table of programmable outputs

Item	Output Action Programming								
Bit Number	9	8	7	6	5	4	3	2	1
Control	Event Enable	Relay 6	Relay 5	Relay 4	Relay 3	Digital O/P-2	Digital O/P-1	Relay 2 (Aux 2)	Relay 1 (Aux 1)
Defaults	User Defined	User Defined	User Defined	User Defined	User Defined	User Defined	Horn	Shut-down	Summary Alarm
Typical String	1	0	0	0	0	0	1	0	1
	Enabled	Disabled	Disabled	Disabled	Disabled	Disabled	Enabled	Disabled	Enabled

The programming screen for inputting the required operational string is shown following. From the particular event screen:

⇒ **Output Action** [#########] for keyboard entry

⇒ [**0**] or ⇒ [**1**] digits

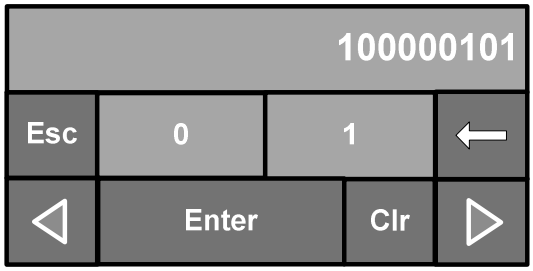
⇒ [**Enter**] to enter data

⇒ [►] or [◄] to position cursor

⇒ [←] for backspace

⇒ [**Clr**] to clear data

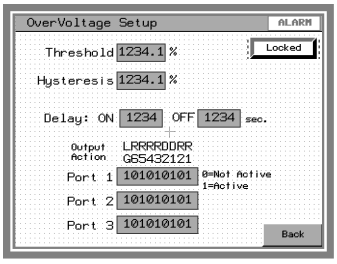
⇒ [**Esc**] to exit keyboard



Caution: Relay 1 is reserved for summary alarms and wired out to the user access terminals and Relay 2 is wired for unit shut-down under monitor control. Only enable Relay 2 for user defined events that require unit shutdown. Note also that monitor shutdown must be enabled by programming jumpers located on the inside of the access door; refer to the section on Maintenance to enable this function.

4.2.12.3 Over Voltage / Under Voltage

The Over-voltage and Under-voltage event thresholds are set globally for all meter ports and are based on percentage of the nominal system values and delays (ON & OFF) set in seconds. From the setup screen:



⇒ [**OverVoltage**] or ⇒ [**UnderVoltage**] as required

⇒ **Threshold** [####] enter % value on popup keyboard (default 110% or 90% respectively)

⇒ **Hysteresis** [####] enter % value on popup keyboard (default 2%)

⇒ **Delay On** [####] enter value in seconds on popup keyboard (default 1 secs.)

⇒ **Delay Off** [####] enter value in seconds on popup keyboard (default 1 secs.)

⇒ **Output Action** [#########] **(**Port 1, Port 2 or Port 3**)** and enter string for required action in popup keyboard (default: 100000000).

4.2.12.4 Voltage Imbalance

The Voltage Imbalance event thresholds are set globally for all meter ports and are based on percentage deviation from the average system line-to-line values and delays (ON & OFF) set in seconds. From the Events Setup screen:

⇒ **Imbalance**

⇒ **Threshold** #### enter % value on popup keyboard (default 25%)

⇒ **Hysteresis** #### enter % value on popup keyboard (default 5%)

⇒ **Delay On** #### enter value in seconds on popup keyboard (default 5 secs.)

⇒ **Delay Off** #### enter value in seconds on popup keyboard (default 5 secs.)

⇒ **Output Action** ######### **(**Port 1, Port 2 or Port 3**)** and enter string for required action in popup keyboard (default: 100000000)

4.2.12.5 Phase Loss

The Phase Loss event thresholds are set globally for all meter ports and are based on percentage deviation from the Nominal system line-to-line values and delays (ON & OFF) set in seconds. From the Events setup screen:

⇒ **Phase Loss**

⇒ **Threshold** #### enter % value on popup keyboard (default 75%)

⇒ **Hysteresis** #### enter % value on popup keyboard (default 10%)

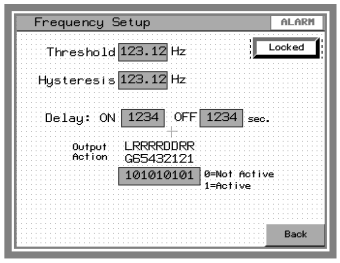
⇒ **Delay On** #### enter value in seconds on popup keyboard (default 5 secs.)

⇒ **Delay Off** #### enter value in seconds on popup keyboard (default 5 secs.)

⇒ **Output Action** ######### **(**Port 1, Port 2 or Port 3**)** and enter string for required action in popup keyboard (default: 100000000)

4.2.12.6 Frequency

The Frequency event threshold is set globally for all meter ports based on a specified frequency deviation from the Nominal and delays (ON & OFF) set in seconds. From the Events setup screen:



⇒ **Frequency**

⇒ **Threshold** #### enter frequency deviation on popup keyboard (default 0.5%)

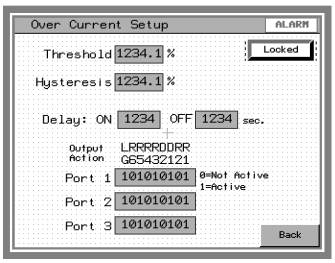
⇒ **Hysteresis** #### enter hysteresis on popup keyboard (default 0.2Hz)

⇒ **Delay On** #### enter value in seconds on popup keyboard (default 2 secs.)

⇒ **Delay Off** #### enter value in seconds on popup keyboard (default 2 secs.)

⇒ **Output Action** ######### enter string for required action on popup keyboard (default: 100000000)

4.2.12.7 Over Current Warning / Over Current Alarm



The Over-current event thresholds (Warning and Alarm) are set globally for all meter ports and are based on percentage of the nominal system line currents and delays (ON & OFF) set in seconds.

These Event Alarms are setup by navigating over to the Event setup Menu, then:

⇒ **Current Warning** or **Current Alarm** as required

- ⇒ **Threshold** #### enter % value on popup keyboard (default 80%)
- ⇒ **Hysteresis** #### enter % value on popup keyboard (default 5%)
- ⇒ **Delay On** #### enter value in seconds on popup keyboard (default 2 secs.)
- ⇒ **Delay Off** #### enter value in seconds on popup keyboard (default 2 secs.)
- ⇒ **Output Action** ######### **(**Port 1, Port 2 or Port 3**)** and enter string for required action in popup keyboard (default: 100000000)

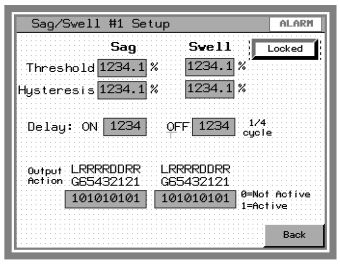
4.2.12.8 Neutral Over-current

The Neutral Over-current event thresholds are set globally for the two output meter ports and are based on percentage of the nominal system line currents and delays (ON & OFF) set in seconds. From the Events setup screen:

⇒ **Neutral Current**

- ⇒ **Threshold** #### enter % value on popup keyboard (default 160%)
- ⇒ **Hysteresis** #### enter % value on popup keyboard (default 5%)
- ⇒ **Delay On** #### enter value in seconds on popup keyboard (default 2 secs.)
- ⇒ **Delay Off** #### enter value in seconds on popup keyboard (default 2 secs.)
- ⇒ **Output Action** ######### **(**Port 1 or Port 2**)** and enter string for required action in popup keyboard (default: 100000000)

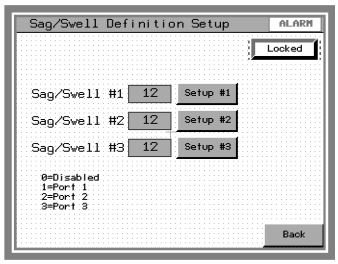
4.2.12.9 Sags and Swells



Sag and Swell setups are used to detect fast (1/2 cycle) events. There are three (3) Sag/Swell detection blocks that are normally assigned 1 per port. The Sag / Swell event thresholds are set and are based on percentage of the nominal system values. Delays are set in numbers of quarter (1/4) cycles for ON & OFF Times.

Note that Sag/Swell detection operates L-L for 3-wire configuration and L-N for 4-wire configurations.

Sag/Swell Block	Assign to Port
1	0 – Disabled 1 – Port 1 2 – Port 2 3 – Port 3
2	
3	



⇒ **Sag/Swell** to access Sag/Swell setup

⇒ **Sag/Swell #1** ## to assign Sag/Swell Block as per table

Note: Repeat for each of the three Sag/Swell blocks #2 & #3

⇒ **Setup # 1** to setup Sag/Swell Block #1

⇒ **Threshold Sag** #### enter % value on popup keyboard (default 85%)

⇒ **Hysteresis Sag** #### enter % value on popup keyboard (default 5%)

⇒ **Threshold Swell** #### enter % value on popup keyboard (default 115%)

⇒ **Hysteresis Swell** #### enter % value on popup keyboard (default 5%)

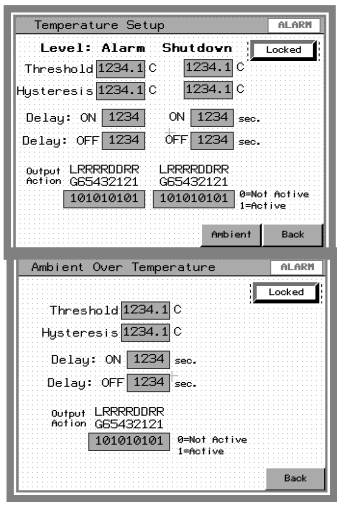
⇒ **Delay On** #### for Sags and Swells in numbers of ¼ cycles on popup keyboard (default 0)

⇒ **Delay Off** #### for Sags and Swells in numbers of ¼ cycles on popup keyboard (default 0)

⇒ **Output Action (**Sag & Swell**)** ######### enter string for required action in popup keyboard (default: 100000000)

Repeat for Sag/Swell blocks #2 and #3

4.2.12.10 Transformer Over-Temperatures



The Over-temperature thresholds are set globally for the three sensor inputs for both an Alarm (warning) level and a shutdown alarm level set in ^{O}C and delays (ON & OFF) set in seconds. An additional alarm is provided for ambient temperatures. From the Events setup screen:

⇒ **Temperature**

⇒ **Threshold Alarm** #### enter value in °C (default 150 °C)

⇒ **Hysteresis Alarm** #### enter value in °C (default 5 °C)

⇒ **Delay ON Alarm** #### enter value in seconds (default 60 secs)

⇒ **Delay OFF Alarm** #### enter value in seconds (default 2 secs.)

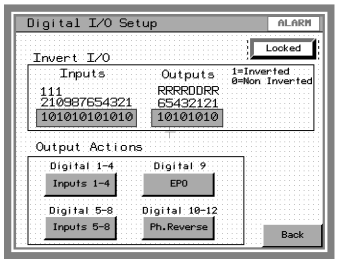
⇒ **Output Action (**Alarm and Shutdown**)** ######### enter string for required action in popup keyboard (default: 100000000)

Repeat the foregoing for **Shutdown** setup

For Ambient event setup:

⇒ **Ambient** and set levels as foregoing

4.2.12.11 Digital Inputs/Outputs (I/Os)



All Digital Inputs and Outputs are programmed under this screen including input and output polarity settings and Phase Reversal sensing (three phase systems) which is treated as a digital input. From the Events setup screen:

⇒ **Digital I/O**

4.2.12.11.1 Invert I/O

The tables below list the Digital Inputs and Outputs and their default polarity assignments. To change the polarities of these, see instructions following the tables.

Table 4-2: Digital I/O Assignments

Digital Input	I.D	Default String Assignment	Description
Digital I/P #1	1	0	0 for Normally open state 1 for Normally Closed state
Digital I/P #2	2	0	
Digital I/P #3	3	0	
Digital I/P #4	4	0	
Digital I/P #5	5	0	
Digital I/P #6	6	0	
Digital I/P #7	7	0	
Digital I/P #8	8	0	
EPO	9	0	
Port 1 Phase Rotation	10	0	0 for Clockwise Rotation. 1 for Anticlockwise rotation
Port 2 Phase Rotation	11	0	
Port 3 Phase Rotation	12	0	

Table 4-3: Output Assignments

Digital Output	I.D	Default String Assignment	Description
Output Relay #1	R1	0	0 for Normally OFF state 1 for Normally ON state
Output Relay #2	R2	0	
Output Digital O/P 1	D1	0	
Output Digital O/P 2	D2	0	
Output Relay #3 (option)	R3	0	
Output Relay #4 (option)	R4	0	
Output Relay #5 (option)	R5	0	
Output Relay #6 (option)	R5	0	

To change the polarity of the digital inputs, enter the required 12-bit string as follows:

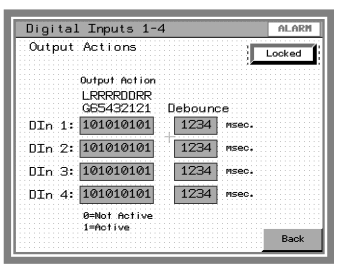
⇒ **Invert I/O Inputs** [####] enter string for required polarity in popup keyboard (default: 000000000000)

To change the polarity of the digital outputs, enter the required 8-bit string as follows:

⇒ **Invert Outputs** [####] enter string for required polarity in popup keyboard (default: 00000000)

4.2.12.11.2 Digital Input Programming

There are a total of eight (8) Digital Inputs (4 on the main unit and 4 optional on an expansion I/O) used for sensing non-potential contacts in the external system. They may be programmed to operate as an event alarm, as normally open or normally closed, to log operation, de-bounce contacts, and set an output action.

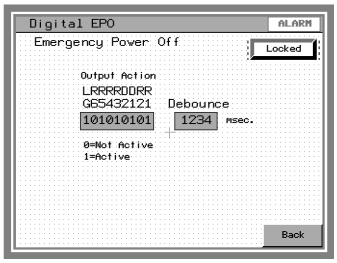


The Digital Inputs are setup from the Digital I/O setup screen and from this screen select:

⇒ **Output Actions DI 1-4 (& 5-8)** ######## enter string for required action in popup keyboard (defaults depend on installed options)

⇒ **Debounce** xxx enter de-bounce time in milliseconds (Default 100ms, max 999) for each digital input

4.2.12.11.3 EPO (Emergency Power Off)



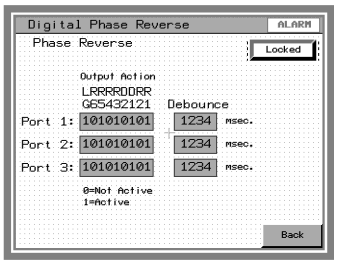
This function is provided to record the operation of the EPO function. Setup from the Digital I/O screen is as follows:

⇒ **Digital 9** EPO .

⇒ **Output Action** ######### enter string for required action in popup keyboard (defaults: 100000000)

⇒ **Debounce** xxx enter de-bounce time in milliseconds (Default 100ms, max 999)

4.2.12.12 Phase Reversal



This function provides an alarm for phase reversal of any of the Metering ports (Port 1 or Port 2, Port 3). Note that the normal phase rotation may be changed in the main Digital I/O setup screen. From the Events setup screen:

⇒ **Digital I/O** ⇒**Digital 10-12** **Ph. Reverse**

⇒ **Output Action Port 1** ######### enter string for required polarity in popup keyboard (default: Port 1: 000000000; Port 2: 000000000; Port 3: 100000000)

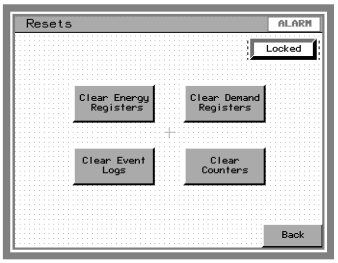
⇒ **Debounce** xxx enter de-bounce time in milliseconds (Default 0 ms) for each digital input

Set Phase Rotation:

⇒ **Back** to return to the Digital I/O setup screen

⇒ **Invert I/O Inputs (#10, #11 or #12)** ############ enter string for required polarity in popup keyboard (default: 000000000000) for a reversed phase rotation.

4.3 Resets



⇒ **Resets** and unlock unit by entering a valid password

⇒ **Clear Energy Registers**

⇒ **Clear Demand Registers**

⇒ **Clear Event Logs**

⇒ **Clear Counters**

4.4 Screen Contrast

⇒ **Display** to set screen contrast & ⇒ **Brightness**

Adjust the ⇒ **Brightness** and ⇒ **Contrast** using the ▲▼buttons for best view ability

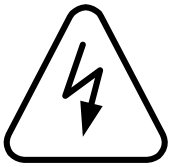
⇒ **OK** or ⇒ **Cancel** then ⇒ **To Run Mode** when complete

4.4.1 COMSERVER (WEB Server) Setup

The unit may be equipped a Powersmiths COMSERVER that facilitates communication with the device over an Ethernet connection using only a standard Internet Browser. Please refer to the Powersmiths COMSERVER Manual for setup instructions available from www.powersmersmiths.com/download.

5 Installation

The instructions provided here only as a guide to the installation of the unit. For full installation instructions please refer to the “Installation Manual” shipped with the unit or download from www.powersmiths.com/download.

DANGER 	***HAZARD OF ELECTRIC SHOCK OR ARC FLASH***
	This equipment to be installed and maintained only by qualified personnel
	Before working on this equipment ensure that all power is off and locked out
	More than one upstream Disconnect may be required to de-energize this equipment
	Use appropriate personal protective equipment (PPE) and follow safe electrical work practices (see NFPA 70E)
	Ensure all covers and doors are in a closed condition prior to applying power
CAUTION 	***DANGER OF TIPPING IF NOT PROPERLY HANDLED***
	Units are tall and narrow with a relatively high center of gravity
	Provide vertical support, handle with care and move slowly to avoid tipping
	Ensure that lifting devices evenly distribute the load over the base or lifting eyes if fitted

5.1 Installation Guidelines

The unit to be installed in accordance with the prevailing local and National Electric Codes such as National Electric Code (NEC) in the USA or Canadian Electric Code in Canada, which governs the requirements for electrical installation. These requirements may include, but not limited to:

The following points should be considered in choosing a location:

- Ventilation Clearance: Twelve (15”) inches minimum ventilation clearance at the top
- Operational and Maintenance Access: Check unit requirements for access which may require up to three sides
- Proximity to Loads: Location relative to the loads may be important for harmonic (non-linear) loading
- Wiring: Conduit entry top or bottom (see “Outline Dimensions and Wiring Access”) requires clearance
- Heat Load (kVA dependant): Losses in the Transformer, Current flow in Breakers, Connectors and wiring will generate heat as indicated on the relevant data sheet or test certificate

  Note: The unit is designed for convection cooling and does not require forced air cooling
- Environmental conditions: Ensure that the enclosure specified and supplied is suitable for the environment and location

The following points should be considered in wiring the unit:

- Ratings: Nameplate ratings (Voltage/Power) of the unit matches the site requirements
- Branch circuit protection devices for connection to the power feed(s) with wire size for current rating of unit: (Note: Insulation temperature rating and wire size related)
- Install Panelboard breakers as required and torque according to manufacturer guidelines
  *Breaker Types: Square-D QOB (10kAIC) or QOB**VH (22KAIC)*
  Table of suggested Torque Guides provided following
- Load connection to the Panelboard Breakers with Neutral and Ground to appropriate terminals See Notes below:

- Isolated Grounds when fitted are used to centrally ground the loads to a common ground otherwise are to be locally grounded at the unit
  - ISO G equipped ES and CES units are factory shipped with the “ISO G” Terminal internally grounded which must be disconnected in order to use this feature
- Wire routing:
  - For bottom exit, wires are to be routed down the front panel to the bottom conduits
  - For top exit, wires are to be routed to the bottom of the panel or through glands where provided then up the rear to the top conduits through the wiring ducts where provided
  - When output load monitoring is supplied (option), thread output wires through current sensor to output breaker (senses load current per breaker)
- Chassis Safety Grounding of the enclosure is mandatory (Electric Code)
- Separation of primary power circuits (600V to 208V) from secondary signaling circuits
- Tidy and bundle installed all installed wiring away from internal wiring
- Torque all connections using table below as a guide (or per specific manufacturer instructions)

Table 5-1: Tables of recommended torques

Table of Recommended Torques for Compression Electrical Lugs					
Wire Size	**Torque** Inch/lbs	**Wire Size**	**Torque** Inch/lbs	**Wire Size**	**Torque** Inch/lbs
14	75	6	110	2/0	180
12	75	4	110	3/0	250
10	75	2	150	4/0	250
12	75	1	150	250 mcm	325
8	75	1/0	180	350 mcm	325

Table of Recommended Torques (Dry) for Bolted Connections					
Bolt (Size/thread ins.)	**Torque** (ft-lbs)	**Bolt** (Size/thread ins.)	**Torque** (ft-lbs)	**Bolt** (Size/thread ins.)	**Torque** (ft-lbs)
1/4 - 20	6	3/8 - 16	20	1/2 - 13	47
5/16 - 18	12	7/16 - 14	32	9/16 - 12	69

Table of Recommended Torques for Panelboard Load Connections		
Load Terminals		**Torque** (inch-lbs)
Terminal	**Wire Range**	
Breaker ≤ 30 A	# 18 - 8 awg.	36*
Breaker > 30 A	# 8 - 2 awg.	45 – 50*****
Neutral	#10 – 14 awg	35
Ground	#8 awg	40
ISO Ground	#4 – 6 awg	46
*******Wire size dependent, refer Breaker manufacturer instructions*		

5.2 Electrical System Schematics

The following simplified schematics are provided to present an overview of the systems. For full detailed drawings refer to the specific schematic supplied each the unit.

