PMC-630 Series

Advanced Multifunction Meter

User Manual

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Ceiec Electric Technology

The information contained in this Manual is believed to be accurate at the time of publication; however, CET assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice. Please consult CET or your local representative for latest product specifications.

Standards Compliance

CE

DANGER

This symbol indicates the presence of danger that may result in severe injury or death and permanent equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

CAUTION

This symbol indicates the potential of personal injury or equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

DANGER

Failure to observe the following instructions may result in severe injury or death and/or equipment damage.

- Installation, operation and maintenance of the meter should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.
- Ensure that all incoming AC power and other power sources are turned OFF before performing any work on the meter.
- Before connecting the meter to the power source, check the label on top of the meter to ensure that it is equipped with the appropriate power supply, and the correct voltage and current input specifications for your application.
- During normal operation of the meter, hazardous voltages are present on its terminal strips and throughout the connected potential transformers (PT) and current transformers (CT). PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuits energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries, …etc).
- Do not use the meter for primary protection functions where failure of the device can cause fire, injury or death. The meter should only be used for shadow protection if needed.
- Under no circumstances should the meter be connected to a power source if it is damaged.
- To prevent potential fire or shock hazard, do not expose the meter to rain or moisture.
- Setup procedures must be performed only by qualified personnel familiar with the instrument and its associated electrical equipment.
- DO NOT open the instrument under any circumstances.

Limited warranty

- Ceiec Electric Technology (CET) offers the customer a minimum of 12-month functional warranty on the meter for faulty parts or workmanship from the date of dispatch from the distributor. This warranty is on a return to factory for repair basis.
- CET does not accept liability for any damage caused by meter malfunctions. CET accepts no responsibility for the suitability of the meter to the application for which it was purchased.
- Failure to install, set up or operate the meter according to the instructions herein will void the warranty.
- Only CET's duly authorized representative may open your meter. The unit should only be opened in a fully anti-static environment. Failure to do so may damage the electronic components and will void the warranty.

Table of Contents

Chapter 1 Introduction

This manual explains how to use the PMC-630 Series Advanced Multifunction Meter. Throughout the manual the term "meter" generally refers to all models. Differences between models are indicated with the appropriate model number.

This chapter provides an overview of the PMC-630 series meter and summarizes many of its key features.

1.1 Overview

The PMC-630 Series Advanced Multifunction Meter is CET's latest offer for the low, medium and high voltage power/energy metering market. Housed in an industry-standard DIN form factor measuring 96mmx96mmx125mm, the PMC-630 is perfectly suited for utility, industrial or commercial applications. The meter features quality construction with metal enclosure, multifunction and high-accuracy measurements, transient detection and waveform recording capabilities, extensive I/O and communication configurations, and an easy-to-read, back-lit LCD display, capable of displaying 3-phase measurements at once. The meter comes standard with six Digital Inputs for status monitoring and two Digital Outputs for control or alarming applications. Further, the PMC-630 optionally provides two additional Digital Outputs, an I residual Input or an Analog Input, and an Analog Output. The standard SOE Log records all setup changes, DI and Setpoint status changes, and DO operations in 1ms resolution. With the standard RS485 port and Modbus protocol support, the PMC-630 becomes a vital component of an intelligent, multifunction monitoring solution for any Power and Energy Management systems.

You can setup the meter through its front panel or via our free PMC Setup software. The meter is also supported by our PecStar® iEMS Integrated Energy Management System.

The PMC-630 is available in three models: PMC-630A, PMC-630B and PMC-630C. Following is a list of typical applications for the PMC-630:

- Analog meter replacement
- Low, medium and high voltage applications
- Industrial and commercial metering
- Substation, building and factory automation
- I residual monitoring
- Extensive logging capability with 2MB on-board memory
- Power quality monitoring and waveform recording

The above are just a few of the many applications. Contact CET Technical Support should you require further assistance with your application.

1.2 Features

Ease of use

- Large, backlit, easy to read LCD display with wide viewing angle
- Password-protected setup via front panel or free PMC Setup software
- Easy installation with mounting slide bar, no tools required

Basic Measurements

- 3-phase voltage, current , I4, frequency and power measurements
- Bi-directional energy measurements
- TOU metering that can accommodate 4 tariff rates, 6 seasons and 1 daily profile with 10 periods

Power Quality

- Voltage and Current Unbalance
- THD, TOHD, TEHD and K-Factor
- Individual harmonics up to 31st on-board
- WF Capture at 128 samples/cycle for harmonics analysis up to 63rd
- WF Recording of all Voltage and Current inputs at 16 samples/cycle for 12 cycles with 3 pre-fault cycles
- I residual ALARM and TRIP protection functions

Sliding Window Demands

- 3-phase voltage, current, power, PF, Frequency, V and I Unbalance, and THD
- Max/Min values per demand interval
- Peak Demands for This Month and Last Month

SOE Log

- 64 events time-stamped to ±1ms resolution
- Setup changes, Setpoint events and I/O operations

Max/Min Log

- Voltage, Current, Frequency, kW, kvar, kVA, Power Factor, Unbalance, VTHD and ITHD of This Month and Last Month

Data Recorders

- 16 Data Recorder Logs of 16 parameters each for real-time measurements, harmonics, interval energy, demand, ….etc
- Recording interval from 1s to 40 days
- Configurable depths and recording offsets
- 2MB log memory

Setpoints

- 9 user programmable setpoints with extensive list of monitoring parameters
- Configurable thresholds and time delays
- WF Recording, Data Recorder and DO trigger
- Transient Voltage and Current setpoints

Digital Inputs

- 6 channels, volts free dry contact, 24VDC internally wetted
- External status monitoring with programmable debounce
- Pulse counting with programmable weight for each channel for collecting WAGES information
- 1000Hz sampling

Digital Outputs

- Up to a maximum of 4 channels
- Form A Mechanical relays – 2 or 4 channels
    - DO1 is reserved for I residual ALARM if present AND enabled
    - DO2 is reserved for I residual TRIP if present AND enabled

    - DO3 and DO4 are available for general purpose control
- Form A SS relays – 2 optional channels for energy pulsing applications
    - DO3 is reserved for kWh pulsing
    - DO4 is reserved for kvarh pulsing

I residual Input (Optional)

- Requires an optional, external Zero Sequence CT (1A nominal)
- Two levels of alarm – ALARM and TRIP. Each alarm level:
    - Can be enabled individually
    - Has its own programmable threshold and time delay
    - Log an SOE event AND trigger a dedicated DO when activated

Analog Input (Optional)

- 0-20 / 4-20mA DC input
- Can be used to measure external transducer signal
- Programmable zero and full scales

Analog Output (Optional)

- 0-20 / 4-20mA DC output
- Can be “keyed” to any measured quantity
- Programmable zero and full scales

Communications

Port 1 (standard) and Port 2 (optional)

- Optically isolated RS485 port
- Baud rate from 1200 to 19200bps
- Modbus RTU protocol

Profibus (optional)

- Auto baud from 9600 bps to 12 Mbps
- Profibus-DP protocol

Real-time clock

- 6ppm battery-backed real-time clock (<0.5s per day)

System Integration

- Supported by our PecStar® iEMS and iPQMS
- Easy integration into other Automation or SCADA systems via Modbus RTU and Profibus-DP protocol

Models and Measurements

Features and Options	PMC-630 Models		
Power and Energy	**A**	**B**	**C**
VLN and VLL per phase and Avg	▪	▪	▪
Current per phase and Avg, I4	▪	▪	▪
Voltage and Current phase angles	▪	▪	▪
kW, kvar, kVA per phase and Total	▪	▪	▪
PF per phase and Total	▪	▪	▪
Frequency	▪	▪	▪
kWh, kvarh Imp/Exp/Total/Net	▪	▪	▪
kVAh Total	▪	▪	▪
V/I/kW/kvar/kVA/PF/FREQ/Unblance/THD Demands	▪	▪	▪
Peak Demands for This/Last Month	▪	▪	▪
kWh & kvarh LED Pulse Outputs	▪	▪	▪
TOU, Setpoint and Logging			
Setpoint (9)	▪	▪	▪
Max/Min Log	▪	▪	▪
SOE Log (64)	▪	▪	▪
TOU		▪	▪
Data Recorder Log (16)		▪	▪
Log memory		2MB	2MB
Power Quality			
V and I Unbalance	▪	▪	▪
THD, THOD, THED, K-Factor	▪	▪	▪
Individual Harmonics (2^{nd} to 31^{st})	▪	▪	▪
WF Capture			▪
WF Recording Log			▪
I residual ALARM and TRIP			
I residual^	1*	1*	1*
Inputs and Outputs			
DI	6	6	6
DO (Mechanical)	2 / 4*	2 / 4*	2 / 4*
DO (Solid State)	2*	2*	2*
AI^ (0-20 / 4-20mA)	1*	1*	1*
AO (0-20 / 4-20mA)	1*	1*	1*
Communications			
Modbus RTU	▪	▪	▪
RS485 Port	1 / 2*	1 / 2*	1 / 2*
Profibus Port	1#	N.A.	N.A.

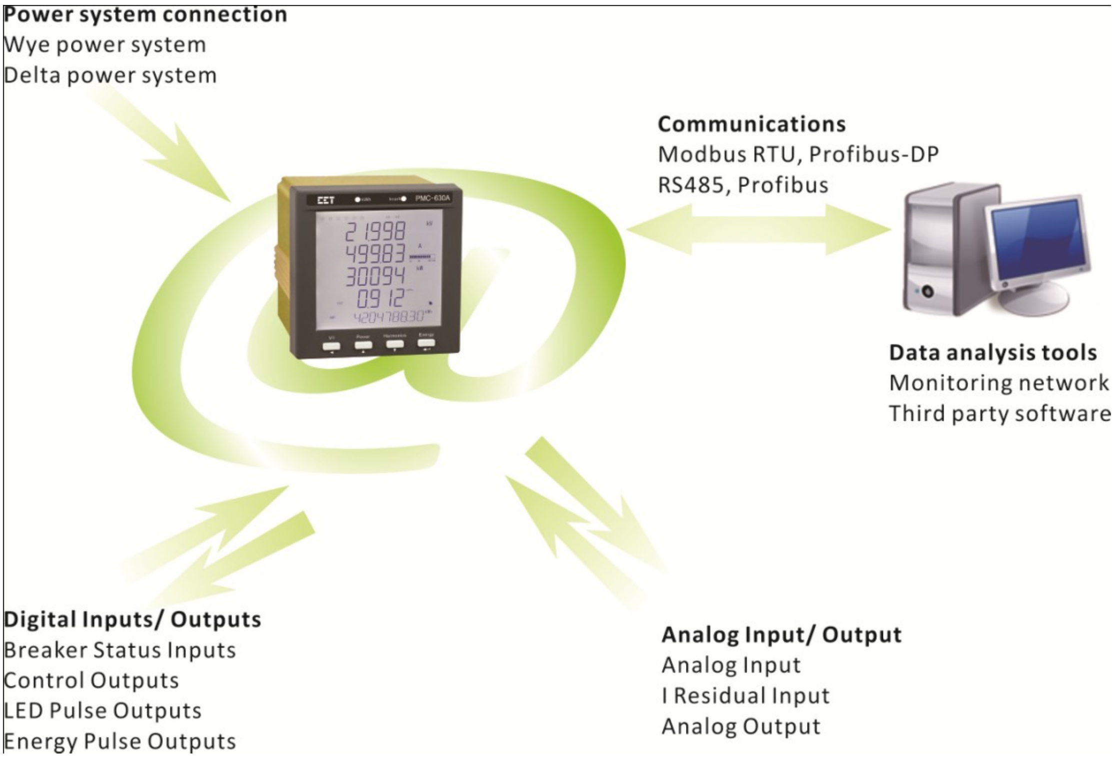
▪ Standard * Optional

^ I residual and AI options are mutually exclusive

Profibus option excludes all other Comm. Options

1.3 PMC-630 series' application in Power and Energy Management Systems

The PMC-630 can be used to monitor Wye or Delta connected power system. Modbus/Profibus communications allow real-time data, events, DI/DO status, Data Logs, Waveform and other information to be transmitted to an Integrated Energy Management system such as PecStar® iEMS.



1.4 Getting more information

Additional information is available from CET via the following sources:

- Visit www.ceiec-electric.com
- Contact your local representative
- Contact CET directly via email or telephone

Chapter 2 Installation

Caution

Installation of the PMC-630 should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

During the operation of the meter, hazardous voltages are present at the input terminals. Failure to observe precautions can result in serious or even fatal injury and equipment damage.

2.1 Appearance

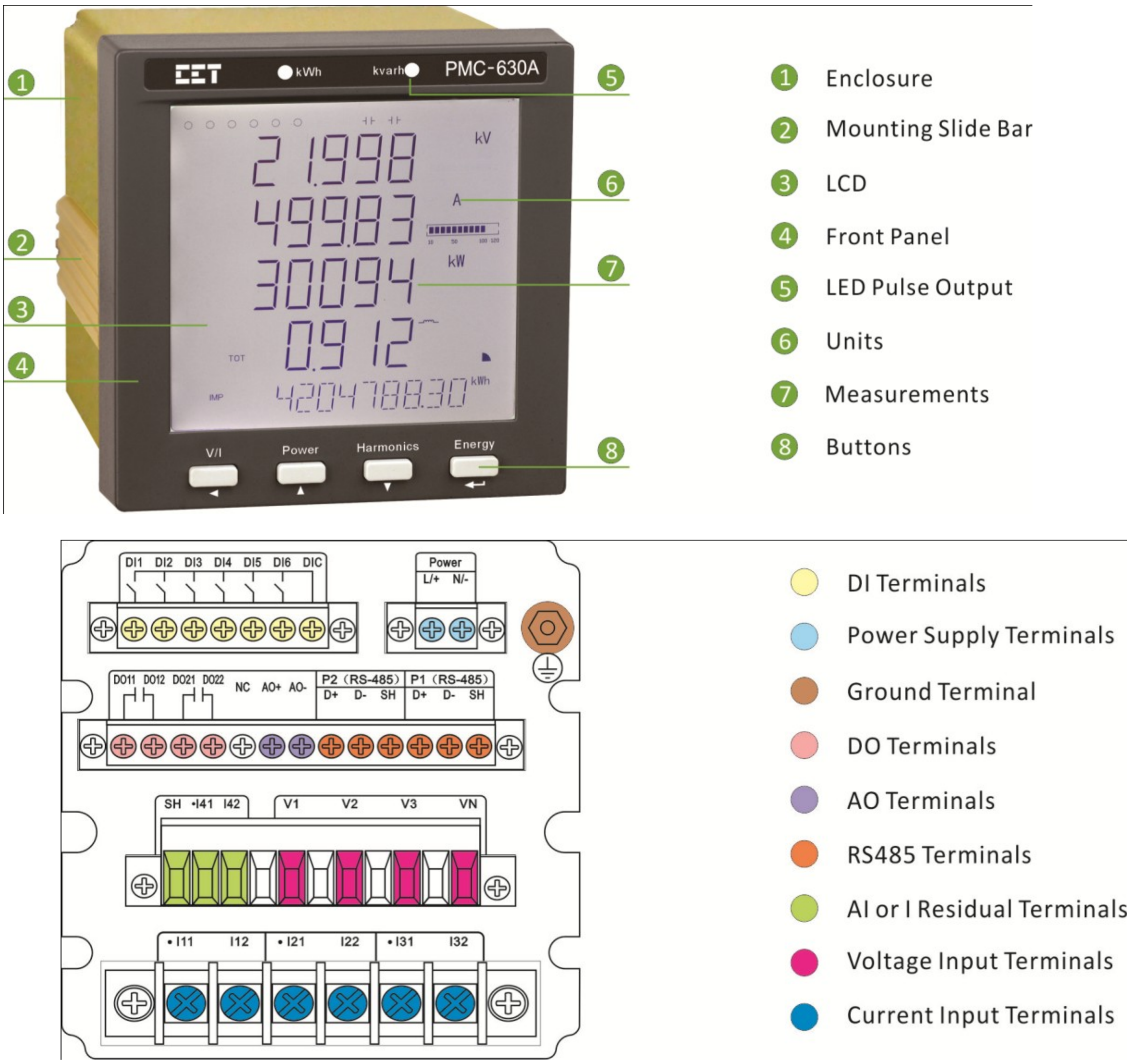


Figure 2-1 Appearance

2.2 Unit Dimensions

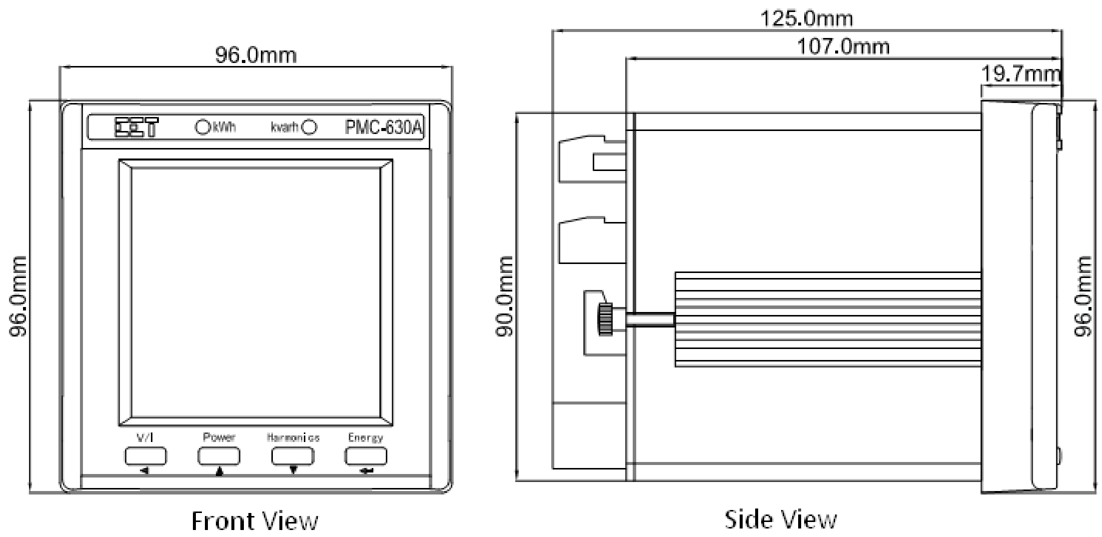


Figure 2-2 Dimensions

2.3 Mounting

The PMC-630 series meter should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise sources.

Installation steps:

- Remove the mounting slide bars from the meter
- Fit the meter through a 92mmx92mm cutout as shown in Figure 2-3
- Re-install the mounting slide bars and tighten the screws against the panel to secure the meter

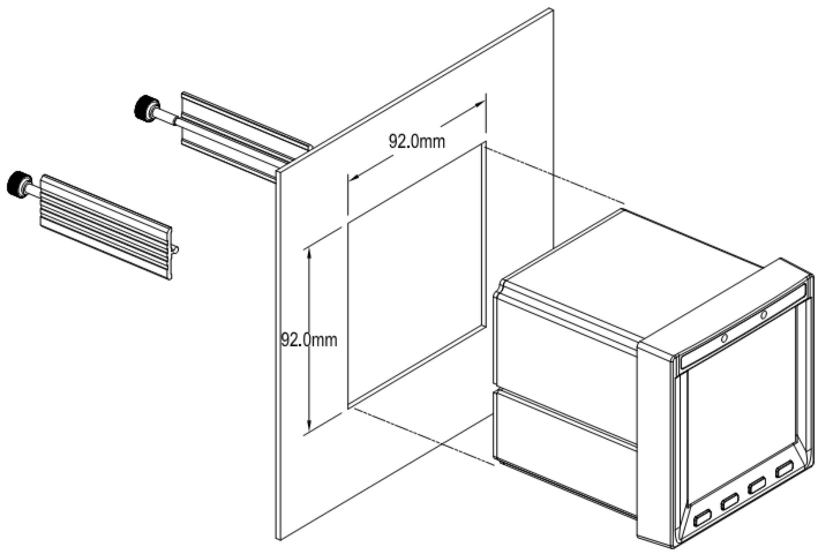


Figure 2-3 Panel Cutout

2.4 Wiring Connections

PMC-630 can satisfy almost any three phase power systems. Please read this section carefully before installation and choose the correct wiring method for your power system. The following wiring modes are supported:

- 3-phase 4-wire Wye Direct Connection
- 3-phase 4-wire Wye with 3PTs and 3CTs
- 3-phase 3-wire Grounded Wye Direct Connection
- 3-phase 3-wire Grounded Wye with 3PTs and 3CTs
- 3-phase 3-wire Open Delta Direct Connection
- 3-phase 3-wire Open Delta with 2PTs and 3CTs
- 3-phase 3-wire Open Delta with 2PTs and 2CTs

Caution

Under no circumstances should the PT secondary be shorted.

Under no circumstances should the CT secondary be open when the CT primary is energized. CT shorting blocks should be installed to allow for easy maintenance.

2.4.1 3-phase 4-wire Wye Direct Connection

Please consult the serial number label to ensure that the system phase voltage is less than or equal to the meter's voltage input specification.

Set the Wiring Mode to Wye.

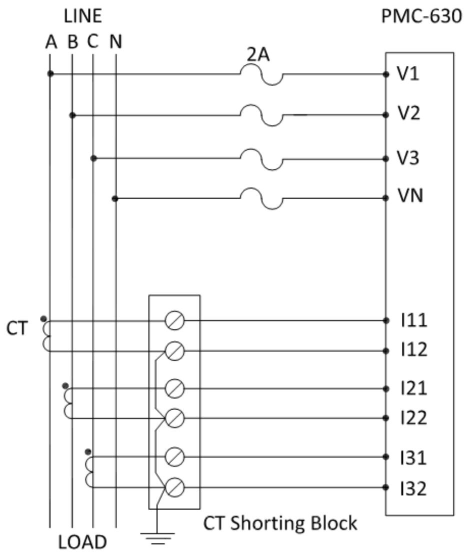


Figure 2-4 4-Wire Wye, Direct Connection

2.4.2 3-phase 4-wire Wye with 3PTs and 3CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter’s voltage input specification.

