

Power Xpert PXM 4000/6000/8000

User and Installation Manual IM02601004E



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1 INTRODUCTION

The Eaton Power Xpert PXM 4000/6000/8000 Meter is a multifunctional revenue-accurate power meter providing power quality analysis. It consists of a panel-mounted Display and a Base Meter that can be attached to the Display or mounted remotely. The Power Xpert Meter is a multi-processor based electrical distribution system monitor providing extensive:

- Metering
- Trending
- Logging
- Waveform capture
- Transient capture
- Remote input monitoring
- Control relaying/Alarming
- Communication capabilities
- Built-in Web server for browsing via the internet

In addition, it incorporates a number of value added features such as self-learning, adaptive reporting, networked display, user levels, intuitive displays, setup wizards and user text descriptions.

1.1. About this Manual

This technical document is the user manual for the installation, operation and unit level maintenance of the Eaton Power Xpert Meter. This document is intended for authorized and qualified personnel who use the Power Xpert Meter. Please refer to the specific WARNINGS and CAUTIONS in this section before proceeding. If you require additional information, contact your Eaton Electrical representative. Technical Support is available 24 hours a day with our Power Quality Technical Support team at 1-800-809-2772, option 4 / sub-option 1. You can also email the team at pqsupport@eaton.com or visit us on the Web, www.eaton.com and follow the Products link.

1.2. Comparison of Meter Versions

This Instruction Manual covers the PXM 4000/6000/8000 series. Introduced in 2010, the PXM series includes significant Microprocessor and Memory upgrades from the PX series introduced in 2006. To determine the series, check the Model number printed on the product label located on the left side of the meter, as shown below.



Improvements:

- Internal RAM - from 32 MB SDR SDRAM to 256 MB DDR2 SDRAM
- Data Storage - increased from a 512 MB (std)/1GB(option) to a fixed 2/4/8 GB for PXM 4000/6000/8000, respectively.
- Waveform Capture - increased storage sample from 256 samples/cycle to 512 samples/cycle at 60 Hz. Delta-sigma over-sampling increased from 1024 samples/cycle to 4096 samples/cycle.
- Transient Capture Resolution - increased from a 10-bit A/D to 14-bit A/D on PXM 8000
- Maximum Operating Temperature - increased from 60° C to 70° C
- Com Reset Button - added to restore Ethernet and other communications to the factory defaults
- Mode Switch Selections - added troubleshooting mode to evaluate the system and connectivity.

Items Remaining the Same:

- Wiring
- I/O and communications expansion cards
- Local Display
- Panel mounting brackets
- Old PX .zip setting files can be loaded into the PXM, which updates its format

Other Changes:

- Meter includes blue highlights, on bottom, as shown below.
- Model number has been changed from PX to PXM, and previous digit for the memory option will



be “1” to represent standard communication

- Power supply module has changed and cannot be used with first generation meters (PX) and vice versa
- Low voltage (24-48 VDC) DC version is not available for the PXM
- Real-time clock - 10-year battery moved from power module to coreboard
- The new PXM firmware has been written to be compatible with the older PX meters on its RS485 subnetwork; however, the PXM must be the master in this arrangement.

This Instruction Manual describes the PXM 4000/6000/8000 series. For instructions and specifications on the PX4000/6000/8000 series refer to IB02601003E.

1.3. Applicability

This manual applies to the Power Xpert Meter and display in the following configurations:

- Power Xpert PXM4000 Meter
- Power Xpert PXM6000 Meter
- Power Xpert PXM8000 Meter

PXM468K-DISP-6 Color Touchscreen Display
 PXM468K-DISP-12 Advanced Color Touchscreen Display
 PX-PMBD - Panel Mounting Bracket Assembly
 PXMCE-B Communication Expansion Card
 PXMIO-B Digital I/O Card

Safety Precautions
 All safety codes, safety standards and/or regulations must be strictly observed in the installation, operation and maintenance of this device.



WARNINGS refer to a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTIONS refer to a hazardous situation which, if not avoided, could result in equipment damage.

WARNINGS

SHOCK HAZARDS:

IMPROPER INSTALLATION CAN CAUSE DEATH, INJURY AND/OR EQUIPMENT DAMAGE. Follow all Warnings and Cautions. Completely read and understand the information in this document before attempting to install or operate the equipment. Improper wiring could cause death, injury and/or equipment damage. Only qualified personnel are to service the Power Xpert Meter.

TROUBLESHOOTING PROCEDURES MAY REQUIRE PROXIMITY TO EXPOSED ENERGIZED (LIVE) ELECTRICAL WIRING AND/OR PARTS WHERE THE HAZARD OF FATAL ELECTRIC SHOCK IS PRESENT.

Exercise extreme care to avoid injury or death. Always disconnect, lock-out and tag the current and voltage sources and the control power supply circuit before touching the connections or components on the rear face of the Meter unit.

FAILURE TO GROUND THE POWER XPERT METER MAY RESULT IN INJURY, DEATH OR EQUIPMENT DAMAGE.

Properly ground the Power Xpert Meter during installation.

VOLTAGE

200ms rms and 1 cycle rms with half-cycle updates:

V_{an} , V_{bn} , V_{cn} , V_{ng} , Avg VLN,

V_{ab} , V_{bc} , V_{ca} , Avg VLL,

AUX (V_{ab} , V_{bc} , V_{ca} , Avg VLL) [PXM42xx, PXM62xx, PXM82xx]

Min/max with timestamp

Waveform

Sub-Cycle Disturbance Capture

Fast-Transient Capture 6Msps/channel (V_{ag} , V_{bg} , V_{cg} , V_{ng}) [PXM 8xxx]

Symmetrical Components [PXM6xxx, PXM8xxx]

Phasor Diagram

CURRENT

200ms rms and 1 cycle rms with half-cycle updates:

I_a , I_b , I_c , I_n , I_g , Avg I (abc)

Min/max with timestamp

Waveform

Symmetrical Components [PXM6xxx, PXM8xxx]

Phasor Diagram

POWER

200ms rms:

Real per-phase and system (kW)

Apparent per-phase and system (kVA)

Reactive per-phase and system (kvar)

Demand

Real Forward, Reverse, Net, Sum (kW)

Apparent (kVA)

Reactive Delivered, Received, Net, Sum (kvar)

Current (Amperes)

POWER FACTOR

Apparent (True) per-phase and system

Displacement per-phase and system

FREQUENCY (OF VAG)

10-100Hz and 350-450Hz

ENERGY

Real Forward, Reverse, Net, Sum (kWh)

Apparent (kVAh)

Reactive Delivered, Received, net, Sum (kvarh)

Current (Ah)

Time of Use Rates A, B, C, D, Total (Energy and Demand)

Energy Profile (2 month comparison)

QUALITY

Power Quality Index (worst of 6 weighted PQ components)

dv/dt count, %TDDi, %THDv (all models); Sag level, Swell level and Flicker (6000 and 8000 series only),

Indicates Normal, Caution, and Alert levels

Latest 10 minutes

Latest 24 hours

K-Factor of phase current

Crest Factor of phase current

Flicker Perceptibility, Pst, and Plt of Van, Vbn, Vcn, Vab, Vbc, and Vca

[PXM 6xxx, PXM 8xxx]

Harmonics

Ia, Ib, Ic, In, Van, Vbn, Vcn, Vab, Vbc, Vca

Harmonic Distortion in Amps, Volts, %TDD, %THD (total available on all models)

Harmonic Distortion in Amps, Volts, %TDD, %THD (even, odd, inter-harmonic available on the 6000 and 8000 Series)

Harmonic spectrum (1-85th harmonic)

Inter-Harmonic spectrum (5Hz resolution) [available on the 6000 and 8000 Series]

TREND

Each of 145 attributes trended automatically for min, max, and average at 5 different intervals. 60 days of 5-minute trend data is available as sets of weekly .csv files in the meter FTP server's Trend folder.

EVENTS

Timestamped Waveforms and Captured Parameters

ITIC curve for Sag and Swell events (available on the 6000 and 8000 Series)

Log of triggered events, new min/max, resets, and setting changes

21 Waveform channels; 4 line-to-ground Voltage, 3 line-to-neutral Voltage, 3 line-to-line Voltage, 5 phase Amps, 3 AUX line-to-line Voltage [PXM42xx, PXM62xx, PXM82xx], and 3 AUX line-to-ground Voltage [PXM42xx, PXM62xx, PXM82xx]

OUT OF LIMITS EVENT TRIGGERS

Any per-phase or system value in the following categories:

Current, Voltage, Power, Power Factor, Frequency, Harmonic Distortion, 9s of Availability/ Compliance calculation based upon any/all triggers selected for Performance (all models)

Flicker, Voltage Unbalance, and Current Unbalance. Symmetrical component (available on the 6000 and 8000 Series)

DEMAND OVERLOAD TRIGGERS

Real Forward, Reverse, Net, Sum (kW)

Apparent (kVA)

Reactive Delivered, Received, Net, Sum (kvar)

Current (Amperes)

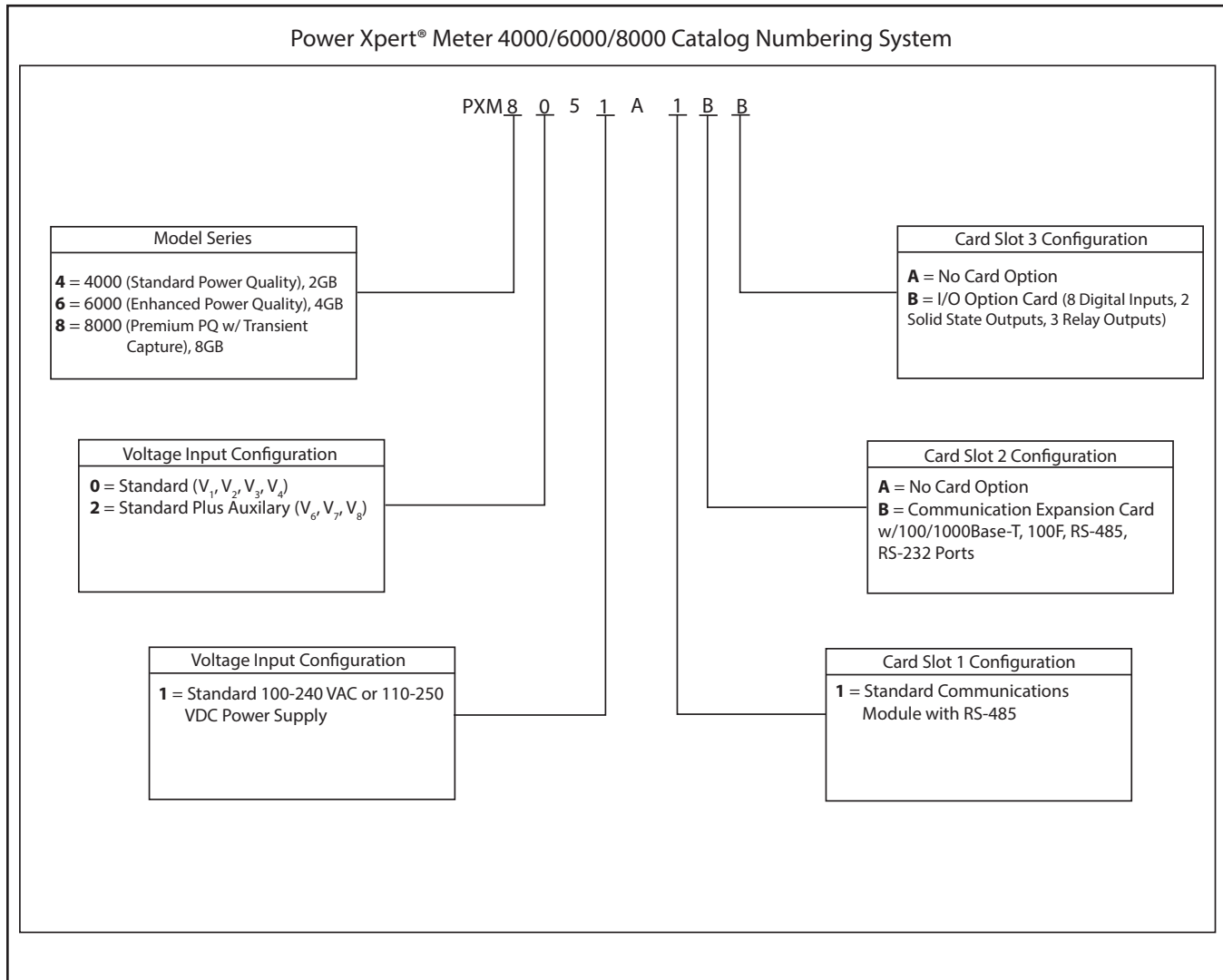
SUBCYCLE DISTURBANCE TRIGGERS

Absolute and dv/dt thresholds based upon 30.72ksps

FAST TRANSIENT TRIGGERS

Absolute and dv/dt thresholds based upon 6Msps (available on the 8000 Series)

Catalog Numbering System



The example above represents a PXM8000 Meter, with Standard AC Power Configuration, and with a Communication Expansion Card and I/O Option Card.

Power Xpert Meter PXM 4000/6000/8000 Meter Accessories

<u>Description</u>	<u>Catalog #</u>
Digital I/O Card: 8 digital Input, 2 Solid Output, 3 Relay Output	PXMIO-B
Comms Expansion Card: Ethernet 100FX, 10/100T, RS-485, RS-232	PXMCE-B
6" Color Touchscreen Display	PXM468K-DISP-6
12" Advanced Color Touchscreen Display	PXM468K-DISP-12
Panel Mounting Bracket assembly required for back-to-back meter to 6" display mounting	PX-PMBD

Note: Only cards with a catalog number beginning with PXM are compatible with the PXM4000/6000/8000 meter.

1.4. AC Power Measurement Concepts Used in this Manual

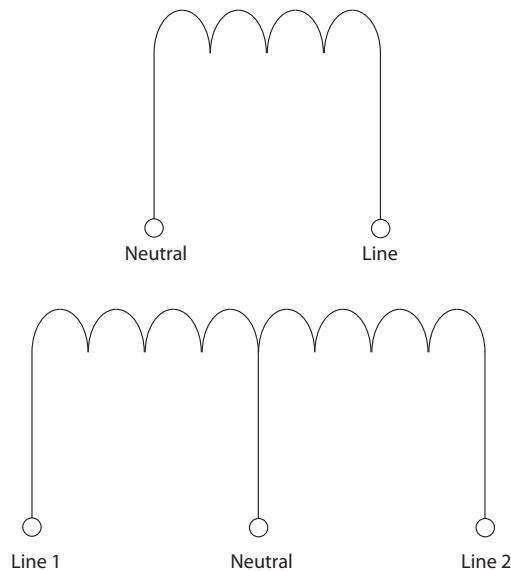
There are three types of power systems we'll discuss:

- Single-Phase
- Three-Phase
- Poly-Phase

SINGLE-PHASE

Single-Phase power distribution systems are two-wire systems used to supply 120 VAC (measured from line-to-neutral). Such systems are typically used for lighting, heating, data equipment, and small appliances. This configuration is usually found in residential and office environments. For higher loads, such as larger resistance heaters used in water heaters, electric dryers, and the like, three-wire, single-phase systems are used that provide 240 VAC (measured from line-to-line).

Two and Three-Wire Single Phase Wiring



Single-Phase Power Equations

The following equations provide the basis for calculating Power (W), Reactive Power (VAR) and Apparent Power in single-phase systems. You'll see these terms used throughout the manual when discussing AC power measurement.

Power (W) within a two-wire, single-phase system is calculated as:

$$VAR = V \times I \times \sin \Theta$$

Where:

V is Potential

I is Current

cos is the phase difference between the Current and the Potential.

Power for a three-wire, single-phase system is calculated as:

$$W = (V_{Line1} \times I_{Line1} \times \cos \Theta) + (V_{Line2} \times I_{Line2} \times \cos \Theta)$$

Where the phase difference between the Current and the Potential is the result of a non-resistive load, which can be either capacitive or reactive.

Reactive Power (VAR) is defined as any additional power consumed by the load that doesn't do any actual work. You can think of this as a measure of the inefficiency of the system. VAR is calculated as:

$$VAR = V \times I \times \sin \Theta$$

Apparent Power (VA) is defined as the total power that's delivered to the load. It's the vector sum of the Power (W) and the Reactive Power (VAR).

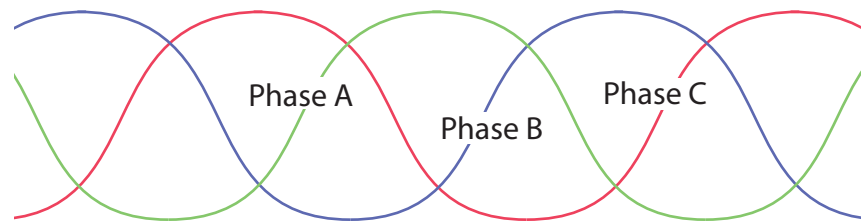
Power Factor (PF) is the ratio between Power (W) and the Apparent Power (VA). Ideally, the power factor should be 1; however, this can only occur if there are no inductive loads. In actuality, many loads are inductive and capacitors are installed to correct a poor Power Factor. Power Factor (PF) is calculated as:

$$PF = \frac{W}{VA} = \frac{W}{\sqrt{W^2 + VAR^2}}$$

THREE-PHASE

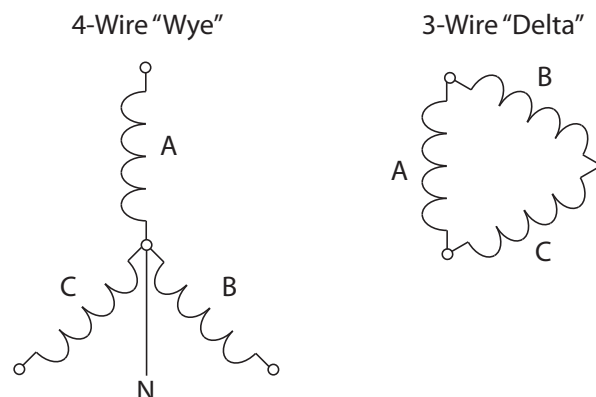
Three-phase is typically used for power transmission, but is also often used to power motors and other industrial or commercial equipment. In three-phase systems, three conductors carry three alternating currents of the same frequency. One conductor is the reference and the remaining conductors have their currents delayed by one-third and two-thirds of a cycle.

Three-Phase Current



Typically, three-phase systems use either a Delta connection or a Wye connection, as shown in the following figure:

Typical Three-Phase Systems



The following equation defines the voltage levels between the phases:

$$V_{an} = V_{bn} = V_{cn} = \frac{V_{ab}}{\sqrt{3}} = \frac{V_{bc}}{\sqrt{3}} = \frac{V_{ac}}{\sqrt{3}}$$

Three-phase systems are distributed in different voltages, depending on load factors, which typically are:

- 208 VAC
- 480 VAC
- 2,400 VAC
- 4,160 VAC
- 6,900 VAC
- 13,800 VAC

POLY-PHASE

To measure power in a poly-phase system, one must apply Blondel's Theorem. This states that in a system having N conductors, N-1 properly connected meter elements will provide a measurement of electrical power. Properly connected means that all potential coils must have a common tie to the conductor to which there is no current coil. Typically, poly-phase systems are configured as either a Delta or a Wye connection.

UNDERSTANDING POWER CONCEPTS

The following defines power consumption, demand, power factor, waveforms, and harmonics.

Consumption The total electrical energy used over a period of time. This is typically measured in Wh (or more likely, kWh). It is defined by the following formula, which utilities use to calculate power consumption within a specified billing period (T). W in this equation is instantaneous power.

$$Wh = WXT$$

Demand The average energy consumed over a specified time period. Utilities determine exactly what that period of time is, and it's typically either 15 or 30 minutes. This measurement deviates from average consumption, which forces utilities to provide sufficient generating capacity to satisfy this measurement.

Power Factor A poor power factor, transferred over a distribution network, results in a loss of energy. Utilities monitor this and penalize customers for poor power factor in an effort to force them to improve their systems.

Waveforms Ideally, power distribution systems should exhibit sinusoidal waveforms for both current and voltage. However, real-world applications have power consuming devices that create distortions. Such distortions are harmonics of the fundamental frequency. Harmonic distortion is something to avoid as it poses a safety hazard, reduces the working life of distribution transformers, and interferes with electronic equipment.

Some of the terms and concepts you'll encounter in this manual are:

Sinusoidal Waveforms: This is defined by the following equation:

$$A \times \sin(\omega \times t)$$

Distorted Waveforms: This is defined by the following:

$$A \times \sin(\omega \times t) + A_1 \times \sin(\omega_1 \times t) + A_2 \times \sin(\omega_2 \times t) + \dots$$

Percent of Total Harmonic Distortion: Defined by the following:

$$\%THD = \frac{\text{RMS of the Total Harmonic Distortion Signal}}{\text{RMS of the Fundamental Signal}} \times 100$$

SIGN CONVENTIONS

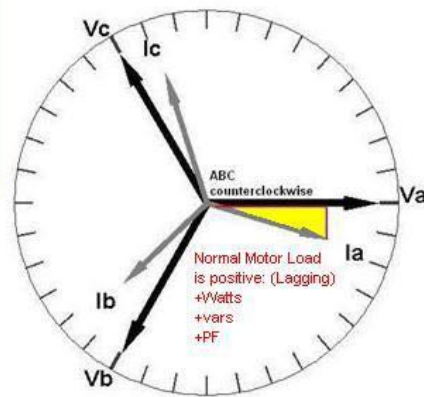
The sign of Watts, vars and PF are related to the phase angle between the voltage and current waveforms. As shown, the PXM 4000/6000/8000 meters indicate positive Watts, vars and PF for consumed power. Within this standard, motors consume both Watts and vars (i.e. a lagging current as measured at the load has +W, +var and +PF).

For power measured at the source, generated Watts and vars are negative, but the sign of PF is consistent with what it is as measured at the load.

A 3-phase motor load is illustrated in the following phaser diagram with an ABC counterclockwise rotation.

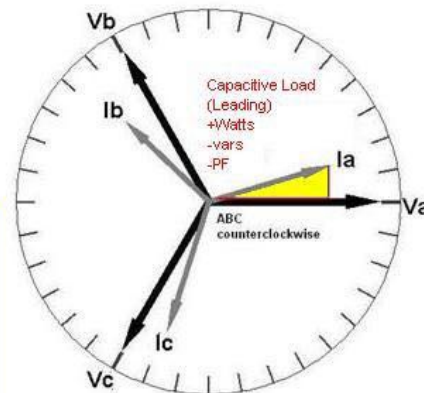
Reactive Power ↑	
QUADRANT 2	QUADRANT 1
Watts Negative	Watts Positive
Vars Positive	Vars Positive
Power Factor Leading (-)	Power Factor Lagging (+)
	Real Power →
Watts Negative	Watts Positive
Vars Negative	Vars Negative
Power Factor Lagging (+)	Power Factor Leading (-)
QUADRANT 3	QUADRANT 4

Power Quadrants, Power Engineering Convention P=VI*

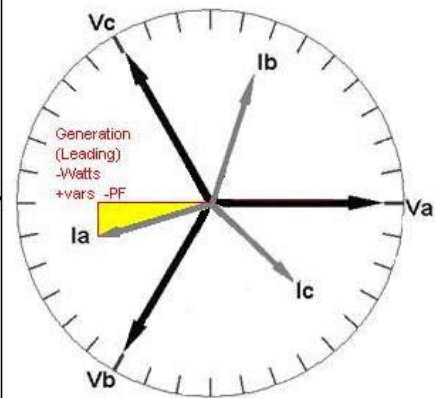


Reactive Power ↑	
QUADRANT 2	QUADRANT 1
Watts Negative	Watts Positive
Vars Positive	Vars Positive
Power Factor Leading (-)	Power Factor Lagging (+)
	Real Power →
Watts Negative	Watts Positive
Vars Negative	Vars Negative
Power Factor Lagging (+)	Power Factor Leading (-)
QUADRANT 3	QUADRANT 4

Power Quadrants, Power Engineering Convention P=VI*

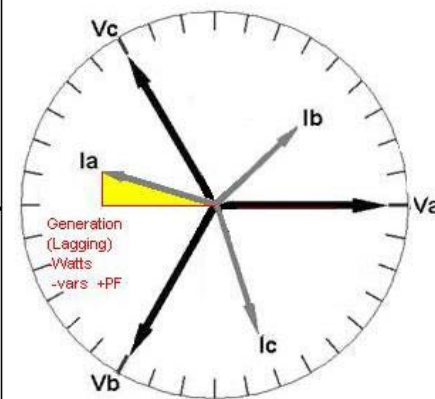


QUADRANT 2 Watts Negative Vars Positive Power Factor Leading (-)	QUADRANT 1 Watts Positive Vars Positive Power Factor Lagging (+)
Watts Negative Vars Negative Power Factor Lagging (+) QUADRANT 3	Watts Positive Vars Negative Power Factor Leading (-) QUADRANT 4



Power Quadrants, Power Engineering Convention $P=VI^*$

QUADRANT 3 Watts Negative Vars Negative Power Factor Lagging (+)	QUADRANT 1 Watts Positive Vars Positive Power Factor Lagging (+)
Watts Negative Vars Negative Power Factor Lagging (+) QUADRANT 3	Watts Positive Vars Negative Power Factor Leading (-) QUADRANT 4



Power Quadrants, Power Engineering Convention $P=VI^*$

SYMMETRICAL COMPONENTS

Symmetrical components are commonly used for analysis of three-phase electrical power systems. Phase vectors are expressed as sets of phasors, either as real or quadrature or magnitude and phase. For example, a vector for three-phase voltages could be written as \mathbf{V}_{abc} :

$$\mathbf{V}_{abc} = \begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix}$$

and the three symmetrical component phasors arranged into a vector as \mathbf{V}_{012} :

$$\mathbf{V}_{012} = \begin{bmatrix} V_0 \\ V_1 \\ V_2 \end{bmatrix}$$

where \mathbf{V}_0 is the zero-sequence component (the portion of voltage with no rotation)

where \mathbf{V}_1 is the positive-sequence component (the portion of voltage with abc rotation)

where \mathbf{V}_2 is the negative-sequence component (the portion of voltage with abc rotation).

A phase rotation operator α is defined to rotate a phasor vector forward by 120 degrees. As a result α^2 is a phase rotation of 240 degrees.

A matrix "A" can be defined using this operator to transform the phase vector into symmetrical components.

$$\mathbf{A} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha^2 & \alpha \\ 1 & \alpha & \alpha^2 \end{bmatrix}$$

The phase voltages are generated by the sequence equation: $\mathbf{V}_{abc} = \mathbf{A} \cdot \mathbf{V}_{012}$.

Conversely, the sequence components are generated from the analysis equations

$$\mathbf{V}_{012} = \mathbf{A}^{-1} \cdot \mathbf{V}_{abc}$$

$$\mathbf{A}^{-1} = \frac{1}{3} \begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha & \alpha^2 \\ 1 & \alpha^2 & \alpha \end{bmatrix}$$

While the analysis of symmetrical components is primarily focused on voltage, the analysis of current is equally valid.

VOLTAGE AND CURRENT UNBALANCE

When individual phases of a three-phase system differ, an unbalance results. Furthermore, harmonic distortion can also result in unbalance. The measure of unbalance is the ratio of the negative-sequence to the positive-sequence components and is represented as a percentage.

Voltage Unbalance = $V2/V1 * 100\%$

Current Unbalance = $I2/I1 * 100\%$

Note that V1, V2, I1 and I2 are symmetrical component values that should not be confused with Va, Vb, Ia, Ib, or with similarly labeled input terminals on the meter.

1.5. Feature Comparison between Power Xpert Meter Models

FEATURE	PXM4000	PXM6000	PXM8000
Trend logging	•	•	•
Load Profile	•	•	•
Event logging	•	•	•
MEMORY & STORAGE			
2 GB Standard Memory	•		
4 GB Standard Memory		•	
8 GB Standard Memory			•
HARMONICS			
Harmonic levels	256	256	256
Total Harmonic Distortion (THD)	•	•	•
Delta-Sigma D/A Conversion Technology	•	•	•
Harmonics over-sampling (4096 samples per cycle)*	•	•	•
Anti-Alias Filtering	•	•	•
Individual Harmonics	•	•	•
Total Demand Distortion (TDD)	•	•	•
Even, Odd and Interharmonics		•	•
HIGHLIGHTS			
Sub-cycle disturbance capturing	•	•	•
dV/dt triggers for sub-cycle oscillatory transients	•	•	•
Absolute Threshold and dV/dt triggering	•	•	•
Power Quality Index - Standard (includes dv/dt count, %TDDi and %THDv)	•	•	•
Power Quality Index - Enhanced (includes Standard Index plus Sag level, Swell level and Flicker)		•	•
Flicker calculations		•	•
Automatic trigger setting		•	•
Automatic event severity analysis		•	•
Event Severity counters		•	•
ITIC (Information Technology Industry Council), previously CBEMA performance curve		•	•

FEATURE	PXM4000	PXM6000	PXM8000
Custom ITIC (CBEMA) plot with individual event magnitude and duration		•	•
Event Calendar View		•	•
Events Timeline View		•	•
Sequence of events and events plot on waveform		•	•
Power Quality Index - Premium (includes Enhanced Index plus counts of impulsive transients)			•
HIGH SPEED TRANSIENT CAPTURE & DETECTION			
6 MHz capture of impulsive transients			•
Transient capture duration: ~20ms/6MHz ~120ms/1MHz			•
Waveform recorded at 100,000 samples per cycle			•
Three-phase voltage and neutral-to-ground fast transient capture			•

* Delta-Sigma A/D oversampling rate

Note: These specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options and product model. Please refer to the technical data sheet for detailed specifications.



1.6. Warranties

WARRANTY FOR PRODUCTS

Seller warrants that the Products manufactured by it will conform to Seller's applicable specifications and be free from failure due to defects in workmanship and material for one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

In the event any Product fails to comply with the foregoing warranty Seller will, at its option, either (a) repair or replace the defective Product, or defective part or component thereof, F.O.B. Seller's facility freight prepaid, or (b) credit Buyer for the purchase price of the Product. All warranty claims shall be made in writing.

Seller requires all non-conforming

Products be returned at Seller's expense for evaluation unless specifically stated otherwise in writing by Seller.


This warranty does not cover failure or damage due to storage, installation, operation or maintenance not in conformance with Seller's recommendations and industry standard practice or due to accident, misuse, abuse or negligence. This warranty does not cover reimbursement for labor, gaining access, removal, installation, temporary power or any other expenses, which may be incurred in connection with repair or replacement.


This warranty does not apply to equipment not manufactured by Seller. Seller limits itself to extending the same warranty it receives from the supplier.

2 QUICK START GUIDE FOR THE METER

2.1. Safety Precautions

All safety codes, safety standards and/or regulations must be strictly observed in the installation, operation and maintenance of this device.

 **WARNINGS** refer to instructions that, if not followed, can result in death or injury.

 **CAUTIONS** refer to instructions that, if not followed, can result in equipment damage.

 **WARNINGS**

SHOCK HAZARDS:

IMPROPER INSTALLATION CAN CAUSE DEATH, INJURY AND/OR EQUIPMENT DAMAGE. Follow all Warnings and Cautions. Completely read and understand the information in this document before attempting to install or operate the equipment. Improper wiring could cause death, injury and/or equipment damage. Only qualified personnel are to service the Power Xpert Meter 4000/6000/8000 and displays.

TROUBLESHOOTING PROCEDURES MAY REQUIRE PROXIMITY TO EXPOSED ENERGIZED (LIVE) ELECTRICAL WIRING AND/OR PARTS WHERE THE HAZARD OF FATAL ELECTRIC SHOCK IS PRESENT. Exercise extreme care to avoid injury or death. Always disconnect, lock-out, and tag the current and voltage sources and the control power supply circuit before touching the connections or components on the rear face of the Power Xpert Meter 4000/6000/8000 and displays.

FAILURE TO GROUND THE POWER XPERT METER MAY RESULT IN DEATH, INJURY OR EQUIPMENT DAMAGE. Properly ground the Meter during installation.

IMPROPER ASSEMBLY AND INSTALLATION OF THE CT TERMINAL BLOCK AND STRAIN RELIEF HOOD MAY RESULT IN OPEN CIRCUITED CTS AND EXPOSURE TO DANGEROUS VOLTAGES WHICH MAY RESULT IN SEVERE INJURY OR DEATH.

Terminal block hoods are provided with the metering current and voltage terminal blocks. The current terminal block retaining screws are part of the matching hood assembly. The current terminal block and hood assembly must be properly installed with retaining screws to secure the current terminal block to the meter housing to prevent exposure to shock hazard.

2.2. Power Supply Connections

1. Connect the Power Supply (PXMP5-1)

The Meter is powered using a 100-240 Vac or 110-250 Vdc (PXMP5-1) standard power supply.

- PS1-3 connected to ground
- PS1-2 connected to Neutral (Vac) or (-) Vdc
- PS1-1 connected to Line (Vac) or (+) Vdc

Fabricate a power cord of suitable length to connect PS1-1/PS1-2/PS1-3 (refer to Figure 1) to a suitable Power Source that supplies (100-240 Vac or 110-250 Vdc).

- Power LED should be solid blue ON.
- Health LED should blink green once per second.

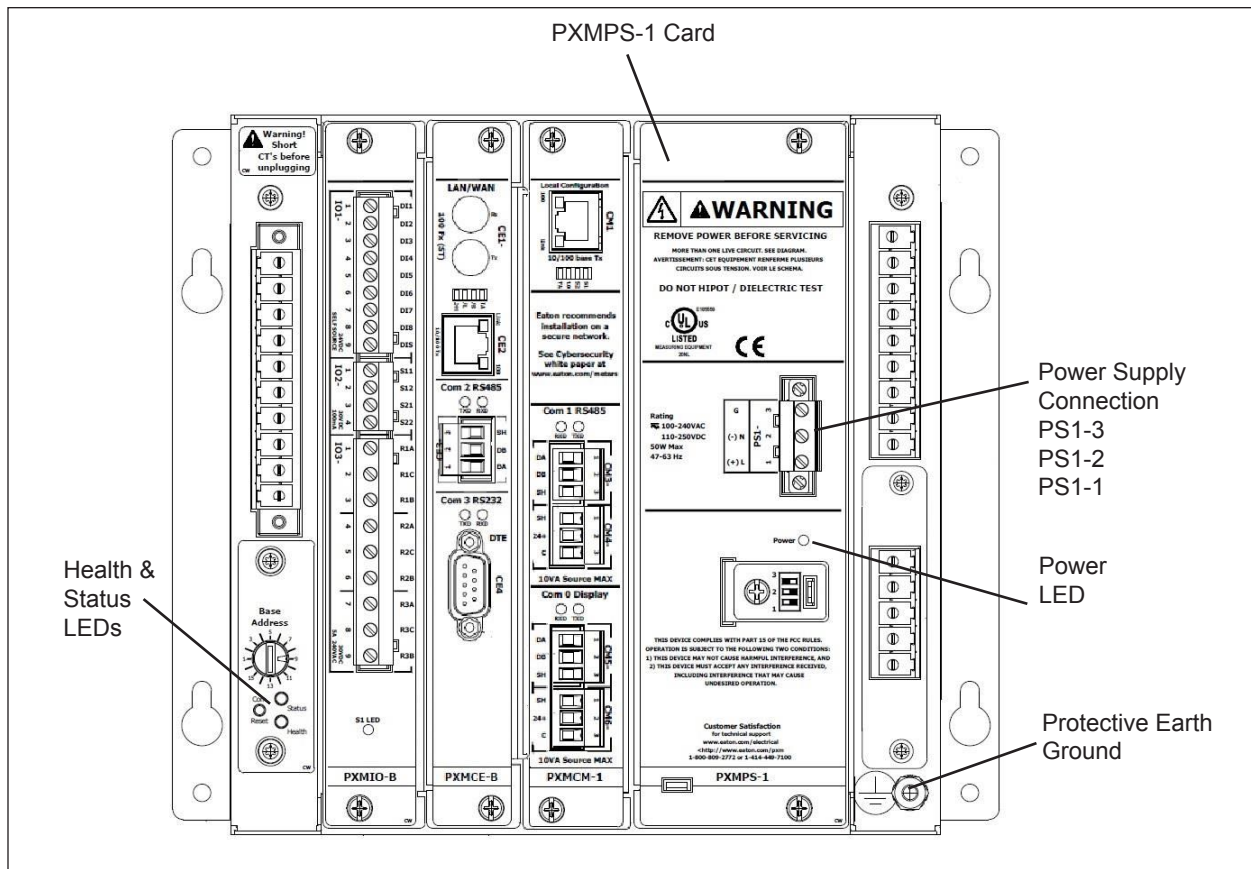
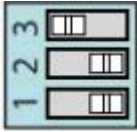
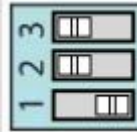




Figure 1: Meter Power Supply Connection and LED Locations.

2.3. Configure the Security Mode Dip Switches

DS-1	DS-2	DS-3		
OFF	OFF	ON is Normal. OFF is Safe Mode.	No restrictions (user ID/Password required) ADMIN/ADMIN accepted for 15 minutes after boot-up	
OFF	ON	ON is Normal. OFF is Safe Mode.	Medium Security - Energy & Demand resets prohibited	
ON	OFF	ON is Normal. OFF is Safe Mode.	High Security- Configuration changes; Energy & Demand reset prohibited	
ON	ON	ON or OFF.	Factory Test Mode - The meter should never be operated in this mode. The meter will indicate that it's in factory test mode through a repeating series of three flashes on the red Status LED	

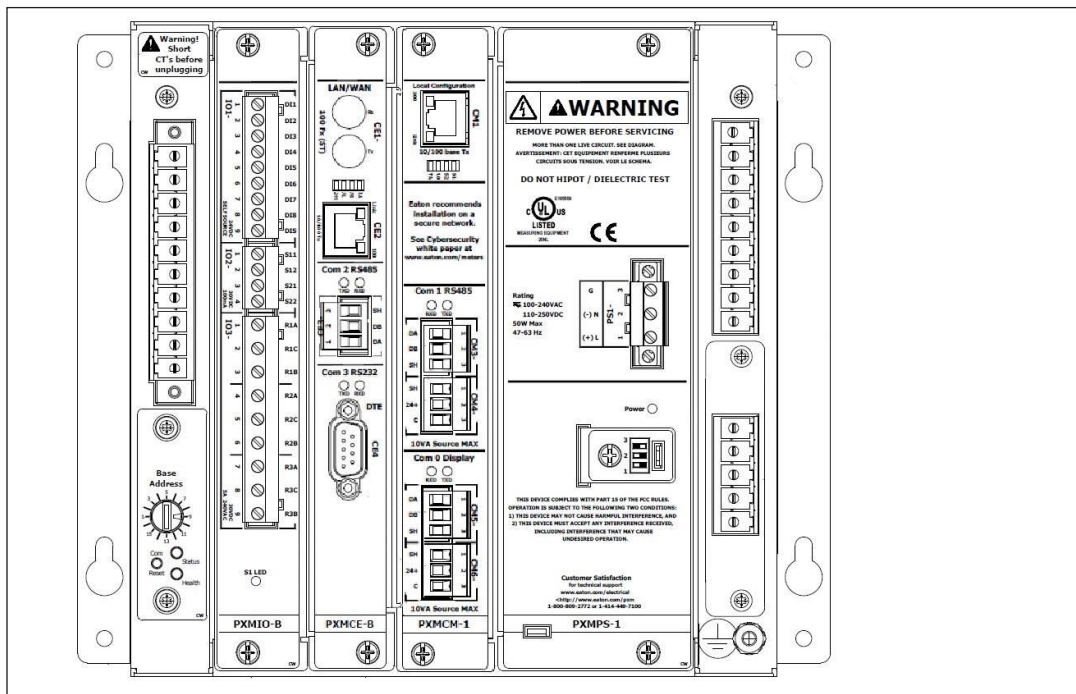
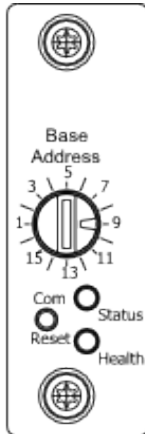


Figure 2: Meter's Dip Switches and Tamper Seals.

2.4. Com Reset Switch



Located above the rotary switch, the Com Reset switch can be used in conjunction with the DIP switches on the power supply front panel to reset the meter's communications ports. The reset switch has the following functions, depending on the DIP switch settings.

DS -1	DS-2	DS-3		
OFF	OFF	ON	Initialize all communications ports to their factory default settings.	
OFF	ON	ON	Initialize the LAN/WAN and Local Config communications ports and assign the following IP addresses: LAN/WAN: 10.1.1.1 Local Config: 192.168.1.1	
ON	OFF	ON	Attempt to recover communications via the LAN/WAN port by disabling then re-enabling the communications port.	
ON	ON	ON or OFF	Factory Test Mode - The meter should never be operated in this mode. The meter will indicate that it's in factory test mode through a repeating series of three flashes on the red Status LED.	

2.5. Base Address

The Power Xpert Meter has a rotary Base Address switch on the bottom-left side of the meter. This rotary switch is for use with the obsolete PXD-MMG on COM0 and does not apply to COM1, COM2, or COM3.

2.6. VT, VX, and CT Connections

Planning CT and VT Connections (Figure 3)

Determine your wiring requirements for the meter. This quick start guide will cover these basic wiring configurations:

- 3-Phase, 3-Wire Delta (Up to 600 V L-L, 347 L-N) 3 CTs
- 3-Phase, 3-Wire Delta (Above Up to 600 V L-L, 347 L-N) 3 CTs
- 3-Phase, 3-Wire Delta (Above Up to 600 V L-L, 347 L-N) 2 CTs
- 3-Phase,4-Wire Y (Up to Up to 600 V L-L, 347 L-N)
- 3-Phase,4-Wire Y (Above Up to 600 V L-L, 347 L-N)

See Wiring Diagrams in this manual for examples of CT and PT connections.

VT Terminal Voltage Connections:

Voltage Inputs can accept up to 600 Vac L:L / 347VL:G direct. A PT with a 120 V secondary is required if this rating is exceeded. Primary settings are 120-500,000, for a PT ratio of 120:120 to 500000 to 120. It is strongly recommended that the Voltage Inputs be connected to the Meter by way of properly rated disconnect switches.

- VTV1 = Line 1 or Va
- VTV2 = Line 2 or Vb
- VTV3 = Line 3 or Vc
- VTV4 = Line 4 or Vn (neutral)
- VTVR = Metering Reference Ground

VX Optional Auxiliary Voltage Connections:

- VXV6 = Line 1' or Va2
- VXV7 = Line 2' or Vb2
- VXV8 = Line 3' or Vc2

CT Terminal Connections:

Current Inputs accepts a 5-amp secondary with available Primary settings of 5-9999, for a CT ratio of 5:5 to 9999:5. It is strongly recommended that the Current Inputs be connected to the Meter by way of a shorting block.

- Line 1 CT connected to Terminals 11 (polarity mark) & 12 (return)
- Line 2 CT connected to Terminals 21 (polarity mark) & 22 (return)
- Line 3 CT connected to Terminals 31 (polarity mark) & 32 (return)
- Neutral CT connected to Terminals 41 (polarity mark) & 42 (return)
- Ground CT connected to Terminals 51 (polarity mark) & 52 (return)

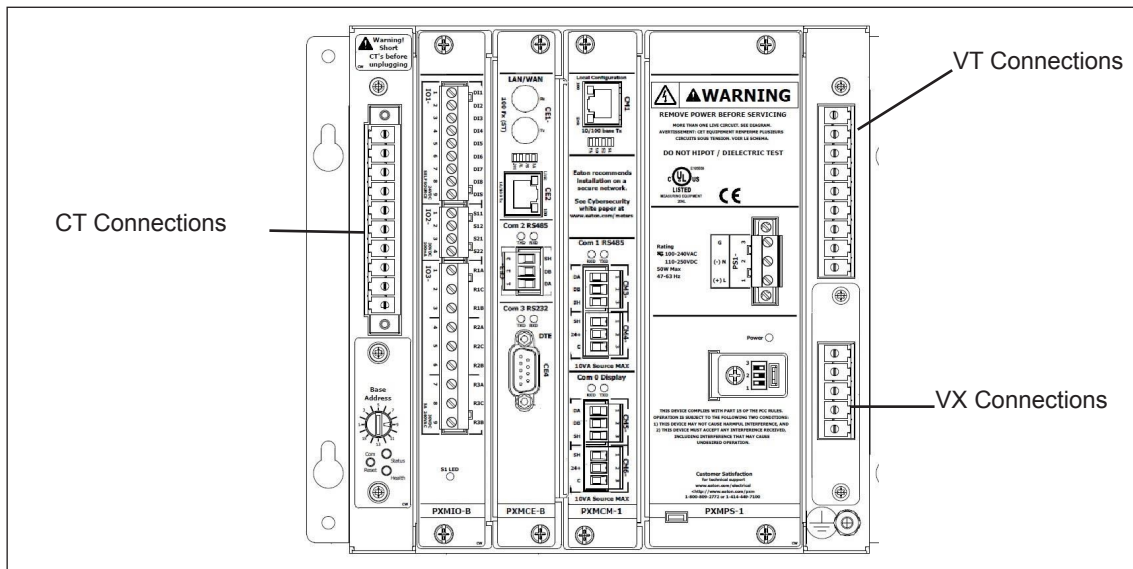


Figure 3: CT and VT Connections.

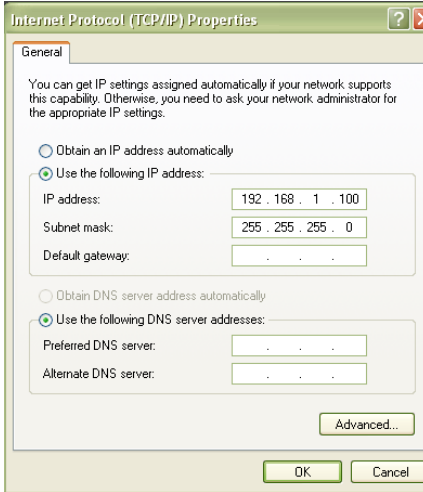
2.7. Establishing Communications between the Meter and the Displays

1. 6-inch color touchscreen display: See TD150015EN (available on the Eaton website, www.eaton.com/meters) for instructions on how to connect the 6-inch display to the Meter.
2. 12-inch advanced color touchscreen display: See TD150019EN (available on the Eaton website, www.eaton.com/meters) for instructions on how to connect the 12-inch display to the Meter.

2.8. Connecting to a Meter Using the Embedded Web Server Interface

NOTE: The set up of the Ethernet ports on the CE card must be done through the local configuration port of the CM card or with the display. After the CE Ethernet port is configured, the meter can be programmed remotely through the LAN/WAN connection.

1. Connecting a laptop to the meter using the local Ethernet browser interface CM1:



- A. Connect the Laptop to the Meter via CM1 port (see Figure 4 below) using a UTP **Cat5 Patch Cable**. Note that the IP address of the CM1 port is configured to be 192.168.1.1.
- B. Set the laptop's IP address to 192.168.1.100 by completing the following steps:
 - Click Window's Start. Then click Settings. Navigate to the Control Panel of your computer.
 - In Control Panel, click Network and right-click Local PC Area Connection. Select Properties from the shortcut menu.
 - In the Properties dialog, select Internet Protocol (TCP/IP) and click the Properties button.
 - In the Internet Protocol (TCP/IP) Properties window, select "Use the following IP address" and then enter the following IP address 192.168.1.100, with a Subnet Mask set to 255.255.255.0.
 - Click OK.

Launch a web browser and then navigate to <http://192.168.1.1>, then go to Step 2 in Section 2.9.

NOTES: When connected to a laptop, the Link LED will illuminate and, when communicating, the TXRX LED will flicker.

For PXCM Cards, the local configuration port may require the use of a UTP Cat 5 cross over cable. The PXMCM card accepts a standard Cat 5 patch cable.

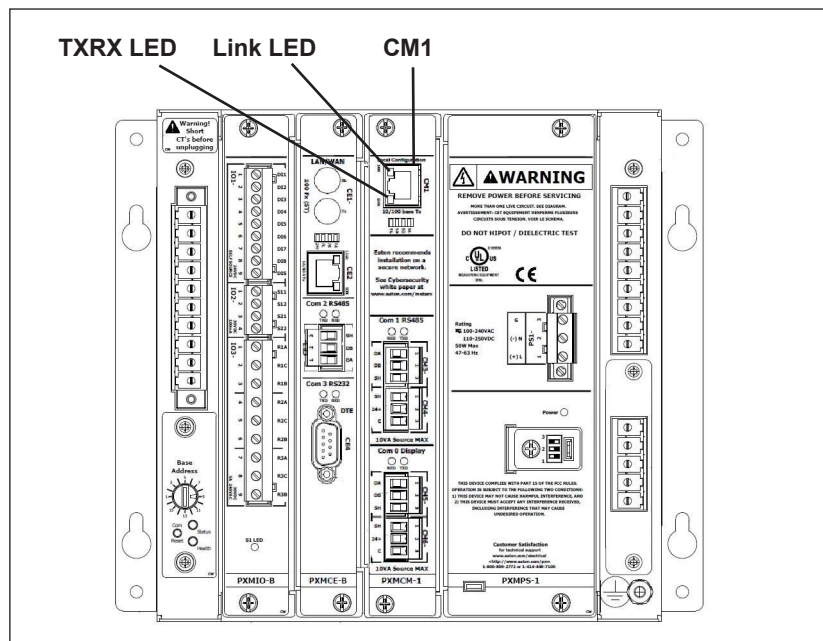


Figure 4: Connect Laptop to Meter.

2.9. Programming the Meter via the Optional Communications Expansion Card

The Optional Communications Expansion (CE) card (see Figure 5 below) provides LAN/WAN Web Ethernet communication via either Fiber (CE1) or UTP/STP Cat5 cable (CE2). It also provides communication via Modbus RTU (CE3 & CE4 - see Modbus Register Map for Power Xpert Meter 4000/6000/8000 (IB150014EN).

Note: The CE card is generally installed by the factory at time of manufacture. If the card is installed as an after sale option, follow instructions for physical installation that accompany the card or refer to Appendix D, Section 6 of this manual. To set up the card, follow these steps:

- A. The PXMCE ships with CE2 enabled for DHCP. Once connected to the Local Area Network supporting DHCP, an IP will be assigned (this may require a power cycle to the PXM4/6/8K). Once energized, the PXMCE CE1/CE2 port LED "DH" will be illuminated. The assigned IP address for PXMCE CE1/CE2 can be determined either through an attached display (PXM468K-DISP-12 or legacy PXD-MMG) or by using the CM1 "Local Configuration" web server interface.
- B. If the PXM4/6/8k was ordered without the PXMCE and is now being installed, follow the instructions that accompany the PXMCE or refer to Appendix D, Section 6 of this manual.
- C. The PXMCE CE1/CE2 Ethernet settings can be modified by accessing the PXM4/6/8k CM1 "Local Configuration" web server interface. This will be required if DHCP will not be used.
- D. Power cycle the PXM4/6/8k to initiate DHCP.

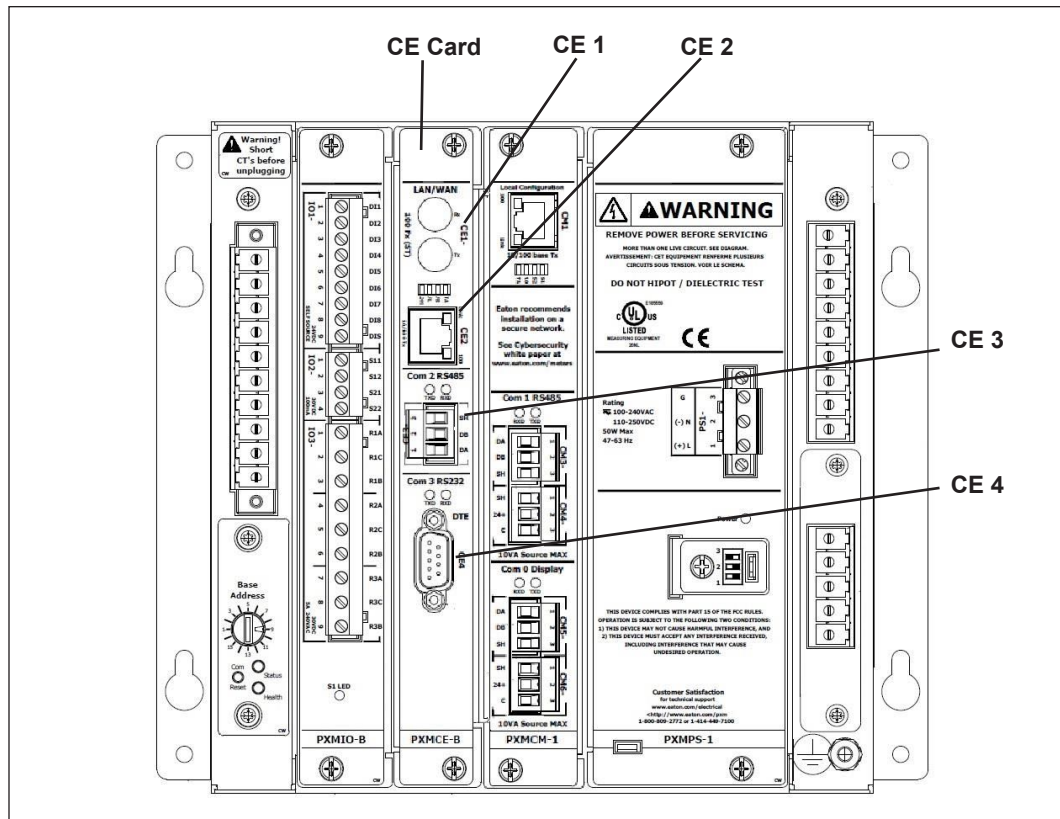


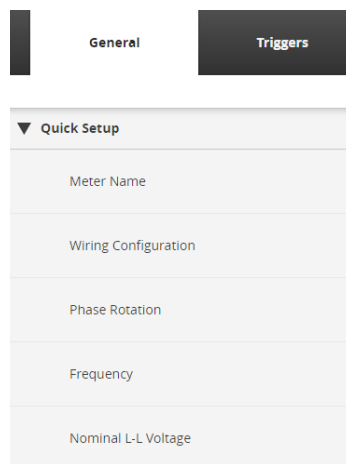
Figure 5: Ethernet and Modbus Connections.

For further details about the following steps, refer to Meter Settings using the Web Server, in this User and Installation Manual (IM02601004E).

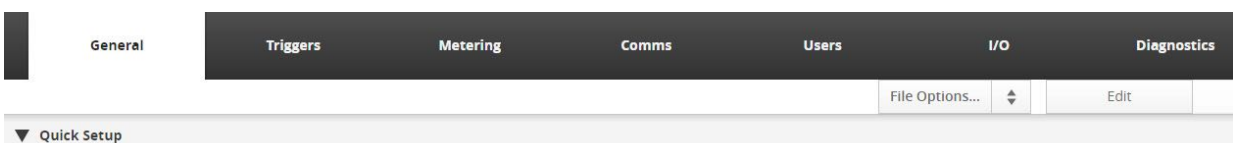
1. Open a web browser. After “http:\”, type in the IP address of the CE Ethernet port in the address box and click OK. The Meter Webserver Home Page will be displayed. (If DHCP is enabled, the user must find the IP address via the Local Configuration port [Setup->Diagnostics->Communication->Ethernet Status] or Local Display).
2. Enter the Username and Password. The defaults are: Username = admin and Password = admin. After entering the Username and Password, click Log In. After clicking Log In, you will be asked to change the admin password.



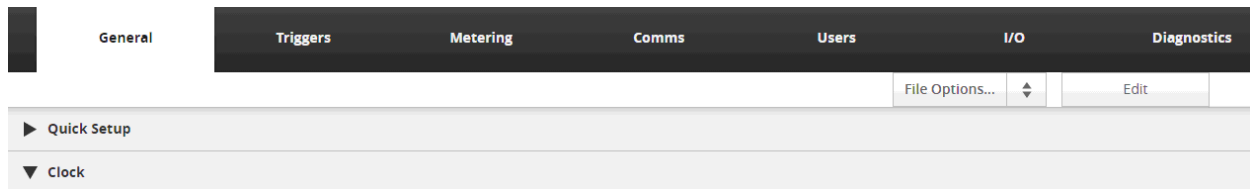
3. On the Meter Webserver home page, click Settings, then Quick Setup to display basic configuration setup.