5.2.1 Typical ES System Schematic

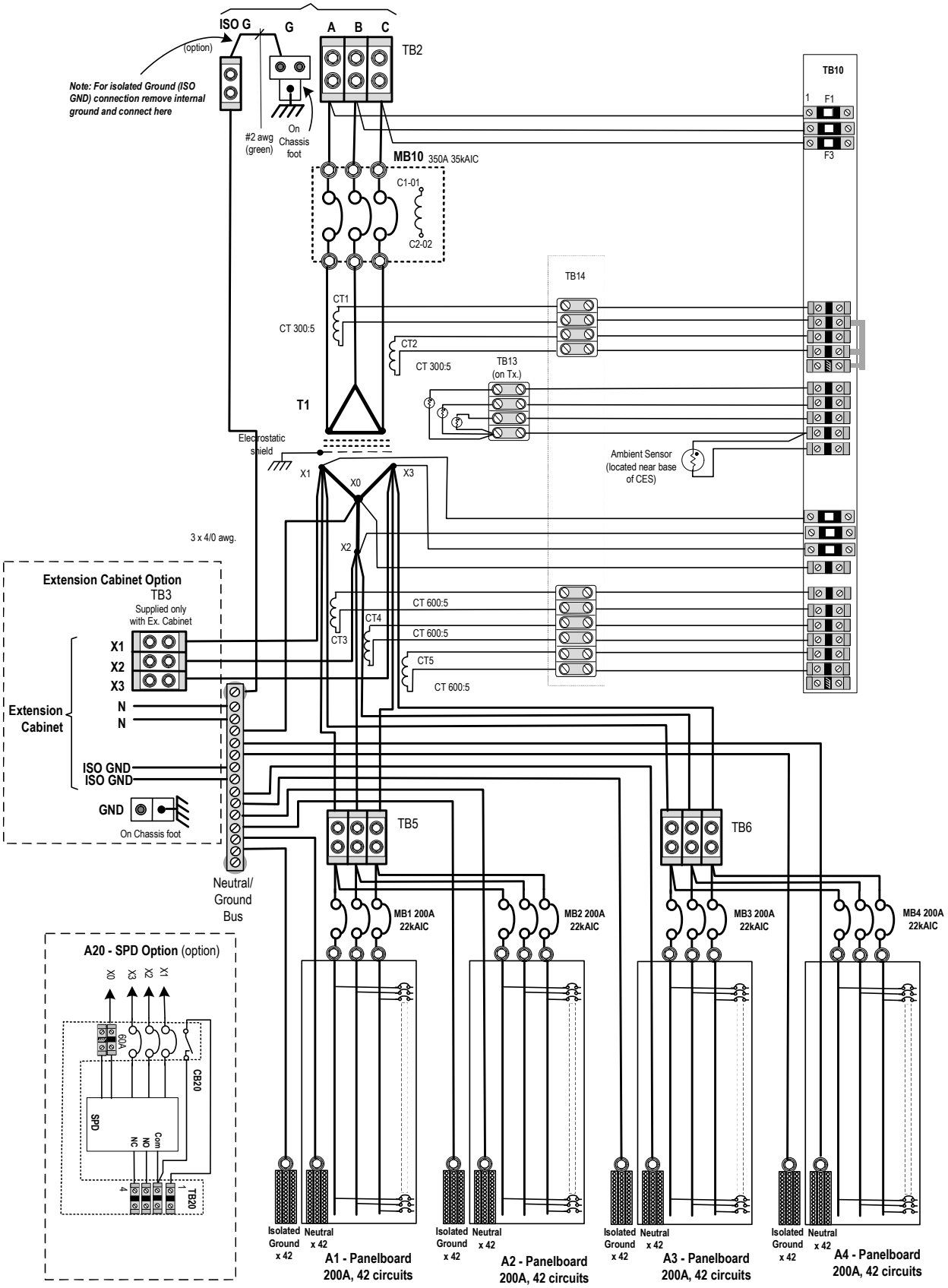


Figure 5-1: Simplified schematic of typical 2/4-panel ES with expansion cabinet option

5.2.2 Typical ES System with Dual Output Transformer (harmonic treatment)

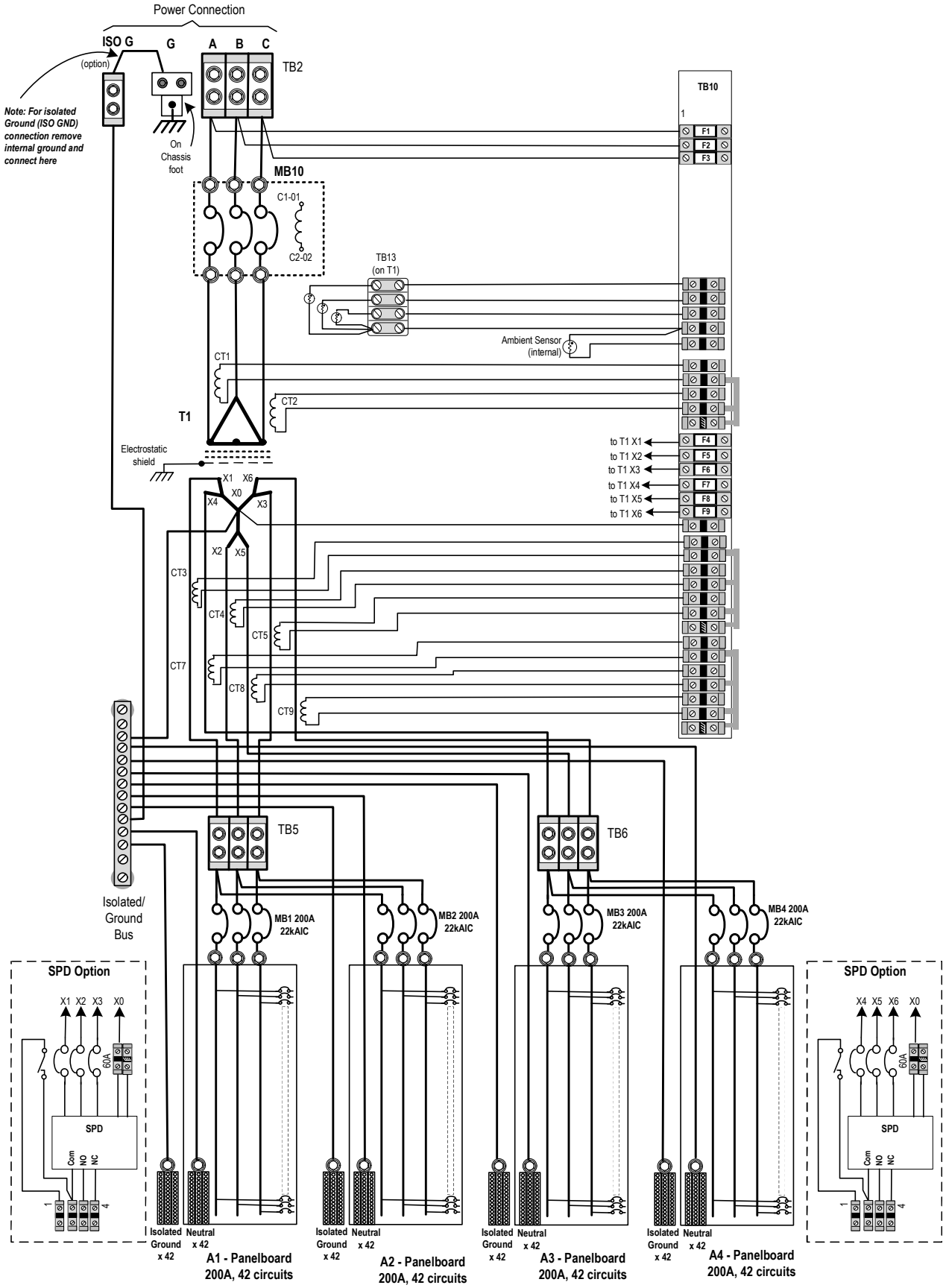


Figure 5-2: Simplified schematic of typical 4-panel ES with dual output Transformer for harmonic treatment

5.2.3 Typical CES System Schematic

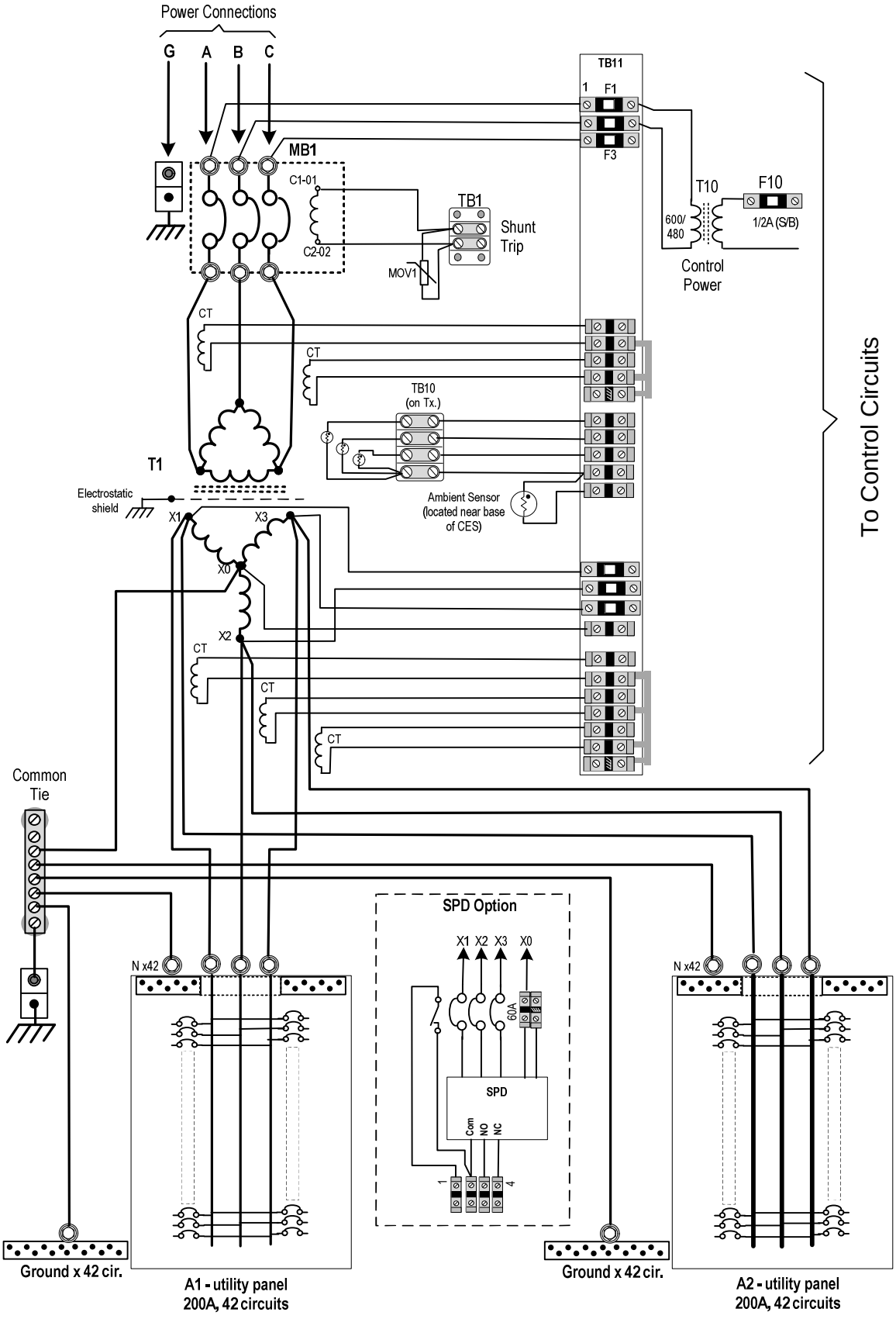


Figure 5-3: Simplified schematic of typical 2-panel CES

5.3 User Terminals

The User Terminals are situated behind the Display/User Control Panel and a typical layout when equipped with a Power Monitor and COMSERVER (WEB Server) is illustrated below for reference.

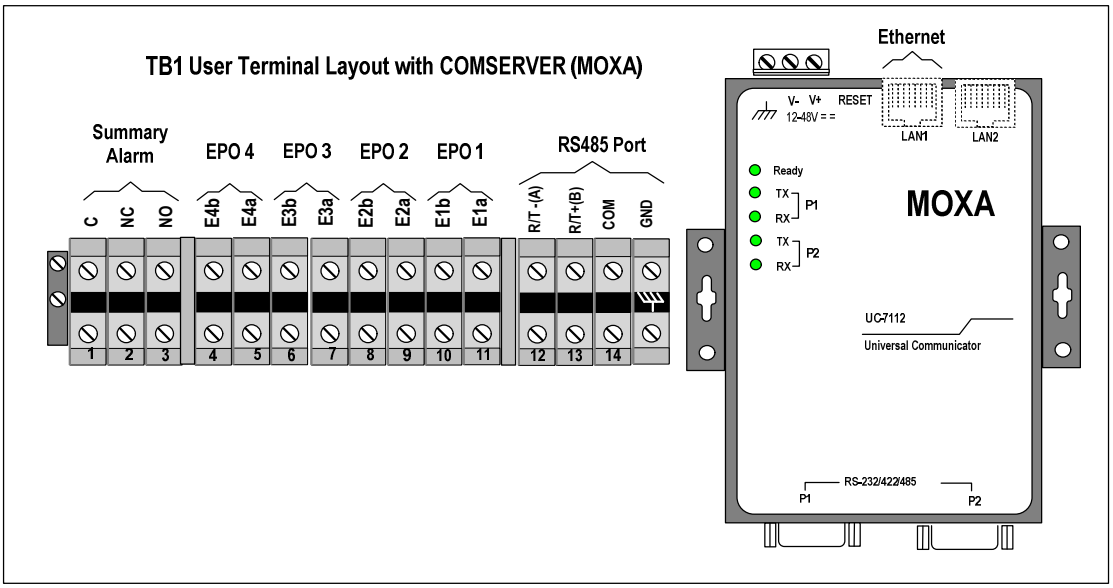


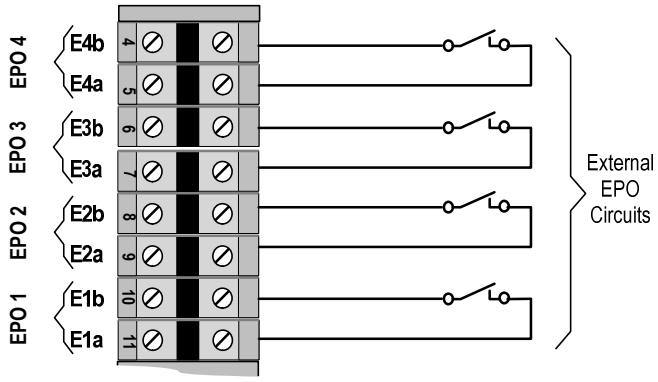
Figure 5-4: Typical User Terminal when equipped with the Power Monitor option

Note: The layout of this terminal may vary based on customer specified options; please refer to the installation manual supplied with the unit for precise details.

5.3.1 EPO Connections

The EPO connections are used for external EPO switches with normally open contacts with specifications as illustrated below:

Table 5-2: External EPO Characteristics

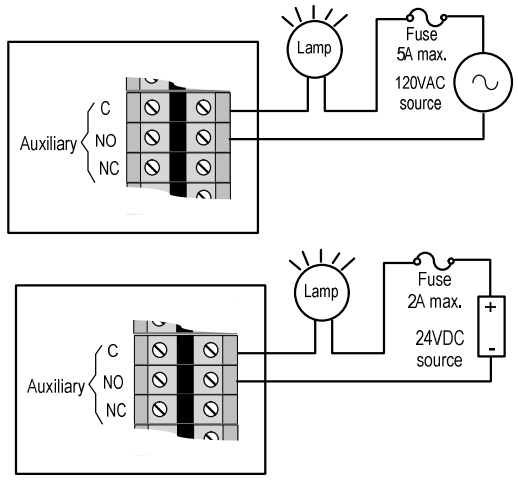
Parameter	Description	Typical Application
Excitation	24VDC (self-excited)	
Current	1.4 Amps (momentary)	
Input Type	NO	
Connector	Compression; #12 to 18 ga. wire	
Function	Trips Input Breaker	
Record*	Event Log	
**With Power Monitor option only*		

Note that normally closed circuits (EPOC) are available per customer requirements and order specification.

5.3.2 Remote Signaling

Remote signaling is provided with the Power Monitor option with a form C electro-mechanical auxiliary contact. Typical signaling applications are illustrated below with control applications following. Refer to the section on setup for operating instructions.

Table 5-3: Auxiliary Relay Output Characteristics

Parameter	Description	Typical Applications
Type	Form C: C, NO, NC	
Connector	Compression; 12 to 18 ga. wire	
Maximum Rating	240VAC @ 5A 24VDC @ 2A	
Isolation	2,500VAC	

5.3.3 Communication Ports

A standard RS485 communication port supporting Modbus RTU is provided with any Metering/Monitoring option with an Ethernet port as an additional option. The Ethernet port is available as a Modbus TCP gateway supporting Modbus TCP or as a WEB server (COMSERVER option) for direct browser support with simultaneous Modbus TCP support. The communication options are described following:

5.3.3.1 RS485 Port (Power Monitor supported, no COMSERVER installed)

Wire the RS485 port to the RS485 network using a low capacitance shielded twisted pair (e.g. Belden 9841 or equivalent). Up to 64 devices may be daisy chained (depending on the characteristics of the RS485 transceivers) with each end of the network terminated with a 120 ohm resistor.

Note: The Cyberhawk Meter includes an internal termination network user selectable at J3 on the device

Table 5-4: Power Monitor supported RS485 Characteristics

Parameter	Description
Connections	Com (Shield) R/T – (A) R/ T + (B)
Connector	Compression; 12 to 24 ga.
Baud Rate	1,200 - 19,200
Max. Range	1,200 m
Isolation	1,500VAC
Wiring (typical)	300V, 75°C #18 – 24 ga.
Termination (internal)	120 ohms* selectable)
Protocol	Modbus RTU
** To enable internal termination install link J3 on Cyberhawk PMP30 mounted on the control panel*	

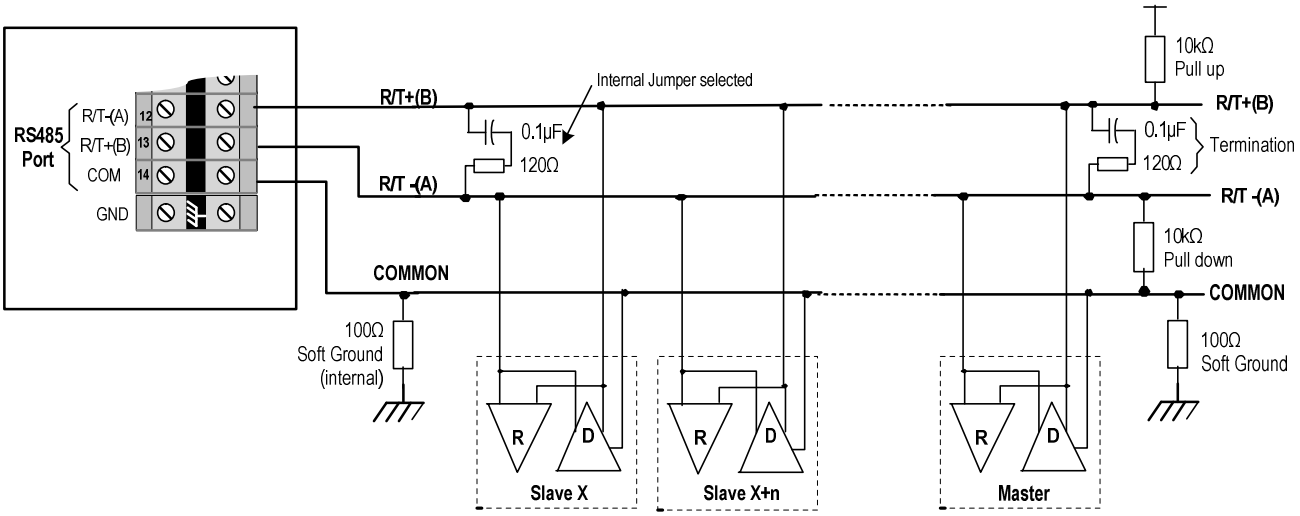


Figure 5-5: Typical RS485 network

5.3.3.2 WEB Server (Ethernet Port)

The unit may be equipped with an Ethernet Port for Ethernet Network communication port Gateway or WEB Server). Physically it is located behind the Meter/Display on the front control panel of the unit with the Ethernet connection shown as illustrated.