Set the Wiring Mode to Wye.

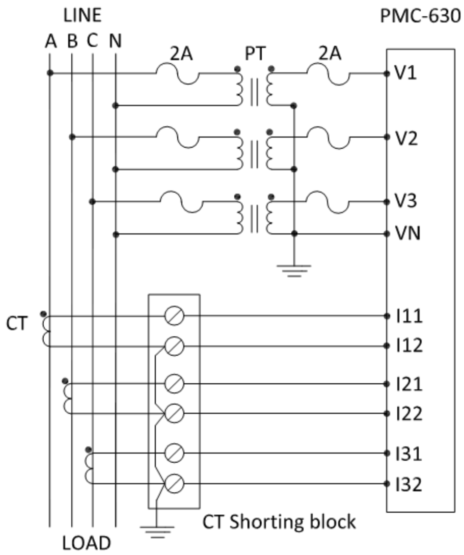


Figure 2-5 4-Wire Wye, 3PTs, 3CTs

2.4.3 3-phase 3-wire Grounded Wye Direct Connection

Please consult the serial number label to ensure that the system phase voltage is less than or equal to the meter’s voltage input specification.

Set the Wiring Mode to Wye.

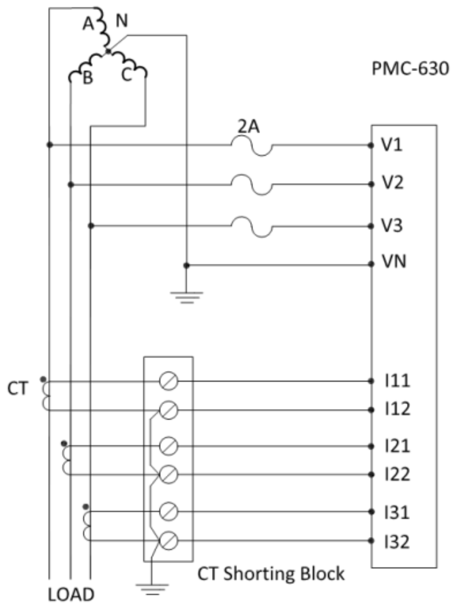


Figure 2-6 3-Wire Grounded Wye, Direct Connection

2.4.4 3-phase 3-wire Grounded Wye with 3PTs and 3CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification.

Set the Wiring Mode to Wye.

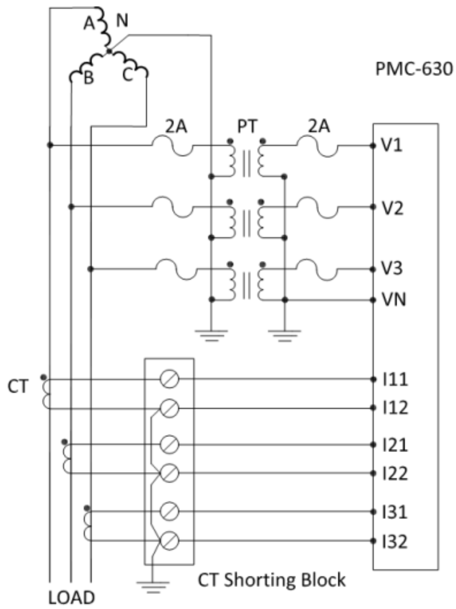


Figure 2-7 3-Wire Grounded Wye, 3PTs, 3CTs

2.4.5 3-phase 3-wire Open Delta Direct Connection

Please consult the serial number label to ensure that the system line voltage is less than or equal to the meter's voltage input specification.

Set the Wiring Mode to Delta.

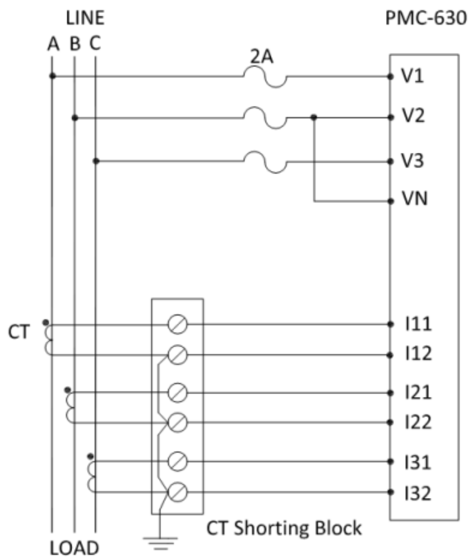


Figure 2-8 3-Wire Delta, no PTs, 3CTs

2.4.6 3-phase 3-wire Open Delta with 2PTs and 3CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification.

Set the Wiring Mode to Delta.

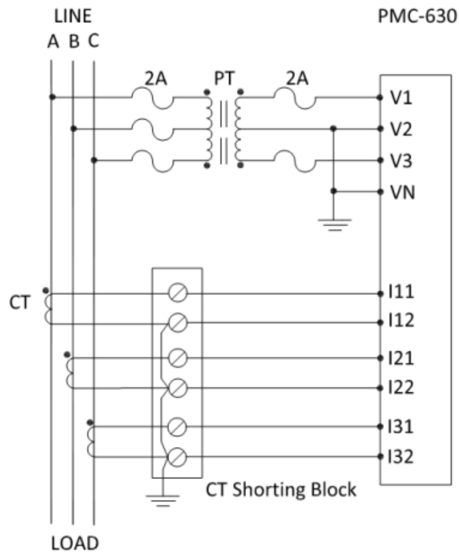


Figure 2-9 3-Wire Delta, 2PTs, 3CTs

2.4.7 3-phase 3-wire Open Delta with 2PTs and 2CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification.

Set the Wiring Mode to Delta.

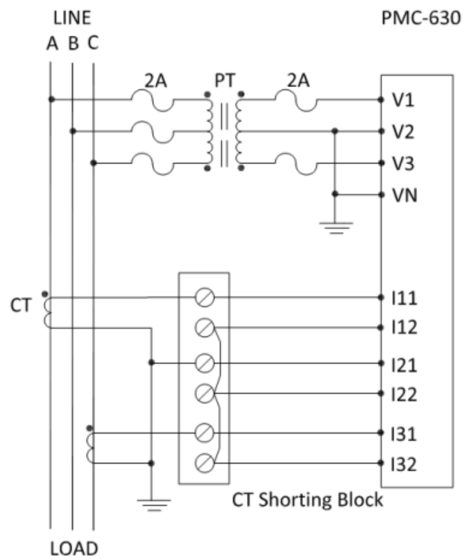


Figure 2-10 3-Wire Delta, 2PTs, 2CTs

2.5 Communications Wiring

2.5.1 RS485 Port

The PMC-630 provides up to two RS485 ports and supports the Modbus RTU protocol. Up to 32 devices can be connected on a RS485 bus. The overall length of the RS485 cable connecting all devices should not exceed 1200m.

If the master station does not have a RS485 communications port, a RS232/RS485 or USB/RS485 converter with optically isolated outputs and surge protection should be used.

The following figure illustrates the RS485 communications connections on the PMC-630:

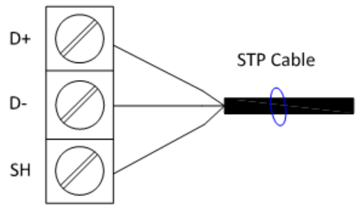


Figure 2-11 RS485 Communications Connections

2.5.2 Profibus Port

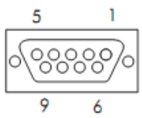


Figure 2-12 Profibus Connector

Pin	Meaning
3	Transmit Data+/ Receive Data+
5	Digital GND
8	Transmit Data-/ Receive Data-

Table 2-1 Profibus Connector Pin Function

2.6 Digital Input Wiring

The following figure illustrates the Digital Input connections on the PMC-630:

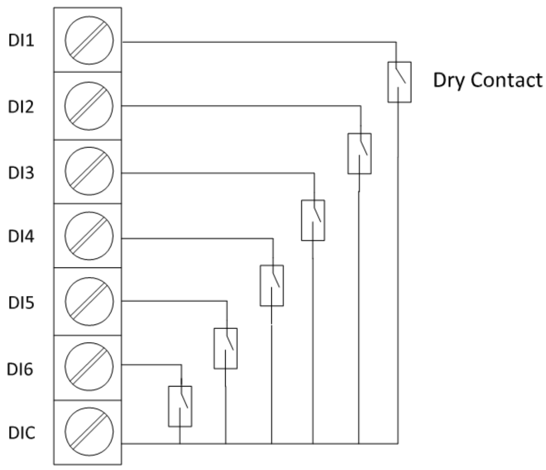


Figure 2-13 DI Connections

2.7 Digital Output Wiring

The following figure illustrates the Digital Output connections on the PMC-630:

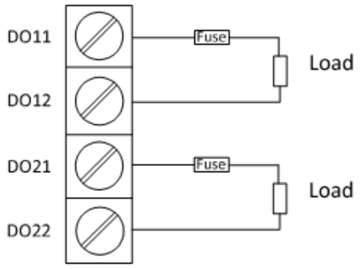


Figure 2-14 DO Connections

2.8 Pulse Output Wiring

The following figure illustrates the Pulse Output connections on the PMC-630:

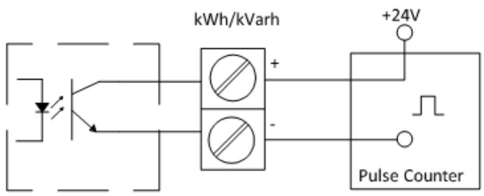


Figure 2-15 Pulse Output Connections

2.9 I residual Wiring

The following figure illustrates the I residual connections on the PMC-630:

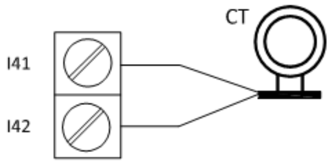


Figure 2-16 I residual Connections

2.10 Analog Input Wiring

The following figure illustrates the Analog Input connections on the PMC-630:

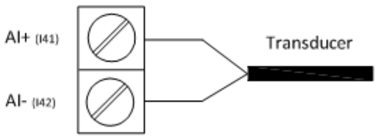


Figure 2-17 AI Connections

2.11 Analog Output Wiring

The following figure illustrates the Analog Output connections on the PMC-630:

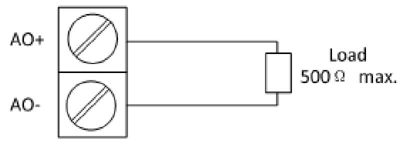


Figure 2-18 AO Connections

2.12 Power supply Wiring

For AC supply, connect the live wire to the L/+ terminal and the neutral wire to the N/- terminal. For DC supply, connect the positive wire to the L/+ terminal and the negative wire to the N/- terminal.

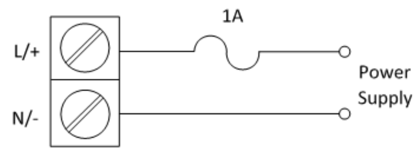


Figure 2-19 Power Supply Connections

2.13 Chassis Ground Wiring

Connect the G terminal to earth ground.

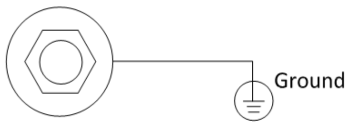


Figure 2-20 Chassis Ground Connection

Chapter 3 Front Panel

The PMC-630 has a large, easy to read LCD display with backlight and four buttons for data display and meter configuration. This chapter introduces the front panel operations.

Figure 3-1 Front Panel

a	DI Status
b	LED Pulse Output
c	DO Status
d	Measurements
e	Measurement Unit
f	P.F. Quadrant Indicator
g	Energy Data

Table 3-1 Front Panel display

3.1 Display Screen Types

The front panel provides two display modes: Data Display and Setup Configuration. There are four buttons on the front panel: **<V/I>**, **<Power>**, **<Harmonics>** and **<Energy>**. Use these buttons to view metering data and configure setup parameters.

3.1.1 LCD Testing

Pressing both the <**Power>** and the <**Harmonics>** buttons simultaneously for 2 seconds enters the LCD Testing mode. During testing, all LCD segments are illuminated for 5 seconds and then turned off for 1 second. This cycle will repeat 3 times to allow for the detection of faulty segments. The LCD will return to its normal Data Display mode afterwards.

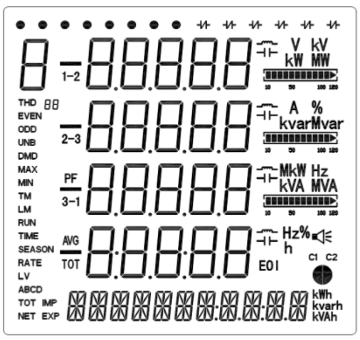


Figure 3-2 PMC-630 Full Display

3.1.2 LCD Display Areas

This section provides a description of the LCD display areas. The PMC-630 LCD display can generally be divided into 5 areas:

A: Displays symbols for parameters such as Voltage, Current, Fundamental, Power, THD, TOHD, TEHD, 2nd to 31st Individual Harmonics, K-Factor, Unbalance, PF, Voltage Phase Angle, Current Phase Angle and Demand etc.

B: Displays the indicators for DI status and DO status

C: Displays Measurement Units and PF Quadrant status

D: Displays Measurement values

E: Displays energy information such as kWh/kvarh Imp/Exp/Net/Total, kWh/kvarh of Tariff A/B/C/D period, and kVAh

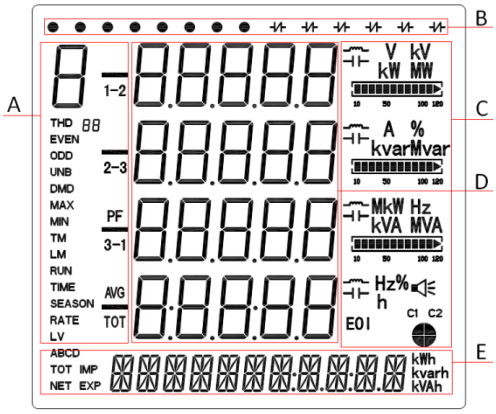


Figure 3-3 LCD Display

The following table shows the special LCD display symbols:

Area	Label	Description			
A	8	U Voltage	I Current	P kW	q kvar
		5 kVA	d Fundamental	t K-Factor	F Frequency
	1-2 88 2-3 PF 3-1 AVG TOT	1 2 3 Line-to-Neutral	1-2 2-3 3-1 Line to Line	PF Power Factor	AVG Average
		TOT Total	— Negative Symbol	PA Phase Angle	

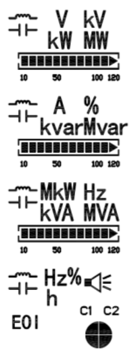
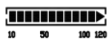
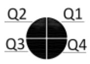
	THD 88 EVEN ODD UNB DMD MAX MIN TM LM RUN TIME SEASON RATE LV	THD THD	THD EVEN TEHD	THD ODD TOHD	HD 2 to THD 31 2nd to 31st Harmonics
		UNB Unbalance	DMD Demand	MAX Maximum	MIN Minimum
		TM This Month	LM Last Month	RUN TIME SEASON RATE LV Reserved	
B	● ⊣/⊢	○ DI Open	● DI Close	⊣⊢ DO Open	⊣/⊢ DO Close
C		V kV A % Hz Units for voltage, current , %Harmonics Distortion and frequency		kW MW kvarMvar kVA MVA Units for Real, Reactive and Apparent Power	
		 %Loading	⊣⊢ Inductive Load Capacitive Load	C1 C2 COM 1 Port Status COM 2 Port Status	Alarm Symbol
		 PF Quadrant – Q1/Q2/Q3/Q4			h E01 Reserved
E		IMP kWh kWh Import	EXP kWh kWh Export	NET kWh kWh Net	TOT kWh kWh Total
		IMP kvarh kvarh Import	EXP kvarh kvarh Export	NET kvarh kvarh Net	TOT kvarh kvarh Total
		kVAh kVAh Energy	ABCD Tariff A/B/C/D		

Table 3-2 LCD Display Symbols

3.1.3 Peak Demand Display

The following special arrangements have been made for the display of Peak Demand and its timestamp with the appropriate unit displayed in the Measurement Unit area.

a: Peak Demand Indicator – Peak Demand of This/Last Month:

b: Peak Demand value

c: Date portion of the Peak Demand timestamp

d: Time portion of the Peak Demand timestamp

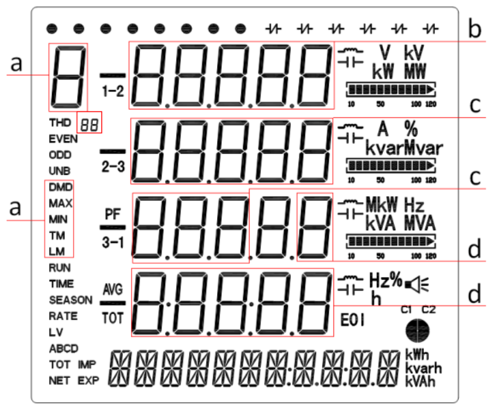


Figure 3-4 Peak Demand Display

Area	Symbol Description			
a	Ia	Ib	Ic	
	kW	kvar	kVA	
	DMD Demand	MAX Maximum	TM This Month	LM Last Month
b	Peak Demand Value			
c	Peak Demand Timestamp (Date Portion) - YYYY.MM.DD			
d	Peak Demand Timestamp (Time Portion) – HH:MM:SS			

Table 3-3 Peak Demand Display

3.1.4 Data Display

The following table illustrates the display screens for the different PMC-630 models.

Press Button	Display screens	First row	Second row	Third row	Fourth row
<V,I>	Display 1	VLL average	I average	∑kW	∑P.F.
	Display 2[1]	Va	Vb	Vc	VLN average
	Display 3	Vab	Vbc	Vca	VLL average
	Display 4	Ia	Ib	Ic	I average
	Display 5		I4		
	Display 6			Frequency	
	Display 7		V Unbalance		
	Display 8		I Unbalance		
	Display 9		AI		
	Display 10	Va Angle	Vb Angle	Vc Angle	

	Display 11	Ia Angle	Ib Angle	Ic Angle	
	Display 12	Ia Demand	Ib Demand	Ic Demand	
	Display 13	Ia Peak Demand of This Month	YYYY.MM.DD HH:MM:SS		
	Display 14	Ib Peak Demand of This Month	YYYY.MM.DD HH:MM:SS		
	Display 15	Ic Peak Demand of This Month	YYYY.MM.DD HH:MM:SS		
	Display 16	Ia Peak Demand of Last Month	YYYY.MM.DD HH:MM:SS		
	Display 17	Ib Peak Demand of Last Month	YYYY.MM.DD HH:MM:SS		
	Display 18	Ic Peak Demand of Last Month	YYYY.MM.DD HH:MM:SS		
<Power>	Display 1[1]	kWa	kWb	kWc	∑kW
	Display 2[1]	kvara	kvarb	kvarc	∑kvar
	Display 3[1]	kVAa	kVAb	kVAc	∑kVA
	Display 4[1]	P.F.a	P.F.b	P.F.c	∑P.F.
	Display 5[1]	dP.F.a	dP.F.b	dP.F.c	d∑P.F.
	Display 6	∑kW	∑kvar	∑kVA	∑P.F.
	Display 7	∑kW Demand	∑kvar Demand	∑kVA Demand	
	Display 8	kW Peak Demand of This Month	YYYY.MM.DD HH:MM:SS		
	Display 9	kvar Peak Demand of This Month	YYYY.MM.DD HH:MM:SS		
	Display 10	kVA Peak Demand of This Month	YYYY.MM.DD HH:MM:SS		
	Display 11	kW Peak Demand of Last Month	YYYY.MM.DD HH:MM:SS		
	Display 12	kvar Peak Demand of Last Month	YYYY.MM.DD HH:MM:SS		
	Display 13	kVA Peak Demand of Last Month	YYYY.MM.DD HH:MM:SS		
<Harmonics>	Display 1	Va THD	Vb THD	Vc THD	VLN avg. THD
	Display 2	Ia THD	Ib THD	Ic THD	I avg. THD
	Display 3	Ia K-Factor	Ib K-Factor	Ic K-Factor	
	Display 4	Va TEHD	Vb TEHD	Vc TEHD	VLN avg. TEHD
	Display 5	Ia TEHD	Ib TEHD	Ic TEHD	I avg. TEHD
	Display 6	Va TOHD	Vb TOHD	Vc TOHD	VLN avg. TOHD
	Display 7	Ia TOHD	Ib TOHD	Ic TOHD	I avg. TOHD
	Display 8	Va 2^{nd} Harmonic	Vb 2^{nd} Harmonic	Vc 2^{nd} Harmonic	VLN avg. 2^{nd} Harmonic
	Display 9	Ia 2^{nd} Harmonic	Ib 2^{nd} Harmonic	Ic 2^{nd} Harmonic	I avg. 2^{nd} Harmonic
			......		
	Display 66	Va 31^{st} Harmonic	Vb 31^{st} Harmonic	Vc 31^{st} Harmonic	VLN avg. 31^{st} Harmonic

	Display 67	Ia 31st Harmonic	Ib 31st Harmonic	Ic 31st Harmonic	I avg. 31st Harmonic
<Energy>	Display 1	kWh Import			
	Display 2	kWh Export			
	Display 3	kWh Net			
	Display 4	kWh Total			
	Display 5	kvarh Import			
	Display 6	kvarh Export			
	Display 7	kvarh Net			
	Display 8	kvarh Total			
	Display 9	kVAh			
	Display 10 (Model B, C only)	kWh Import of Tariff A period			
	Display 11 (Model B, C only)	kWh Export of Tariff A period			
	Display 12 (Model B, C only)	kWh Import of Tariff B period			
	Display 13 (Model B, C only)	kWh Export of Tariff B period			
	Display 14 (Model B, C only)	kWh Import of Tariff C period			
	Display 15 (Model B, C only)	kWh Export of Tariff C period			
	Display 16 (Model B, C only)	kWh Import of Tariff D period			
	Display 17 (Model B, C only)	kWh Export of Tariff D period			
	Display 18 (Model B, C only)	kvarh Import of Tariff A period			
	Display 19 (Model B, C only)	kvarh Export of Tariff A period			
	Display 20 (Model B, C only)	kvarh Import of Tariff B period			
	Display 21 (Model B, C only)	kvarh Export of Tariff B period			
	Display 22 (Model B, C only)	kvarh Import of Tariff C period			
	Display 23 (Model B, C only)	kvarh Export of Tariff C period			
	Display 24 (Model B, C only)	kvarh Import of Tariff D period			
	Display 25 (Model B, C only)	kvarh Export of Tariff D period			

Table 3-4 PMC-630 Data Display Screens

Notes:

(1) When the wiring mode is Delta, the screens that display per phase line-to-neutral voltages, kWs, kvars, kVAs and PFs are bypassed and do not appear.