4. Click Edit to make changes to these parameters.



5. Set the clock by clicking on Settings > Clock > Edit.



Notes on Modbus support:

The Optional Communications Expansion (CE) card also provides communication via Modbus RTU (CE3 & CE4 - see the User and Installation manual [IM02601004E] for Modbus instructions). The RS485 CE3 port supports Modbus RTU slave to a master monitoring system. The port defaults as a Master Gateway, which relays Ethernet Modbus TCP command to slave meters connected to the same RS485 link. The Modbus slave address may be set via the Display or with a web browser.

3 INSTALLATION

The Power Xpert Meter is designed to be installed, operated and maintained by adequately trained personnel. These instructions do not include all details, variations or combinations of the equipment, its storage, delivery, installation, checkout, safe operation or maintenance. Compliance with local, state and national regulations, as well as with industry standard safety practices for this class of equipment, is imperative.

This chapter describes mounting, wiring, startup and miscellaneous details associated with the Power Xpert Meter. Every section should be reviewed prior to installing this device.



WARNING

SHOCK HAZARD:

VERIFY THAT ANY INCOMING AC POWER OR FOREIGN POWER SOURCES ARE TURNED OFF AND LOCKED OUT BEFORE PERFORMING ANY WORK ON THE POWER XPERT METER OR ASSOCIATED EQUIPMENT. Failure to do so can result in death, injury, or damage to equipment.

3.1. Mounting

It is recommended that the Power Xpert Meter is mounted in an electrical switchgear enclosure that is suitable for its environment. The Power Xpert Meter is designed with flexibility in mind. While it is recommended that the display be door or panel mounted, the meter can be mounted remotely from the display on a flat surface or panel elsewhere in the enclosure.

- To maintain proper ventilation, Power Xpert Meter must remain vertical at all times with 3 inches of clearance above and below the chassis. The meter also requires a minimum of 2 inches of clearance in front of the face plate for wiring clearance or 4 inches of clearance if fiber optic or RS232 connections are used.
- The meter should be installed in a Pollution Degree II environment.
- The meter should be protected from accidental contact with live terminals in the enclosure. A 1/8 inch steel panel or door, solidly grounded, is recommended.
- Before cutting the panel, check the required three-dimensional clearances for the meter case, particularly behind the panel (see the dimension drawings in this chapter). If mounting on a swinging door, check the swinging clearance of rear projections and wired connections. Remember to allow for extra space for all wiring, intermediate terminal strips, shorting blocks or any other required components.
- The Power Xpert Meter comes standard with the remote mounting brackets attached.
- Attach the meter to the flat panel using the four circular holes or the four keyholes previously drilled into the panel.

3.2. Wiring of CT & VT Connections

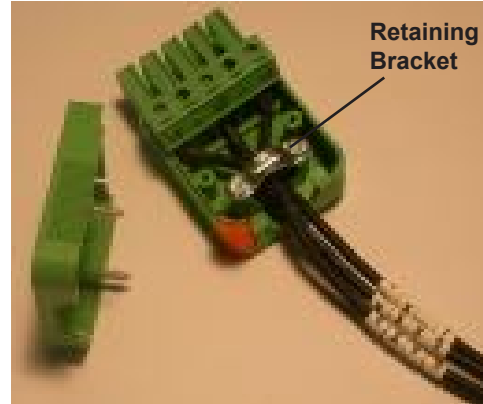
Install the cable supplied in the mounting kit to connect the display (DG1 & DG2) to the Meter (CM5 & CM6) on the CM-X board.

The Power Xpert Meter models PXM4000, PXM6000, and PXM8000 series are provided with terminal blocks for CT and VT connections. Due to the hazards of open circuit CT's, the Current terminal block is equipped with a special hood that includes top and bottom retaining screws. It is required that this terminal block be fully assembled including the hood in order to properly secure the current terminal block. Failure to fully assemble and secure this connector to the meter chassis can result in an open circuit CT condition.

NOTE: Because the hooded connector will cover the wiring designations printed on the block terminal, it is important to mark the wires so they can be identified after the ends are seated in the connector housing.

The Power Xpert Meter PXM4000/PXM6000/PXM8000 is equipped with multiple cards and terminal blocks. Each terminal block has an identification and each terminal has an identification. For example, the voltage input terminal block is identified as [VT-] The individual terminals are identified as V1, V2, V3, V4, and VR. The intended terminal identification scheme combines these references. For example, the V1 connection on the VT terminal block would be referred to as VT-V1. Proper use of this terminal block and terminal point nomenclature should result in a clear identification scheme for each connection to the meter.

The current and voltage terminal blocks provided will accept up to one #10 AWG wire per connection. Before wiring and assembling connectors, wire markers should be placed on the wires a sufficient distance from the stripped ends to be clearly visible after the connector hoods are assembled. Each wire identification should be visually confirmed as it is attached to the terminal block.



VX Auxiliary Voltage Terminal Block Inputs



VT Voltage Terminal Block Inputs



CT Current Terminal Block Inputs

Wiring of CT & VT Connections, Con't.

Check to be sure all required CT and VT terminal block and terminal block hood hardware is available. Do not proceed with installation without the correct CT and VT terminal block and terminal block hood hardware.

Insulation should be stripped back 3/8 in. for proper connection.

A 1/8 in. flat blade screwdriver should be used to tighten the terminal block screws.

Current and Voltage terminal block hoods are equipped with retaining brackets to retain the wires in the proper wire channel. To prevent accidental damage to wire insulation while assembling connector hoods, retaining brackets be securely and properly installed.

The hooded connector, when properly assembled, can be grasped to insert and remove from terminal block socket. Do not remove terminal blocks by pulling on the wires.

Terminal blocks are polarized and should only be inserted in the proper orientation. To prevent damage to the equipment or hazardous conditions, care should be taken to orient the terminal plug correctly with respect to the socket before insertion.

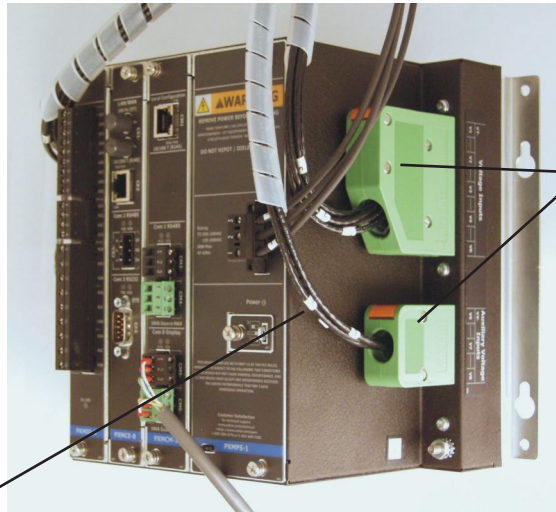
If CT or VT terminal blocks or connector hoods are lost or damaged, contact your Eaton representative to obtain the correct replacement hardware.



WARNING! The use of improper CT or VT terminal block hardware may result in severe injury or death.

Photos of the Power Xpert Meter with hooded connections properly installed are displayed on the following page.

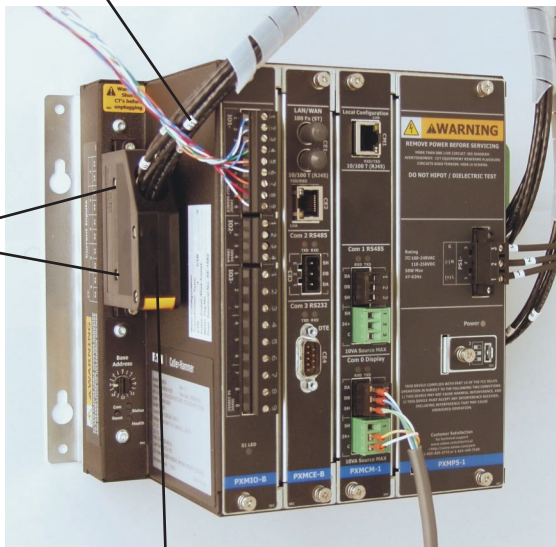
3.3. CT & VT Connector Installation on the Power Xpert



VT and VX Voltage Terminal Block hood assemblies

Wire markers

NOTE: Because the hooded connectors will cover the wiring designations printed on the block terminals, it is important to mark the wires so they can be identified after the ends are seated in the connector housings.



CT Terminal Block Retaining Screws

CT Terminal Block hood assembly

3.4. Meter Dimensions

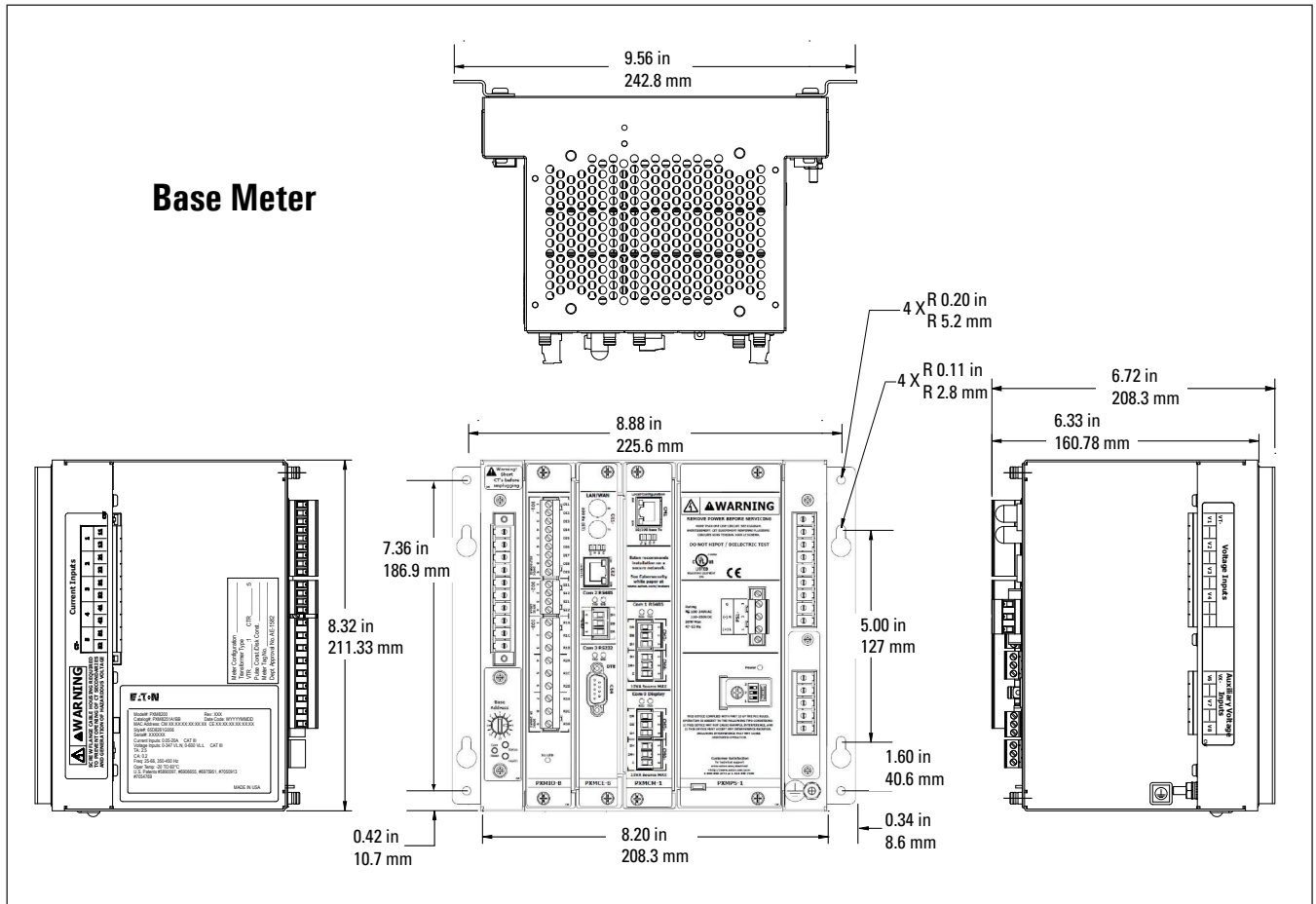


Figure 6: Power Xpert 4000/6000/8000 Meter.

3.5. Wiring



Wiring of the Power Xpert Meter must follow a suitable wiring plan drawing. The phase wiring plan refers to the drawings made for the specific application. It describes all electrical connections between the meter and external equipment. A network wiring diagram can also be helpful for networked systems. Specific wiring diagrams are useful when creating the overall wiring plan drawing. Wiring diagrams for each system configuration are addressed below.

WARNINGS

SHOCK HAZARDS:

IF THIS DEVICE IS BEING USED ON A SINGLE PHASE SYSTEM, WIRE TO PHASE A AND NEUTRAL.

The following general considerations should be complied with during the wiring of the Power Xpert Meter.

All wiring must conform to applicable Federal, State and Local codes.

The wires to the terminal blocks must not be larger than AWG No. 10 (CT, VT, VX). Larger wire will not connect properly to the terminal block.

Wiring diagrams contacts are shown in their de-energized position.

Because the Power Xpert Meter monitors the neutral-to-ground voltage, the chassis of the meter must be connected to ground. A good low impedance ground is essential for proper functioning.

PT AND CT SECONDARY CIRCUITS ARE CAPABLE OF GENERATING DANGEROUS VOLTAGES AND CURRENTS WITH THEIR PRIMARY CIRCUITS ENERGIZED, AND COULD CAUSE PERSONAL INJURY AND OR DEATH.

The proper selection of any required current transformers or potential transformers is critical to the proper and accurate functioning of the Power Xpert Meter. Instrumentation grade devices are required. **Shorting blocks for CTs and a three-phase switch or circuit breaker for voltage are recommended near the equipment for ease of installation.** If assistance with the selection process is desired, contact Power Quality Technical Support representative.

3.6. Fuses

It is required that user supplied fuses be installed as described below.

External fuses should be installed in the meter voltage tap to the main lines, near the meter housing. 600 V 1/2 A BUSS type KTK-R-1/2 Fast Acting or equivalent fuses are recommended for the Power Xpert Meter VT connections.

External fuses should be installed in the potential transformer lines as specified in the National Electric Code for the specific application.

The power supply wiring should be fused or put on a breaker sized to protect the wire.

3.7. Hipot and Megohm (Megger) Testing

CAUTION

DO NOT HIPOT OR MEGOHM TEST THE METER. SEVERE DAMAGE TO THE METER CAN RESULT.

3.8. Communication Wiring

The Power Xpert Meter (PXM 4000/6000/8000) has inverted terminal blocks for CM4 - the 24V Auxiliary I/O Power and CM6. These inverted terminal blocks prevent the user from crossing 24v source and communication terminals.

RS485 fail safe biasing resistors are used at each master port.

Eaton strongly recommends using ferrules on wire ends when connecting to a terminal block.

When connecting to a terminal block, the twisted pair sensitivity is critical for COM0, COM1 and COM2. This means that the Data A wire must match up with Data A on the terminal and the Data B wire must match up with Data B on the terminal.

Terminal	Port Name	Port Type	Port Connection	Cable Length	Cable Type	Max Baud Rate	Max Number of Devices	End of Line Termination	Star	Tap	Twisted Pair Sensitivity
CM5	COM0RS485	RS485	Terminal Plug	2,000ft / 610 M	Shielded Twisted Pair	115 K	16	120ohms	NO	NO	YES
CM3	COM1RS485	RS485	Terminal Plug	**4,000ft / 1,219.20 M	Shielded Twisted Pair	115 K	32	120ohms	NO	NO	YES
CE3	COM2RS485	RS485	Terminal Plug	**4,000ft / 1,219.20 M	Shielded Twisted Pair	115 K	32	120ohms	NO	NO	YES
CE4	COM3RS232	RS232	DB9	50 ft / 15 M	Shielded Cable	115 K	2(1:1)	na	NO	NO	YES
CE1	LAN/WAN	100Fx	ST	2000 M	Multimode 62.5 μ m or 50 μ m	100M	2(1:1)	na	NO	NO	NO
CE2	LAN/WAN	10/100 T	RJ45	328 - 492 ft/100-150M	CAT5 Shielded TwistedPair / UTP*	100M	2(1:1)	na	NO	NO	NO
CM1	Local Configuration	10/100 T	RJ45	98 ft / 30 M	Cat 5 Shielded Twisted Pair/ UTP	100M	2(1:1)	na	NO	NO	NO

**RS485 maximum cable length is dictated by baud rate. Above 38.4Kbaud the length is restricted to 2,000 ft.

3.9. RS485 Network

The following simplified rules apply to a given system consisting of master and slave devices. For more complex configurations please refer to standard wiring specification rules for the RS485 network.

The maximum system capacity is 4,000 feet of communication cable and 32 devices.

Make sure the twisted pair wire is recommended for RS485 network use. For reference, review the RS485 wiring spec for wiring specifications.

Tie the communication cable shield to ground only once at the RS485 master device.

3.10. RS485 Cable Characteristics

Make sure the twisted pair wire is recommended for RS485 applications:

- Single twisted pair for data 18-24AWG
- Shield consisting of aluminized Mylar & partial coverage braid with drain wire
- Characteristic impedance ~ 120 ohms
- Data L-L capacitance ~12pF/ft.
- Typical ratings are 75C and 300V NEC CM
- Belden Data Tray series 3074F is 600V NEC TC

3.11. RS485 Wiring Basics

The maximum system capacity is 4000 ft. of cable and 32 devices. The baud rate can restrict the maximum cable length (see the table in this section).

- Wiring is done in a strict daisy chain without taps or stars
- 120 ohm 1/4 W End-of-Line Termination Resistors (EOLTR) are required at each end of the cable
- Attach like terminals to like terminal types for each RS485 port being networked.
- Tie the communication cable, shield to ground, at one location only.
- Data line definition - As per the RS485 standard - In an idle marked state (logic 1) Data B (+) will be electrically > than Data A (-)

Note: When connecting to third party RS485 devices their data line nomenclature may be inverted. If the RXD LED is on continuously, this indicates a crossed data pair.

- The use of ferrules to terminate the cable ends is strongly recommended to minimize problems with frayed wires and to strengthen the terminal block connection, when daisy chaining wires use a dual wire ferrule.

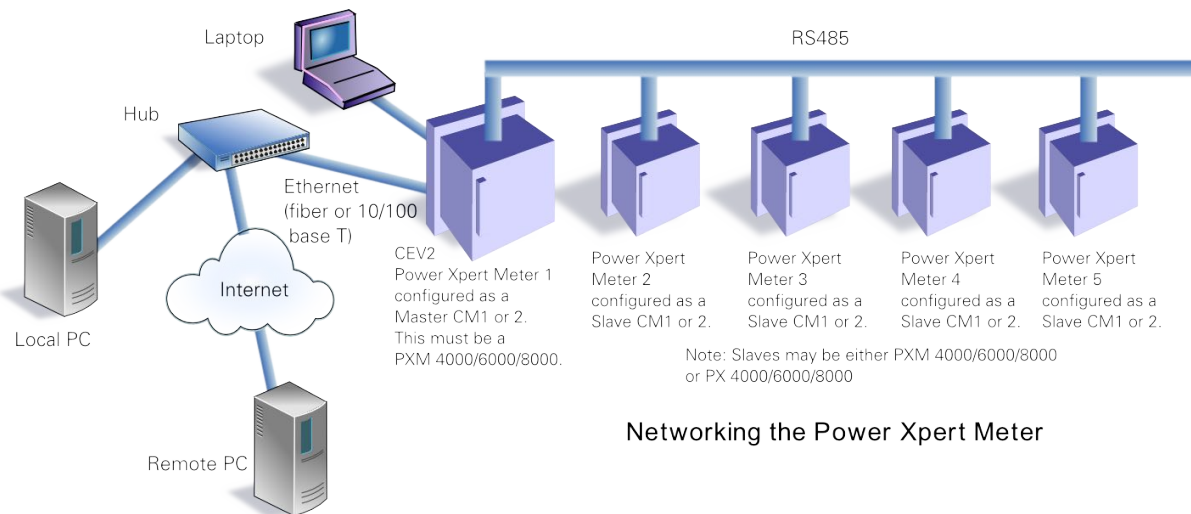
Phoenix Contact and many other vendors carry ferrules and crimping tools for this purpose.

For more information about RS485 wiring, please refer to TD 17513, Eaton Electrical field Devices Communication Wiring Specification.

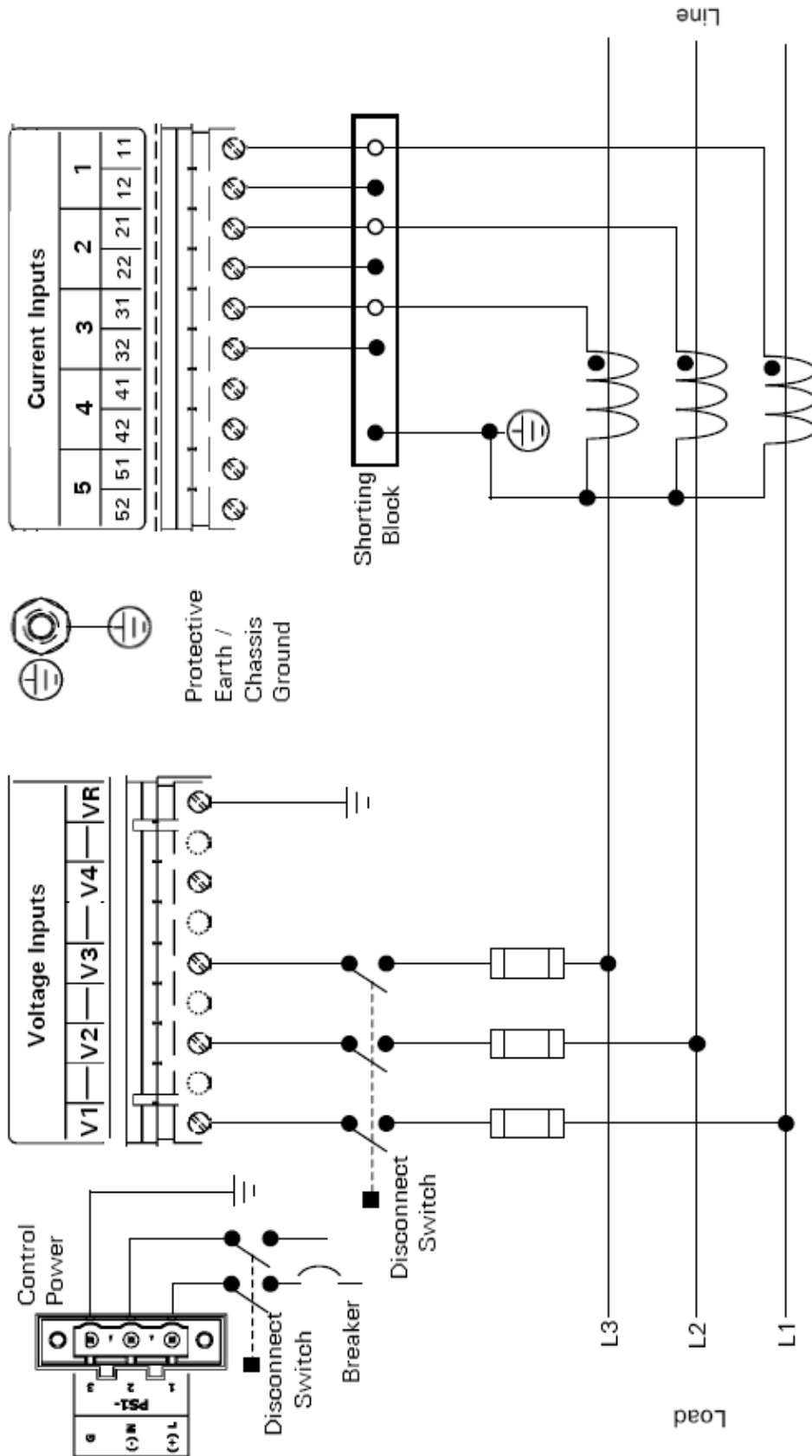
Fail safe Pull up/down Bias resistors (Rb) are used to insure that the RS485 link goes to a marked state when no node is driving the line. The bias resistors are applied at only the Master node of each RS485 link and not at each slave. The COM ports on PXMCE and PXMCM cards have jumpers to selectively engage the bias.

- COM0 - defaults to a slave - jumpers default to Rb NOT ENGAGED.
- COM1 defaults to a slave - jumpers default to Rb NOT ENGAGED
- COM2 defaults to a master - jumpers default to a Rb ENGAGED

Refer to Appendix D for jumper placement on the PXCE card. Refer to Appendix E for jumper placement on the PXMCM card.

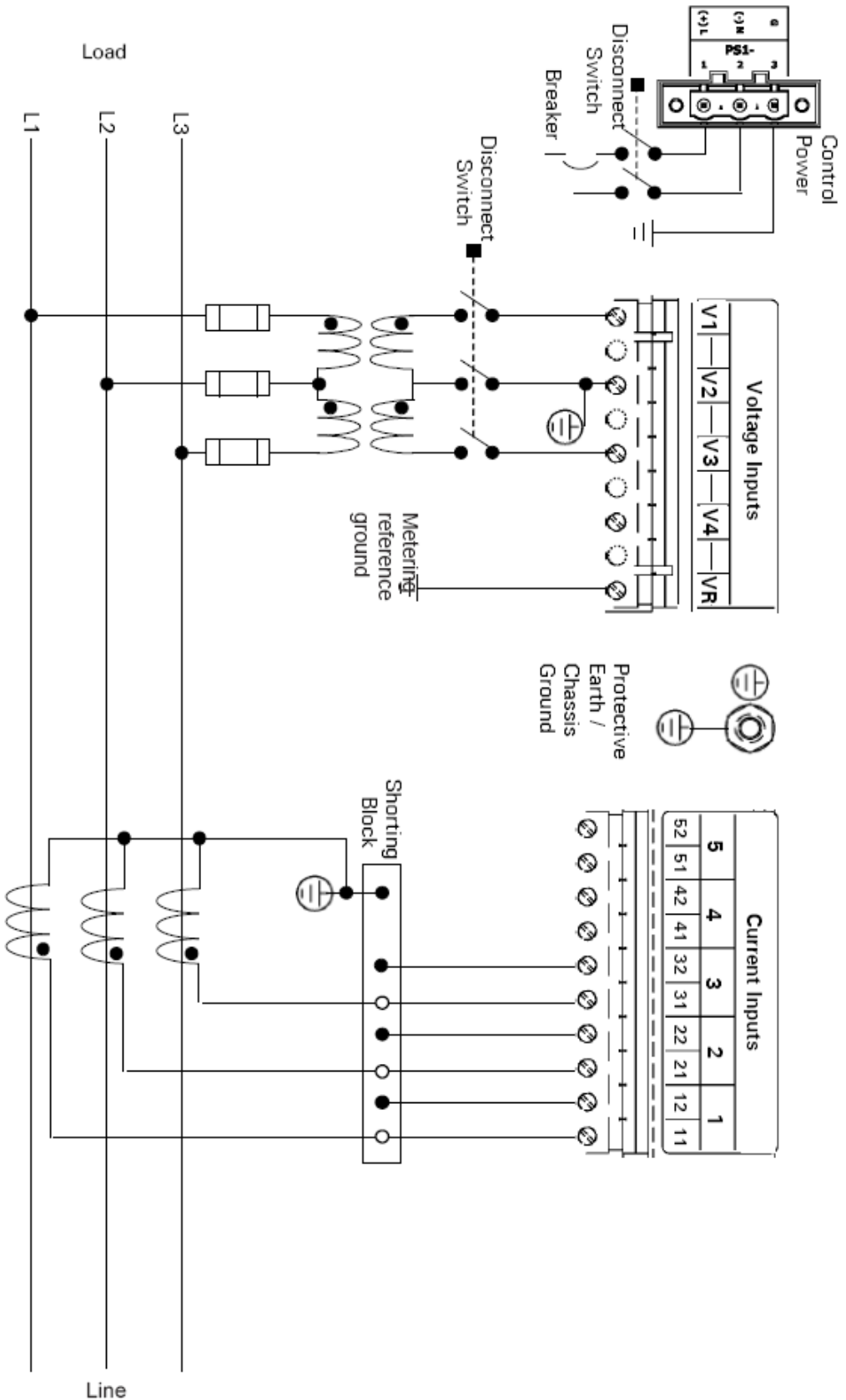


Networking the Power Xpert Meter



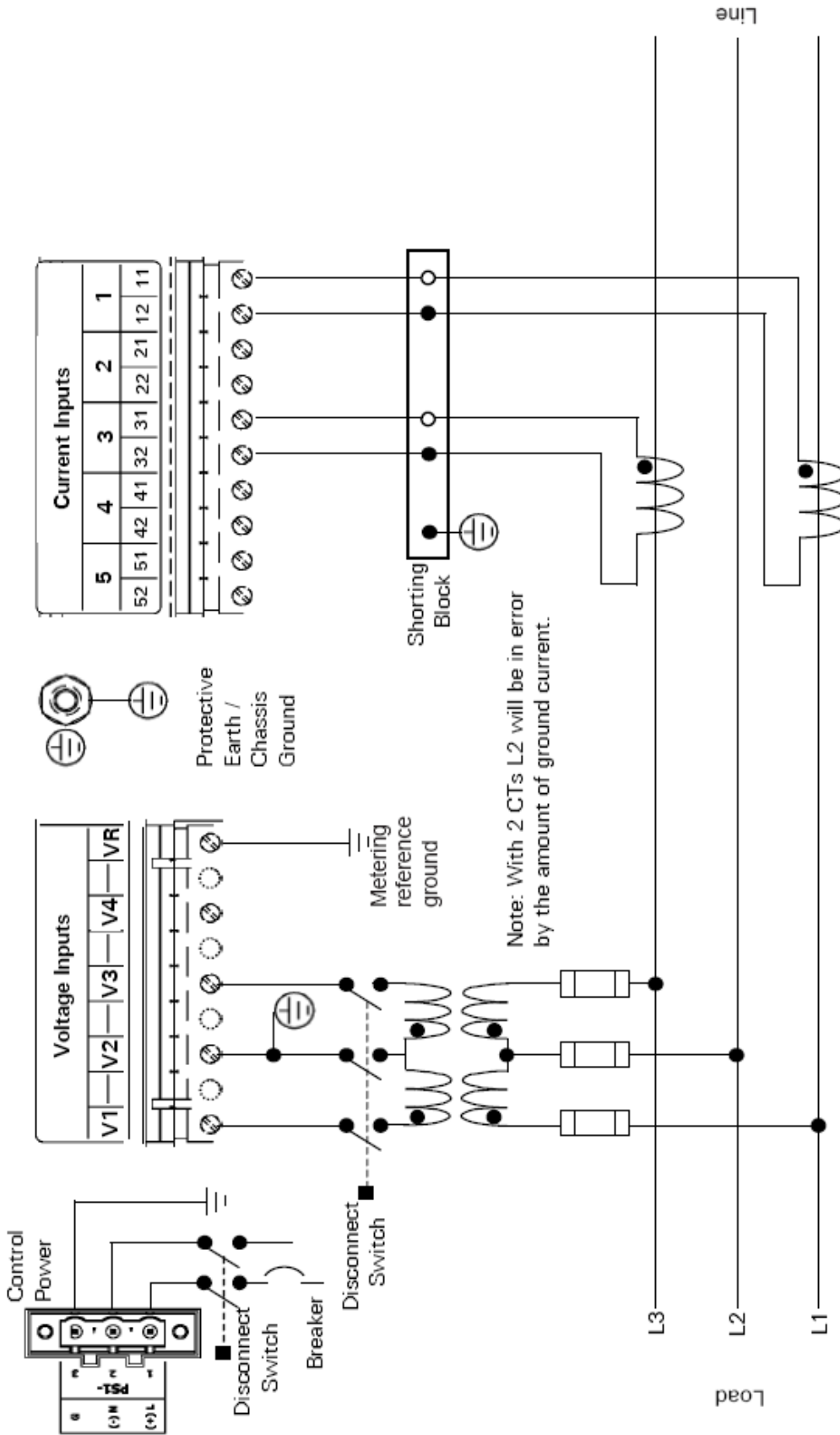
Based upon the voltage rating, a control power transformer may be needed for the control power.

**3 Phase 3 Wire Delta (Up to 480 Volts)
Direct Voltage Connection & External Current Transformers**



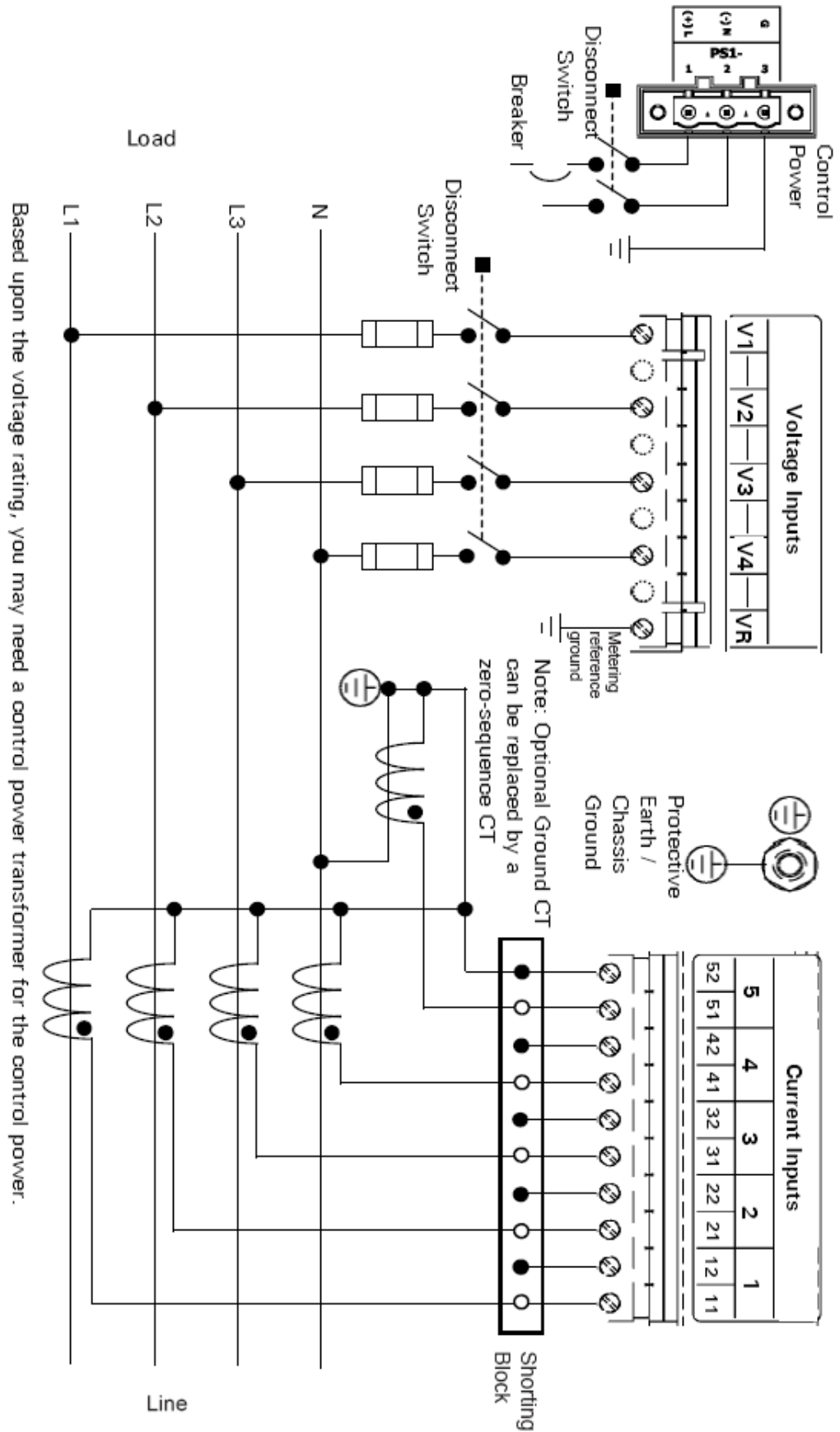
Based upon the voltage rating, a control power transformer may be needed for the control power.

**3 Phase 3 Wire Delta (Above 480 Volts)
External Voltage Transformers & Current Transformers**

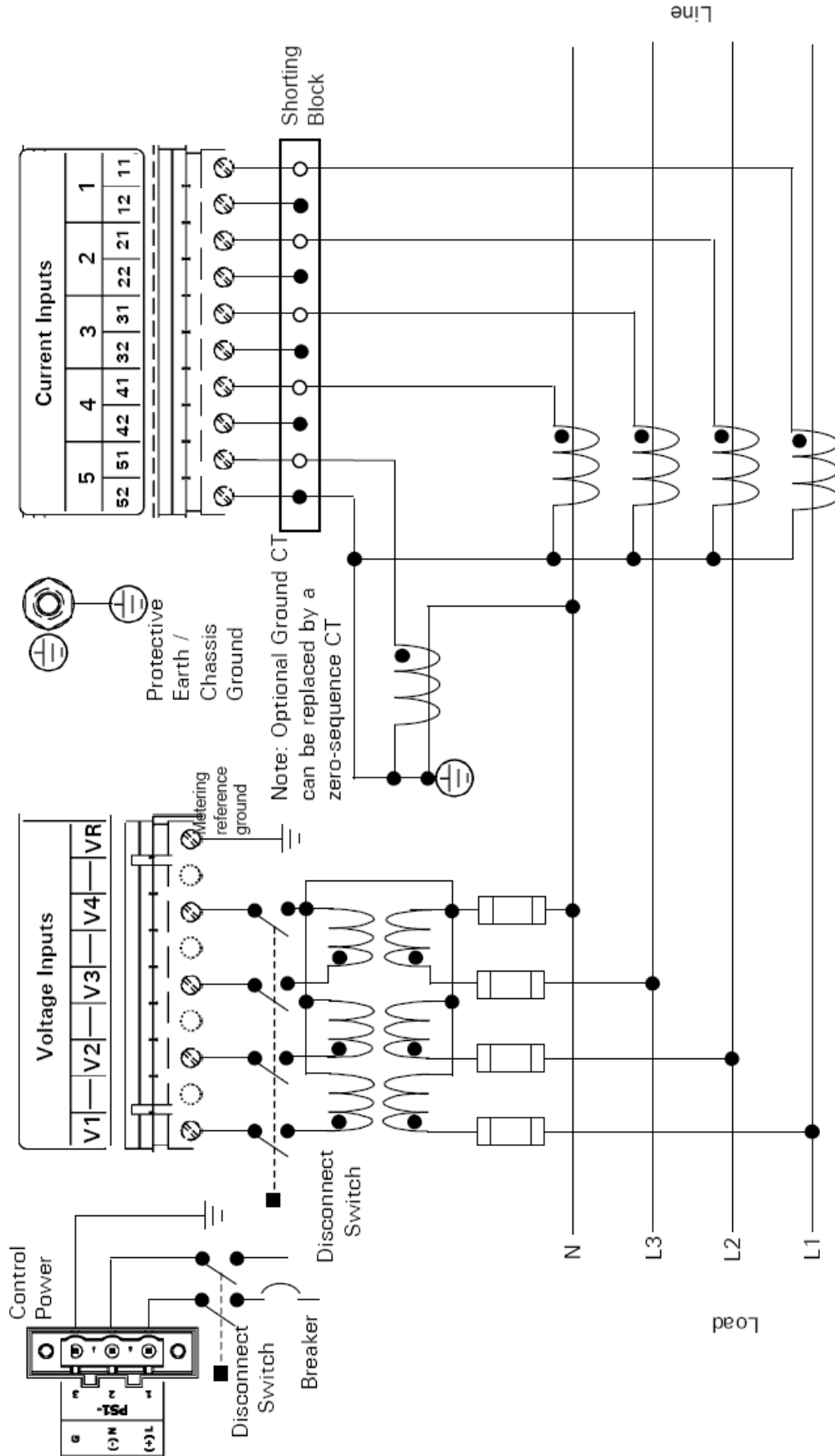


Based upon the voltage rating, a control power transformer may be needed for the control power.

**3 Phase 3 Wire Delta (Above 480 Volts) 2 CTs
External Voltage Transformers & Current Transformers**

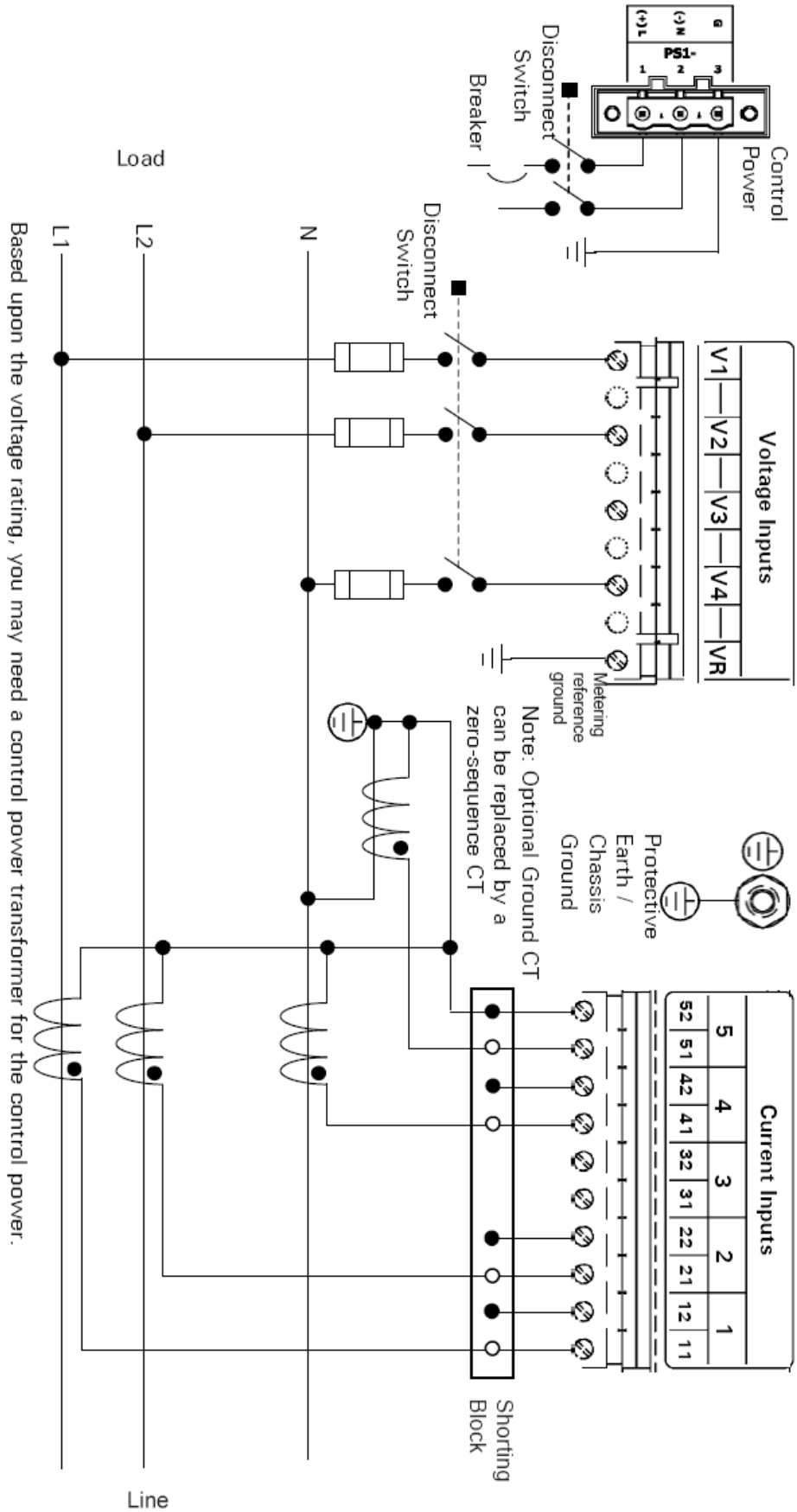


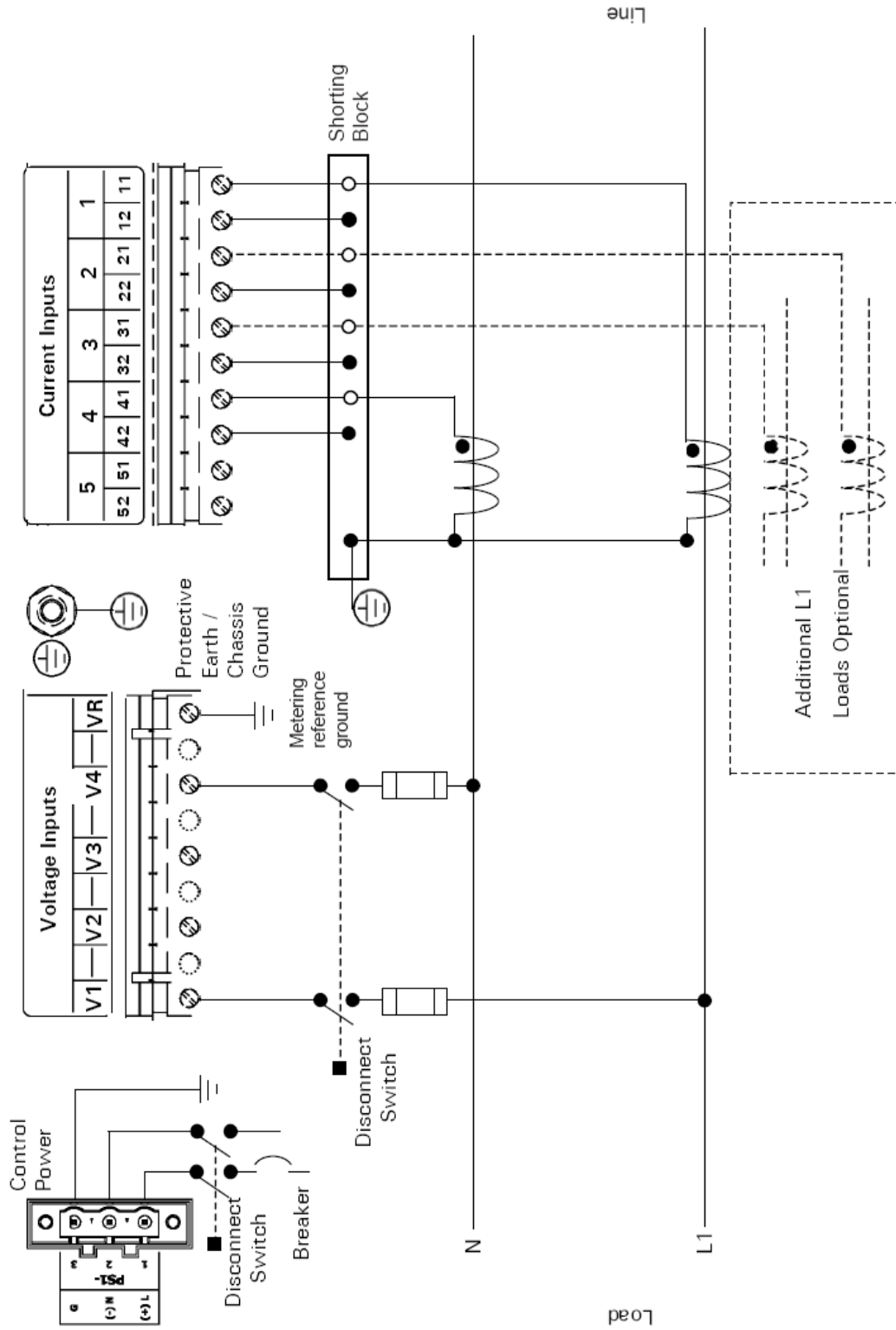
3 Phase 4 Wire Y (Up to 600 Volts)
Direct Voltage Connection & External Current Transformers



Based upon the voltage rating, you may need a control power transformer for the control power.

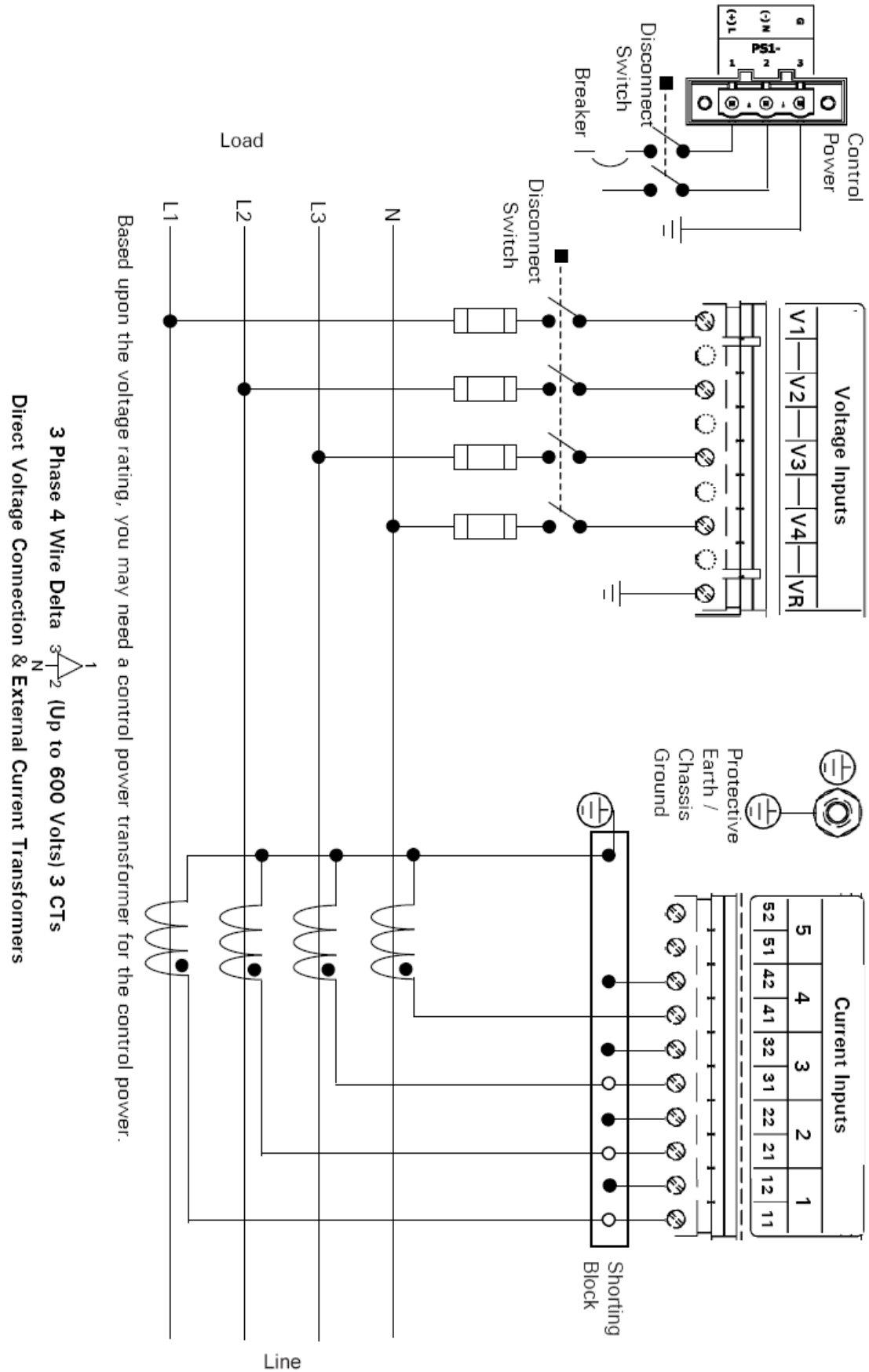
**3 Phase 4 Wire Y (Above 600 Volts)
External Voltage Transformers & Current Transformers**

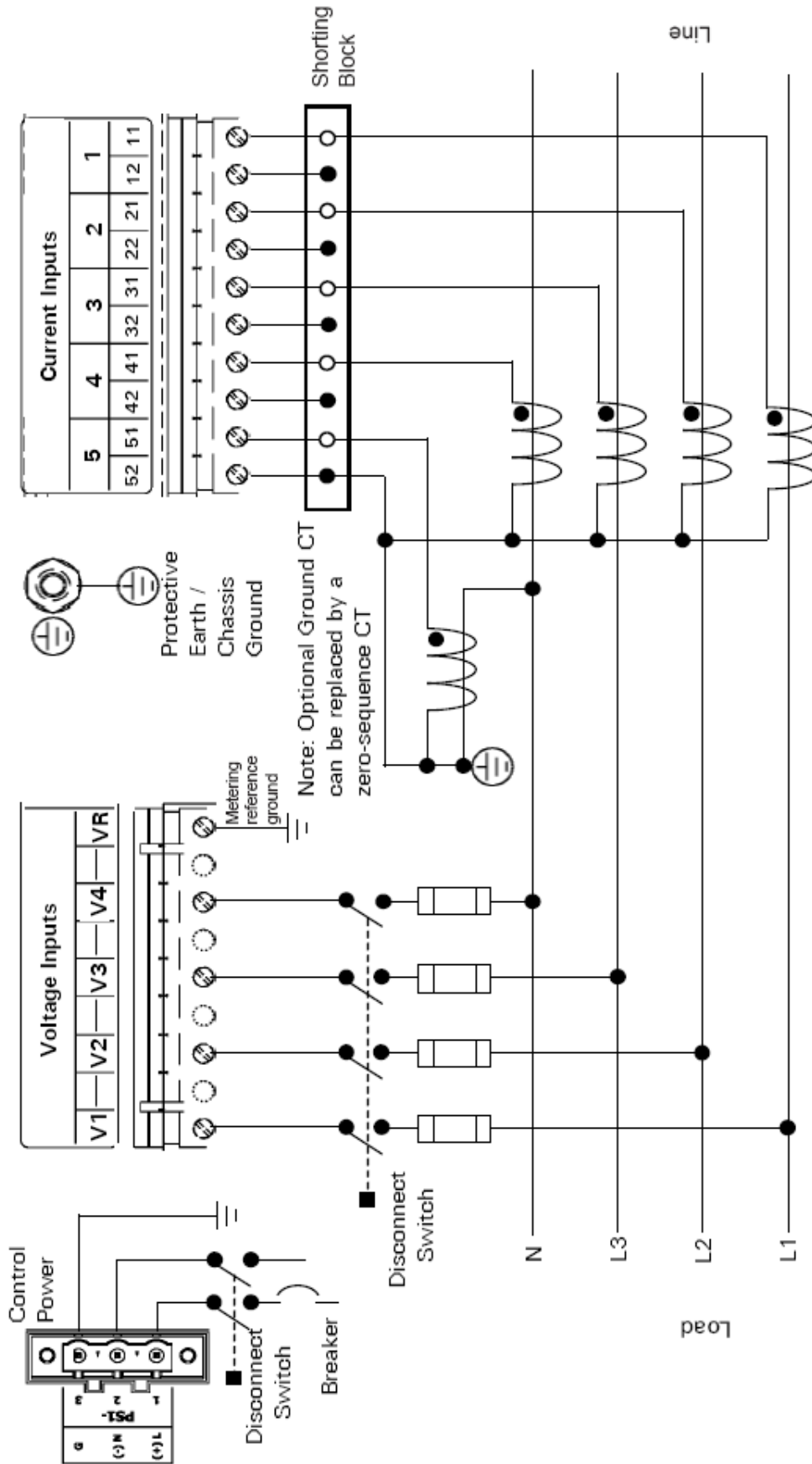




Based upon the voltage rating, you may need a control power transformer for the control power.