Table 5-5: Ethernet Port Characteristics

Parameter	Description
Bit rate	10/100 BaseT
Connection	RJ45
Isolation	1,500V
Location	With user terminals behind display panel
Protocols	TCP/IP, Modbus TCP
IP Addressing	DHCP Client (dynamic and static)
Note: Unit shipped with dynamic addressing enabled which may be changed to static at setup.	

Note: It may be advisable *to check with the local IT administrator prior to actually connecting the unit to the network for pre-assignment of Network IP addresses; refer to the COMERVER manual for detailed setup instructions.*

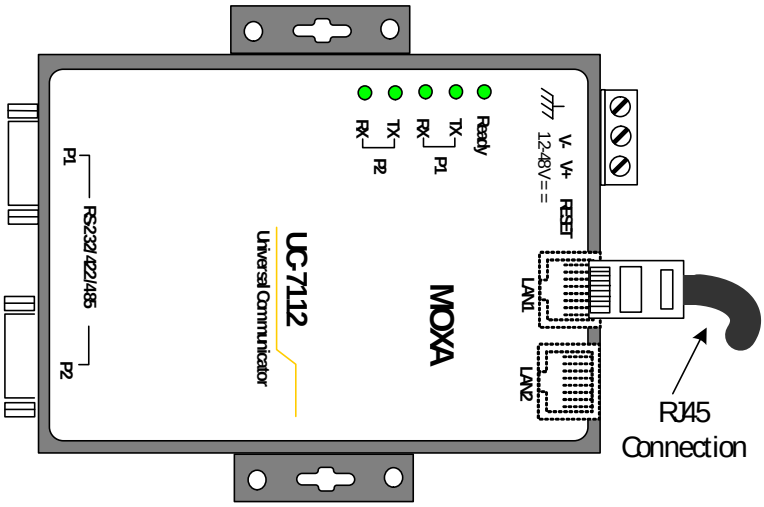


Figure 5-6: COMSERVER Port Configurations

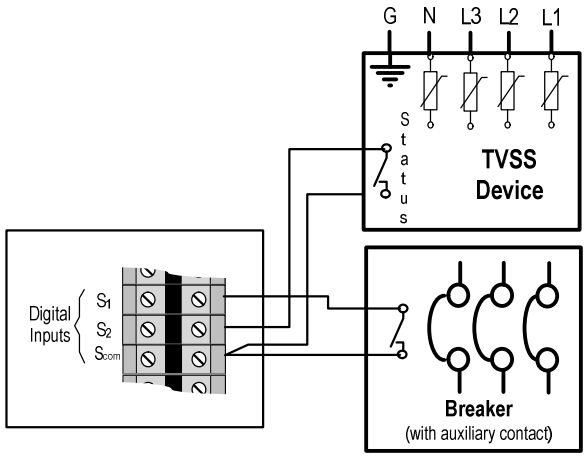
5.4 Optional Input / Output Interfaces (reference only)

The following input and output interfaces may be optionally wired per the user's requirements. Please refer to the documentation shipped with the unit to determine installed options.

5.4.1 Digital Inputs

Digital inputs are used to sense the state of external devices via non-potential signaling contacts. External sensing when specified by customer order requirements are used for external sensing up to a maximum of four inputs.

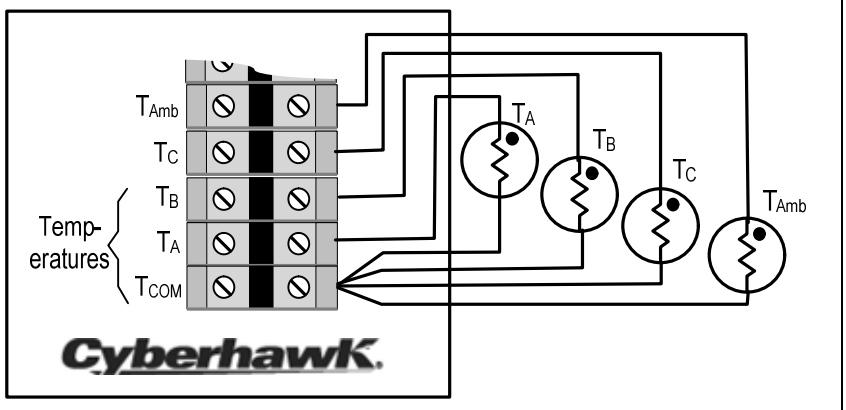
Table 5-6: Table of Digital Input Characteristics

Parameter	Description	Typical Application
Input	Non-Potential 10mA max.	
Type	NO or NC (programmable)	
Connector	Compression; #12 to 18 ga. wire	
Excitation	Self Excited 24VDC	
Naming	User Defined	
Function	User programmable	
Response Time	1ms to minutes (programmable)	

5.4.2 Temperature Inputs

The Temperature inputs are used to sense the transformer temperatures (one per coil) and one ambient using a type "A" NTC sensor and shown below for reference.

Table 5-7: Table of Temperature Input Characteristics

Parameter	Description	Typical Application
Sensor	Type "A" Thermistor	
Inputs	4 max.	
Reference	5 VDC	
Connector	Compression; 12 to 18 ga.	
Temp. Range	-20°C - 220°C	
Function	Display and alarming	
Response Time	~ 1 min.	

5.5 Internal Power Monitor RS232 and RS485 Connections (reference only)

The Power Monitor is internally equipped with two native communication ports COM1 & COM2). COM1 is used for internal communication and COM2 for external user applications.

5.5.1 Internal Monitor Supported Port Description

- COM1: Supporting RS232 and RS485 communication normally dedicated for the Display
- COM2: Supporting RS485 communication normally for external communication

COM 1 has three physical nodes, which are automatically selected based on an order of priority; these nodes are a RJ10 RS232 service connection, a DB9 RS232 serial link and a captive screw terminal RS485 link. Note that all COM 1 Ports have a common ground (return) connection but are independently isolated (as a group). COM 2 is fully independently isolated from any other circuit.

Table 5-8: Communication Ports

COM Ports	Connector	Type	Protocols	Application / Notes
COM 1 (local)	RJ-10	RS 232	VT100	Service Setup
	DB 9	RS 232	Modbus RTU	Display, PC, Modem
	Screw Terminal	RS 485	Modbus RTU	Display
COM 2 (local or remote)	Screw Terminal	RS 485	Modbus RTU	Independently Isolated
Ethernet (uses COM 2)	RJ-45	Ethernet	TCP/IP, Modbus TCP	Ethernet network

5.5.1.1 COM 1 Connections

The general characteristics of COM 1 ports are as given in the table below. Note that all ports of COM 1 may be simultaneously connected, but the unit detects and only responds to the connections based on an order of priority as defined in the table below; as an example, with the service port connected to a computer, the other ports are disabled, or with DE 9 (DB 9) connected the RS 485 is disabled.

Table 5-9: COM 1 Port Characteristics

Port	Connector	Type	Priority	Duplex	Baud	Format	Protocols
COM 1	RJ-10 (service)	RS 232	1st (Highest)	None	9,600	8-N-1	VT100
	DB 9	RS 232	2nd (Middle)	2-wire (half)	19,200	8-N-1	Modbus RTU
	Screw Terminal	RS 485	3rd (lowest)				

Table 5-10: COM 1 RS 232 Pin outs

	Pin Name/Number									
Signal ID	**DCD**	**RXD**	**TXD**	**DTR**	**GND**	**DSR**	**RTS**	**CTS**	**RI**	**+5V**
J5 (DB9)	1	2	3	4	5	6	7	8	9	
J6 (RJ10)		1	2		4					3
**** Note: Pins marked with asterisk are connected together***										

5.5.1.2 COM 1 Service Connection (re-flashing)

The unit may be re-flashed using the COM1 connection (contact factory). The physical hook-up between the computer and the monitor is by means of an RJ10 plug to a female DB9 Plug with connection as illustrated in the figure. The Powersmiths part number for this cable is 306-001145-201.

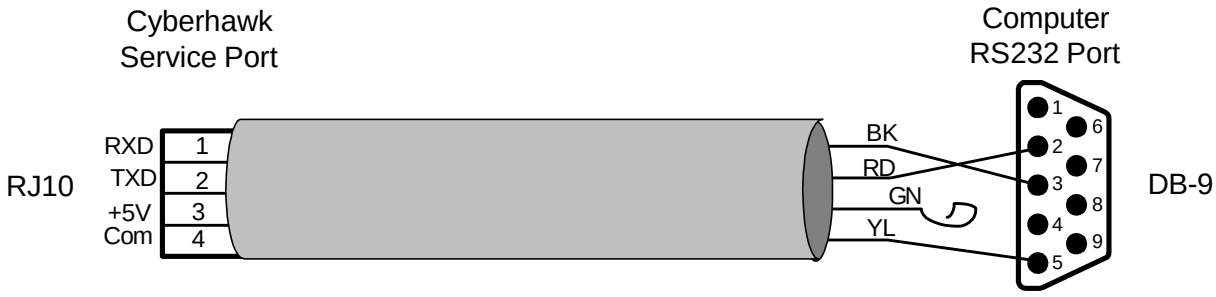


Figure 5-7: *Service connection to computer (PC)*

5.5.1.3 COM 2 RS485 Connection

This connection is made at terminal TB3 (captive wire type) and the primary application for this port is for communication to a remote Computer or PLC. This port is fully isolated with a total communication cable length capability of up to 4,000 feet with up to 32 devices connected to this port. Is recommended that a twisted shielded 22 AWG gauge (or larger) wire be used for busing. An internal termination resistor (120 ohms) for the RS 485 bus is available by inserting jumper J4 (use only if the unit is at the end of the loop).

Table 5-11: COM 2 RS 485 Connections

Terminal/Pin	Description
TB3 - 1	R/T – (A)
TB3 - 2	R/ T + (B)
TB3 - 3	Com (shield)

5.5.2 Internal Communication Setup

The communication ports support the MODBUS protocol with the exception that the VT100 protocol is available on the Service port. All the MODBUS Registers are remotely accessible.

Note: COM 1 is factory set and can only be changed via the service port or via COM2

Table 5-12: RS232/485 COM 1 Communication parameters

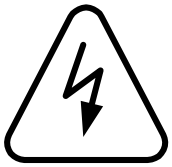
COM 1 Port	Connector	Selections					
		Flow Control	Baud	Data Format	Protocol	Delay	Defaults/Notes
RS232	J5*	RTS/CTS RTS with delay	1,200 2,400 4,800 9,600 19,200*	8-N-1* 8-E-1 8-O-1	Modbus RTU*	0 – 999ms (1ms steps)	ID: 1* (1 – 247) Delay: 10ms*
RS485	TB4	-					
*Note: * Factory defaults*							

5.5.2.1 COM 2 Communication Setup

Table 5-13: COM. 2 RS485 Communication Parameters

COM 2 Port	Connector	Selections				
		Baud	Data Format	Protocols	Delay	Defaults/Notes
COM 2	TB3	1,200 2,400 4,800 9,600 19,200*	8-N-1* 8-E-1 8-O-1	Modbus RTU*	0 – 999ms (1 ms steps)	ID: 1* (1 –247) Delay 10ms*
*Note: * Factory defaults*						

6 Maintenance

DANGER 	HAZARD OF ELECTRIC SHOCK OR ARC FLASH
	This equipment to be installed and maintained only by qualified personnel
	Before working on this equipment ensure that all power is off and locked out
	More than one upstream Disconnect may be required to de-energize this equipment
	Use appropriate personal protective equipment (PPE) and follow safe electrical work practices (see NFPA 70E)
	Ensure all covers and doors are in a closed condition prior to applying power

6.1 Periodic Maintenance Requirements

The units do not incorporate any fans, filters or moving parts but periodic attention some periodic maintenance to help ensure optimal performance and reliability. Please refer to the table below for maintenance guidelines.

Table 6-1: Table of Maintenance Checks

Schedule	Procedure
Periodic	- Check that the ventilation grills are not obstructed by foreign objects - Clean off excess dirt from the surface of the Enclosure using a damp rag
Major Maintenance **DANGER**  ***See "Safety Instructions"***	**Power checks**: - Check that loading is in correct range for the unit - Check load balance per phase and redistribute loading if possible **Visual Checks:** De-energize unit and open doors: - Vacuum or blow off (dry compressed air) any excessive dust build-up - Check for signs of discoloration on the terminals (signs of overheating) - Check that connections are tight and re-torque as required *Note: See section on Installation for torque values*
***Note: The inspection frequency depends on the operating conditions with annual or longer periods acceptable for clean dry locations but more frequent for adverse environmental conditions (eg. Dust, airborne contaminants, chemical fumes, etc.).*	

6.2 Accessing Internal Circuitry

There are two basic types of construction, front access units and side access units.

6.2.1 Front Access Units

Access to the internal circuitry, is via the front access hinged panel for front access units.

6.2.2 Side Access Units

For side access units. the access panels first must be removed. Note that the access panel is normally located on the left side of the unit or in the middle front of the unit with for front only access (see installation instructions for more specific details).

To remove side access panel, carefully remove the four retaining screws from the left side panel while applying slight pressure to the panel to avoid it sliding down *(note that there is a retaining ledge at the top of the panel)* then lift off *(note weight is approximately 25 lbs).*

CAUTION 

FOR YOUR SAFETY:

Do not assume but check between any exposed electrical terminals that are to be handled and to Ground with a reliable voltmeter to ensure that no voltage is present before touching.

6.3 Tap Adjustment Procedure

ESs and CESs have integrated transformers with Tap adjustment provisions on the actual transformer. Taps are used to adjust for the average available input voltage or to 'tweak' the output voltage (e.g. adjust for cable voltage drops). Units are normally supplied with two 2½ % Taps above nominal (2 x 2½ % FCAN) and two 2½ % Taps below (2 x 2½ % FCBN) and factory set at the nominal setting. The Tap information is printed on labels attached to the top of the transformer and the adjustment procedure is summarized below is shown for nominal 208, 480 and 600 Volt systems with nominal shown shaded/bolded:

Table 6-2: Table of Tap adjustments

DANGER	**Coil** (each of three)	**208V**			**480V**			**600V**	
		Tap	**Link**		**Tap**	**Link**		**Tap**	**Link**
		218	1 - 2		504	1 - 2		630	1 - 2
		213	2 - 3		492	2 - 3		615	2 - 3
		208	**3 - 4**		**480**	**3 - 4**		**600**	**3 - 4**
		203	4 - 5		468	4 - 5		585	4 - 5
See safety Instructions		198	5 - 6		456	5 - 6		570	5 - 6

To adjust for:

▪ Higher Input voltage	Unbolt Tap and reconnect to a higher voltage output setting
▪ Lower Input voltage	Unbolt Tap and reconnect to a lower voltage output setting
▪ Reduce output voltage	Unbolt Tap and reconnect to the next higher voltage setting
▪ Increase output voltage	Unbolt Tap and reconnect to the next lower voltage setting

Note: Refer to Nameplate attached on the top of the transformer for specific Voltage and Tap configurations as some models are equipped with up to six 2 ½% taps or more or with multi-input voltages as per customer order

6.4 EPO Indicator Replacement

There are two procedures based on manufacturing date; prior to September 2012 and September 2012.

6.4.1 EPO Indicator Replacement (units prior to Sep 2012)

Refer to instruction on indicator change-out "EPO PUSH BUTTON ILLUMINATION LAMP REPLACEMENT PROCEDURE" No: 201-002457-690.

6.4.2 EPO Indicator Replacement (units manufactured from Sept 2012)

Units manufactured from September 2012 have enabling/disabling jumpers to facilitate EPO Indicator change-out without risking an accidental EPO operation in addition to an enabling/disabling

Open hinged access panel and locate three terminal block. Remove the orange jumper connected between Terminals 1 & 2.

Note: This removes power from the local EPO button and local Monitor shutdown control to facilitate safe Indicator change-out.

The indicator module can then be replaced following the manufacturer's instruction packed with the unit.

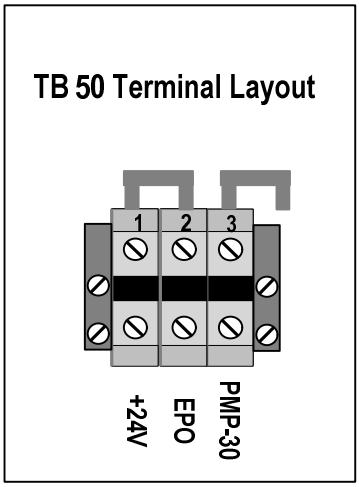


Figure 6-1: Terminal Identification for disabling local EPO and Monitor control shutdown

6.5 Control Panel (MON option only)

The Power Monitoring (MON) option utilizes the Powersmiths Cyberhawk-PMP30 Power management platform for metering/monitoring and control. It is installed on a control panel adjacent to the side access area which includes the control fuses. The layout is shown below for reference only.

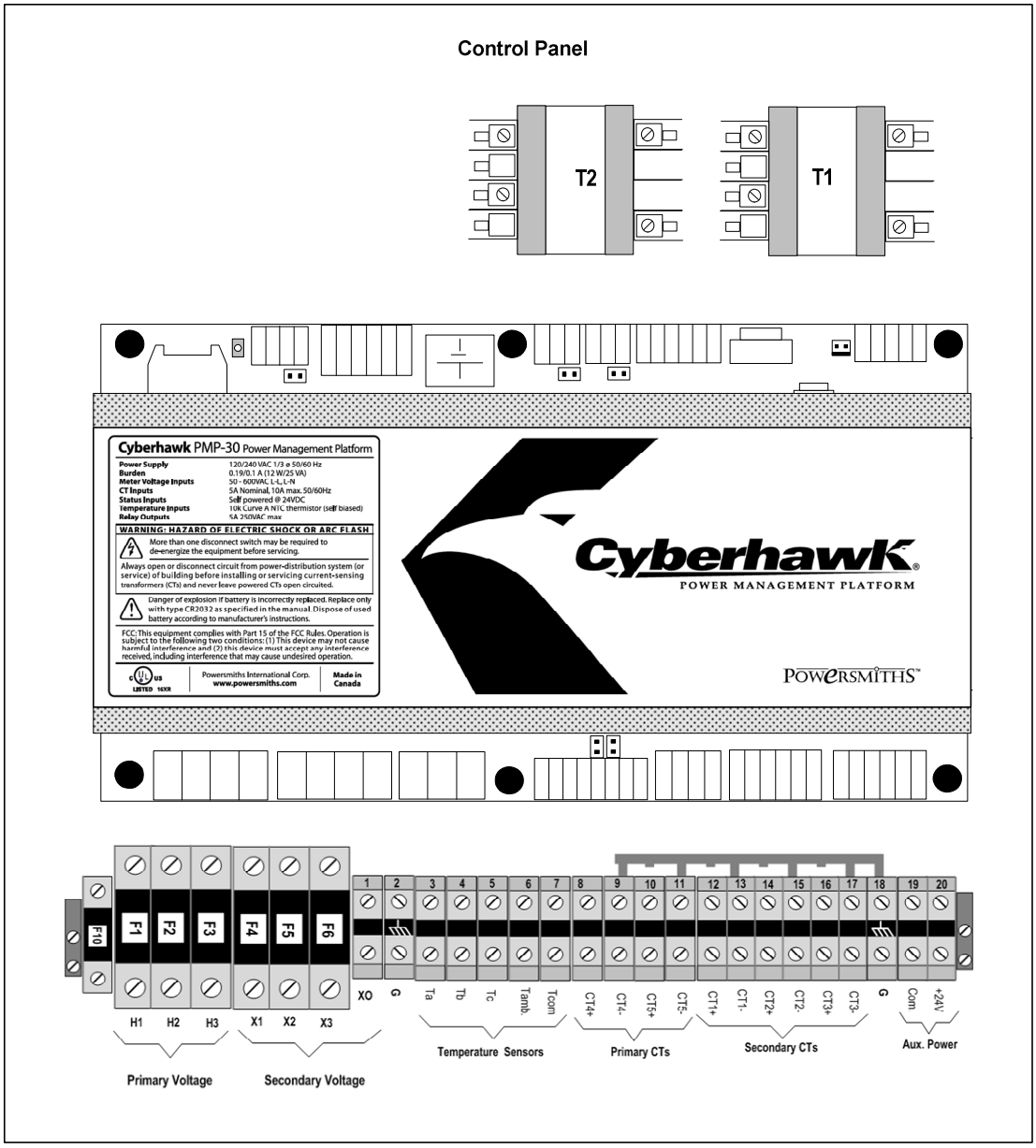


Figure 6-2: Power Monitor (MON) Panel Layout

6.5.1 Control Fuses

The unit incorporates internal control fusing for safety and equipment protection in event of a catastrophic component failure. The fuse holders are safety touch safe are located on the control panel interface terminal strip. For replacement information please refer to the installation manual supplied with the unit and/or to the internal fuse identification label adjacent to the control panel.