3.2 Setup Configuration via the Front Panel

Pressing the **<Energy>** button for more than 3 seconds enters the Setup Configuration mode where setup parameters can be changed. Upon completion, pressing the **<Energy>** button for more than 3 seconds returns to the Data Display mode.

3.2.1 Functions of buttons

The four front panel buttons take on different meanings in the Setup Configuration mode and are described below:

<Energy>: Pressing this button for more than three seconds toggles between Data Display mode and Setup Configuration mode. Once inside the Setup Configuration mode, pressing this button selects a parameter for modification. After changing the parameter, pressing this button again saves the new setting into memory.

<Power>: Before a parameter is selected for modification, pressing this button advances to the next parameter in the menu. If a parameter is already selected, pressing this button increments a numeric value or advances to the next value in the selection list.

<Harmonics>: Before a parameter is selected for modification, pressing this button goes back to the last parameter in the menu. If a parameter is already selected, pressing this button decrements a numeric value or goes back to the last value in the selection list.

<V/I>: Once a parameter is selected, pressing this button moves the cursor to the left by one position if the parameter being changed is a numeric value. Otherwise, this button is ignored.

Making setup changes:

- Press the **<Energy>** button for more than 3 seconds to access Setup Configuration mode.
- Press the **<Power>** button to advance to the Password page.
- A correct password must be entered before changes are allowed. The factory default password is zero. Press the **<Energy>** button to select the parameter for modification. Use the **<Power>**, **<Harmonics>** and **<V/I>** buttons to enter the correct password.

Selecting a parameter to change:

- Use the **<Power>** and **<Harmonics>** buttons to scroll to the desired parameter.
- Press the **<Energy>** button to select the parameter. Once selected, the parameter value will blink.

Changing and saving a parameter:

- Use the **<Power>**, **<Harmonics>** and **<V/I>** buttons to make modification to the selected parameter.
- After modification, press the **<Energy>** button to save the new value into memory.

Returning to the Data Display mode:

- Pressing the **<Energy>** button for more than three seconds to return to the default display screen.

3.2.2 Setup Menu

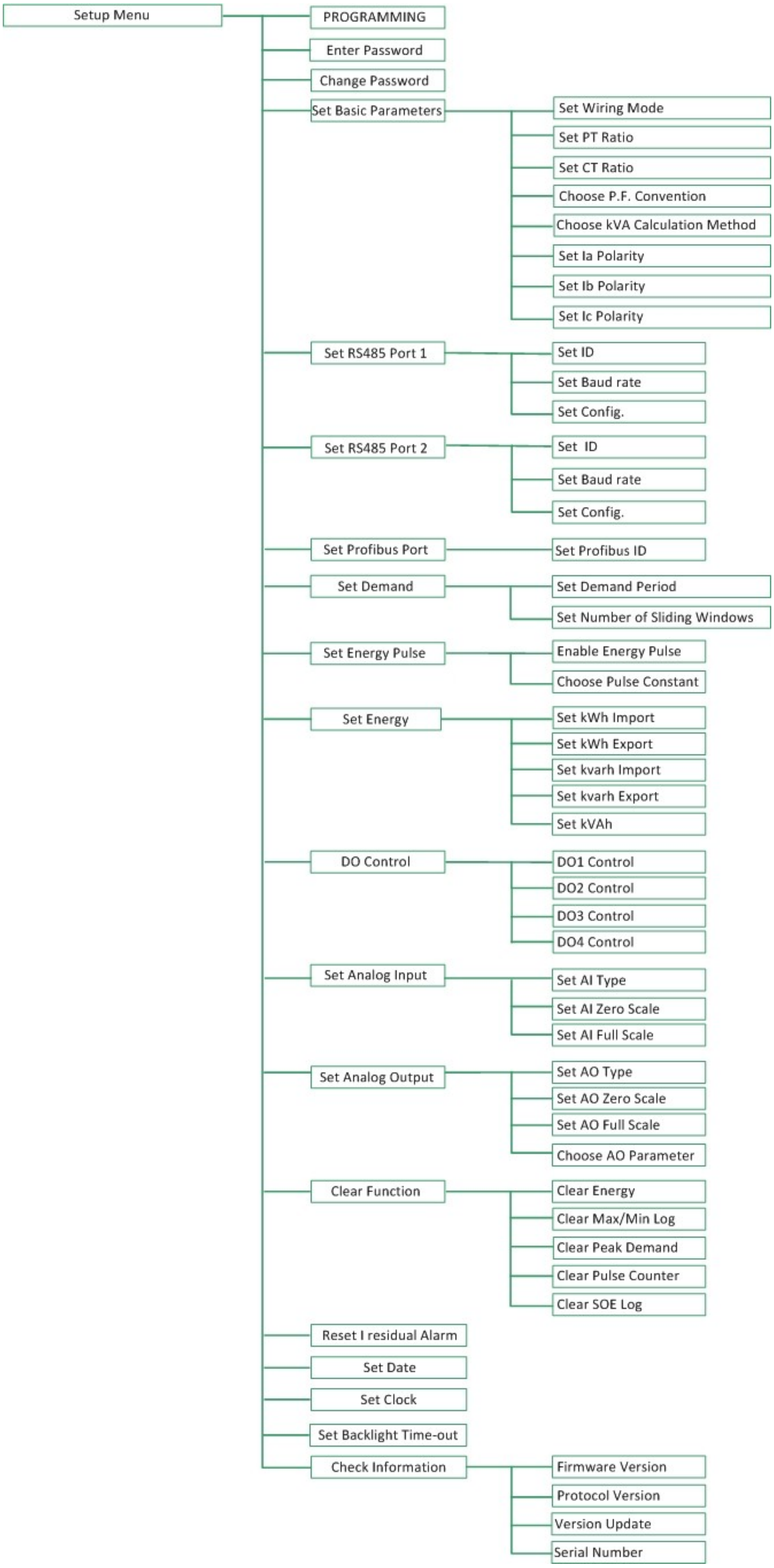


Figure 3-5 Setup Menu

3.2.3 Front Panel Setup Parameters

The Setup Configuration mode provides access to the following setup parameters:

Label menu 1st	Label menu 2nd	Parameters	Description	Options/Range	Default
PROGRAMMING			Setup Configuration mode	/	/
PASWORD		Password	Enter Password	/	"0"
PAS SET			Change Password?	YES/NO	NO
	New PAS	New Password	Change Password	0000 to 9999	"0"
SYS SET			Configure System Parameters?	YES/NO	NO
	TYPE	Wiring Mode	The Wiring Connection of the meter	WYE/DELTA/DEMO	WYE
	PT	PT Ratio[1]	PT Ratio	1 to 2200	1
	CT	CT Ratio[1]	CT Ratio	1 to 30,000 (1A) 1 to 6,000 (5A)	1
	PF SET	P.F. Convention[2]	P.F. Convention	IEC/IEEE/-IEEE	IEC
	KVA SET	kVA Calculation[3]	kVA Calculation Method	V/S	V
	I1 REV	Phase A CT	Reverse Phase A CT Polarity	YES/NO	NO
	I2 REV	Phase B CT	Reverse Phase B CT Polarity	YES/NO	NO
	I3 REV	Phase C CT	Reverse Phase C CT Polarity	YES/NO	NO
COM1 SET			Configure COM1 Parameters?	YES/NO	NO
	ID1	Port 1 Meter Address	Modbus Address	1-247	100
	BAUD1	Port 1 Baud rate	Data rate in bits per second	1200/2400/4800/ 9600/19200 bps	9600
	CONFIG1	Port 1 Configuration	Data Format	8N2/8O1/8E1/8N1/8O2/8E2	8E1
COM2 SET			Configure COM2 Parameters?	YES/NO	NO
	ID2	Port 2 Meter Address	Modbus Address	1-247	101
	BAUD2	Port 2 Baud rate	Data rate in bits per second	1200/2400/4800/ 9600/19200 bps	9600
	CONFIG2	Port 2 Configuration	Data Format	8N2/8O1/8E1/8N1/8O2/8E2	8E1
PROF SET			Configure Profibus Parameters?		
	ID	Profibus Meter Address	Profibus Address	1-125	100
DMD SET			Configure Demand Parameters?	YES/NO	NO

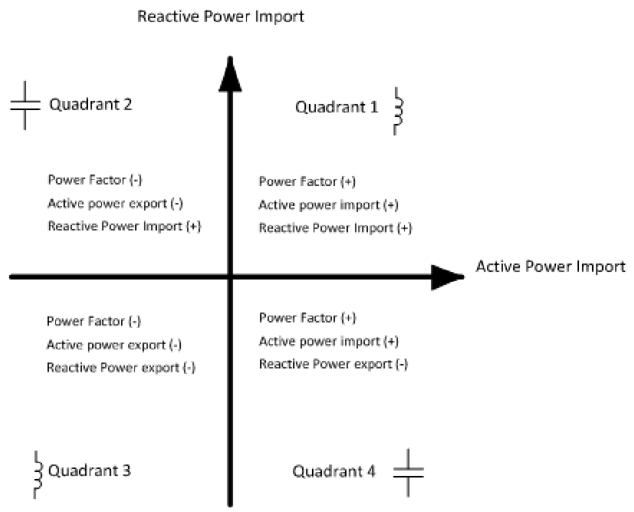
PERIOD	Sliding Window Interval	Sliding Window Interval	1/2/3/5/10/15/30/60 (minutes)	15
NUM	Number of Sliding Windows	Number of Sliding Windows	1-15	1
PULS SET		Configure Pulse Output?	YES/NO	NO
EN PULSE	Energy Pulse	Enable Energy Pulsing	YES/NO	NO
EN CONST[4]	Pulse Constant	Pulse Constant	1k/3.2k/5k/6.4k/12.8k	1k
ENGY SET	Energy Values	Preset Energy Values	YES/NO	NO
IMP kWh	kWh Import	Preset kWh Import Value	0 to 999,999,999	0
EXP kWh	kWh Export	Preset kWh Export value	0 to 999,999,999	0
IMP kvarh	kvarh Import	Preset kvarh Import Value	0 to 999,999,999	0
EXP kvarh	kvarh Export	Preset kvarh Export value	0 to 999,999,999	0
kVAh	kVAh	Preset kVAh Value	0 to 999,999,999	0
DO SET	DO Control	DO Control	YES/NO	NO
DO1	DO1 Control	DO1 Control	NORMAL/ON/OFF	NORMAL
DO2	DO2 Control	DO2 Control	NORMAL/ON/OFF	NORMAL
DO3	DO3 Control	DO1 Control	NORMAL/ON/OFF	NORMAL
DO4	DO4 Control	DO2 Control	NORMAL/ON/OFF	NORMAL
AI SET	Analog Input	Configure Analog Input	YES/NO	NO
TYPE	Analog Input Type	Select between 0-20mA or 4-20mA input	4-20 / 0-20	4-20
ZERO	Zero Scale	The value that corresponds to the minimum Analog Input of 0 mA or 4 mA	-999,999 to 999,999	400
FULL	Full Scale	The value that corresponds to the maximum Analog Input of 20 mA	-999,999 to 999,999	2000
SET AO	Analog Output	Configure Analog Output	YES/NO	NO
TYPE	Analog Output Type	Select between 0-20mA or 4-20mA output	4-20 / 0-20	4-20
ZERO	Zero Scale	The parameter value that corresponds to the minimum Analog Output of 0 mA or 4 mA	-999,999 to 999,999	0
FULL	Full scale	The parameter value that corresponds to the maximum Analog Output of 20 mA	-999,999 to 999,999	0
KEY[5]	Analog Output Parameter	The parameter to which the Analog Output is proportional	See Table 3-7 Analog Output Parameters	Vab
CLR SET		Clear Logs	YES/NO	NO
CLR ENGY	Clear Energy	Clear kWh, kvarh and kVAh	YES/NO	NO

CLR MXMN	Clear Max/Min	Clear Max/Min Logs of This Month	YES/NO	NO
CLR PDMD	Clear Demand	Clear Peak Demands of This Month	YES/NO	NO
CLR DIC	Clear Pulse Counter	Clear Pulse Counter	YES/NO	NO
CLR SOE	Clear SOE	Clear SOE Log	YES/NO	NO
RESET AI	Reset I residual Alarm	Reset I residual Alarm	YES/NO	NO
DAT	Date	Enter the Current Date	(20)YY-MM-DD	/
CLk	Time	Enter the Current Time	HH:MM:SS	/
BLTO SET	Backlight Time-out[6]	Set the backlight Time	0 to 60 (mins)	3
INFO	Information (Read Only)	Check meter information	YES/NO	NO
630A/B/C	Version	Firmware Version	For example, 630A 11000 means the meter is PMC-630A and the firmware version is V1.10.00.	/
PRO VER	Protocol Version	Protocol Version	e.g. 10 means V1.0	/
UPDAT	Update Date	Date of the latest firmware update	e.g. 090821	/
	Serial Number	Meter Serial Number	e.g. 0908471895	/

Table 3-5 Setup Parameters

Notes:

1) PT Ratio × CT Ratio × Rated Phase Voltage Input × Rated Current Input x $\sqrt{3}$ must be less than 790,000,000.
2) P.F. Convention: -IEEE is the same as IEEE but with the opposite sign.



IEC

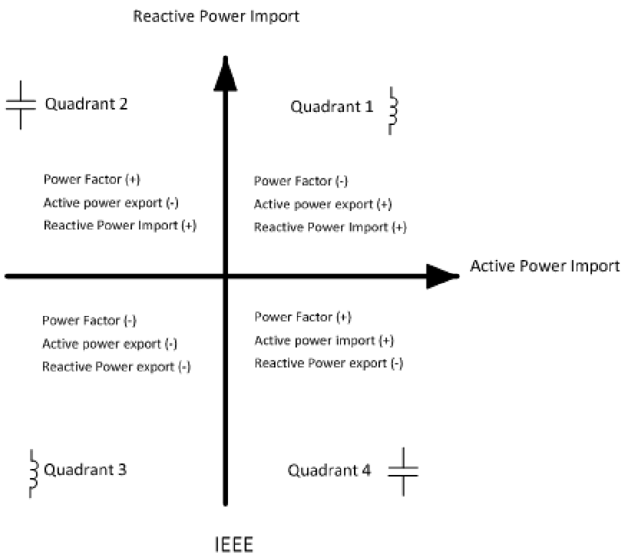


Figure 3-6 Power Factor Definitions

3) There are two ways to calculate kVA:

Mode V (Vector method**):** $kVA_{total} = \sqrt{kW_{total}^2 + kvar_{total}^2}$

Mode S (Scalar method**):** $kVA_{total} = kVA_a + kVA_b + kVA_c$

4) The EN CONST setup parameter is available in Firmware Version V2.00.xx or later. The PMC-630 provides the following pulse constants for different input ratings:

PMC-630 Configurations	Pulse Constant Options (imp/kWh, imp/kvarh)	Default
120VLL, 1A	1000/3200/5000/6400/12800	1000
120VLL, 5A	1000/3200/5000/6400/12800	1000
415VLL, 1A	1000/3200/5000/6400/12800	1000
415VLL, 5A	1000/3200	1000
690VLL, 1A	1000/3200/5000	1000
690VLL, 5A	1000	1000

Table 3-6 Pulse Constant

5) Analog Output Parameters

If **∑PF** is chosen as the AO parameter, the values for **ZERO** (zero scale) and **FULL** (full scale) should be set as 1000 times the actual value.

If **FREQ** is chosen as the AO parameter, the values for **ZERO** (zero scale) and **FULL** (full scale) should be set as 100 times the actual value.

The Units for voltage, current, kW, kvar, kVA and FREQ are V, A, kW, kvar, kVA and Hz, respectively.

Key	0	1	2	3	4	5	6	7
Parameter	Vab	Vbc	Vca	VLL avg	Ia	Ib	Ic	I avg
Key	8	9	10	11	12	13	14	15
Parameter	kWa	kWb	kWc	∑kW	kvara	kvarb	kvarc	∑kvar
Key	16	17	18	19	20	21		
Parameter	kVAa	kVAb	kVAc	∑kVA	∑PF	FREQ		

Table 3-7 Analog Output Parameters

6) The Backlight Time-out can be set from 0 to 60 minutes. If the value is 0, the backlight is always on. This setup parameter is available in Firmware Version V2.00.03 or later.

Chapter 4 Applications

4.1 Inputs and Outputs

4.1.1 Digital Inputs

The PMC-630 comes standard with six self-excited Digital Inputs that are internally wetted at 24 VDC.

Digital Inputs on the PMC-630 can be used in the following applications:

1) Digital Inputs are typically used for monitoring external status which can help prevent equipment damage, improve maintenance, and track security breaches. The real-time statuses of the Digital Inputs are available on the front panel LCD Display as well as through communications. Changes in Digital Input status are stored as events in the SOE Log in 1 ms resolution.

2) Digital Inputs can be used for pulse counting to collect WAGES (water, air, gas, electricity and steam) information. The DI Pulse Counter information is available via communications. Pulse Counters can be reset from the front panel or via communications.

   There are 3 setup parameters:
   DI Function: 0 = Digital Input; **1 = Pulse Counter**
   DI Debounce: Between 0 and 1000 (ms). The default value is 20 (ms).
   DI Pulse Weight: Between 1 and 1,000,000 (x0.001). The default value is 1 (0.001).

3) Digital Inputs provide setpoint capability which can trigger Digital Outputs as well as Waveform Recording upon becoming active. Please refer to Section 4.3.2 for a complete description of the Digital Input Setpoints.

4.1.2 Digital Outputs

The PMC-630 comes standard with two Form A Electromechanical Digital Outputs. Further, the PMC-630 can optionally be equipped with two additional Digital Outputs, which can be of either Electromechanical or Solid State type. Digital Outputs are normally used for setpoint alarming, load control, or remote control applications.

Digital Outputs on the PMC-630 can be used in the following applications:

Front Panel Control: Manually operated from the front panel. Please refer to the **DO CTRL** setup parameter in Section 3.2.3 for a detailed description.

Remote Control: Remotely operated over communications via our free PMC Setup software or the PecStar® iEMS.

Control Setpoint: Control Setpoints can be programmed to trigger DO, Waveform Recording or Data Recorder upon becoming active. Please refer to Section 4.3.1 for a detailed description.

Digital Input Setpoint: Digital Inputs can be programmed to trigger DO or Waveform Recording upon becoming active. Please refer to Section 4.3.2 for a detailed description.

I residual Setpoint: If the PMC-630 is equipped with the optional I residual input, the I residual ALARM and TRIP setpoints can be enabled to provide residual current monitoring and trigger DO actions in response to the I residual setpoints becoming active. Please refer to Section 4.3.3 for a detailed description.

Since there are so many ways to utilize the Digital Outputs on the PMC-630, a prioritized scheme has been developed to avoid conflicts between different applications. In general, Front Panel Control has the highest priority and can override any other applications. Next in the priority list is Remote Control. I residual Setpoints, Digital Input Setpoints and Control Setpoints share the same priority, meaning that they can all be programmed to control the same Digital Output. This scheme is equivalent to having an implicit Logical OR operation for the control of a Digital Output and may be useful in providing a generic alarm output signal. However, the sharing of a Digital Output is not recommended if the user intends to generate a control signal in response to a specific setpoint condition.

4.1.3 Energy Pulse Outputs

The PMC-630 comes standard with two front panel LED Pulse Outputs and can be equipped with two additional Solid State Digital Outputs for kWh and kvarh pulsing. Energy pulsing can be enabled from the front panel through the **EN PULSE** setup parameter. Energy Pulse Outputs are typically used for accuracy testing. The pulse constant can be configured as 1000/3200/5000/6400/12800 imp/kxh, and the pulse width is fixed at 80ms. If the PMC-630 is equipped with two Solid State Digital Outputs for pulsing applications, DO3 and DO4 are reserved for kWh and kvarh pulse outputs, respectively.

4.1.4 I residual Input

The PMC-630 optionally provides an I residual input to be used with an external Residual Current Sensor (see Appendix D) that has an input range of 20mA to 1200mA and an output range of 0 to 1.2V. The outputs of the Residual Current Sensor are connected to the I residual (I4) input of the PMC-630 if so equipped. This is illustrated in Figure 4-1 below.

The I residual input provides accurate ground fault monitoring through the I residual Setpoints and is mainly used for indirect grounding protection to ensure personnel safety. Please refer to Section 4.3.3 for a complete description of the I residual Setpoints operation.

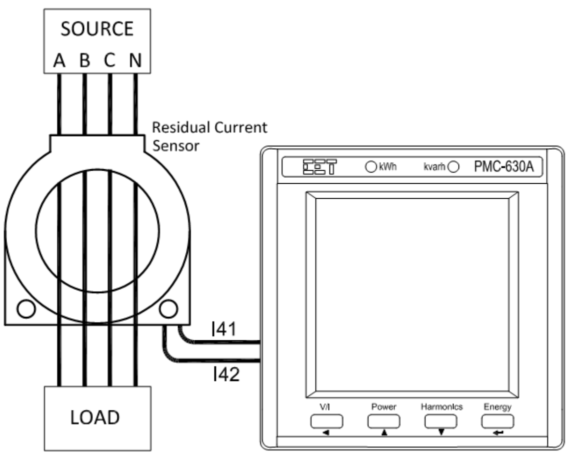


Figure 4-1 I residual Connections

4.1.5 Analog Input

The PMC-630 comes optionally with an Analog Input which can be programmed as 0mA to 20mA or 4mA to 20mA input.