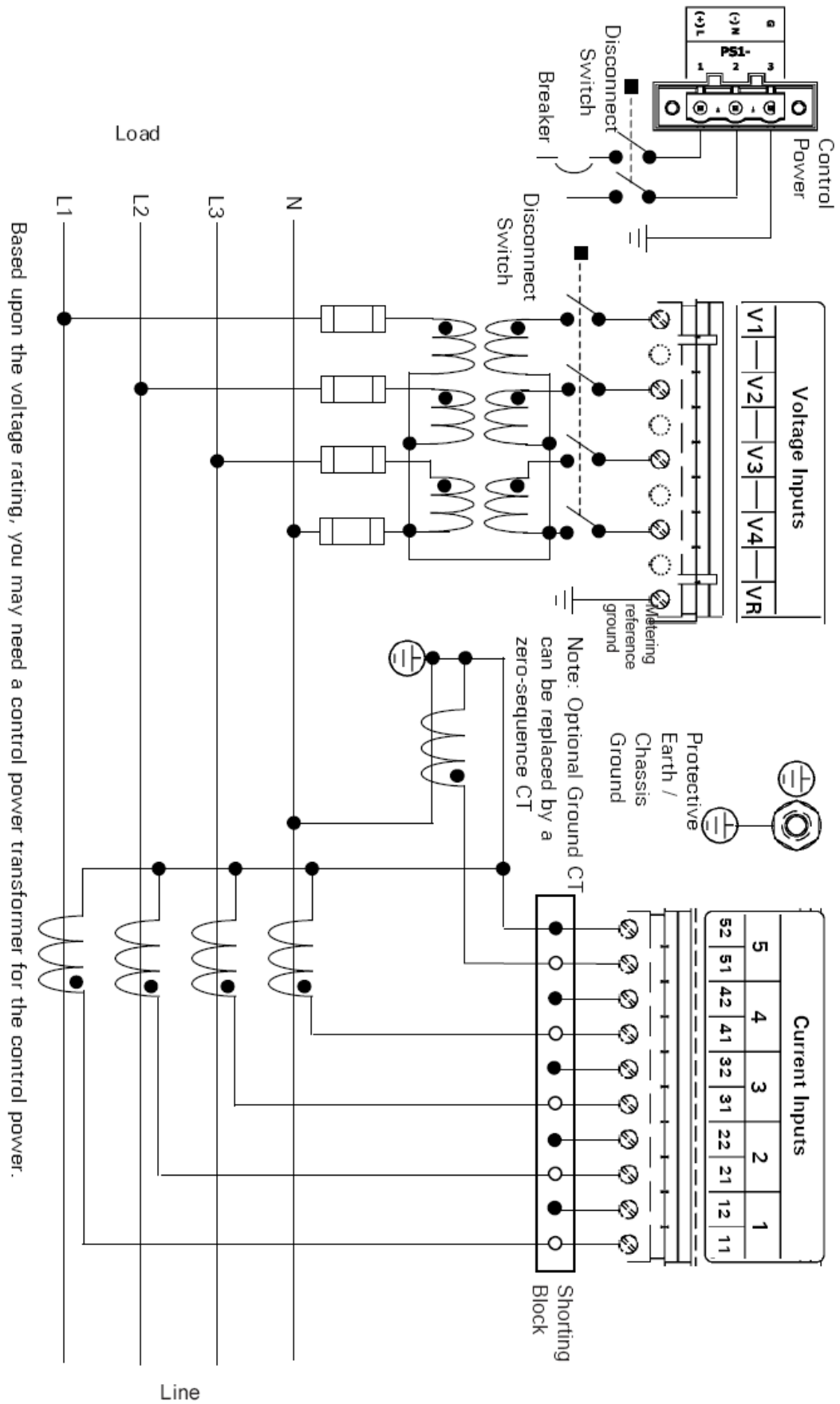
Single Phase 2 Wire (Up to 600 Volts)
Direct Voltage Connection & External Current Transformers





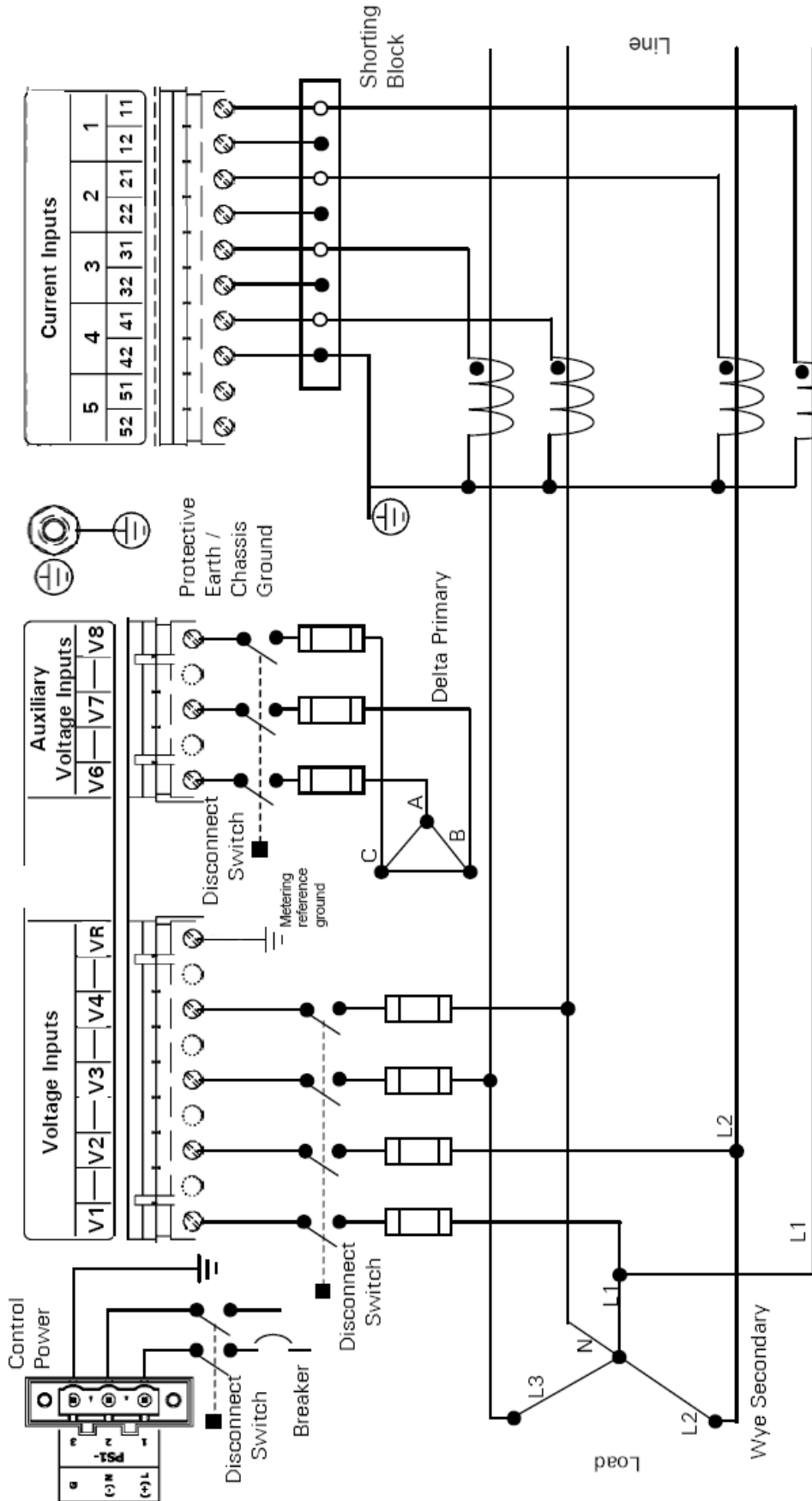
Based upon the voltage rating, you may need a control power transformer for the control power.

3 Phase 4 Wire Y (Up to 600 Volts)
Direct Voltage Connection & External Current Transformers



Based upon the voltage rating, you may need a control power transformer for the control power.

**3 Phase 4 Wire Y (Above 600 Volts)
External Voltage Transformers & Current Transformers**



When Auxiliary Voltage Input is present Voltage Input VR is not available.

Delta Wye Transformer Monitoring (up to 480/600 Delta/Wye Volts)
 (AUX Application) Direct Voltage connections & External Current Transformers

3.12. LEDs

The Power Xpert Meter contains several LEDs for health, application event status and communication links. These LEDs provide a quick way of confirming power, application status (event) and communication activities.

Meter LEDs

The Health LED, located on the bottom left side of the meter, will blink green at a slow rate (1 sec on/off) when the meter has no fault conditions present. It will blink red at an accelerated rate (twice per second) when a reboot operation is required due to a self-test failure, an internal fault, an invalid configuration, or a communication fault during power-up initialization.

NOTE: During initialization, the Status LED will blink red in patterns of 3 until the meter's Digital Signal Processor (DSP) is running and accumulating energy. At that point, the Health LED will blink green rapidly while the Power Xpert Meter's Linux operating system boots.

NOTE: For the first minute, the Health LED will blink green rapidly. During this time, the Power Xpert Meter accumulates energy, but does not record new min/max values. It will blink red rapidly to indicate that changes to settings will not take effect until the meter is rebooted. If the Health LED is off continuously, this indicates the power is off or an abnormal condition exists. If the Health LED is on continuously, this indicates an abnormal condition.

The Status LED, located on the bottom left side of the meter (next to the Health LED), will be either green or red. Normally be solidly green, but will slowly blink red when there are unacknowledged events in the Power Xpert Meter's Events list. After the events are acknowledged or cleared, the Status LED will return to a solid, green state. If the LED repeats a series of three red blinks, the meter is in factory test mode. See the Troubleshooting chapter for more information.

Card LEDs

The blue Power LED, (located in the center of the PXMPS-1 faceplate, is lit whenever power is applied to the meter. Before servicing the meter, ensure that this LED is not lit.

The following ports have transmitting LEDs and receiving LEDs that blink when transmitting or receiving information respectively:

- LAN/WAN 10/100 T RJ45 (CE2)
- COM2 RS485 (CE3)
- COM3 RS232 (CE4)
- COM3 Modem (CE5)
- Local Configuration 10/100 T RJ45 (CM1)
- COM1 RS485 (CM3)
- COM0 (CM5)

The Ethernet ports support a link LED and combine the TXRX function as a bicolor LED. The PXMIO Card has an S1 LED at the bottom of the card that follows the status of solid state relay #1. This red LED can be used with optical standards.

3.13. Comm Reset

You can reset all of the communications ports by pressing a recessed button located to the left of the status LEDs. The button is marked "Com Reset." This may be done as part of troubleshooting. The button must be held for at least 2 seconds to prevent pressing it accidentally.

4 INTRODUCTION TO WEB SERVER SCREENS

This chapter is an introduction to the Power Xpert Meter web server main screens and describes how to access basic information through them. Each option provides easy access to basic metering functions as well as setup configuration. Other information, such as waveforms, trending graphs, harmonic tables, phasors and ITIC curves is also available.

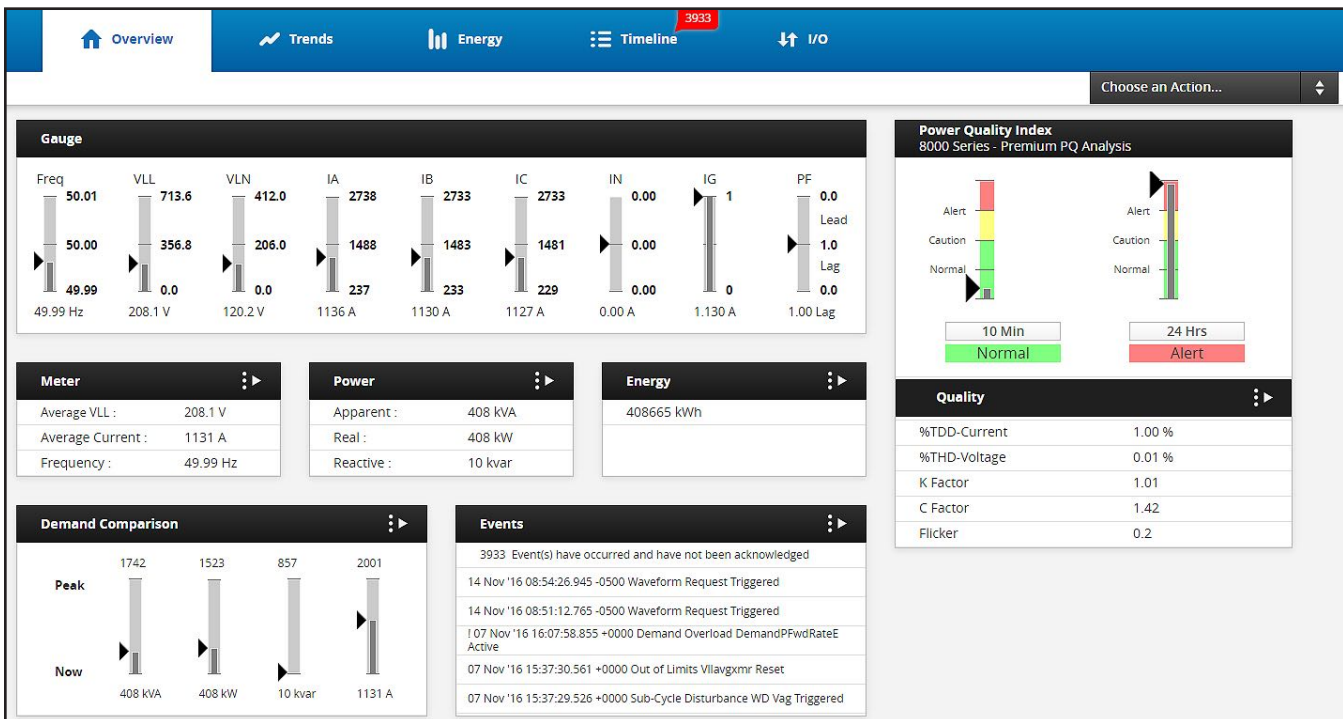
The Functions on the Web Server Screens chapter provides more detailed information about the functions, features and options available on each screen.

4.1. Overview Screen

From this screen the user can gain additional information about Overview, Trends, Energy, I/O, Timeline, and Settings. These selectable options are displayed in a menu bar at the top of the screen, as illustrated below. When one of the options is selected, the main section of the screen will update to display information about that option.

Each screen provides the means to access more detailed information by clicking on the appropriate icons. For example, in the Power Quality Index section below, there are buttons labeled 10 Min and 24 Hrs. By clicking on these options, the user will be able to access information that occurred during those time frames.

NOTE: The setup screens require a password to edit settings.



4.2. Trends

4.2.1 METER SCREEN

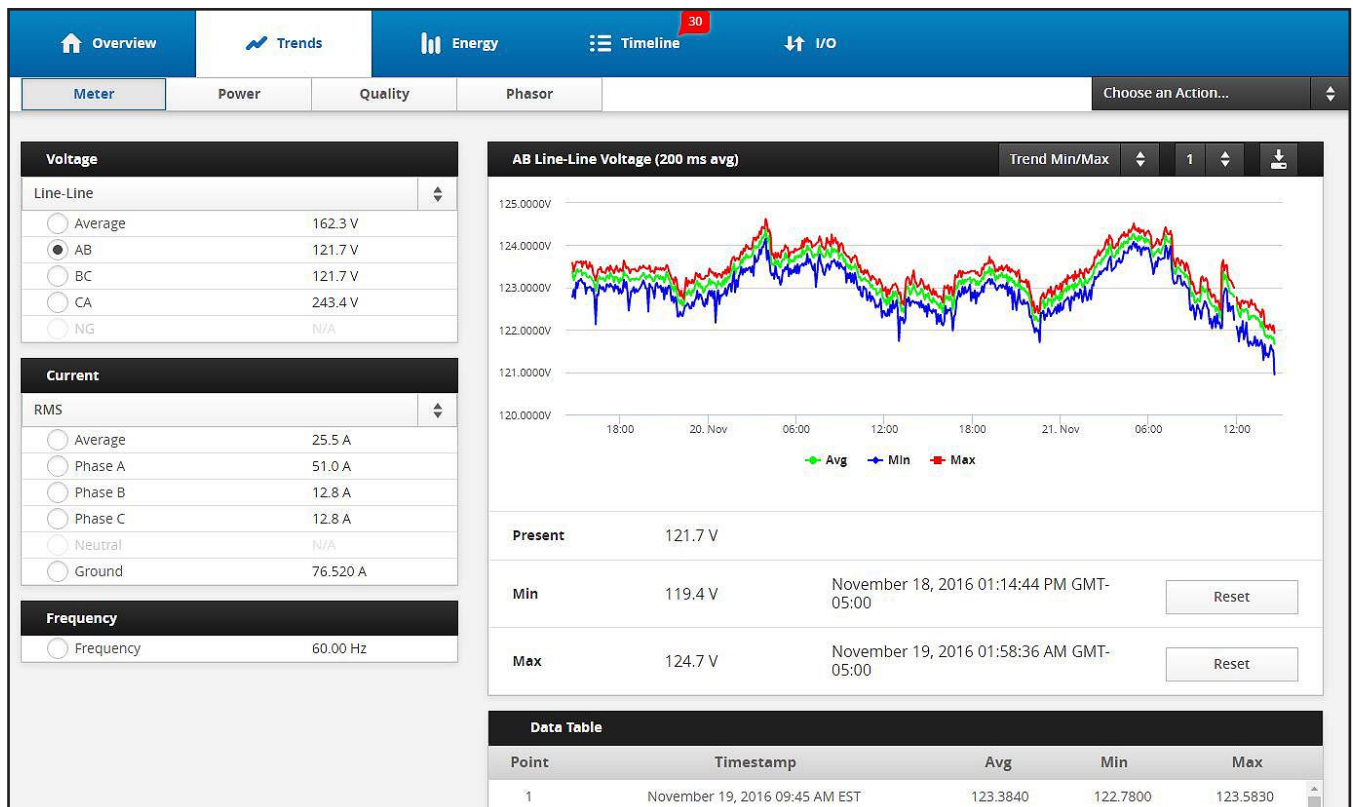
The Meter screen below has dropdown menus and radio buttons that allow the user to select how the voltage, current, and frequency are viewed. For example, voltage can be viewed Line to Line, Line to Neutral, Aux Line to Line, or Symmetric. The voltage option also contains radio buttons that permit the user to select the view; Average, AB, BC, CA or NG.

When a selection is made, the screen will update to display the information selected. This is a “snapshot” of the current values plus the historical values in the designated range (zoom). It doesn’t update automatically. Reselect the information to update the screen.

In the upper right portion of the screens, another drop down menu provides options for graphically viewing the information as well as an export a .CSV data file button.

For example, on the Meter screen the user can select Trend Min/Max, Waveform, or Harmonics views. Use the numbered dropdown at the top right corner of the graph to select your zoom level. The zoom feature provides the following options:

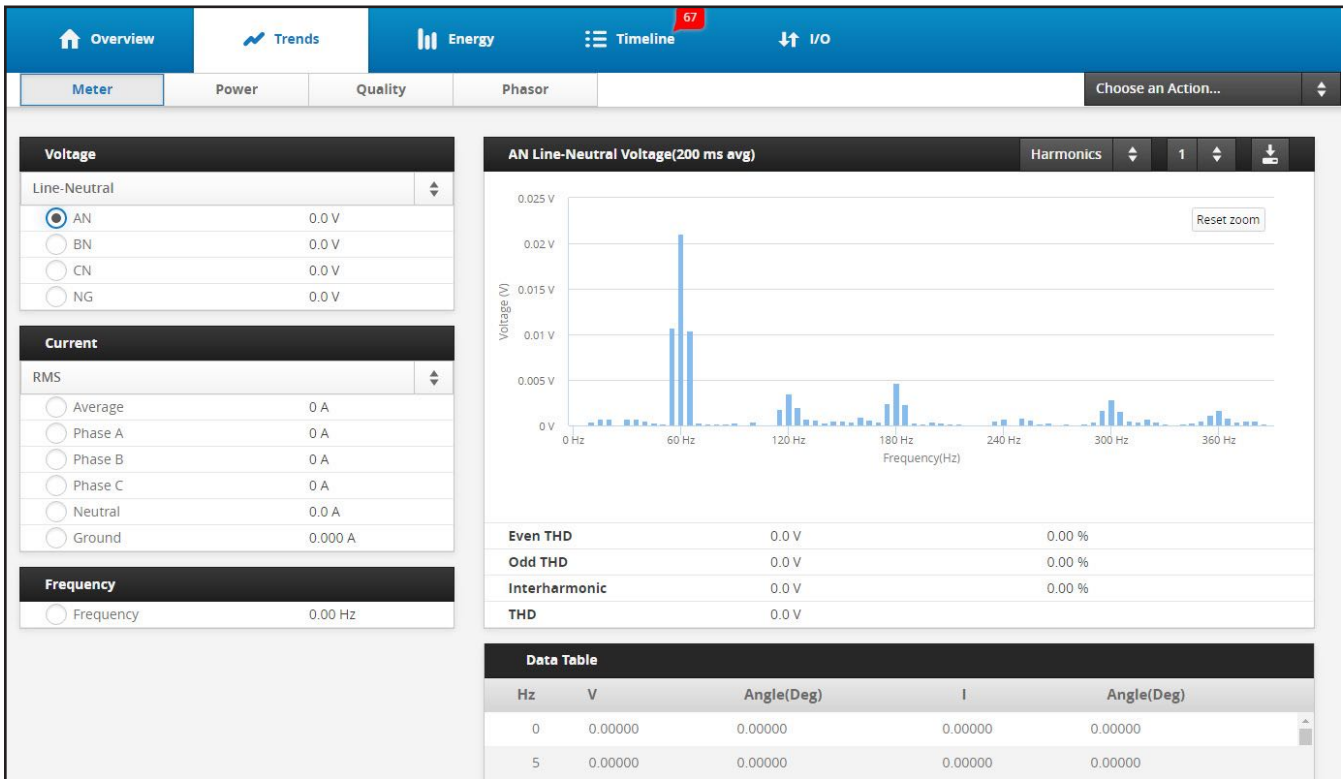
- (Zoom1) 16-hour range of 5-minute data pans to 48 hours
- (Zoom2) 48-hour range of 15-minute data pans to 192 hours (8 days)
- (Zoom3) 8-day range of 1-hour data pans to 28 days
- (Zoom4) 64-day range of 8-hour data pans to 56 weeks
- (Zoom5) 1,344-day (192-week) range of 1-week data pans to 44 months



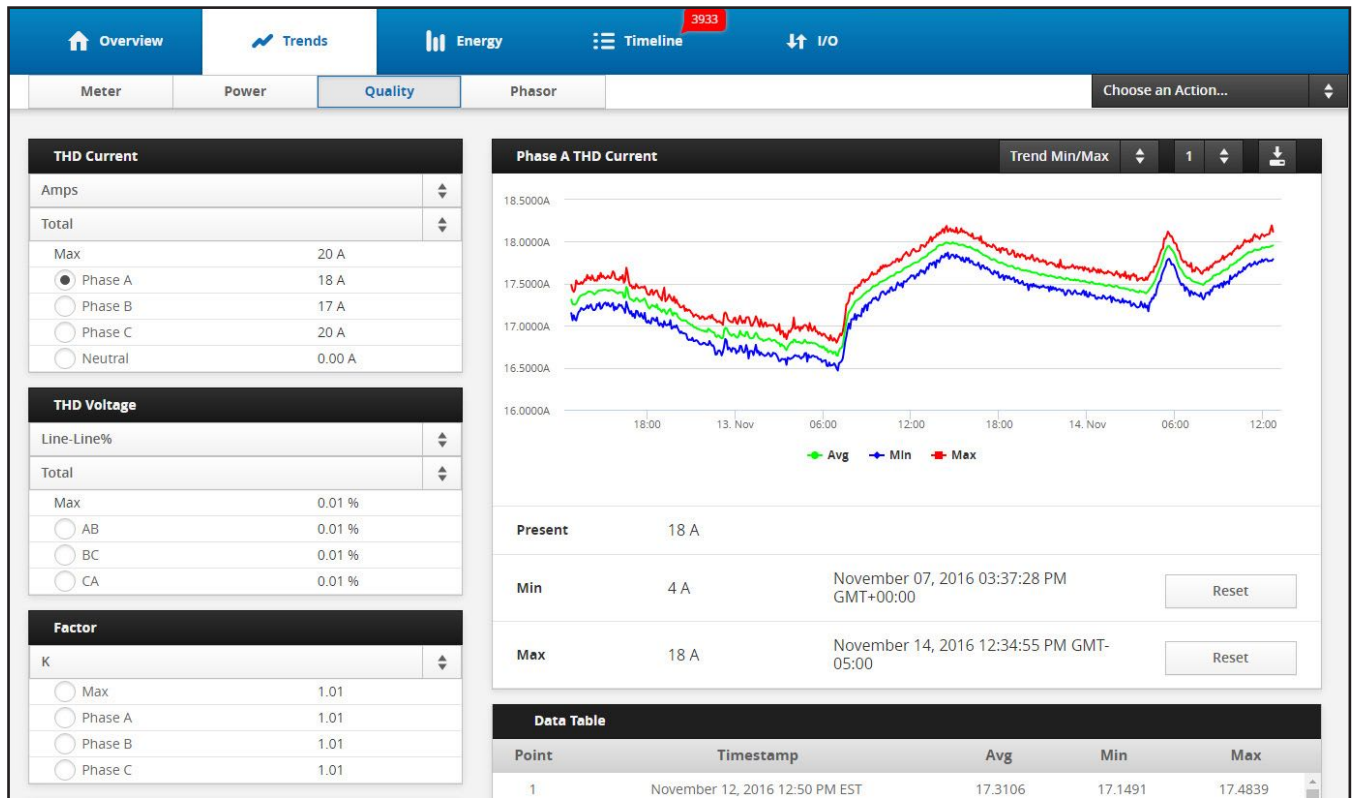
4.2.2 POWER SCREEN

The Power screen has dropdown menus and radio buttons that allow the user to select the information to be viewed and options for viewing it.

In the upper right portion of the screens, another dropdown menu provides options to control the level of zooming into the graph.



4.2.3 QUALITY SCREEN



4.3. Energy Screen

Click on the TOU drop-down box, then click on the option desired to navigate to that screen. The options are: Demand Profile, Demand Comparison, Energy Profile and Energy Comparison.

The screenshot shows the Energy screen interface. On the left, there are radio buttons for 'Energy / Demand' (Forward, Reverse, Net, Sum, KVAh / KVA, KVARh / KVAR) and 'Active' (Received, Delivered, Net, Sum, Display Demands in Amps). The 'Rate' is set to 'B'. The 'Last Demand Reset' is '21 Oct, 16 13:28:52'. The main area shows a TOU dropdown menu with options: Demand Profile, Demand Comparison, Energy Profile, and Energy Comparison. Below this is a table with columns for Energy and Demand.

	Energy	Demand
	(Present) 408 kW (Peak) 1523 kW 24 Oct 2016 19:51:49 (Peak Today) 408 kW@14 Nov 2016 12:52:50	
	(Total) 409096 kWh	
A	65437 kWh	1516 kW 30 Oct 2016 04:49:38
B	184338 kWh	1523 kW 24 Oct 2016 19:51:49
C	96726 kWh	1516 kW 27 Oct 2016 11:53:03
D	62595 kWh	1516 kW 30 Oct 2016 07:53:19
RTP	0 kWh	0 kW 21 Oct 2016 13:28:52

4.4. Timeline Screen

The left side of this screen lists events and the event log (e.g.; person logged in, new min/max, etc.) for the device. Click on an event to view detailed information about that event.

Drop down menus near the top of the screen provide viewing options such as Captured Parameters, Waveform, or RMS. To zoom in on the graph, click on the dropdown with the number one on the top right corner of the graph.

The RMS plot on the right side of the screen shows the RMS voltage trend line of the waveform captured during the disturbance.

The screenshot shows the Timeline screen. On the left is an event log with a list of events. The main area is split into two sections. The top section shows a waveform graph for 'November 21, 14:08:33.498 -0500 Sub-Cycle Disturbance WD Vag Triggered'. The bottom section shows an RMS plot for the same event. The event details for the selected event are shown below the RMS plot.

Event Log:

- 21 Nov '16 14:08:33.498 -0500 Sub-Cycle Disturbance WD Vag Triggered
- 21 Nov '16 14:08:32.685 -0500 Out of Limits Vab Reset
- 21 Nov '16 14:08:32.468 -0500 Sub-Cycle Disturbance WD Vag Triggered
- 21 Nov '16 14:08:28.686 -0500 Out of Limits THDVllys Reset
- 21 Nov '16 14:08:27.460 -0500 Out of Limits Vab Reset
- 21 Nov '16 14:08:27.239 -0500 Sub-Cycle Disturbance WD Vag Triggered
- 21 Nov '16 14:08:26.818 -0500 Out of Limits Vab Reset
- 21 Nov '16 14:08:26.560 -0500 Sub-Cycle Disturbance WD Vag Triggered
- 21 Nov '16 14:08:26.484 -0500 Out of Limits Fays Reset
- 21 Nov '16 14:08:26.305 -0500 Sub-Cycle Disturbance WD Vag Triggered
- 21 Nov '16 14:05:57.698 -0500 Out of Limits THDVllys Reset
- 21 Nov '16 14:05:57.698 -0500 Out of Limits THDVllys Reset
- 21 Nov '16 14:05:58.698 -0500 Out of Limits Fays Reset

Event Details:

- Acknowledgement: No
- Active: No
- Date/Time: November 21, 2016 02:08:33.498 PM -0500
- Type: DSPThreshold
- Measurement: WD_Vag
- Event: Triggered

4.5. I/O Screen

On Power Xpert Meters equipped with a PXMIO card, the I/O screen displays the status of the Discrete Inputs and Relay Outputs. For selected Discrete Inputs that are configured as counters, a profile plot appears. Typically, these represent selected consumption of Water, Air, Gas, Electricity or Steam from flow other than metering devices.

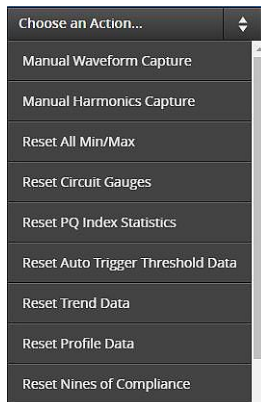


5 FUNCTIONS ON THE WEB SERVER PAGES

OVERVIEW

The Power Xpert Meter provides a detailed web interface, providing information for five main functional categories:

- Overview
- Trends
- Energy
- Timeline
- I/O



A great deal of information is nested in drop down menus and related pages within these categories. By drilling-down through the many pages within each category, increasing levels of detail about the measurements can be obtained. At the upper right corner of the page for each category is a dropdown list titled “Choose an Action...”. This list can be used to reset data, as shown to the left.

This chapter of the manual is not an exhaustive resource that displays every page in the system. The intent is to give the user a general understanding of where the most useful and pertinent information is stored for review.

All of the stored, measured values can be accessed by using any communication port available, including the COM0 (unless otherwise noted).

A GENERAL NOTE ABOUT GRAPHS AND PLOTS

When you display a trend plot or other graph on the various meter pages, this is a “snapshot” showing the last values when the graph was displayed plus the historical data. To update with more current values, reselect the value that’s displayed in the list of radio buttons along the left of the page.

METER

The Meter page(s) provide Voltage, Current, and Frequency readings. You can view information by measurement type or by phase. By Accessing further details you can look at trends, min/max values, and set triggers.

VOLTAGE

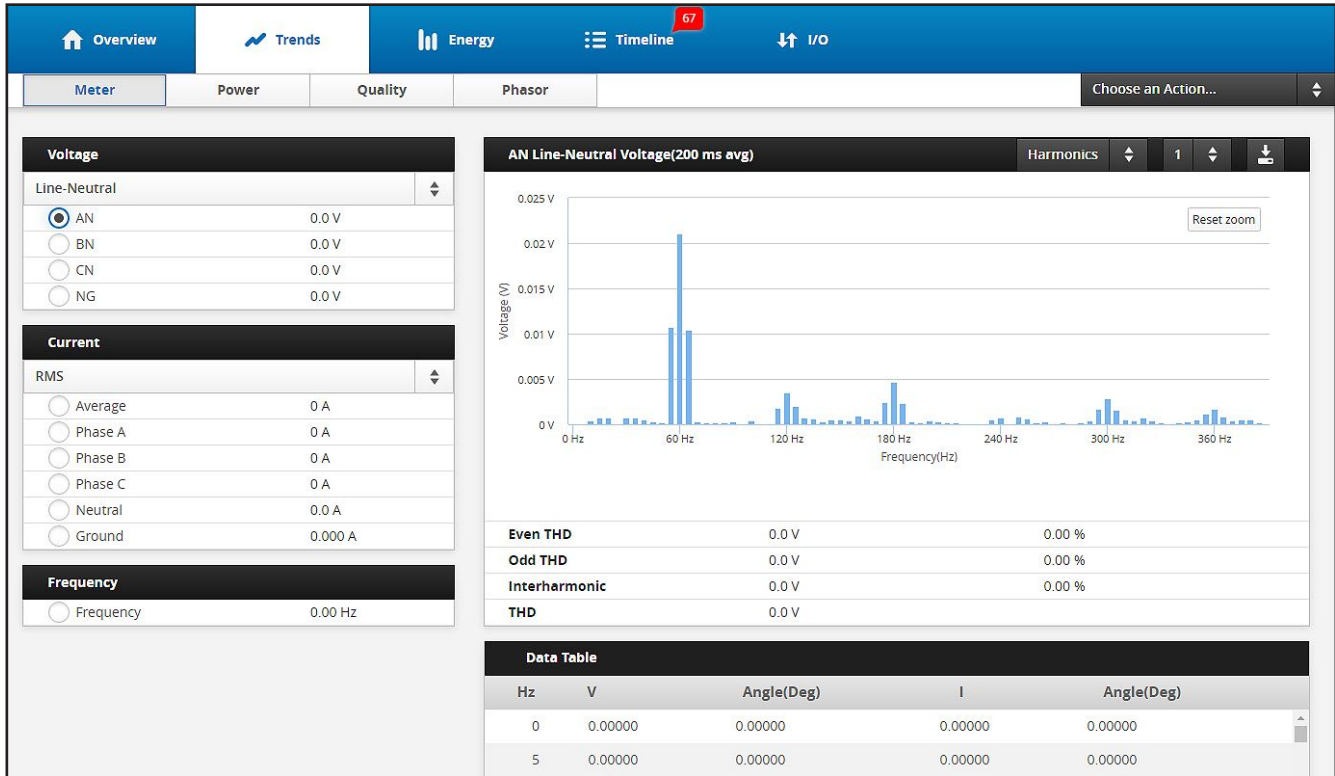
The Power Xpert Meter measures line-to-line and line-to-neutral voltages and calculates rms values over the period of 200 milliseconds. The system average values are calculated for main voltage channels as well as AUX.

NOTE: Systems with an AUX (PXM42xx) option will provide only line-to-line voltages.

Symmetric components are available for main voltage channels; symmetric components are not available for PXM40xx and PXM42xx versions of the meter.

The Power Xpert Meter maintains a log of all voltage rms measurements over the period of 1 year with date and time stamps. This information is also available as a trend for display and communications. The min, max and averages are recorded for each interval; 2 days at 5 minute intervals, 28 days at 1 hour intervals and 44 months at 1 week intervals.

The most recent minimum and maximum values are detected for all the voltage channels and symmetric, and are logged with date and time stamps. Current minimum and maximum values can be cleared by the user at any time. After the current values are cleared, the meter will begin calculating new minimum and maximum values.



LOCATING VOLTAGE INFORMATION

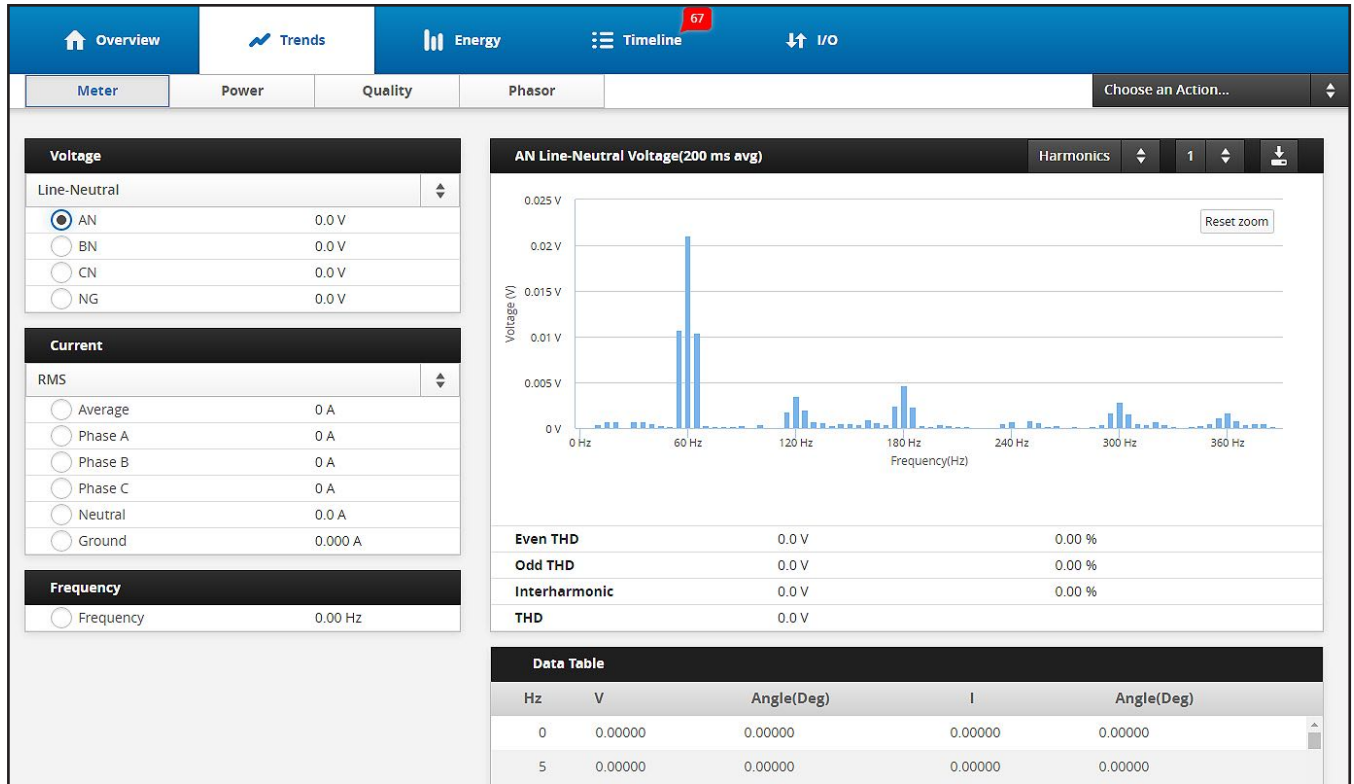
From the Meter page select Line to Line, Line to Neutral, Symmetric or AUX Line to Line from the drop-down box beside Voltage on the left side of the page. Click one of the radio buttons below Voltage to select a specific voltage (e.g.: AB, BC, CA, NG, AN, BN, or CN). The page will update to display the selection.

You can select trending, waveform, harmonics or phasor graphs from the drop-down box near the top of the page.

When Trend and Min/Max is selected, the minimum and maximum values are displayed with date and time stamps.

When Harmonics is selected, a table is displayed showing the Voltage, Voltage Angle, Current, Current Angle and the calculated watts ($V \times I \times \cos[\text{Angle } V - \text{Angle } I]$). **Note:** Watts calculation is only valid for AN, BN, and CN selections.

By default, the fundamental frequency is displayed. It can be excluded by clearing the Exclude Fundamental check box on the left side of the page.



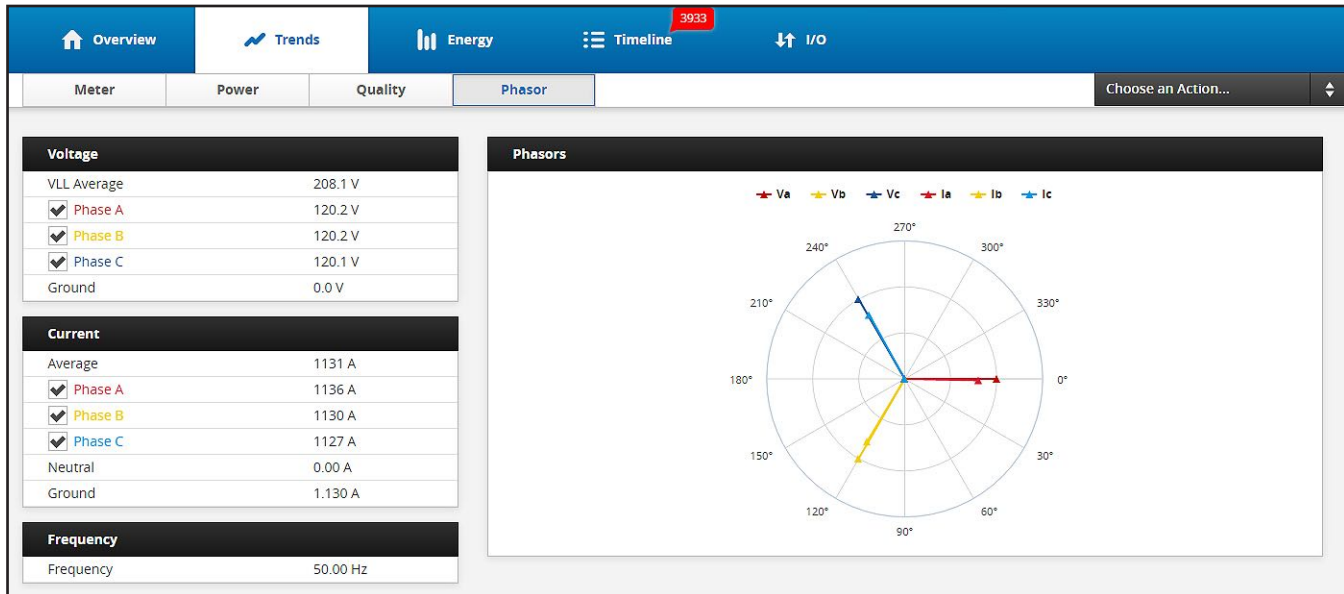
CURRENT

The Power Xpert Meter measures per phase and average system current and calculates rms values over the period of 200 milliseconds. Neutral and Ground current measurements are optional; if the current transformer for neutral or ground is not available the user has an option to select the calculated values for ground and neutral currents.

NOTE: Current measurements are not available for the Vaux channels. Symmetric components are available for all channels, but are not available for the standard PXM40xx version of the Power Xpert Meter.

The meter will maintain a log of all rms measurements and symmetric components over the period of 1 year with date and time stamps. The same information is available as a trend for display and communications.

The most recent minimum and maximum values are detected for all the channels and symmetric, and are logged with date and time stamps. Current minimum and maximum values can be cleared by the user at any time. After the current values are cleared, the meter will start calculating new minimum and maximum values.



LOCATING CURRENT INFORMATION

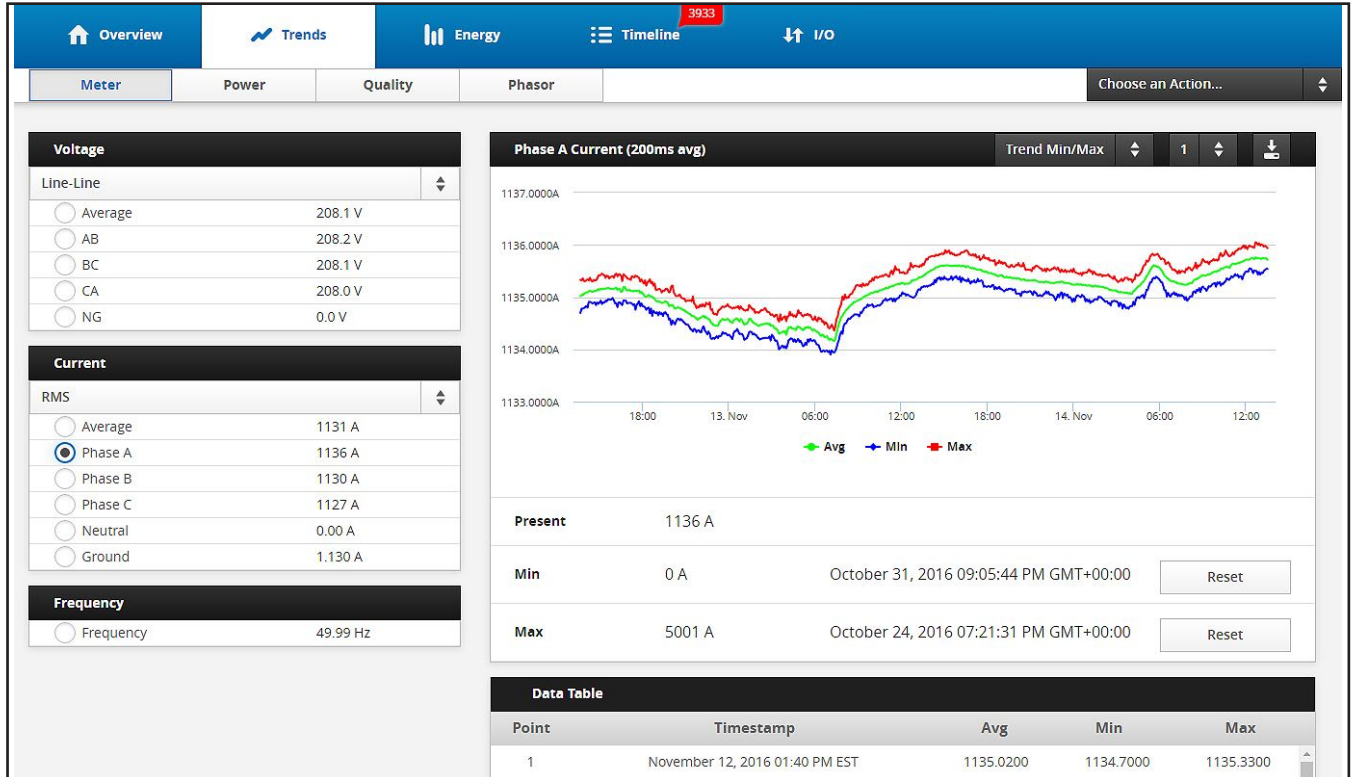
From the Meter page, select RMS or Symmetric from the drop-down box beside Current. Click one of the radio buttons listed below Current to select a specific phase; neutral or ground. The page will update to display the selection.

To view the trending, waveform, harmonics or phasor graphs, click the drop-down box located on the top right side of the page and make a selection.

When Trend and Min/Max is selected, the minimum and maximum values are displayed on the bottom, right side of the page with date and time stamps.

When Harmonics is selected, a table is displayed showing the Voltage, Voltage Angle, Current, Current Angle and the calculated watts ($V \times I \times \cos[\text{Angle V} - \text{Angle I}]$).

By default, all the options are selected when the Phasor diagram is selected. You can clear an option on the left side of the page to remove the correlating point of the phasor diagram.



FREQUENCY

Frequency measurements for the meter occur every 200 milliseconds using phase A voltage on V1. In the absence of voltage, there is no frequency measurement. The result is a gap in the trend data for frequency-dependent items. For the same reason, 0 Hz is never recorded as a minimum value. A trend of frequency measurements is maintained with date and time stamps. Minimum and maximum values are detected and saved with date and time stamps of the occurrence.

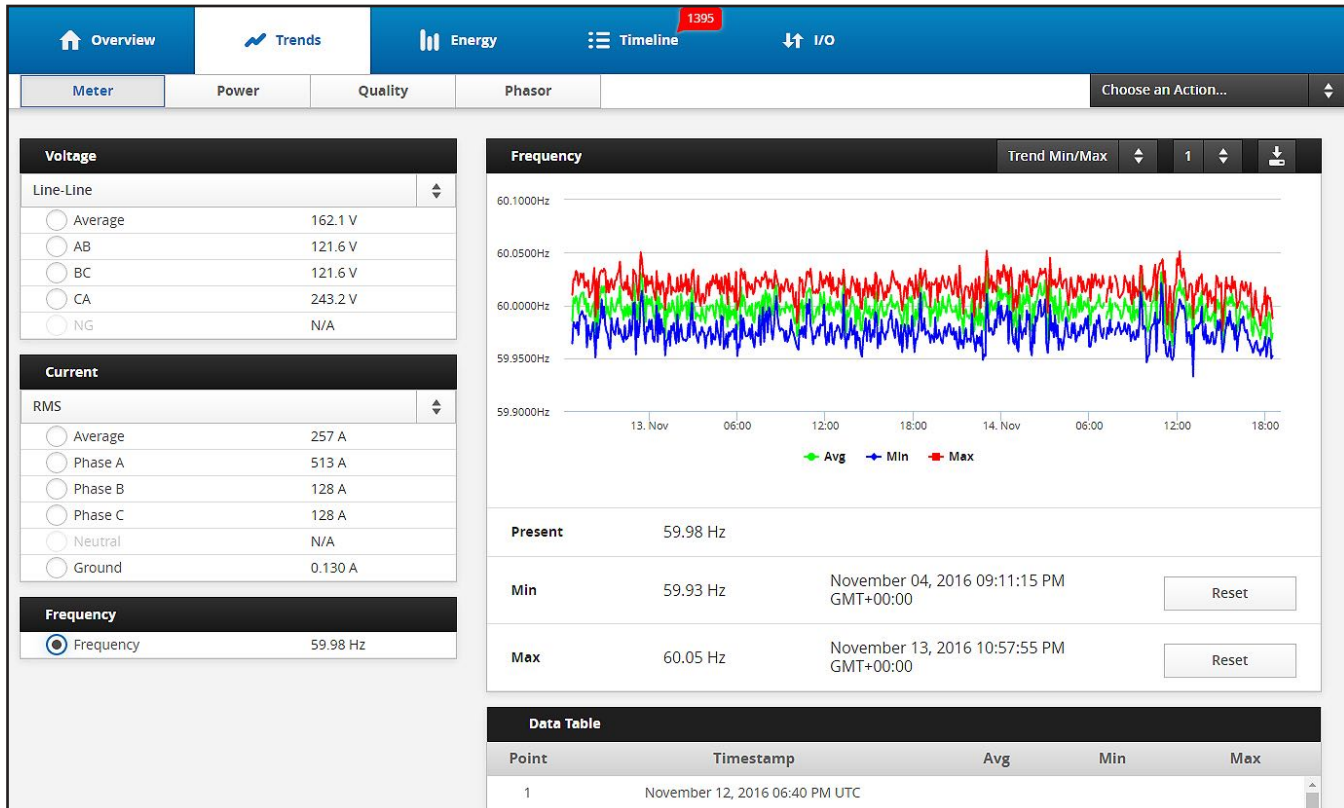
LOCATING FREQUENCY INFORMATION ON THE WEB

From the Meter Home Page, click the frequency radio button beside Frequency on the left side of the page.

To view the trending, and phasor graphs, click the drop-down box at the top of the page and make a selection.

When Trend and Min/Max is selected, the minimum and maximum values are displayed on the bottom right side of the page with date and time stamps.

By default, all the options are selected when the Phasor diagram is selected. The user can unselect an option on the left side of the page to remove the correlating point of the phasor diagram.



POWER

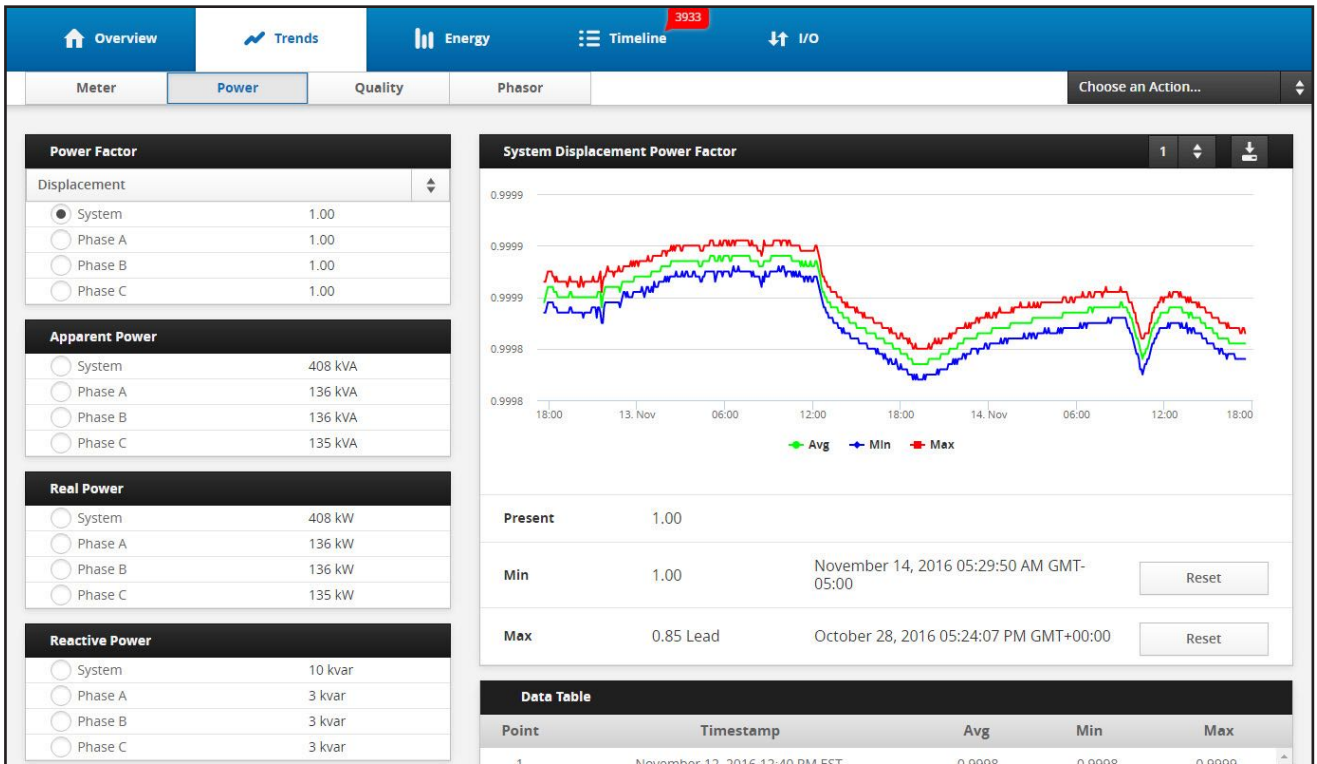
The Power and Energy section contains information about the present power consumption in the following categories: Demand, Energy, Load Profile and Power Factor. The meter calculates the following instantaneous values averaged over a period of 200 milliseconds:

- Apparent and Displacement Power Factor for System, Phase A, Phase B and Phase C
- Apparent Power for System, Phase A, Phase B and Phase C
- Real Power for System, Phase A, Phase B and Phase C
- Reactive Power for System, Phase A, Phase B and Phase C

The meter will log the trend for all of the above measurements, as well as detect and save Minimum and Maximum values with date and time stamps for all of the above parameters.

LOCATING APPARENT & DISPLACEMENT POWER FACTOR, REAL POWER, REACTIVE POWER AND APPARENT POWER FOR SYSTEM INFORMATION ON THE WEB

From the Power Main Page, click the drop-down box beside PWR Factor. Select Apparent or Displacement. Click one of the radio buttons on the left side of the page that represents the kind of Power Factor you want to view. The page will up date to display a graph with minimum, maximum and average values as per the selection.



DEMAND

Demand is the power consumption at the receiving terminal averaged over a specific interval of time or in response to a signal at a designated discrete input. The Power Xpert Meter is capable of measuring demand by two internally triggered methods; Fixed or Sliding in intervals of 1 to 60 minutes. These measurements are configured to calculate the Total Current, kW Forward/Reverse, Net and Sum; kVar Lead/Lag, Net and Sum and kVA.

FIXED AND SLIDING DEMAND

Fixed demand (Total Current), which is an average system current over time can be set to average current over a range of 1 to 60 minutes. This is known as a fixed window. For example, setting the current demand window to 15 sets the meter to determine the average current over the past 15 minutes and update the value every 15 minutes.

Power demand can be fixed, as described above, or sliding. For example, a 15 minute average can be obtained that is updated every 3 minutes. To accomplish this, the subinterval is set to 3 minutes and the number of intervals is set to 5 (i.e. 3 minutes times 5 intervals equals 15 minutes).

NOTE: The demand interval is the number of minutes in the average calculation. The subinterval is the number of minutes between updates.

Separate demand values are computed on a monthly basis. At the end of every calendar month, peak demand values with date and time stamps are saved as last months values. Peak demand is reset and new peak demand calculations begin for next month.

In the absence of an External Synchronization, the Power Xpert Meter starts demand windows according to the real-time clock at the top of the hour and top of the minute. In the typical case of a 15-minute window, the intervals would start at the top of the hour, at 15 minutes past the hour, half-past the hour, and 45 minutes past the hour.

Demand reset can be executed using any available user interface or it can be scheduled in the calendar. When the demand reset occurs a snapshot of all peak demand values and energy values are saved as last demand reset values and demand reset count, with date and time.

Snapshots of peak demand values with date and time stamps and energy values are saved in a file each time the demand reset is executed. This self-read process can also be initiated by using the calendar schedule. The latest five snapshots are available in a file.

EXTERNAL SYNC

You can also designate any of the discrete inputs as an external synchronization source for setting when the meter should record a demand update. You can set a discrete input to be an sync source through Settings > I/O > Internal I/O > Inputs, then select a discrete input (DI 1 through DI 8). When editing a discrete input, you can change the Mode to Demand Sync.

REAL-TIME PRICING

In addition to the above, the meter also computes separate demand values for Real-Time Pricing (RTP). RTP can be activated by discrete input #8 to the meter when configured. The meter determines the peak demand for individual rate periods and saves the information with the date and time of the occurrence. Present demand and previous demand values are made available along with peak demand data, over any available communication port and display.