6.5.2 Power Monitor Calibration

Calibration is not normally required through the life of the product.

6.5.3 Cyberhawk-PMP30 Clock Battery

The internal Power Monitor, when installed) utilizes a standard 3-volt lithium battery used for time keeping backup, which has an expected service life in excess of 10 years. A low battery warning will be given when the battery requires replacement but it is recommended that it be changed every 10 years.

Suitable replacement battery types are UL approved types CR2032 such as Panasonic or Eveready CR2032, which is a common computer clock battery type.

6.5.3.1 Replacing the PMP30 Battery

The battery holder is located on the *Cyberhawk-PMP 30* beside the communication and auxiliary relay terminals. *Note that prior to changing the battery, it is advisable that power be removed from the unit.* To change the clock battery, place fingers on both sides of the battery holder below the rim, slide the battery up and remove it. To insert the replacement battery, slide battery into holder noting the holder mechanical polarization that prevents incorrect insertion.

Note: The clock will not normally require resetting if this procedure is completed within a couple of minutes.

6.5.4 Trouble Shooting

Standard trouble shooting practices should be employed with the following additional tips:

- Identify the problem area: - Power circuit or monitor

  Tip: Check Event logs on Power Monitor that may indicate root cause of the problem
- If in the power circuit was the unit tripped by EPO (local or remote)

  Note: A tripped breaker is recognizable by the handle being in the central position
- If main Breaker cannot be reset (move to open then closed position) check external EPO circuits
- Alarms are generated from user set conditions

  Tip: Check Event logs for Event (Alarm) history
- If the Power circuit is functional but Power Monitor is dead check control fuses

  The unit incorporates internal fuses for safety and equipment protection in event of a catastrophic component failure. However fuses may fail for other reasons and may be replaced with exact type and rating as listed in the unit and on the installation instructions
- Check operation of Power Monitor by observing operation of “Heartbeat” light

Figure 6-3: Location of Heartbeat Light on Power Monitor (Cyberhawk-PMP 30)

For support on resolving any unresolved issues with the operation please contact Powersmiths for technical support.

6.5.5 Replacing the PMP30

The PMP30 is the data acquisition and control element within the Power Monitor. In the event of a suspected failure of this unit it is advisable to contact the factory for technical support in isolating the root cause of the observed miss-operation. If replacement is deemed necessary, the factory will prepare and ship a replacement, preprogrammed with the initial factory preset defaults, using a RMA procedure. *(Note that the unit settings may be changed in the field at the touch panel after installation).*

6.5.5.1 PMP30 Replacement Procedure

The procedure for changing out the unit is as follows noting the warnings and cautions at the beginning of this section:

- Follow procedure at the beginning of this section to access Power Monitor circuitry
- Check voltages at the fuse terminals F1-F6 to panel to ensure no voltage present
- Gently slide off all terminals to the PMP30 and leave loose
  Note that terminals are designed and positioned to avoid incorrect reinsertion
- Unscrew and remove ground connection at TB33 if connected (not all units have this connection)
- Unscrew four screws retaining the PMP30 to the chassis and lift it away
- Install replacement unit by first remounting using the mounting screws with attached hardware
- Reinsert all plugs and reattach the ground wire to TB33 if initially attached
- Temporarily reapply power to the unit and observe that the green 'Heartbeat" LED on the PMP30 flashes
- Turn off power again and reinstall access panel
- Reapply power to the unit and operate as required

Note that the Power Monitor should be checked to ensure that it is correctly programmed for the application. Check the following:

- Voltages, Currents and Powers are as expected (indicates configuration is correctly set)
- Check alarm settings are as required (refer to test certificate shipped with the unit)

For reprogramming the unit, please refer to the Section 4 (Power Monitor Setup); Powersmiths may be contacted for any required technical support.

6.6 Monitor Shutdown Enable/Disable (units manufactured from Sept 2012)

Units manufactured from September 2012 have enabling/disabling jumpers to disable shutdown under Monitor control (example over-temperature) in addition to disabling the local EPO to facilitate EPO Indicator change-out without risking an accidental EPO shutdown.

The monitor disable jumper is factory shipped in the open condition (disabled). To enable shutdown under monitor control.

6.6.1 Enabling Monitor Shutdown Control

Open hinged access panel and locate three terminal block. Pull out the jumper inserted at terminal 3 and insert it into positions 2 & 3.

Note: Jumper in position 1 & 2 enables both local EPO and Monitor controlled unit shutdown.

Caution: This enables unit shut-down under monitor control so ensure that the monitor is correctly programmed prior to implementing this action to avoid an unintentional shutdown.

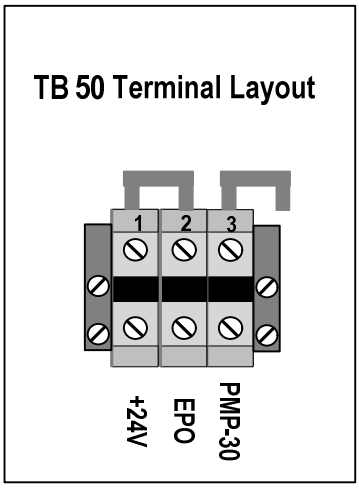


Figure 6-4: Terminal Identification for Monitor control shutdown

This page intentionally blank

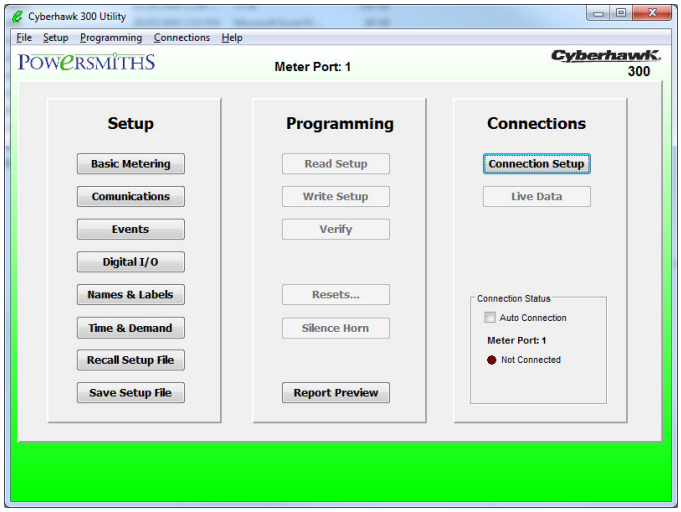
7 Appendix 1: Power Monitor Setup with Software utility

The Power Monitor used in this product is manufactured by Powersmiths and the Setup utility is also a Powersmiths product. The software commissioning guide is included in this manual for convenience. Note that the software configuration tool is available from the Powerswiths WEB site at http://www.powersmiths.com/download .

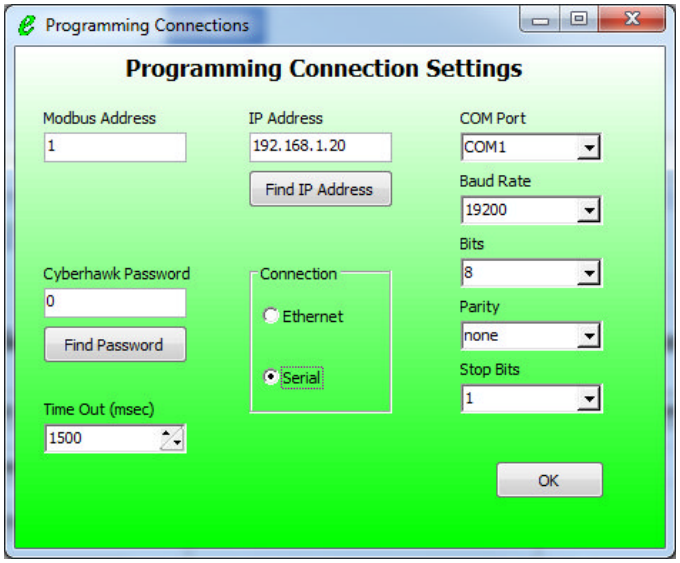
This guide is intended to help the user commission the Power Monitoring System for operation using the Powersmiths Software Utility.

Note: In units equipped with an Ethernet Port (COMSERVER), the Powersmiths Network Setup Utility can be used to "find" the unit IP address which may be also changed/assigned with this tool.

1. To obtain the program, navigate to the Powersmiths WEB site and under Energy Station, select downloads and Cyberhawk-300. Double click the file to start the installation process and following the installation instructions within the "Windows" environment.
2. **Start Program:** Run the program to be found under Powersmiths - Setup Utilities.



3. **Connection Setup:** ⇒ **Connection Setup** to setup the communication parameters



4. **Serial Connections:** Select ● "Serial" for serial connections and input the serial port parameters (refer to test certificate for actual values):
   - COM Port (the com port that the PC uses)
   - Baud Rate (Default 19,200)
   - Format: 8 – none – 1 (Bits, Parity, Stop bits)
   - Modbus Address (Normally 21)
   - Password (default "0")

   ⇒ **Ok** .

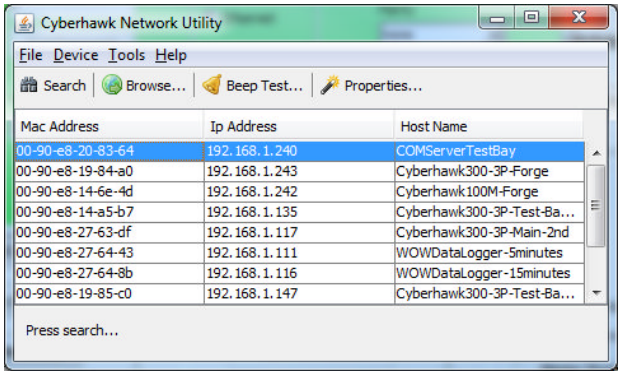
5. **Ethernet Connections:** Select ● "Ethernet" for Ethernet connections and input the Ethernet port parameters (refer to test certificate for actual values):

   - IP Address
   - Modbus Address (Normally 21)
   - Password (default "0")

   ⇒ **Ok** .

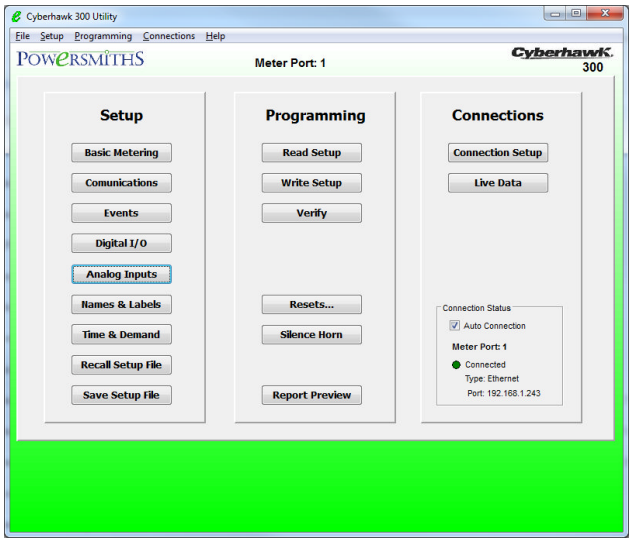
   Note: Programming over Ethernet requires a license file from Powersmiths; contact support.

   If the IP is not known, invoke the Find IP Address Utility ⇒ **Find IP Address &** ⇒ **Search**



   A Browser may be also invoked by ⇒ **Browse..**

   Note: Refer to the "Cyberhawk Network Utility" Manual for full operating details

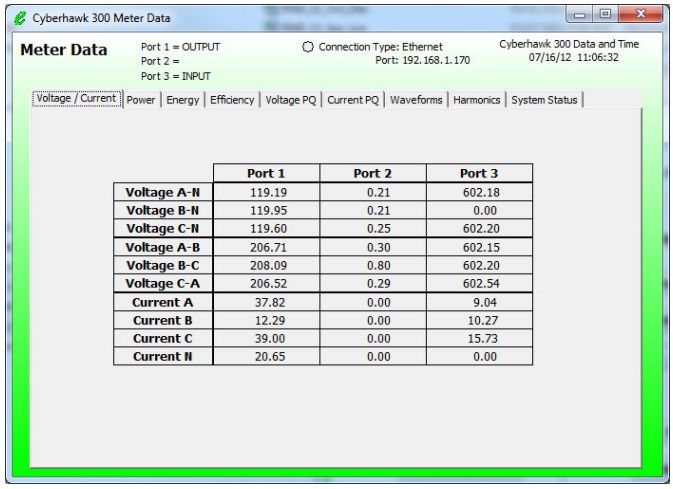


   ✓ Select Auto Connection and a green ● dot will indicate a successful connection with the Port No. displayed.

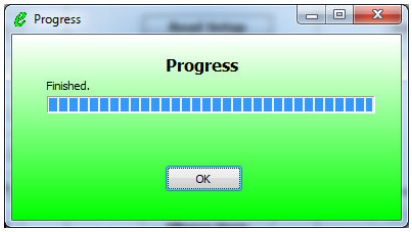
6. **Read Live Data:** Once communication is established, live data may be read using this utility.

   ⇒ **Live Data** to view all measured parameters including waveforms, and select the appropriate Tab for the required data.

   Note: A green ● dot will at the top of the dialog box to indicate that the software is successfully communicating.



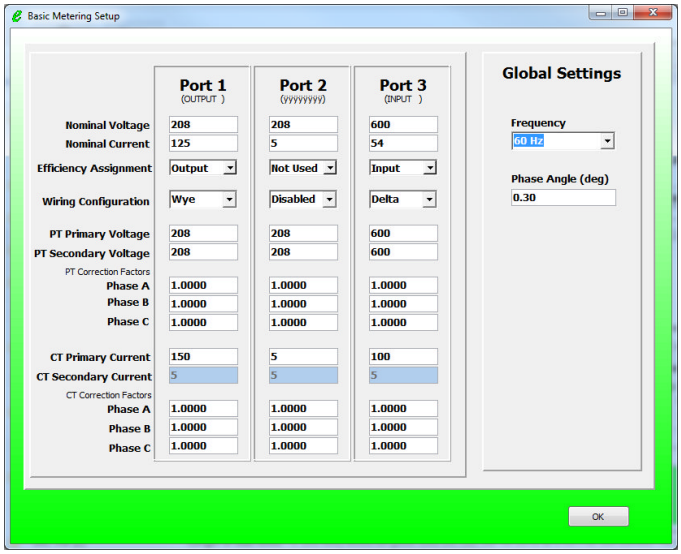
7. **Read Current Configuration:** To read the current setup configuration ⇒ **Read Setup**



8. **System Parameters:** The system metering parameters are set with this dialog box.

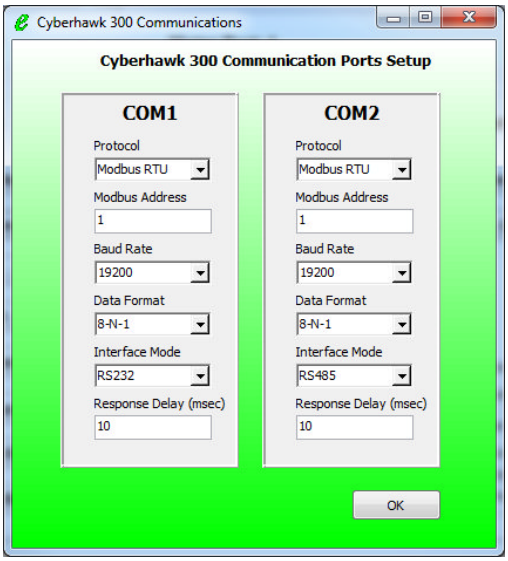
   ⇒ **Basic Metering**

   Note: These settings should not need to be changed but shown for reference.



9. **Communication:** The Power monitor communication parameters are set with this dialog box.

   Note: COM1 Port should not need to be changed as it is used for internal communications



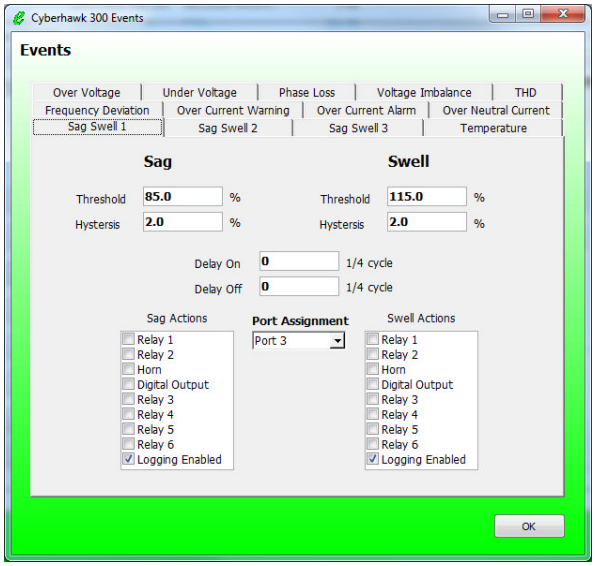
10. **Events Setup:** The Power monitor communication parameters are set with this dialog box.

    Select the event parameter tab to be set and input the required threshold parameters, delays and output actions.

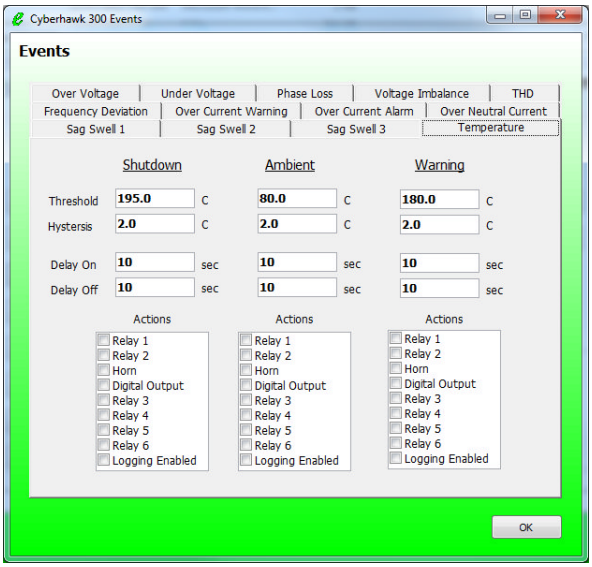
    Note: Relay 2 is reseved for unit shutdown and should not be selected if no shutdoen is desired.