There are 3 setup parameters:

Type: Select between 0-20mA or 4-20mA input.

AI Full: This value corresponds to the maximum Analog Input of 20 mA and has a range of -999,999 to +999,999.

AI Zero: This value corresponds to the minimum Analog Input of 0 mA (for 0-20mA input) or 4 mA (for 4-20mA input) and has a range of -999,999 to +999,999.

For example, to measure the oil temperature of a transformer, connect the outputs of the temperature sensor to the AI terminals of the PMC-630. The temperature sensor outputs 4mA when the temperature is -25°C and 20mA when the temperature is 100°C . As such, the **Type** parameter should be programmed as **4-20mA**. The **AI FULL** parameter should be programmed with the value 100, and the **AI ZERO** parameter should be programmed with the value -25. Therefore, when the output of the sensor is 20mA, the reading will be 100.00°C. When the output is 4mA, the reading will be -25.00°C. When the output is 12mA, the reading will be (100°C - (-25°C)) x (12mA-4mA) / (20mA-4mA) + (-25°C) = 37.50°C.

4.1.6 Analog Output

The PMC-630 comes optionally with an Analog Output which can be programmed as 0mA to 20mA or 4mA to 20mA output.

There are 4 setup parameters:

Type: Select between 0-20mA or 4-20mA output.

AO Zero: Defines the zero scale value of the parameter when the Analog Output is 0 mA (for 0-20mA output) or 4 mA (for 4-20mA output). The value ranges between -999,999 to +999,999.

AO Full: Defines the full scale value of the parameter when the Analog Output is 20 mA. The value ranges between -999,999 and +999,999.

Key: Defines the parameter to which the Analog Output is proportional. The Analog Output Parameters are listed in Table 3-7.

For example, an AO of 4-20mA is required to be proportional to Phase A current. The maximum value of phase A current is 2000A, and the minimum value is 500A. As such, the **Type** parameter should be programmed as **4-20mA**. The **Key** parameter should be programmed with Ia (Phase A Current). The **AO FULL** parameter should be programmed with the value 2000. The **AO ZERO** parameter should be programmed with the value 500. Therefore, when Phase A Current is 500A or below, The AO output is 4mA. When Phase A Current is 2000A, the AO output is 20mA. When Phase A Current is 1250A, The AO is (1250A-500A) x (20mA-4mA) / (2000A-500A) + 4mA = 12.00(mA).

4.2 Power and Energy

4.2.1 Phase Angle

Phase analysis is used to identify the angle relationship between the three-phase voltages and currents.

For Wye connected systems, the per phase difference of the current and voltage angles should correspond to the per phase PF. For example, if the power factor is 0.5 Lag and the voltage phase angles are 0.0°, 240.0° and 120.0°, the current phase angles should have the values of -60.0°, 180.0° and 60.0°.

For Delta connected systems, the current phasors lag line-to-line voltage phasors by 30°. For example, if the total power factor for a balanced 3-phase system is 0.5 Lag and the line-to-line voltage phase angles are 0.0°, 240.0° and 120.0°, the current phase angles should have the values of -90.0°, 150.0° and 30.0°.

4.2.2 Energy

Basic energy parameters include active energy (kWh), reactive energy (kvarh) and apparent energy (kVAh) with a resolution of 0.01 and a maximum value of ±999,999,999.99. When the maximum value is reached, it will automatically roll over to zero.
The energy can be reset manually or preset to user-defined values through the front panel or via communications.

The PMC-630 provides the following energy measurements:

Active Energy	kWh Import	kWh Export	kWh Net	kWh Total
Reactive Energy	kvarh Import	kvarh Export	kvarh Net	kvarh Total
Apparent Energy	kVAh Total			

Table 4-1 Energy

4.2.3 Demand

Demand is defined as the average power consumption over a fixed interval (usually 15 minutes). The PMC-630 supports the sliding window demand calculation and has the following setup parameters:

# of Sliding Windows: 1-15

Demand Period: 1, 2, 3, 5, 10, 15, 30, 60 minutes. For example, if the # of Sliding Windows is set as 1 and the Demand Period is 15, the demand cycle will be 1×15=15min.

The PMC-630 provides the following Demand parameters:

Demand Parameters			
Va Demand	Vb Demand	Vc Demand	VLN average Demand
Vab Demand	Vbc Demand	Vca Demand	VLL average Demand
Ia Demand	Ib Demand	Ic Demand	I average Demand
kWa Demand	kWb Demand	kWc Demand	∑kW Demand
kvara Demand	kvarb Demand	kvarc Demand	∑kvar Demand
kVAa Demand	kVAb Demand	kVAc Demand	∑kVA Demand
P.F.a Demand	P.F.b Demand	P.F.c Demand	∑P.F. Demand
FREQ Demand	V Unbalance Demand	I Unbalance Demand	
Va THD Demand	Vb THD Demand	Vc THD Demand	
Ia THD Demand	Ib THD Demand	Ic THD Demand	

Table 4-2 Demand Parameters

4.2.4 TOU (PMC-630B and PMC-630C)

The Time-Of-Use (TOU) system allows the user to configure an electricity price schedule inside the PMC-630 and accumulate energy consumption into different TOU rates based on the time of consumption. TOU programming is only supported through communications.

The TOU feature on the PMC-630 supports 4 Tariff Rates, 6 Seasons, 1 Daily Profile for each season and 10 Profile Periods within the Daily Profile. The user can define the start time and the end time for each Season within a year and the Profile Periods in 15-minute steps within a day. All days within a Season have the same Daily Profile since the PMC-630 only supports one Daily Profile for each season. There are four Tariff Rates – Tariff A, Tariff B, Tariff C and Tariff D, which can be applied to any time period.

For each of the four Tariff Rates, the PMC-630 provides the following Energy information: kWh Import, kWh Export, kvarh Import, kvarh Export.

Time-Of-Use data is available through the front panel and communications.

4.3 Setpoints

The PMC-630 provides four different types of setpoints for different applications.

1) **Control Setpoints:** General purpose control and alarming applications.
2) **Digital Input Setpoints:** Provides control output actions in response to changes in Digital Input status.
3) **I residual Setpoints:** Residual Current monitoring and protection
4) **Transient Setpoints:** Provides high-speed transient monitoring of Voltage and Current signals and the ability to trigger Waveform Recording. This feature is available only on PMC-630C.

4.3.1 Control Setpoints

The PMC-630 comes standard with 9 user programmable control setpoints which provide extensive control by allowing a user to initiate an action in response to a specific condition. Typical setpoint applications include alarming, demand control, fault detection and power quality monitoring.

The alarm symbol at the bottom of the LCD display is lit if there are any active Control Setpoints. The setpoints can be programmed over communications and have the following setup parameters:

1) **Setpoint Type:**

   Specify the monitoring condition – Over Setpoint, Under Setpoint, or Disabled.

2) **Setpoint Parameter:**

   Specify the parameter to be monitored. Table 4-3 below provides a list of Setpoint Parameters.

3) **Setpoint Active Limit** :

   Specify the value that the setpoint parameter must exceed for Over Setpoint or go below for Under Setpoint for the setpoint to become active.

4) **Setpoint Inactive Limit**:

Specify the value that the setpoint parameter must go below for Over Setpoint or exceed for Under Setpoint for the setpoint to become inactive.

5) **Setpoint Active Delay**:

Specify the minimum duration in seconds that the setpoint condition must be met before the setpoint becomes active. An event will be generated and stored in the SOE Log. The range of the **Setpoint Active Delay** for the Standard Setpoint is between 0 and 9,999 (seconds).

6) **Setpoint Inactive Delay**:

Specify the minimum duration in seconds that the setpoint Return condition must be met before the setpoint becomes inactive. An event will be generated and stored in the SOE Log. The range of the **Setpoint Active Delay** for the Standard Setpoint is between 0 and 9,999 (seconds).

7) **Setpoint Trigger**:

Specify what action the setpoint will take when it becomes active. These actions include No Trigger, Trigger DOx, Trigger Waveform Recording, and Trigger Data Recorderx.

The PMC-630 provides the following Setpoint Parameters:

Key	Parameter	Scale/Unit
0	None	/
1	VLN	x100, V
2	VLL	x100, V
3	I	1000, A
4	∑kW	x1000, kW
5	∑kvar	x1000, kvar
6	∑P.F.	x1000
7	V THD	x10000
8	I THD	x10000
9	V TEHD	x10000
10	I TEHD	x10000
11	V TOHD	x10000
12	I TOHD	x10000
13	∑kW Demand	x1000, kW
14	∑kvar Demand	x1000, kvar
15	kVA Demand	x1000, kVA
16	I avg Demand	x1000, A

Table 4-3 Setpoint Parameters

4.3.2 Digital Input Setpoints

The PMC-630 comes standard with six Digital Inputs. Each Digital Input can be programmed to trigger Digital Outputs as well as Waveform Recording when its input becomes active. The programming of the Digital Input Setpoints is only supported through communications.

Digital Inputs on the PMC-630 can be used in the following applications:

- A Digital Input can be programmed to operate one or more Digital Outputs when it becomes active. An event with the following information is stored in the SOE Log:
    1) Digital Output Status (Open or Close)
    2) Digital Input Channel that triggers the output actions (1 to 6)
    3) Digital Output(s) that are operated by this DI setpoint
- A Digital Input can be programmed to trigger Waveform Recording of 3 phase Voltages and Currents at 16 samples per cycle for 12 cycles with 3 pre-fault and 9 post-fault cycles. An event indicating the DI channel that triggers the Waveform Recording is stored in the SOE Log. Please refer to Section 4.5.3 for a complete description of the Waveform Recording feature.

4.3.3 I residual Setpoints

The PMC-630 provides two types of I residual Setpoints, ALARM and TRIP, which can be individually enabled. The programming of the I residual Setpoints is only supported over communications. The alarm symbol at the bottom of the LCD display is lit if there are active I residual Setpoints. The following table provides a description of the I residual Setpoint's programming and operational details.

I residual Setpoint	ALARM	TRIP
Mode	0 = Disabled 1 = Enabled with SOE logging 2 = Enabled with SOE logging and ALARM Trigger output [1]	0 = Disabled 1 = Enabled with SOE logging and TRIP Trigger output[1]
Setpoint Limit	20 - 1000 (mA)	20 - 1000 (mA)
Action/Release Delay	0 to 600 (x0.1 second)	0 to 600 (x0.1 second)
Action[1]	1) I residual >= ALARM **Setpoint Limit** 2) The ALARM Setpoint becomes active when I residual has exceeded the ALARM **Setpoint Limit** for a duration longer than the **Action Delay** time. 3) When ALARM is active, an SOE event would be generated. 4) If ALARM **Trigger** is enabled, DO1 would close.	1) I residual >= TRIP **Setpoint Limit** 2) The TRIP Setpoint becomes active when I residual has exceeded the TRIP **Setpoint Limit** for a duration longer than the **Action Delay** time. 3) When TRIP is active, an SOE event would be generated and DO2 would close.
Release	1) I residual < ALARM **Setpoint Limit** 2) The ALARM Setpoint becomes inactive when I residual is less than ALARM **Setpoint Limit** for a duration longer than the **Release**	1) I residual < TRIP **Setpoint Limit** 2) The TRIP Setpoint becomes inactive when I residual is less than TRIP **Setpoint Limit** for a duration longer than the **Release**

	Delay time. 3) DO1 (if enabled) must be reset manually after the ALARM Setpoint has become inactive[2].	**Delay** time. 3) DO2 would open automatically

Table 4-4 I Residual ALARM and TRIP Setpoints

Notes:

1) DO1 is reserved as the ALARM output while DO2 is reserved as the TRIP output for the I residual Setpoints if they are enabled.

2) The ALARM output can be reset from the front panel or through communications after the I residual ALARM Setpoint has become inactive. To manually reset the ALARM from the front panel, enter the Setup Configuration mode, scroll to the **RESET AI** parameter and set it to **YES**.

4.3.4 Transient Setpoints (PMC-630C)

The PMC-630C provides two high-speed Transient Setpoints for monitoring sudden changes in the Voltage and Current Signals. The following table provides a complete description of the Transient Setpoint's programming and operational details.

Transient Setpoint	Voltage	Current
Mode	0 = Disabled, 1 = Enabled	
Setpoint Limit	5-50 (% of Vnominal)	10-100 (% of Inominal)
Details	1) The Transient Setpoints monitor the Voltage and Current inputs continuously and compare the present value against past values based on historical information. 2) The PMC-630 uses a proprietary algorithm for transient detection. In general, if the latest waveforms deviate from the past waveforms by an amount that is greater than the **Setpoint Limit**, it will trigger a Waveform Recording of 3-phase Voltage and Current signals at 16 samples per cycle for 12 cycles. The Transient Setpoints operate continuously at 16 samples per cycle on a cycle by cycle basis. It has a maximum response time of 1 cycle. 3) An event would be generated when a WFR is triggered by the Transient Setpoint.	

Table 4-5 Transient Setpoints

4.4 Logging

4.4.1 Peak Demand Log

The PMC-630 stores peak demand data of **This Month** and **Last Month** with timestamp for Ia/Ib/Ic/∑kW/∑kvar/∑kVA. All of the peak demand data can be accessed through front panel LCD as well as communications.

The **Self-Read Time** allows the user to specify the time and day of the month for the Peak Demand Self-Read operation. At the specified time in each month, the Peak Demand register of **This Month** is transferred to the Peak Demand register of **Last Month** and then zeroed. The **Self-Read Time** supports two options:

- A zero value means that the Self-Read will take place at 00:00 of the first day of each month.
- A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = Day * 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.

The peak demand data of this month can be reset manually through the front panel or via communications.

The PMC-630 provides the following Peak Demand parameters:

Peak Demand of This Month	Peak Demand of Last Month
∑kW Peak Demand of This Month	∑kW Peak Demand of Last Month
∑kvar Peak Demand of This Month	∑kvar Peak Demand of Last Month
∑kVA Peak Demand of This Month	∑kVA Peak Demand of Last Month
Ia Peak Demand of This Month	Ia Peak Demand of Last Month
Ib Peak Demand of This Month	Ib Peak Demand of Last Month
Ic Peak Demand of This Month	Ic Peak Demand of Last Month

Table 4-6 Peak Demand Measurements

4.4.2 Max/Min Log

The PMC-630 records each new minimum and new maximum data of **This Month** and **Last Month** with timestamp for VLN/VLL/I/∑kW/∑kvar/∑kVA/PF/frequency/THD/Unbalance. All of the maximum and minimum data can be accessed through communications.

The **Self-Read Time** allows the user to specify the time and day of the month for the Max/Min Self-Read operation. At the specified time in each month, the Max/Min Log of **This Month** is transferred to the Max/Min Log of **Last Month** and then reset. The **Self-Read Time** supports two options:

- A zero value means that the Self-Read will take place at 00:00 of the first day of each month.
- A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = Day * 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.

The maximum and minimum data of this month can be reset manually from the front panel or via communications.

The PMC-630 provides the following Max/Min parameters:

Max/Min Value of This Month		Max/Min Value of Last Month	
Va max	Va min	Va max	Va min
Vb max	Vb min	Vb max	Vb min
Vc max	Vc min	Vc max	Vc min
VLN avg. max	VLN avg. min	VLN avg. max	VLN avg. min
Vab max	Vab min	Vab max	Vab min

Vbc max	Vbc min	Vbc max	Vbc min
Vca max	Vca min	Vca max	Vca min
VLL avg. max	VLL avg. min	VLL avg. max	VLL avg. min
Ia max	Ia min	Ia max	Ia min
Ib max	Ib min	Ib max	Ib min
Ic max	Ic min	Ic max	Ic min
I avg. max	I avg. min	I avg. max	I avg. min
kWa max	kWa min	kWa max	kWa min
kWb max	kWb min	kWb max	kWb min
kWc max	kWc min	kWc max	kWc min
∑kW max	∑kW min	∑kW max	∑kW min
kvara max	kvara min	kvara max	kvara min
kvarb max	kvarb min	kvarb max	kvarb min
kvarc max	kvarc min	kvarc max	kvarc min
∑kvar max	∑kvar min	∑kvar max	∑kvar min
kVAa max	kVAa mix	kVAa max	kVAa mix
kVAb max	kVAb mix	kVAb max	kVAb mix
kVAc max	kVAc mix	kVAc max	kVAc mix
∑kVA max	∑kVA mix	∑kVA max	∑kVA mix
P.F.a max	P.F.a min	P.F.a max	P.F.a min
P.F.b max	P.F.b min	P.F.b max	P.F.b min
P.F.c max	P.F.c min	P.F.c max	P.F.c min
∑P.F. max	∑P.F. min	∑P.F. max	∑P.F. min
FREQ max	FREQ min	FREQ max	FREQ min
Voltage Unbalance max	Voltage Unbalance min	Voltage Unbalance max	Voltage Unbalance min
Current Unbalance max	Current Unbalance min	Current Unbalance max	Current Unbalance min
Va THD max	Va THD min	Va THD max	Va THD min
Vb THD max	Vb THD min	Vb THD max	Vb THD min
Vc THD max	Vc THD min	Vc THD max	Vc THD min
Ia THD max	Ia THD min	Ia THD max	Ia THD min
Ib THD max	Ib THD min	Ib THD max	Ib THD min
Ic THD max	Ic THD min	Ic THD max	Ic THD min

Table 4-7 Max/Min Measurements

4.4.3 Data Recorder (DR) Log (PMC-630B and PMC-630C)

The PMC-630B/C comes equipped with 2MB of memory and provides 16 Data Recorders (**DR**) capable of recording 16 parameters each. The recorded data is stored in the device's non-volatile memory and will not suffer any loss in the event of a power failure.

The programming of the Data Recorder is only supported over communications. Each Data Recorder provides the following setup parameters:

1) **Triggered Mode:** 0=Disabled/ 1=Triggered by Timer/ 2=Triggered by Setpoint
2) **Recording Depth**: 0 to 65535 (entry)
3) **Recording Interval**: 0 to 3456000 seconds

4) **Recording Offset:** 0 to 43200 seconds
5) **Number of Parameters**: 0 to 16
6) **Parameter 1 to 16**: 0 to 169 (Please see **Appendix A DR Parameters)**

The Data Recorder Log is only operational when the values of **Triggered Mode**, **Recording Depth**, **Recording Interval**, and **Number of Parameters** are all non-zero.

The **Recording Offset** parameter can be used to delay the recording by a fixed time from the **Recording Interval**. For example, if the **Recording Interval** parameter is set to 3600 (hourly) and the **Recording Offset** parameter is set to 300 (5 minutes), the recording will take place at 5 minutes after the hour every hour, i.e. 00:05, 01:05, 02:05, …etc. The programmed value of the **Recording Offset** parameter should be less than that of the **Recording Interval** parameter.

4.4.4 SOE Log

The PMC-630's SOE Log can store up to 64 events such as power-on, power-off, setpoint actions, relay actions, Digital Input status changes and setup changes in its non-volatile memory. Each event record includes the event classification, its relevant parameter values and a timestamp in 1ms resolution.

All events can be retrieved via communications for display. If there are more than 64 events, the newest event will replace the oldest event on a first-in-first-out basis. The SOE Log can be reset from the front panel or via communications.

4.5 Power Quality

4.5.1 Harmonics

The PMC-630 provides on-board harmonics analysis for THD, TOHD, TEHD, K-factor and Individual Harmonics up to the 31st order. All harmonics parameters are available through the front panel LCD display or via communications.

The PMC-630 provides the following Harmonics measurements:

	Phase A	Phase B	Phase C
Harmonics-Voltage	THD	THD	THD
	TEHD	TEHD	TEHD
	TOHD	TOHD	TOHD
	2nd Harmonics	2nd Harmonics	2nd Harmonics of
		……	
	31st Harmonics	31st Harmonics	31st Harmonics
Harmonics-Current	THD	THD	THD
	TEHD	TEHD	TEHD
	TOHD	TOHD	TOHD
	K-Factor	K-Factor	K-Factor
	2nd Harmonics	2nd Harmonics	2nd Harmonics
		……	
	31st Harmonics	31st Harmonics	31st Harmonics

Table 4-8 Harmonics Measurements

4.5.2 Unbalance

The PMC-630 can measure Voltage and Current Unbalances. The calculation method of Voltage and Current Unbalances is listed below:

$$\text{Voltage Unblance} = \frac{[|Va-Vavg|,|Vb-Vavg|,|Vc-Vavg|]_{MAX}}{Vavg} \times 100\%$$

$$\text{Current Unblance} = \frac{[|Ia-Iavg|,|Ib-Vavg|,|Ic-Iavg|]_{MAX}}{Iavg} \times 100\%$$

4.5.3 Waveform Recording (PMC-630C only)

Each Waveform Record consists of 3-phase voltages and currents at a resolution of 16 samples per cycle for 12 cycles with 3 pre-fault and 9 post-fault cycles. Waveform Recording on the PMC-630 can be triggered by Control Setpoints, Digital Input Setpoints, Transient Voltage and Current Setpoints or manually through communications. The manual trigger command has a higher priority. When Waveform Recording is already in progress, other Waveform Recording commands will be ignored until the current recording has completed. The Waveform Recording Log has a capacity of 3 records organized in a first-in-first-out basis, with the newest waveform record replacing the oldest one. The waveform data is stored in the device's non-volatile memory and will not suffer any loss in the event of a power failure. All waveform records can be retrieved via communications by our PecStar® iEMS or our free PMC Setup Software for display.