TIME OF USE

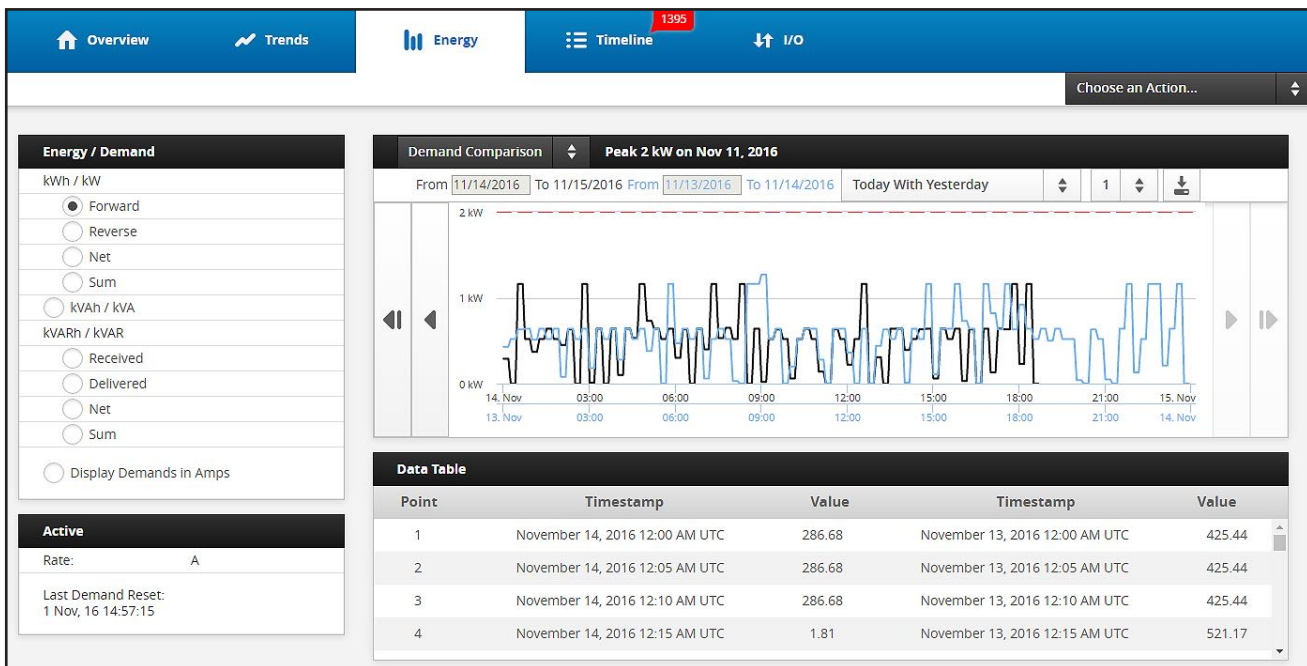
The Power Xpert Meter also supports four rate periods for Time Of Use (TOU): A, B, C, and D in addition to displaying RTP. The Demand information also contains the current value for Today's Peak Demand

LOCATING DEMAND AND ENERGY INFORMATION ON THE WEB

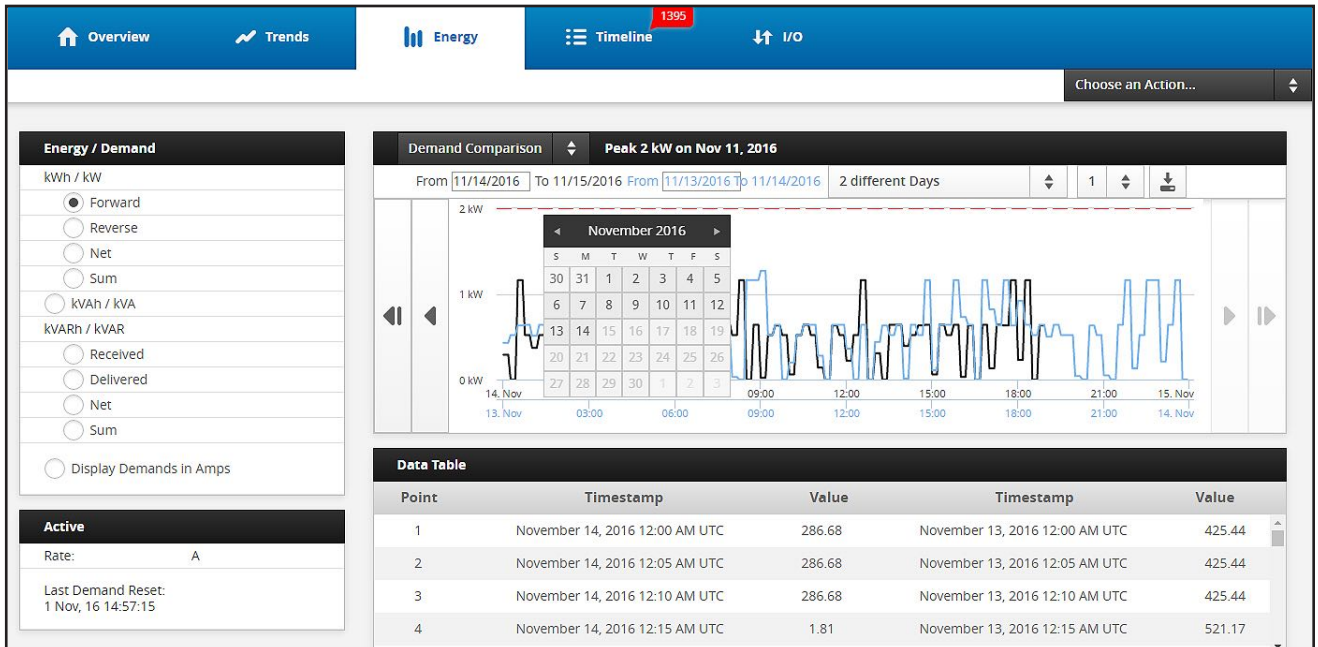
From the Energy Main Page,

- Click a radio button on the left side of the page that represents the kind of Energy and Demand you wish to view.
- From the drop-down box near the top of the page, select either TOU, Demand Profile, Demand Comparison, Energy Profile, or Energy Comparison.
- Select to view the Present or Last Reset information from the second drop-down box.

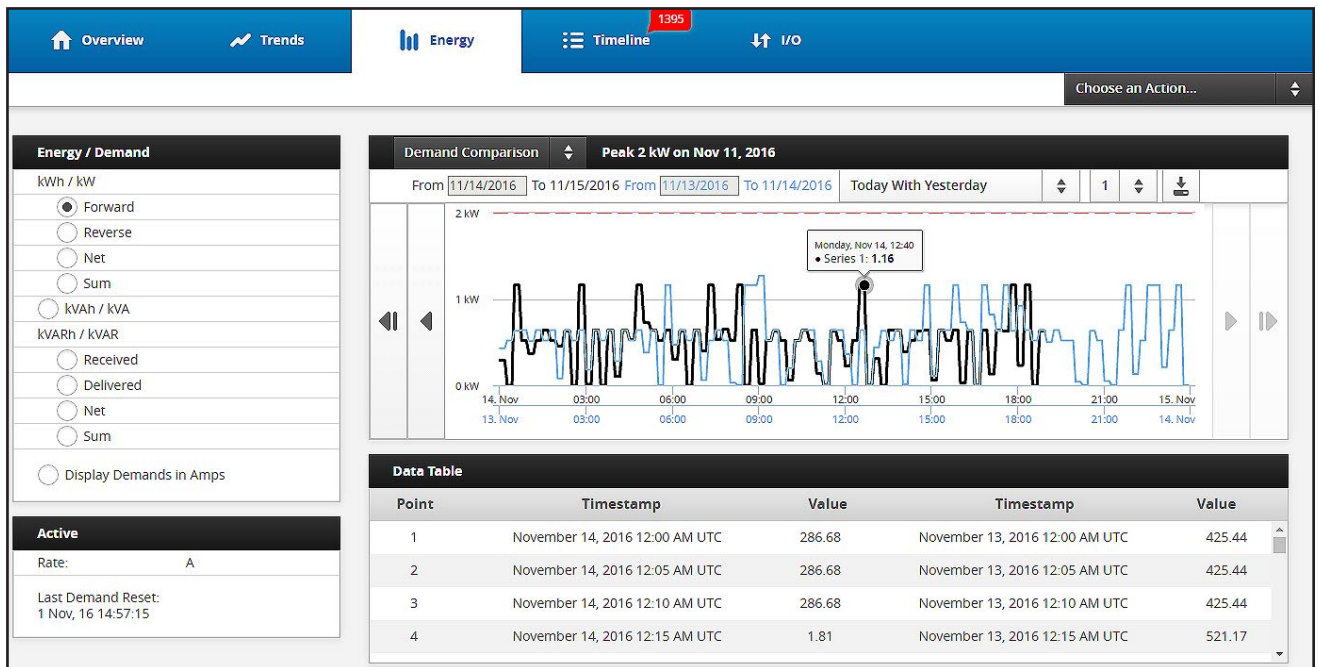
The page will update to display the information selected.



While viewing either the Demand Comparison or Energy Comparison pages, you can also select to compare the information to previous time periods: day-to-day (Demand Comparison only), week-to-week, or month-to-month. If you're comparing two specified time periods, such as two different days, a calendar control appears when you click either date. Click a day in the calendar to select the beginning and ending dates in the comparison. The < and > controls in the calendar move forward or backward one month. The << and >> controls move the calendar forward or backward one year.



Placing your mouse over any point on the energy plots reports both the timestamp and energy that's represented at that point.



The table shown below the graph shows each demand update value along with the time stamp. The contents of the table can be written to file formats that are compatible with various third-party spreadsheet, database, and data analysis tools. The Save button writes a comma separated values (.csv) file, with the data from the table, to the My Documents folder of your local computer. The first row in the file contains the column titles. The Save Table button saves the same data to your local computer, but in Excel format (.xls).

If you want to just copy a section of a table to paste into a report or email, simply select the information you want in the table and copy it to the Windows clipboard (Ctrl+C). Place the cursor where you wish to paste the information in the third-party application and press Ctrl+V.

Data Table				
Point	Timestamp	Value	Timestamp	Value
1	November 22, 2016 12:00 AM UTC	407246.00	November 21, 2016 12:00 AM UTC	407150.00
2	November 22, 2016 12:05 AM UTC	407246.00	November 21, 2016 12:05 AM UTC	407150.00
3	November 22, 2016 12:10 AM UTC	407246.00	November 21, 2016 12:10 AM UTC	407150.00
4	November 22, 2016 12:15 AM UTC	407248.00	November 21, 2016 12:15 AM UTC	407150.00

ENERGY

The Power Xpert Meter measures and accumulates three kinds of energy values every 200 milliseconds, Real Power (Watts), Reactive Power (vars) and Apparent Power (VA). With four different types of accumulation; forward, reverse, net and sum for Real Power and Reactive Power. These measurements are configured to calculation the kWh Forward/Reverse, Net and Sum; kvarh Lag/Lead, Net and Sum and kVAh.

Real Power (Watts). **Note:** Watts calculated is only valid for AN, BN, and CN selections.

Reactive Power (var) You can select the means of calculating vars is in the QuickSetup page. By default, reactive power is calculated from VA and Watts as $\sqrt{VA^2 - W^2}$. As a result, harmonic power is included with vars.

Optionally, reactive power is calculated via a 90-degree phase shift of the fundamental. As a result, harmonic power is typically excluded from the vars. and is the product of the voltage, the current, and the sine of the phase angle between them.

Apparent Power (VA) is the square root of the sum of the squares of the active and reactive powers.

Separate energy registers accumulate energy values over a period of one calendar month. At the end of every calendar month, energy values along with peak demand values with date and time stamps are saved as last months values. At this point energy accumulators are reset and begin accumulating values for next month.

TIME OF USE

The meter supports four rate periods for Time Of Use (TOU): A, B, C and D in addition to total rate, which is independent of time of use. Energy values are accumulated separately for each of these rate periods. The Time of Use page also display the Present, Peak, and Peak Today (the peak value for this day) Demand.

DEMAND PROFILE

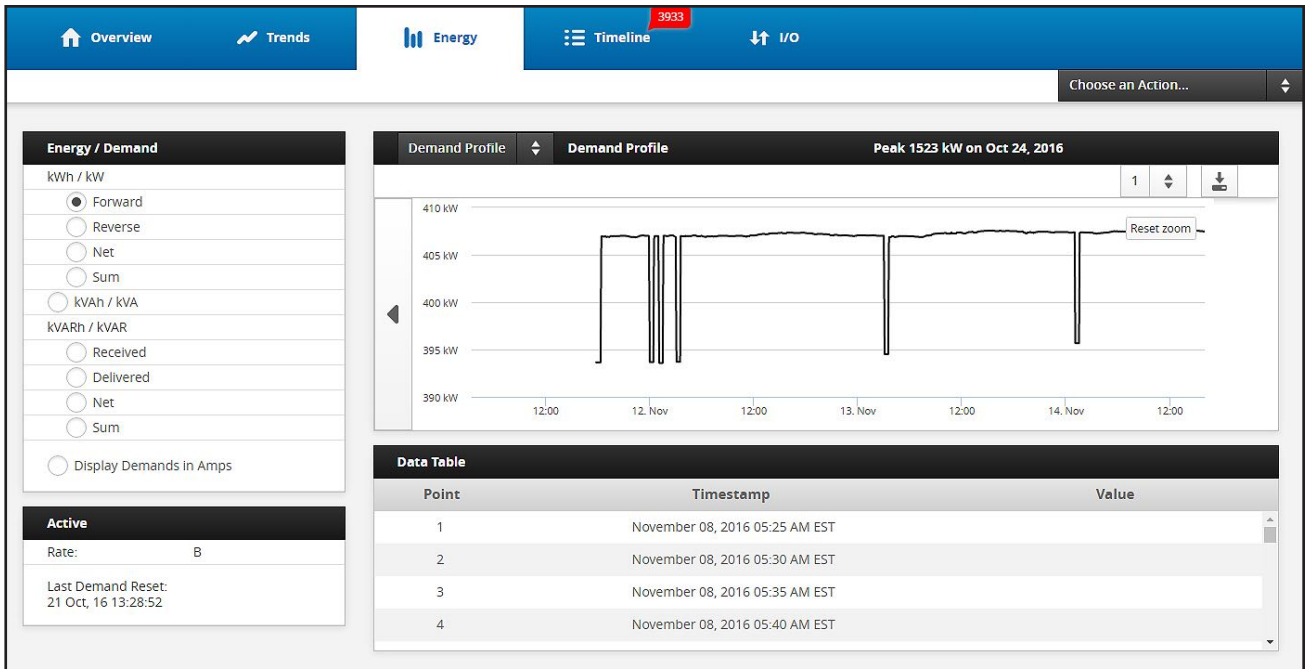
Demand Profile is the magnitude and duration of loads applied in a prescribed time sequence, including the transient and steady-state characteristics of the individual loads. The Power Xpert Meter logs demand profile data from the following sources:

- kWh/kw: Forward, Reverse, Net, Sum,
- kVAh/kVA - kVARh/kVAR: Received, Delivered, Net, Sum, and Total Current in Amperes.

You can set the interval (in lengths of 5 to 60 minutes), sub-interval (used if Sliding is selected), and the demand type (Fixed, Sliding, or Ext_Sync) in the Demand page under Setup. The interval duration for the monthly profile is a fixed interval of 15 minutes, it is not user programmable. The interval duration for the yearly profile is a fixed interval of 1 week and is not user programmable.

LOCATING DEMAND PROFILE INFORMATION ON THE WEB

On the Energy Main Page, click the kind of Profile you wish to view. Select Demand Profile from the drop-down box.



DEMAND COMPARISON

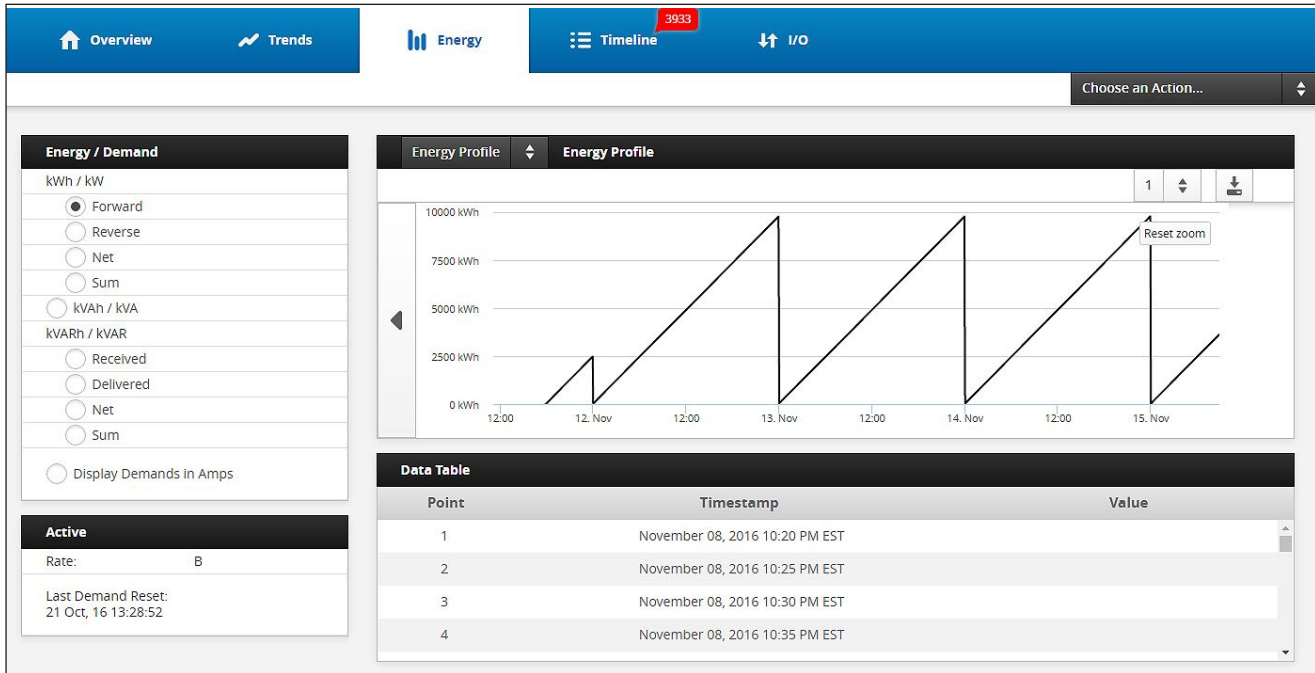
The Demand Comparison page is similar to the Demand Profile page, but provides a graph you can use to compare two overlaid demand plots from selectable periods of time. You can select to compare plots between:

- Today with Yesterday
- This Week with Last Week
- This Month with Last Month
- 2 different Days
- 2 different Weeks
- 2 different Months

Peak demand is shown in the graph as a dashed line.

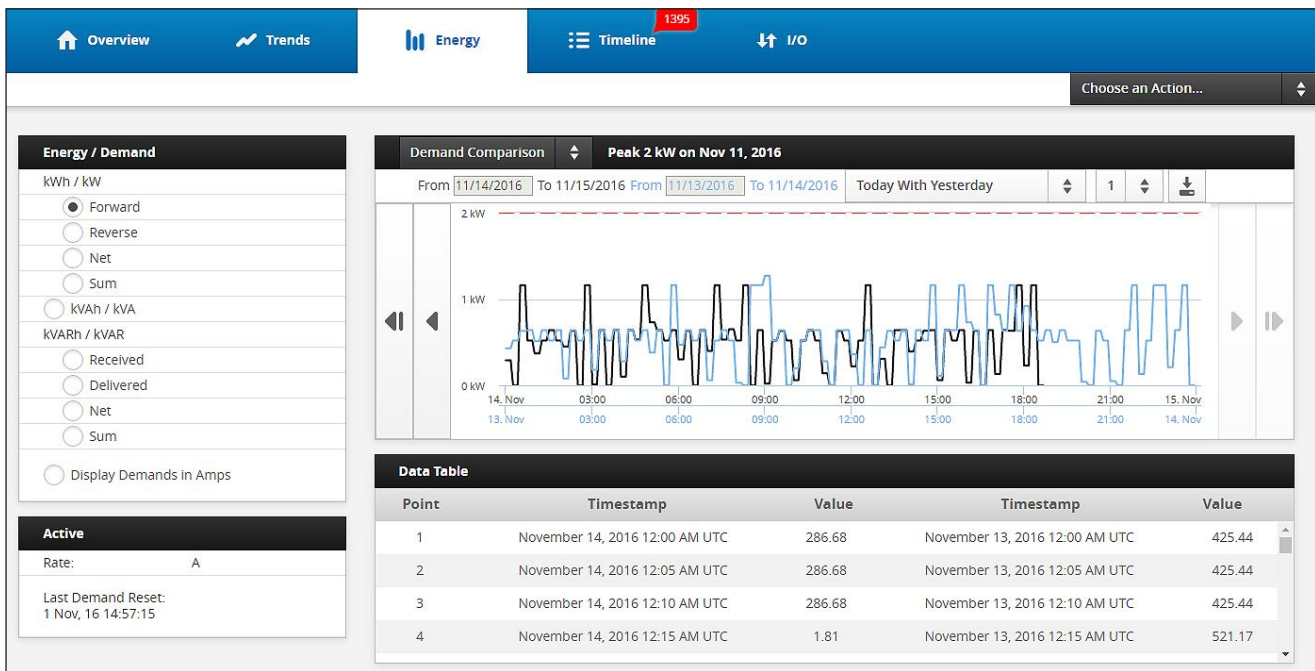
LOCATING DEMAND COMPARISON INFORMATION ON THE WEB

On the Energy Main Page, click the kind of Profile you wish to view. Select Demand Comparison from the drop-down box.



ENERGY PROFILE

Again, the Energy Profile page is similar to the Load Profile, with all of the same options, but displays the daily energies from midnight to midnight. To locate this page, select Energy Profile from the drop-down box.

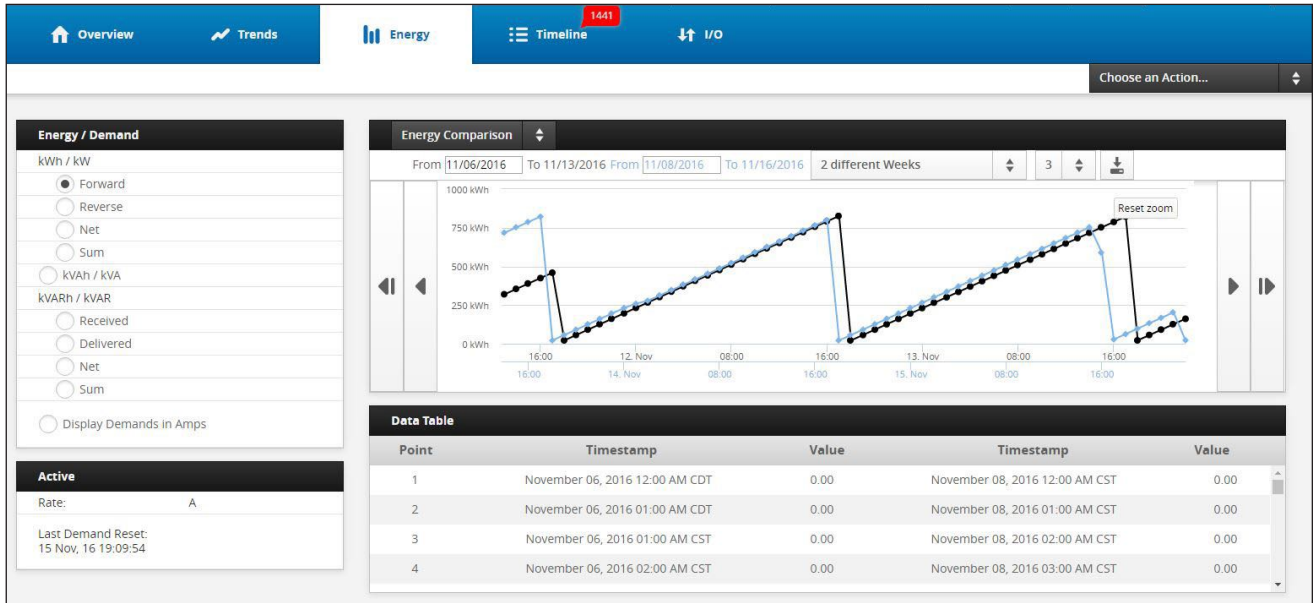


Energy Comparison

The Energy Comparison page shows the same information as the Energy Profile, but allows you to compare data as follows:

- This Week with Last Week
- This Month with Last Month
- 2 different Weeks
- 2 different Months

To locate this page, select Energy Comparison from the drop-down box.



QUALITY

The Quality section of the Power Xpert Meter outlines the measurements that have been calculated and describes the health of the system. It consists of seven main sections of information, THD Current, THD Voltage, K Factor, Crest Factor, Flicker and 9's of Availability.

THD

The Total Harmonic Distortions (THD) is the ratio, expressed as a percent, of the rms value of the ac signal after the fundamental component is removed and inter-harmonic components are ignored, to the rms value of the fundamental. The formula for THD is provided below. The variables X_1 and x_n may represent either voltage or current and may be expressed either as rms or peak values, as long as all are expressed in the same fashion.

X_1 = fundamental value of current or voltage.

x_n = nth harmonic value of current or voltage.

CURRENT

The THD Current is calculated for peak phase A, B and, C as Amperes. Meanwhile, the TDD% is calculated as a percentage of peak demand current. The THD Current is individually measured for Odd, Even and Inter Harmonics. Maximum THD Current is determined using individual phase THD Currents. All of the THD Current measurements in the Power Xpert Meter are trended and minimum and maximum values are logged with date and time stamps.

Locating THD Current Information on the Web

From the Quality page, click the top drop-down box beside THD Current to view information in Amperes or Percentage TDD. Click the second drop-down box to view Total, Odd, Even or Interharmonic information. The values listed under the drop-down boxes will update to reflect the selections. The user can then click one of the radio buttons to view graphical information about Max, Phase A, Phase B, Phase C or Neutral. The graph will update accordingly. Using the drop-down box above the graph, the user can select to view this information as a waveform, trend with minimum and maximum values or harmonics.

THD VOLTAGE

The THD Voltage is calculated for line-to-line and line-to-neutral as a percentage as well as in volts. The THD Voltage is individually measured for Odd, Even and Interharmonics. The Maximum THD Voltages for line-to-line and line-to-neutral is also determined.

The Power Xpert Meter Vaux (PXM 4200/6200/8200) option will also contain line-to-line THD Voltage calculations for phases AB, BC and CA as a percentage as well as in volts. The Maximum THD Voltage value will be determined from the individual line-to-line values.

All of the THD Voltage measurements are trended and minimum and maximum values are logged with date and time of each occurrence.

Locating THD Voltage Information on the Web

From the Quality page click the drop-down box next to THD Voltage on the left hand side of the page to select to view Line to Line Voltage, Line to Line %, Line to Neutral Voltage, Line to Neutral %, Vaux Line to Line Voltage or Vaux Line to Line % information. When this option is selected, click the second drop-down box to select to view Total, Odd, Even or Interharmonic information. The values listed underneath the drop-down boxes will change to reflect the selections. At this point the user can click one of the radio buttons to view graphical information for either Max, AB, BC or CA. Once this radio button is selected the graph shown on the right hand side of the page will change. Using the drop-down box above the graph, the user can select to view this information as a waveform, trend with minimum and maximum values or harmonics.

NOTE: Vaux Line to Line Voltage and Vaux Line to Line % are only options on the meter Vaux version.

K FACTOR

The meter calculates the Maximum, Phase A, Phase B and Phase C values for K Factor. The K Factor is a derating factor related to the sum of the squares of harmonic current times the squares of their harmonic numbers (multiples of the fundamental).

HOW TO LOCATE K FACTOR INFORMATION ON THE WEB

From the Quality page the K Factor values are listed half way down the left hand side of the page.

CREST FACTOR

The meter calculates the Maximum, IA, IB and IC values for Crest Factor. The Crest Factor is the ratio of peak current to rms current. A pure sine wave has a crest factor of 1.414.

LOCATING CREST FACTOR INFORMATION ON THE WEB

From the Quality page the Crest Factor values are listed towards the bottom half of the left hand side of the page.

FLICKER

Per EN61000-4-15, Flicker is a variation of input voltage, either magnitude or frequency, sufficient in duration to allow visual observation of a change in electric light source intensity. The Power Xpert Meter provides Perceptibility, Pst (10 minutes), Plt (2 hours), Trend and Trigger information for Flicker line-to-line and line-to-neutral values. (Flicker available on the 6000 and 8000 Series).

LOCATING FLICKER INFORMATION ON THE WEB

From the Quality page, click one of the radio buttons listed underneath “Flicker” on the bottom left side to view Perceptibility, Pst or Plt graphical information. The graph will update to display the selection.

9’S OF AVAILABILITY (PERFORMANCE OR COMPLIANCE)

The availability of service is often measured in how many 9’s of availability it provides. If the service is up 90% of the time, it has one 9 of availability. If service is up 99% of the time, it has two 9’s of availability, and so on. These 9’s translate into how much downtime is allowed per year.

- 90.0000% = 37 days
- 99.0000% = 3.7 days
- 99.9000% = 8.8 hours
- 99.9900% = 53 minutes
- 99.9990% = 5.3 minutes
- 99.9999% = 32 seconds

The Power Xpert Meter is highly configurable for 9’s of Compliance. Any or all of the Out of Limits triggers can be selected in the 9s calculation.

The meter calculates the Previous Month’s 9’s of Availability percentage and the current Month To Date’s 9’s of Availability percentage.

LOCATING 9’S OF AVAILABILITY INFORMATION ON THE WEB

From the Quality Main Page the 9’s of Availability values are listed at the bottom of the left hand side of the page.

PQ INDEX

The Power Xpert Meter calculates power quality information (in graphical and text format) for the last 10 minutes and the last 24 hours; providing the level and value of Sags, Swells, dv/dt, TDD, THDv and Flicker. The 10 minute value is the worst of the PQ components. The Alert level is for values 300 and higher while caution values are above 200. A value below 200 is normal. The 24 hour value ratchets up to new 10 minute PQ values and decays with a 17 hour time constant.

LOCATING PQ INDEX INFORMATION ON THE WEB

From the Home Page the PQ Index graph is located on the top right hand side of the page. Click one of the underlined options, Latest 10 Minutes or Latest 24 Hours to view detailed information about the selection. Once the option is selected the top right hand side of the page will change listing the levels and values. At this point the user can either view the alternate option, or return back to the Power Quality Index by clicking on the underlined label.

EVENTS

The Power Xpert™ Meter monitors and logs six kinds of Events; Input Status, Out of Limits, Demand Overload, ITIC Sag/Swell, Sub-cycle Disturbance and Transients. Each event can be used to trigger parameter capture, waveform capture and/or send e-mail as well as be used to change the state of internal or external I/Os.

TRIGGERS

The following list highlights potential triggers. Each event trigger can be automatic or manual depending on the selection of the user. In the case of auto trigger, the limits of the next trigger are calculated by the meter based on the historical data; in the absence of historical data default values are used. In manual triggering the meter will use the programmed limits set by the user.

Each trigger input can be programmed to monitor performance as for 9’s of Availability or Compliance, capture waveform, capture parameters and/or send e-mail. Once an event is triggered, the Reset value will be used to check and clear the condition. Every event and it’s corresponding parameters along with the date and time of the occurrence are logged and available for display or retrieval using a communication port. (Triggers are available on the 6000 and 8000 Series).

OUT OF LIMITS

The Power Xpert Meter monitors and logs Out of Limit events for the following triggers:

- System Voltage Swells and Sags
- Line to Line Voltage Swells and Sags
- Line to Neutral Voltage Swells and Sags
- AUX Line to Line Voltage Swells and Sags
- Voltage Symmetric components V0, V1 and V2
- Voltage Unbalance
- Over Current on all current inputs
- Current Symmetric Components I0, I1 and I2
- Current Unbalance
- Real Power (System and Individual Phase Upper and Lower Limits)
- Reactive Power (System and Individual Phase Upper and Lower Limits)
- Apparent Power (System and Individual Phase Upper and Lower Limits)
- Apparent Power Factor (System and Individual Phase Upper and Lower Limits)
- Displacement Power Factor (System and Individual Phase Upper and Lower Limits)
- System Upper THD Voltage (for Total)
- Line to Line Upper THD Voltage (for Total)
- Line to Line Upper TD Current (for Total)
- Line to Neutral Upper THD Voltage (for Total)
- System Lower THD Voltage (for Total)
- Line to Line Lower THD Voltage (for Total)
- Line to Neutral Lower THD Voltage (for Total)
- System Upper Flicker Perceptibility
- Line to Line Upper Flicker Perceptibility
- Line to Neutral Upper Flicker Perceptibility

DEMAND OVERLOAD

The Power Xpert Meter can shed load upon demand amperes, demand watts, demand reverse watts, demand vars capacitive load, demand vars inductive load or demand VA. Each Demand Overload selection has a threshold as if it were a trigger threshold. The meter can only change state on demand window boundaries. For example, with a 15-minute fixed window, the meter can only change state every 15 minutes.

ITIC CURVE (Available on the 6000 and 8000 Series.)

Information Technology Industry Council update of what was known as the CBEMA Curve. This classifies sag and swell events according to their magnitude and duration. The Power Xpert™ Meter classifies these further with a severity rating (L1, L2, L4, L8). A number of Out of Limits triggers are unavailable on the 4000 series. Voltage Symmetric components V0, V1 and V2, Voltage Unbalance, Current Symmetric components, I0, I1, I2, Current Unbalance, and Flicker Perceptibility (Available on the 6000 and 8000 Series).

FAST TRANSIENT (Available on the 8000 Series).

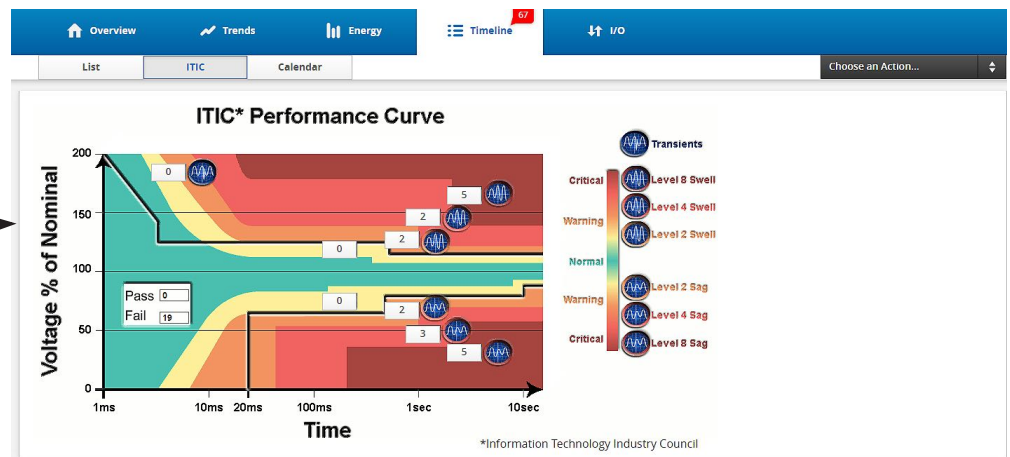
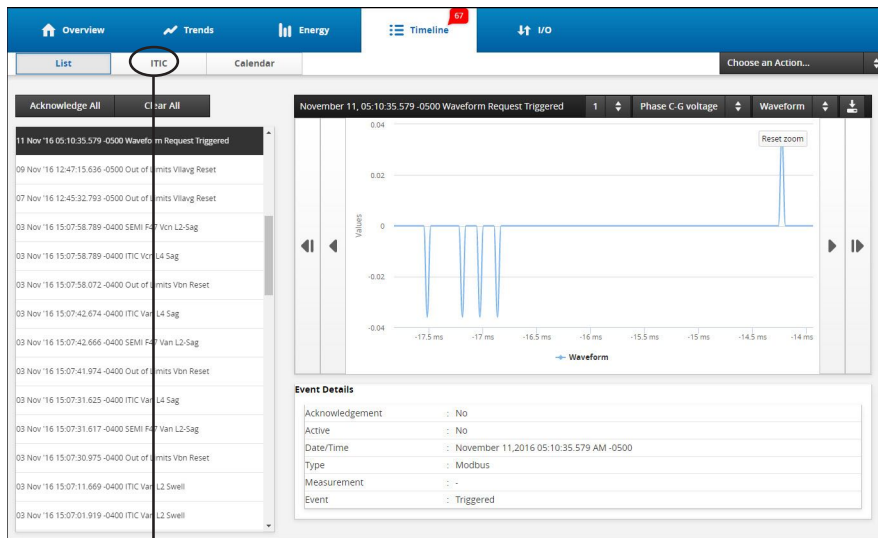
A transient is the rapid change in voltage. A typical transient reaches its peak in 5us and lasts 50us. The meter captures transients with optional hardware that samples 5 channels at up to 6Msp for 22ms or 1 Msps for 131 ms.

SUBCYCLE DISTURBANCE

A disturbance is the rapid change in voltage with a duration that can be as long as 1/4 cycle. The meter captures disturbances as events, which records all voltage and current channels at 30.72 ksp/s for 1000 ms.

LOCATING EVENTS ON THE WEB

From the Events Main Page the user can view all events that have occurred and a log that displays event date and time. Click a specific event in the log to display the detailed information on the page. Use the drop-down box at the top of the page to view the captured parameter or waveform. Click the ITIC Curve button on the bottom of the page to view the ITIC Curve. (Available on the 6000 and 8000 Series). From this new page the user can click any event listed on the ITIC Curve to display the Event page listing the event information relevant to the event selected.



Note: Using your left mouse button, you can pull the divider to the right to resize the window frames and expose the entire Event and Event Log descriptions.

You can also view the view the ITIC Curve for a single ITIC event.

EVENT CALENDAR AND TIMELINE VIEWS

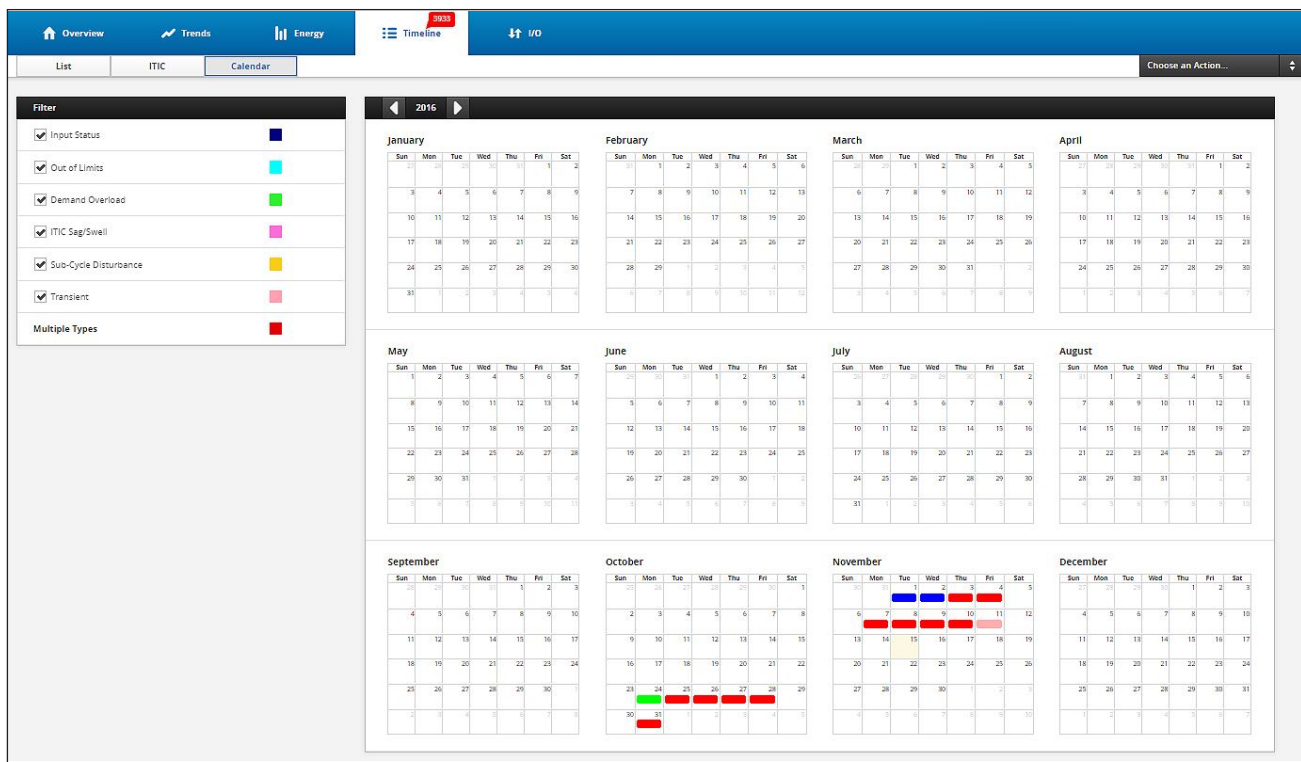
You can also view the last 500 recorded events on either a monthly calendar or on a timeline view. These views make it much easier to locate events over a period of time. When you switch from the calendar to the timeline view, you can “zoom” in to smaller time units.

To view the Calendar:

- From the Events page, click the Events Timeline button.

The following figure shows a typical Events Calendar and details its controls (refer to the keyed explanation that follows the figure). (Available on the 6000 and 8000 Series).

- ① Use the Filter control to select which event types are displayed in the Events Calendar and the Update button to display only those event types selected in the filter. If an event occurs on a given day, that day is shown in that event type’s color. If multiple event types occur on a given day, the day is shown in red (as in this example). By default, all event types are selected. Clearing a check box also clears those types from the Events Calendar.

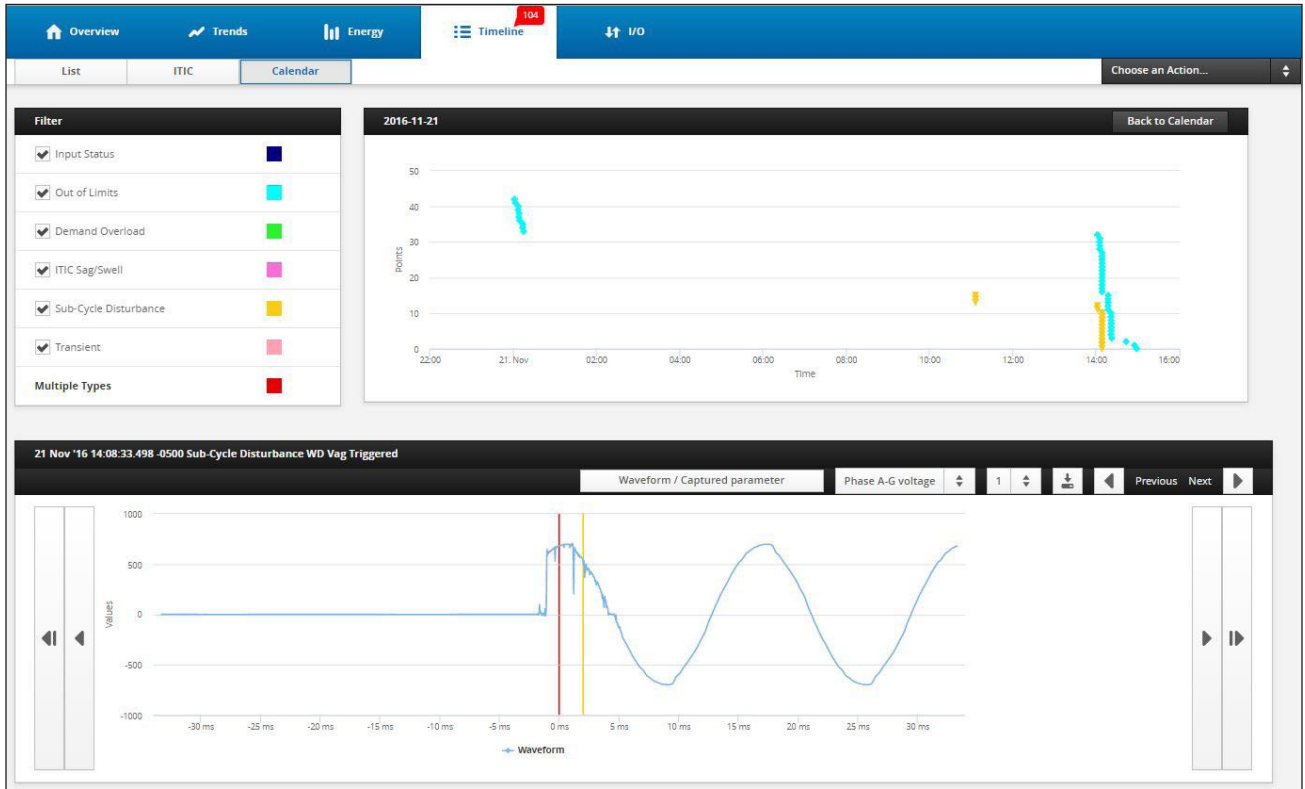


- ② Click this button to return to the Events page.
- ③ Click this control to pan the Calendar to the previous month.
- ④ Click this control to pan the Calendar to the next month.
- ⑤ These days are shown in color, meaning that events occurred on these days. Red signifies multiple event types occurred (see the Filter control for the event type color codes). Clicking a day “drills-down” to the timeline view so that you can see what events occurred during the day.

The default view of the Events Timeline view shows the day’s events on an hour-by-hour basis; however, you can expand the time scale resolution down to hundredths of a second.

USING THE EVENTS TIMELINE

The following figure details the controls on the Events Timeline page. Refer to the keys following the figure for a description of the various controls. The Events Timeline page is divided into an event timeline in the top half and a waveform timeline or captured parameters display in the bottom half. If you select an event in the top timeline, its data is displayed in the lower half of the page.



- ① Click this button to return to the Event page.
- ② Use the Filter control to select which event types are displayed in the events timeline (top half of the page). Clearing a check box also clears those types from the the Timeline View. When you have made your filter selections, click the Update button to update the event timeline.
- ③ Click an Event to show its Waveform or Captured Parameters in the lower half of the page. The currently selected event is shown in red and its associated trigger point(s) are shown as red vertical lines in the waveform timeline. Events appear “stacked” in the event timeline when they occur close together in time; however, you can change the resolution of the timeline using the Zoom control to “spread them out.” Hovering the mouse pointer over a single event displays its information.

If the trigger for another event also appears in a waveform timeline, that event is shown in yellow in the events timeline and its trigger point(s) are shown as yellow horizontal lines in the waveform timeline (see the following figure).



- ④ The Pan slider moves the events timeline forward (right) or backward (left) through time.
- ⑤ The Zoom control changes the resolution of the events timeline. Click the center drop-down list and select one of the following time resolutions:
 - 7 Switches the page to the Events Calendar view.
 - 6 Timeline displays 14 hours in two-hour increments.
 - 5 Timeline displays nine hours in one-hour increments.
 - 4 Timeline displays 75 minutes in 15-minute increments.
 - 3 Timeline displays 75 seconds in 15-second increments.
 - 2 Timeline displays 2.5 seconds in 0.5 second increments.
 - 1 Timeline displays 0.1 seconds in 0.025 second increments.

The + and - buttons beside the drop-down list either increase or decrease the timeline resolution one setting from the current value.
- ⑥ If there are more events than can be shown in the events timeline through the current Pan and Zoom controls, then the Meter creates up to 10 Events Timeline pages. You can switch between these by either selecting a page from the drop-down list or clicking the << (previous page) or >> (next page) buttons.
- ⑦ The Previous and Next buttons shift the waveform timeline to view the next trigger point related to the currently selected event. If there is only one trigger point within the event, these buttons remain deselected.
- ⑧ If there is both Waveform and Captured Parameter data available for the event, click this button to switch between these views.
- ⑨ Use the dropdown list to select whether or not to view the voltage Line-Line, Line-Neutral, Aux Line-Line, or Symmetric.
- ⑩ Use the radio buttons to select whether or not to view the Average, AB, BC, CA, or NG of the voltage.
- ⑪ The Pan and Zoom controls work similarly to the ones in the events timeline. Pan moves the waveform timeline forward and backward in time while the zoom controls increase or decrease the resolution. Note that you can also choose to print a waveform timeline (print button) or save the waveform values to a comma-separated values file (file button) on your local computer.

6 METER SETTINGS USING THE WEB SERVER

This section provides information about Meter Settings via the Web server, including the settings that are currently active and how to change settings in specific categories.

SETTINGS PAGES

When the Settings pages load, the page defaults to the General tab. Underneath the General tab, as well as the other tabs, are arrows that expand to display all of the detailed information available for viewing or configuration. The detailed information will be displayed directly underneath each dropdown heading.

List boxes, radio buttons, text boxes, etc., that are appropriate to the selection will appear to facilitate editing.

NOTE: All configuration (edit) abilities discussed in the following sections require login with a user name and password to complete. The user account must have sufficient privileges to edit the page.

After login, if the page remains idle for 10 minutes or longer, an automatic logout will occur with no visual confirmation that this has happened. If this occurs, the system will not respond to data entry attempts and you will have to login again to continue the editing process.

NOTE: The user will be prompted with a pop-up message if an invalid entry is attempted.

6.1. General Screen

QUICK SETUP

The Quick Settings page provides quick access to the most common configuration settings.

NOTE: Only users with Wiring and Meter configuration permissions will be able to edit the Quick Setup.

The Quick Settings page provides access to:

- The Wiring Configuration selection
- Phase Rotation and Frequency selections
- Line-to-Line Voltage, the Potential Transformer (PT) Ratio, the Current Transformer (CT Ratio), the Ground CT, and the Neutral CT selections
- Energy units display format, such as meter ID
- Enable/disable the Neutral Current (In), Ground Current (Ig), Calculated Neutral Current (In) and Calculated Ground Current (Ig)

NOTE: If Neutral Current is selected, Calculated Neutral Current can NOT be selected and vice-versa. If Ground Current is selected, Calculated Ground Current can NOT be selected and vice-versa.

Select one of the following wiring configurations based on the installation:

- Single phase 2 wire (1CT)
- Single phase 3 wire (2CT)
- 3 Phase, 3 wire (Delta 3 CT)
- 3 Phase, 4 wire (Y 3CT)
- 3 Phase, 3 wire (Delta 2CT)
- 3 Phase, 4 wire (Y 3 CT, 2V) 2 1/2 Element
- 3 Phase, 4 wire (center tapped Delta 3 CT)

Selecting Measure Ig allows you to view actual ground current. When Calculate Ig is selected, the meter estimates the ground current based on 3 phase and neutral current unbalance. Selecting Measure In allow you to view actual neutral current based on the 3 phase current unbalance. When Calculate In is selected, the meter estimates the neutral current.

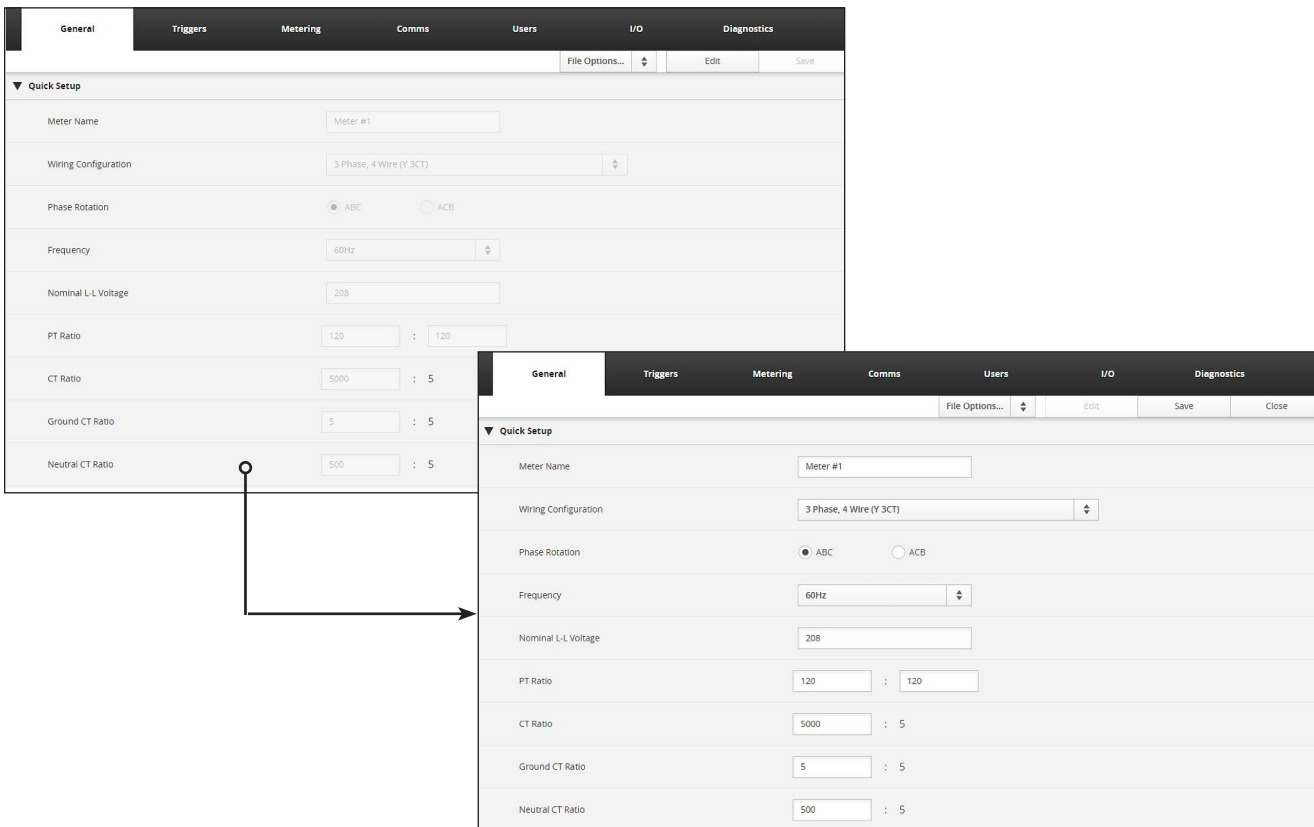
NOTE: When both Measure In and Calculate In are selected, Measure In overrides the setting.

Enter the nominal line to line voltage. The Nominal line to line voltage value is used as a reference for swells and sags monitoring.

Select the Phase Rotation based on the Phase Rotation of the Input Voltages. Select the Nominal Frequency of the Input Voltages from the Frequency list.

Locating Quick Settings On The Web

1. From the Settings main page, select Quick Setup from the tree structure. The page will update to list all the current settings for Quick Setup. An Edit and a Save button will appear at the top of the page.
2. Click Edit to change any of the listed settings.
3. Click Save when new entries are completed. Click Close to exit Edit mode.



The image displays two screenshots of the web interface for configuring meter settings. Both screenshots show the 'Quick Setup' page under the 'General' tab, with various settings fields and buttons.

Left Screenshot (Edit Mode):

- Buttons: File Options..., Edit, Save
- Fields: Meter Name (Meter #1), Wiring Configuration (3 Phase, 4 Wire (Y 3CT)), Phase Rotation (ABC selected, ACB unselected), Frequency (60Hz), Nominal L-L Voltage (208), PT Ratio (120 : 120), CT Ratio (5000 : 5), Ground CT Ratio (5 : 5), Neutral CT Ratio (500 : 5)

Right Screenshot (Save Mode):

- Buttons: File Options..., Save, Close
- Fields: Meter Name (Meter #1), Wiring Configuration (3 Phase, 4 Wire (Y 3CT)), Phase Rotation (ABC selected, ACB unselected), Frequency (60Hz), Nominal L-L Voltage (208), PT Ratio (120 : 120), CT Ratio (5000 : 5), Ground CT Ratio (5 : 5), Neutral CT Ratio (500 : 5)

An arrow points from the 'Edit' button in the left screenshot to the 'Save' button in the right screenshot, indicating the transition from edit mode to save mode.

CONFIGURATION FILES

When the Quick Setup dropdown is expanded, configuration files can be downloaded to your local file system and then uploaded from your local file system to a meter. This is a handy convenience feature, especially if you're setting up multiple meters with either the same or similar settings. You can set up one meter, download the configuration file to your local computer, and then upload that same configuration file to other meters. If you want a hardcopy version of the meter settings, you can also create a formatted printout,

NOTE: The configuration file is actually a ZIP file that contains multiple files, each with configuration settings for a different aspect of the meter setup.

To download the current configuration file:

1. Select the File Options dropdown while within the Quick Setup dropdown.
2. Click Save Config.
3. Give the file a name (the dialog will fill in the .zip) extension.
4. Click Save.