    Representative setup screens are shown following for each type of event:

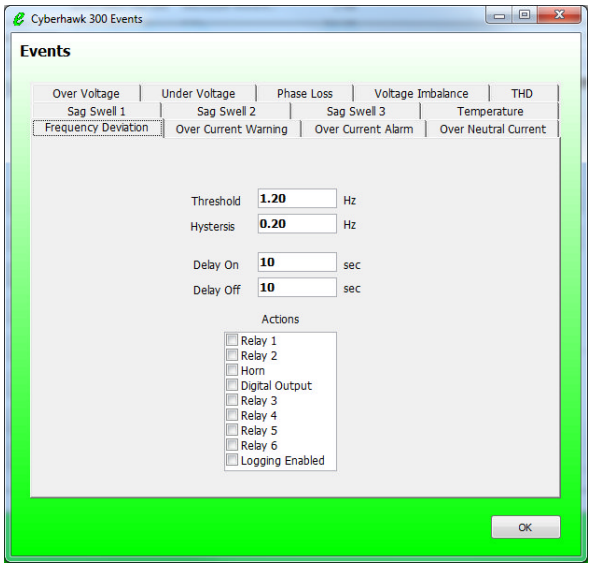
Sag/Swell Event Setup Dialog Box



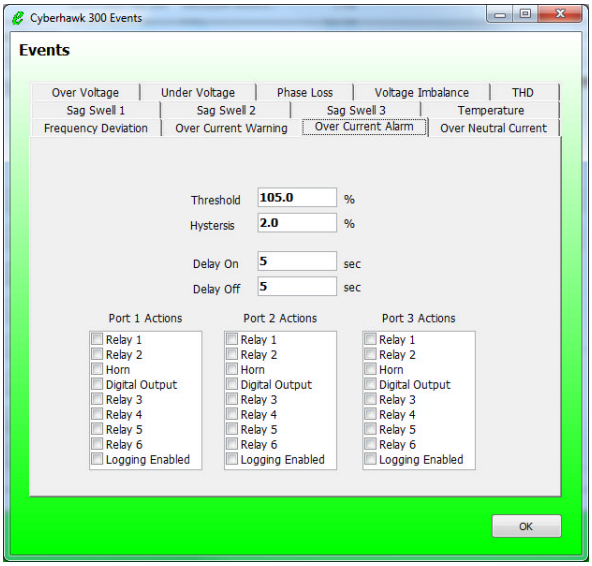
Temperature Event Setup Dialog Box



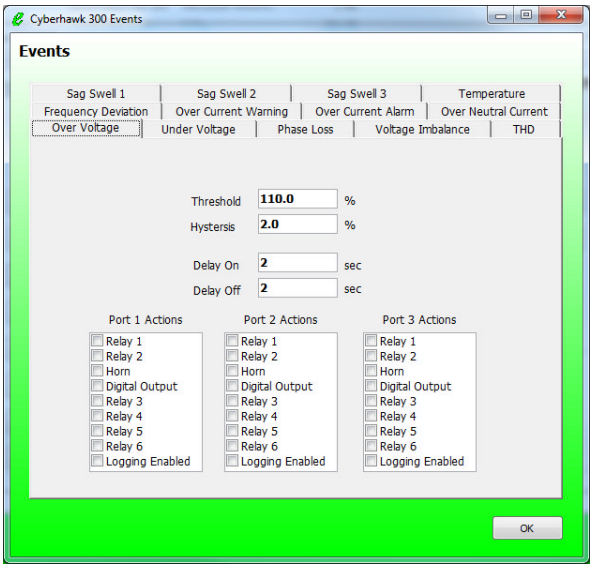
Frequency Deviation Dialog Box



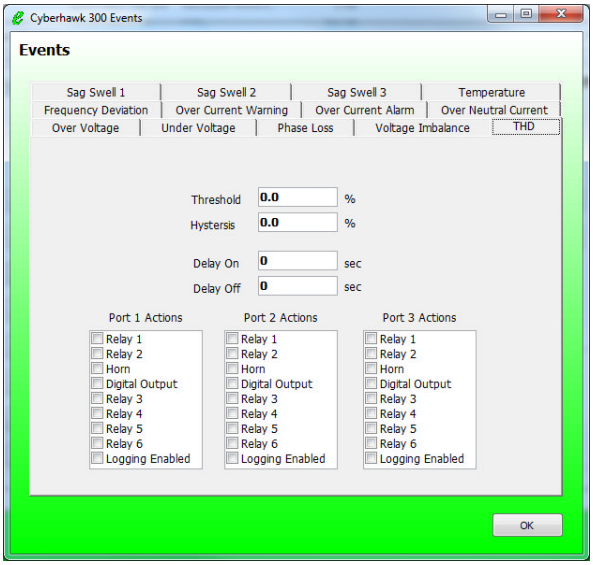
Over-Current Dialog Box



Over-Voltage Dialog Box



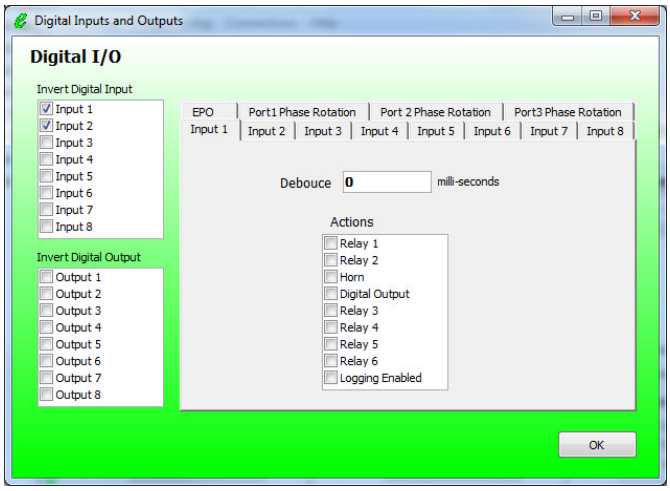
THD Dialog Box



Digital I/O and Phase Rotation Dialog Box

Notes: The following are set on this dialog box:

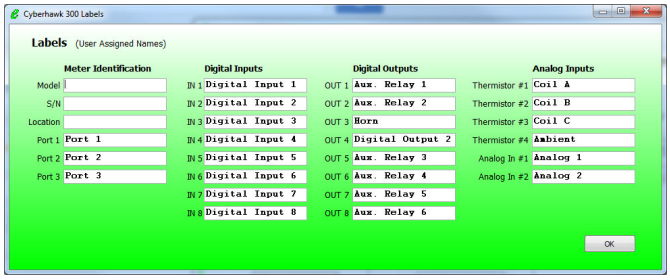
- Invert Digital Inputs 1 - 8
- Invert Outputs
  - Output 1 = Relay 1
  - Output 2 = Relay 2
  - Output 3 = Digital 1
  - Output 4 = Digital 2
  - Output 5/8 = Relay 3/6 respectively
- EPO
- Phase Rotation Port 1 - 3



11. **Analog Inputs:** Assign Scaling for input signal based on unit per volt (eg: 1000mA per Volt). Then set Event Thresholds (like prior settings).

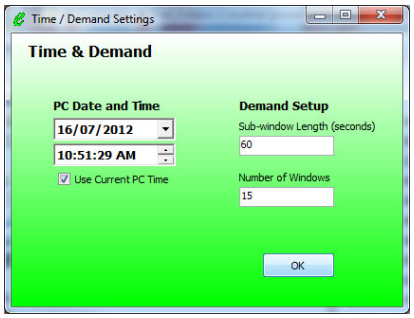
    Note: Event Thresholds are set based on scaled values.

12. **Names and Labels:** User names may be assigned to the Ports, Inputs, Outputs, Temperatures and Analog Inputs.



13. **Time and Demand:** Time and Demand periods are set in this dialog box.

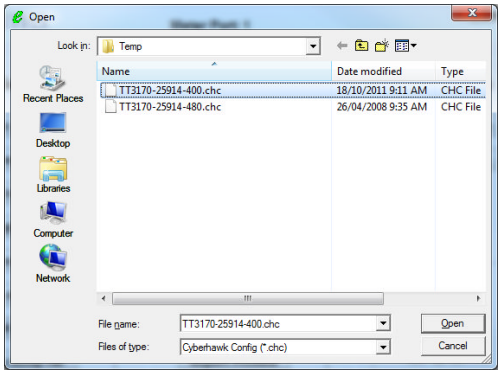
    Note: PC time may be used.



⇒ **OK** when ready to write

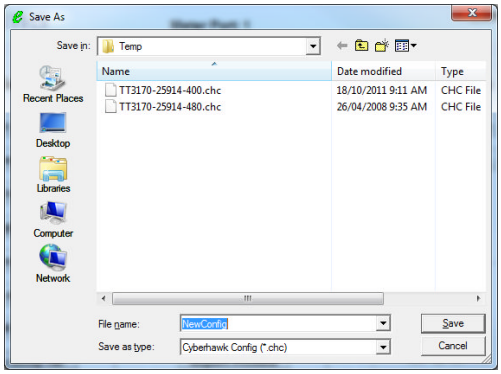
14. **Recall Setup File:** A prior setup file (*.chc) may be read into the program.

⇒ **Recall Setup File** and select file to be read in.



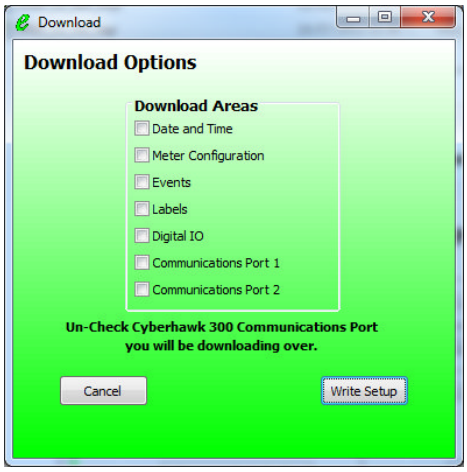
15. **Save Setup File:** The setup file may (*.chc) may be saved for future reference.

⇒ **Save Setup File** and save the file to a selected directory with an appropriate name (suggest serial number of the unit).



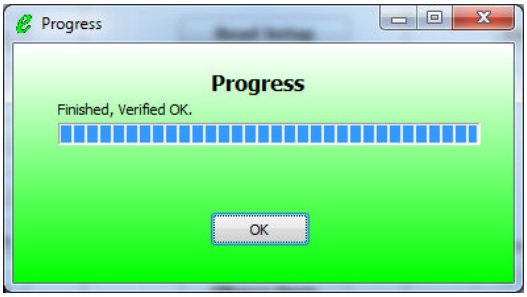
16. **Write Setup:** The inputted values are written to the Cyberhawk Power Monitor

⇒ **Write Setup** and select the download items that are to be written.



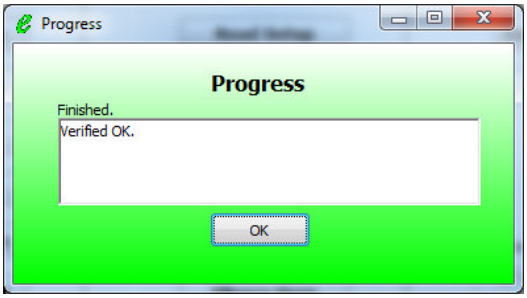
⇒ **Write Setup** to complete the process

Note: It is not recommended that the reserved factory setting be overwritten. Powersmiths maintains a file of the as shipped configuration which may be requested and used to return the unit to the as shipped configuration..



17. **Verify Settings:** The verify function provides a comparison between the settings in the program and that in the meter and may be used to verify that the setting have been correctly written or for comparing the settings between different units.

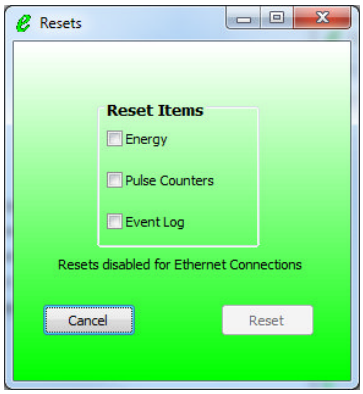
⇒ **Verify** to compare the setting in the program and that in the meter



18. **Resets:** The Energy registers, Pulse Counters and Event Logs may be reset under this dialog box.

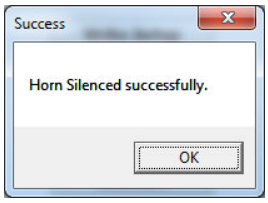
    ⇒ **Resets…** and select the parameter to be reset.

Note: Resets are not permitted over Ethernet connections for security reasons



19. **Horn Silence:** The Horn may be silenced by this button.

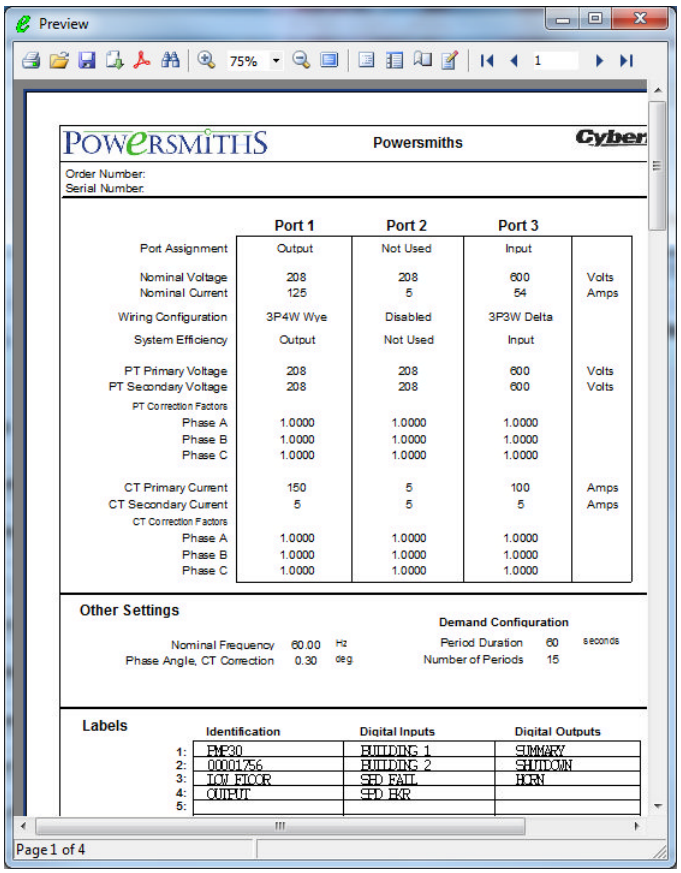
    ⇒ **Silence Horn…** to silence horn.



20. **Reports:** A report showing all the set values may be displayed and/or saved in PDF format at any time prior or after writing new setup values.

    Note: The PDF report file may be printed or saved under the normal "Windows" environment.

    ⇒ **Report Preview** to preview report



8 Appendix 2: Sub-Feed Monitor Setup with Software utility

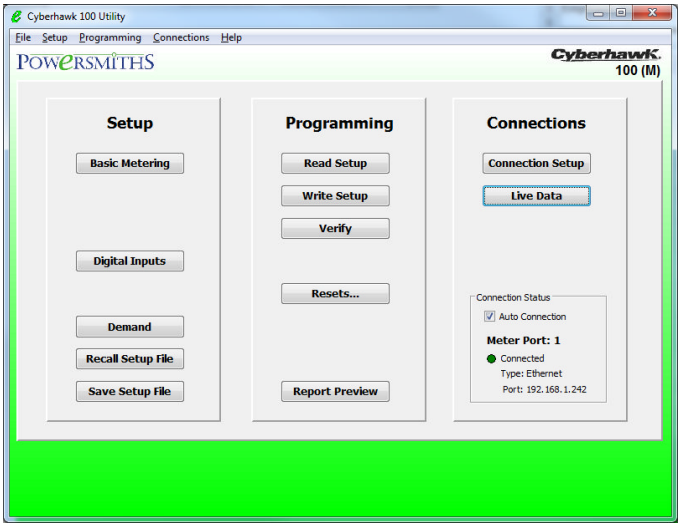
The Sub-Feed Monitor used in this product is manufactured by Gavazzi and the setup software is written by Powersmiths. This software commissioning guide is included in this manual for convenience. Note that the software configuration tool is available from the Powersmiths WEB site at http://www.powersmiths.com/download .

This guide is intended to help the user commission the Sub-feed Monitoring System for operation using the Powersmiths Software Utility.

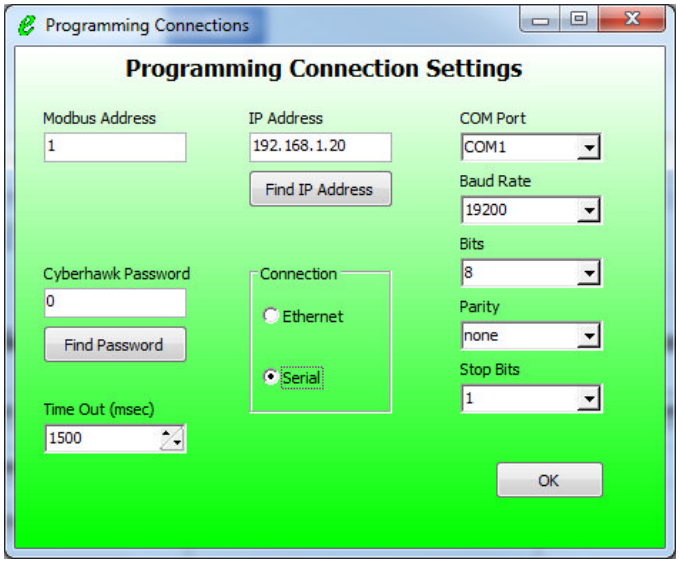
Note: In units equipped with an Ethernet Port (COMSERVER), the Powersmiths Network Setup Utility can be used to "find" the unit IP address which may be also changed/assigned with this tool.

1. To obtain the program, navigate to the Powersmiths WEB site and under Energy Station, select downloads and Cyberhawk-100. Double click the file to start the installation process and following the installation instructions within the "Windows" environment.

2. **Start Program:** Run the program to be found under Powersmiths - Setup Utilities.



3. **Connection Setup:** ⇒ **Connection Setup** to setup the communication parameters



4. **Serial Connections:** Select ● "Serial" for serial connections and input the serial port parameters (refer to test certificate for actual values):

   - COM Port (the com port that the PC uses)
   - Baud Rate (Default 19,200)
   - Format: 8 – none – 1 (Bits, Parity, Stop bits)
   - Modbus Address (Normally 21)
   - Password (default "0")

   ⇒ **Ok .**

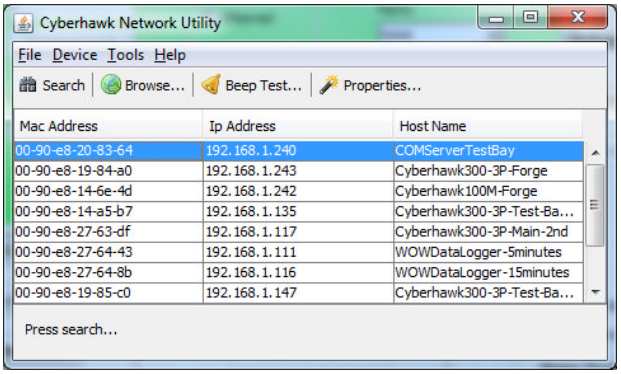
5. **Ethernet Connections:** Select ● "Ethernet" for Ethernet connections and input the Ethernet port parameters (refer to test certificate for actual values):

   - IP Address
   - Modbus Address (Normally 21)
   - Password (default "0")

   ⇒ **Ok .**

   Note: Programming over Ethernet requires a license file from Powersmiths; contact support.

   If the IP is not known, invoke the Find IP Address Utility ⇒ **Find IP Address &** ⇒ **Search**



   A Browser may be also invoked by ⇒ **Browse..**

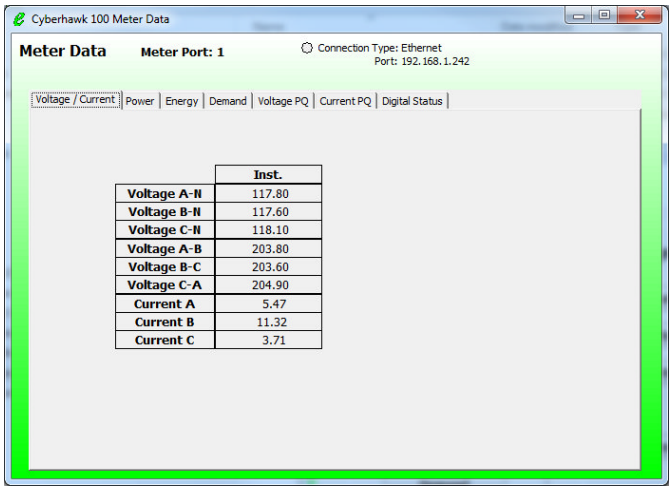
Note: Refer to the "Cyberhawk Network Utility" Manual for full operating details

[✓] Select Auto Connection and a green ● dot will indicate a successful connection with the Port No. displayed.

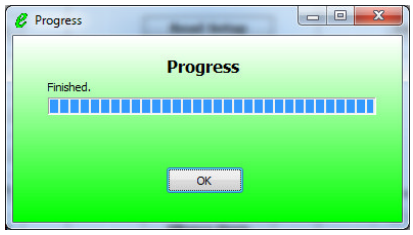
6. **Read Live Data:** Once communication is established, live data may be read using this utility.

   ⇒ **Live Data** to view all measured parameters including waveforms, and select the appropriate Tab for the required data.

   Note: A green ● dot will at the top of the dialog box to indicate that the software is successfully communicating.



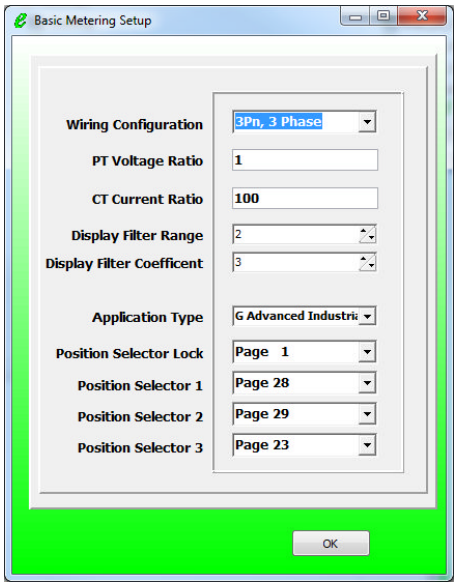
7. **Read Current Configuration:** To read the current setup configuration ⇒ **Read Setup**



8. **System Parameters:** The system metering parameters are set with this dialog box.