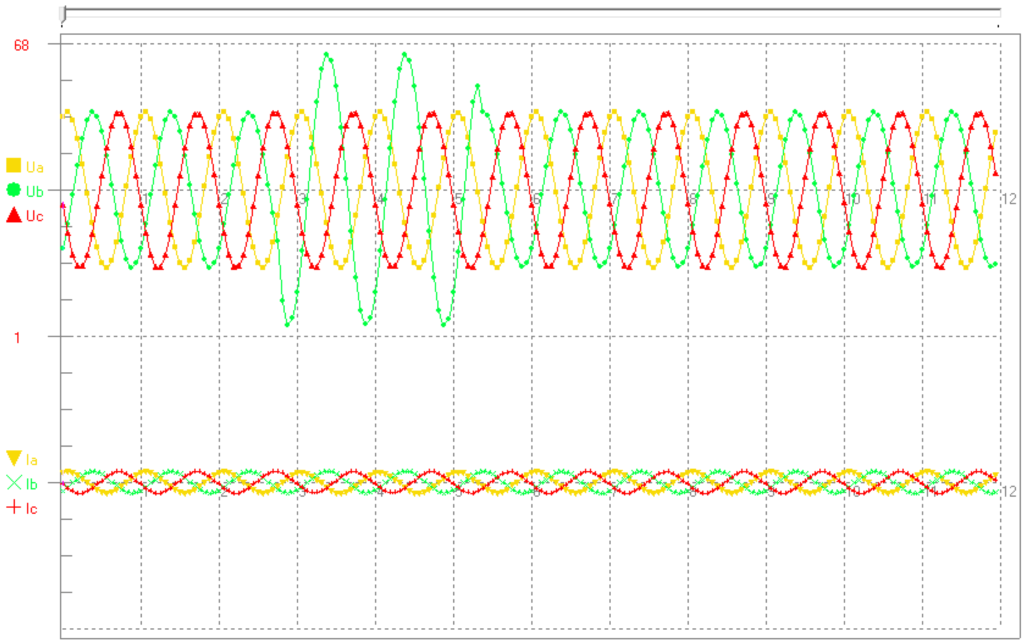


Figure 4-2 Waveform Recording displayed in PecStar®

4.5.4 Waveform Capture (PMC-630C only)

The PMC-630 provides a means to record waveforms in high resolution through its Waveform Capture feature, which can be triggered through communications for the recording of a single channel voltage or current input at 128 samples per cycle for 1 cycle. The captured waveform can be retrieved subsequently from the PMC-630 over communications by the PecStar® iEMS or our free PMC Setup

Software to provide harmonics analysis up to the 63rd order. The captured waveform remains in the PMC-630's non-volatile memory until the next waveform capture is triggered.

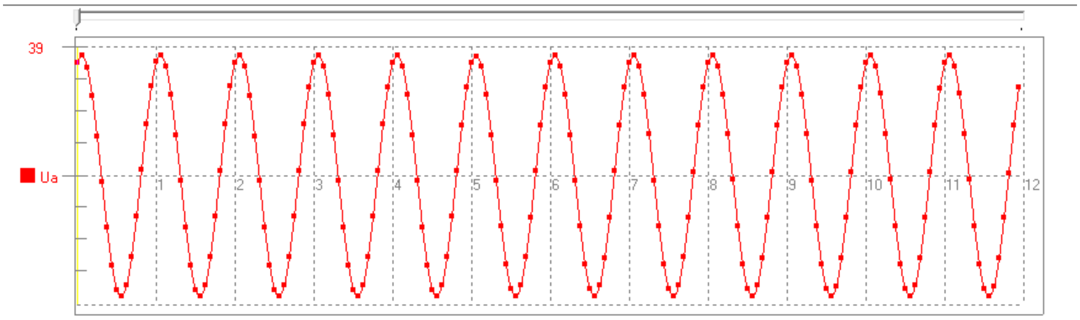


Figure 4-3 Waveform Capture displayed in PecStar®

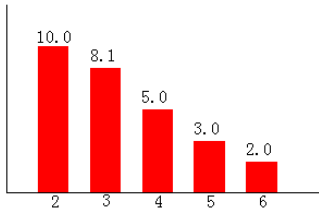


Figure 4-4 Harmonics spectrum displayed in PecStar®

Chapter 5 Modbus Register Map

This chapter provides a complete description of the Modbus register map (**Protocol Versions 5.1** and above) for the PMC-630 Power Quality Monitor to facilitate the development of 3rd party communications driver for accessing information on the PMC-630.

The PMC-630 supports the following Modbus functions:

1) Read Holding Registers (Function Code 0x03)
2) Force Single Coil (Function Code 0x05)
3) Preset Multiple Registers (Function Code 0x10)
4) Read General Reference (Function Code 0x14)

For a complete Modbus Protocol Specification, please visit http://www.modbus.org.

Read General Reference Packet Structure (Function Code 0x14)

Read Reference Request Packet (Master Station to PMC-630)	
Slave Address	1 Byte
Function Code (0x14)	1 Byte
Byte Count	1 Byte
Sub-Req X, Reference Type (0x06)	1 Byte
Sub-Req X, File Number	2 Bytes
Sub-Req X, Start Address	2 Bytes
Sub-Req X, Register Count	2 Bytes
Sub-Req X+1……	
Error Check (CRC)	2 Byte

Read Reference Response Packet (PMC-630 to Master Station)	
Salve Address	1 Byte
Function Code (0x14)	1 Byte
Byte Count	1 Byte (NxN_0+2)
Sub-Res X, Byte Count	1 Byte
Sub-Res X, Reference Type (0x06)	1 Byte (NxN_0+1)
Sub-Res X, Register Data	NxN_0 Bytes
Sub-Res X+1……	
Error Check (CRC)	2 Bytes

Notes:

1) Modbus function code 0x14 is used to access the Data Recorder Log.
2) In the Request Packet, the **File Number** parameter is used to reference which Data Recorder Log to read.
3) Start Address = [**DR #X Pointer** / **DR #X Depth**].
4) In the Response Packet, N represents the number of logs returned in the packet, and N_0 is the length of a single log. N_0 = n*4+6 where n is the number of parameters for a particular Data Recorder.

5.1 Basic Measurements

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
0000	RO	Va[1]	UINT32	×100, V[2]	■	■	■
0002	RO	Vb[1]	UINT32	×100, V	■	■	■
0004	RO	Vc[1]	UINT32	×100, V	■	■	■
0006	RO	VLN average	UINT32	×100, V	■	■	■
0008	RO	Vab	UINT32	×100, V	■	■	■
0010	RO	Vbc	UINT32	×100, V	■	■	■
0012	RO	Vca	UINT32	×100, V	■	■	■
0014	RO	VLL average	UINT32	×100, V	■	■	■
0016	RO	Ia	UINT32	×1000, A	■	■	■
0018	RO	Ib	UINT32	×1000, A	■	■	■
0020	RO	Ic	UINT32	×1000, A	■	■	■
0022	RO	I average	UINT32	×1000, A	■	■	■
0024	RO	kWa[1]	INT32	×1000, kW	■	■	■
0026	RO	kWb[1]	INT32	×1000, kW	■	■	■
0028	RO	kWc[1]	INT32	×1000, kW	■	■	■
0030	RO	∑kW	INT32	×1000, kW	■	■	■
0032	RO	kvara[1]	INT32	×1000, kvar	■	■	■
0034	RO	kvarb[1]	INT32	×1000, kvar	■	■	■
0036	RO	kvarc[1]	INT32	×1000, kvar	■	■	■
0038	RO	∑kvar	INT32	×1000, kvar	■	■	■
0040	RO	kVAa[1]	INT32	×1000, kVA	■	■	■
0042	RO	kVAb[1]	INT32	×1000, kVA	■	■	■
0044	RO	kVAc[1]	INT32	×1000, kVA	■	■	■
0046	RO	∑kVA	INT32	×1000, kVA	■	■	■
0048	RO	P.F.a[1]	INT16	×1000	■	■	■
0049	RO	P.F.b[1]	INT16	×1000	■	■	■
0050	RO	P.F.c[1]	INT16	×1000	■	■	■
0051	RO	∑P.F.	INT16	×1000	■	■	■
0052	RO	FREQ	UINT16	×100, Hz	■	■	■
0053	RO	I4	UINT32	×1000, A	■	■	■
0055 - 0064		Reserved			■	■	■
0065	RO	Voltage Unbalance	UINT16	×1000	■	■	■
0066	RO	Current Unbalance	UINT16	×1000	■	■	■
0067	RO	dP.F.a[1]	INT16	×1000	■	■	■
0068	RO	dP.F.b[1]	INT16	×1000	■	■	■
0069	RO	dP.F.c[1]	INT16	×1000	■	■	■
0070	RO	Va Angle	UNIT16	x100, °	■	■	■
0071	RO	Vb Angle	UNIT16	x100, °	■	■	■
0072	RO	Vc Angle	UNIT16	x100, °	■	■	■

0073	RO	Ia Angle	UNIT16	x100, °	▪	▪	▪
0074	RO	Ib Angle	UNIT16	x100, °	▪	▪	▪
0075	RO	Ic Angle	UNIT16	x100, °	▪	▪	▪
0076	RO	AI / I residual[3]	INT32	×100	▪	▪	▪
0078	RO	AO	UINT32	×100	▪	▪	▪
0080	RO	DI Status[4]	UNIT16		▪	▪	▪
0081	RO	DO Status[5]	UNIT16		▪	▪	▪
0082	RO	Alarm[6]	UNIT16		▪	▪	▪
0083	RO	SOE Pointer[7]	UINT32		▪	▪	▪
0085	RO	WF Capture Pointer[8]	UINT32				▪
0087	RO	WF Recorder Pointer[8]	UINT32				▪
0089	RO	DR #1 Pointer[9]	UINT32			▪	▪
0091	RO	DR #2 Pointer[9]	UINT32			▪	▪
……		……				▪	▪
0117	RO	DR #15 Pointer[9]	UINT32			▪	▪
0119	RO	DR #16 Pointer[9]	UINT32			▪	▪

Table 5-1 Basic Measurements

Notes:

1) When the **Wiring Mode** is Delta, the per phase line-to-neutral voltages, kWs, kvars, kVAs and PFs have no meaning, and their registers are reserved.

2) "×100, V" indicates the value returned in the register is 100 times the actual engineering value with the unit V (voltage). For example, if a register contains a value 22003, the actual value is 22003/100=220.03V.

3) Analog Input and I residual share the same register as these two options are mutually exclusive.

4) For the **DI Status** register, the bit values of B0 to B5 represent the states of DI1 to DI6, respectively, with "1" meaning active (closed) and "0" meaning inactive (open).

5) For the **DO Status** register, the bit values of B0 to B3 represent the states of DO1 to DO4, respectively, with "1" meaning active (closed) and "0" meaning inactive (open).

6) The Alarm register indicates the various alarm states with a bit value of 1 meaning active and 0 meaning inactive. The following table illustrates the details of the Alarm register.

Bit	Alarm Event
B0	I residual ALARM
B1	I residual TRIP
B2	Reserved
B3	Setpoint #1
B4	Setpoint #2
B5	Setpoint #3
B6	Setpoint #4

B7	Setpoint #5
B8	Setpoint #6
B9	Setpoint #7
B10	Setpoint #8
B11	Setpoint #9
Other bits	Reserved

Table 5-2 Alarm Register (0082)

7) The range of the **SOE Pointer** is between 0 and 0xFFFFFFFF. The **SOE Pointer** is incremented by one for every event generated and will roll over to 0 if its current value is 0xFFFFFFFF. Since the **SOE Pointer** is a 32-bit value and the SOE Log capacity is relatively small with only 64 events in the PMC-630, an assumption has been made that the **SOE pointer** will never roll over. If a **CLR SOE** is performed from the front panel or via communications, the **SOE Pointer** will be reset to zero and then immediately incremented by one with a new "Clear SOE via Front Panel" or "Clear SOE via Communications" event. Therefore, any 3rd party software should assume that a **CLR SOE** action has been performed if it sees the **SOE Pointer** rolling over to one or to a value that is smaller than its own pointer. In this case, the new **SOE Pointer** also indicates the number of events in the SOE Log if it is less than 64. Otherwise, there will always be 64 events in the SOE Log.

8) The range of the **WF Recording** and **WF Capture Pointers** are between 0 and 0xFFFFFFFF. The pointers point to the current logging position and are incremented by one for every new record generated. A value of zero indicates that the device does not contain any WF Capture Log or WF Recorder Log. The WF Capture Log has a capacity of one record only while the WF Recorder Log has a capacity of 3 records. Since the **WF Capture** and **WF Recorder Pointers** are 32-bit values, an assumption has been made that these pointers will never roll over. To determine the latest WF Recorder log location:

   WF Recorder latest log location = Modulo [(**WF Recorder Pointer**-1)/ 3]

9) The PMC-630 has sixteen Data Recorders (**DR #1/2/…/16**). Each **DR** has a Pointer that indicates its current logging position. The range of the **DR Pointer** is between 0 and 0xFFFFFFFF. The **DR Pointer** is incremented by one for every DR log generated and will roll over to 0 if its current value is 0xFFFFFFFF. A value of zero indicates that the device does not contain any DR Log. If a **Clear DR** is performed via communications, the **DR Pointer** will be reset to zero.

   To determine the latest DR #X log location (X=1 to 16):
   DR #X latest log location = Modulo [**DR #X Pointer** / **DR #X Depth**]

5.2 Energy Measurements

The Energy registers have a maximum value of 999,999,999 and will roll over to zero automatically when it is reached. The PMC-630 also provides energy measurements in fractional values if they are required. Using the "Fractional" registers, having units such as W ·sec and var ·sec, the user can obtain decimal resolution for achieving higher accuracy. For example, if the value of the kWh fractional register is 3200000 W ·sec, the decimal value is 3200000/3600000=0.8889kWh. If the higher resolution is not required, it is not necessary to read the fractional energy registers.

Register	Property	Description	Format	Unit	PMC-630		
					A	B	C
0200	RW	kWh Import	UINT32	kWh	■	■	■
0202	RW	kWh Export	UINT32	kWh	■	■	■
0204	RO	kWh Net	INT32	kWh	■	■	■
0206	RO	kWh Total	UINT32	kWh	■	■	■
0208	RW	kvarh Import	UINT32	kvarh	■	■	■
0210	RW	kvarh Export	UINT32	kvarh	■	■	■
0212	RO	kvarh Net	INT32	kvarh	■	■	■
0214	RO	kvarh Total	UINT32	kvarh	■	■	■
0216	RW	kVAh	UINT32	kVAh	■	■	■
0218	RW	kWh Import of Tariff A period	UINT32	kWh		■	■
0220	RW	kWh Export of Tariff A period	UINT32	kWh		■	■
0222	RW	kWh Import of Tariff B period	UINT32	kWh		■	■
0224	RW	kWh Export of Tariff B period	UINT32	kWh		■	■
0226	RW	kWh Import of Tariff C period	UINT32	kWh		■	■
0228	RW	kWh Export of Tariff C period	UINT32	kWh		■	■
0230	RW	kWh Import of Tariff D period	UINT32	kWh		■	■
2332	RW	kWh Export of Tariff D period	UINT32	kWh		■	■
0234	RW	kvarh Import of Tariff A period	UINT32	kvarh		■	■
0236	RW	kvarh Export of Tariff A period	UINT32	kvarh		■	■
0238	RW	kvarh Import of Tariff B period	UINT32	kvarh		■	■
0240	RW	kvarh Export of Tariff B period	UINT32	kvarh		■	■
0242	RW	kvarh Import of Tariff C period	UINT32	kvarh		■	■
0244	RW	kvarh Export of Tariff C period	UINT32	kvarh		■	■
0246	RW	kvarh Import of Tariff D period	UINT32	kvarh		■	■
0248	RW	kvarh Export of Tariff D period	UINT32	kvarh		■	■
0250	RO	kWh Import Fractional	FP32	W ·sec	■	■	■
0252	RO	kWh Export Fractional	FP32	W ·sec	■	■	■
0254	RO	kWh Net Fractional	FP32	W ·sec	■	■	■
0256	RO	kWh Total Fractional	FP32	W ·sec	■	■	■
0258	RO	kvarh Import Fractional	FP32	var ·sec	■	■	■
0260	RO	kvarh Export Fractional	FP32	var ·sec	■	■	■
0262	RO	kvarh Net Fractional	FP32	var ·sec	■	■	■
0264	RO	kvarh Total Fractional	FP32	var ·sec	■	■	■
0266	RO	kVAh Fractional	FP32	VA ·sec	■	■	■
0268	RO	kWh Import Fractional of Tariff A period	FP32	W ·sec		■	■
0270	RO	kWh Export Fractional of Tariff A period	FP32	W ·sec		■	■
0272	RO	kWh Import Fractional of Tariff B period	FP32	W ·sec		■	■
0274	RO	kWh Export Fractional of Tariff B period	FP32	W ·sec		■	■
0276	RO	kWh Import Fractional of Tariff C period	FP32	W ·sec		■	■
0278	RO	kWh Export Fractional of Tariff C period	FP32	W ·sec		■	■
0280	RO	kWh Import Fractional of Tariff D period	FP32	W ·sec		■	■

0282	RO	kWh Export Fractional of Tariff D period	FP32	W ·sec		■	■
0284	RO	kvarh Import Fractional of Tariff A period	FP32	Var ·sec		■	■
0286	RO	kvarh Export Fractional of Tariff A period	FP32	Var ·sec		■	■
0288	RO	kvarh Import Fractional of Tariff B Period	FP32	Var ·sec		■	■
0290	RO	kvarh Export Fractional of Tariff B Period	FP32	Var ·sec		■	■
0292	RO	kvarh Import Fractional of Tariff C period	FP32	Var ·sec		■	■
0294	RO	kvarh Export Fractional of Tariff C period	FP32	Var ·sec		■	■
0296	RO	kvarh Import Fractional of Tariff D period	FP32	Var ·sec		■	■
0298	RO	kvarh Export Fractional of Tariff D period	FP32	Var ·sec		■	■

Table 5-3 Energy Measurements

5.3 Pulse Counter

The Pulse Counter data returned is 1000 times the actual value. For example, if the register contains a value of 1234567, the actual counter value is 1234.567.

Register	Property	Description	Format	PMC-630		
				A	B	C
0350	RW	Pulse Counter #1 (DI1)	UINT32	■	■	■
0352	RW	Pulse Counter #2 (DI2)	UINT32	■	■	■
0354	RW	Pulse Counter #3 (DI3)	UINT32	■	■	■
0356	RW	Pulse Counter #4 (DI4)	UINT32	■	■	■
0358	RW	Pulse Counter #5 (DI5)	UINT32	■	■	■
0360	RW	Pulse Counter #6 (DI6)	UINT32	■	■	■

Table 5-4 Pulse Counter

5.4 Harmonic Measurements

The Harmonics data (Individual Harmonics, THD, TOHD and TEHD) returned is 10000 times the actual value. For example, if the register contains a value of 1031, the actual harmonic value is 10.31% (0.1031). The K Factor data is returned is 10 times the actual value.

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
0400-0402		Reserved					
0403	RO	Ia K Factor	UINT16	×10	■	■	■
0404	RO	Ib K Factor	UINT16	×10	■	■	■
0405	RO	Ic K Factor	UINT16	×10	■	■	■
0406	RO	Va TOHD	UINT16	×10000	■	■	■
0407	RO	Vb TOHD	UINT16	×10000	■	■	■
0408	RO	Vc TOHD	UINT16	×10000	■	■	■
0409	RO	Ia TOHD	UINT16	×10000	■	■	■
0410	RO	Ib TOHD	UINT16	×10000	■	■	■
0411	RO	Ic TOHD	UINT16	×10000	■	■	■
0412	RO	Va TEHD	UINT16	×10000	■	■	■
0413	RO	Vb TEHD	UINT16	×10000	■	■	■

0414	RO	Vc TEHD	UINT16	×10000	■	■	■
0415	RO	Ia TEHD	UINT16	×10000	■	■	■
0416	RO	Ib TEHD	UINT16	×10000	■	■	■
0417	RO	Ic TEHD	UINT16	×10000	■	■	■
0418	RO	Va THD	UINT16	×10000	■	■	■
0419	RO	Vb THD	UINT16	×10000	■	■	■
0420	RO	Vc THD	UINT16	×10000	■	■	■
0421	RO	Ia THD	UINT16	×10000	■	■	■
0422	RO	Ib THD	UINT16	×10000	■	■	■
0423	RO	Ic THD	UINT16	×10000	■	■	■
0424	RO	Va 2nd Harmonic	UINT16	×10000	■	■	■
0425	RO	Vb 2nd Harmonic	UINT16	×10000	■	■	■
0426	RO	Vc 2nd Harmonic	UINT16	×10000	■	■	■
0427	RO	Ia 2nd Harmonic	UINT16	×10000	■	■	■
0428	RO	Ib 2nd Harmonic	UINT16	×10000	■	■	■
0429	RO	Ic 2nd Harmonic	UINT16	×10000	■	■	■
……		……		×10000	■	■	■
0598	RO	Va 31st Harmonic	UINT16	×10000	■	■	■
0599	RO	Vb 31st Harmonic	UINT16	×10000	■	■	■
0600	RO	Vc 31st Harmonic	UINT16	×10000	■	■	■
0601	RO	Ia 31st Harmonic	UINT16	×10000	■	■	■
0602	RO	Ib 31st Harmonic	UINT16	×10000	■	■	■
0603	RO	Ic 31st Harmonic	UINT16	×10000	■	■	■

Table 5-5 Harmonics Measurements

5.5 Demand

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
1000	RO	Va Demand	INT32	x100, V	■	■	■
1002	RO	Vb Demand	INT32	x100, V	■	■	■
1004	RO	Vc Demand	INT32	x100, V	■	■	■
1006	RO	VLN average Demand	INT32	x100, V	■	■	■
1008	RO	Vab Demand	INT32	x100, V	■	■	■
1010	RO	Vbc Demand	INT32	x100, V	■	■	■
1012	RO	Vca Demand	INT32	x100, V	■	■	■
1014	RO	VLL average Demand	INT32	x100, V	■	■	■
1016	RO	Ia Demand	INT32	x1000, A	■	■	■
1018	RO	Ib Demand	INT32	x1000, A	■	■	■
1020	RO	Ic Demand	INT32	x1000, A	■	■	■
1022	RO	I average Demand	INT32	x1000, A	■	■	■
1024	RO	kWa Demand	INT32	x1000, kW	■	■	■
1026	RO	kWb Demand	INT32	x1000, kW	■	■	■
1028	RO	kWc Demand	INT32	x1000, kW	■	■	■