To upload a configuration file to a meter:

1. Select the File Options dropdown while within the Quick Setup dropdown.
2. Click Load Config.
3. Select a .zip file.
4. Click OK.

NOTE: If you are not logged in or you do not have sufficient privileges, you will receive an authentication violation error message.

To restore factory default settings:

1. Select the File Options dropdown while within the Quick Setup dropdown.
2. Click Factory Reset.



CLOCK

The Power Xpert Meter uses a real-time clock for time keeping. The meter can be configured to adjust for Daylight Savings Time (DST) based on the time zone selection and to synchronize time using NTP. By using NTP, time will be maintained by the real time clock, and the real time clock will be calibrated and time corrected using NTP.

NOTE: The initial clock setting is in UTC/GMT (Greenwich Mean Time). The user-selected Time Zone only takes effect after clicking "Save".

The Clock setup allows you to set the time in hours and minutes, select a time sync option, and set the date for the meter. If NTP is selected for time sync, an IP address of the NTP server should be set. When selecting DCF-77 as the Time Sync Source, an Input channel must be selected under I/O -> Internal I/O -> Inputs. When selecting NTP (Network Time Protocol) as the Time Sync Source, at least one IP Address must be entered (as many as three NTP server IP addresses may be entered). Use this page to enter the NTP server IP address for an Ethernet connection.

NOTE: In order to retain the clock setting through a power cycle, the battery back up must be engaged. Set Switch D3 to the On position to engage the battery (See cover on power supply; Fig.2).

Locating the Clock Settings on the Web

1. From the Settings main page, select the Clock arrow. The page will update to list all the current settings for Clock. An Edit and a Save button will appear at the top of the page.
2. Click Edit to change any of the listed settings.
3. Click Save when new entries are completed. Click Close to exit Edit mode.

General	Triggers	Metering	Comms	Users	I/O	Diagnostics
File Options... Edit Save Close						
▶ Quick Setup						
▼ Clock						
Set Time						
Time	11		:	04		
Date	Dec	18		2016		
Time Zone	America/New_York					
<input checked="" type="radio"/> No Time Synchronization <input type="radio"/> Set Time Manually						
<input type="radio"/> Synchronize with NTP Server(s) <input type="radio"/> Update time and date manually						
NTP Server 1						
NTP Server 2						
NTP Server 3						

General	Triggers	Metering	Comms	Users	I/O	Diagnostics	
					Edit	Save	Close
▶ Pulse Initiation							
▼ Internal I/O							
▼ Inputs							
▼ DI 1							
ID	Input One						
Mode	DCF-77						
	Pulse Weight				Counts/Pulse		
	Pulse Multiplier						
	Units						
	Delay	30.00			milliseconds		
Polarity	Active when Energized						

SYSTEM

The System settings is divided into two sections: Hardware and Firmware. These pages have no user changeable fields. They display pertinent hardware and firmware information.

HARDWARE

The System Hardware page lists the models/versions and manufacturing information of the:

- Core Board
- Power Supply
- Communication Main Board (including MAC address)
- Communication Expansion Board
- I/O Board

This page also lists the Compact Flash and System Flash Total Memory and Available Memory and availability of FPGA for Fast Transient Capture.

The MAC address is also found on this screen, as part of the Communication Main Board.

Locating Hardware Setup on the Web

1. From the Settings main page, select the System arrow.
2. Click on the Hardware arrow. The page will update to display Hardware information.

General	Triggers	Metering	Comms	Users	I/O	Diagnostics
File Options... <input type="button" value="Edit"/> <input type="button" value="Save"/>						
▶ Quick Setup						
▶ Clock						
▼ System						
▼ Hardware						
Model		Enhanced				
Core Board						
Subassembly Name		ENHANCED				
Part Number						
Revision		17.				
Serial Number		00023158				
Date Code		20151222				

FIRMWARE

The System Firmware page displays the Power Xpert Meter Firmware Version and the date of release with buttons to upgrade firmware update and reboot the meter.

Locating Firmware Setup on the Web

1. From the Settings main page, select the System arrow.
2. Click on the Firmware arrow. The page will update to display the Firmware version. Refer to Firmware Upgrade, for the upgrade procedure.

General	Triggers	Metering	Comms	Users	I/O	Diagnostics
File Options... <input type="button" value="Edit"/> <input type="button" value="Save"/>						
▶ Quick Setup						
▶ Clock						
▼ System						
▶ Hardware						
▼ Firmware						
Firmware Version				13.3.7.2.9021		
UI Version				V2.5		
Firmware Version Date				2016/11/18		
<input type="button" value="Upgrade"/>		<input type="button" value="Reboot"/>		<input type="button" value="Licenses"/>		

6.2. Triggers Screen

Event triggers can be automatic or manual. If you select manual triggering, the meter will use these programmed limits for event triggering.

Each manual trigger input can be programmed to monitor performance, capture waveform, capture parameters, and/or send e-mail. When an event is triggered, the Reset Value will be used to check and clear the condition. Every event and its corresponding parameters, along with data and time of the occurrence, are logged and available for display or retrieval using a communication port.

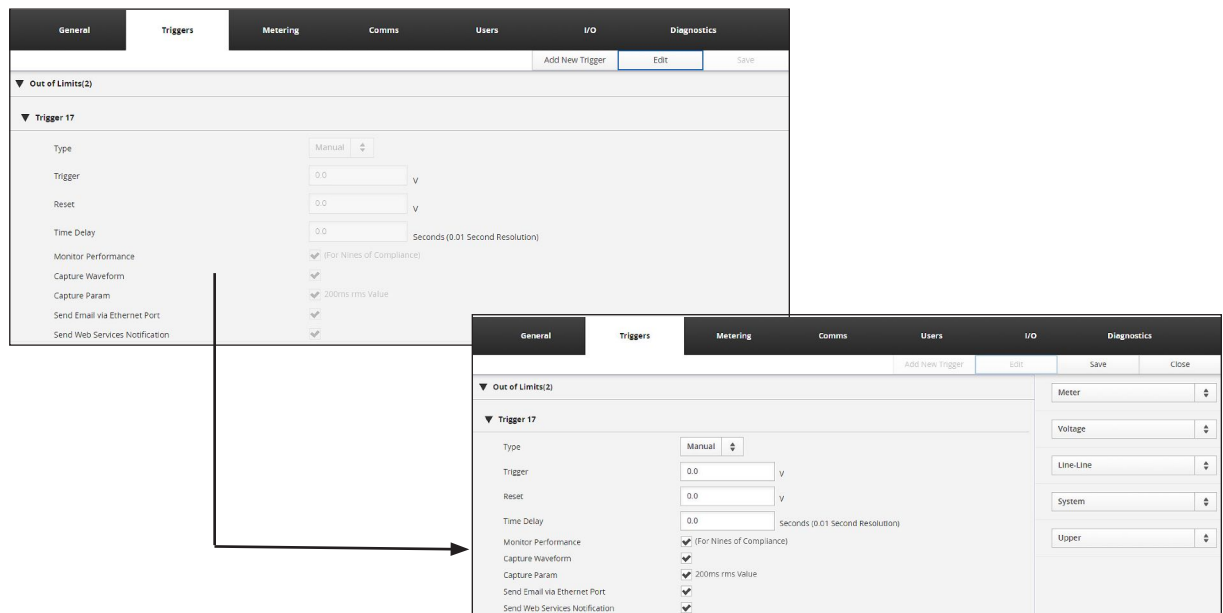
The Power Xpert Meter has seven kinds of triggers; Out of Limit, ITIC, Demand Overload, Sub-cycle Disturbance, Digital Input Status, Modbus Triggered, and Fast Transient. Input Status triggers are configured in the I/O tab under I/O -> Internal I/O -> Inputs. Modbus triggered events are not configurable, and as such are not shown here.

OUT OF LIMITS

The Out of Limits Triggers are divided into three categories; Meter, Power and Quality. Each has several options to choose from. Refer to the “Out of Limits” section in Chapter 5 of this manual for these options.

Locating Out of Limits Setup on the Web

1. From the Settings main page, select the Triggers tab.
2. Select the Out of Limits arrow.
3. Underneath the Out of Limits arrow are arrows to select available triggers.
4. When clicking on a specific trigger, the page will update to list all the current settings for that trigger. Edit and Delete buttons are provided at the top of the page for use in modifying existing triggers.
5. Use the Add New Trigger button at the top of the Out of Limits Trigger page to add an additional trigger.
6. Click Edit to change any of the listed settings.
7. Click Save when new entries are completed. Click Close to exit Edit mode.

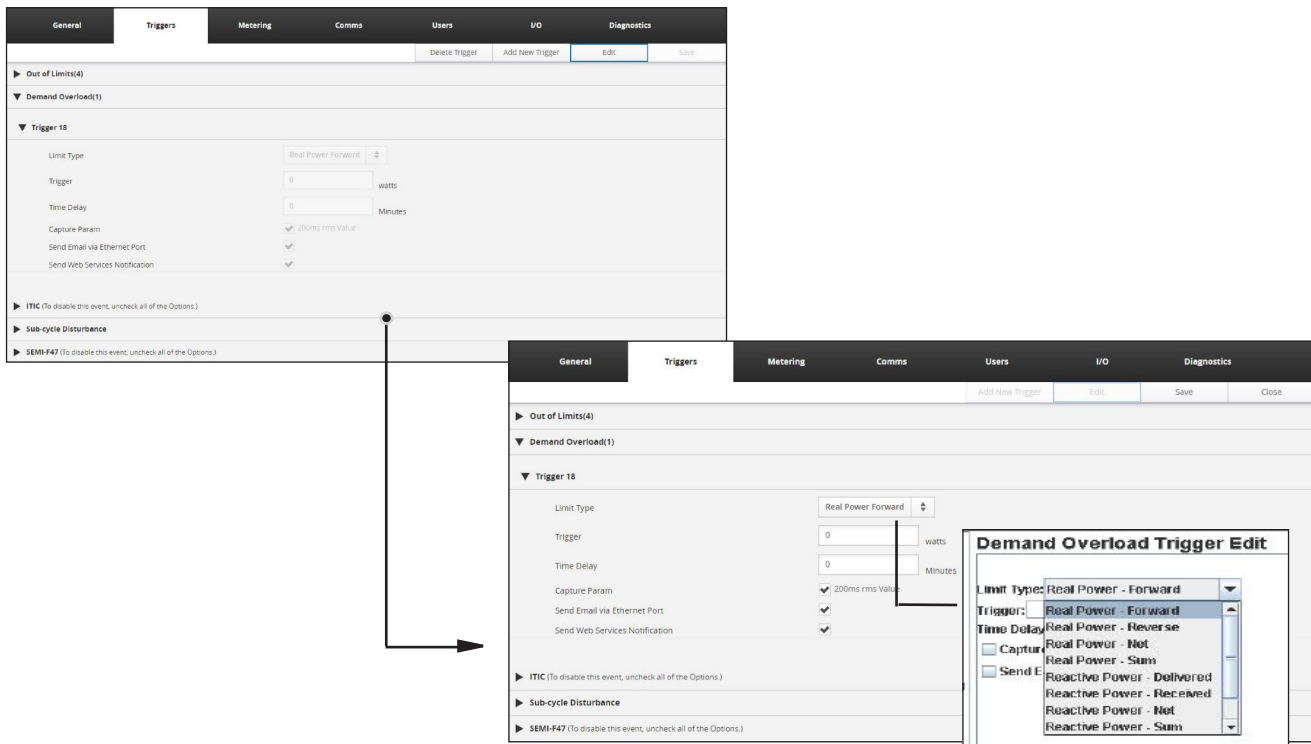


DEMAND OVERLOAD

You can set Demand Overload for Real Power (forward, reverse, net, or sum), Apparent Power, Reactive Power (delivered, received, net or sum), and Current with a specific delay for each.

Locating Demand Overload Settings on the Web

1. From the Settings main page, select the Triggers tab.
2. Select the Demand Overload arrow.
3. Underneath the Demand Overload arrow are arrows to select available triggers.
4. When clicking on a specific trigger, the page will update to list all the current settings for that trigger. Edit and Delete buttons are provided at the top of the page for use in modifying existing triggers.
5. Use the Add New Trigger button at the top of the Demand Overload Trigger page to add an additional trigger.
6. Click Edit to change any of the listed settings.
7. Click Save when new entries are completed. Click Close to exit Edit mode.



The image displays two screenshots of the Eaton web interface, illustrating the steps to edit a Demand Overload Trigger.

Left Screenshot: Shows the 'Triggers' tab selected. Under 'Demand Overload(1)', 'Trigger 18' is expanded. The settings for Trigger 18 are visible: Limit Type (Real Power Forward), Trigger (0 watts), Time Delay (0 Minutes), Capture Param (200ms rms Value), Send Email via Ethernet Port (checked), and Send Web Services Notification (checked). Buttons for 'Delete Trigger', 'Add New Trigger', 'Edit', and 'Save' are visible at the top.

Right Screenshot: Shows the 'Demand Overload Trigger Edit' modal window. The 'Limit Type' dropdown is open, showing options: Real Power - Forward, Real Power - Reverse, Real Power - Net, Real Power - Sum, Reactive Power - Delivered, Reactive Power - Received, Reactive Power - Net, and Reactive Power - Sum. The 'Trigger' dropdown is also open, showing options: Real Power - Forward, Real Power - Reverse, Real Power - Net, and Real Power - Sum. The 'Time Delay' is set to 0 Minutes. The 'Capture Param' is set to 200ms rms Value. The 'Send Email via Ethernet Port' and 'Send Web Services Notification' checkboxes are checked.

ITIC

ITIC Triggers are fixed triggers. Event triggers are dependent on levels of sag and swell conditions. You can select Capture Waveform, Capture Parameters, or choose to have an email sent when the event occurs.

Locating ITIC Settings On The Web

1. From the Settings main page, select the Triggers tab.
2. Select the ITIC arrow.
3. Underneath the ITIC arrow is a table displaying check boxes defining current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

General	Triggers	Metering	Comms	Users	I/O	Diagnostics
						<input type="button" value="Edit"/> <input type="button" value="Save"/>
▶ Out of Limits(4)						
▶ Demand Overload(1)						
▼ ITIC (To disable this event, uncheck all of the Options.)						
	Capture Waveform	Capture Parameters	Send E-mail	Send Web Notification		
L2 Sags	▼	▼	<input type="checkbox"/>	▼		
L4 Sags	▼	▼	<input type="checkbox"/>	▼		
L8 Sags	▼	▼	<input type="checkbox"/>	▼		
L2 Swells	▼	▼	<input type="checkbox"/>	▼		
L4 Swells	▼	▼	<input type="checkbox"/>	▼		
L8 Swells	▼	▼	<input type="checkbox"/>	▼		
▶ Sub-cycle Disturbance						
▶ SEMI-F47 (To disable this event, uncheck all of the Options.)						

SUB-CYCLE DISTURBANCE

The Power Xpert Meter captures sub-cycle disturbances with its regular metering hardware, which samples at 30.72 ksps. You can set the dv/dt Threshold and Absolute Threshold for Van, Vbn, Vcn, Vab, Vbc, and Vca. In addition, you can select the kind of action that will occur when one of the thresholds has been reached; Capture Waveform, Capture Parameters and/or Send E-mail.

The Absolute Threshold Voltage setting is intended to trigger on Voltage spikes that exceed the normal positive and negative peak values, which are typically 1.4 times the rms line-to-ground Voltage. It is important to set this threshold safely above the expected peaks. The Settings page suggests a threshold that is 20% above the Nominal L-L Voltage (divided by the PT ratio). For example, a 120V/208V system has a 120V rms and 170V peak (line-to-ground), and so a 250V threshold is appropriate (i.e. 208 + 20%).

The dv/dt Threshold setting is entered in dv while the dt is fixed at the hardware sampling rate. The Settings page suggests an aggressive threshold. Specifically, the settings page suggests a threshold that is 5% of the Nominal L-L Voltage (divided by the PT ratio).

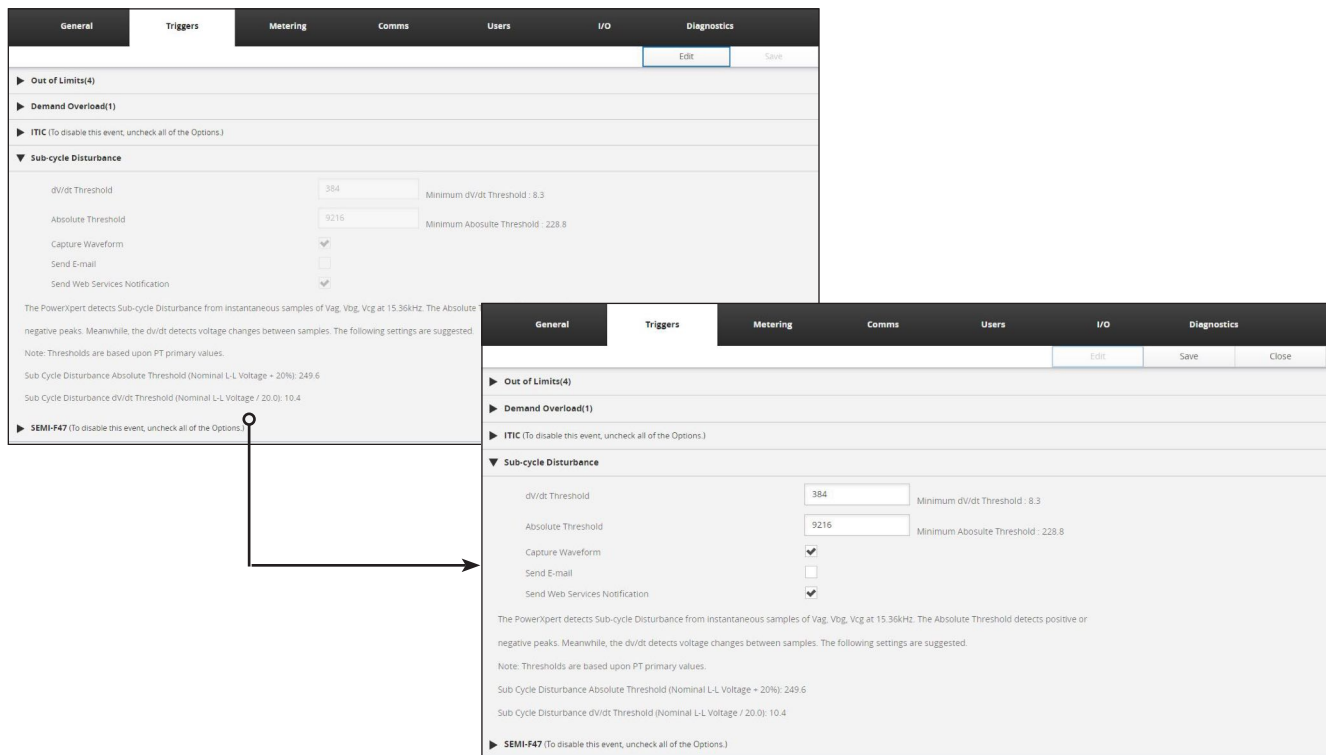
To calculate the volts per microsecond, multiply the threshold Volts by 0.03072. For example, if the dv/dt Threshold is set at 20V, the Volts per micro second would be 0.744 (i.e. 20V x 0.0372 Msps = 0.744 V/ microsecond).

A 30.72 ksps sampling rate and a pure 120V sine wave would result in a dv of 1.5V per sample at the zero crossing. A disturbed waveform would have a much higher dv/dt.

NOTE: To notify Power Xpert software of sub-cycle disturbances, select the Send Web Services Notification box.

Locating Sub-cycle Disturbance Setup on the Web

1. From the Settings main page, select the Triggers tab.
2. Select the Sub-cycle Disturbance arrow.
3. Underneath the Sub-cycle Disturbance arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



The screenshot displays the 'Triggers' configuration page. The 'Sub-cycle Disturbance' section is expanded, showing the following settings:

- dv/dt Threshold: 384 (Minimum dv/dt Threshold: 8.3)
- Absolute Threshold: 9216 (Minimum Absolute Threshold: 228.8)
- Capture Waveform:
- Send E-mail:
- Send Web Services Notification:

The callout box shows the 'Edit' mode for these settings, with an arrow pointing from the 'Edit' button in the main view to the callout.

FAST TRANSIENT

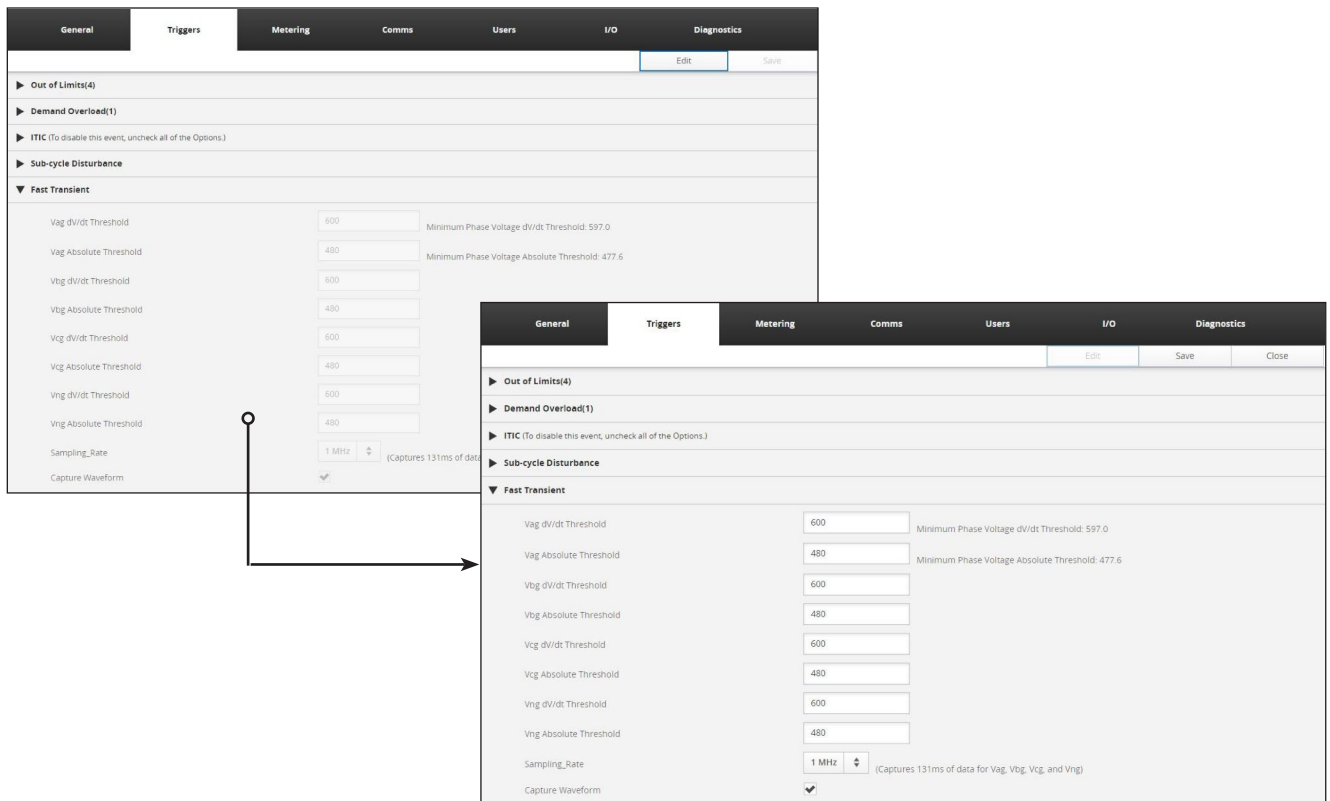
The Power Xpert Meter captures transients with optional hardware that samples 4 channels according to user settings. You can set the dv/dt Threshold and Absolute Threshold for Vag, Vbg, Vcg and Vng. You can also select the Sampling Speed as well as the kind of action that will occur when one of the thresholds has been reached [Capture Waveform, Capture Parameters, and/or Send E-mail].

The Absolute Threshold Voltage setting is intended to trigger on Voltage spikes that exceed the normal positive and negative peak values, which are typically 1.4 times the rms line-to-ground Voltage. It is important to set this threshold safely above the expected peaks. The Settings page suggests a threshold that is 20% above the Nominal L-L Voltage (divided by the PT ratio). For example, a 120V/208V system has a 120V rms and 170V peak (line-to-ground), and so a 250V threshold is appropriate (i.e., 208 + 20%).

The dv/dt Threshold setting is entered in dv while the dt is fixed at the hardware sampling rate. The Settings page suggests a conservative threshold to avoid false triggering. Specifically, the Settings page suggests a threshold that is 50% above the Nominal L-L Voltage (divided by the PT ratio). A moderately aggressive lower threshold would be the 50% of the Nominal L-L Voltage (divided by the PT ratio). To calculate the volts per microsecond, multiply the threshold Volts by the sample time. For example, if the dv/dt Threshold is set a 10V and the speed selection is 6 Msps, the Volts per micro second would be 60 (i.e., 10V x 6 Msps = 60V/microsecond).

Locating Fast Transient Setup on the Web

1. From the Settings main page, select the Triggers tab.
2. Select the Fast Transient arrow.
3. Underneath the Fast Transient arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



6.3. Metering Screen

DEMAND

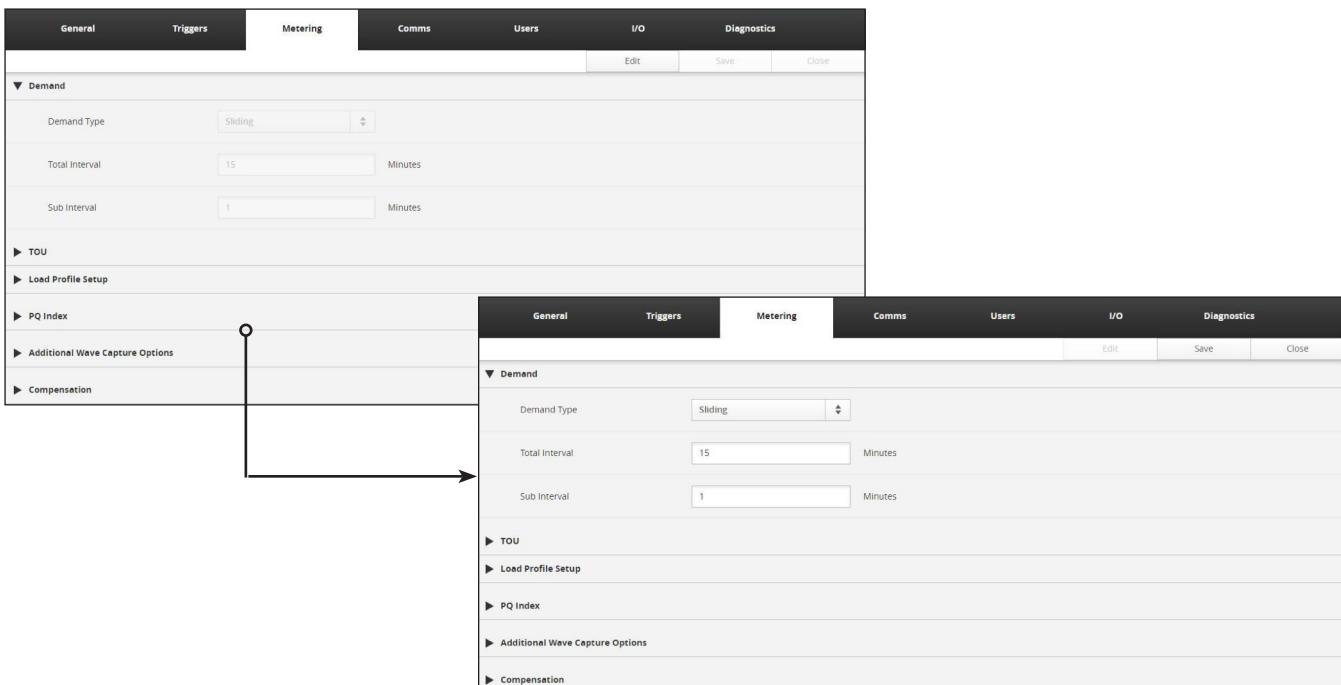
The Demand setup pages allow you to select either a Fixed Window or Sliding Window and the respective intervals in minutes. A fixed window setting allows you to select one interval period.

For example, if 15 minutes is selected, the demand calculation will be performed and the demand values will be updated every 15 minutes.

With a sliding window setting, the Power Xpert Meter provides a rolling average; you select the interval period and the subinterval period. For example, if you select 15 minutes as the demand interval and 5 minutes as the subinterval, the demand will calculate every 5 minutes using the 3 subinterval values ($15 = 5 \times 3$). The interval and subinterval value may be 1 to 60 minutes. If both values are the same, the demand interval is considered the fixed interval. A fixed interval period should be evenly divided by the subinterval value in case of a sliding interval.

Locating Demand Setup on the Web

1. From the Settings main page, select the Metering tab.
2. Select the Demand arrow.
3. Underneath the Demand arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



The screenshot displays the web interface for configuring the Demand setup. The interface is organized into tabs: General, Triggers, Metering, Comms, Users, I/O, and Diagnostics. The Metering tab is selected, and the Demand section is expanded. The Demand Type is set to Sliding, Total Interval is 15 Minutes, and Sub Interval is 1 Minute. Below the Demand section are links for TOU, Load Profile Setup, PQ Index, Additional Wave Capture Options, and Compensation. An arrow points from the Demand section in the left screenshot to the right screenshot, indicating the transition to the edit mode.

TOU

Four rate periods are supported for Time Of Use (TOU); A, B, C, and D in addition to total rate (which is independent of time of use).

At the start of a new demand interval, the Power Xpert Meter updates the TOU demand registers. If a scheduled rate change occurs, the demands are updated before the new rate is applied. The TOU schedule changes the rate and initiates a new demand window. The next demand window uses the new rate.

The meter will support up to 64 rate schedules with day types of weekdays and weekend. Time of Use defines the Rate Schedule and the Calendar for the meter.

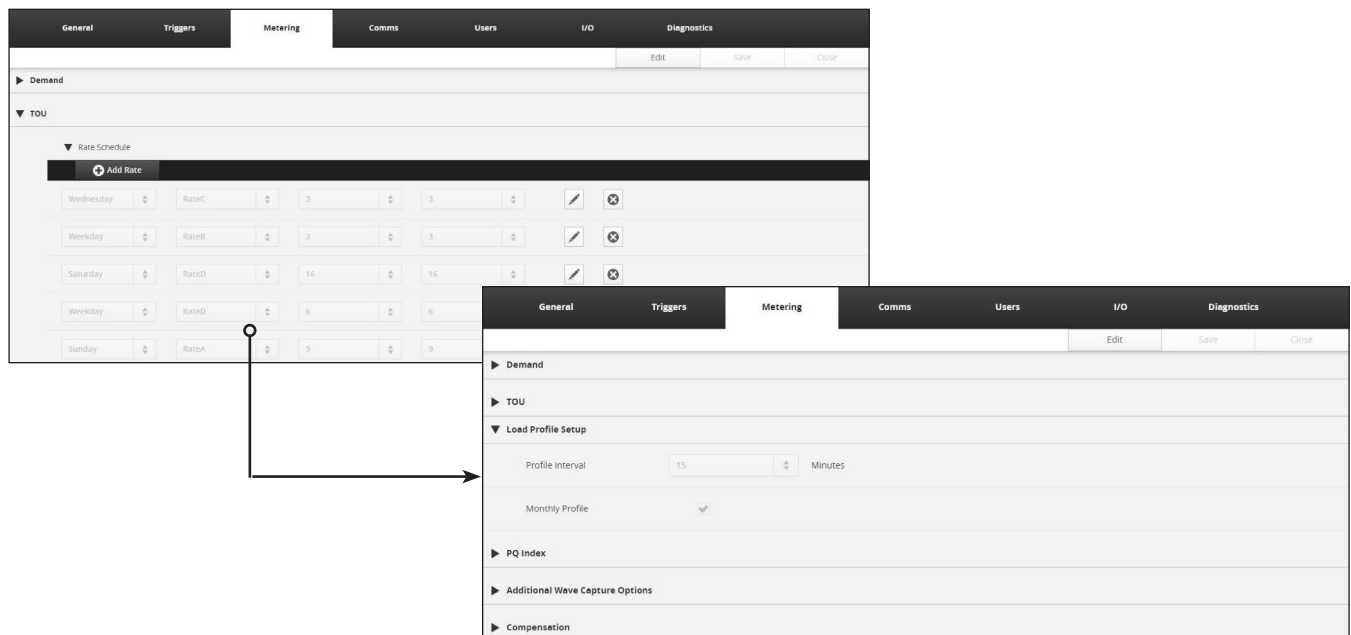
Rate Schedule Setup

The Power Xpert Meter has up to four user definable rate schedules. You can define the rate as a weekday or weekend and select the time the rate schedule is to begin. The rate schedule's ending hour is defined by the beginning of another rate schedule.

For example, Rate A is defined as a weekday beginning at 7:00 A.M. and ending at 4:59:59 P.M. when Rate B begins at 5:00 P.M.

Locating Rate Schedule Setup on the Web

1. From the Settings main page, select the Metering tab.
2. Select the TOU arrow, then the Rate Schedule arrow.
3. Underneath the Rate Schedule arrow is a list displaying all of the current Rates and a button option to add additional Rates.
4. Click Edit to change any of the listed Rates.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

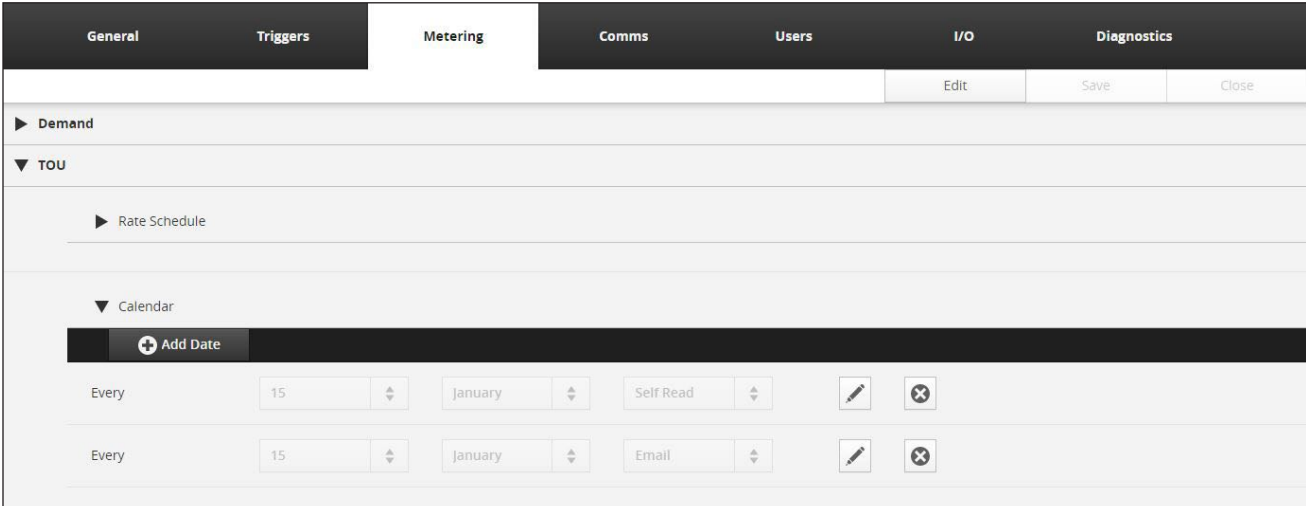


CALENDAR SETUP

The TOU section provides the means to define the Calendar of Events. Dates can be selected for the meter to reset or send an e-mail. For example, you can add a date that specifies the meter to send an email every Friday or reset the demand on the 1st day or every month.

Locating the Calendar Setup on the Web

1. From the Setup main page, select the Metering tab.
2. Select the TOU arrow, then the Calendar arrow.
3. Underneath the Calendar arrow is a list displaying all of the current Dates and a button option to add additional Dates.
4. Click Edit to change any of the listed Dates.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



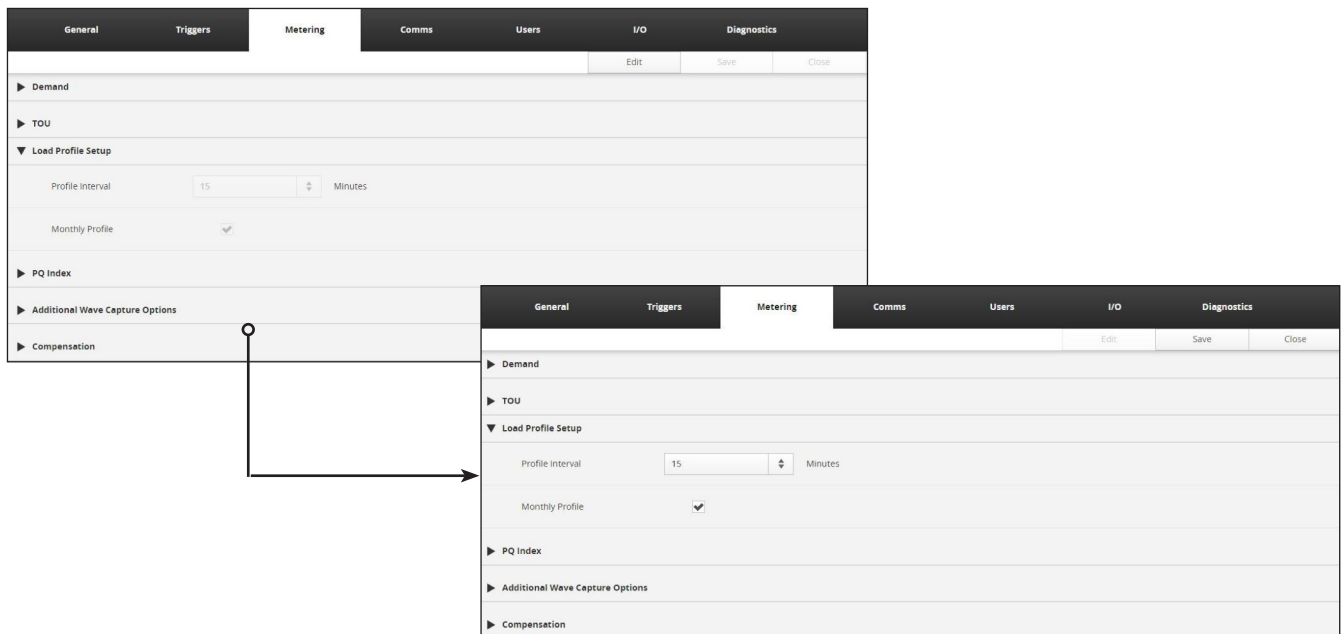
General	Triggers	Metering	Comms	Users	I/O	Diagnostics		
						Edit	Save	Close
▶ Demand								
▼ TOU								
▶ Rate Schedule								
▼ Calendar								
+ Add Date								
Every	15	January	Self Read					
Every	15	January	Email					

LOAD PROFILE SETUP

The Load Profile feature allows you to log and view interval values from Real Power (Forward, Reverse, Net and Sum), Apparent Power, Reactive Power, (Delivered, Received) Net and Sum, as well as Ampere. You can also set the log interval. The interval is 5 to 60 minutes. The Load Profile also provides a monthly profile, if enabled.

Locating Load Profile Setup on the Web

1. From the Settings main page, select the Metering tab.
2. Select the Load Profile Setup arrow.
3. Underneath the Load Profile Setup arrow is a list displaying all of the current Load Profile Interval minutes and the monthly profile as enabled or disabled.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

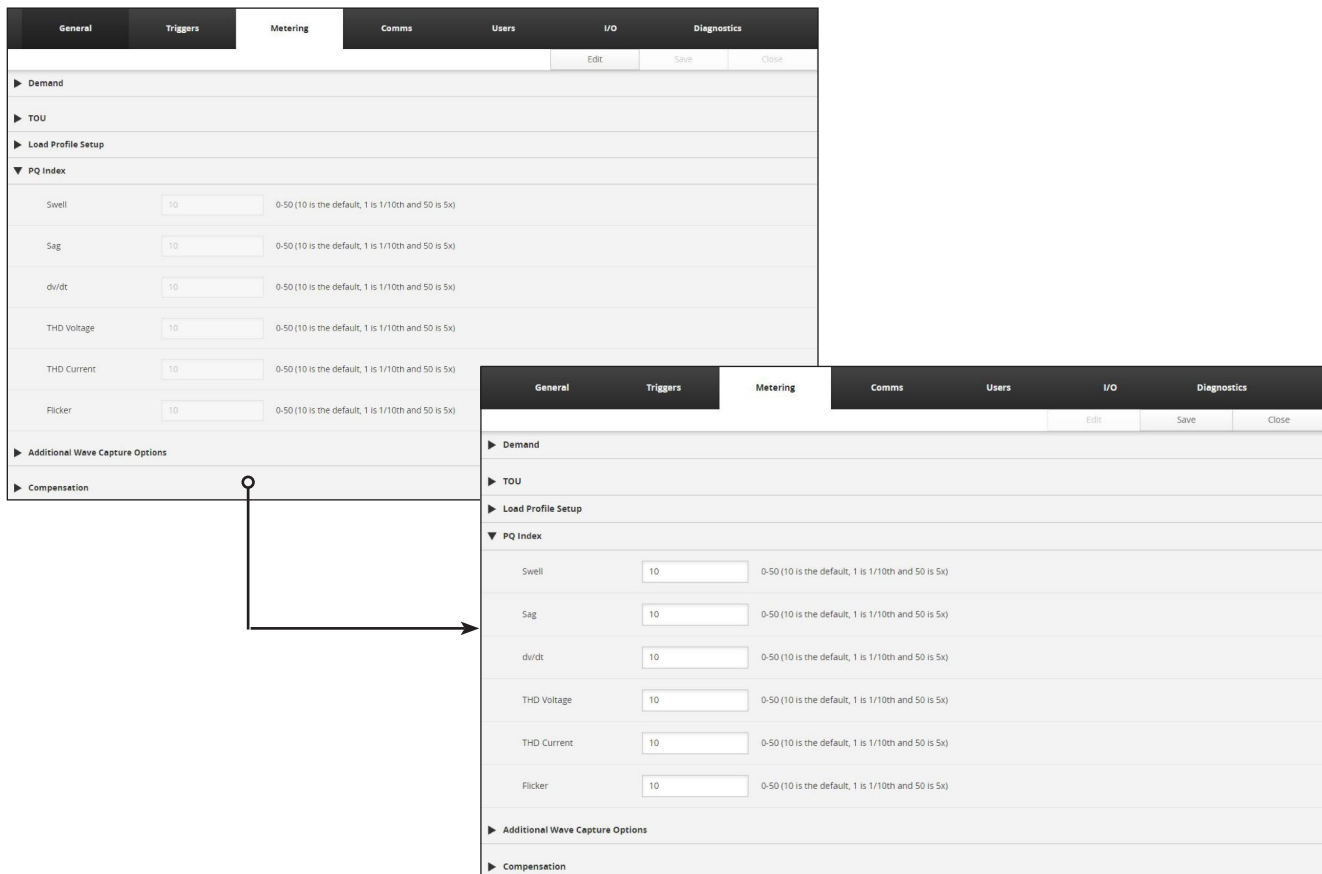


PQ INDEX

The PQ Index page provides the means to rank the importance of the information captured on the power quality page. This is done by assigning a value from 0 to 50 for Swell, Sag, dv/dt, THD Voltage, THD Current, and Flicker. For example, if a user does not want the Power Quality page to recognize Flicker activity, the Flicker percent can be set to 0. Measurements of greater importance can be assigned higher values accordingly.

Locating PQ Index Setup on the Web

1. From the Settings main page, select the Metering tab.
2. Select the PQ Index arrow.
3. Underneath the PQ Index arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings to values ranging from 0 to 50. The default value is 10.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



The screenshot displays the web interface for configuring the PQ Index. The interface includes a navigation bar with tabs for General, Triggers, Metering, Comms, Users, I/O, and Diagnostics. The Metering tab is selected, and the PQ Index section is expanded. A list of settings is shown with input fields for Swell, Sag, dv/dt, THD Voltage, THD Current, and Flicker, all set to 10. An arrow points from the 'Additional Wave Capture Options' section to the 'Edit' button in the PQ Index section.

Setting	Value	Range
Swell	10	0-50 (10 is the default, 1 is 1/10th and 50 is 5x)
Sag	10	0-50 (10 is the default, 1 is 1/10th and 50 is 5x)
dv/dt	10	0-50 (10 is the default, 1 is 1/10th and 50 is 5x)
THD Voltage	10	0-50 (10 is the default, 1 is 1/10th and 50 is 5x)
THD Current	10	0-50 (10 is the default, 1 is 1/10th and 50 is 5x)
Flicker	10	0-50 (10 is the default, 1 is 1/10th and 50 is 5x)

ADDITIONAL WAVE CAPTURE OPTIONS

User has the option to choose between two additional waveform capture methods, Periodic Harmonic Waveform Capture or Extended Waveform Capture.

Note: If Extended Waveform Capture is enabled for every waveform event, the system would capture 18 seconds of data, i.e. 22 MB of data, for every event. Waveforms would need to be periodically cleared to avoid running out of storage space.

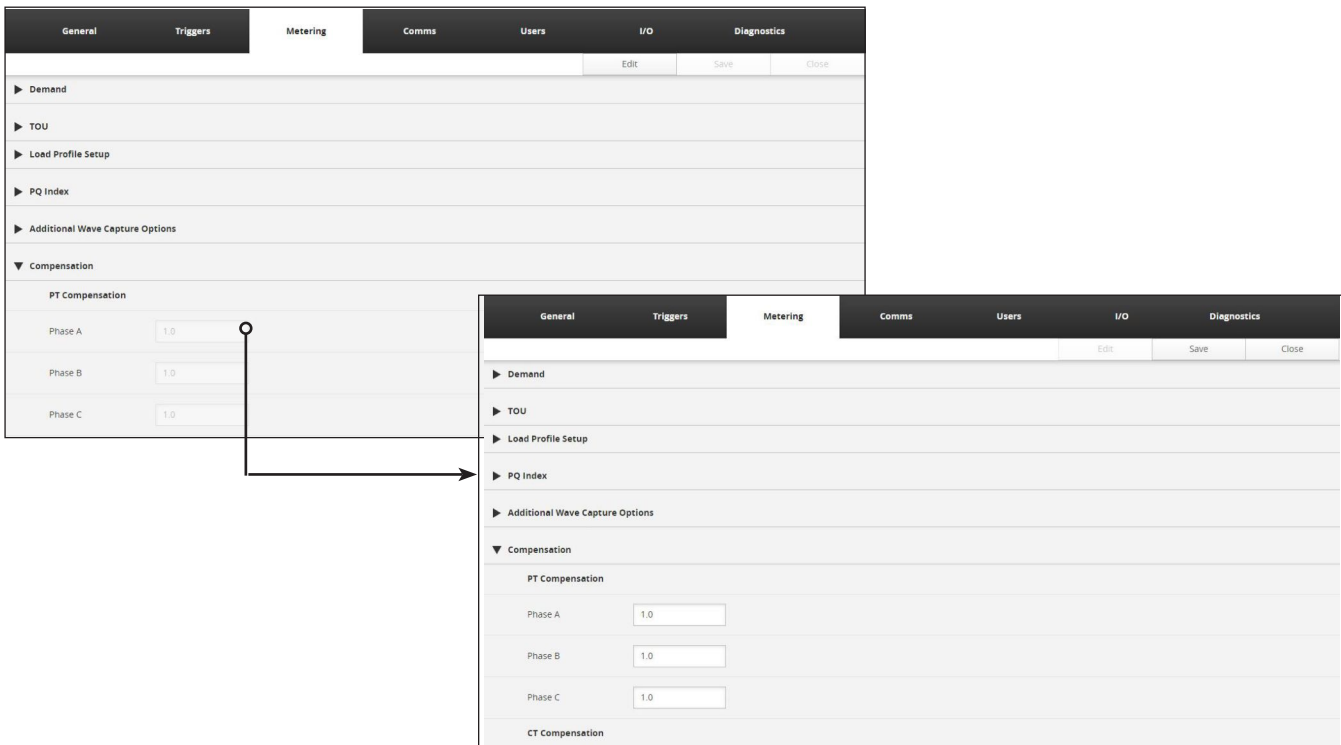
▼ Additional Wave Capture Options	
Periodic Harmonic Waveform Capture	<input type="checkbox"/>
Extended Waveform Capture	<input type="checkbox"/>
<small>Warning: If Extended Waveforms are enabled for every waveform event the system would capture 18 seconds of data i.e. 22MB of data for every event and you might have to clear waveforms periodically to avoid running out of space.</small>	

COMPENSATION

This page allows you to compensate for errors within their PT and/or CT. The value entered is used by the meter to multiply with respective to voltage and current channels. The valid range is -10 to 10. A CT Compensation value with a negative sign could be used to reverse the sign of measured current. This allows you to correct the polarity if the CT wires are incorrectly wired to the meter. For example, if a transformer had a 1% loss and the CT were wired backwards, the CT compensation would be -1.01.

Locating Compensation Setup on the Web

1. From the Settings main page, select the Metering tab.
2. Select the Compensation arrow.
3. Underneath the Compensation arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



The screenshot displays the web interface for configuring meter settings. The top navigation bar includes tabs for General, Triggers, Metering, Comms, Users, I/O, and Diagnostics. The Metering tab is selected, and the Compensation section is expanded. The PT Compensation section contains three input fields for Phase A, Phase B, and Phase C, each with a value of 1.0. The CT Compensation section is visible below. A callout box highlights the PT Compensation section, showing a magnified view of the input fields.

6.4. Comms Screen:

COM 1 is provided as a standard feature with all Power Xpert Meters. The LAN/WAN COM 2 and COM 3 are included with the optional Communications Expansion card. The page for each of these categories displays the current settings and communications ports in use.

NOTE: The CM Card RS 485 COM 1 is shipped from the factory as a slave port. Default jumper settings match this slave configuration. If the port configuration is changed to a master, refer to Appendix D for proper jumper placement instructions.

NOTE: The CE Card RS485 COM 2 is shipped from the factory as a master port. Default jumper settings match this master configuration. If the port configuration is changed to a slave, refer to Appendix E for proper jumper placement instructions.

Locating Communication (COM 1, 2, 3, & Ethernet/LAN) Setup on the Web

1. From the Settings main page, select the Comms tab.
2. Select either the Com 1 & 2 Setup, Com 3 Setup, or Ethernet/LAN arrow.
3. Underneath your selected arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

COM 1 & 2 SETUP

Use the COM1 & COM2 Setup page to:

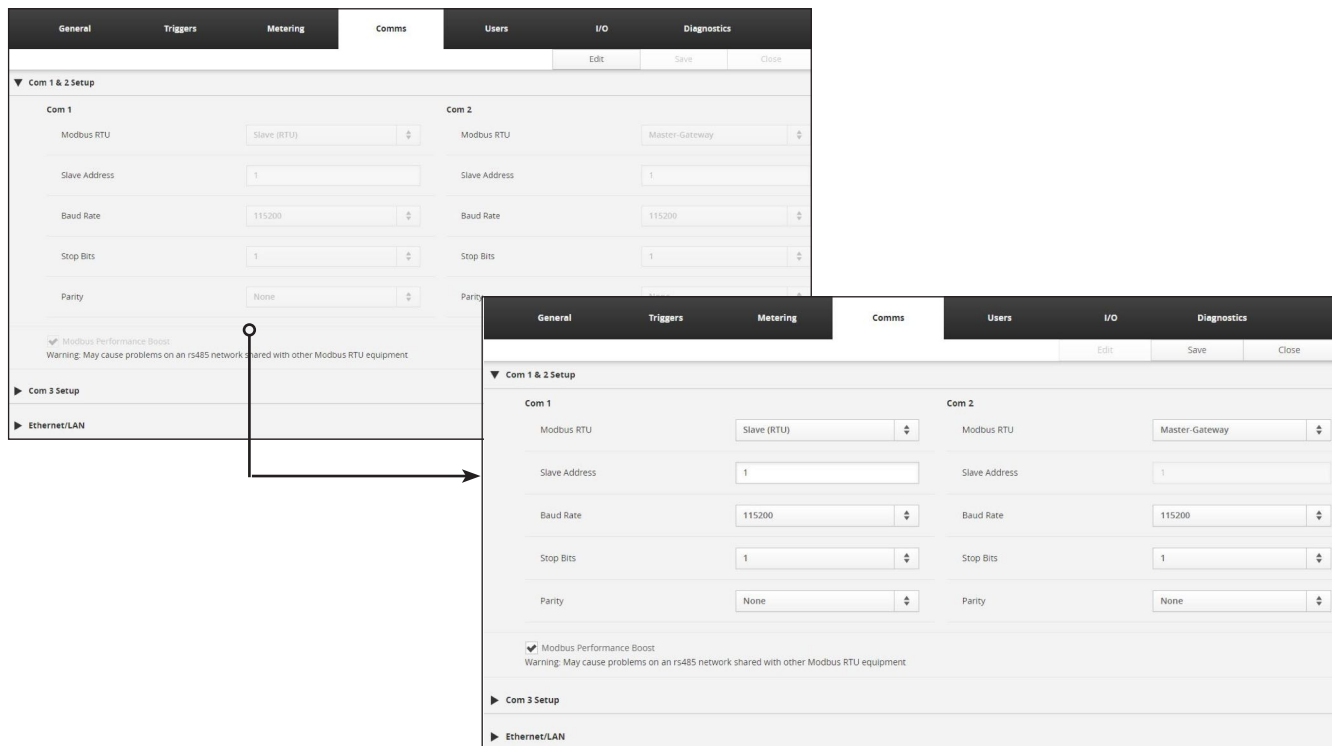
- Setup the Modbus RTU as a Master-Gateway, Slave-Gateway, Master-IO, or Modbus Slave. For Slave, you can choose to communicate via Modbus ASCII or Modbus RTU.
- Select a Modbus Slave addresses.
- Select the Baud Rate, Stop Bits and Parity for the COM1 device on the CM3 port or the COM2 device on the CE3 port.

NOTE: Only one of these ports can be configured as Master - Gateway.

Click the Edit button at the top right of the page to modify current COM1/COM2 settings. Click the drop down list beside Modbus RTU to select if the device is Disabled, a Slave (RTU), a Slave-Gateway, a Master-Gateway, a Slave (ASCII), or a Master-IO. If Slave (RTU) or Slave (ASCII) are selected, the slave address must be entered in the appropriate text box.

Click the drop down box beside Baud Rate to select the appropriate rate; 9600, 19.2K, 38.4K, 57.6K, 115.2K. Click the drop down box beside Stop bits to select 1 or 2. Click the Parity drop down box to select None, Odd, or Even.

NOTE: If Slave-Gateway is selected, the meter will only respond to the slave address set via the hex switch on that port (Hex switch value + 15).



The image displays two screenshots of the web server interface for configuring COM1 and COM2 settings. The interface is divided into several tabs: General, Triggers, Metering, Comms, Users, I/O, and Diagnostics. The 'Comms' tab is active, showing the 'Com 1 & 2 Setup' page. The page is divided into two columns: 'Com 1' and 'Com 2'. Each column has a 'Modbus RTU' dropdown menu, a 'Slave Address' text box, a 'Baud Rate' dropdown menu, a 'Stop Bits' dropdown menu, and a 'Parity' dropdown menu. The 'Com 1' settings are: Modbus RTU (Slave (RTU)), Slave Address (1), Baud Rate (115200), Stop Bits (1), and Parity (None). The 'Com 2' settings are: Modbus RTU (Master-Gateway), Slave Address (1), Baud Rate (115200), Stop Bits (1), and Parity (None). Below the settings, there is a checkbox for 'Modbus Performance Boost' which is checked, with a warning message: 'Warning: May cause problems on an rs485 network shared with other Modbus RTU equipment.' Below the warning, there are two expandable sections: 'Com 3 Setup' and 'Ethernet/LAN'. An arrow points from the warning message in the left screenshot to the right screenshot.