   ⇒ **Basic Metering**

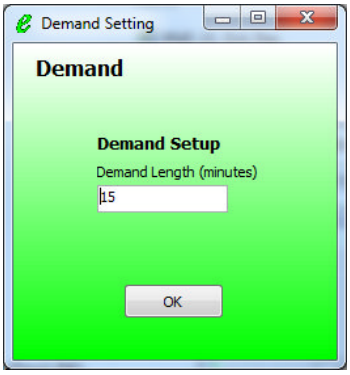
   Note: These settings should not need to be changed but shown for reference.



Note: The default application type should be G to provide the appropriate thedata set. The Position selection "0" through "3" is not applicable to this application.

9. **Digital Inputs:** Digital Inputs are not used in this application.

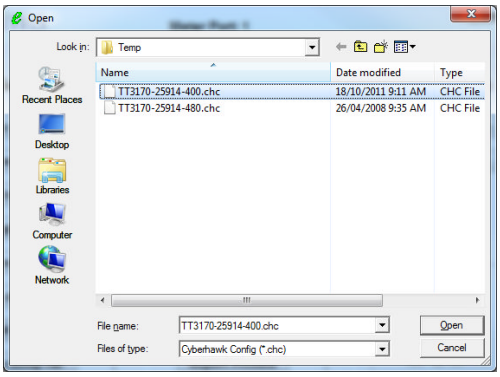
10. **Demand:** The Demand period is set in this dialog box.



⇒ **OK** when ready to write

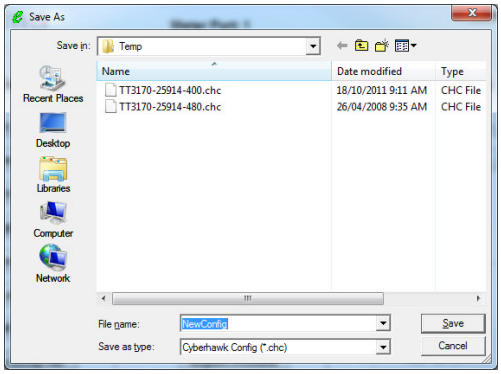
11. **Recall Setup File:** A prior setup file (*.chc) may be read into the program.

    ⇒ **Recall Setup File** and select file to be read in.



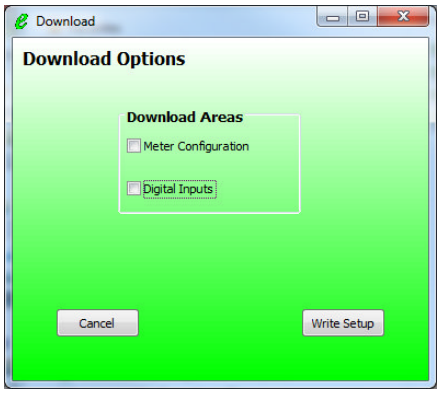
12. **Save Setup File:** The setup file may (*.chc) may be saved for future reference.

    ⇒ **Save Setup File** and save the file to a selected directory with an appropriate name (suggest serial number of the unit).



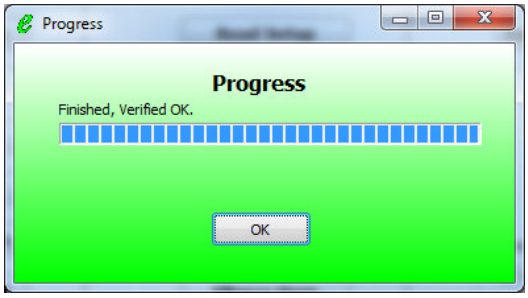
13. **Write Setup:** The inputted values are written to the Cyberhawk Power Monitor

    ⇒ **Write Setup** and select the download items that are to be written.



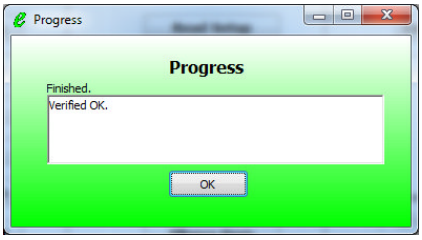
    ⇒ **Write Setup** to complete the process

Note: It is not recommended that the reserved factory setting be overwritten. Powersmiths maintains a file of the as shipped configuration which may be requested and used to return the unit to the as shipped configuration..



14. **Verify Settings:** The verify function provides a comparison between the settings in the program and that in the meter and may be used to verify that the setting have been correctly written or for comparing the settings between different units.

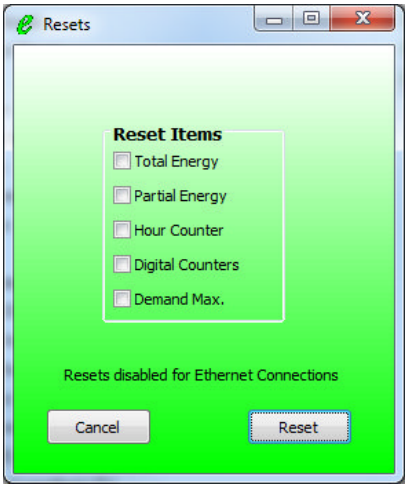
    ⇒ **Verify** to compare the setting in the program and that in the meter



15. **Resets:** The Energy registers, Pulse Counters and Event Logs may be reset under this dialog box.

    ⇒ **Resets…** and select the parameter to be reset.

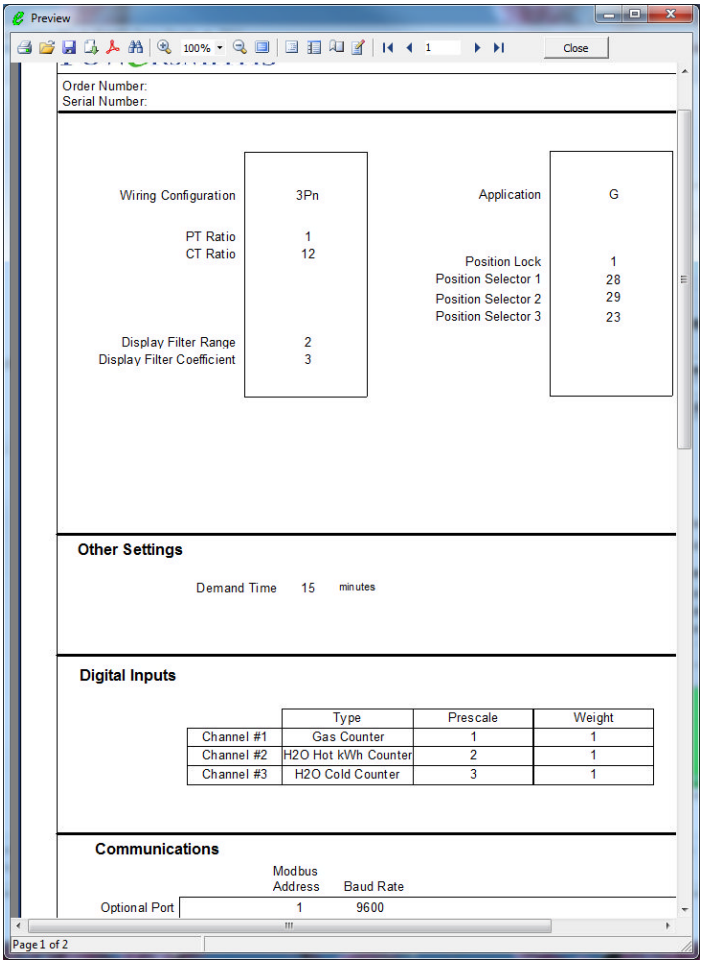
Note: Resets are not permitted over Ethernet connections for security reasons



16. Reports: A report showing all the set values may be displayed and/or saved in PDF format at any time prior or after writing new setup values.

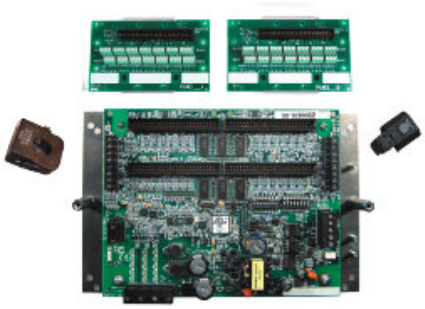
Note: The PDF report file may be printed or saved under the normal "Windows" environment.

⇒ **Report Preview** to preview report

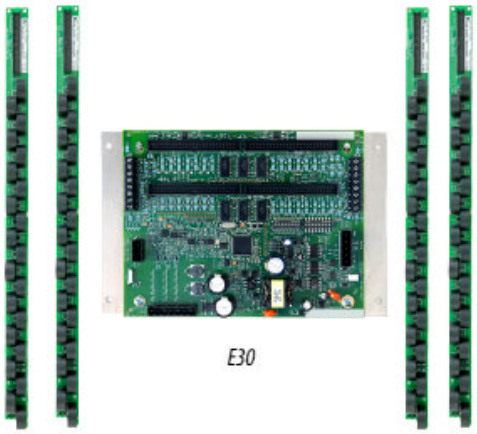


9 Appendix 3: Panelboard Monitor Setup with Software Utility

The Monitor used in this product is manufactured by Veris (division of Schneider Electric) and their commissioning guide is included in this manual for convenience. Note that the software configuration tool is available from the Veris WEB site at http://www.veris.com/Item/E30A042.aspx



E31



E30

This guide is intended to help the user commission the E3x Panelboard Monitoring System for operation using the software utility. The following are covered in this guide:

- The configuration Software tool from Veris
- Using the Configuration Software
  - Configure Device Tab
  - Global Resets Tab
  - Alarm Status Tab
  - Data Monitoring Tab
- Configuring Alarm Registers
- Latching Alarm Registers

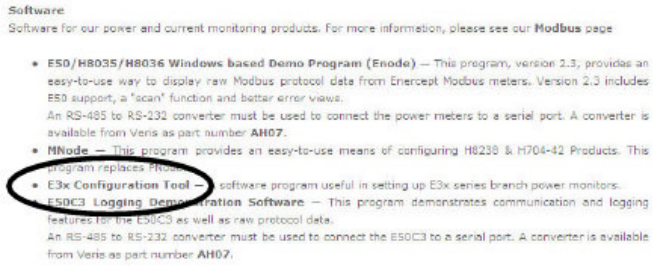
Note: In units equipped with an Ethernet Port (COMSERVER), the Powersmiths Network Setup Utility can be used to "find" the unit IP address which may be also changed/assigned with this tool.

.

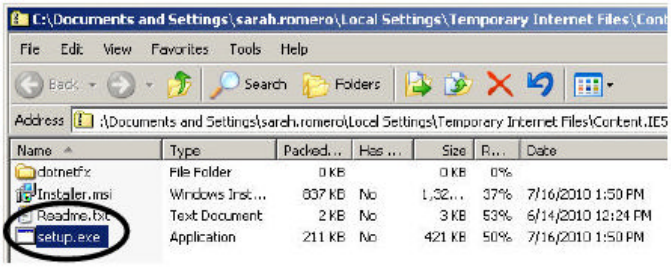
DOWNLOAD THE CONFIGURATION TOOL

1. Go to the Veris Industries website navigate to the Software option:

2. Choose the E3x Configuration tool from the list of available software.

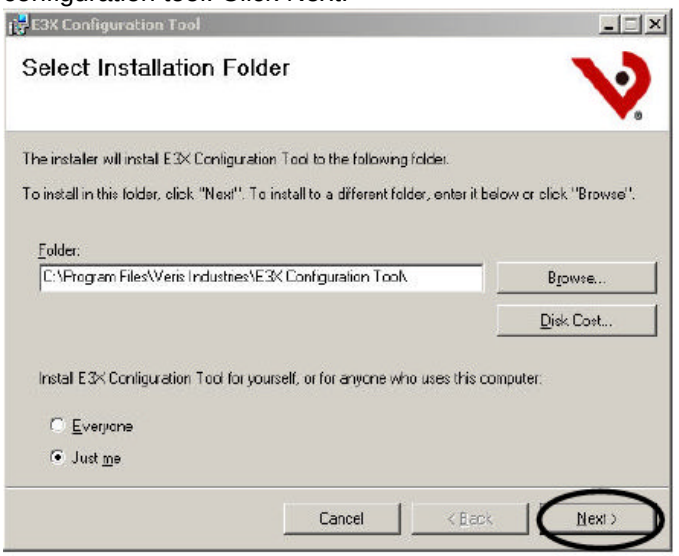


3. Open the executable file.

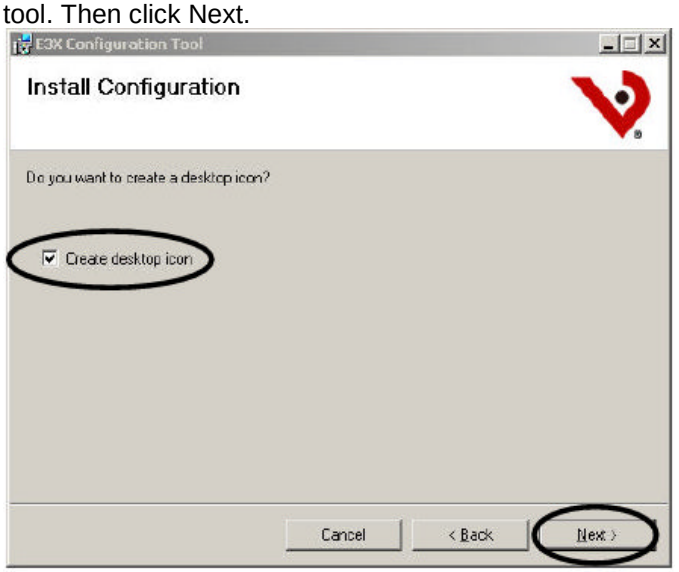


4. The configuration tool Welcome window appears. Choose Next

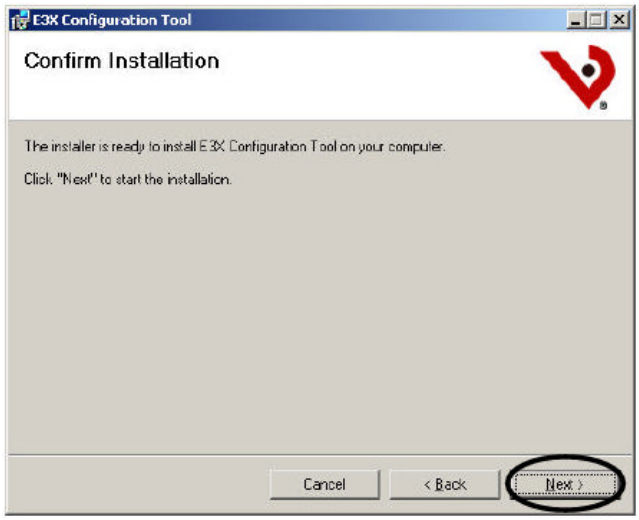
5. Select a destination on the computer to store the configuration tool. Click Next.



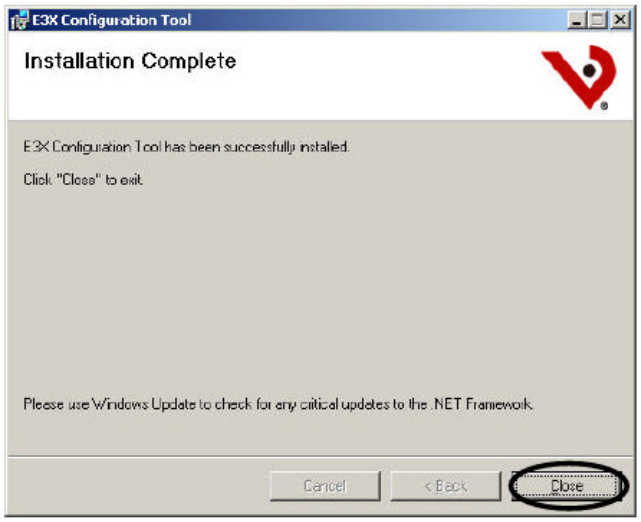
6. If desired, check the option to create a desktop shortcut to open the configuration tool. Then click Next.



7. The tool is now ready to install on the computer. Choose Next to confirm installation.



8. When installation is complete, choose Close to exit the software.



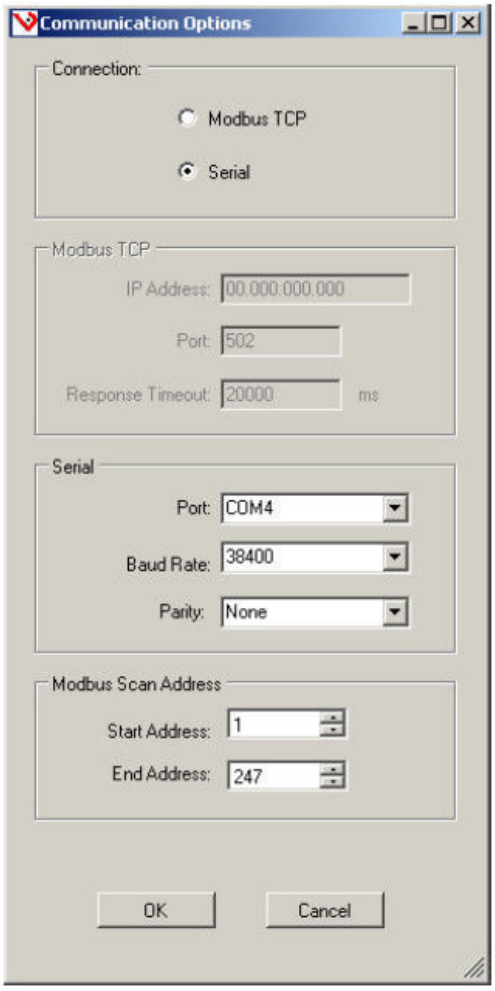
The E3x configuration is now successfully installed on your computer. You are ready to begin commissioning the E3x monitoring system for operation.

USING THE CONFIGURATION SOFTWARE

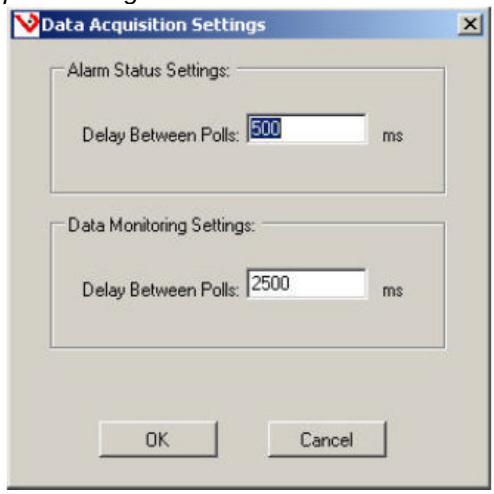
Open the software using either the desktop icon (if selected) or by navigating to the location chosen previously.

In the toolbar at the top of the window, use the Options button to adjust your communication and data acquisition settings. Default settings appear in the window; changes these as needed.

Note: For Ethernet connection, select Modbus/TCP

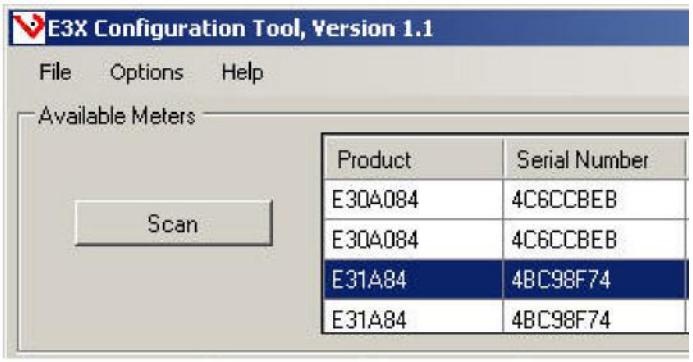


Note: Adjust Modbus Scan Address settings to a more precise range to decrease scan time.



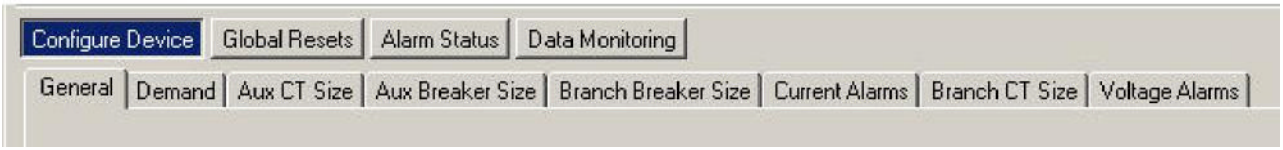
Click the Scan button to have the software locate available devices on the system.

All devices located in the scan will appear in the box adjacent to the Scan button. Click on the device you wish to configure



.

Below the Scan window is a row of buttons: Configure Device, Global Resets, Alarm Status, and Data Monitoring.