1030	RO	∑kW Demand	INT32	x1000, kW	▪	▪	▪
1032	RO	kvara Demand	INT32	x1000, kvar	▪	▪	▪
1034	RO	kvarb Demand	INT32	x1000, kvar	▪	▪	▪
1036	RO	kvarc Demand	INT32	x1000, kvar	▪	▪	▪
1038	RO	∑kvar Demand	INT32	x1000, kvar	▪	▪	▪
1040	RO	kVAa Demand	INT32	x1000, kVA	▪	▪	▪
1042	RO	kVAb Demand	INT32	x1000, kVA	▪	▪	▪
1044	RO	kVAc Demand	INT32	x1000, kVA	▪	▪	▪
1046	RO	∑kVA Demand	INT32	x1000, kVA	▪	▪	▪
1048	RO	P.F.a Demand	INT32	x1000	▪	▪	▪
1050	RO	P.F.b Demand	INT32	x1000	▪	▪	▪
1052	RO	P.F.c Demand	INT32	x1000	▪	▪	▪
1054	RO	∑P.F. Demand	INT32	x1000	▪	▪	▪
1056	RO	FREQ Demand	INT32	x100, Hz	▪	▪	▪
1058	RO	Voltage Unbalance Demand	INT32	x1000	▪	▪	▪
1060	RO	Current Unbalance Demand	INT32	x1000	▪	▪	▪
1062	RO	Va THD Demand	INT32	x10000	▪	▪	▪
1064	RO	Vb THD Demand	INT32	x10000	▪	▪	▪
1066	RO	Vc THD Demand	INT32	x10000	▪	▪	▪
1068	RO	Ia THD Demand	INT32	x10000	▪	▪	▪
1070	RO	Ib THD Demand	INT32	x10000	▪	▪	▪
1072	RO	Ic THD Demand	INT32	x10000	▪	▪	▪

Table 5-6 Present Demand

5.6 Max/Min Value per Demand Period

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
1400	RO	Va max	INT32	x100, V	▪	▪	▪
1402	RO	Vb max	INT32	x100, V	▪	▪	▪
1404	RO	Vc max	INT32	x100, V	▪	▪	▪
1406	RO	VLN average max	INT32	x100, V	▪	▪	▪
1408	RO	Vab max	INT32	x100, V	▪	▪	▪
1410	RO	Vbc max	INT32	x100, V	▪	▪	▪
1412	RO	Vca max	INT32	x100, V	▪	▪	▪
1414	RO	VLL average max	INT32	x100, V	▪	▪	▪
1416	RO	Ia max	INT32	x1000, A	▪	▪	▪
1418	RO	Ib max	INT32	x1000, A	▪	▪	▪
1420	RO	Ic max	INT32	x1000, A	▪	▪	▪
1422	RO	I average max	INT32	x1000, A	▪	▪	▪
1424	RO	kWa max	INT32	x1000, kW	▪	▪	▪
1426	RO	kWb max	INT32	x1000, kW	▪	▪	▪
1428	RO	kWc max	INT32	x1000, kW	▪	▪	▪
1430	RO	∑kW max	INT32	x1000, kW	▪	▪	▪

1432	RO	kvara max	INT32	x1000, kvar	▪	▪	▪
1434	RO	kvarb max	INT32	x1000, kvar	▪	▪	▪
1436	RO	kvarc max	INT32	x1000, kvar	▪	▪	▪
1438	RO	∑kvar max	INT32	x1000, kvar	▪	▪	▪
1440	RO	kVAa max	INT32	x1000, kVA	▪	▪	▪
1442	RO	kVAb max	INT32	x1000, kVA	▪	▪	▪
1444	RO	kVAc max	INT32	x1000, kVA	▪	▪	▪
1446	RO	∑kVA max	INT32	x1000, kVA	▪	▪	▪
1448	RO	P.F.a max	INT32	x1000	▪	▪	▪
1450	RO	P.F.b max	INT32	x1000	▪	▪	▪
1452	RO	P.F.c max	INT32	x1000	▪	▪	▪
1454	RO	∑P.F. max	INT32	x1000	▪	▪	▪
1456	RO	FREQ max	INT32	x100, Hz	▪	▪	▪
1458	RO	V Unbalance max	INT32	x1000	▪	▪	▪
1460	RO	I Unbalance max	INT32	x1000	▪	▪	▪
1462	RO	Va THD max	INT32	x10000	▪	▪	▪
1464	RO	Vb THD max	INT32	x10000	▪	▪	▪
1466	RO	Vc THD max	INT32	x10000	▪	▪	▪
1468	RO	Ia THD max	INT32	x10000	▪	▪	▪
1470	RO	Ib THD max	INT32	x10000	▪	▪	▪
1472	RO	Ic THD max	INT32	x10000	▪	▪	▪

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
1600	RO	Va min	INT32	x100, V	▪	▪	▪
1602	RO	Vb min	INT32	x100, V	▪	▪	▪
1604	RO	Vc min	INT32	x100, V	▪	▪	▪
1606	RO	VLN average min	INT32	x100, V	▪	▪	▪
1608	RO	Vab min	INT32	x100, V	▪	▪	▪
1610	RO	Vbc min	INT32	x100, V	▪	▪	▪
1612	RO	Vca min	INT32	x100, V	▪	▪	▪
1614	RO	VLL average min	INT32	x100, V	▪	▪	▪
1616	RO	Ia min	INT32	x1000, A	▪	▪	▪
1618	RO	Ib min	INT32	x1000, A	▪	▪	▪
1620	RO	Ic min	INT32	x1000, A	▪	▪	▪
1622	RO	I average min	INT32	x1000, A	▪	▪	▪
1624	RO	kWa min	INT32	x1000, kW	▪	▪	▪
1626	RO	kWb min	INT32	x1000, kW	▪	▪	▪
1628	RO	kWc min	INT32	x1000, kW	▪	▪	▪
1630	RO	∑kW min	INT32	x1000, kW	▪	▪	▪
1632	RO	kvara min	INT32	x1000, kvar	▪	▪	▪
1634	RO	kvarb min	INT32	x1000, kvar	▪	▪	▪
1636	RO	kvarc min	INT32	x1000, kvar	▪	▪	▪
1638	RO	∑kvar min	INT32	x1000, kvar	▪	▪	▪

1640	RO	kVAa min	INT32	x1000, kVA	▪	▪	▪
1642	RO	kVAb min	INT32	x1000, kVA	▪	▪	▪
1644	RO	kVAc min	INT32	x1000, kVA	▪	▪	▪
1646	RO	∑kVA min	INT32	x1000, kVA	▪	▪	▪
1648	RO	P.F.a min	INT32	x1000	▪	▪	▪
1650	RO	P.F.b min	INT32	x1000	▪	▪	▪
1652	RO	P.F.c min	INT32	x1000	▪	▪	▪
1654	RO	∑P.F. min	INT32	x1000	▪	▪	▪
1656	RO	FREQ min	INT32	x100, Hz	▪	▪	▪
1658	RO	V Unbalance min	INT32	x1000	▪	▪	▪
1660	RO	I Unbalance min	INT32	x1000	▪	▪	▪
1662	RO	Va THD min	INT32	x10000	▪	▪	▪
1664	RO	Vb THD min	INT32	x10000	▪	▪	▪
1666	RO	Vc THD min	INT32	x10000	▪	▪	▪
1668	RO	Ia THD min	INT32	x10000	▪	▪	▪
1670	RO	Ib THD min	INT32	x10000	▪	▪	▪
1672	RO	Ic THD min	INT32	x10000	▪	▪	▪

Table 5-7 Max/Min Value per Demand Period

5.7 Peak Demand Log

The Peak Demand data is 1000 times the actual value. For example, if the register# 1815 contains a value of 5005, the actual Ia Peak Demand value is 5.005A.

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
1800-1804	RO	∑kW Peak Demand of This Month	Table 5-24 Peak Demand Data Structure	x1000, kW	▪	▪	▪
1805-1809	RO	∑kvar Peak Demand of This Month		x1000, kvar	▪	▪	▪
1810-1814	RO	∑kVA Peak Demand of This Month		x1000, kVA	▪	▪	▪
1815-1819	RO	Ia Peak Demand of This Month		x1000, A	▪	▪	▪
1820-1824	RO	Ib Peak Demand of This Month		x1000, A	▪	▪	▪
1825-1829	RO	Ic Peak Demand of This Month		x1000, A	▪	▪	▪
Register	**Property**	**Description**	**Format**	**Scale/Unit**	**PMC-630**		
					A	**B**	**C**
1850-1854	RO	∑kW Peak Demand of Last Month	Table 5-24 Peak Demand Data Structure	x1000, kW	▪	▪	▪
1855-1859	RO	∑kvar Peak Demand of Last Month		x1000, kvar	▪	▪	▪
1860-1864	RO	∑kVA Peak Demand of Last Month		x1000, kVA	▪	▪	▪
1865-1869	RO	Ia Peak Demand of Last Month		x1000, A	▪	▪	▪
1870-1874	RO	Ib Peak Demand of Last Month		x1000, A	▪	▪	▪
1875-1879	RO	Ic Peak Demand of Last Month		x1000, A	▪	▪	▪

Table 5-8 Peak Demand

5.8 Max/Min Log

5.8.1 Max Log of This Month

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
2000-2004	RO	Va max	Table 5-25 Max-Min-LOG Data Structure	x100, V	▪	▪	▪
2005-2009	RO	Vb max		x100, V	▪	▪	▪
2010-2014	RO	Vc max		x100, V	▪	▪	▪
2015-2019	RO	VLN average max		x100, V	▪	▪	▪
2020-2024	RO	Vab max		x100, V	▪	▪	▪
2025-2029	RO	Vbc max		x100, V	▪	▪	▪
2030-2034	RO	Vca max		x100, V	▪	▪	▪
2035-2039	RO	VLL average max		x100, V	▪	▪	▪
2040-2044	RO	Ia max		x1000, A	▪	▪	▪
2045-2049	RO	Ib max		x1000, A	▪	▪	▪
2050-2054	RO	Ic max		x1000, A	▪	▪	▪
2055-2059	RO	I average max		x1000, A	▪	▪	▪
2060-2064	RO	kWa max		x1000, kW	▪	▪	▪
2065-2069	RO	kWb max		x1000, kW	▪	▪	▪
2070-2074	RO	kWc max		x1000, kW	▪	▪	▪
2075-2079	RO	∑kW max		x1000, kW	▪	▪	▪
2080-2084	RO	kvara max		x1000, kvar	▪	▪	▪
2085-2089	RO	kvarb max		x1000, kvar	▪	▪	▪
2090-2094	RO	kvarc max		x1000, kvar	▪	▪	▪
2095-2099	RO	∑kvar max		x1000, kvar	▪	▪	▪
2100-2104	RO	kVAa max		x1000, kVA	▪	▪	▪
2105-2109	RO	kVAb max		x1000, kVA	▪	▪	▪
2110-2114	RO	kVAc max		x1000, kVA	▪	▪	▪
2115-2119	RO	∑kVA max		x1000, kVA	▪	▪	▪
2120-2124	RO	P.F.a max		x1000	▪	▪	▪
2125-2129	RO	P.F.b max		x1000	▪	▪	▪
2130-2134	RO	P.F.c max		x1000	▪	▪	▪
2135-2139	RO	∑P.F. max		x1000	▪	▪	▪
2140-2144	RO	FREQ max		x100, Hz	▪	▪	▪
2145-2149	RO	V Unbalance max		x1000	▪	▪	▪
2150-2154	RO	I Unbalance max		x1000	▪	▪	▪
2155-2159	RO	Va THD max		x10000	▪	▪	▪
2160-2164	RO	Vb THD max		x10000	▪	▪	▪
2165-2169	RO	Vc THD max		x10000	▪	▪	▪
2170-2174	RO	Ia THD max		x10000	▪	▪	▪
2175-2179	RO	Ib THD max		x10000	▪	▪	▪
2180-2184	RO	Ic THD max		x10000	▪	▪	▪

Table 5-9 Max Log of This Month

5.8.2 Min Log of This Month

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
2300-2304	RO	Va min	Table 5-25 Max-Min-LOG Data Structure	x100, V	▪	▪	▪
2305-2309	RO	Vb min		x100, V	▪	▪	▪
2310-2314	RO	Vc min		x100, V	▪	▪	▪
2315-2319	RO	VLN average min		x100, V	▪	▪	▪
2320-2324	RO	Vab min		x100, V	▪	▪	▪
2325-2329	RO	Vbc min		x100, V	▪	▪	▪
2330-2334	RO	Vca min		x100, V	▪	▪	▪
2335-2347	RO	VLL average min		x100, V	▪	▪	▪
2340-2344	RO	Ia min		x1000, A	▪	▪	▪
2345-2349	RO	Ib min		x1000, A	▪	▪	▪
2350-2354	RO	Ic min		x1000, A	▪	▪	▪
2355-2359	RO	I average min		x1000, A	▪	▪	▪
2360-2364	RO	kWa min		x1000, kW	▪	▪	▪
2365-2369	RO	kWb min		x1000, kW	▪	▪	▪
2370-2374	RO	kWc min		x1000, kW	▪	▪	▪
2375-2379	RO	∑kW min		x1000, kW	▪	▪	▪
2380-2384	RO	kvara min		x1000, kvar	▪	▪	▪
2385-2389	RO	kvarb min		x1000, kvar	▪	▪	▪
2390-2394	RO	kvarc min		x1000, kvar	▪	▪	▪
2395-2399	RO	∑kvar min		x1000, kvar	▪	▪	▪
2400-2404	RO	kVAa min		x1000, kVA	▪	▪	▪
2405-2409	RO	kVAb min		x1000, kVA	▪	▪	▪
2410-2414	RO	kVAc min		x1000, kVA	▪	▪	▪
2415-2419	RO	∑kVA min		x1000, kVA	▪	▪	▪
2420-2424	RO	P.F.a min		x1000	▪	▪	▪
2425-2429	RO	P.F.b min		x1000	▪	▪	▪
2430-2434	RO	P.F.c min		x1000	▪	▪	▪
2435-2439	RO	∑P.F. min		x1000	▪	▪	▪
2440-2444	RO	FREQ min		x100, Hz	▪	▪	▪
2445-2449	RO	V Unbalance min		x1000	▪	▪	▪
2450-2454	RO	I Unbalance min		x1000	▪	▪	▪
2455-2459	RO	Va THD min		x10000	▪	▪	▪
2460-2464	RO	Vb THD min		x10000	▪	▪	▪
2465-2469	RO	Vc THD min		x10000	▪	▪	▪
2470-2474	RO	Ia THD min		x10000	▪	▪	▪
2475-2479	RO	Ib THD max		x10000	▪	▪	▪
2480-2484	RO	Ic THD max		x10000	▪	▪	▪

Table 5-10 Min Log of This Month

5.8.3 Max Log of Last Month

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
2600-2604	RO	Va max	Table 5-25 Max-Min-LOG Data Structure	x100, V	▪	▪	▪
2605-2609	RO	Vb max		x100, V	▪	▪	▪
2610-2614	RO	Vc max		x100, V	▪	▪	▪
2615-2619	RO	VLN average max		x100, V	▪	▪	▪
2620-2624	RO	Vab max		x100, V	▪	▪	▪
2625-2629	RO	Vbc max		x100, V	▪	▪	▪
2630-2634	RO	Vca max		x100, V	▪	▪	▪
2635-2639	RO	VLL average max		x100, V	▪	▪	▪
2640-2644	RO	Ia max		x1000, A	▪	▪	▪
2645-2649	RO	Ib max		x1000, A	▪	▪	▪
2650-2654	RO	Ic max		x1000, A	▪	▪	▪
2655-2659	RO	I average max		x1000, A	▪	▪	▪
2660-2664	RO	kWa max		x1000, kW	▪	▪	▪
2665-2669	RO	kWb max		x1000, kW	▪	▪	▪
2670-2674	RO	kWc max		x1000, kW	▪	▪	▪
2675-2679	RO	∑kW max		x1000, kW	▪	▪	▪
2680-2684	RO	kvara max		x1000, kvar	▪	▪	▪
2685-2689	RO	kvarb max		x1000, kvar	▪	▪	▪
2690-2694	RO	kvarc max		x1000, kvar	▪	▪	▪
2695-2699	RO	∑kvar max		x1000, kvar	▪	▪	▪
2700-2704	RO	kVAa max		x1000, kVA	▪	▪	▪
2705-2709	RO	kVAb max		x1000, kVA	▪	▪	▪
2710-2714	RO	kVAc max		x1000, kVA	▪	▪	▪
2715-2719	RO	∑kVA max		x1000, kVA	▪	▪	▪
2720-2724	RO	P.F.a max		x1000	▪	▪	▪
2725-2729	RO	P.F.b max		x1000	▪	▪	▪
2730-2734	RO	P.F.c max		x1000	▪	▪	▪
2735-2739	RO	∑P.F. max		x1000	▪	▪	▪
2740-2744	RO	FREQ max		x100, Hz	▪	▪	▪
2745-2749	RO	V Unbalance max		x1000	▪	▪	▪
2750-2754	RO	I Unbalance max		x1000	▪	▪	▪
2755-2759	RO	Va THD max		x10000	▪	▪	▪
2760-2764	RO	Vb THD max		x10000	▪	▪	▪
2765-2769	RO	Vc THD max		x10000	▪	▪	▪
2770-2774	RO	Ia THD max		x10000	▪	▪	▪
2775-2779	RO	Ib THD max		x10000	▪	▪	▪
2780-2784	RO	Ic THD max		x10000	▪	▪	▪

Table 5-11 Max Log of Last Month

5.8.4 Min Log of Last Month

Register	Property	Description	Format	Scale/Unit	PMC-630		
					A	B	C
2900-2904	RO	Va min	Table 5-25 Max-Min-LOG Data Structure	x100, V	▪	▪	▪
2905-2909	RO	Vb min		x100, V	▪	▪	▪
2910-2914	RO	Vc min		x100, V	▪	▪	▪
2915-2919	RO	VLN average min		x100, V	▪	▪	▪
2920-2924	RO	Vab min		x100, V	▪	▪	▪
2925-2929	RO	Vbc min		x100, V	▪	▪	▪
2930-2934	RO	Vca min		x100, V	▪	▪	▪
2935-2939	RO	VLL average min		x100, V	▪	▪	▪
2940-2944	RO	Ia min		x1000, A	▪	▪	▪
2945-2949	RO	Ib min		x1000, A	▪	▪	▪
2950-2954	RO	Ic min		x1000, A	▪	▪	▪
2955-2959	RO	I average min		x1000, A	▪	▪	▪
2960-2964	RO	kWa min		x1000, kW	▪	▪	▪
2965-2969	RO	kWb min		x1000, kW	▪	▪	▪
2970-2974	RO	kWc min		x1000, kW	▪	▪	▪
2975-2979	RO	∑kW min		x1000, kW	▪	▪	▪
2980-2984	RO	kvara min		x1000, kvar	▪	▪	▪
2985-2989	RO	kvarb min		x1000, kvar	▪	▪	▪
2990-2994	RO	kvarc min		x1000, kvar	▪	▪	▪
2995-2999	RO	∑kvar min		x1000, kvar	▪	▪	▪
3000-3004	RO	kVAa min		x1000, kVA	▪	▪	▪
3005-3009	RO	kVAb min		x1000, kVA	▪	▪	▪
3010-3014	RO	kVAc min		x1000, kVA	▪	▪	▪
3015-3019	RO	∑kVA min		x1000, kVA	▪	▪	▪
3020-3024	RO	P.F.a min		x1000	▪	▪	▪
3025-3029	RO	P.F.b min		x1000	▪	▪	▪
3030-3034	RO	P.F.c min		x1000	▪	▪	▪
3035-3039	RO	∑P.F. min		x1000	▪	▪	▪
3040-3044	RO	FREQ min		x100, Hz	▪	▪	▪
3045-3049	RO	V Unbalance min		x1000	▪	▪	▪
3050-3054	RO	I Unbalance min		x1000	▪	▪	▪
3055-3059	RO	Va THD min		x10000	▪	▪	▪
3060-3064	RO	Vb THD min		x10000	▪	▪	▪
3065-3069	RO	Vc THD min		x10000	▪	▪	▪
3070-3074	RO	Ia THD min		x10000	▪	▪	▪
3075-3079	RO	Ib THD min		x10000	▪	▪	▪
3080-3084	RO	Ic THD min		x10000	▪	▪	▪

Table 5-12 Min Log of Last Month

5.9 Setup Parameters

Register	Property	Description	Format	Range/Options	PMC-630		
					A	B	C
6000	RW	PT Ratio[1]	UINT16	1* to 2200	▪	▪	▪
6001	RW	CT Ratio[1]	UINT16	1* to 6000 (5A input) 1* to 30000 (1A input)	▪	▪	▪
6002	RW	Wiring Mode	UINT16	0=WYE* 1=DELTA 2=DEMO	▪	▪	▪
6003	RW	Port 1 Unit ID	UINT16	1 to 247 (Default = 100)	▪	▪	▪
6004	RW	Port 1 Baud rate	UINT16	0=1200 1=2400 2=4800 3=9600* 4=19200	▪	▪	▪
6005	RW	Port 1 Configuration	UINT16	0=8N2 1=8O1 2=8E1* 3=8N1 4=8O2 5=8E2	▪	▪	▪
6006	RW	Port 2 Unit ID	UINT16	1 to 247 (Default = 101)	▪	▪	▪
6007	RW	Port 2 Baud rate	UINT16	0=1200 1=2400 2=4800 3=9600* 4=19200	▪	▪	▪
6008	RW	Port 2 Configuration	UINT16	0=8N2 1=8O1 2=8E1* 3=8N1 4=8O2 5=8E2	▪	▪	▪
6009-6013	RW	Reserved	UINT32		▪	▪	▪
6015	RW	Power Factor Convention	UINT16	0=IEC* 1=IEEE 2=-IEEE	▪	▪	▪
6016	RW	kVA Calculation	UINT16	0=Vector* 1=Scalar	▪	▪	▪
6017	RW	Ia Polarity	UINT16	0=Normal* 1=Reverse	▪	▪	▪
6018	RW	Ib Polarity	UINT16		▪	▪	▪