COM 3 SETUP

Use the COM3 Setup page to:

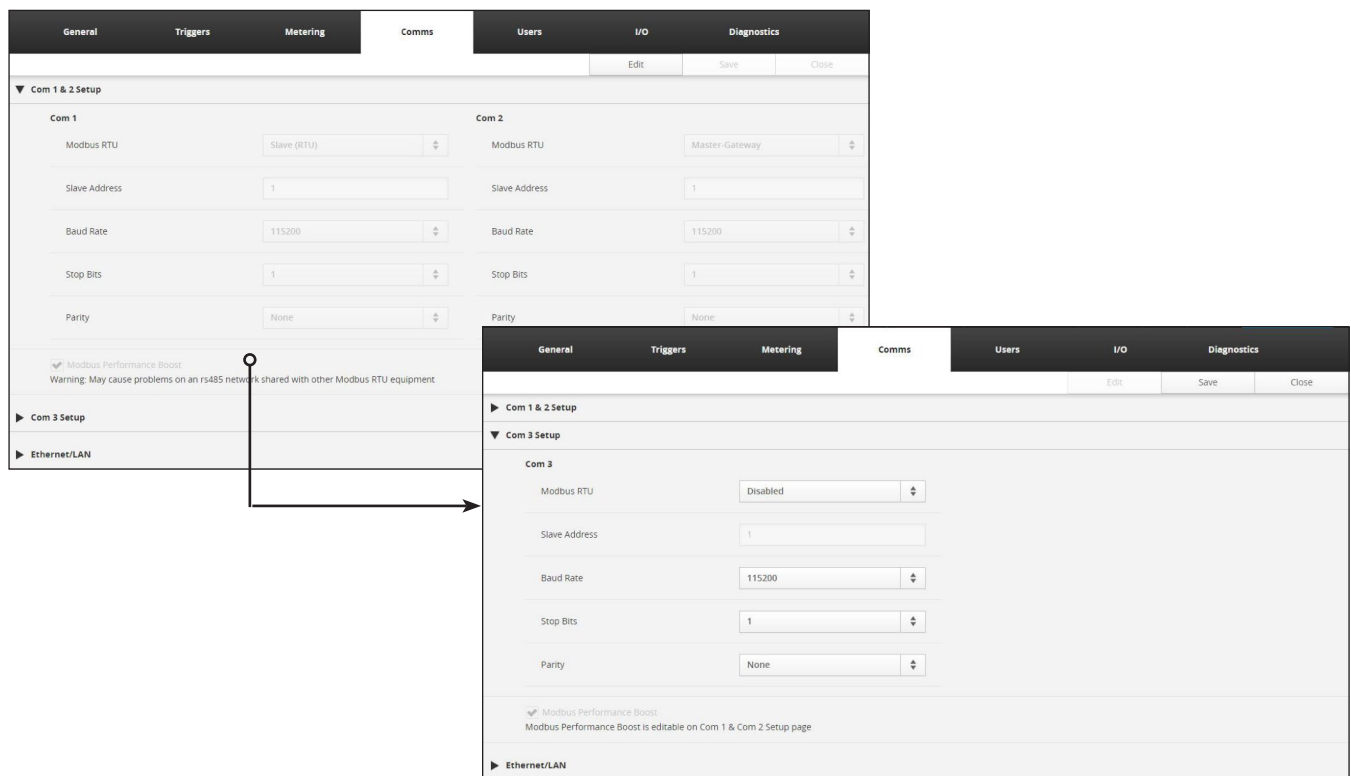
- Setup the Modbus RTU as a Master-Gateway, Slave-Gateway, Master-IO, or Modbus Slave. For Slave, you can choose to communicate via Modbus ASCII or Modbus RTU.
- Select the Modbus Slave addresses.
- Select the Baud Rate, Stop Bits and Parity for the COM3 device on the CE4 RS232 port

These options are the same as for COM1 and COM2 except that COM3 is an RS232 interface for one-on-one communication or multipoint through a modem.

Note: To use COM3 (RS232) between a Power Xpert Meter Master Gateway and Slave-Gateway, use a null-modem cable that swaps RX with TX on the 9-pin D connector.

Click the Edit button at the top right of the page to modify current COM3 settings. Click the drop down list beside Modbus RTU to select if the device is Disabled, a Slave (RTU), a Slave-Gateway, a Master-Gateway, a Slave (ASCII), or a Master-IO. If Slave (RTU) or Slave (ASCII) are selected, the slave address must be entered in the appropriate text box.

Click the drop down box beside Baud Rate to select the appropriate rate; 9600, 19.2K, 38.4K, 57.6K, 115.2K. Click the drop down box beside Stop bits to select 1 or 2. Click the Parity drop down box to select None, Odd, or Even.

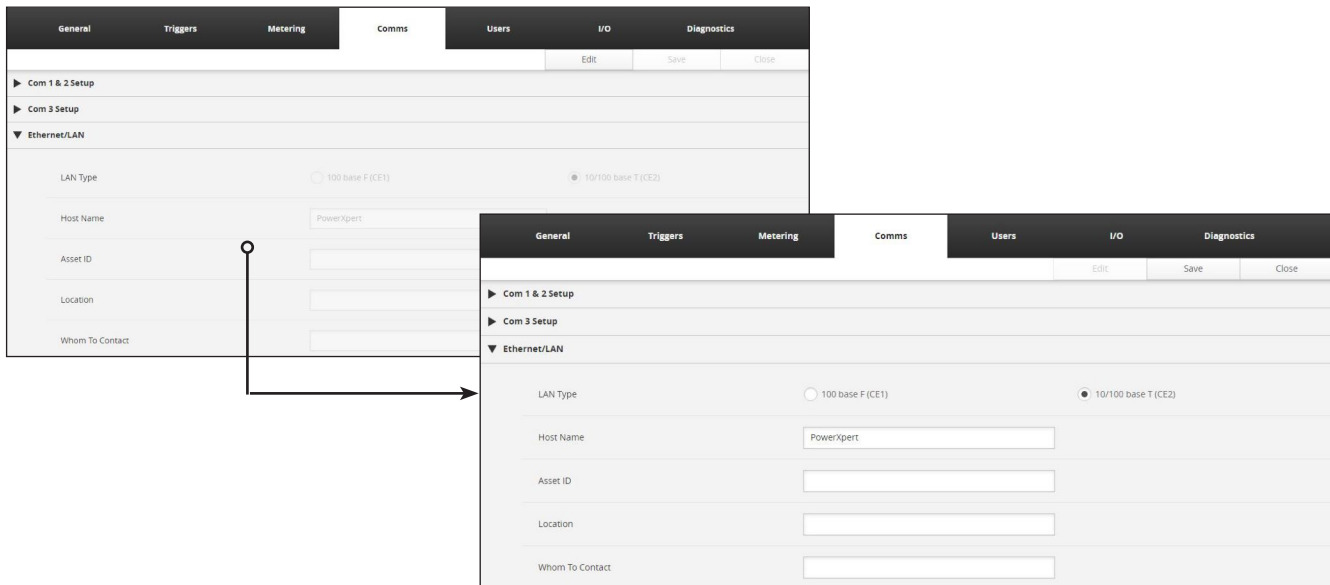


ETHERNET/LAN

The Ethernet/LAN Setup page allows you to select the kind of connection to be used (a fiber optic cable on the CE1 port or a 10/100 base T on the CE2 port), address information for the IP, the DNS Server and the Time Server (NTP), and to enable and configure the Modbus TCP.

Click the Edit button at the top right of the page to modify current Ethernet/LAN settings. Click the appropriate radio button to select the kind of port in use (10/100 base T or 100 base F). Enter the IP Address information or select Obtain Automatically. Enter the DNS Server Address or select Obtain Automatically. Lastly, enable Modbus TCP, if desired.

Select Obtain Automatically if you have a DHCP server available. This allows the meter to obtain an IP address automatically. Enter an IP address if the NTP server of the NTP Time Sync option is selected in the Clock settings.



CONFIGURING MODBUS COMMUNICATIONS

When Modbus/TCP is enabled, it can be configured to accept connections from either all clients or trusted clients. You can set this by entering the IP address mask. The X.X.X.X setting accepts all connections; however, you can also use the mask to accept connections from any client within a given subnet. For example, 192.168.X.X allows connections from any client in the subnet 192.168.0.0 to 192.168.254.254.

You can also use the meter as a gateway to a Modbus subnet and the Ethernet/LAN Setup page provides settings for configuring the gateway. Either RS-485 serial port can be configured as the connection to the subnet; however, there are some tuning considerations, which are covered later, that may affect the choice of port. Either of the two RS-485 ports, or the RS-232 port, can be designated Master-Gateway and Master-IO. These can be designated as such on the Com 1 & 2 Setup Edit page, and the Com 3 Setup page.

MODBUS TUNING

Modbus clients can respond differently to polling commands and may require additional time to respond. Also, the meter may need to attempt to poll a device multiple times as it may be in a state that does not allow it to immediately reply and therefore exceed the timeout value. You can use these settings to configure the meter to accommodate the various requirements of the devices on the subnet.

If there will be a high level of polling traffic, you should seriously consider having the Display Link on a separate RS485 port from the Modbus subnet. A high level of polling traffic can degrade the performance of the Display Link. Modbus modes 3 and 4 allow you to automatically split the requests between the two ports, depending on the slave device address. These are “load balancing” options as all Display Link address fall in the lower part of the range, and are therefore automatically routed to a particular RS485 port using these modes.

Modbus Timeouts

The following explains the Modbus timeout settings, and how to use them. These two settings combine to create a total timeout period (in ms) that equals the following formula:

$$\text{Total Timeout} = \text{Subnet Timeout} \times (\text{Subnet Retries value} + 1)$$

If a subnet device doesn't respond within the Total Timeout, the meter responds with exception 11 (0xb) or “Gateway Target Device Failed to Respond.”

Subnet Timeout This is the timeout value (or amount of time permitted for a subnet device to respond to a command). **The default value is 1000 ms.** This can also be set via Modbus register 2005.

Subnet Retries The number of times the meter will retry a subnet command before issuing. **The default value is 0** (or, “only try once”).

Modbus Subnet Gateway Configuration

The Subnet Mode field controls how the meter behaves as a Modbus subnet gateway. See “COM 1 & 2 Setup” in this section of the manual for instructions on configuring the RS485 ports (COM1, or if the Communications Adapter is installed, COM2.)

- 0** Setting the Subnet Mode to zero disables the meter from functioning as a Subnet Gateway Master. It will only respond to Modbus commands sent to its own slave address. The local address is the base address set by the hex switch.
- 1** **This is the default setting for COM1.** Setting Subnet Mode to 1 enables the meter as a Modbus Subnet Gateway Master. This is the default setting for Com1The meter will route any commands to slave addresses (other than its own) to the RS485/RS-232 port set as a Master-Gateway. If no response is received from the slave device within the total timeout (specified above), the meter returns an exception 11 (0xB) “Gateway Target Device Failed to Respond.” If no RS-485 port is currently set as the Master-Gateway, the meter returns an exception 10 (0xA) “Gateway Path Unavailable.”

- 2 This is the default setting for Com2.** Setting the mode to 2 also enables the meter as a Modbus Subnet Gateway Master. This is the default setting for Com2. The meter will route any commands to slave addresses (other than its own) to the RS485/RS232 port set as a Master-IO. If no response is received from the slave device within the total timeout (specified above), the meter returns an exception 11 (0xB) "Gateway Target Device Failed to Respond." If no RS485/RS232 port is currently set as the Master-IO, the meter returns an exception 10 (0xA) "Gateway Path Unavailable."
- 3** This is a load balancing option that requires that the optional Communications Expansion card has been installed. Unlike Subnet Gateway Master modes 1 and 2, the Gateway will route any commands to slave address (other than its own) to one of the RS485/RS232 ports, depending on the address. Slave addresses of 127 or below are routed to the RS485 port configured as a Master-IO while slave addresses of 128 or above are routed to the Master -Gateway.

As with the other Subnet Gateway Master Modes, if no response is received from the slave device within the total timeout (specified above), the meter returns an exception 11 (0xB) "Gateway Target Device Failed to Respond." If no RS-485 or RS232 port is currently set as either the Master-Gateway or Master-IO, the meter returns an exception 10 (0xA) "Gateway Path Unavailable."
- 4** This is another "load balancing" option that requires that the optional Communications Expansion card has been installed. The Gateway will route any commands to slave address (other than its own) to one of the RS485 or RS232 ports, depending on the address. Slave addresses of 127 or below are routed to the RS485/RS232 port configured as a Master-Gateway while slave addresses of 128 or above are routed to the Master-IO.

If no response is received from the slave device within the total timeout (specified above), the meter returns an exception 11 (0xB) "Gateway Target Device Failed to Respond." If no RS-485/RS232 port is currently set as either the Master-Gateway or Master-IO, the meter returns an exception 10 (0xA) "Gateway Path Unavailable."

E-MAIL SETUP

The Power Xpert Meter can send email messages when an alarm is triggered or when a defined event has occurred. E-Mail client could be setup to send periodic emails or alarm emails. The option to send an email is available on other pages, such as Time of Use and Alarms. The E-Mail Setup page contains information about where to send an email notification and what to include in each e-mail. Use the TOU (Time of Use) calendar setup to configure periodic emails Use the trigger set up page to configure alarm emails.

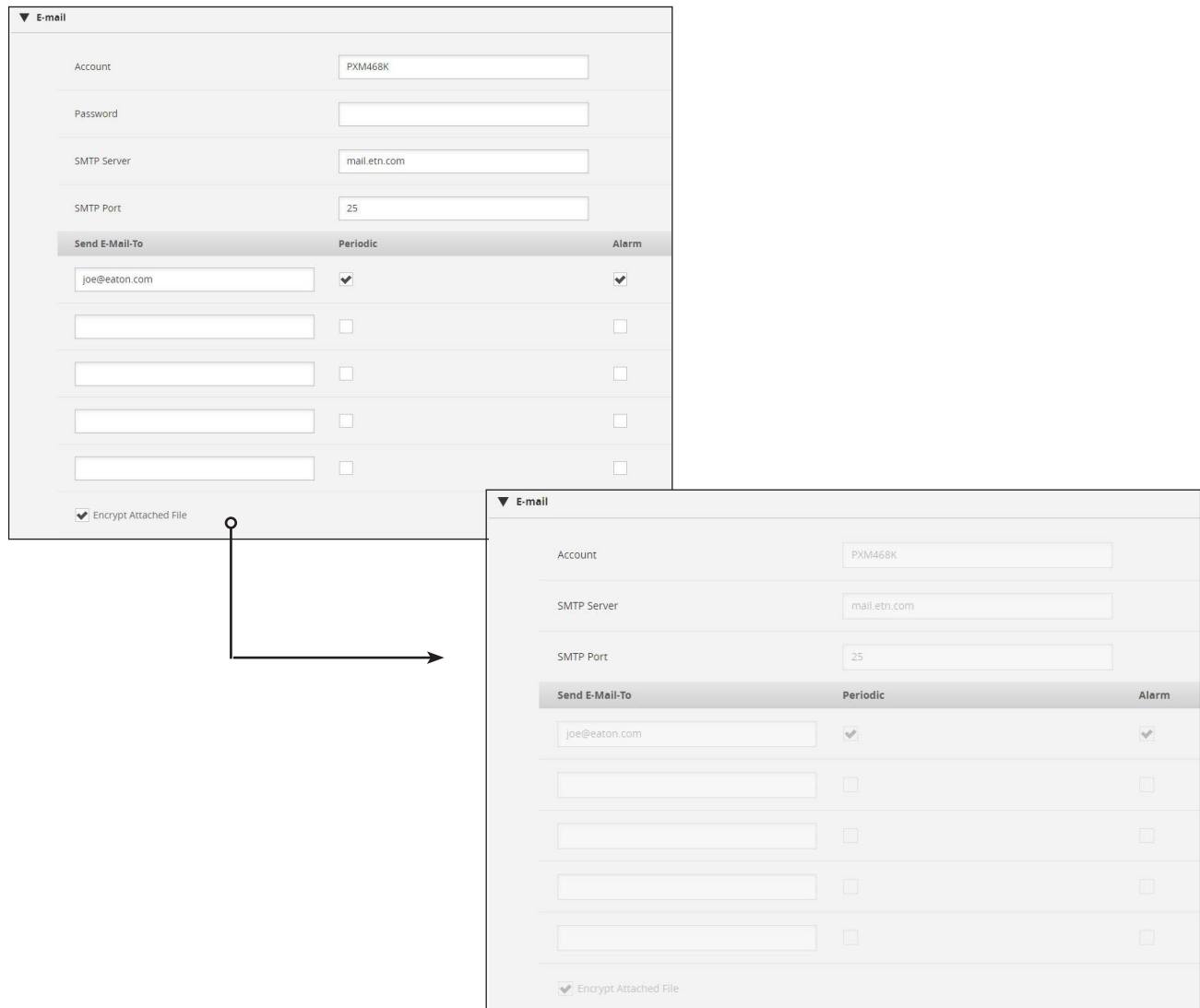
Use the E-Mail Setup page to configure the email client. Enter the Email account and password. Enter the email address recipients. Up to 5 email address can be entered. Select when to send an email by selecting Periodic or Alarm. Select the content of the email. Emails may be sent to up to five separate email addresses.

The Email page contains the meter's account name. This is the name entered into the server or the server account name, the SMTP Server, and the email addresses.

A periodic email will be sent if email was selected for any dates on the Calendar setup page. Refer to the Calendar Setup for additional information. An email will be sent if the email option was selected on any of the Trigger setup page.

Locating Email Setup on the Web

1. From the Settings main page, select the Comms tab.
2. Select the Ethernet/LAN arrow, then scroll down to select the E-mail arrow.
3. Underneath the E-mail arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



SETTING UP EMAIL

On the E-mail Setup page, you must fill in four pieces of information to connect to an SMTP server:

- **Account:** This is the email account used to log into the mail server. You (or your IT group) must create an email account on your mail server for use by the meter.
- **Password:** This is the password for the email account used by the meter. Presently, this field has no function as the meter firmware does not yet support a connection to the mail server using TLS or SSL.
- **SMTP Server:** This is the name or IP address of your SMTP mail server. If you don't know the name of your server, contact your IT group.
- **SMTP Port:** This is the port number assigned for SMTP [default is 25]. Port numbers allow multiple applications to share the Ethernet hardware without interfering with each other.

On the Ethernet/LAN Setup page, you must also set:

- At least one DNS Server.
- The fully qualified domain name. This is concatenated from the **Host Name on the E-mail Setup page** and the **Domain Name on the Ethernet Setup page**. For example, for a **Host Name** of meter1 and a **Domain Name** of mydomain.com, the resultant fully qualified domain name is meter1.mydomain.com.

Your IT group should ensure that the **Hostname** is set as the reverse lookup name for the meter in DNS. If the meter has been assigned a static IP address, you can normally check if the Hostname has been properly configured in DNS by running the following from a Windows command prompt:

```
> nslookup meter_ip_address
```

where meter_ip_address is the IP address assigned to the meter, terminated with a dot ['.']. If the meter's **Hostname** has been properly configured in DNS, you should see the **Hostname** returned by the command.

SNMP SETUP

The Power Xpert Meter supports Simple Network Management Protocol (SNMP) version 1, and provides information about the meter as per the following Management Information Bases (MIBs):

MIB	Filename	Description / Usage
Eaton Power Xpert Meter MIB	EATON-PWR-MTR-MIB.txt	Metered electrical system values.
Eaton Alarms+Traps MIB	EATON-PXG-MIB.txt	Alarms and notifications (traps).
Eaton Object Identifier (OID) assignments	EATON-OIDS.txt	Base document for all OID assignments for Eaton's MIBs.
RFC 4133 Entity MIB	ENTITY-MIB.txt	Identification and description of each device
RFC 4268 Entity State MIB	ENTITY-STATE-MIB.txt	Five availability status meters for each device attached to the card
RFC 4268 Entity State MIB Part 2	ENTITY-STATE-TC-MIB.txt	Possible state values for the Entity State MIB

Meter events (traps) are sent to designated SNMP manager devices. Traps may include such information as the ITIC event and time stamp as well as the event name and the meter name.

When setting up the SNMP functionality, you can designate the following:

SNMP Read Community String	This is the meter password required to read information from the meter. With this community string, the meter will respond to an SNMP GET REQUEST by sending the requested information via an SNMP GET RESPONSE. By SNMP convention, this string defaults to public. By SNMP convention, this string defaults to public .
SNMP Write Community String	This is the meter password required to change meter settings. With this community string, the meter will change the specified setting to the specified value when it receives an SNMP SET REQUEST.
SNMP Trap Community String	This string identifies the meter to the SNMP manager receiving the trap.
SNMP Trap Agent	This is the IP address of the SNMP manager that should receive the traps. You can designate up to six IP addresses.

Locating SNMP Setup on the Web

1. From the Settings main page, select the Comms tab.
2. Select the Ethernet/LAN arrow, then scroll down to select the SNMP arrow.
3. Underneath the SNMP arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

WEB SERVICES SETUP

The Web Services setup page was designed to provide controls for communications with Power Xpert Software. For optimum Power Xpert Software communications, the trending data updates are set at 15 minute intervals, which are a strongly recommended and required setting for larger networks, especially those with multiple meters. Shorter intervals may severely degrade performance. You should also leave alarm notification active.

The Web Services setup page also has an Install SSL Certificate button. This is a link which will open the Root Installation CA page for the meter. From this page, you can install an SSL certificate which will allow https communication between your web browser and the meter. For more information about installing a security certificate, see Appendix G: Root Certificate Authority Installation.

6.5. Users Screens

You can use the Users Screen to add/delete users, edit user names, change passwords, and change permissions.

USERS

The Users section lists all users and their assigned Security Group. The user has the ability to:

- View all users and their Security Group
- Edit the listing*
- Remove the listing*
- Set Password for the listing*
- Add Users

* With appropriate permissions

The Security Permissions page lists all setup pages and commands and the Security Groups required to edit them. Only users with the required Security Group or higher can edit that specific page. For example, if the Wiring Configuration page has a Security Group of 4, only users with a Security Group of 1 through 4 can edit that page. Only users with the required Security Group or higher as the Security Setup Permission page can edit the security levels for each page.

Locating Users Setup on the Web

1. From the Settings main page, select the Users tab.
2. Select the Users arrow.
3. Underneath the Users arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.



SECURITY PERMISSIONS

Account permissions are defined by the Security Group to which they are assigned. The Security Groups range from high (1) to low (5) level security. The account's security group must be equal to, or higher than, the group required to set security permissions in order to change security settings. For example, if the Security group permission is set to 2, then the account must have been assigned a group of 1 or 2 in order to change security settings. However, any user may change his or her own user account security settings without this permission.

The following is a list of the pages that require a Security Group to be assigned:

- Security
- Wiring Configuration
- Triggers
- Meter Configuration (Demand/IP/TOU)
- I/O Configuration
- Communication Port Setup
- Demand Reset
- Energy Reset
- Start & Stop Load Profile
- Acknowledge Events
- Clear Events and Waveforms
- Acknowledge Event Logs
- Clear Event Logs
- Clear Min Max
- Reset All Data
- Reboot
- Firmware Upgrade
- Set Date & Time
- Set Default Configuration

Locating Security Information On The Web

1. From the Settings main page, select the Users tab.
2. Select the Security Permissions arrow.
3. Underneath the Security Permissions arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

NOTE: Only users with the same or higher security group can edit permissions. For example, a security group 5 user will not be able to edit security group 4 through 1 permissions. A user with a security group of 1 will be able to edit all permissions.

Setting	Security Group
Setup (Group 1 Highest)	
Security	2
Wiring Config	3
Triggers	4
Metering Config	3
Demand Tou LP PQ	
I/O Configuration	3
Communication Port Setup	3

ACCESS CONTROL

The user has the ability to customize security features, such as password expiration date or enable FTP.

▼ Access Control

Secure Settings

<input type="checkbox"/> Account Password Expires After	60	Days	Number of days a password can be used before user must change it. Available range : 1 to 9,999 days. Default value : 60 days.
<input type="checkbox"/> Account Lockout Period	365	Days	Number of days after which an inactive account will be locked out. Available range : 1 to 9,999 days. Default value : 365 days.
<input checked="" type="checkbox"/> Modbus Disconnect Timeout Period	60	Minutes	Number of minutes that a Modbus TCP connection remains open if there is no Modbus activity in the network. Available range : 1 to 9,999 minutes. Default value : 10 minutes.
<input type="checkbox"/> SSH Service Enable			
<input type="checkbox"/> Enable SFTP			
<input checked="" type="checkbox"/> Enable FTP	<input type="checkbox"/> FTP Password		
System Use Notification			

Note: If "Enable SFTP" or "FTP Password" is checked, an account with "ftp" as User Name must be created.
 Please go to Settings > Users > Users webpage to create this account.
 FTP service is accessible via port 22.
 SFTP service is accessible via port 2222.
 Modbus TCP service is accessible via port 502.

6.6. I/O Screen

PULSE INITIATION

The default mode for all outputs is Host Control. To select an output for Pulse Initiation, select this feature in the I/O Settings page, assigning a source and pulse constant. Pulse constants are handled differently for S1 and S2 versus R1, R2, and R3. S1 and S2 pulse constants are entered in secondary rated Watt-Seconds per pulse (not including CT and PT ratios). R1, R2, and R3 pulse constants are entered in primary rated Watt-Hours per pulse. (CT and PT ratios are automatically factored.)

The meter generates pulses through discrete or relay outputs based on the value of selected accumulators. This is a fixed pulse and fixed width; 0 to 1000 kWh scaling factor. The meter can serve as a pulse initiator for all energies: real, reactive, or apparent.

Pulse Initiation settings allow you to select the Source and Pulse Constant for the two solid-state relay outputs (S1 and S2) and the three outputs (R1, R2, and R3).

You can select Watt hours Forward or Reverse, VAR hours received or delivered, or VA hours and enter the Pulse Constant for each.

For S1 and S2 (solid state outputs), the entered pulse constant is in Watt-second secondary. For example, if the CT Ratio is 5000:5, the PT Ratio is 120:120 and the pulse constant is set to 3600 Watt-Seconds, the primary rated pulse constant equals 1000 Watt-Hours per pulse. The S1 and S2 outputs pulse with a fixed width.

R1, R2, and R3 are form C relays. In case the R1, R2, and R3 pulse constant value entered is Watt-Hour primary, the pulse output from these relays takes CT and PT ratios into account. R1, R2, and R3 relays change the state every time the energy value reaches the pulse constant value.

Locating Pulse Initiation Setup on the Web

1. From the Settings main page, select the I/O tab.
2. Select the Pulse Initiation arrow.
3. Underneath the Pulse Initiation arrow is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

The image displays two screenshots of the web interface for Pulse Initiation settings. The top screenshot shows the 'Pulse Initiation' section expanded, with a table of settings for relays S1, S2, R1, R2, and R3. The bottom screenshot shows the same page with an 'Edit' button highlighted, and an arrow pointing to the 'Pulse Constant' field for relay R2.

Relay	Source	Pulse Constant	Unit
S1	W Forward	3600.0	(Watt-Second Secondary) = 1000.0(Watt-Hours Primary)
S2	VAR Received	3600.0	(VAR-Second Secondary) = 1000.0(VAR-Hours Primary)
R1	Host Control		
R2	Host Control		
R3	Host Control		

INTERNAL I/O

Internal I/O is divided into two sub-categories: Inputs and Outputs. The arrow for each allows you to identify input or output and assign functionality to it.

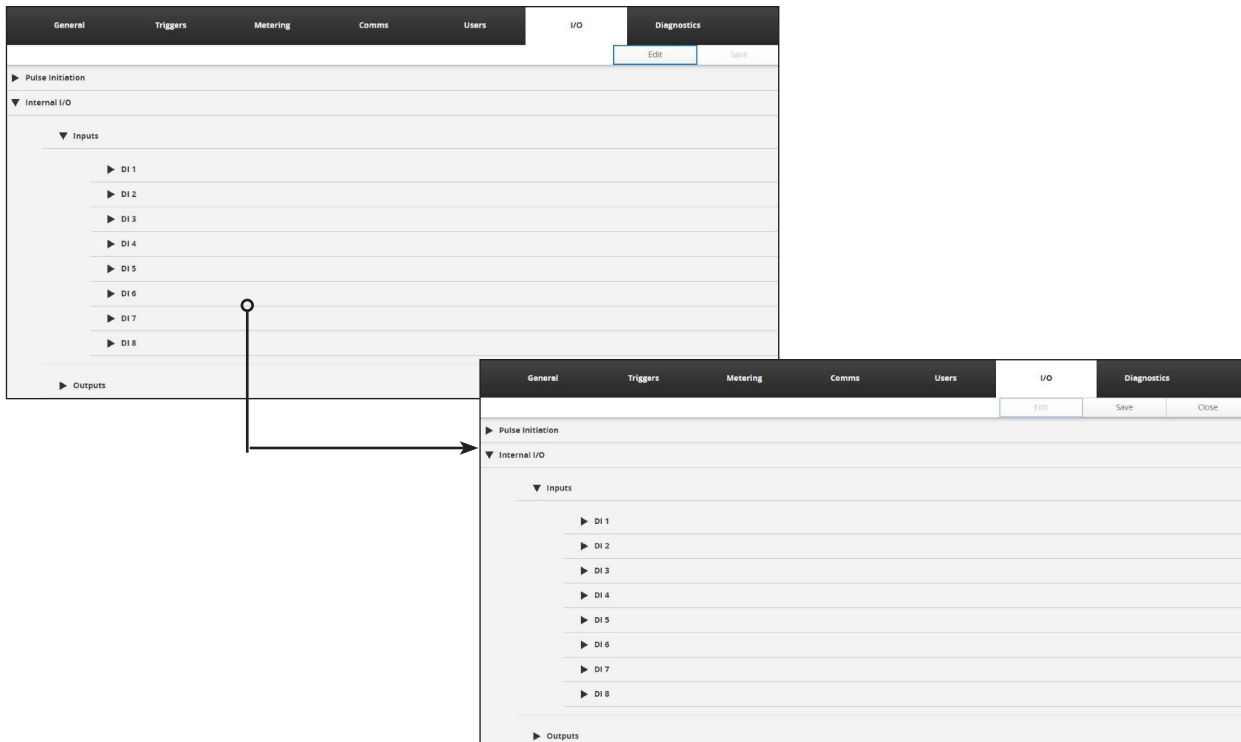
INTERNAL I/O - INPUTS

The Input section of the Internal I/O lists each of the 8 digital inputs, their IDs, and function. The Function assigned to the digital input dictates what or how the digital input responds, as a Counter, calculating summation log trends, giving Status via e-mail or capturing Waveforms, etc. Input 8 is fixed for real time pricing mode. Only one input can be selected for Demand Sync and DCF 77 Time Sync, and only input 8 can be configured for Real Time Pricing.

Locating Internal I/O Input Setup on the Web

1. From the Settings main page, select the I/O tab.
2. Select the Internal I/O arrow, then the Inputs arrow.
3. Underneath the Inputs arrow are arrows for each of the 8 digital inputs. Within each digital input is a list displaying all of the current settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

Use the ID text box to name the digital input if desired. Use the Mode drop down box to select the function (Counter, Status, Demand Sync, DCF 77, and Disable) of each digital input. Additional information may be required for some functions. For example, if Counter is selected, Pulse Weight, Pulse Multiplier, and Units must be entered. If Status is selected, the Delay time in seconds, the polarity of the input, and the triggering behavior must be set. In addition, the output settings, Log Event, Capture Waveform, and/or Send e-mail must be entered.



INTERNAL I/O – OUTPUTS

The Output section of the Internal I/O contains three separate relay pages, R1, R2, and R3. Each of these pages list the relay's ID, Mode, Trigger Type, Trigger, and Duration. You can associate each relay with up to 16 triggers. The Trigger Types are dictated by entries in previous settings pages. There are nine possible triggers types available to you.

- Out of Limits
- ITIC Alarms
- Sub-cycle Disturbance
- Fast Transient
- Demand Overload
- Input Status
- Modbus Triggered, and
- End of Interval.

If one of these setup pages is not completed or selected, the option will not be available in the drop down box for Trigger Type. If triggers are established for Out of Limits, Alarms and Demand Overload, these options will be available in the Trigger Type drop down box.

The Trigger drop down boxes provide options relative to the Trigger Type only. For example, if you select Out of Limits as the Trigger Type, the Trigger options will be restricted to the triggers set up in the Out of Limits setup page, such as: Phase AB Line - Line Voltage, System Real Power, etc. If the trigger is not setup in the previous page, it will not be available for selection in this page.

One of the three modes; Latched, Timed, or Normal could be selected for a relay output.

- In Latched mode, the relay is energized when a selected event occurs. The relay stays energized until it is reset manually.
- In Timed mode, the relay is energized for the duration specified when the event occurs.
- In Normal mode, the relay is energized when the event occurs and de-energized when the event is reset. Duration specifies the minimum time the relay will stay energized after recognizing the event.

Locating Internal I/O Output Setup on the Web

1. From the Settings main page, select the I/O tab.
2. Select the Internal I/O arrow, then the Outputs arrow.
3. Underneath the Outputs arrow are arrows for each of the 3 relays. Within each relay is a list displaying all of the current trigger settings.
4. Click Edit to change any of the listed settings.
5. Click Save when new entries are completed. Click Close to exit Edit mode.

Use the ID text box to name the relay output, if desired. Use the drop down box below the ID to select the Trigger Type and the Trigger from the options available. After these options are selected, choose the Mode from the drop down box and enter the duration. To add additional triggers for this relay, click the Add New Trigger button directly below the relay arrow header. Use the Delete button beside the Trigger to remove the Trigger Type from the relay."

6.7. Diagnostics Screen

The Diagnostics page displays the current health of the meter or a log of health-related events. These screens have no user-changeable fields. They display information only.

Locating Diagnostic Information on the Web

1. From the Settings main page, select the Diagnostics tab.
2. Select either the Battery Status, System Log, Cumulative Event Counts, Communication, I/O, or Connections arrow.
3. Underneath your selected arrow is current information.

BATTERY STATUS

- Battery Status - Good or Bad

The purpose of the battery (located on the core board) is to retain the real time clock through a power cycle. A status of "Bad" indicates that the real time clock has stopped because the battery no longer provides power.

General	Triggers	Metering	Comms	Users	I/O	Diagnostics
▼ Battery Status						
Status		Good				
<input type="button" value="Reset Battery Status"/>						
▶ System Log						
▶ Cumulative Event Counts						
▶ Communication						
▶ I/O						
▶ Connections						

SYSTEM LOG

- Power Fail Date and Time
- Power Return Date and Time
- Setup Change Date and Time*
- Demand Reset Date and Time*
- Energy Reset Date and Time*
- Min/Max Reset Date and Time*
- Reset Events Date and Time*
- Clear Log Date and Time*
- Clear Trend Date and Time*
- Clear Load Profile Date and Time*
- Clear Data Date and Time*
 - Security - Log-in Failure Date and Time*
- Security - Log-in and Log-out Date and Time*

*User name is logged

General Triggers Metering Comms Users I/O Diagnostics

Battery Status

System Log

Reset All Copy All

```

16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterCTPrimaryN by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterCTPrimaryG by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterCTPrimary by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterPTSecondary by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterPTPrimary by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterIncomingLLV by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterFrequency by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry MeterPhaseRotation by User: admin
16 Jan '16 22:52:40 -0500:Writing Configuration Entry IgCalculated by User: admin
16 Jan '16 22:52:39 -0500:Writing Configuration Entry MeasureIlg by User: admin
16 Jan '16 22:52:39 -0500:Writing Configuration Entry InCalculated by User: admin
16 Jan '16 22:52:39 -0500:Writing Configuration Entry MeasureIn by User: admin
16 Jan '16 22:52:39 -0500:Writing Configuration Entry MeterWiringConfig by User: admin
16 Jan '16 22:52:16 -0500:Writing Configuration Entry NodeName by User: admin
16 Jan '16 22:52:16 -0500:Writing Configuration Entry MeterEnergyUnits by User: NO USER
    
```

Cumulative Event Counts

Communication

I/O

Connections

CUMULATIVE EVENT COUNTS

- Accumulator Rollovers
- Demand Overload
- Out of Limit Triggers
- Fast Transient Triggers
- ITIC Triggers

General Triggers Metering Comms Users I/O Diagnostics

Battery Status

System Log

Cumulative Event Counts

Clear

Event	Count	Date & Time of Last Trigger
Accumulator Rollovers	0	-
Demand Overload	12	18 January 2016 10:51 PM
Out of Limit Triggers	39	18 December 2016 11:34 AM
Fast Transient Triggers	0	-
ITIC Triggers	19	03 November 2016 03:07 PM

Communication

I/O

Connections

COMMUNICATION – ETHERNET STATUS

- IP Address
- Subnet Mask
- Default Gateway
- MAC Address (CE)
- Expansion Comms Ethernet Link Status
- MAC address (CM)
- Main Comms Ethernet Link Status

General	Triggers	Metering	Comms	Users	I/O	Diagnostics
▶ Battery Status						
▶ System Log						
▶ Cumulative Event Counts						
▼ Communication						
▼ Ethernet Status						
IP Address			10.130.14.206			
Subnet Mask			255.255.252.0			
Default Gateway			10.130.12.1			
MAC address (CE)			00:d0:af:07:bb:55			
Expansion Comms Ethernet Link Status			Active			
MAC address (CM)			00:d0:af:07:bb:54			
Main Comms Ethernet Link Status			Down			

COMMUNICATION – ETHERNET MAIN STATUS

- Main Comms MAC Address
- Main Comms Receive Bytes
- Main Comms Receive Packets
- Main Comms Receive Errors
- Main Comms Receive Drops
- Main Comms Receive FIFO Errors
- Main Comms Receive Frame Errors
- Main Comms Transmit Bytes
- Main Comms Transmit Packets
- Main Comms Transmit Errors
- Main Comms Transmit Drops
- Main Comms Transmit FIFO Errors
- Main Comms Transmit Collisions

▼ Ethernet Main Status	
Main Comms MAC Address	00:d0:af:07:c5:70
Main Comms Receive Bytes	0
Main Comms Receive Packets	0
Main Comms Receive Errors	0
Main Comms Receive Drops	0
Main Comms Receive FIFO Errors	0
Main Comms Receive Frame Errors	0
Main Comms Transmit Bytes	0
Main Comms Transmit Packets	0
Main Comms Transmit Errors	0
Main Comms Transmit Drops	0
Main Comms Transmit FIFO Errors	0
Main Comms Transmit Collisions	0

COMMUNICATION – ETHERNET EXPANSION STATUS

- Main Comms MAC Address
- Main Comms Receive Bytes
- Main Comms Receive Packets
- Main Comms Receive Errors
- Main Comms Receive Drops
- Main Comms Receive FIFO Errors
- Main Comms Receive Frame Errors
- Main Comms Transmit Bytes
- Main Comms Transmit Packets
- Main Comms Transmit Errors
- Main Comms Transmit Drops
- Main Comms Transmit FIFO Errors
- Main Comms Transmit Collisions

▼ Ethernet Expansion Status	
Main Comms MAC Address	00:d0:af:07:bb:55
Main Comms Receive Bytes	107488319
Main Comms Receive Packets	321796
Main Comms Receive Errors	0
Main Comms Receive Drops	0
Main Comms Receive FIFO Errors	0
Main Comms Receive Frame Errors	0
Main Comms Transmit Bytes	150526624
Main Comms Transmit Packets	246373
Main Comms Transmit Errors	0
Main Comms Transmit Drops	0
Main Comms Transmit FIFO Errors	0
Main Comms Transmit Collisions	0

COMMUNICATION – COM 0 STATUS

- ACKNOWLEDGED REQUESTS
- OTHER MESSAGES
- EXCEPTION ERRORS
- SLAVE NO RESPONSES
- SLAVE NAKS
- SLAVE BUSY
- BUS CHARACTER OVERRUNS

▼ Communication	
▶ Ethernet Status	
▶ Ethernet Main Status	
▶ Ethernet Expansion Status	
▼ COM 0 Status	
ACKNOWLEDGED REQUESTS	0
OTHER MESSAGES	0
EXCEPTION ERRORS	0
SLAVE NO RESPONSES	0
SLAVE NAKS	0
SLAVE BUSY	0
BUS CHARACTER OVERRUNS	0

COMMUNICATION – COM 1 STATUS

- MODBUS RTU
- ACKNOWLEDGED REQUESTS
- OTHER MESSAGES
- EXCEPTION ERRORS
- SLAVE NO RESPONSES
- SLAVE NAKS
- SLAVE BUSY
- BUS CHARACTER OVERRUNS

Communication	
▶ Ethernet Status	
▶ Ethernet Main Status	
▶ Ethernet Expansion Status	
▶ COM 0 Status	
▼ COM 1 Status	
MODBUS RTU	Slave (RTU)
ACKNOWLEDGED REQUESTS	0
OTHER MESSAGES	0
EXCEPTION ERRORS	0
SLAVE NO RESPONSES	0
SLAVE NAKS	0
SLAVE BUSY	0
BUS CHARACTER OVERRUNS	0

COMMUNICATION – COM 2 STATUS

- MODBUS RTU
- MESSAGES SENT
- ACKNOWLEDGED REQUESTS
- OTHER MESSAGES
- SLAVE NO RESPONSES
- SLAVE NAKS
- SLAVE BUSY
- BUS CHARACTER OVERRUNS

▼ COM 2 Status	
MODBUS RTU	Master-Gateway
MESSAGES SENT	1188
ACKNOWLEDGED REQUESTS	0
OTHER MESSAGES	1188
SLAVE NO RESPONSES	1188
SLAVE NAKS	0
SLAVE BUSY	0
BUS CHARACTER OVERRUNS	0

COMMUNICATION – COM 3 STATUS

- MODBUS RTU

(Insert Screenshot named to Page 252 – bottom right image)

▼ COM 3 Status	
MODBUS RTU	Disabled

I/O – INTERNAL INPUT STATUS

- Present Status*
- Status Change Count*
- or each digital input

▼ I/O		
▼ Internal Input Status		
Input	Present Status	Status Change Count
DI1	OFF	0
DI2	OFF	0
DI3	OFF	0
DI4	OFF	0
DI5	OFF	0
DI6	OFF	0
DI7	OFF	0
DI8	OFF	43

I/O – INTERNAL OUTPUT STATUS

- Present Status*
*For each relay output

▼ I/O	
▶ Internal Input Status	
▼ Internal Output Status	
	Present Status
RY1	DE-ENERGIZED
RY2	DE-ENERGIZED
RY3	DE-ENERGIZED

CONNECTIONS

▼ Connections		
Login Change Users Logout		
Number of Logged On User 1 Users Logged On		
Number of Web Client 1 Web Clients		
Number of Modbus TCP Clients		
Current Login: admin		
Logged On User List	User Name	Group
	admin	1

7 FIRMWARE UPGRADE

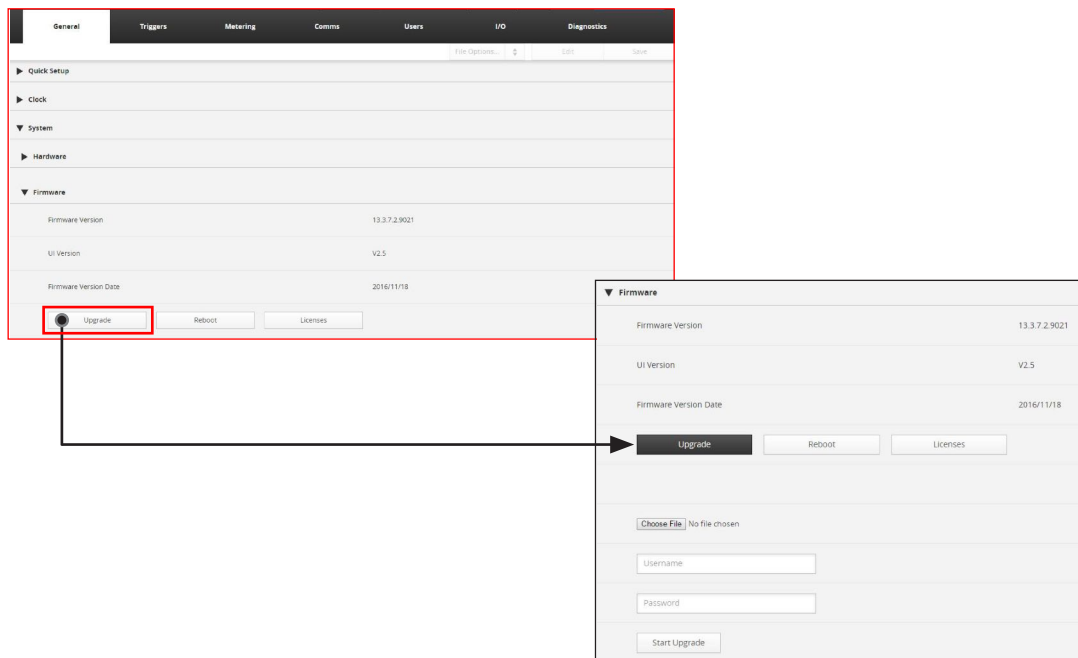
The Power Xpert Meter and display firmware is field upgradeable. Firmware can be remotely upgraded using a web interface by connecting through any Ethernet port provided on the display or the meter. Multiple meters in the RS485 sub-network also can be upgraded when connected through the meter configured as a gateway.

Important! Make certain that you download the correct firmware for the PXM4000/PXM6000/PXM8000 meters. Firmware for previous versions of the Power Xpert Meter, with model numbers of PX4xxx, PX6xxx, or PX8xxx is not compatible with the PXM4000/PXM6000/PXM8000 meters.

7.1. Locating & Upgrading System Firmware on the Web

Locate and download the firmware on the www.eaton.com/pxm web site. Save the firmware upgrade zip file in the PC. Click on the Upgrade button on the System Firmware screen. Options for the upgrade will be displayed.

Under Settings -> General -> System -> Firmware, choose the Upgrade button. Use the Browse button below to open a file browser pop-up. Locate and select the Firmware Upgrade. Enter the username and password and choose "Start Upgrade". For this to work, the user must have permission to upgrade the firmware. The system administrator credentials will also work.



Clicking the “Licenses” button displays the open source software licenses.

Power Xpert[®] METERS **EAT•N**

Index of /licenses/

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
boost/	2016-Sep-14 17:20:54	-	Directory
busybox/	2016-Sep-14 17:20:55	-	Directory
cgi/	2016-Sep-14 17:20:51	-	Directory
e2fsprogs/	2016-Sep-14 17:20:51	-	Directory
ethtool/	2016-Sep-14 17:20:52	-	Directory
expat/	2016-Sep-14 17:20:30	-	Directory
fcgi/	2016-Sep-14 17:21:08	-	Directory
flock/	2016-Sep-14 17:20:55	-	Directory
gdb/	2016-Sep-14 17:20:55	-	Directory
gettext/	2016-Sep-14 17:20:54	-	Directory
glib/	2016-Sep-14 17:20:52	-	Directory
gsoap/	2016-Sep-14 17:20:51	-	Directory
i2c-tools/	2016-Sep-14 17:20:51	-	Directory
iptables/	2016-Sep-14 17:20:50	-	Directory
libcurl/	2016-Sep-14 17:20:55	-	Directory
lighttpd/	2016-Sep-14 17:20:30	-	Directory
linux/	2016-Sep-14 17:21:08	-	Directory
lzo/	2016-Sep-14 17:20:50	-	Directory
mtoutils/	2016-Sep-14 17:20:50	-	Directory
nbd/	2016-Sep-14 17:21:08	-	Directory
ncurses/	2016-Sep-14 17:20:31	-	Directory
net-snmp/	2016-Sep-14 17:21:08	-	Directory
net-tools/	2016-Sep-14 17:20:45	-	Directory
ntp/	2016-Sep-14 17:20:50	-	Directory
openssh/	2016-Sep-14 17:20:52	-	Directory
openssl/	2016-Sep-14 17:20:53	-	Directory
opprofile/	2016-Sep-14 17:20:30	-	Directory
parted/	2016-Sep-14 17:20:53	-	Directory
pcrc/	2016-Sep-14 17:20:55	-	Directory
popt/	2016-Sep-14 17:20:31	-	Directory
procps/	2016-Sep-14 17:21:08	-	Directory
proftpd/	2016-Sep-14 17:21:09	-	Directory
rsync/	2016-Sep-14 17:20:50	-	Directory
squashfs/	2016-Sep-14 17:20:49	-	Directory
stunnel/	2016-Sep-14 17:20:55	-	Directory
sunlux/	2016-Sep-14 17:20:55	-	Directory
sysstat/	2016-Sep-14 17:21:09	-	Directory
uboot/	2016-Sep-14 17:20:49	-	Directory
zlib/	2016-Sep-14 17:20:50	-	Directory

lighttpd/1.4.35

Click on the Start Upgrade button to start the firmware upgrade on the selected device. When the upgrade begins, a pop-up progress window will be displayed. When the upgrade is completed, close the pop-up and then the browser to reconnect. Check the firmware version by navigating to the System Firmware screen.

Firmware

Firmware Version: 13.3.7.2.9022

UI Version

Firmware Version Date

Choose File | r20161118_S...2_9021.zip

admin

.....

Firmware Upgrading

Starting update of 1 - Meter #1 with block size of 0xfed4

File Upload completed for Linux Kernel - 1 - Meter #1

File Upload completed for DTB File - 1 - Meter #1

File Upload completed for Version Control File - 1 - Meter #1

the upgrade is successfully done - 1 - Meter #1

Waiting for device to process files... - 1 - Meter #1

Processing - 1 - Meter #1

This meter has been rebooted. - 1 - Meter #1

Status : Done

Uploading Version Control File (243) To - 1 - Meter #1

Total Progress: Meter Progress(100%)

File Progress size 243 (100%)

8 TROUBLESHOOTING & MAINTENANCE

8.1. Level of Repair

This manual supports unit-level troubleshooting only. If the cause of a malfunction is traced to the Power Xpert Meter, replace the unit. Return the faulty unit to Eaton for factory repairs.

8.2. Warnings!

SHOCK HAZARDS:

ALL MAINTENANCE PROCEDURES MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL. Failure to observe this warning could result in serious injury, death and/or equipment damage.

TROUBLESHOOTING PROCEDURES MAY INVOLVE WORKING IN EQUIPMENT AREAS WITH EXPOSED LIVE PARTS WHERE THE HAZARD OF A FATAL ELECTRIC SHOCK IS PRESENT. Personnel must exercise extreme caution to avoid injury or death.

ALWAYS DISCONNECT AND LOCK OUT THE CURRENT SOURCE AND CONTROL POWER SUPPLY BEFORE TOUCHING THE COMPONENTS ON THE REAR OF THE METER.

CLEANING:

REMOVE THE POWERXPRT FROMLINE POWER WHEN CLEANING. Do not use water or any liquid cleaning product. Clean the unit with a clean dry cloth only.

8.3. Maintenance and Care

The Power Xpert Meter is designed to be a self contained and maintenance free unit. The printed circuit boards are calibrated at the factory. They are intended for service by factory trained personnel only.

The Power Xpert Meter should be stored in an environment that does not exceed the storage temperature range of -40° to 85° C. The environment should also be free of excess humidity. If possible, the device should be stored in its original packing material and container.

8.4. Calibration

The Power Xpert Meter is permanently calibrated at the factory. Further calibration in the field is not necessary. Calibration can be verified via the pulse initiator relays that are available on the optional I/O card.

8.5. Technical Assistance

The Troubleshooting Matrix that follows is provided to aid service personnel in identifying the origin of a malfunction. For additional information, technical assistance or referral to a local authorized distributor, contact Power Quality Technical Support at 1-800-809-2772 option 4. You can also e-mail the team at PQSupport@eaton.com or visit us on the Web at www.Eaton.com. Select the Products tab and follow the Power Management product link.

8.6. Return Procedure

If an internal malfunction is identified, the unit should be returned to the factory for repair or replacement. To have a unit returned, contact your Eaton authorized distributor with your system hardware and system firmware identification information. This information can be found in the “Settings -> General -> System -> Hardware” section of the web interface. See the Setup on the Web Server Pages chapter for additional information.

8.7. Resetting the Meter to Factory Defaults (Web Browser)

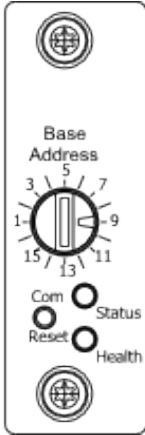
A factory reset may take up to five minutes to complete. Once you’ve confirmed the reset from the web interface, please close your browser window and wait five minutes before reconnecting to the unit.

To reset the meter to factory defaults with a known username and password:

1. Open a web browser and navigate to the meter by typing its IP address into the web browser’s address field.
2. Once the web interface has loaded, log in as an administrator level user. If you do not know your admin username and password, please contact Eaton Support for instructions on how to recover a lost username and password..
3. Once you are logged in, click on the Settings tab in the top right corner, then under the General tab, click on the Quick Setup dropdown. This will expose the File Options dropdown at the top right part of the page.
4. Click on the File Options dropdown, then select the Factory Reset button.
5. A confirmation dialog box will appear. Click Yes to confirm the factory reset. Doing so will erase all data on the unit, and clear all of its settings.
6. Make note of the time, it will take approximately five minutes for the meter to complete its factory reset.
7. Once the green LED on the left side of the Meter has returned to a slow blink pattern (one second on, one second off) the meter is ready to be configured.

NOTE: the CE Card Ethernet settings will have been lost during factory reset, please log into the meter using the local configuration port to configure the meter.

8.8. Com Reset Switch



Located above the rotary switch, the Com Reset switch can be used in conjunction with the DIP switches on the power supply front panel to reset the meter's communications ports. The reset switch has the following functions, depending on the DIP switch settings.

DS -1	DS-2	DS-3		
OFF	OFF	ON	Initialize all communications ports to their factory default settings.	
OFF	ON	ON	Initialize the LAN/WAN and Local Config communications ports and assign the following IP addresses: LAN/WAN: 10.1.1.1 Local Config: 192.168.1.1	
ON	OFF	ON	Attempt to recover communications via the LAN/WAN port by disabling then re-enabling the communications port.	
ON	ON	ON or OFF	Factory Test Mode - The meter should never be operated in this mode. The meter will indicate that it's in factory test mode through a repeating series of three flashes on the red Status LED.	

8.9. Operating in Safe Mode

For normal operation the default position of DS-3 is ON. With DS-3 OFF the meter operates in Safe Mode. While in this mode, the meter runs Linux and telnet for troubleshooting but does not run the metering application. Diagnosis and repair can be performed over the Local Configuration port. The meter responds to ping and provides a telnet server, but webpage, web-service, and Modbus are disabled.

8.10. Troubleshooting Matrix

Symptom	Probable Cause	Possible Solution
Meter Status LED repeats 3 red blinks	If the Status LED repeats a red 3-blink pattern, the meter is in self-test mode.	<ol style="list-style-type: none"> 1. Remove power from the meter. 2. Locate the DIP switch array on the lower right side of the meter face. 3. If switches 1 & 2 are in the ON position (to the left) the meter is in factory test mode. Select one of the following switch configurations instead: 4. 1 (OFF) 2 (OFF) - no security, ID and password required. 5. 1 (OFF) 2 (ON) - medium security, energy & demand resets prohibited. 6. 1 (ON) 2 (OFF) - high security - configuration changes, energy & demand resets prohibited, ADMIN/ADMIN accepted 15 minutes after boot-up. 7. Re-apply power to the meter.
Health LED is blinking green quickly (faster than once per second).	Setup file is missing following a firmware upgrade.	Review & enter Quick Setup, Triggers, Communication, Clock Settings & reboot the meter. Several reboots may be required.

Symptom	Probable Cause	Possible Solution
All operator panel indicator LEDs are off.	Line voltage level is deficient. Separate source control power is deficient.	Locate cause of deficiency in AC line monitored. Locate cause of deficiency in the AC control power line.
	AC line connections or optional external voltage transformers are not properly wired or installed.	Verify the the AC line and/or potential transformers are wired as shown on the appropriate wiring drawing. Verify line voltage.
	Blown or loose fuses.	Check fuses(s) on effected phase(s). Reset fuse(s) and replace if necessary. If the problem persists, replace the unit.
	Meter set for Factory Test Mode.	Depending on the firmware version, the meter may be set for factory test mode. Refer to the "Meter Red Status LED repeats 3 blinks" section at the the beginning of this matrix.
	Power Xpert Meter has malfunctioned.	Replace the unit
Meter is not in list of devices.	Display Unit just powered-up.	On display unit power-up, it can take up to two (2) minutes for the display to recognize all meters on the network.
	Duplicate Base Address	Make sure that the meter in question has a unique base address. The base address is set on the rotary switch on the lower-left of the housing.
Voltage and current readings are incorrect and unstable.	The case is not grounded.	Attach ground wire to meter Earth Ground terminal.
	VR unreferenced.	Attach to metering ground or case ground.
Min/Max/Average Trend data does not appear on the Trend and Min/Max charts.	Timestamped data is inconsistent with the real-time clock.	Verify that the battery switch is ON (SW3 on the PXPS-1/ PXPS). Enter the correct time and Reset the Trend data (right click menu). Reboot the meter.
One or more voltage phase(s) read incorrectly.	Blown or loose fuses.	Verify line voltage.
	Incorrect voltage setting.	Check fuses(s) on effected phase(s).