When each button is selected, a unique row of tabs appears below. The information in these tabs must be configured to the system requirements. Every setting has a default value programmed in. The next sections describe the settings found within each tab.

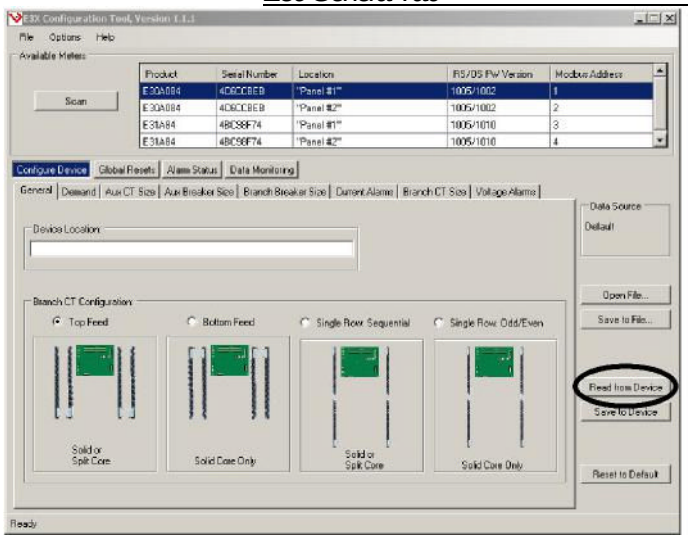
Configure Device Button

After scanning for devices, the tool locates all E3x meters connected to the system. Select a meter from the list and click the **Read From Device button** to configure.

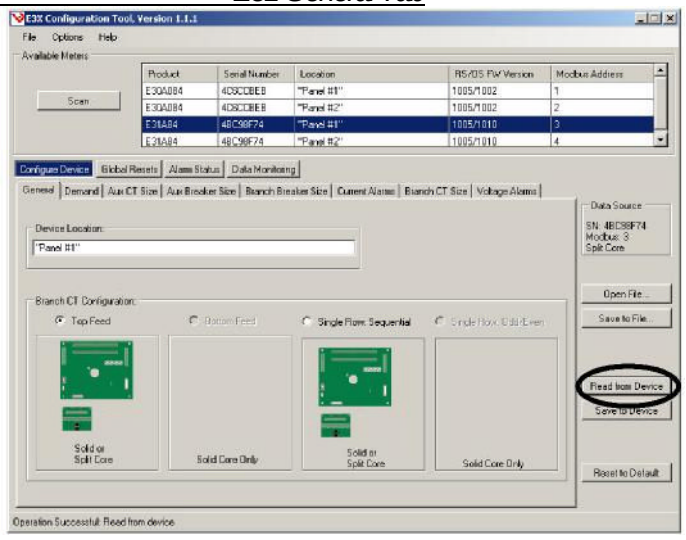
1. **General.**

   Select the CT configuration used in the installation. This tab looks different for the E30 and E31 devices, with only the options for the selected device appearing as options. The Device Location is an optional description the installer can enter to specify the location of each device on the network. **Note: If the configuration tool is opened on a computer not connected to a meter, the tool defaults to the E30 General tab.**

E30 General Tab

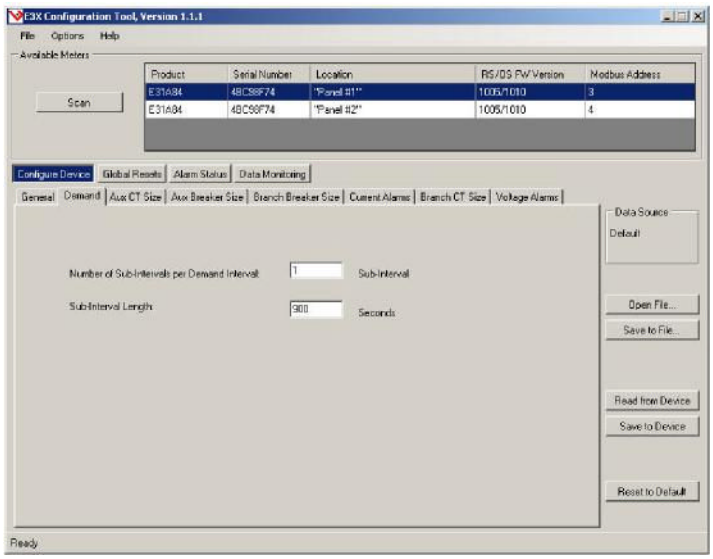


E31 General Tab



2. **Demand.**

   Select the number of sub-intervals and the sub-interval length to be used in data collection.

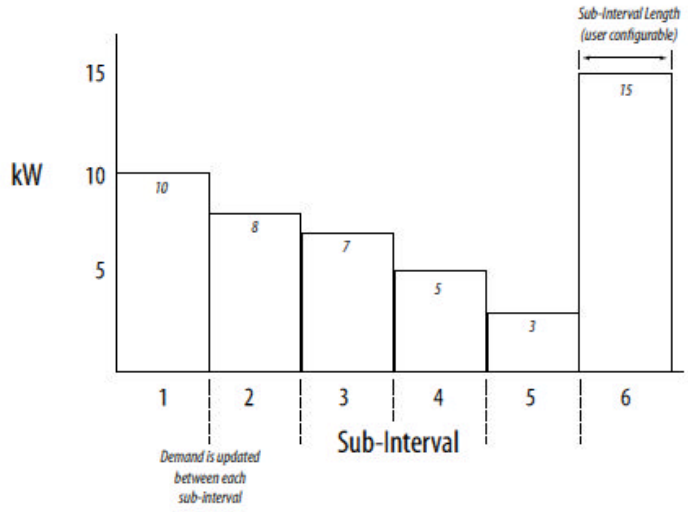


These settings apply to current demand (registers 269-272, 1462 - 1503) and power demand (registers 277, 1378-1419).

Configure the number of sub intervals. The default is 1, but it can be set for 1-6 sub-interval windows.

Configure sub-interval length (register 72). The default is 900 sec (15 minutes), but it can be set from 10 – 32767 (in seconds). For Sync to Comms, set to 0. Sync to Comms mode will start demand calculations based on writes to Modbus register 295 with a value of 26012 (decimal).

Calculate Demand by continuously summing the subinterval averages and dividing by the number of subintervals. The subinterval average is recalculated every second from the RMS values for current and power. The Demand register will update at the end of each subinterval. See the example below. For Block mode, set the number of subintervals to 1 (Reg 71).

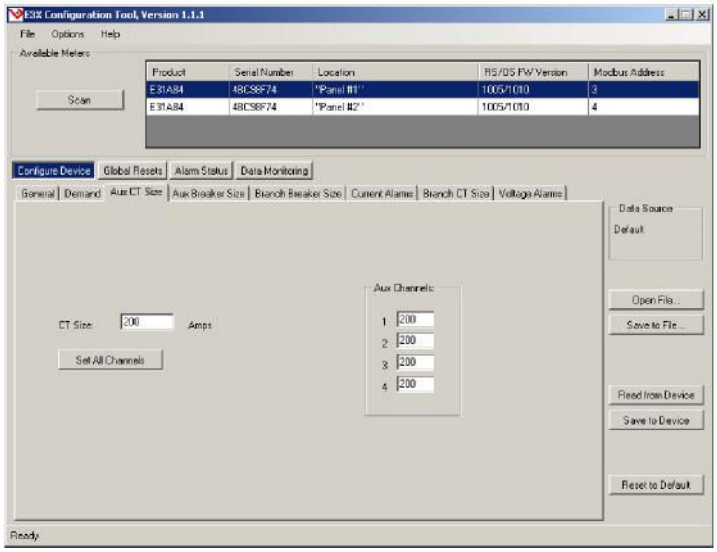


$$\text{Demand} = \sum_{n=1}^{6} \frac{\text{subinterval average (N) (kW)}}{6}$$

$$8\,\text{kW} = \frac{10}{6} + \frac{8}{6} + \frac{7}{6} + \frac{5}{6} + \frac{3}{6} + \frac{15}{6}$$

3. Aux CT Size.

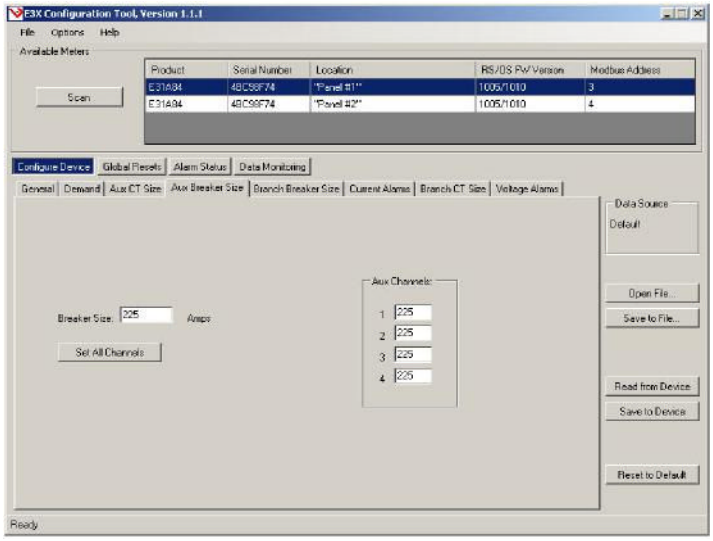
Set the CT size for each channel. Enter the value for each channel separately, or enter one value and click Set All Channels. Auxiliary #1 (register 115) to Auxiliary #4 (register 118) define the auxiliary or “mains” CT size (typically 200 A). Type the appropriate numeric value for each auxiliary CT installed in the panel. CT size must be 1-32,767. Set this value for each panel on the E3x.



4. Aux. Breaker Size

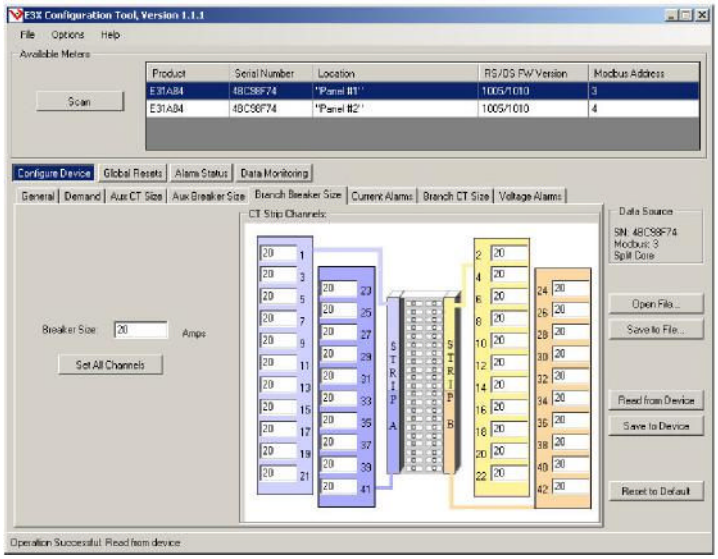
Set the breaker size for each channel. This value is used for alarm calculations. Enter the value for each channel separately, or enter one value and click Set All Channels.

Auxiliary #1 (register 161) to Auxiliary #4 (register 164) define the auxiliary or “mains” breaker size (typically 225 A). Type the appropriate numeric value for each auxiliary breaker in the panel. **For unused breakers, set the value to zero to disable alarms for those channels.** Set this value for each panel on the E3x (i.e. 225 (decimal) = 225A; range 0-32,767).

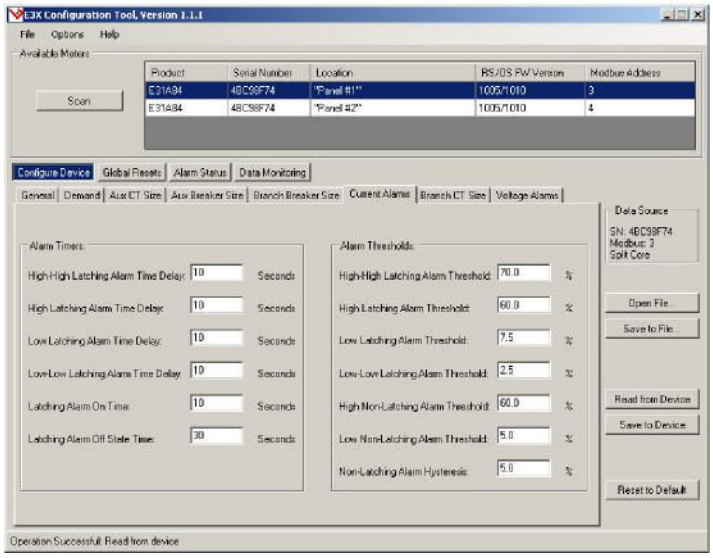


5. Branch Breaker Size.

Set the size of each branch circuit breaker. The default for each circuit is 20 Amps. The Breaker Size box and the Set All Channels button can be used to set all circuits to the same value, or each circuit can be set separately to the necessary value. Channel #1 (register 119) to Channel #42 (register 160) define the channel or “branch” breaker size (typically 20 A). Type the appropriate numeric value for each channel breaker in the panel. **For unused breakers, set the value to zero to disable alarms for those channels.**



6. Current Alarms.



The instantaneous current alarm setup parameters define the maximum (high alarm) and minimum (low alarm) limits for all branch and main circuits monitored by the E3x. Instantaneous current alarms are ON only if the alarm conditions are met. These alarms are reset automatically (alarm is turned OFF or cleared when circuit current is within the normal range).

High Alarm Thresholds

Type the instantaneous current value, expressed as a percentage of the breaker size (default = 60%). When the circuit current exceeds that value, the high current alarm is activated. To disable any alarms, set the specific high alarm threshold to zero.

Example: If the threshold is set to 60%, the high alarm would be activated when instantaneous current for a 20 A breaker exceeds 12 A (i.e. 20 A x 0.60).

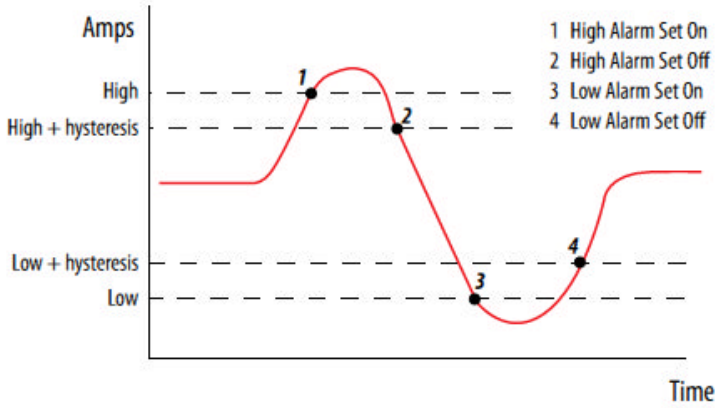
Low Alarm Thresholds

Type the instantaneous current value, expressed as a percentage of the breaker size (default = 5%). When the circuit current falls below that value, the low current alarm is activated. To disable any alarms, set the specific low alarm threshold to zero.

Example: If the threshold is set to 5%, the low alarm would be activated when instantaneous current for a 20 A breaker drops below 1 A (i.e. 20 A x 0.05). ***Hysteresis***

Type the value, expressed as a percentage of the alarm threshold, that defines how much the circuit current must fall below the High alarm threshold or rise above the Low alarm threshold, to determine the alarm's "OFF" state (default = 5%; non-latching only).

Example: If hysteresis is set to 5%, the "OFF" state for a high alarm threshold of 12 A would be at 11.4 A and below (i.e. 12 A minus (12 A x 0.05)), while the "OFF" state for a low alarm threshold of 1 A would be at 1.05 A and above (i.e. 1 A plus (1 A x 0.05)).



There are two types of alarms, Latching and Non-Latching.

Latching Alarm Settings Defined

High-High Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously above the High-High Alarm Threshold before the High-High alarm is activated (default = 10 s).

High Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously above the High Alarm Threshold before the High alarm is activated (default = 10 s).

Low Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously below the Low Alarm Threshold before the Low alarm is activated (default = 10 s).

Low-Low Alarm Delay (s): Number of seconds the current in a circuit needs to be continuously below the Low-Low Alarm Threshold before the Low-Low alarm is activated (default = 10 s).

Latching Alarm On Time (s): Number of seconds the current in a circuit needs to stay above the low-low alarm threshold level before the latching alarms are armed/ enabled for that channel (default = 10 s).

Latching Alarm Off Time (s): Number of seconds the current in a circuit needs to be below the Low-Low Alarm Threshold level before the latching alarm is de-activated (default = 30 s). After this point, on this channel, all latching alarms are disabled.

High-High Alarm Threshold (%): Limit for the High-High current alarm state, expressed as a percentage of the breaker size (default = 70%). For example, the High-High alarm threshold for a 20 A breaker is 14 A (i.e., 20 x 0.70). To disable this alarm (for all channels) set its threshold value to 0%.

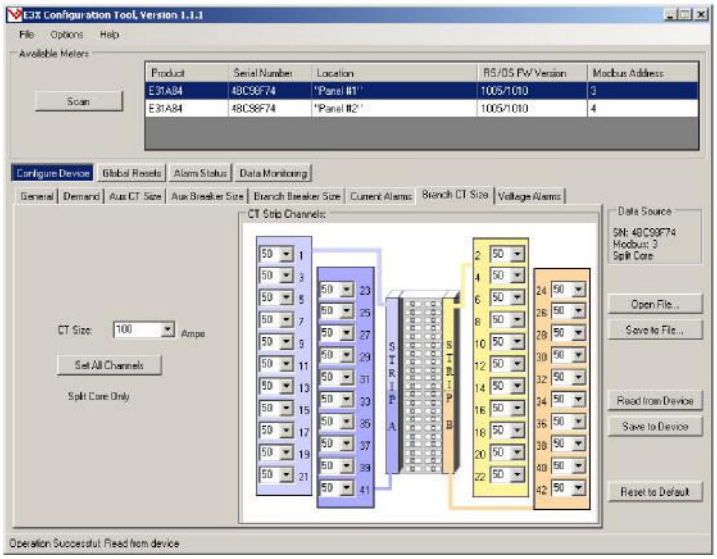
High Alarm Threshold (%): Limit for the High current alarm state, expressed as a percentage of the breaker size (default = 60%). For example, the High alarm threshold for a 20 A breaker is 12 A (i.e., 20 x 0.60). To disable this alarm (for all channels) set its threshold value to 0%.

Low Alarm Threshold (%): Limit for the Low current alarm state, expressed as a percentage of the breaker size (default = 7.5%). For example, the Low alarm threshold for a 20 A breaker is 1.5 A (i.e., 20 x 0.075). To disable this alarm (for all channels) set its threshold value to 0%.

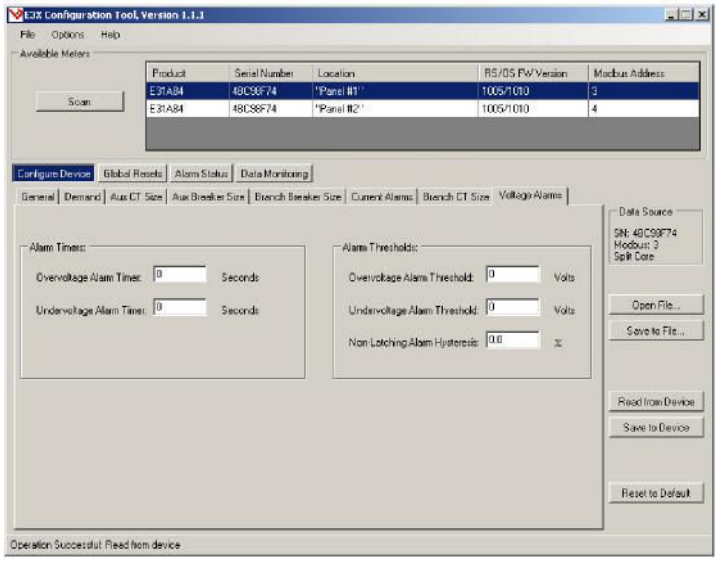
Low-Low Alarm Threshold (%): Limit for the Low-Low current alarm state, expressed as a percentage of the breaker size (default = 2.5%). For example, the Low-Low alarm threshold for a 20 A breaker is 0.5 A (i.e., 20 x 0.025). To disable this alarm (for all channels) set its threshold value to 0%.

7. **Branch CT Size.**

Set the size of each CT monitoring the branch circuit breakers. For the E30 solid-core products, the CT size for each branch circuit is automatically set and locked at 100 Amps. For the E31 split-core products, select the appropriate CT size per channel from the drop down menu. If all channels must be set to the same CT size, the Set All Channels button can be used for convenience.