6019	RW	Ic Polarity	UINT16		▪	▪	▪
6020	RW	Demand Period	UINT16	1, 2, 3, 5, 10, 15*, 30, 60 (minutes)	▪	▪	▪
6021	RW	Number of Sliding Windows	UINT16	1* to 15	▪	▪	▪
6022	RW	DI1 Function	UINT16	0=Digital Input* 1=Pulse Counter	▪	▪	▪
6023	RW	DI2 Function	UINT16		▪	▪	▪
6024	RW	DI3 Function	UINT16		▪	▪	▪
6025	RW	DI4 Function	UINT16		▪	▪	▪
6026	RW	DI5 Function	UINT16		▪	▪	▪
6027	RW	DI6 Function	UINT16		▪	▪	▪
6028	RW	DI1 Debounce	UINT16	1 to 1000 (ms) (Default=20ms)	▪	▪	▪
6029	RW	DI2 Debounce	UINT16		▪	▪	▪
6030	RW	DI3 Debounce	UINT16		▪	▪	▪
6031	RW	DI4 Debounce	UINT16		▪	▪	▪
6032	RW	DI5 Debounce	UINT16		▪	▪	▪
6033	RW	DI6 Debounce	UINT16		▪	▪	▪
6034	RW	DI1 Pulse Weight	UINT32	1* to 1000000 (x0.001)	▪	▪	▪
6036	RW	DI2 Pulse Weight	UINT32		▪	▪	▪
6038	RW	DI3 Pulse Weight	UINT32		▪	▪	▪
6040	RW	DI4 Pulse Weight	UINT32		▪	▪	▪
6042	RW	DI5 Pulse Weight	UINT32		▪	▪	▪
6044	RW	DI6 Pulse Weight	UINT32		▪	▪	▪
6046	RW	DI1 and DI2 Setpoints	DI Setpoint Data Structure	See Section 5.17.3 Digital Input Setpoint Data Structure (Default = 0)	▪	▪	▪
6047	RW	DI3 and DI4 Setpoints			▪	▪	▪
6048	RW	DI5 and DI6 Setpoints			▪	▪	▪
6049	RW	DO1 Pulse Width	UINT16	0 to 6000 (x0.1s) 0 = Latch Mode (Default = 10)	▪	▪	▪
6050	RW	DO2 Pulse Width	UINT16		▪	▪	▪
6051	RW	DO3 Pulse Width	UINT16		▪	▪	▪
6052	RW	DO4 Pulse Width	UINT16		▪	▪	▪
6053	RW	AI Type	UINT16	0=4-20mA* 1= 0-20mA	▪	▪	▪
6054	RW	AI Zero scale	INT32	-999,999 to +999,999 (Default = 0)	▪	▪	▪
6056	RW	AI Full scale	INT32	-999,999 to +999,999 (Default = 0)	▪	▪	▪
6058	RW	AO Type	UINT16	0=4-20mA* 1=0-20mA	▪	▪	▪
6059	RW	AO Key[2]	UINT16	Table 5-14 AO Parameters (Default=Vab)	▪	▪	▪

6060	RW	AO Zero scale	INT32	-999,999 to +999,999 (Default = 0)	▪	▪	▪
6062	RW	AO Full scale	INT32	-999,999 to +999,999 (Default = 0)	▪	▪	▪
6064-6067	RW	I residual ALARM	I residual Setpoint Data Structure	See 5.17.4 I residual Setpoint Data Structure	▪	▪	▪
6068-6071	RW	I residual TRIP			▪	▪	▪
6072-6080	RW	Setpoint #1	Setpoint Data Structure	See Section 5.17.5 Control Setpoint Data Structure	▪	▪	▪
6081-6089	RW	Setpoint #2			▪	▪	▪
6090-6098	RW	Setpoint #3			▪	▪	▪
6099-6107	RW	Setpoint #4			▪	▪	▪
6108-6116	RW	Setpoint #5			▪	▪	▪
6117-6125	RW	Setpoint #6			▪	▪	▪
6126-6134	RW	Setpoint #7			▪	▪	▪
6135-6143	RW	Setpoint #8			▪	▪	▪
6144-6152	RW	Setpoint #9			▪	▪	▪
6153	RW	TOU Season 2 Start Day	UINT16	See Section 5.17.6 TOU Profile Data Structure		▪	▪
6154	RW	TOU Season 3 Start Day	UINT16			▪	▪
6155	RW	TOU Season 4 Start Day	UINT16			▪	▪
6156	RW	TOU Season 5 Start Day	UINT16			▪	▪
6157	RW	TOU Season 6 Start Day	UINT16			▪	▪
6158-6176	RW	TOU Season 1 Profile Periods	TOU Profile Data Structure			▪	▪
6177-6195	RW	TOU Season 2 Profile Periods				▪	▪
6196-6214	RW	TOU Season 3 Profile Periods				▪	▪
6215-6233	RW	TOU Season 4 Profile Periods				▪	▪
6234-6252	RW	TOU Season 5 Profile Periods				▪	▪
6253-6271	RW	TOU Season 6 Profile Periods				▪	▪
6272	RW	Enable Energy Pulse	UINT16	0=Disabled* 1=Enable	▪	▪	▪
6273	RW	Pulse Constant (Available in Firmware Version V2.00.xx or later)	UINT16	0=1000 imp/kxh* 1=3200 imp/kxh 2=5000 imp/kxh 3=6400 imp/kxh 4=12800 imp/kxh	▪	▪	▪
6274	RW	Self-Read Time[3]	UINT16	(Default = 0)	▪	▪	▪
6275	RW	DI Setpoint for	UINT16	Bits 0 to 5 represent the			▪

		Waveform Recording		Enable bit for DI1 to DI6 Setpoints for triggering Waveform Recording where 0=Disabled and 1=Enabled. Bits 6-15 are reserved. (Default = 0)			
6276	RW	Enable Transient Voltage and Current Setpoints Trigger for Waveform Recording	UINT16	0=Disabled* 1=Enabled			▪
6277	RW	Transient Current Setpoint Limit	UINT16	Range: 10-100 (%In) (Default = 20)			▪
6278	RW	Transient Voltage Setpoint Limit	UINT16	Range: 5 to 50 (%Vn) (Default = 10)			▪
6279-6289		Reserved					▪
6290	WO	Clear Energy	UINT16	Writing “0xFF00” to the register clears all energy registers	▪	▪	▪
6291	WO	Clear SOE	UINT16	Writing “0xFF00” to the register clears the SOE Log	▪	▪	▪
6292	WO	Clear Peak Demand of This Month	UINT16	Writing”0XFF00” to the register clears the Peak Demand of This Month.	▪	▪	▪
6293	WO	Clear Max/Min Log of This Month	UINT16	Writing “0xFF00” to the register clears the Max/Min Log of This Month	▪	▪	▪
6294	WO	Waveform Capture Trigger	UINT16	0=Va 1=Ia 2=Vb 3=Ib 4=Vc 5=Ic			▪
6295	WO	Manual Waveform Recording Trigger	UINT16	Writing ”0xFF00” triggers Waveform Recording			▪
6296	WO	Clear Counter #1 (DI1)	UINT16	Writing “0xFF00” to the register clears DI Counter register	▪	▪	▪
6297	WO	Clear Counter #2 (DI1)	UINT16		▪	▪	▪
6298	WO	Clear Counter #3 (DI1)	UINT16		▪	▪	▪
		……			▪	▪	▪
6301	WO	Clear Counter 16 (DI1)	UINT16		▪	▪	▪
6302	WO	Clear DR #1	UINT16	Writing “0xFF00” to the register clears the Data Recorder		▪	▪
6303	WO	Clear DR #2	UINT16			▪	▪
		……				▪	▪

6317	WO	Clear DR #16	UINT16			■	■
6318-6329		Reserved					

* Default

Table 5-13 Setup Parameters

Notes:

1) PT Ratio × CT Ratio × Rated Phase Voltage Input × Rated Current input x √3 must be less than 790,000,000.

2) Analog Output Parameters

   If **∑PF** is chosen as the AO parameter, the values for **ZERO** (zero scale) and **FULL** (full scale) should be set as 1000 times the actual value.

   If **FREQ** is chosen as the AO parameter, the values should be set as 100 times the actual values.

   The Units for voltage, current, kW, kvar, kVA and FREQ are V, A, kW, kvar, kVA and Hz, respectively.

Key	0	1	2	3	4	5	6	7
Parameter	Vab	Vbc	Vca	VLL avg	Ia	Ib	Ic	I avg
Key	8	9	10	11	12	13	14	15
Parameter	kWa	kWb	kWc	∑kW	kvara	kvarb	kvarc	∑kvar
Key	16	17	18	19	20	21		
Parameter	kVAa	kVAb	kVAc	∑kVA	∑PF	FREQ		

Table 5-14 Analog Output Parameters

3) The Self-Read Time is applicable to Peak Demand Log and Max/Min log.

   There are two types of Self-Read Time. The value 0 indicates that the transfer will happen at 00:00 of the first day of every month. A non-zero value indicates that the transfer will happen at a specific time based on the formula [Hour+Day*100] where 0≤Hour≤23 and 1≤Day≤28.

   For example, the value 1512 means that the Peak Demand of Current Month will be transferred to the Peak Demand of Last Month register at 12:00pm on the 15th day of each month.

5.10 Data Recorder Setup Parameters (PMC-630B and PMC-630C)

Register	Property	Description	Format
7000-7022	RW	Data Recorder #1	See Table 5-16 DR Setup Parameters Data Structure
7023-7045	RW	Data Recorder #2	
7046-7068	RW	Data Recorder #3	
7069-7091	RW	Data Recorder #4	
7092-7114	RW	Data Recorder #5	
7115-7137	RW	Data Recorder #6	
7138-7160	RW	Data Recorder #7	
7161-7183	RW	Data Recorder #8	
7184-7206	RW	Data Recorder #9	
7207-7229	RW	Data Recorder #10	
7230-7252	RW	Data Recorder #11	

7253-7275	RW	Data Recorder #12	
7276-7298	RW	Data Recorder #13	
7299-7321	RW	Data Recorder #14	
7322-7344	RW	Data Recorder #15	
7345-7367	RW	Data Recorder #16	

Table 5-15 Data Recorder Setup Parameters

The following table shows the data structure for the Data Recorder Setup Parameters:

Offset	Property	Description	Format	Range/Options
+0	RW	Triggered Mode[1,6]	UINT16	0=Disabled 1=Triggered by Timer 2=Triggered by Setpoint
+1	RW	Recording Depth[2,6]	UINT16	0 to 65535
+2	RW	Recording Interval[6]	UINT32	1 to 345600 (seconds)
+4	RW	Recording Offset[3,6]	UINT32	0 to 43200 (seconds)
+6	RW	Number of Parameters[4,6]	UINT16	0 to 16
+7	RW	Parameter 1[5]	UINT16	0 to 169
+8	RW	Parameter 2[5]	UINT16	0 to 169
+9	RW	Parameter 3[5]	UINT16	0 to 169
+10	RW	Parameter 4[5]	UINT16	0 to 169
+11	RW	Parameter 5[5]	UINT16	0 to 169
+12	RW	Parameter 6[5]	UINT16	0 to 169
+13	RW	Parameter 7[5]	UINT16	0 to 169
+14	RW	Parameter 8[5]	UINT16	0 to 169
+15	RW	Parameter 9[5]	UINT16	0 to 169
+16	RW	Parameter 10[5]	UINT16	0 to 169
+17	RW	Parameter 11[5]	UINT16	0 to 169
+18	RW	Parameter 12[5]	UINT16	0 to 169
+19	RW	Parameter 13[5]	UINT16	0 to 169
+20	RW	Parameter 14[5]	UINT16	0 to 169
+21	RW	Parameter 15[5]	UINT16	0 to 169
+22	RW	Parameter 16[5]	UINT16	0 to 169

Table 5-16 DR Setup Parameters Data Structure

Notes:

1) The Data Recorder can be triggered by Setpoints (**Triggered by Setpoint**), or on a time basis using the meter clock (**Triggered by Timer**).

   For **Triggered by Setpoint**, the Data Recorder starts recording when the setpoint becomes active and stops when the Setpoint becomes inactive.

2) If the "**Recording Depth**" is set to "**0**", the Data Recorder will be disabled.

3) The **Recording Offset** parameter can be used to delay the recording by a fixed time from the **Recording Interval**. For example, if the **Recording Interval** parameter is set to 3600

(hourly) and the **Recording Offset** parameter is set to 300 (5 minutes), the recording will take place at 5 minutes after the hour every hour, i.e. 00:05, 01:05, 02:05…etc. The programmed value of the **Recording Offset** parameter should be less than that of the **Recording Interval** parameter.

4) If the "**Number of parameters**" is set to "**0**", the Data Recorder will be disabled.

5) The Data Recorder can record any one of the 169 parameters documented in **Appendix A Data Recorder Parameters**.

6) Modifying the any setup parameters will clear the DRx Log. The Pointer of DRx will be reset to "0".

5.11 Waveform Recorder Log (PMC-630C only)

Each Waveform Recorder Log occupies 1170 registers and contains the recording for 3-phase Voltages and Currents (Va, Vb, Vc, Ia, Ib and Ic) with 16 samples/cycle for 12 cycles. Each channel occupies 16x12=192 registers.

The WF data contains the secondary side value. The Voltage data returned is 10 times of the actual secondary Voltage and the Current data is 1000 times of the actual secondary Current. Therefore, the primary side Voltage and Current values are calculated using the following formulas:

Primary Voltage Value = Voltage Data × PT Ratio ÷ 10

Primary Current Value = Current Data × CT Ratio ÷ 1000

Register	Property	Description	Format
11000	RO	Waveform Recorder Log #1	See section 5.17.8 Waveform Recorder Data Structure
12170	RO	Waveform Recorder Log #2	
13340	RO	Waveform Recorder Log #3	

Table 5-17 Waveform Recorder Log

5.12 Waveform Capture Log (PMC-630C only)

The Waveform Capture Log provides high resolution recording of a single Voltage or Current channel with 128 samples/cycle for 1 cycle. The WF data contains the secondary side value. The Voltage data is 10 times of the actual secondary Voltage, and the Current data is 1000 times of the actual secondary Current. Therefore, the primary side Voltage and Current values are calculated using the following formulas:

Primary Voltage Value = Voltage data × PT Ratio ÷ 10

Primary Current Value = Current data × CT Ratio ÷ 1000

Register	Property	Description	Format	Note
8000	RO	Channel	UINT16	0:Va(Delta:Vab) 1:Ia 2:Vb(Delta:Vbc) 3:Ib 4:Vc(Delta:Vca) 5:Ic

8001	RO	Trigger Type	UINT16	0:Manual
8002	RO	Time of first sample in UNIX Time (s)	UINT32	Waveform Capture Start Time
8004	RO	Time of first sample in millisecond (ms)	UINT16	
8005	RO	1st sample value	INT16	
8006	RO	2nd sample value	INT16	
……		……	INT16	
8132	RO	128th sample value	INT16	

Table 5-18 Waveform Capture Log

5.13 SOE Log

The SOE Pointer points to the register address within the SOE Log where the next event will be stored. The following formula is used to determine the register address of the most recent SOE event referenced by the SOE Pointer value:

Register Address = 10000 + Modulo(SOE Pointer-1/64)*8

Register	Property	Description	Format	PMC-630		
				A	B	C
10000 - 10007	RO	Event 1	See Section 5.17.9 SOE LOG Data Structure	▪	▪	▪
10008 - 10015	RO	Event 2		▪	▪	▪
10016 - 10023	RO	Event 3		▪	▪	▪
10024 - 10031	RO	Event 4		▪	▪	▪
10032 - 10039	RO	Event 5		▪	▪	▪
10040 - 10047	RO	Event 6		▪	▪	▪
10048 - 10055	RO	Event 7		▪	▪	▪
10056 - 10063	RO	Event 8		▪	▪	▪
10064 - 10071	RO	Event 9		▪	▪	▪
10072 - 10079	RO	Event 10		▪	▪	▪
10080 - 10087	RO	Event 11		▪	▪	▪
10088 - 10195	RO	Event 12		▪	▪	▪
……				▪	▪	▪
10504 - 10511	RO	Event 64		▪	▪	▪

Table 5-19 SOE Log

5.14 Time

There are two sets of Time registers supported by the PMC-630 - Year/Month/Day/Hour/Minute/Second (Register # 9000 to 9002) and UNIX Time (Register # 9004). When sending time to the PMC-630 over Modbus communications, care should be taken to only write one of the two Time register sets. All registers within a Time register set must be written in a single transaction. If registers 9000 to 9004 are being written to at the same time, both Time register sets will be updated to reflect the new time specified in the UNIX Time register set (Register # 9004) and the time specified in registers 9000-9002 will be ignored. Writing to the Millisecond register

(Register # 9003) is optional during a Time Set operation. When broadcasting time, the function code must be set to 0x10 (Pre-set Multiple Registers). Incorrect date or time values will be rejected by the meter.

Register	Property	Description	Format	Note
9000	RW	High-order Byte: Year	UINT16	1 to 99 (Year-2000)
		Low-order Byte: Month		1 to 12
9001	RW	High-order Byte: Day	UINT16	1 to 28/29/30/31
		Low-order Byte: Hour		0 to 23
9002	RW	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59
9003	RW	Millisecond	UINT16	0 to 999
9004	RW	UINX Time	UINT32	(0 to 4102444799) This time shows the number of seconds since 00:00:00 January 1, 1970

Table 5-20 Time Registers

5.15 DO Control

The DO Control registers are implemented as "Write-Only" Modbus Coil Registers (0XXXXX) and can be controlled with the Force Single Coil command (Function Code 0x05). The PMC-630 does not support the Read Coils command (Function Code 0x01) because DO Control registers are "Write-Only". Register 0081 (DO Status) should be read instead to determine the current DO status.

The PMC-630 adopts the ARM before EXECUTE operation for the remote control of its Digital Outputs. Before executing an OPEN or CLOSE command on a Digital Output, it must be "Armed" first. This is achieved by writing the value 0xFF00 to the appropriate register to "Arm" a particular DO operation. The DO will be "Disarmed" automatically if an "Execute" command is not received within 15 seconds after it has been "Armed". If an "Execute" command is received without first having received an "Arm" command, the meter ignores the "Execute" command and returns the 0x04 exception code.

Register	Property	Description	Format	Note
9100	WO	Arm DO1 Close	UINT16	Writing "0xFF00"
9101	WO	Execute DO1 Close	UINT16	Writing "0xFF00"
9102	WO	Arm DO1 Open	UINT16	Writing "0xFF00"
9103	WO	Execute DO1 Open	UINT16	Writing "0xFF00"
9104	WO	Arm DO2 Close	UINT16	Writing "0xFF00"
9105	WO	Execute DO2 Close	UINT16	Writing "0xFF00"
9106	WO	Arm DO2 Open	UINT16	Writing "0xFF00"
9107	WO	Execute DO2 Open	UINT16	Writing "0xFF00"
9108	WO	Arm DO3 Close	UINT16	Writing "0xFF00"
9109	WO	Execute DO3 Close	UINT16	Writing "0xFF00"

9110	WO	Arm DO3 Open	UINT16	Writing “0xFF00”
9111	WO	Execute DO3 Open	UINT16	Writing “0xFF00”
9112	WO	Arm DO4 Close	UINT16	Writing “0xFF00”
9113	WO	Execute DO4 Close	UINT16	Writing “0xFF00”
9114	WO	Arm DO4 Open	UINT16	Writing “0xFF00”
9115	WO	Execute DO4 Open	UINT16	Writing “0xFF00”
9116-9164		Reserved		
9165	WO	Reset of I residual ALARM	UINT16	Writing “0xFF00”

Table 5-21 DO Control

5.16 Meter Information

Register	Property	Description	Format	Note
9800 - 9819	RO	Meter Model[1]	UINT16	PMC-630A/B/C
9820	RO	Firmware Version	UINT16	e.g. 10000 shows the version is V1.00.00
9821	RO	Protocol Version	UINT16	e.g. 40 shows the version is V4.0
9822	RO	Firmware Update Date: Year-2000	UINT16	e.g. 080709 means July 9, 2008
9823	RO	Firmware Update Date: Month	UINT16	
9824	RO	Firmware Update Date: Day	UINT16	
9825	RO	Serial Number	UINT32	e.g. 0908471895 means that this meter was the 1895th meter manufactured in Lot 47 of August 2009
9827 - 9828	RO	Reserved	UINT16	
9829	RO	Feature Code	UINT16	B1B0: 00: 6 DI and 2 DO 01: 6 DI and 4 DO 10: 0 DI and 0 DO 11: reserved
				B7: 0: 0 AO 1: 1 AO
				B10: 0: No Pulse Output 1: Pulse Output
				B11: 0: No AI 1: 1 AI

				B12: 0: No Ir 1: 1 Ir
				Other bits are reserved.
9830	RO	Current configuration	UINT16	1, 5 (A)
9831	RO	Voltage configuration	UINT16	120*, 415*, 690* (V)

* Available in Firmware Version V2.0x.03

Table 5-22 Meter Information

Note:

1) The Meter Model appears in registers 9800 to 9819 and contains the ASCII encoding of the string “PMC-630A” as shown in the following table.