Symptom	Probable Cause	Possible Solution
One or more currents read incorrectly.	Incorrect current transformer ratio setting.	Verify incoming current to the meter with separate ammeter. Verify correct settings programmed in the meter for system type, L-L voltage and PT rating.
	CT Shorting Screws	Power values are low when CT shorting screws are in place. Typically, the impedance of shorting screws is not much less than that of PXM's current inputs.
Power parameters (Watt, Var, VA, Power Factor) read incorrectly.	Phasing for voltage and current is mismatched.	Examine the phasor diagram as seen on the Meter web page and compare phase angles of Va, Vb, Vc, Ia, Ib, Ic, to detect possible mis-wiring. The phasor diagram is also available on the Local Display by using the following path: Meter > VagL-L Voltage > Vavg > Phasor.
	Current transformers polarity is reversed.	Verify connections per wiring diagrams. Reverse current transformer leads. Verify ground wiring per drawings. Reverse current polarity via settings. Enter password and change CT compensation in Setup mode. A CT compensation value of - 1.0 has the effect of reversing polarity.
	CT Shorting Screws	Power values are low when CT shorting screws are in place. Typically, the impedance of shorting screws is not much less than that of PXM's current inputs.
Unit fails to detect contact closure on Discrete Contact Inputs.	Discrete Inputs not properly configured.	Check meter setpoints.
	Excessive ext contact resistance.	Contact must be compatible with 24Vdc, 10 mA.
	Improper wiring or faulty external device providing contact closure. Contact welded.	Verify that external contact actually closes and that impedance is essentially zero when contact is closed. Also, verify wiring to Discrete Contact inputs per drawings.
Slave devices on the master side of the open circuit continue to communicate; however, the slaves on the far side do not communicate.	One or both conductors in the RS-485 bus are broken.	Open Circuit, check RS-485 connection.

Symptom	Probable Cause	Possible Solution
TXD LED does not flash	Incorrect hardware configuration. Hardware failure.	Reconfigure hardware. Repair or replace hardware.
TXD LED flashes, RXD LED doesn't.	There's a problem in the communications channel connecting the PC to the LED.	Trace the signal from the communications channel to the meter. Determine where the signal is being interrupted and correct the problem. Data rate or frame mismatch.
Frequency variation is higher than expected.	VR terminal is floating.	Wire VR terminal to earth/ground reference.
Default "admin" and "X" UserID/Password sets do not work.	UserID/Password forgotten.	Remove the tamper sealable security cover from the PXPS-1 or PXPS-4 card. Move the Mode 1 and Mode 2 switches to the OFF position. Cycle power to the meter. Login as "ADMIN" with the "ADMIN" password within 15 minutes. Setup new administrator-level UserID/Password. Return to secure mode with the Mode 1 or Mode 2 switch in the ON position. Reinstall the tamper sealable security cover. Reboot the meter.
Cannot connect over the LAN/WAN Ethernet.	Duplicate IP Address.	Network requires a Domain name PC arp table contains an old MAC Address for the given IP Use DHCP to automatically assign a unique IP address. Once a Domain name is acquired, turn off the automatic setting and enter the Domain Name setting. Clear the PC's arp table (e.g., arp -d on the Windows command prompt).

Symptom	Probable Cause	Possible Solution
Web interface through LAN/WAN CE2 port not working	Network or hardware problem. Try the following to isolate the cause:	Unplug CAT5 connector from Display Unit Ethernet port and then reconnect with firm push.
		Verify IP address using either Local Configuration Port or through the Local Display. The IP address can either be static or dynamic. Verify that IP and DNS are both set to either fixed or DHCP. Verify that FIBER is disabled.
		Make sure laptop is either connected either via a cross-over cable or through an Ethernet hub.
		Ping IP address, verify Link light is lit and Tx/Rx activates (from Windows command prompt, type: <code>ping ip_address</code>).
		Verify the laptop IP address is compatible with LAN/WAN (from the Windows command prompt, type: <code>ipconfig</code>)
		Check for duplicate devices with duplicate IP address on the LAN/WAN. Unplug the meter from the LAN/WAN and ping for its IP address.
		Clear Internet Explorer's proxy server configuration. Access this through the Connections tab on Tools > Internet Options. Click the LAN Settings button and deselect Proxy server.
		Clear the ARP cache (from the Windows command prompt, type: <code>arp -d</code>)
		Turn off auto-negotiate 10/100 for your NIC or Ethernet hub.
		At the meter, remove power and then remove the compact flash (CF) card. Re-insert the CF card and reapply power. If web interface now works, replace the CF card.

Symptom	Probable Cause	Possible Solution
Web interface through LAN/WAN CE1 port (fiber, 100FX) not working	Network or hardware problem. Try the following to isolate the cause:	Verify IP address using either Local Configuration Port or through the Local Display. The IP address can either be static or dynamic. Verify that IP and DNS are both set to either fixed or DHCP. Verify that FIBER is disabled.
		Ping IP address, verify Link light is lit and Tx/Tx activates (from Windows command prompt, type: <code>ping ip_address</code>).
		Verify the laptop IP address is compatible with LAN/WAN (from the Windows command prompt, type: <code>ipconfig</code>).
		Check for duplicate devices with duplicate IP address on the LAN/WAN. Unplug the meter from the LAN/WAN and ping for its IP address.
		Clear Internet Explorer's proxy server configuration. Access this through the Connections tab on Tools > Internet Options. Click the LAN Settings button and deselect Proxy server.
		Clear the ARP cache (from the Windows command prompt, type: <code>arp -d</code>)
		At the meter, remove power and then remove the compact flash (CF) card. Re-insert the CF card and reapply power. If web interface now works, replace the CF card.
		Remove power from meter and reseat communications card. Apply power.

Symptom	Probable Cause	Possible Solution
<p>Web interface through Display Unit 10/100 or local configuration ethernet port not working</p>	<p>Network or hardware problem. Try the following to isolate the cause:</p>	<p>Make sure laptop is either connected to Display Unit via a cross-over cable or through an Ethernet hub.</p>
		<p>Ping 192.168.1.1, verify Link light is lit and Rx/Tx activates (from Windows command prompt, type: ping 192.168.1.1).</p>
		<p>Unplug CAT5 connector from Display Unit Ethernet port and then reconnect with firm push.</p>
		<p>While Display Unit port IP address is fixed at 192.168.1.1, it falls back to 10.1.1.1 if the LAN/WAN CE2 is set to an IP address of 192.168.1.x. Try 10.1.1.1.</p>
		<p>Verify the laptop IP address is set to 198.168.1.x (from the Windows command prompt, type: ipconfig).</p>
		<p>Clear Internet Explorer's proxy server configuration. Access this through the Connections tab on Tools > Internet Options. Click the LAN Settings button and deselect Proxy server.</p>
		<p>Clear the ARP cache (from the Windows command prompt, type: arp -d)</p>
		<p>Turn off auto-negotiate 10/100 for your NIC or Ethernet hub</p>
		<p>At the meter, remove power and then remove the compact flash (CF) card. Re-insert the CF card and reapply power. If web interface now works, replace the CF card.</p>

Symptom	Probable Cause	Possible Solution
Modbus LAN/WAN CE2 port not working	Try the following:	Modbus TCP/IP address = xxx . xx . xxx . xxx. The Meter ID is determined from the Base Address setting on rotary switch (lower left of meter housing).
		Unplug CAT5 connector from Display Unit Ethernet port and then reconnect with firm push.
		Verify IP address using either Local Configuration Port or through the Local Display. The IP address can either be static or dynamic. Verify that IP and DNS are both set to either fixed or DHCP. Verify that FIBER is disabled.
		Make sure laptop is either connected either via a cross-over cable or through an Ethernet hub.
		Ping IP address, verify Link light is lit and Tx/Rx activates (from Windows command prompt, type: ping ip_address).
		From the Windows command prompt, type: ipconfig.
		Unplug the meter from the LAN/WAN and ping for its IP address.
		Access this through the Connections tab on Tools > Internet Options. Click the LAN Settings button and deselect Proxy server.
		From the Windows command prompt, type: arp -d
		Turn off auto-negotiate 10/100 for your NIC or Ethernet hub.
		At the meter, remove power and then remove the compact flash (CF) card. Re-insert the CF card and reapply power. If web interface now works, replace the CF card.
Remove power from meter and reseat communications card. Apply power.		

9 GLOSSARY

9's of Availability

A measurement used to show the availability of service. The 9's translate into how much downtime is allowed per year.

90.0000% = 37 days

99.0000% = 3.7 days

99.9000% = 8.8 hours

99.9900% = 53 minutes

99.9990% = 5.3 minutes

99.9999% = 32 seconds

Apparent Power

For sinusoidal quantities in either single-phase or polyphase circuits, apparent power is the square root of the sum of the squares of the active and reactive powers.

AWG

American Wire Gauge. Standard wire-cross section area.

CBEMA Factor

A transformer harmonic derating factor (THDF) defined as a pure sine wave's crest factor (1.4141) divided by the measured crest factor.

Crest Factor

Ratio of peak current to rms current. A pure sine wave has a crest factor of 1.414.

CT (Current Transformer)

An instrument transformer that is intended to have its primary winding connected in series with the conductor carrying the current to be measured or controlled.

Demand

The average value of power or a related quantity over a specified interval of time.

dv/dt

Delta voltage divided by delta time.

Flicker

A variation of input voltage, either magnitude or frequency, sufficient in duration to allow visual observation of a change in electric light source intensity. See EN 61000-4-15 for details.

Fourier Coefficients

$$f(x) = 0.5A_0 + \sum_{n=1}^{n=x} [A_n \cos nx + B_n \sin nx]$$

$$= 0.5A_0 + \sum_{n=1}^{n=x} C_n \sin (nx + \Theta_n)$$

$$A_n = \frac{1}{\pi} \int_0^{2\pi} f(x) \cos nx \, dx$$

$$n = 0, 1, 2, 3, \dots$$

$$B_n = \frac{1}{\pi} \int_0^{2\pi} f(x) \sin nx \, dx$$

Expressed as a complex number with Magnitude C_n & Phase Θ_n

$$C_n = (A_n^2 + B_n^2)^{1/2}$$

$$\Theta_n = \arctan A_n/B_n$$

Fourier Series

A single-valued periodic function (that fulfills certain mathematical conditions) may be represented by a Fourier series as follows:

Note: $0.5A_0$ is the average of a periodic function $f(x)$ over one primitive period.

Gateway

A dedicated computer that attaches to two or more networks and routes packets from one to the other. In networking, a device that connects two systems that use different protocols.

GPS

Global positioning system.

Harmonic

The components of the harmonic content as expressed in terms of the order and rms values of the Fourier series terms, describing the periodic function.

Ia, Ib, Ic

Phase currents for phases a, b and c respectively.

IMPACC™

Standard Cutler-Hammer Integrated Monitoring, Protection And Control Communications protocol definition for communication on the INCOM network.

INCOM™

Cutler-Hammer INdustrial COMmunications network.

K-Factor

A derating factor related to the sum of the squares of harmonic current times the squares of their harmonic numbers (multiples of the fundamental).

kVA (Kilovolt-Ampere)

One that designates the input kVA or volt-amperes at rated primary voltage with the secondary terminal short-circuited.

kVAh

Kilovolt-ampere hour.

kVAh

Kilovolt-ampere reactive.

kvarh

Kilovolt amps reactive hours.

kW

Kilowatt.

kWh

Kilowatt hour.

Lag

The phase delay in current with respect to voltage.

Load Profile

The magnitude and duration of loads applied in a prescribed time sequence, including the transient and steady-state characteristics of the individual loads. The recording, storage and analysis of consumption data over a period of time for a particular installation.

Load Shed

The process of deliberately removing preselected loads from a power system in response to an abnormal condition in order to maintain the integrity of the system.

mA

MilliAmpere.

mV

MilliVolt.

Maximum Demand

See Peak Demand.

Modbus

A popular industrial communication protocol.

MVAR

Megavolt amperes reactive.

MVARh

Megavolt amperes reactive hours.

MWh

Megawatt hours.

NTP

Network time protocol.

Peak Demand

The greatest of all the demands that have occurred during a specified period of time; determined by measurement over a prescribed time interval.

PFA

See, "Power factor", Apparent.

PFD

See, “Power factor”, Displacement. Also known as “True Power Factor”.

Phasor Diagram

A diagram showing the relationships of as many of the following phasor quantities as are necessary: armature current, armature voltages, the direct and quadrature axes, armature flux linkages due to armature and field winding currents, magnetomotive forces due to armature and field winding currents, and the various components of air-gap flux.

PT (Potential Transformer)

An instrument transformer that is intended to have its primary winding connected in shunt with a power-supply circuit, the voltage of which is to be measured or controlled.

Power Factor

A ratio of fundamental (50/60Hz) active power to apparent power (Fundamental watts to Fundamental VA).

Power Factor, Apparent

The ratio of the active power of the total rms, in watts, to the apparent power of the total rms, in volt-amperes. This is also known as True Power Factor.

Power Factor, Displacement

The ratio of the active power of the fundamental wave, in watts, to the apparent power of the fundamental wave, in volt-amperes.

Power Quality

The concept of powering and grounding electronic equipment in a manner that is suitable to the operation of the equipment and compatible with the premise wiring system and other connected equipment.

Pulse Initiator

Any device, mechanical or electrical, used with a meter to initiate pulses, the number of which are proportional to the quantity being measured. It may include an external amplifier or auxiliary relay or both.

Reactive Power

For sinusoidal quantities in a two-wire circuit, reactive power is the product of the voltage, the current, and the sine of the phase angle between them. For nonsinusoidal quantities, it is the sum of all harmonic components, each determined as above. In a polyphase circuit, it is the sum of the reactive

powers of the individual phases.

RJ-11

A six-pin modular telephone plug. Also called a permissive connection, an RJ-11 plug is generally used on two-wire circuits, but can be used on four-wire circuits.

RJ-45

An eight-pin modular telephone plug. Also called a programmable connection, an RJ-45 plug is generally used on four-wire circuits, but can be used on eight-wire circuits such as Ethernet.

rms (root mean squared)

The effective value, or the value associated with joule heating, of a periodic electromagnetic wave. The rms value is obtained by taking the square root of the mean of the squared value of a function.

RS-232

An EIA standard for asynchronous serial data communications between terminal devices, such as printers, computers and communications equipment, such as modems. This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment.

Sag

A decrease in rms voltage at the power frequency for durations of 0.5 cycle to 1 minute. A sag lasting longer than one minute is typically called undervoltage.

Swell

An increase in rms voltage at the power frequency for durations from 0.5 cycles to 1 minute. A swell lasting longer than one minute is typically called overvoltage.

TDD (Total Demand Distortion)

Within the PowerXpert this is the ratio expressed as a percent of the rms value of the ac signal after fundamental component is removed and interharmonic components are ignored, to the rated current (CT primary).

$$\%TDD = 100 \times \left(\sum_{n=2}^{85} C_n^2 \right)^{1/2} / \text{CT Primary}$$

THD (Total Harmonic Distortion)

The rms value of the ac signal after the fundamental component is removed and inter-harmonic components are ignored. Expressed as a percent, it is the ratio of the harmonic distortion to the rms value of the fundamental.

$$\text{THD} \left(\sum_{n=2}^{85} C_n^2 \right)^{1/2} = \% \text{THD} = \frac{\text{THD}}{C_1} \times 100$$

Trigger

To cause a device to change state or to perform some other operation. A signal that causes a circuit or device to change state.

VA, VB, VC

Phase voltages for phases a, b and c respectively.

VAB, VBC, VCA

Line-to-line voltage between phase a & b, phase b & c, phase c & a respectively.

VT (Voltage Terminals)

An instrument transformer designed for use in the measurement or control of voltage. Its primary winding is connected across the supply circuit.

Waveform Data

The numeric oscillographic values that may be captured. A manifestation or representation or visualization of a wave, pulse or transition (graph, plot, equation(s), table of coordinate or statistical data).

NOTE: Some of the information provided within these definitions have been extracted from The Authoritative Dictionary of IEEE Standard Terms Seventh Edition.

A MODBUS COMMUNICATION (SEE IB150014EN)

For information on communications via Modbus, please refer to Modbus Register Map for Power Xpert Meter 4000/6000/8000 (IB150014EN).

B STANDARD & EXTENDED MODBUS REGISTER MAPS (SEE IB150014EN)

For information on communications via Modbus, please refer to Modbus Register Map for Power Xpert Meter 4000/6000/8000 (IB150014EN).

C SNMP COMMUNICATION

C.1. SNMP in Power Xpert Meter

The goal of the SNMP implementation in Power Meters is to help network managers to better manage a full and diverse set of Power Chain devices in their enterprise. This is achieved by providing, for all devices:

A *consistent view of each device* with:

- simple status information
- basic descriptive information
- highlighting of devices that require attention, with an indication of what sort of problem is present

Historical information (traps) that can be logged for event reconstruction:

- sent when any device's simple status changes
- sent when alarms occur or clear

The MIBs supported are:

MIB	filename	Description / Usage
Eaton Power Xpert Meter MIB	EATON-PWR-MTR-MIB.txt	Metered electrical system values.
Eaton Alarms+Traps MIB	EATON-PXG-MIB.txt	Alarms and notifications (traps).
Eaton Object Identifier (OID) assignments	EATON-OIDS.txt	Base document for all OID assignments for Eaton's MIBs.
RFC 4133 Entity MIB	ENTITY-MIB.txt	Identification and description of each device
RFC 4268 Entity State MIB	ENTITY-STATE-MIB.txt	Five availability status meters for each device attached to the card
RFC 4268 Entity State MIB Part 2	ENTITY-STATE-TC-MIB.txt	Possible state values for the Entity State MIB

The MIB files referenced above are available at the following Eaton web site URL:

<http://www.eaton.com/EatonCom/Markets/Electrical/Products/PowerQualityManagement/PowerXpertArchitecture/PowerXpertGatewaySeries1000Card/index.htm>

You can add these files to the MIB database of your SMP management software to access the individual MIB objects.

MIB FILES

This section describes various the Management Information Base (MIB) files available. A MIB is an information repository residing on a device in a communication network. Network management software uses a device's MIB to manage the device. Every manageable device on a network has a MIB consisting of one or more files that list information about the device.

Use the facilities provided by your Simple Network Management Protocol (SNMP) management software to access the individual MIB objects.

You can configure a device so that it generates a trap if a certain condition occurs, such as an alarm clearing. The trap is sent to the management station to inform it of the occurrence.

See the MIB files for detailed information about each MIB object.

D OPTION CARDS

The Power Xpert Meter can be equipped with option cards. This section describes the optional I/O-B and Communications Expansion cards that can be ordered with a new meter or as a field upgrade.



WARNINGS

SHOCK HAZARDS:

IMPROPER INSTALLATION CAN CAUSE DEATH, INJURY AND/OR EQUIPMENT DAMAGE. Completely read and understand the information in this document before attempting to install or operate the equipment. Improper installation could cause death, injury and/or equipment damage. Only qualified personnel are to service the Power Xpert Meter.

Remove the input power (PSI) and verify that the health LED is no longer flashing before removing any option card. Do not remove any cards while the meter is energized.

FOR FIELD UPGRADE, DEENERGIZE EQUIPMENT. ENERGIZED (LIVE) ELECTRICAL WIRING AND/OR PARTS PRESENT THE HAZARD OF FATAL ELECTRIC SHOCK.

Exercise extreme care to avoid injury or death. Always disconnect, lock-out and tag the current and voltage sources and the control power supply circuit before touching the connections or components on the rear face of the Meter unit.

FAILURE TO GROUND THE POWER XPERT METER MAY RESULT IN INJURY, DEATH OR EQUIPMENT DAMAGE. Properly ground the Power Xpert Meter during installation. A protective Earth grounding stud is located on the bottom right corner of the meter



CAUTION:

AVOID ELECTROSTATIC DISCHARGE TO PREVENT EQUIPMENT DAMAGE. The Power Xpert Meter option cards are bare circuit boards with ESD sensitive components. The installer must follow proper ESD prevention techniques when handling the boards. Grounded wrist straps are recommended.

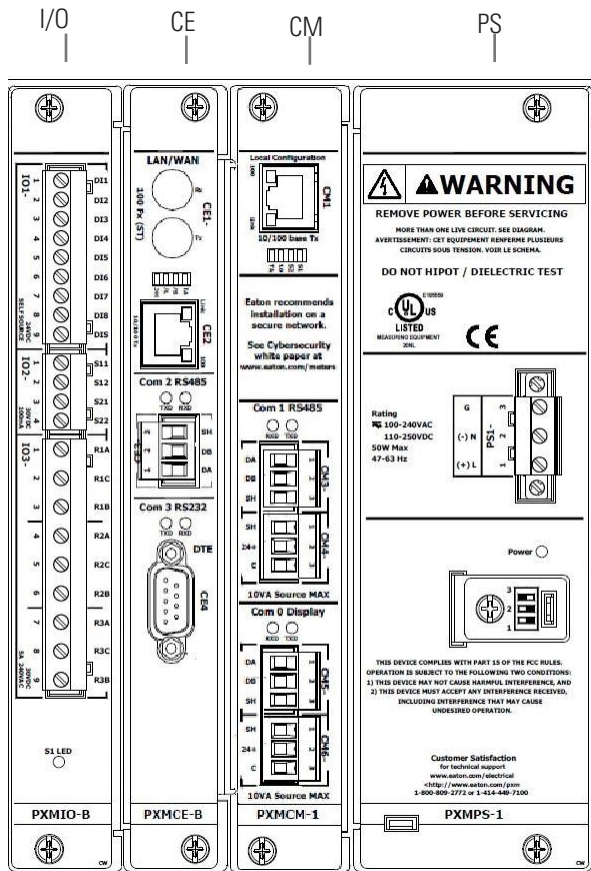
Terminal Naming Conventions

The naming of the terminal blocks follow circuit function and/or the association with the meter card name that they are located on. The metering inputs begin with CT, VT and Vx. The plug-in cards begin with IO, CE, CM and PS. On the plug-in modules, the separate terminal block group numbering starts at the top of the card and increases down the card. Individual terminals per block start with 1 and increase along the terminal block. The one exception is the V x auxiliary terminal which increments on top of VT.

D.1. Power Xpert Meter Option Cards

The Power Xpert Meter cards must be installed in their assigned slots due to the overlapping design of the terminal plates. The diagram below displays the correct placement for each card and the order in which each card must be disassembled or assembled when replacing cards.

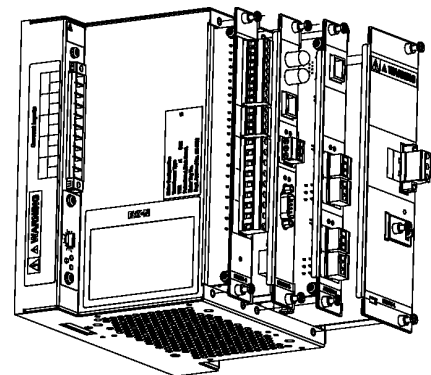
Disassembly order:	4	3	2	1
Assembly order:	1	2	3	4



NOTE: The option cards are bare circuit boards with ESD sensitive components. The installer must follow proper ESD prevention techniques when handling the boards. Grounded wrist straps are recommended.

NOTE: Each terminal plate overlaps and fits together in specific order, requiring the correct disassembly and reassembly sequence.

Power Xpert Meter Card Definitions	
I/O	PXMIO-B (Discrete Input/Output)
CE	PXMCE-B (Communication Expansion)
CM	PXMCM-1 (Communication Main)
PS	PXMP5-1 Power Supply Card



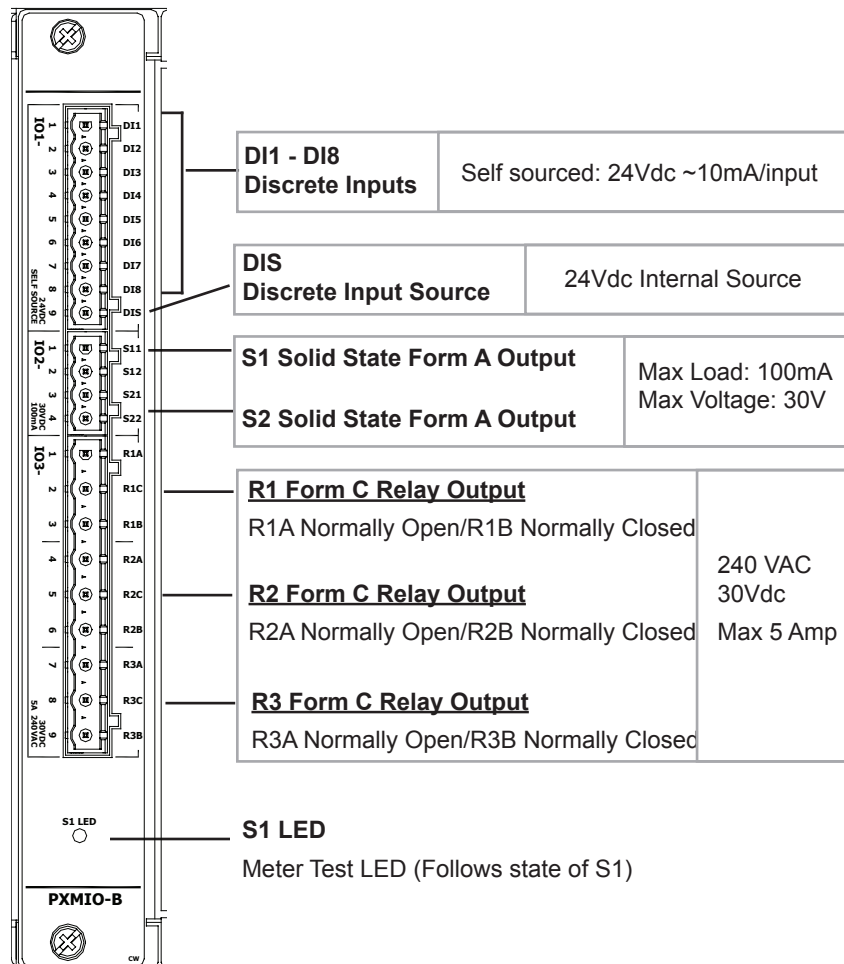
D.2. Optional I/O Card

The Power Xpert Meter can be equipped with an optional Discrete Input/Output (IO) card. The PXMIO-B card can be ordered with a new meter or as a field upgrade. This card includes 8 discrete inputs, 2 solid state outputs, 3 relay outputs and a test LED.

For field upgrade, de-energize equipment to prevent shock hazard.

The meter includes sensitive electronic components. Caution should be used to avoid electrostatic discharge to prevent equipment damage.

1. Disconnect control power and verify that the health LED is no longer flashing before proceeding.
2. Remove power supply card after the health LED stops flashing
3. Remove the main communications board and optional CE card or blank filler plate.
4. Carefully insert I/O card using card slot provided. Care should be taken that the card alignment is correct before seating the card into the connector socket.
5. Secure with screws at top and bottom.
6. Reassemble the CE card or blank filler plate and main communications and power supply, securing retaining screws on all cards. This card provides for external discrete I/O interfacing.



- IO1 - 8 Discrete Inputs to external dry contacts
 - IO11-IO18 ~ 10mA sink input
 - IO19 – 24V internal source for all inputs
- IO2 – 2 Solid State relays – external source and load limited to 30VDC and 100mA.
 - IO21-I/O22 Solid State Output 1 (logic also tied to S1 LED)
 - IO23-I/O24 Solid State Output 2
- IO3 – 3 Electro mechanical Relays rated for 240VAC/30VDC @ 5Amps
 - IO31 R1A - Form A contact Relay1
 - IO32 R1C - Common Relay 1
 - IO33 R1B - Form B contact Relay 1
 - IO34 R2A - Form A contact Relay2
 - IO35 R2C - Common Relay 2
 - IO36 R2B - Form B contact Relay 2
 - IO37 R3A - Form A contact Relay 3
 - IO38 R3C - Common Relay 3
 - IO39 R3B - Form B contact Relay 3

D.3. 1ms Time Stamping of Digital and Sub-Cycle Disturbance Events

The Power Xpert Meter is capable of time stamping digital and sub-cycle disturbance events to within +/- 1ms of the time of occurrence. The ability to time stamp digital input events and sub-cycle events with +/- 1ms accuracy can be invaluable when reconstructing the sequence of events in a forensic event analysis. In order to achieve +/- 1ms accuracy, the Power Xpert meter must be configured for one of two optional time sources.

D.4. NTP Time Server

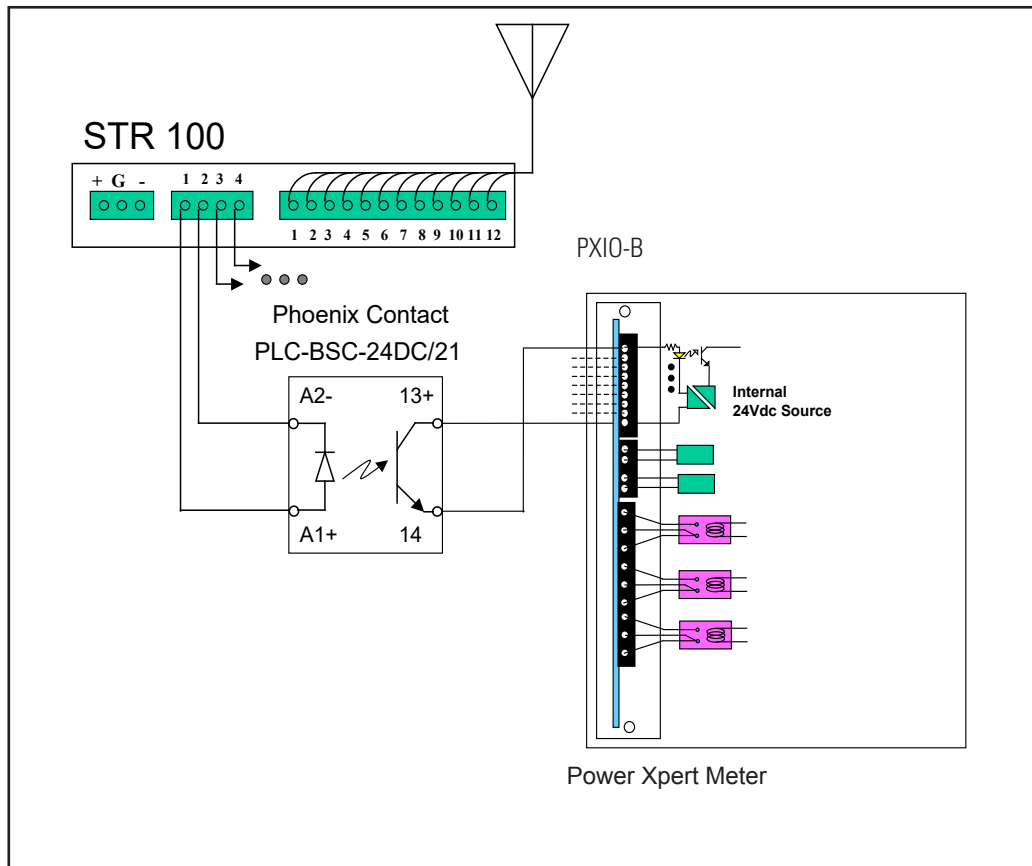
Eaton offers the following time servers:

- Power Xpert 100 Network Time Server (PX100NTSA) and the
- Power Xpert 200 Network Time Server (PX200NTSA NTP)

depending on the application requirements. The Power Xpert Meter must be equipped with a Communications Expansion card in order to interface to the NTP Time Server. Eaton recommends that the NTP time server be installed on the same network drop as the Power Xpert Meters in order to optimize the accuracy of the meter time stamps for +/-1ms accuracy. The Power Xpert Meter should be configured for NTP as the clock source and the NTP server IP address must be configured in the communications setup page. Eaton recommends the use of an NTP server to synch the Power Xpert Meter for 1 ms time stamping applications to minimize wiring and installation costs.

D.5. Satellite Time Reference (Cyber-Sciences STR-100)

For existing installations already equipped with a Satellite Time Reference (Cyber Sciences STR-100), the Power Xpert meter also accepts the DCF-77 time sync pulse stream. The STR-100 setup for DCF-77 pulse stream is only needed for the STR100 option. In order to use the STR-100 as a time reference, the Power Xpert Meter must be equipped with a PXIO-B card. One of the inputs on this card can be configured to accept the DCF-77 signal from the STR-100. In addition, the Power Xpert Meter clock must be configured for DCF-77 as the time source. A diagram of the electrical connection to the STR-100 output and the small isolation device used to isolate the Power Xpert input from the STR-100 output is displayed below.



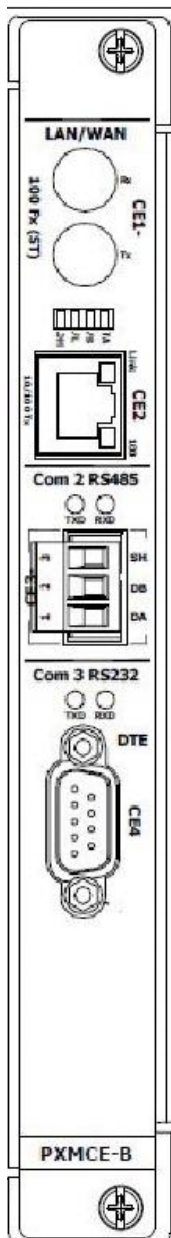
D.6. Communications Expansion Card (PXMCE card)

The Power Xpert Meter can be equipped with a Communications Expansion card. The Communications Expansion card can be ordered with a new meter or as a field upgrade. This card includes a 100FX fiber port, a 10/100Base T RJ45, an RS485 and RS232 ports. The user must select either the 100FX fiber port or the 10/100Base T RJ45 port for the Ethernet network connection. This configuration option is described in the Setup chapter.

For field upgrade, de-energize equipment.

The Power Xpert Meter includes sensitive electronic components. Caution should be used to avoid electrostatic discharge to prevent equipment damage.

1. Remove the power supply and verify that the health LED is no longer illuminated before proceeding. Remove the main communications board.
2. Carefully insert Communication Expansion card using card slot provided. Care should be taken that the card alignment is correct before seating the card into the connector socket.
4. Reassemble cards in appropriate order, securing retaining screws on all cards.



100FX ST-type Ethernet
(multi-mode 62.5/125 or 50/125 μm)

10/100Base-T Ethernet RJ45

COM2 RS485 Terminal Block CE3-			
Terminals:			
CE3-3	SH	RS485 Shield	
CE3-2	DB	RS485 Data B*	
CE3-1	DA	RS485 Data A*	
* Twisted pair			

COM3 RS232 DB9 DTE Connector CE4		
Pinout		
1	CD	Carrier Detect
2	RX	Receive
3	TX	Transmit
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator

CE Com 2 (Terminal CE 3)

Each RS 485 link requires a set of fail safe bias resistors to guarantee that the line goes to a marked state while the line is idle.

The Power Xpert Meter convention is to set the 750 ohm bias resistors at the Master node only.

The RS 485 Com port on the CE card defaults to Master Gateway function. The bias resistors are engaged via the jumper.

Com 2 can be programmed alternatively to be a Slave Gateway or Modbus Slave RTU and therefore would need the bias resistors disengaged via jumpers on the circuit board. To disengage the bias resistors, the CE board must be removed from the meter. See general card removal guidelines.

Com 2 two bias jumpers, A and B; one for each data line. Both data lines should be treated the same.

The jumper designators are stenciled as CN# with the following positions:

Jumper Setting: N=No Bias (slave); Rb=Bias (master)

NOTE: Care should be taken to keep jumpers A and B set to the same value.

CE Com 3

Com 3 RS 232 port can be programmed to be a master or Slave Gateway or a Modbus slave RTU. This port defaults as disabled.

Note: The Power Xpert Meter must be equipped with a Communications Expansion card in order to interface to the NTP Time Server.

D.7. Communication Ports (PXMCE card)

This optional Communication card allows for expanded networking capabilities of the meter. **Note** that the CE1 and CE2 Ethernet physical ports are connected to a common data channel. Only one of these can be used at a time. The card configuration is accessed via the local configuration port or the Display.

CE1 - LAN/WAN Ethernet 100Fx - Fiber optic ST multimode cable (62.5/125 μ m or 50/125 μ m). IP address default set to DHCP and this physical interface disabled.

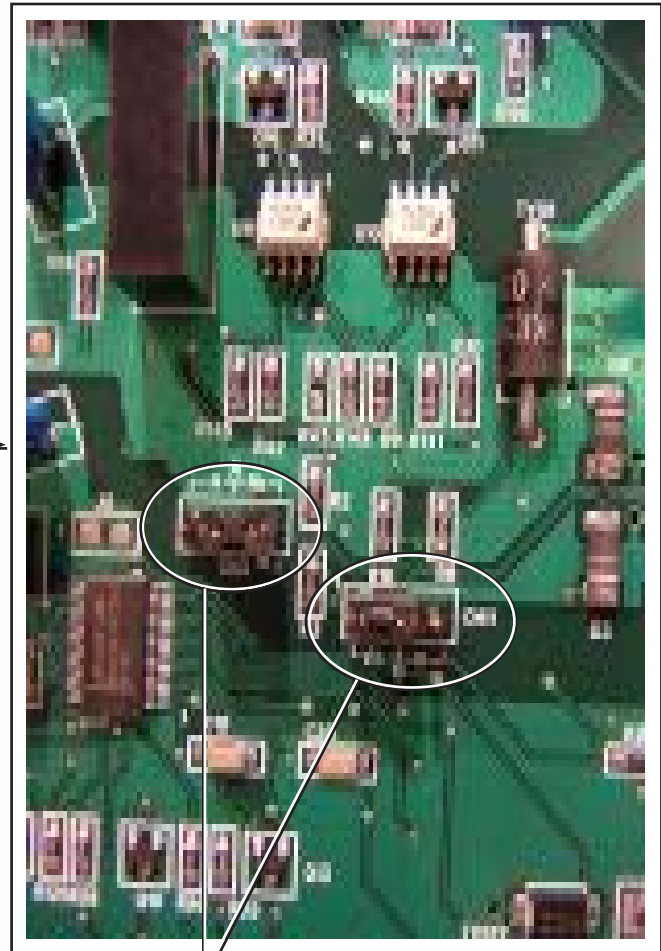
- CE11 Fx Rx
- CE12 Fx Tx

CE2 - LAN/WAN Ethernet 10/100baseT Cat 5 (RJ45) interface. IP address set for DHCP and this physical port enabled.

CE3 - COM2 – 3 terminal plug RS485 interface is configurable as Modbus RTU Slave or Gateway Master/Slave. **Factory default setting is Master Gateway.**

- CE31 Data A (-)
- CE32 Data B (+)
- CE33 Shield (RS485 common)

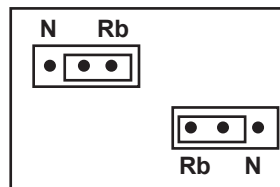
CE4 - COM3 - DTE DB9 RS232 interface is configurable as Modbus RTU Slave or Gateway Master/Slave. **Factory default setting is disabled.**



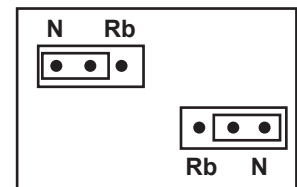
Com 2 Jumpers

Jumper ID	Jumper Setting	
	Slave Port	Master Port
Com 2 A	N	Rb
Com 2 B	N	Rb

Master



Slave



NOTE: Care should be taken to keep jumpers A and B set to the same value.

E STANDARD CARDS

This chapter describes the standard Communication Main (CM) and Power Supply (PS) cards that are installed in all Power Xpert Meters.



SHOCK HAZARDS:

IMPROPER INSTALLATION CAN CAUSE DEATH, INJURY AND/OR EQUIPMENT DAMAGE. Completely read and understand the information in this document before attempting to install or operate the equipment. Improper installation could cause death, injury and/or equipment damage. Only qualified personnel are to service the Power Xpert Meter.

Remove the input power (PSI) and verify that the health LED is no longer flashing before removing any option card. Do not remove any cards while the meter is energized.

FOR FIELD UPGRADE, DE-ENERGIZE EQUIPMENT. ENERGIZED (LIVE) ELECTRICAL

WIRING AND/OR PARTS PRESENT THE HAZARD OF FATAL ELECTRIC SHOCK.

Exercise extreme care to avoid injury or death. Always disconnect, lock-out and tag the current and voltage sources and the control power supply circuit before touching the connections or components on the rear face of the Meter unit.

FAILURE TO GROUND THE POWER XPERT

METER MAY RESULT IN INJURY, DEATH OR EQUIPMENT DAMAGE. Properly ground the Power Xpert

Meter during installation. A protective Earth grounding stud is located on the bottom right corner of the meter.



AVOID ELECTROSTATIC DISCHARGE TO PREVENT EQUIPMENT DAMAGE. The Power Xpert Meter option cards are bare circuit boards with ESD sensitive components.

The installer must follow proper ESD prevention techniques when handling the boards.

Grounded wrist straps are recommended.

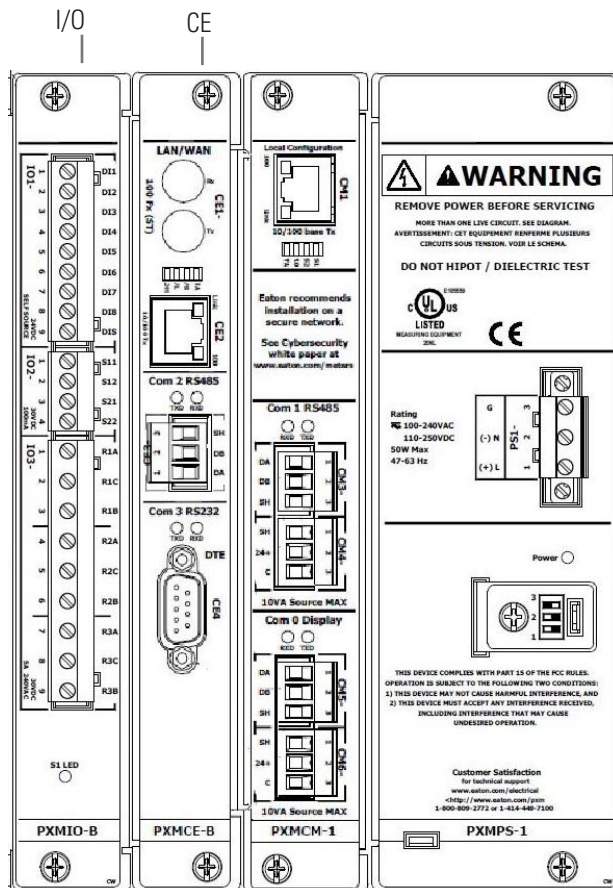
Terminal Naming Conventions

The naming of the terminal blocks follow circuit function and/or the association with the meter card name that they are located on. The metering inputs begin with CT, VT and Vx. The plug-in cards begin with IO, CE, CM and PS. On the plug-in modules, the separate terminal block group numbering starts at the top of the card and increases down the card. Individual terminals per block start with 1 and increase along the terminal block. The one exception is the V x auxiliary terminal which increments on top of VT.

E.1. Power Xpert Meter Cards

The Power Xpert Meter cards must be installed in their assigned slots due to the overlapping design of the terminal plates. The diagram below displays the correct placement for each card and the order in which each card must be disassembled or assembled when they are replaced.

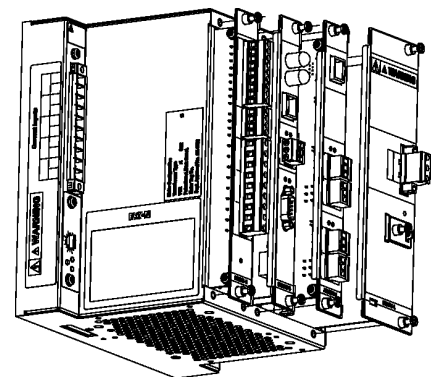
Disassembly order:	4	3	2	1
Assembly order:	1	2	3	4



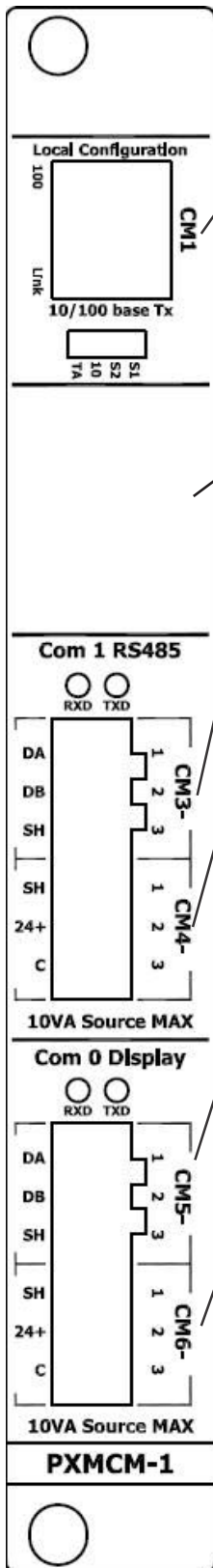
NOTE: The cards are bare circuit boards with ESD sensitive components. The installer must follow proper ESD prevention techniques when handling the boards. Grounded wrist straps are recommended.

NOTE: Each terminal plate overlaps and fits together in specific order, requiring correct disassembly and reassembly sequence.

- Power Xpert Meter Card Definitions**
- I/O
 - PXMIO-B (Discrete Input/Output)
 - CE
 - PXMCE-B (Communication Expansion)
 - CM
 - PXMCM-5 (Communication Main)
 - PS
 - PXPS-X Power Supply Card (PS-1,4...)



E.2. Communication Main (PXMCM) Card



The PXMCM card is the default communication card in all Power Xpert Meters. Configuration can be accessed via the CM local configuration port or the Display.

CM1 – Local Configuration Port - Ethernet 10/100baseT RJ45 interface requires Cat 5 crossover cable. The IP address is fixed at 192.168.1.1 and is dedicated for configuration of the meter (including serial ports) with a PC browser.

NOTE: This is NOT a LAN/WAN interface.

Future Expansion

CM3 - COM1 – 3 terminal plug RS485 interface configurable as Modbus RTU Slave or Gateway Master/Slave. Defaults to slave Gateway.

- CM31 Data A (-)
- CM32 Data B (+)
- CM33 Shield (RS485 common)

CM4 - 24Vdc 10W max - 3 terminal, gender inverted plug. Source for use with auxiliary devices. (See following pages for further details.)

NOTE: This output is electrically common with CM3/COM1. Do not extend cable beyond 30M.

- CM41 Shield
- CM42 24V+ • CM43 24V common

CM5 - COM0 - RS485 dedicated to remote Display interface for connection to DG1/COM0 of the Display. The Meter address is assigned using the Rotary Switch found below the meter left side CT terminal.

- CM51 Data A (-)
- CM52 Data B (+)
- CM53 Shield (RS485 common)

CM6 - 24Vdc 10W max – Used to power the 6" Color Touch Screen Display if the cable distance is less than 30M. If greater than 30M, use a separate 24V supply to power the Display.

- CM61 Shield
- CM62 24V+
- CM63 24V common

E.3. PXMCM Com 0 and Com 1 RS485 bias resistors (Terminals CM3, CM5)

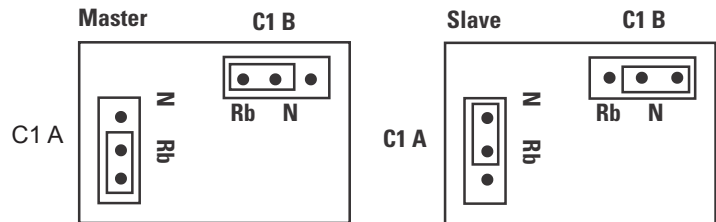
Each RS485 link requires a set of fail safe bias resistors to guarantee that the line goes to a marked state while the line is idle.

The meter convention is to set the 750 ohm bias resistors at the Master node only.

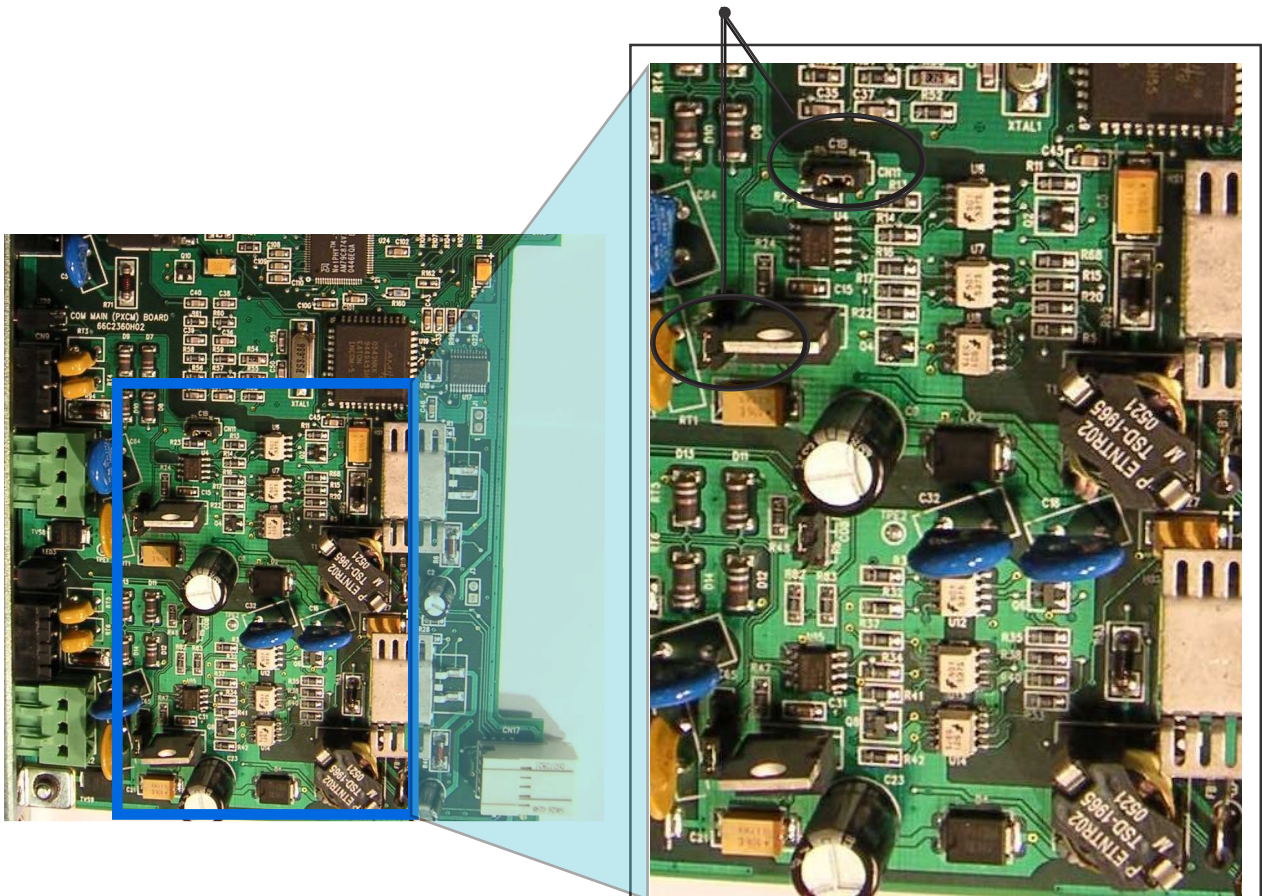
- The RS485 Com ports on the PXMCM card default to Slave functions, therefore the factory default jumper position is N for no bias.
- Com 0 jumpers are set to N for use on the display's network.
- Com 1 can be programmed to be a Master Gateway. This requires changing the positions of jumpers C1A and C1B from N to Rb.
- To change the jumper position, the PXMCM board must be removed from the meter. See general card removal guidelines.
- There are two bias resistors per port to bias each data line. Both jumpers should be set to the same position (N or Rb).
- The jumpers designators are stenciled as C0 A and C0 B; C1A and C1B. Positions N are for not engaged and positions Rb are for engaged. See illustration on the following page.
- Com 0 has jumpers C0 A and C0 B
- Com 1 has jumpers C1A and C1B

PXMCM Com 0 and Com 1 RS485 bias resistors (Terminals CM3, CM5), Con't.

		Jumper Setting	
		Slave Port	Master Port
Com 0	C0 A	N	N/A
	C0 B	N	N/A
Com 1	C1 A	N	Rb
	C2 B	N	Rb



Com 1 Jumpers



NOTE: Care should be taken to keep jumpers A and B set to the same value.

E.4. 24V Source Outputs CM4 & CM6

Note that the Outputs are color coded green and have gender inverted terminal plug header to prevent incorrect wiring with the communication ports.

The maximum external load rating is 10W for each output.

- The intended use for CM4 is to support external accessories
- The intended use for CM6 is to support the 6" Color Touch Screen Display, PXM468K-DISP-6. The wiring between the 24V source and the 24V load may not exceed 30M in length.
- Beyond 30M, a separate external power supply must be supplied.
- The power cable should be shielded with drain wire and the twisted power lines 18 -14 AWG.
- Use ferrules to dress the power lines and prevent frayed wire shorting.

The 24V outputs may NOT be used in parallel. The output power is common to the associated RS485 circuit.

- CM3/CM4 - RS485/Power are common.
- CM5/CM6 - RS485/Power are common.
- Care should be taken not to drive a voltage between the RS485 and power common.
- A common communication and power cable can be used from the meter to the display. Belden 7895A or equivalent is recommended. Use Red/black pair for power, Blue/white pair for data

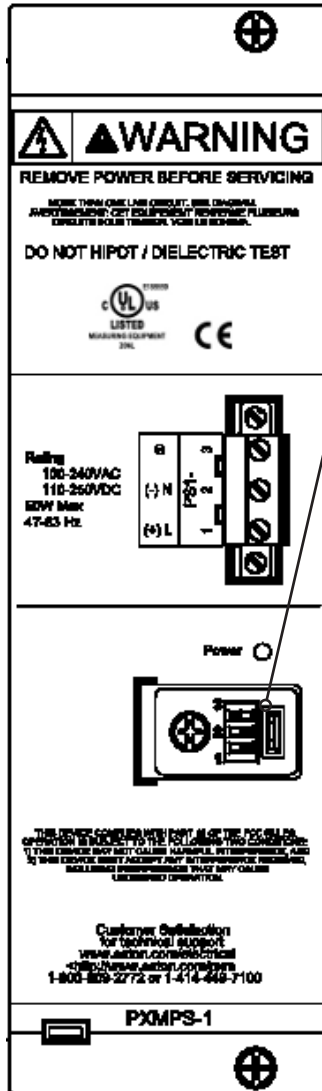
The 24V outputs are turned on during power up.

If during a voltage sag the input to the power supply is too low for normal operation, the CM4 and CM6 24V outputs are turned off to conserve ride through energy. This output drop will cause the display to cycle power and re-initialize after full voltage is restored.

E.5. Power Supply Card PXMPS-1

Power Supply Connections: The PXMPS-1 Standard power supply module powers the meter.

- PS1 Power supply is sourced by either 100-240Vac or 110-250Vdc, 50W draw max.
- PS11 Line (Vac) or (+) Vdc
- PS12 Neutral (Vac) or (-)Vdc
- PS13 ground



DIP Switch Configuration

The mode switches for the meter are located under a cover on the face of the PXPMS-1 power supply.

The meter reads the DIP switch settings during power-up. After making changes to the DIP switch, power must be cycled to the meter by removing and reapplying power to terminals PS1-1 and PS1-2. The switch cover supports a seal tab mechanism to prevent tampering with the meter mode. A second seal tab is located on the bottom of the power supply to allow for sealing the hardware configuration and restricting access.

DS -1	DS-2	DS-3		
OFF	OFF	ON is Normal. OFF is Safe Mode	No restrictions (user ID/Password required)	
OFF	ON	ON is Normal. OFF is Safe Mode	Medium Security - Energy & Demand resets prohibited	
ON	OFF	ON is Normal. OFF is Safe Mode	High Security- Configuration changes; Energy & Demand reset prohibited	
ON	ON	ON or OFF	Factory Test Mode - The meter should never be operated in this mode. The meter will indicate that it's in factory test mode through a repeating series of three flashes on the red Status LED.	

E.6. Diagnostic DIP Switch Settings

Should a problem arise with your meter, EATON support personnel may ask you to enable a diagnostic mode using the DIP switches. When in diagnostic mode, Eaton personnel may instruct you to connect a laptop to the meter and either retrieve files or perform other tasks on the meter. The following shows the DIP switch configuration for diagnostic mode.

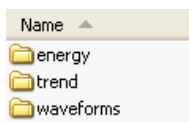
DS -1	DS-2	DS-3		
OFF	OFF	ON is Normal. OFF is Safe Mode	Diagnostic mode.	