8. **Voltage Alarms.**



Line-to-Line Voltage Alarms Defined

The Voltage Alarm setup parameters define the alarm delay (timer) and threshold (limit) for the voltage inputs monitored by the E3x (E3x model A & B Only). **Voltage alarms are global; settings and alarms are shared between both panels for main boards with four ribbon cable connections.**

The alarm timer settings define the length of time that a voltage input must be in an alarm state (i.e. exceeds the overvoltage alarm threshold or falls below the undervoltage alarm threshold) before activating the latching alarm. A return to normal (non-alarm) state is instantaneous, so the alarm timer is reset if the voltage returns to the normal state before the timer expires. The voltage alarms are always enabled unless the threshold is set to zero, unlike the current alarms there is no On-Time Delay.

The latching and non-latching voltage alarms share overvoltage and undervoltage thresholds.

The non-latching voltage alarm is set as soon as the voltage inputs are in an alarm state (i.e. exceeds the overvoltage alarm threshold or falls below the undervoltage alarm threshold) and are cleared as soon as the voltage inputs are out of an alarm state plus the hysteresis setting (i.e. below the overvoltage alarm threshold minus hysteresis or exceeds the undervoltage alarm threshold plus hysteresis).

Overvoltage Alarm Timer: Enter the number of seconds the voltage can exceed Over Voltage Threshold level before activating the Over Voltage Latching alarm.

Undervoltage Alarm Timer: Enter the number of seconds the voltage can drop below the Under Voltage Threshold level before activating the Under Voltage Latching alarm.

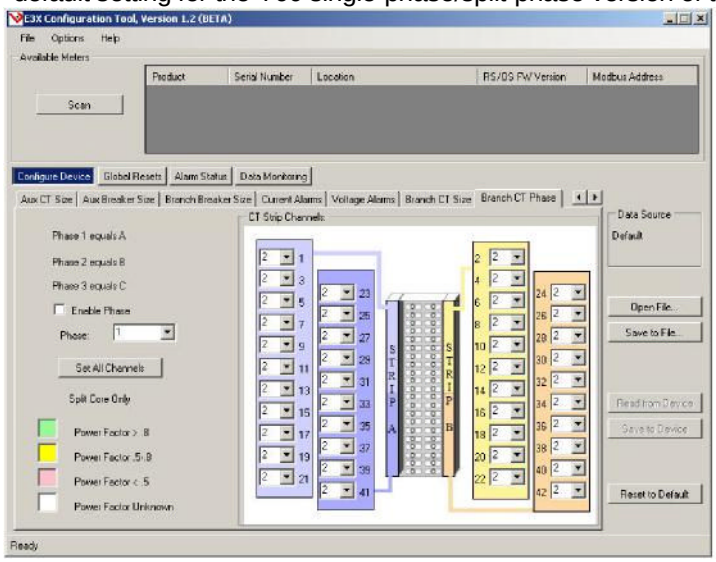
Overvoltage Alarm Threshold (V): Type the limit for the Over Voltage alarm state in Volts. To disable this alarm (for all voltage inputs) set its threshold value to 0 Volts. Threshold for both Latching and Non-Latching alarm.

Undervoltage Alarm Threshold (V): Type the limit for the Under Voltage alarm state in Volts. To disable this alarm (for all voltage inputs) set its threshold value to 0 Volts. Threshold for both Latching and Non-Latching alarm.

Non-Latching Alarm Hysteresis (%): Type the value, expressed as a percentage of the alarm threshold, that defines how much the voltage must fall below the Over voltage threshold or rise above the Under voltage threshold to determine the alarm's "OFF" state.

9. **Branch** CT Phase.

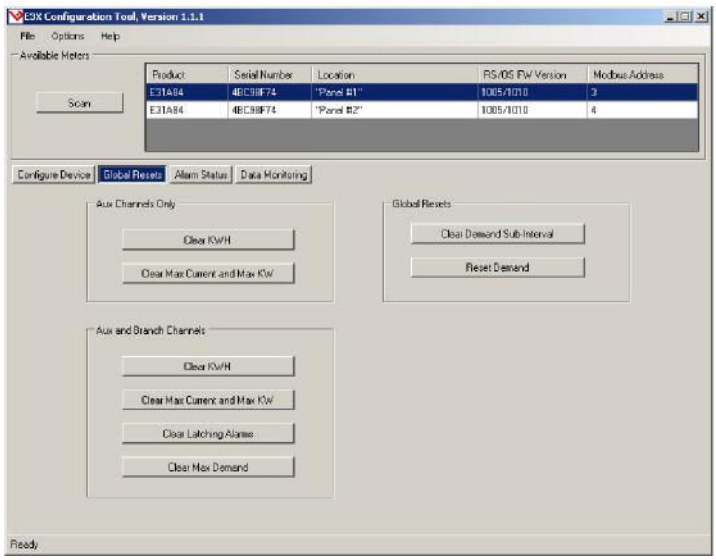
Use this tab to set the phase per channel. The standard product default setting is an “A, B, C” phase rotation. The default setting for the Y60 single-phase/split-phase version of the product is “A, B, A, B.”



Global Resets Button

This section is used to reset data values. Resets are for each individual panel.

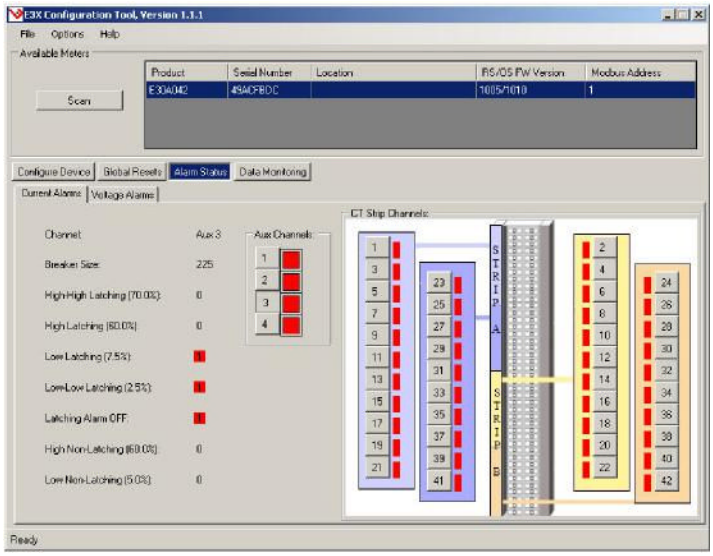
WARNING: Data will be deleted and counters will return to a value of zero.



Alarm Status Button

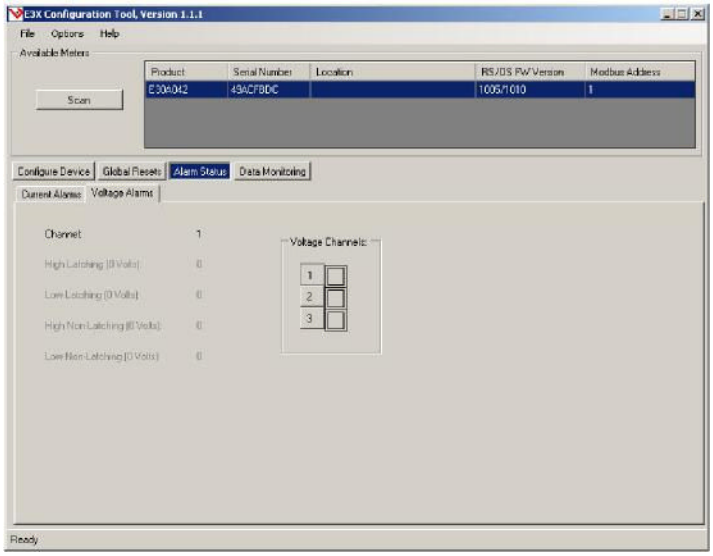
1. **Current Alarms Tab.**

Choose a channel from the numbered buttons in the center of the window. The data values at the left will update to show current alarm status. A red box next to the channel number indicates an alarm condition.



2. **Voltage Alarms Tab.**

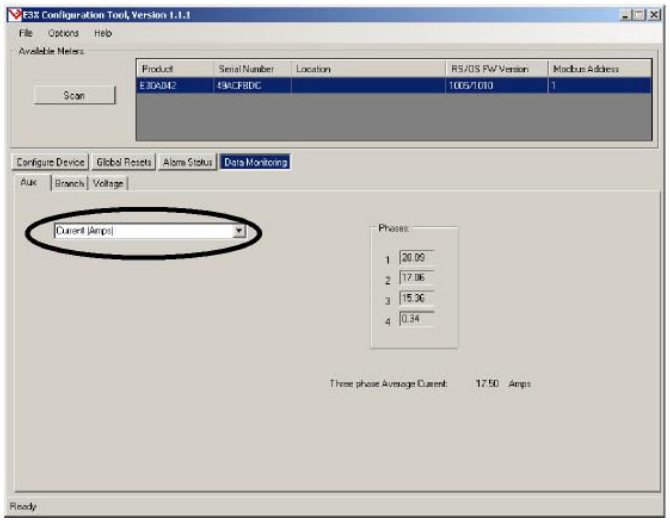
Choose a channel from the numbered buttons in the center of the window. The data values at the left will update to show current alarm status. A red box next to the channel number indicates an alarm condition.



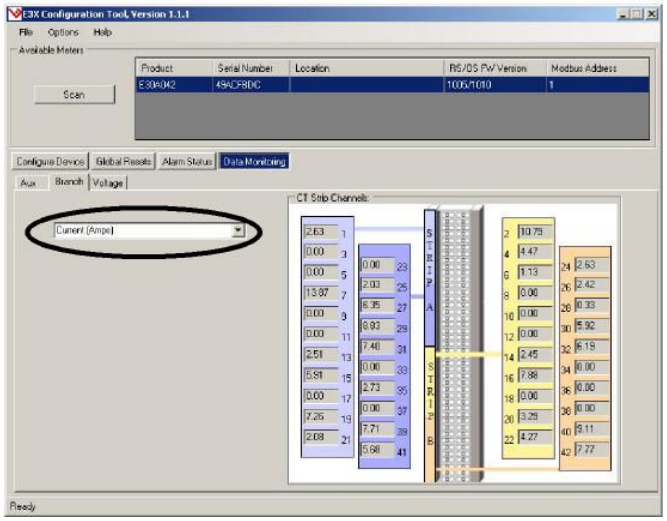
Data Monitoring Button

These tabs allow real-time viewing of data values.

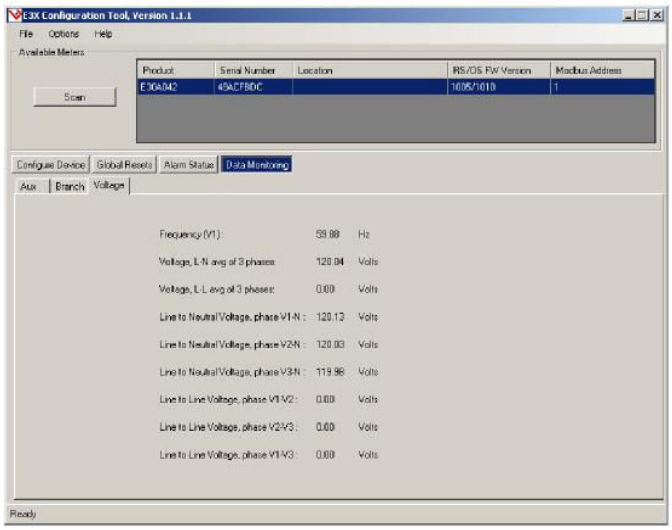
1. **Aux Tab.** Use the drop-down button to choose a data value. The selected data type appears to the right.



2. Branch **Tab.** Use the drop-down button to choose a data value. The selected data type appears to the right.



3. Voltage **Tab.** This tab has no drop-down list, as all data values appear on a single screen.



CONFIGURING ALARM REGISTERS

Latching alarms

Once the alarm threshold is crossed into an alarm state and after the associated Alarm Timer expires, the corresponding latching status bit is set and is not reset until the status bit is manually cleared by writing the alarm status register or resetting Latching alarms even if the signal is no longer in an alarm state. The alarm is also cleared if the threshold is changed.

Non-Latching alarms

Once the alarm threshold is crossed into an alarm state the corresponding Non-Latching status bit is set. The Non-Latching status bit is cleared once the signal crosses the threshold (plus hysteresis) out of an alarm state.

Alarm Timers

These timers control entry into an alarm state. All channels use the same global per-panel timers; per-panel timers only apply to latching alarms.

Registers 165-170:

- High-High Latching Alarm Time Delay
- High Latching Alarm Time Delay
- Low Latching Alarm Time Delay
- Low-Low Latching Alarm Time Delay
- Latching Alarm ON Time (when current is above Low-Low alarm then ON state is declared)
- Latching Alarm OFF State (current is below Low-Low alarm and ON state was declared)

Alarm Thresholds

All values are expressed as a percentage of breaker size. All channels use the same global per-panel values. An entry of 0% will disable the alarm for that channel. Hysteresis only applies to Non-Latching alarms.

Registers 171-177:

- High-High Latching Alarm Threshold
- High Alarm Latching Alarm Threshold
- Low Alarm Latching Alarm Threshold
- Low Low Latching Alarm Threshold
- Non-Latching High Threshold
- Non-Latching Low Threshold
- Hysteresis (0-100% percent of setpoint; non-latching alarms only)

Branch Current Alarms

Registers 178-219:

Latching Alarms are cleared by writing a 0 to its alarm bit. A write to a Non-Latching alarm is ignored.

- Bit 0: High High Latching Alarm
- Bit 1: High Latching Alarm
- Bit 2: Low Latching Alarm
- Bit 3: Low Low Latching Alarm
- Bit 4: Latching Alarm off state declared
- Bit 5-7: Reserved for future use (reads 0)
- Bit 8: High Non-Latching Alarm
- Bit 9: Low Non-Latching Alarm
- Bit 10-15: Reserved for future use (reads 0)

AUX Current Alarms

Registers 220-223:

Latching Alarms are cleared by writing a 0 to its alarm bit.

- Bit 0: High High Latching Alarm
- Bit 1: High Latching Alarm
- Bit 2: Low Latching Alarm
- Bit 3: Low Low Latching Alarm
- Bit 4: Latching Alarm Off
- Bit 5-7: Reserved for future use (reads 0)
- Bit 8: High Non-Latching Alarm
- Bit 9: Low Non-Latching Alarm
- Bit 10-15: Reserved for future use (reads 0)

Line-to-Line Voltage Alarm Timers

These timers control entry into an alarm state. All channels use the same global per-panel channels. **Voltage alarms are global; settings and alarms are shared between both panels for main boards with four ribbon cable connections.**

Registers 236-237:

- Overvoltage Alarm Timer
- Undervoltage Alarm Timer

Line-to-Line Voltage Alarm Thresholds

Thresholds are expressed as Volts. An entry of 0 disables that alarm for all channels.

Registers 238-240:

- Overvoltage Alarm Threshold
- Undervoltage Alarm Threshold
- Voltage Alarm Hysteresis (percentage of setpoint)

Line-to-Line Voltage Alarms

Registers 241-243:

- Latching Alarms are cleared by writing a 0 to its alarm bit.
- Bit 0: High Latching Alarm
- Bit 1: Low Latching Alarm
- Bit 2-7: Reserved for future use (reads 0)
- Bit 8: High Non-Latching Alarm
- Bit 9: Low Non-Latching Alarm
- Bit 10-15: Reserved for future use (reads 0)

Global Alarm Registers (Per Panel)

Registers 224-227:

These registers provide a means of identifying alarm conditions without polling every alarm and inspecting all the bits. A Global alarm register bit is set when a Branch

or Auxiliary alarm channel activates. For example, if Bit 2 in Branch alarm status 38 is set, then Bit 2 in the Global latching alarm status will also be set. This allows the user to read the Global alarms only in the event of an alarm condition, minimizing

network traffic. Global Most-Recent latching alarm channel tells the user the number of the channel that has had the most recent alarm event. Note: Bits 0 to 4 in Branch alarm status correspond to Bits 0 to 4 in Global alarm status; higher Bits do not match directly. An excerpt from the Modbus Point Map appears below; see the full Point Map for more information.

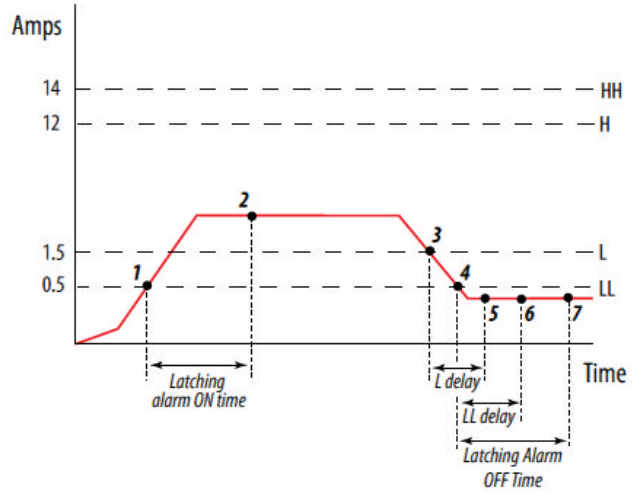
Registe	Description
224	Global Latching Alarm Status; Bit 0: High High Latching Alarm; Bit 1: High Latching Alarm; Bit 2: Low Latching Alarm; Bit 3: Low Low Latching Alarm; Bit 4: Latching Alarm OFF state declared (1=OFF; ON state must have been achieved prior); Bit 5-7: Reserved for future use (reads 0); Bit 8: High Voltage Latching Alarm; Bit 9: Low Voltage Latching Alarm; Bit 10-15: Reserved for future use (reads 0)
225	Global Non-Latching Alarm Status; Bit 0: High Non-Latching Alarm; Bit 1: Low Non-Latching Alarm; Bit 2-7: Reserved for future use (reads 0); Bit 8: High Voltage Non-Latching Alarm; Bit 9: Low Voltage Non-Latching Alarm; Bit 10-15: Reserved for future use (reads 0)

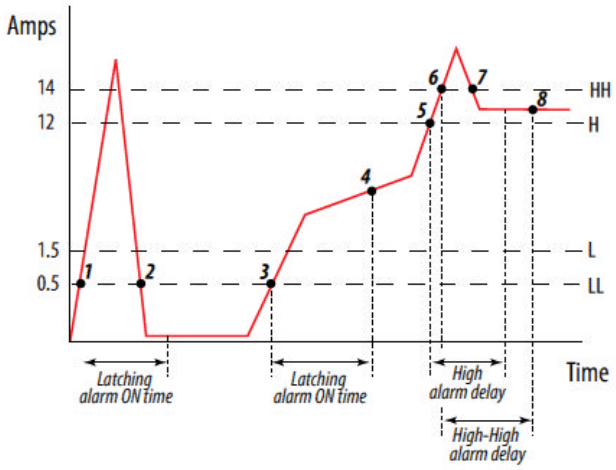
Alarm Counters

The alarm counters measure the number of times an alarm has been set. On a multi-master system, these counters indicate whether an alarm went off and whether it was cleared afterward. It also allows one master to retain these records even if another master has cleared the alarm. When any of the 46 corresponding counters increment, the global variants of the latching alarm counters increment correspondingly.

LATCHING ALARM EXAMPLES

Example 1





1. Current rises above LL (low-low alarm threshold) — this starts the Latching Alarm ON timer.
2. Current drops below LL before the Latching Alarm ON time period ends, so alarming is not enabled. The Latching Alarm ON timer is reset.
3. Current rises above LL — this starts the Latching Alarm ON timer.
4. Current remains above the low-low alarm threshold, beyond the time period specified by the Latching Alarm ON time setting — this enables the Latching Alarm (all Latching Alarms for the specific channel are armed).
5. Current rises above H (high alarm threshold) — this starts the high alarm delay timer.
6. Current rises above HH (high-high alarm threshold) — this starts the high-high alarm delay timer.
7. Current drops below HH before the high-high alarm delay period ends, so the high-high alarm delay timer is reset.
8. High alarm is latched at the end of the high alarm delay time period.

Example 2

1. Current rises above LL (low-low alarm threshold) — this starts the Latching Alarm ON timer.
2. Current remains above the low-low alarm threshold, beyond the time period specified by the Latching Alarm ON time setting — this enables the Latching Alarms (all Latching Alarms are armed).
3. Current drops below L (low alarm threshold) — this starts the low alarm delay timer.
4. Current drops below LL (low-low alarm threshold) — this starts the low-low alarm delay timer and the Latching Alarm Delay timer.

   Note: When the circuit current is continuously below the Low-Low Alarm Threshold (%) setting for the duration of the Latching Alarm OFF time period (and longer), the latching alarms for that channel are disarmed. At this point, the latched alarming feature is disabled (i.e. alarms disarmed), even though the Low, Low-Low and Latching Alarms are latched.
5. Low alarm is latched at the end of the L delay (low alarm delay) time period.
6. Low-low alarm is latched at the end of the L-L delay (low-low alarm delay) time period.
7. Current remains below the low-low alarm threshold, beyond the time period specified in the Latching Alarm OFF time setting, thus setting the Latching Alarm Off register for that channel