F DATA FILES

The Power Xpert Meter provides an FTP site, with anonymous access, that contains the following types of logs from the meter:

- COMTRADE Files
- Trend Logs (in .csv format). Because of the number of data fields that are recorded, the trend logs are broken into three separate files.
- Energy Logs (in .csv format)

F.1. Accessing the Files



Using an FTP client, such as Microsoft Internet Explorer, Filezilla, or the command line FTP utility, open

FTP://*ip_address*

Where *ip_address* is the IP address of the meter.

Note: If you use Internet Explorer, you can select Open FTP Site in Windows Explorer from the Page menu and use the familiar File Explorer to copy files down to your local computer.

The FTP site has three directories: energy (energy logs), trend (trend logs), and waveforms (COMTRADE files).

F.2. COMTRADE Files

The COMTRADE (Common Format for Transient Data) file format is an IEEE standard for storing and exchanging various types of transient electrical data. COMTRADE was developed for the power industry, and specifies such things as the sources of the data, sampling rate, and filters. A set of three files is required:

- A header file (with a .hdr extension)
- A configuration file (with a .cfg extension)
- A data file (with a .dat extension)

All three files are required for data exchange. The COMTRADE files store the following data:

Voltage	Current	Digital Input Channel*
VAG	IA	DI1
VBG	IB	DI2
VCG	IC	DI3
VNG	IG	DI4
VGAUX	IN	DI5
VBGAUX		DI6
VCGAUX		DI7
		DI8
RESERVED1		

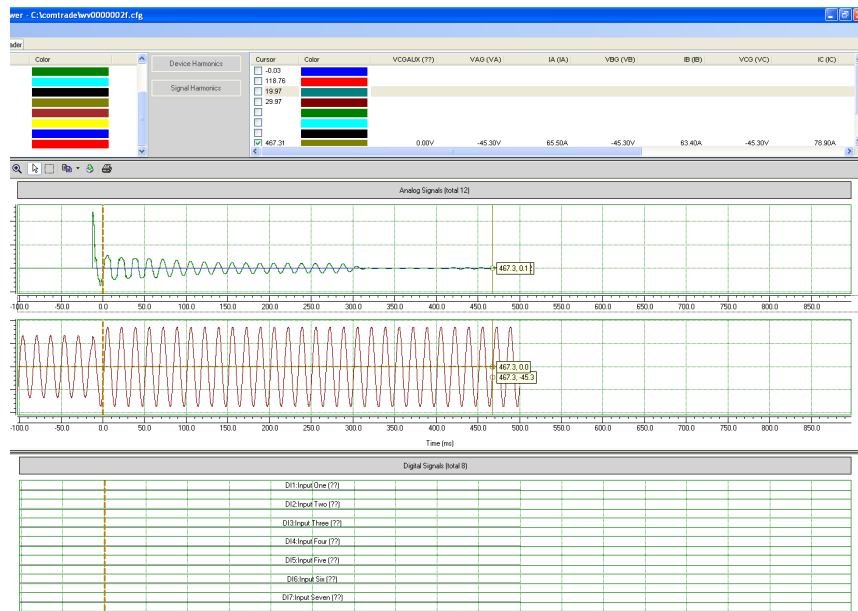
*Waveforms (1 ms resolution) from digital inputs 1 through 8.

Voltage	Current	Digital Input Channel*
RESERVED2		
RESERVED3		

*Waveforms (1 ms resolution) from digital inputs 1 through 8.

Note: for more information about digital input channels, see “Internal I/O inputs” in Section 6 of this manual. Capture waveform must be active for the input for data to be written to the file.

The Power Xpert Software Quality Manager has a Waveform Viewer that can read COMTRADE files. You can use the Waveform Viewer to examine the waveform data in detail, as well as the metadata about each waveform. The following figure shows a COMTRADE file, taken from the meter, displayed in the Waveform Viewer.



ACCESSING THE COMTRADE FILES

COMTRADE file sets can be found in the waveforms directory of the meter’s anonymous FTP site. When copying these files to your local computer, make sure you get all three files in the set. Each file in a set has the same file name, such as wv00000001. The last characters of the filename are simply sequential numbers in hexadecimal, used to give each set unique filenames.

F.3. Energy Logs

Energy log file entries (rows) are captured in increments set for the Profile Interval on the Load Profile Setup screen. The default interval is 15 minutes. The log file format is a comma-separated values (CSV) file that can be readily loaded into Microsoft Excel, Microsoft Access, or other spreadsheet, graphing, and database applications.

The log files contain the following data fields:

- Date
- Time
- Forward kW Demand
- Reverse kW Demand
- Net kW Demand
- Sum kW Demand

- Received kvar Demand
- Delivered kvar Demand
- Net kvar Demand
- Sum kvar Demand
- kVA Demand
- Forward kWh
- Reverse kWh
- Net kWh
- Sum kWh
- Received kvarh
- Delivered kvarh
- Net kvarh
- Sum kvarh
- kVAhw

The following figure shows a small portion of a typical energy log file in Microsoft Excel.

	A	B	C	D	E	F	G	H
1	Date	Time	Forward kV	Reverse kV	Net kW	De Sum kW	C Received k	Delivered k
2	17/12/2007	16:45	41376	0	41376	41376	0	-23740.6
3	17/12/2007	17:00	40985.9	0	40985.9	40985.9	0	-23915.9
4	17/12/2007	17:15	40817.1	0	40817.1	40817.1	0	-24097.2
5	17/12/2007	17:30	40741.3	0	40741.3	40741.3	0	-24161
6	17/12/2007	17:45	40806.7	0	40806.7	40806.7	0	-24131.4
7	17/12/2007	18:00	40866.6	0	40866.6	40866.6	0	-24785
8	17/12/2007	18:15	40814.4	0	40814.4	40814.4	0	-24619.7
9	17/12/2007	18:30	40995.9	0	40995.9	40995.9	0	-25459
10	17/12/2007	18:45	40987.3	0	40987.3	40987.3	0	-25462
11	17/12/2007	19:00	41000.1	0	41000.1	41000.1	0	-25445
12	17/12/2007	19:15	41003.8	0	41003.8	41003.8	0	-25354
13	17/12/2007	19:30	41013.8	0	41013.8	41013.8	0	-25416
14	17/12/2007	19:45	41017	0	41017	41017	0	-25432.5
15	17/12/2007	20:00	41115.5	0	41115.5	41115.5	0	-25437.6
16	17/12/2007	20:15	41099.1	0	41099.1	41099.1	0	-25512.4
17	17/12/2007	20:30	40984.7	0	40984.7	40984.7	0	-25548.8
18	17/12/2007	20:45	41045.9	0	41045.9	41045.9	0	-25533.5
19	17/12/2007	21:00	40991	0	40991	40991	0	-25562.1
20	17/12/2007	21:15	40997.3	0	40997.3	40997.3	0	-25564.9
21	17/12/2007	21:30	40983.9	0	40983.9	40983.9	0	-25588.2
22	17/12/2007	21:45	40936.1	0	40936.1	40936.1	0	-25562.5
23	17/12/2007	22:00	40930.1	0	40930.1	40930.1	0	-25390.6
24	17/12/2007	22:15	40931.9	0	40931.9	40931.9	0	-25296.7
25	17/12/2007	17:30	45967.3	0	45967.3	45967.3	0	-24063.5
26	17/12/2007	17:45	46482.4	0	46482.4	46482.4	0	-24027.8
27	17/12/2007	18:00	41552.7	0	41552.7	41552.7	0	-25478

ACCESSING THE ENERGY LOGS

Energy log files are in the energy directory on the meter’s anonymous FTP site. The filename also contains a date stamp.

F.4. Trend Logs

Trend log file entries (columns) are captured in increments of five minutes, and this value can’t be changed. The log file format is a comma-separated values (CSV) file that can be readily loaded into Microsoft Excel or other spreadsheet, data analysis, or database applications.

Because the meter logs so much data, the trend data is broken down into three separate files:

- Trend_log_yyyymmdd.csv
- Trend_HarmMag_yyyymmdd.csv

- Trend_HarmPct_YYYYMMDD.csv

Where YYYYMMDD is a time stamp with the year, month, and day.

The Trend_Log_YYYYMMDD.csv contains all of the trend data except the harmonics data. The Trend_HarmMag_YYYYMMDD.csv file contains all of the harmonic magnitude and fundamental magnitude data, whereas the the Trend_HarmPct_YYYYMMDD.csv file contains all of the harmonic percentage data.

For reference purposes, the following tables show the contents of each of the log files:

Trend_HarmMag_YYYYMMDD.csv data fields		
Date	Time	EvenHarmonicIa(avg)
EvenHarmonicIa(min)	EvenHarmonicIa(max)	EvenHarmonicIb(avg)
EvenHarmonicIb(min)	EvenHarmonicIb(max)	EvenHarmonicIc(avg)
EvenHarmonicIc(min)	EvenHarmonicIc(max)	EvenHarmonicIn(avg)
EvenHarmonicIn(min)	EvenHarmonicIn(max)	EvenHarmonicVab(avg)
EvenHarmonicVab(min)	EvenHarmonicVab(max)	EvenHarmonicVabxmr(avg)
EvenHarmonicVabxmr(min)	EvenHarmonicVabxmr(max)	EvenHarmonicVan(avg)
EvenHarmonicVan(min)	EvenHarmonicVan(max)	EvenHarmonicVbc(avg)
EvenHarmonicVbc(min)	EvenHarmonicVbc(max)	EvenHarmonicVbcxmr(avg)
EvenHarmonicVbcxmr(min)	EvenHarmonicVbcxmr(max)	EvenHarmonicVbn(avg)
EvenHarmonicVbn(min)	EvenHarmonicVbn(max)	EvenHarmonicVca(avg)
EvenHarmonicVca(min)	EvenHarmonicVca(max)	EvenHarmonicVcaxmr(avg)
EvenHarmonicVcaxmr(min)	EvenHarmonicVcaxmr(max)	EvenHarmonicVcn(avg)
EvenHarmonicVcn(min)	EvenHarmonicVcn(max)	FundamentalIa(avg)
FundamentalIa(min)	FundamentalIa(max)	FundamentalIb(avg)
FundamentalIb(min)	FundamentalIb(max)	FundamentalIc(avg)
FundamentalIc(min)	FundamentalIc(max)	FundamentalIn(avg)
FundamentalIn(min)	FundamentalIn(max)	FundamentalVab(avg)
FundamentalVab(min)	FundamentalVab(max)	FundamentalVabxmr(avg)
FundamentalVabxmr(min)	FundamentalVabxmr(max)	FundamentalVan(avg)
FundamentalVan(min)	FundamentalVan(max)	FundamentalVbc(avg)
FundamentalVbc(min)	FundamentalVbc(max)	FundamentalVbcxmr(avg)
FundamentalVbcxmr(min)	FundamentalVbcxmr(max)	FundamentalVbn(avg)
FundamentalVbn(min)	FundamentalVbn(max)	FundamentalVca(avg)
FundamentalVca(min)	FundamentalVca(max)	FundamentalVcaxmr(avg)
FundamentalVcaxmr(min)	FundamentalVcaxmr(max)	FundamentalVcn(avg)
FundamentalVcn(min)	FundamentalVcn(max)	InterHarmonicIa(avg)
InterHarmonicIa(min)	InterHarmonicIa(max)	InterHarmonicIb(avg)
InterHarmonicIb(min)	InterHarmonicIb(max)	InterHarmonicIc(avg)
InterHarmonicIc(min)	InterHarmonicIc(max)	InterHarmonicIn(avg)
InterHarmonicIn(min)	InterHarmonicIn(max)	InterHarmonicVab(avg)
InterHarmonicVab(min)	InterHarmonicVab(max)	InterHarmonicVabxmr(avg)
InterHarmonicVabxmr(min)	InterHarmonicVabxmr(max)	InterHarmonicVan(avg)
InterHarmonicVan(min)	InterHarmonicVan(max)	InterHarmonicVbc(avg)
InterHarmonicVbc(min)	InterHarmonicVbc(max)	InterHarmonicVbcxmr(avg)
InterHarmonicVbcxmr(min)	InterHarmonicVbcxmr(max)	InterHarmonicVbn(avg)
InterHarmonicVbn(min)	InterHarmonicVbn(max)	InterHarmonicVca(avg)
InterHarmonicVca(min)	InterHarmonicVca(max)	InterHarmonicVcaxmr(avg)

Trend_HarmMag_YYYYmmdd.csv data fields		
InterHarmonicVcaxmr(min)	InterHarmonicVcaxmr(max)	InterHarmonicVcn(avg)
InterHarmonicVcn(min)	InterHarmonicVcn(max)	OddHarmonicIa(avg)
OddHarmonicIa(min)	OddHarmonicIa(max)	OddHarmonicIb(avg)
OddHarmonicIb(min)	OddHarmonicIb(max)	OddHarmonicIc(avg)
OddHarmonicIc(min)	OddHarmonicIc(max)	OddHarmonicIn(avg)
OddHarmonicIn(min)	OddHarmonicIn(max)	OddHarmonicVab(avg)
OddHarmonicVab(min)	OddHarmonicVab(max)	OddHarmonicVabxmr(avg)
OddHarmonicVabxmr(min)	OddHarmonicVabxmr(max)	OddHarmonicVan(avg)
OddHarmonicVan(min)	OddHarmonicVan(max)	OddHarmonicVbc(avg)
OddHarmonicVbc(min)	OddHarmonicVbc(max)	OddHarmonicVbcxmr(avg)
OddHarmonicVbcxmr(min)	OddHarmonicVbcxmr(max)	OddHarmonicVbn(avg)
OddHarmonicVbn(min)	OddHarmonicVbn(max)	OddHarmonicVca(avg)
OddHarmonicVca(min)	OddHarmonicVca(max)	OddHarmonicVcaxmr(avg)
OddHarmonicVcaxmr(min)	OddHarmonicVcaxmr(max)	OddHarmonicVcn(avg)
OddHarmonicVcn(min)	OddHarmonicVcn(max)	TotalHarmonicIa(avg)
TotalHarmonicIa(min)	TotalHarmonicIa(max)	TotalHarmonicIb(avg)
TotalHarmonicIb(min)	TotalHarmonicIb(max)	TotalHarmonicIc(avg)
TotalHarmonicIc(min)	TotalHarmonicIc(max)	TotalHarmonicIn(avg)
TotalHarmonicIn(min)	TotalHarmonicIn(max)	TotalHarmonicVab(avg)
TotalHarmonicVab(min)	TotalHarmonicVab(max)	TotalHarmonicVabxmr(avg)
TotalHarmonicVabxmr(min)	TotalHarmonicVabxmr(max)	TotalHarmonicVan(avg)
TotalHarmonicVan(min)	TotalHarmonicVan(max)	TotalHarmonicVbc(avg)
TotalHarmonicVbc(min)	TotalHarmonicVbc(max)	TotalHarmonicVbcxmr(avg)
TotalHarmonicVbcxmr(min)	TotalHarmonicVbcxmr(max)	TotalHarmonicVbn(avg)
TotalHarmonicVbn(min)	TotalHarmonicVbn(max)	TotalHarmonicVca(avg)
TotalHarmonicVca(min)	TotalHarmonicVca(max)	TotalHarmonicVcaxmr(avg)
TotalHarmonicVcaxmr(min)	TotalHarmonicVcaxmr(max)	TotalHarmonicVcn(avg)
TotalHarmonicVcn(min)	TotalHarmonicVcn(max)	

Trend_HarmPct_YYYYmmdd.csv data fields		
Date	Time	EvenHarmlaPct(avg)
EvenHarmlaPct(min)	EvenHarmlaPct(max)	EvenHarmlbPct(avg)
EvenHarmlbPct(min)	EvenHarmlbPct(max)	EvenHarmlcPct(avg)
EvenHarmlcPct(min)	EvenHarmlcPct(max)	EvenHarmlnPct(avg)
EvenHarmlnPct(min)	EvenHarmlnPct(max)	EvenHarmVabPct(avg)
EvenHarmVabPct(min)	EvenHarmVabPct(max)	EvenHarmVabxmrPct(avg)
EvenHarmVabxmrPct(min)	EvenHarmVabxmrPct(max)	EvenHarmVanPct(avg)
EvenHarmVanPct(min)	EvenHarmVanPct(max)	EvenHarmVbcPct(avg)
EvenHarmVbcPct(min)	EvenHarmVbcPct(max)	EvenHarmVbcxmrPct(avg)
EvenHarmVbcxmrPct(min)	EvenHarmVbcxmrPct(max)	EvenHarmVbnPct(avg)
EvenHarmVbnPct(min)	EvenHarmVbnPct(max)	EvenHarmVcaPct(avg)
EvenHarmVcaPct(min)	EvenHarmVcaPct(max)	EvenHarmVcaxmrPct(avg)
EvenHarmVcaxmrPct(min)	EvenHarmVcaxmrPct(max)	EvenHarmVcnPct(avg)
EvenHarmVcnPct(min)	EvenHarmVcnPct(max)	InterHarmlaPct(avg)

Trend_HarmPct_YYYYmmdd.csv data fields		
InterHarmIaPct(min)	InterHarmIaPct(max)	InterHarmIbPct(avg)
InterHarmIbPct(min)	InterHarmIbPct(max)	InterHarmIcPct(avg)
InterHarmIcPct(min)	InterHarmIcPct(max)	InterHarmInPct(avg)
InterHarmInPct(min)	InterHarmInPct(max)	InterHarmVabPct(avg)
InterHarmVabPct(min)	InterHarmVabPct(max)	InterHarmVabxmrPct(avg)
InterHarmVabxmrPct(min)	InterHarmVabxmrPct(max)	InterHarmVanPct(avg)
InterHarmVanPct(min)	InterHarmVanPct(max)	InterHarmVbcPct(avg)
InterHarmVbcPct(min)	InterHarmVbcPct(max)	InterHarmVbcxmrPct(avg)
InterHarmVbcxmrPct(min)	InterHarmVbcxmrPct(max)	InterHarmVbnPct(avg)
InterHarmVbnPct(min)	InterHarmVbnPct(max)	InterHarmVcaPct(avg)
InterHarmVcaPct(min)	InterHarmVcaPct(max)	InterHarmVcaxmrPct(avg)
InterHarmVcaxmrPct(min)	InterHarmVcaxmrPct(max)	InterHarmVcnPct(avg)
InterHarmVcnPct(min)	InterHarmVcnPct(max)	OddHarmIaPct(avg)
OddHarmIaPct(min)	OddHarmIaPct(max)	OddHarmIbPct(avg)
OddHarmIbPct(min)	OddHarmIbPct(max)	OddHarmIcPct(avg)
OddHarmIcPct(min)	OddHarmIcPct(max)	OddHarmInPct(avg)
OddHarmInPct(min)	OddHarmInPct(max)	OddHarmVabPct(avg)
OddHarmVabPct(min)	OddHarmVabPct(max)	OddHarmVabxmrPct(avg)
OddHarmVabxmrPct(min)	OddHarmVabxmrPct(max)	OddHarmVanPct(avg)
OddHarmVanPct(min)	OddHarmVanPct(max)	OddHarmVbcPct(avg)
OddHarmVbcPct(min)	OddHarmVbcPct(max)	OddHarmVbcxmrPct(avg)
OddHarmVbcxmrPct(min)	OddHarmVbcxmrPct(max)	OddHarmVbnPct(avg)
OddHarmVbnPct(min)	OddHarmVbnPct(max)	OddHarmVcaPct(avg)
OddHarmVcaPct(min)	OddHarmVcaPct(max)	OddHarmVcaxmrPct(avg)
OddHarmVcaxmrPct(min)	OddHarmVcaxmrPct(max)	OddHarmVcnPct(avg)
OddHarmVcnPct(min)	OddHarmVcnPct(max)	TotalHarmIaPct(avg)
TotalHarmIaPct(min)	TotalHarmIaPct(max)	TotalHarmIbPct(avg)
TotalHarmIbPct(min)	TotalHarmIbPct(max)	TotalHarmIcPct(avg)
TotalHarmIcPct(min)	TotalHarmIcPct(max)	TotalHarmInPct(avg)
TotalHarmInPct(min)	TotalHarmInPct(max)	TotalHarmVabPct(avg)
TotalHarmVabPct(min)	TotalHarmVabPct(max)	TotalHarmVabxmrPct(avg)
TotalHarmVabxmrPct(min)	TotalHarmVabxmrPct(max)	TotalHarmVanPct(avg)
TotalHarmVanPct(min)	TotalHarmVanPct(max)	TotalHarmVbcPct(avg)
TotalHarmVbcPct(min)	TotalHarmVbcPct(max)	TotalHarmVbcxmrPct(avg)
TotalHarmVbcxmrPct(min)	TotalHarmVbcxmrPct(max)	TotalHarmVbnPct(avg)
TotalHarmVbnPct(min)	TotalHarmVbnPct(max)	TotalHarmVcaPct(avg)
TotalHarmVcaPct(min)	TotalHarmVcaPct(max)	TotalHarmVcaxmrPct(avg)
TotalHarmVcaxmrPct(min)	TotalHarmVcaxmrPct(max)	TotalHarmVcnPct(avg)
TotalHarmVcnPct(min)	TotalHarmVcnPct(max)	

Trend_log_YYYYmmdd.csv Data Fields		
Date	Time	FlickerPerceptSys(avg)
FlickerPerceptSys(min)	FlickerPerceptSys(max)	PltVab(avg)
PltVab(min)	PltVab(max)	PltVan(avg)

Trend_log_YYYYmmdd.csv Data Fields		
PltVan(min)	PltVan(max)	PltVbc(avg)
PltVbc(min)	PltVbc(max)	PltVbn(avg)
PltVbn(min)	PltVbn(max)	PltVca(avg)
PltVca(min)	PltVca(max)	PltVcn(avg)
PltVcn(min)	PltVcn(max)	PltVsys(avg)
PltVsys(min)	PltVsys(max)	PstSys(avg)
PstSys(min)	PstSys(max)	APFa(avg)
APFa(min)	APFa(max)	APFb(avg)
APFb(min)	APFb(max)	APFc(avg)
APFc(min)	APFc(max)	APFsys(avg)
APFsys(min)	APFsys(max)	CFa(avg)
CFa(min)	CFa(max)	CFb(avg)
CFb(min)	CFb(max)	CFc(avg)
CFc(min)	CFc(max)	CFsys(avg)
CFsys(min)	CFsys(max)	DPFa(avg)
DPFa(min)	DPFa(max)	DPFb(avg)
DPFb(min)	DPFb(max)	DPFc(avg)
DPFc(min)	DPFc(max)	DPFsys(avg)
DPFsys(min)	DPFsys(max)	FlickerPerceptVab(avg)
FlickerPerceptVab(min)	FlickerPerceptVab(max)	FlickerPerceptVan(avg)
FlickerPerceptVan(min)	FlickerPerceptVan(max)	FlickerPerceptVbc(avg)
FlickerPerceptVbc(min)	FlickerPerceptVbc(max)	FlickerPerceptVbn(avg)
FlickerPerceptVbn(min)	FlickerPerceptVbn(max)	FlickerPerceptVca(avg)
FlickerPerceptVca(min)	FlickerPerceptVca(max)	FlickerPerceptVcn(avg)
FlickerPerceptVcn(min)	FlickerPerceptVcn(max)	Fsys(avg)
Fsys(min)	Fsys(max)	Ia200(avg)
Ia200(min)	Ia200(max)	Iavg200(avg)
Iavg200(min)	Iavg200(max)	Ib200(avg)
Ib200(min)	Ib200(max)	Ic200(avg)
Ic200(min)	Ic200(max)	IFa(avg)
IFa(min)	IFa(max)	IFb(avg)
IFb(min)	IFb(max)	IFc(avg)
IFc(min)	IFc(max)	IFsys(avg)
IFsys(min)	IFsys(max)	Ig200(avg)
Ig200(min)	Ig200(max)	In200(avg)
In200(min)	In200(max)	KFa(avg)
KFa(min)	KFa(max)	KFb(avg)
KFb(min)	KFb(max)	KFc(avg)
KFc(min)	KFc(max)	KFsys(avg)
KFsys(min)	KFsys(max)	NegSeqI(avg)
NegSeqI(min)	NegSeqI(max)	NegSeqV(avg)
NegSeqV(min)	NegSeqV(max)	NegSeqVxmr(avg)
NegSeqVxmr(min)	NegSeqVxmr(max)	Pa(avg)

Trend_log_YYYYMMDD.csv Data Fields		
Pa(min)	Pa(max)	Pb(avg)
Pb(min)	Pb(max)	Pc(avg)
Pc(min)	Pc(max)	PosSeqI(avg)
PosSeqI(min)	PosSeqI(max)	PosSeqV(avg)
PosSeqV(min)	PosSeqV(max)	PosSeqVxmr(avg)
PosSeqVxmr(min)	PosSeqVxmr(max)	PstVab(avg)
PstVab(min)	PstVab(max)	PstVan(avg)
PstVan(min)	PstVan(max)	PstVbc(avg)
PstVbc(min)	PstVbc(max)	PstVbn(avg)
PstVbn(min)	PstVbn(max)	PstVca(avg)
PstVca(min)	PstVca(max)	PstVcn(avg)
PstVcn(min)	PstVcn(max)	Ptotal(avg)
Ptotal(min)	Ptotal(max)	Qa(avg)
Qa(min)	Qa(max)	Qb(avg)
Qb(min)	Qb(max)	Qc(avg)
Qc(min)	Qc(max)	Qtotal(avg)
Qtotal(min)	Qtotal(max)	Sa(avg)
Sa(min)	Sa(max)	Sb(avg)
Sb(min)	Sb(max)	Sc(avg)
Sc(min)	Sc(max)	Stotal(avg)
Stotal(min)	Stotal(max)	Vab200(avg)
Vab200(min)	Vab200(max)	Vabxmr200(avg)
Vabxmr200(min)	Vabxmr200(max)	Van200(avg)
Van200(min)	Van200(max)	Vbc200(avg)
Vbc200(min)	Vbc200(max)	Vbcxmr200(avg)
Vbcxmr200(min)	Vbcxmr200(max)	Vbn200(avg)
Vbn200(min)	Vbn200(max)	Vca200(avg)
Vca200(min)	Vca200(max)	Vcaxmr200(avg)
Vcaxmr200(min)	Vcaxmr200(max)	Vcn200(avg)
Vcn200(min)	Vcn200(max)	Vllavg200(avg)
Vllavg200(min)	Vllavg200(max)	Vllavgxmr200(avg)
Vllavgxmr200(min)	Vllavgxmr200(max)	Vlnavg200(avg)
Vlnavg200(min)	Vlnavg200(max)	Vng200(avg)
Vng200(min)	Vng200(max)	ZeroSeqI(avg)
ZeroSeqI(min)	ZeroSeqI(max)	ZeroSeqV(avg)
ZeroSeqV(min)	ZeroSeqV(max)	ZeroSeqVxmr(avg)
ZeroSeqVxmr(min)	ZeroSeqVxmr(max)	

ACCESSING THE TREND LOG FILES

Trend log files are in the trend directory on the meter's anonymous FTP site.

G ROOT CERTIFICATE AUTHORITY INSTALLATION

Improve the security of your Power Xpert Meter on the Web by installing a root certificate authority (CA). A CA is a trusted third-party organization that issues digital certificates for use with encrypted digital transactions. The digital certificate guarantees that the company holding a certificate is who it claims to be.

You can use the meter without installing a root CA (using http), but the transactions will not be as secure as with the root CA (using https). The performance of the meter is not impacted by using secure transactions.

This section explains root CA installation for:

- Microsoft Internet Explorer 11
- Google Chrome
- Mozilla Firefox
- Edge
- Safari

G.1. Installing Root CA with Microsoft Internet Explorer 11

To install a certificate for the Power Xpert Meter with Microsoft Internet Explorer 11:

1. Open the browser and type the IP address of the meter followed by the path "/ca.html" in the address bar. For example: https://192.168.1.1/ca.html

The install CA certificate page appears.

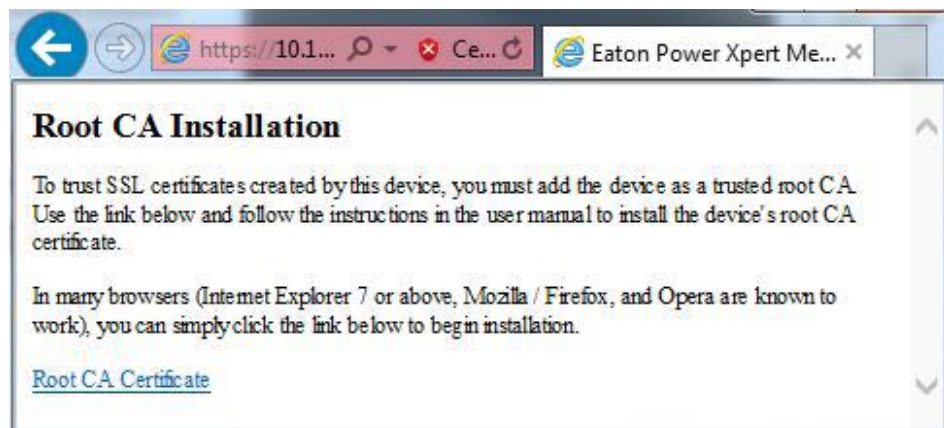


Figure 1: Install CA Certificate Page.

2. Click the Root CA Certificate link.

3. Click the Open button.

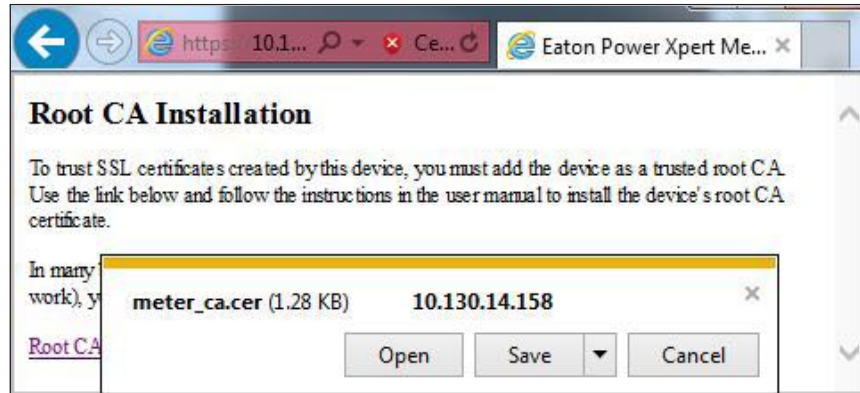


Figure 2: File Download Dialog Box.

4. In the Certificate dialog box, click the Install Certificate... button.

NOTE The certificate cannot be verified yet because it is issued by a non-trusted CA.

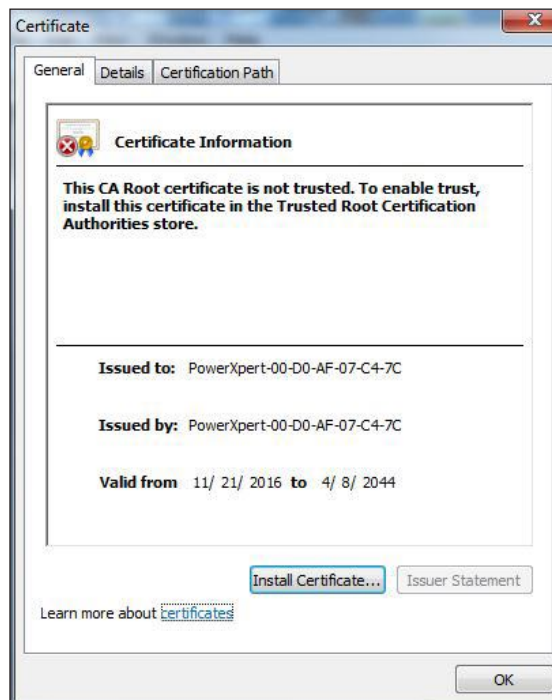


Figure 3: Certification Path Window.

- The Certificate Import Wizard window opens. Click Next. Verify that the default setting, Automatically select the certificate store based on the type of certificate, is selected and then Click Next.

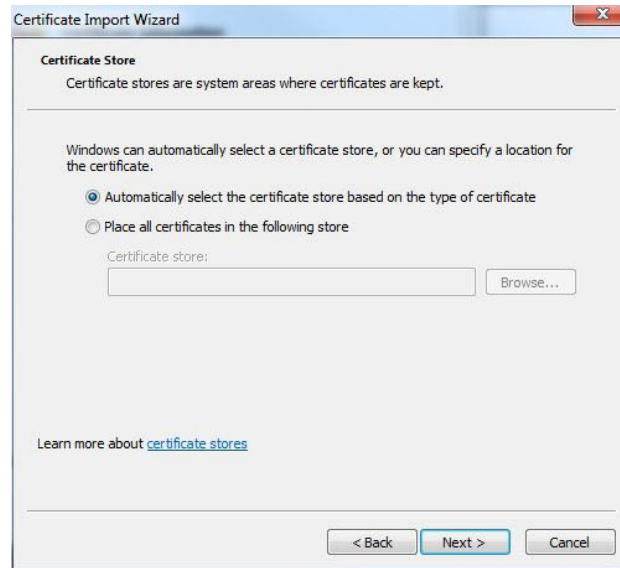


Figure 4: Certificate Import Wizard.

- The certificate wizard confirms the selected setting for certificate import. Click Finish.

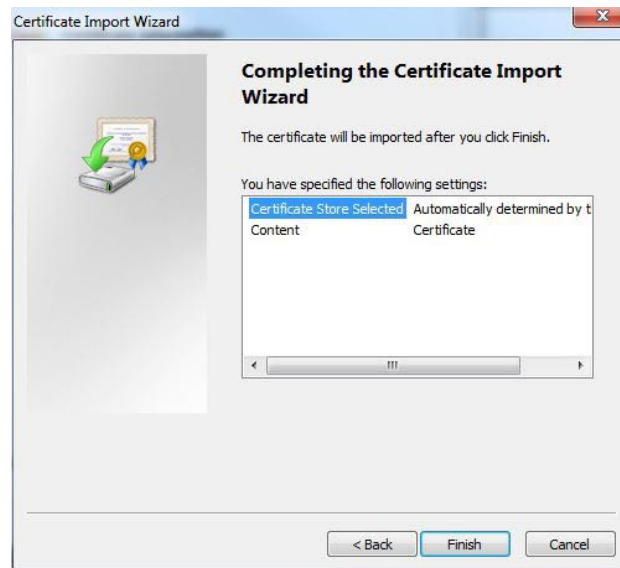


Figure 5: Certificate Import Wizard – Confirming Import Settings.

7. A new dialog box window opens to verify that the import was done successfully



Figure 6: Import Successful Dialog Box.

8. Click OK.
9. Click OK to close the Certificate Window. The installation process is complete. You can now access the meter using the https protocol (For example: <https://192.168.1.1/>).

G.2. Installing Root CA with Google Chrome

To install a certificate for the Power Xpert Meter with Google Chrome:

1. Open the browser and type the IP address of the meter followed by the path "/ca.html" in the address bar. For example: <https://192.168.1.1/ca.html>
The install CA certificate page appears (see Figure 1).
 2. Click the Root CA Certificate link.
 3. Click the Open button (see Figure 2).
 4. In the Certificate dialog box, click the Install Certificate... button (see Figure 3).
- NOTE** The certificate cannot be verified yet because it is issued by a non-trusted CA.
5. The Certificate Import Wizard window opens. Click Next.
Verify that the default setting, Automatically select the certificate store based on the type of certificate, is selected and then Click Next (see Figure 4).
 6. The certificate wizard confirms the selected setting for certificate import. Click Finish (see Figure 5).
 7. A new dialog box window opens to verify that the import was done successfully (see Figure 6).
 8. Click OK.
 9. Click OK to close the Certificate Window. The installation process is complete. You can now access the meter using the https protocol (For example: <https://192.168.1.1/>).

G.3. Installing Root CA with Mozilla Firefox

To install a certificate for the Power Xpert Meter with Mozilla Firefox:

1. Open the browser and type the IP address of the meter followed by the path “/ca.html” in the address bar. For example: https://192.168.1.1/ca.html
The install CA certificate page appears.

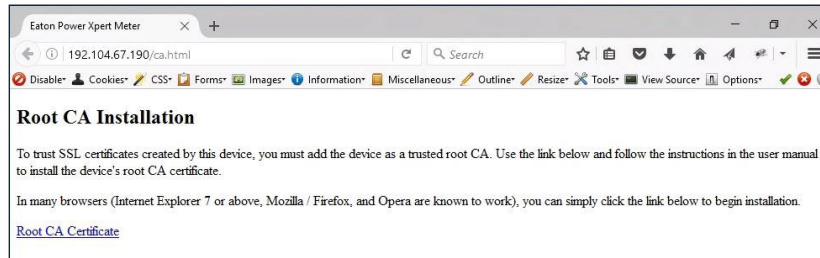


Figure 7: Install CA Certificate Page.

2. Click the Root CA Certificate link. Firefox opens the Downloading Certificate window.
3. Click the Trust this CA to identify web sites check box option.



Figure 8: Downloading Certificate Window.

4. Click OK to complete the installation process. The installation process is complete. You can now access the meter using the https protocol (for example, https://192.168.1.1/ca.html).

G.4. Installing Root CA with Edge

To install a certificate for the Power Xpert Meter with Edge:

1. Open the browser and type the IP address of the meter followed by the path “/ca.html” in the address bar. (For example: https://192.168.1.1/ca.html).

The install CA certificate page appears.



Figure 9: Install CA Certificate Page.

2. Click the Root CA Certificate link.
3. Click the Open button.

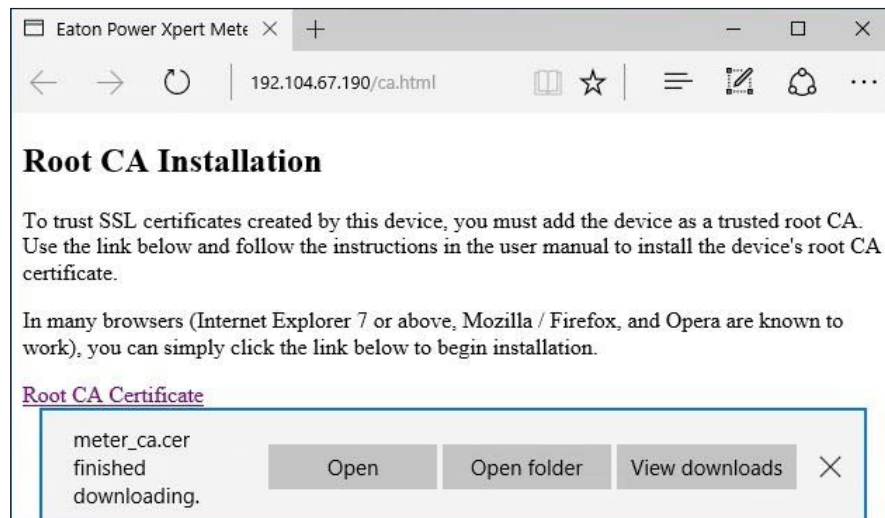


Figure 10: File Download Dialog Box.

4. In the Certificate dialog box, click the Install Certificate... button.

NOTE The certificate cannot be verified yet because it is issued by a non-trusted CA.

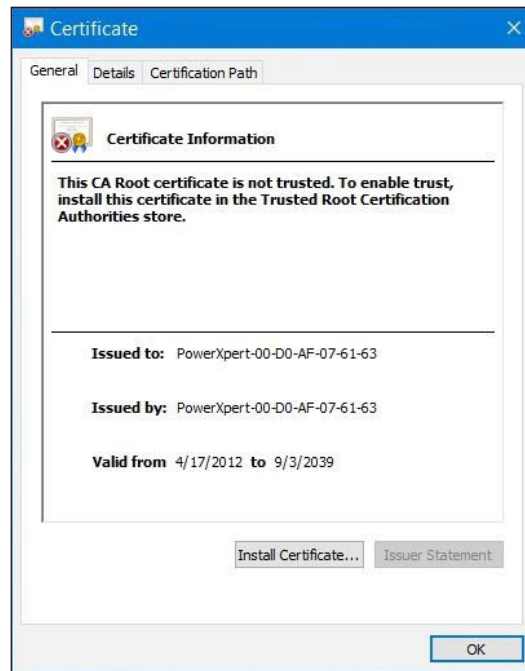


Figure 11: Certification Path Window.

5. The Certificate Import Wizard window opens. Verify that the default setting, Current User, is selected and then Click Next.

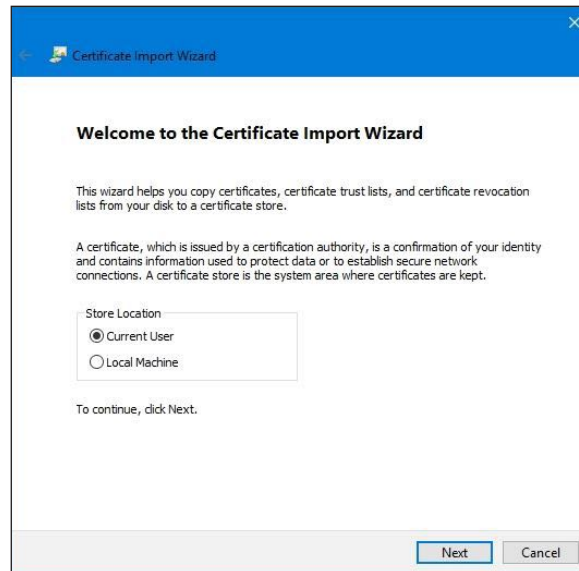


Figure 12: Certification Import Wizard – Welcome Screen

- Verify that the default setting, Automatically select the certificate store based on the type of certificate, is selected and then Click Next.

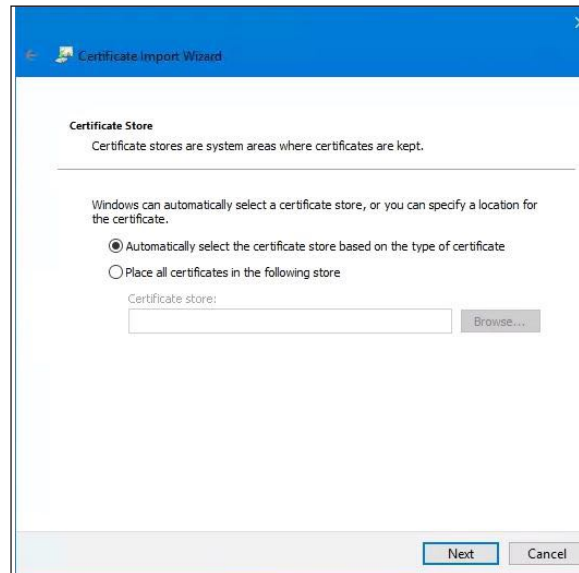


Figure 13: Certification Import Wizard – Certificate Store

- The certificate wizard confirms the selected setting for certificate import. Click Finish.

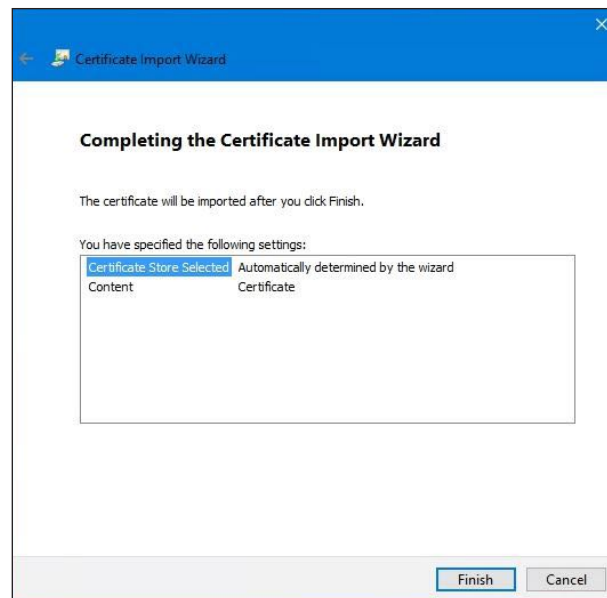


Figure 14: Certification Import Wizard – Confirming Import Settings

8. A new dialog box window opens to verify that the import was done successfully.



Figure 15: Import Successful Dialog Box.

9. Click OK.

H SPECIFICATIONS

Compliance: Meter & Display

Safety

EN 61010-1

CNL evaluation to CAN/C22.2 No 1010.1.92

UL 61010-1, 2nd Edition

Display face, UL Validated to NEMA type 12, IP42

Meter & Display back, UL Validated to NEMA type 1, IP30

Accuracy

IEC/EN 62053-22, Classes 0.2 & 0.5 (0.2% min)

ANSI C12.20 (Electricity Meters 0.2%)

CE mark

Electromagnetic Compatibility

Emissions

FCC Part 15, Subpart B, Class A Radiated & Conducted

EN55011 Class A Radiated & Conducted

IEC 61000-3-2, EMC - Harmonic Current

IEC 61000-3-3, EMC - Flicker - Low Voltage

Immunity - EN 61326, Industrial EMC Immunity

EN 61000-4-2, ESD Level 3

EN 61000-4-3, Rad. RF Level 3

EN 61000-4-4, EFT Level 3

EN 61000-4-5, Surge Level 3 (2 signal)

EN 61000-4-6, Cond. RF Level 3

EN 61000-4-11, Voltage Var.

Environmental

IEC 60529

Display face IP42

Display back IP30

Meter IP30

IEC 60255-21-1, Vibration, Class 1

IEC 60255-21-2, Shock/Bump, Class 1

IEC 60255-21-3 Seismic, Class 1

IEC 68-2-6, Vibration

Environmental Ratings - Meter and Display

For Indoor Use Only

Operating Temperature

Meter: -20° to 70°C (-4° to 158°F) - no rating restriction

Display: -20° to 60°C

Storage Temperature

-40° to 85°C (-40° to 185°F)

Humidity

5% - 95% (non-condensing) for all temperatures

Maximum Operating Altitude

3000 meters (6,561 feet)

Pollution Degree II for Meter and Display Back

Pollution Degree III for Display Front

Panel Housing must be => NEMA 12 or IP52

Panel must be flat to accept Display gasket

Display Ethernet cover must be closed

Specifications, Con't.

Dimensions/Clearances/Weights

Meter

Height: 8.32 inches
 Top/Bottom Clearance -3 inches minimum
 Clearance required for proper ventilation

Width: 8.2 inches
 Side clearance - 2 inches minimum
 Clearance required for proper access to termination

Depth: with terminals and panel mounting feet - 6.8 inches
 Add 1.2 inch depth clearance for terminal plug field cable termination
 Add 3.2 inch depth clearance for RS232 or Fiber Optic

Shipping Weight 7.1 lbs.

Electrical Specifications

Display Power Supply Input (DG2)

24 Vdc +/- 10%
 8 W maximum draw
 Common TVS bonded to ground ~ 300V
 Wiring to 4 position removable terminal plug
 12-18 AWG, wire ferrules recommended

Meter Power Supply Input

PXMPS-1 Standard (PS1):
 100 - 240 Vac +/- 20%, 47 - 63 Hz
 110 - 250 Vdc +/- 20%
 50W maximum draw
 Minimum Ride through 0.5 Sec
 Neutral (-) TVS bonded to ground ~ 575V
 Wiring to 3 position removable terminal plug
 12-18 AWG, wire ferrules recommended

Meter PXMCM 24VDC outputs (CM4, CM6)

24VDC +/-10%
 10W maximum load
 Output switched off on PS1 power down
 Common to paired RS485 port
 CM3/CM4
 CM5/CM6
 Common TVS bonded to ground ~ 300V
 Wiring to 3 position removable terminal plug
 12-18 AWG, wire ferrules recommended

Meter PXMIO Discrete Inputs (IO1)

Qty 8 common circuits IO1.1-1.8
 24V internal source IO1.9
 To drive external dry contact

Input impedance	~ 2.2K ohm
Input current draw	~ 10 mA
Minimum pulse width	10 millisecond
Maximum pulse rate	20 Hz
Common TVS clamped to ground	~ 300V

Wiring to 9 position removable terminal plug
 12-18 AWG, wire ferrules recommended

Specifications, Con't.

Meter PXMIO Solid-State Outputs (IO2)

Qty 2 – Form A NO Bidirectional FET
 Isolation Circuit to ground 2KV /1 min.
 Isolation SS1 to SS2 2KV / 1 min.
 Maximum external source voltage 30Vdc
 Line to Line TVS clamp at 32Vdc
 Maximum load current 100 mA.
 Minimum pulse width 20milliseconds
 Fixed 25milliseconds for Pulse Initiator function
 Maximum pulse rate 25Hz
 Wiring to 4 position removable terminal plug
 12-18 AWG, wire ferrules recommended

Meter PXMIO Relay Outputs (IO3)

Qty 3 - Form C Relays (both NO=A and NC=B contacts)
 Rated Current Voltage 5 A/30 Vdc, 100 - 240 Vac
 Isolation circuit to ground 2,500 V / 1 minute
 Isolation Relay to Relay circuit 2,500 V / 1 minute
 Contacts MOV protected at ~300V
 Lifetime 5 A load 1,000,000 cycles
 Response Turn-On/Off Time ~ 20 - 30 msec
 Wiring to 9 position removable terminal plug
 12-18 AWG, wire ferrules recommended

Metering inputs

Current Inputs CT1-5 (Each channel)

Rating 5 A secondary nominal,
 20 A continuous max
 Metering Range 0.05 to 20A
 Burden < 10 mohm
 Overload Withstand
 500 A ac / 1 sec, non-repeating
 Accuracy
 0.05% of reading + .01% of full scale (50 mA to 20A)
 Wiring to removable terminal plug
 Screw down cover
 Range 10 AWG - 18 AWG
 Safety Insulation Rating
 600 V all CT circuits to ground
 Installation Category CAT III
 Dielectric Withstand
 All inputs to ground 3500 Vac / 1 min
 ADC Conversion
 30.72 ksps through delta-sigma A/D
 True rms processing at 512 sample/cycle
 Delta sigma A/D oversampling rate: 4096 samples/cycle

*Specifications, Con't.***Standard Metering Voltage Inputs VTV1-VR**

Maximum Rating
 347 Vac rms L:G
 600 Vac rms L:L
 Installation Category CAT -III
 Metering Range (Temporary transitions)
 30-700 Vac rms L:G
 Abuse Overload Rating
 1000 Vrms Sustained
 Input Impedance 2 megohm
 Accuracy
 0.1% of reading + .02% of full scale 63-347 Vac rms L:G
 Wiring to removable terminal plug
 Range 10 AWG - 18 AWG
 ADC Conversion
 30.72 ksps through delta-sigma A/D
 True rms processing at 512 sample/cycle
 Delta sigma A/D oversampling rate: 1024 samples/cycle

Auxiliary Voltage Inputs VXV6-V8

Maximum Rating
 347 Vac rms L:G
 600 Vac rms L:L
 Installation Category CAT -III
 Metering Range (Temporary transitions)
 30-700 Vac rms L:G
 Abuse Overload Rating
 1000 Vrms Sustained
 Input Impedance 2 megohm
 Accuracy
 0.1% of reading + .02% of full scale 63-347 Vac rms L:G
 Wiring to removable terminal plug
 Range 10 AWG - 18 AWG
 ADC Conversion
 30.72 ksps through delta-sigma A/D
 True rms processing at 512 sample/cycle
 All samples used in all rms calculations
 Delta sigma A/D oversampling rate: 4096 samples/cycle

High Speed Transient Voltage Inputs VTV1-VR

(Parallel circuit to Standard Metering using the same terminal block.)

Maximum Rating
 347 Vac rms L:G
 600 Vac rms L:L
 Installation Category CAT -III
 Metering Range
 (Temporary transitions- Surge/transients)
 +/- 1-8000 Vpk L:G
 Abuse Overload Rating
 1000 Vrms Sustained
 Input Impedance - 2 mega ohm
 Accuracy
 +/-1V
 Wiring to removable terminal plug
 Range 10 AWG - 18 AWG
 ADC Conversion
 1 or 6 MHz

Specifications, Con't.

VT Standard/High Speed Inputs

PT Potential Transformers Requirements

Single Phase

No PT required:

120 Vac L:N or 240 Vac L:L

277 Vac L:N or 554 Vac L:L

PT required:

Over 277 L:N or 554 Vac L:L

Wye

No PT required:

120 Vac L:N or 208 Vac L:L

277 Vac L:N or 480 Vac L:L

347 Vac L:N or 600 Vac L:L

PT required:

Over 347 Vac L:N or 600 Vac L:L

Delta

PT recommended:

Up to 480 Vac L:L

PT required:

Over 480 Vac L:L

Optional VX Auxiliary Input

PT Potential Transformers Requirements

Delta

PT recommended:

Up to 480 Vac L:L

PT required:

Over 480 Vac L:L

Communication Main Termination Definition

<u>COM 1</u>	CM 3.1	Data A
	CM 3.2	Data B
	CM 3.3	Shield / Common
	CM 4.1*	Shield
	CM 4.2*	24 V+ Source
	CM 4.3*	Common
<u>COM 0</u>	CM 5.1	Data A
	CM 5.2	Data B
	CM 5.3	Shield / Common
	CM 6.1*	Shield
	CM 6.2*	24 V+ Source
	CM 6.3*	Comonm

Specifications, Con't.

Communication Expansion -Termination Definition

<u>COM 2</u>	CE 3.1	Data A (-)
	CE 3.2	Data B (+)
	CE 3.3	Shield / Common

Communication Expansion Card PXMCE

<u>Port</u>	<u>Connection</u>	<u>Description</u>	<u>LED</u>
CE1	Ethernet Fiber ST RJ45 Ethernet	LAN/WAN	Uses LEDs on RJ45
CE2	Copper TX/RX - Bicolor	LAN/WAN	Bottom Link Yellow / Top
CE3	RS485	Com 2	TXD - Red / RXD - Green
CE4	RS232	Com 3	TXD - Red / RXD - Green

Communication Main Card PXMCM

<u>Port</u>	<u>Connection</u>	<u>Description</u>	<u>LED</u>
CM1	RJ45 10/100 T TX/RX - Bicolor	(Local Configuration)	Bottom Link Yellow / Top
CM3	Terminal Plug	COM1	TXD - Red / RXD - Green
CM4	Terminal Plug	Remote I/O Power	
CM5	Terminal Plug	Display Link COM 0	TXD - Red / RXD - Green
CM6	Terminal Plug	Display Power	

ETHERNET PORTS

CM1

<u>Specifications</u>	<u>Description</u>
Data Rate	100/10 Mbps
Supported Protocols connections	192.168.1.1 fixed IP addresses support five concurrent connections

10/100 Base T

Isolation	Transformer isolated Min. isolation voltage: 1,000 Vac 1 min.
Wire Type	Equal or exceed 5 UTP Category 5 unshielded twisted pair recommended cable. Max. length: 100 meters Use of STP cable will yield improved EMI performance
Connector Type	Male RJ45 modular, Grounded Metal Shield

Specifications, Con't.

CE1, CE2

<u>Specifications</u>	<u>Description</u>
Data Rate	100/10 Mbps
Supported Protocols	DHCP or fixed IP addresses and support five concurrent connections

10/100 Base T

Isolation	Transformer isolated
	Min. isolation voltage: 1,000 Vac 1min.
Wire Type	High quality 5 UTP Category 5 unshielded twisted pair recommended cable. Max. length: 100 meters Use of STP cable will yield improved EMI performance.
Connector Type	Male RJ45 modular, Grounded Metal Shield

100 Fx (ST)

Isolation	Optical
Cable Type	62.5/125 micron multimode fiber 50/125 micron multimode fiber Max. length: 1000 m
Connector Type	ST-type

Use Fiber Optic when distance and noise immunity leaving the gear is a concern.

RS-485

Com 0, Com 1, Com 2 **

<u>Specifications</u>	<u>Description</u>
Baud Rates	9600 - 115.2K
Duplex	Half
Supported Protocols	Modbus gateway to other meters or a Modbus slave on a sub-network.

***Field circuit common is clamped to ground with TVS diode.**

Specifications, Con't.

Isolation	Optical isolation from all other inputs *and outputs, 240 Vac / 1 min.
Cable Type	Shielded Twisted Pair, 22 AWG
Max. Cable Length	4,000 feet
Twisted Pair Sensitivity	Connect like data terminals
Star	No
Tap	No
End of Line Termination	100 - 120 ohms (match impedance of cable)
Max. number of devices	32 (The Display supports 16)

RS-232

Com 3

<u>Specifications</u>	<u>Description</u>
Baud Rates	9600 - 115.2K
Duplex	Full
Supported Protocols	Modbus
Isolation	Optical isolation from all other inputs *and outputs, 240 Vac / 1 min.
Cable Type	Shielded Twisted Pair, 22 AWG
Max. Cable Length	50 feet, DTE 9 pin dsub

***Field circuit common is clamped to ground with TVS diode at 300V.**



Powering Business Worldwide

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