Register	Value(Hex)	ANSCII
9800	0x50	P
9801	0x4D	M
9802	0x43	C
9803	0x2D	-
9804	0x36	6
9805	0x33	3
9806	0x30	0
9807	0x41	A
9808-9819	0x20	<Null>

Table 5-23 ASCII Encoding of “PMC-630A”

5.17 Data Format

5.17.1 Peak Demand Data Structure

Offset	Property	Description	Format	Note
+0	RO	Peak Demand	INT32	/
+2	RO	High-order Byte: Year	UINT16	1 to 99 (Year-2000)
		Low-order Byte: Month		1 to 12
+3	RO	High-order Byte: Day	UINT16	1 to 28/29/30/31
		Low-order Byte: Hour		0 to 23
+4	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59

Table 5-24 Peak Demand Data Structure

5.17.2 Max/Min Data Structure

Offset	Property	Description	Format	Note
+0	RO	Max/Min Value	INT32	/
+2	RO	High-order Byte: Year	UINT16	1 to 99 (Year-2000)
		Low-order Byte: Month		1 to 12
+3	RO	High-order Byte: Day	UINT16	1 to 28/29/30/31
		Low-order Byte: Hour		0 to 23
+4	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59

Table 5-25 Max-Min-LOG Data Structure

5.17.3 Digital Input Setpoint Data Structure

		DI2					DI1			
Bit	**12-15**	**11**	**10**	**9**	**8**	**4-7**	**3**	**2**	**1**	**0**
Trigger DO	Reserved	DO4	DO3	DO2	DO1	Reserved	DO4	DO3	DO2	DO1

Table 5-26 Register 6046

		DI4					DI3			
Bit	**12-15**	**11**	**10**	**9**	**8**	**4-7**	**3**	**2**	**1**	**0**
Trigger DO	Reserved	DO4	DO3	DO2	DO1	Reserved	DO4	DO3	DO2	DO1

Table 5-27 Register 6047

		DI4					DI3			
Bit	**12-15**	**11**	**10**	**9**	**8**	**4-7**	**3**	**2**	**1**	**0**
Trigger DO	Reserved	DO4	DO3	DO2	DO1	Reserved	DO4	DO3	DO2	DO1

Table 5-28 Register 6048

For example, if register 6046 contains a value of 0x050A, it means that the DI1 is programmed to trigger DO2 and DO4 when it becomes active and DI2 is programmed to trigger DO1 and DO3. When DI1 closes, DO2 and DO4 will operate. When DI1 opens, then DO2 and DO4 will release. Similarly, when DI2 closes, DO1 and DO3 will operate. When DI2 opens, DO1 and DO3 will release.

5.17.4 I residual Setpoint Data Structure

Offset	Format	Description	
		I residual ALARM	**I residual TRIP**
+0	UINT16	0 = Disabled 1 = Enabled + SOE 2 = Enabled + SOE + DO1	0 = Disabled 1 = Enabled + SOE + DO2

+1	UINT32	**I residual Setpoint Limit** Range: 2000 to 100000 (in 0.01 mA steps) The Setpoint Limit is 100 times the actual value. For example, if the Setpoint Limit is 18,000, the actual setpoint value is 180mA.
+3	UINT16	**I residual Setpoint Delay** Range: 0 to 600 (in 0.1s steps) The actual range is 0.0 to 60.0 seconds. For example, if the delay time is 1s, the Setpoint Delay should be programmed as 1s / 0.1s = 10.

Table 5-29 I residual Setpoint Data Structure

5.17.5 Control Setpoint Data Structure

Offset	Property	Description	Format	Range/Options
+0	RW	Type	UINT16	0=Disabled 1=Over Setpoint 2=Under Setpoint
+1	RW	Paramenter[1]	UINT16	1 to 16
+2	RW	Active Limit	INT32	/
+4	RW	Inactive Limit	INT32	/
+6	RW	Active Delay	UINT16	0 to 9999 (second)
+7	RW	Inactive Delay	UINT16	0 to 9999 (second)
+8	RW	Trigger	UINT16	0 to 21

Table 5-30 Setpoint Data Structure

Notes:

1) "**Parameter**" specifies the parameter to be monitored. Table 5-31 below provides a list of Setpoint Parameters.

Key	Parameter	Scale/Unit
0	None	/
1	VLN	x100, V
2	VLL	x100, V
3	I	x1000, A
4	∑kW	x1000, kW
5	∑kvar	x1000, kvar
6	∑P.F.	x1000
7	V THD	x10000
8	I THD	x10000
9	V TEHD	x10000
10	I TEHD	x10000
11	V TOHD	x10000
12	I TOHD	x10000
13	∑kW Demand	x1000, kW
14	∑kvar Demand	x1000, kvar
15	∑kVA Demand	x1000, kVA
16	I avg Demand	x1000, A

Table 5-31 Setpoint Parameters

2) "**Trigger**" specifies what action the setpoint will take when it becomes active. Table 5-32 below provides a list of Setpoint Triggers.

Key	Action	Key	Action
0	None	**11**	Data Recorder #6
1	DO1	**12**	Data Recorder #7
2	DO2	**13**	Data Recorder #8
3	DO3	**14**	Data Recorder #9
4	DO4	**15**	Data Recorder #10
5	Waveform Recording	**16**	Data Recorder #11
6	Data Recorder #1	**17**	Data Recorder #12
7	Data Recorder #2	**18**	Data Recorder #13
8	Data Recorder #3	**19**	Data Recorder #14
8	Data Recorder #4	**20**	Data Recorder #15
10	Data Recorder #5	**21**	Data Recorder #16

Table 5-32 Setpoint Triggers

5.17.6 TOU Profile Data Structure

The TOU feature supports 4 Tariff Rates, 6 Seasons, 1 Daily Profile with 10 Profile Periods. The user can define the Start Day for each Season within a year and the Profile Periods in 15-minute steps within a day. All days within a Season have the same Daily Profiles. All registers within the TOU Profile Data Structure are required to be written in a single transaction with Function Code 0x10 (Preset Multiple Registers).

- **Tariff Rate:**

  There are four tariff rates – Tariff A, Tariff B, Tariff C and Tariff D. The tariff rates can be applied to any time period.

- **Season X Start Day:**

  There is no Season 1 **Start Day** because Season 1 always starts on the first day of the year. Only the **Start Days** for Seasons 2 to 6 need to be programmed. For the PMC-630, a year consists of 366 days to account for the leap year. February is presumed to always have 29 days. For example, if the Season 2 **Start Day** is on March 1st, it should be programmed as 31+29+1 = 61. The Season X **Start Day** should always be greater than the Season X-1 **Start Day**. If the TOU has only 4 seasons, the Season 5 and 6 **Start Days** should be programmed with the value 366.

- **Season X Daily Profile Periods:**

  There are 10 Profile Periods within the Daily Profile. The Profile **Period Start Time** is programmed with values between 1 to 96 in 15-minute steps. There is no Profile **Period 1 Start Time** because it always starts at 00:00. Only Profile **Period Start Times** 2 to 10 need to be programmed. The Profile **Period Start Time** X should always be greater than the Profile **Period Start Time** X-1. If a Daily Profile has only 5 Profile Periods, the Profile **Period Start Times** 6 to 10 should be programmed with the value 96.

Offset	Format	Description	Range/Option
+0	UINT16	Profile Period 2 Start Time	1 to 96
+1	UINT16	Profile Period 3 Start Time	
+2	UINT16	Profile Period 4 Start Time	
+3	UINT16	Profile Period 5 Start Time	
+4	UINT16	Profile Period 6 Start Time	
+5	UINT16	Profile Period 7 Start Time	
+6	UINT16	Profile Period 8 Start Time	
+7	UINT16	Profile Period 9 Start Time	
+8	UINT16	Profile Period 10 Start Time	
+9	UINT16	Profile Period 1 Tariff Rate	0= Tariff A 1= Tariff B 2= Tariff C 3= Tariff D
+10	UINT16	Profile Period 2 Tariff Rate	
+11	UINT16	Profile Period 3 Tariff Rate	
+12	UINT16	Profile Period 4 Tariff Rate	
+13	UINT16	Profile Period 5 Tariff Rate	
+14	UINT16	Profile Period 6 Tariff Rate	
+15	UINT16	Profile Period 7 Tariff Rate	
+16	UINT16	Profile Period 8 Tariff Rate	
+17	UINT16	Profile Period 9 Tariff Rate	
+18	UINT16	Profile Period 10 Tariff Rate	

Table 5-33 TOU Profile Data Structure

5.17.7 Data Recorder Log Data Structure

Offset	Property	Description	Format	Note
+0	RO	Parameter 1	INT32	/
+2	RO	Parameter 2	INT32	/
……	RO	……	INT32	/
Nx2	RO	Parameter N (N=1 to 16)	INT32	/
Nx2+1	RO	High-order Byte: Year	UINT16	1 to 99 (Year-2000)
		Low-order Byte: Month		1 to 12
Nx2+2	RO	High-order Byte: Day	UINT16	1 to 28/29/30/31
		Low-order Byte: Hour		0 to 23
Nx2+3	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59

Table 5-34 DR Data Structure

5.17.8 Waveform Recorder Data Structure

Offset	Description	Format	Note
+0	Trigger Type	UINT16	1=Manual Trigger 2=DI1 3=DI2 4=DI3 5=DI4 6=Setpoint #1 7=Setpoint #2 8=Setpoint #3 9=Setpoint #4 10=Setpoint #5 11=Setpoint #6 12=Setpoint #7 13=Setpoint #8 14=Setpoint #9 17=Va Transient Setpoint 18=Ia Transient Setpoint 19=Vb Transient Setpoint 20=Ib Transient Setpoint 21=Vc Transient Setpoint 22=Ic Transient Setpoint 23=DI5 24=DI6
+1	UNIX Time(s)	UINT32	Waveform Recorder Start Time
+3	Millisecond(ms)	UINT16	
+4	Va WF (Delta:Vab)	INT16	12 cycles, 16 samples per cycle
+196	Ia WF	INT16	12 cycles, 16 samples per cycle
+388	Vb WF (Delta:Vbc)	INT16	12 cycles, 16 samples per cycle
+580	Ib WF	INT16	12 cycles, 16 samples per cycle
+772	Vc WF (Delta:Vca)	INT16	12 cycles, 16 samples per cycle
+964	Ic WF	INT16	12 cycles, 16 samples per cycle
+1156	Reserved		
…….	Reserved		
+1169	Reserved		

Table 5-35 Waveform Recorder Data Structure

5.17.9 SOE Log Data Structure

Offset	Properties	Description
+0	RO	Reserved
+1	RO	High-order Byte: Event Classification[1]
		Low-order Byte: Sub-Classification[1]
+2	RO	High-order Byte: Year (Year-2000)
		Low-order Byte: Month (0 to 12)

+3	RO	High-order Byte: Day (0-31)
		Low-order Byte: Hour (0 to 23)
+4	RO	High-order Byte: Minute (0 to 59)
		Low-order Byte: Second (0 to 59)
+5	RO	Millisecond (0 to 999)
+6	RO	Event Value High-order Word
+7	RO	Event Value Low-order Word

Table 5-36 SOE Log Data Structure

Notes:

1) Please see **Appendix B - Event Classification** for more information.

Revision History

Revision	Date	Description
3.0A	20120611	First Edition

Appendix A - Data Recorder Parameters

Key	Parameters	Scale/Unit	Key	Parameters	Scale/Unit
0	None	/	1	Va	x100, V
2	Vb	x100, V	3	Vc	x100, V
4	VLN average	x100, V	5	Vab	x100, V
6	Vbc	x100, V	7	Vca	x100, V
8	VLL average	x100, V	9	Ia	x1000, A
10	Ib	x1000, A	11	Ic	x1000, A
12	I average	x1000, A	13	kWa	x1000, kW
14	kWb	x1000, kW	15	kWc	x1000, kW
16	∑kW	x1000, kW	17	kvara	x1000, kvar
18	kvarb	x1000, kvar	19	kvarc	x1000, kvar
20	∑kvar	x1000, kvar	21	kVAa	x1000, kVA
22	kVAb	x1000, kVA	23	kVAc	x1000, kVA
24	∑kVA	x1000, kVA	25	P.F.a	x1000
26	P.F.b	x1000	27	P.F.c	x1000
28	∑P.F.	x1000	29	kWh Import	kWh
30	kWh Export	kWh	31	kWh Total	kWh
32	kvarh Import	kvarh	33	kvarh Export	kvarh
34	kvarh Total	kvarh	35	Interval kWh Import	kWh
36	Interval kWh Export	kWh	37	Interval kvarh Import	kvarh
38	Interval kvarh Import	Kvarh	39	Interval kVAh Total	kVAh
40	Va Demand	x100, V	41	Vb Demand	x100, V
42	Vc Demand	x100, V	43	VLN avg. Demand	x100, V
44	Vab Demand	x100, V	45	Vbc Demand	x100, V
46	Vca Demand	x100, V	47	VLL avg. Demand	x100, V
48	Ia Demand	x1000, A	49	Ib Demand	x1000, A
50	Ic Demand	x1000, A	51	I avg. Demand	x1000, A
52	kWa Demand	kWh	53	kWb Demand	kWh
54	kWc Demand	kWh	55	∑kW Demand	kWh
56	kvara Demand	kvarh	57	kvarb Demand	kvarh
58	kvarc Demand	kvarh	59	∑kvar Demand	kvarh
60	kVAa Demand	kVAh	61	kVAb Demand	kVAh
62	kVAc Demand	kVAh	63	∑kVA Demand	kVAh
64	P.F.a Demand	x1000	65	P.F.b Demand	x1000
66	P.F.c Demand	x1000	67	∑P.F. Demand	x1000
68	FREQ Demand	x100, Hz	69	U Unbalance Demand	x1000
70	I Unbalance Demand	x1000	71	Va THD Demand	x10000
72	Vb THD Demand	x10000	73	Vc THD Demand	x10000
74	Ia THD Demand	x10000	75	Ib THD Demand	x10000
76	Ic THD Demand	x10000	77	Va max per Demand Period	x100, V

78	Vb max per Demand Period	x100, V	**79**	Vc max per Demand Period	x100, V
80	VLN avg. max Per Demand Period	x100, V	**81**	Vab max per Demand Period	x100, V
82	Vbc max per Demand Period	x100, V	**83**	Vca max per Demand Period	x100, V
84	VLL avg. max per Demand Period	x100, V	**85**	Ia max per Demand Period	x1000, A
86	Ib max per Demand Period	x1000, A	**87**	Ic max per Demand Period	x1000, A
88	I avg. max Per Demand Period	x1000, A	**89**	kWa max per Demand Period	kWh
90	kWb max per Demand Period	kWh	**91**	kWc max per Demand Period	kWh
92	∑kW max per Demand Period	kWh	**93**	kvara max per Demand Period	kvar
94	kvarb max per Demand Period	kvar	**95**	kvarc max per Demand Period	kvar
96	∑kvar max per Demand Period	kvar	**97**	kVAa max per Demand Period	kVA
98	kVAb max per Demand Period	kVA	**99**	kVAc max per Demand Period	kVA
100	∑kVA max per Demand Period	kVA	**101**	P.F.a max per Demand Period	x1000
102	P.F.b max per Demand Period	x1000	**103**	P.F.c max per Demand Period	x1000
104	∑P.F. max per Demand Period	x1000	**105**	FREQmax per Demand Period	x100, Hz
106	U Unbalance max Per Demand Period	x1000	**107**	I Unbalance max Per Demand Period	x1000
108	Va THD max per Demand Period	x10000	**109**	Vb THD max per Demand Period	x10000
110	Vc THD max per Demand Period	x10000	**111**	Ia THD max per Demand Period	x10000
112	Ib THD max per Demand Period	x10000	**113**	Ic THD max per Demand Period	x10000
114	Va min per Demand Period	x100, V	**115**	Vb min per Demand Period	x100, V
116	Vc min per Demand Period	x100, V	**117**	VLN avg. min Per Demand Period	x100, V
118	Vab min per Demand Period	x100, V	**119**	Vbc min per Demand Period	x100, V
120	Vca min per Demand Period	x100, V	**121**	VLL avg. min Per Demand Period	x100, V

122	Ia min per Demand Period	x1000, A	**123**	Ib min per Demand Period	x1000, A
124	Ic min per Demand Period	x1000, A	**125**	I avg. min per Demand Period	x1000, A
126	kWa min per Demand Period	kW	**127**	kWb min per Demand Period	kW
128	kWc min per Demand Period	kW	**129**	∑kW min per Demand Period	kW
130	kvara min per Demand Period	kvar	**131**	kvarb min per Demand Period	kvar
132	kvarc min per Demand Period	kvar	**133**	∑kvar min per Demand Period	kvar
134	kVAa min per Demand Period	kVA	**135**	kVAb min per Demand Period	kVA
136	kVAc min per Demand Period	kVA	**137**	∑kVA min per Demand Period	kVA
138	P.F.a min per Demand Period	x1000	**139**	P.F.b min per Demand Period	x1000
140	P.F.c min per Demand Period	x1000	**141**	∑P.F. min per Demand Period	x1000
142	FREQ min Per Demand Period	x100, Hz	**143**	U Unbalance min per Demand Period	x1000
144	I Unbalance per Demand Period	x1000	**145**	Va THD min per Demand Period	x10000
146	Vb THD min per Demand Period	x10000	**147**	Vc THD min per Demand Period	x10000
148	Ia THD min per Demand Period	x10000	**149**	Ib THD min per Demand Period	x10000
150	Ic THD min per Demand Period	x10000	**151**	Va THD	x10000
152	Vb THD	x10000	**153**	Vc THD	x10000
154	Va TEHD	x10000	**155**	Vb TEHD	x10000
156	Vc TEHD	x10000	**157**	Va TOHD	x10000
158	Vb TOHD	x10000	**159**	Vc TOHD	x10000
160	Ia THD	x10000	**161**	Ib THD	x10000
162	Ic THD	x10000	**163**	Ia TEHD	x10000
164	Ib TEHD	x10000	**165**	Ic TEHD	x10000
166	Ia TOHD	x10000	**167**	Ib TOHD	x10000
168	Ic TOHD	x10000	**169**	AI	x100

Appendix B - Event Classification

Event Classification	Sub-Classification	Event Value Scale/Option	Description
1	1	1/0	DI1 Close/DI1 Open
	2	1/0	DI2 Close/DI2 Open
	3	1/0	DI3 Close/DI3 Open
	4	1/0	DI4 Close/DI4 Open
	5	1/0	DI5 Close/DI5 Open
	6	1/0	DI6 Close/DI6 Open
2	1	1/0	DO1 Operated/Released by Remote Control
	2	1/0	DO2 Operated/Released by Remote Control
	3	1/0	DO3 Operated/Released by Remote Control
	4	1/0	DO4 Operated/Released by Remote Control
	5	1/0	DO1 Operated/Released by Setpoint
	6	1/0	DO2 Operated/Released by Setpoint
	7	1/0	DO3 Operated/Released by Setpoint
	8	1/0	DO4 Operated/Released by Setpoint
	9	1/0	DO1 Operated/Released by Front Panel
	10	1/0	DO2 Operated/Released by Front Panel
	11	1/0	DO3 Operated/Released by Front Panel
	12	1/0	DO4 Operated/Released by Front Panel
	13	1/0	DO1 Operated/Released by I residual ALARM
	14	1/0	DO2 Operated/Released by I residual TRIP
	15	1/0	DO1 Operated/Released by DI Setpoint
	16	1/0	DO2 Operated/Released by DI Setpoint
	17	1/0	DO3 Operated/Released by DI Setpoint
	18	1/0	DO4 Operated/Released by DI Setpoint
3	1	Trigger Value (x100)	Over VLN Setpoint Active
	2	Trigger Value (x100)	Over VLL Setpoint Active
	3	Trigger Value (x1000)	Over Current Setpoint Active
	4	Trigger Value	Over ∑kW Setpoint Active
	5	Trigger Value	Over ∑kvar Setpoint Active
	6	Trigger Value (x1000)	Over ∑P.F. Setpoint Active
	7	Trigger Value (x10000)	Over Voltage THD Setpoint Active
	8	Trigger Value (x10000)	Over Current THD Setpoint Active
	9	Trigger Value	Over Voltage TEHD Setpoint Active

		(x10000)	
	10	Trigger Value (x10000)	Over Current TEHD Setpoint Active
	11	Trigger Value (x10000)	Over Voltage TOHD Setpoint Active
	12	Trigger Value (x10000)	Over Current TOHD Setpoint Active
	13	Trigger Value (x1000)	Over ∑kW Demand Setpoint Active
	14	Trigger Value (x1000)	Over ∑kvar Demand Setpoint Active
	15	Trigger Value (x1000)	Over ∑kVA Demand Setpoint Active
	16	Trigger Value (x1000)	Over I Demand Setpoint Active
	17	Return Value (x100)	Over VLN Setpoint Return
	18	Return Value (x100)	Over VLL Setpoint Return
	19	Return Value (x1000)	Over Current Setpoint Return
	20	Return Value	Over ∑kW Setpoint Return
	21	Return Value	Over ∑kvar Setpoint Return
	22	Return Value (x1000)	Over ∑P.F. Setpoint Return
	23	Return Value (x10000)	Over Voltage THD Setpoint Return
	24	Return Value (x10000)	Over Current THD Setpoint Return
	25	Return Value (x10000)	Over Voltage TEHD Setpoint Return
	26	Return Value (x10000)	Over Current TEHD Setpoint Return
	27	Return Value (x10000)	Over Voltage TOHD Setpoint Return
	28	Return Value (x10000)	Over Current TOHD Setpoint Return
	29	Return Value (x1000)	Over ∑kW Demand Setpoint Return
	30	Return Value (x1000)	Over ∑kvar Demand Setpoint Return
	31	Return Value (x1000)	Over ∑kVA Demand Setpoint Return

	32	Return Value (x1000)	Over I Demand Setpoint Return
	33	Trigger Value (x100)	Under VLN Setpoint Active
	34	Trigger Value (x100)	Under VLL Setpoint Active
	35	Trigger Value (x1000)	Under Current Setpoint Active
	36	Trigger Value	Under ∑kW Setpoint Active
	37	Trigger Value	Under ∑kvar Setpoint Active
	38	Trigger Value (x1000)	Under ∑P.F. Setpoint Active
	39	Trigger Value (x10000)	Under Voltage THD Setpoint Active
	40	Trigger Value (x10000)	Under Current THD Setpoint Active
	41	Trigger Value (x10000)	Under Voltage TEHD Setpoint Active
	42	Trigger Value (x10000)	Under Current TEHD Setpoint Active
	43	Trigger Value (x10000)	Under Voltage TOHD Setpoint Active
	44	Trigger Value (x10000)	Under Current TOHD Setpoint Active
	45	Trigger Value (x1000)	Under ∑kW Demand Setpoint Active
	46	Trigger Value (x1000)	Under ∑kvar Demand Setpoint Active
	47	Trigger Value (x1000)	Under ∑kVA Demand Setpoint Active
	48	Trigger Value (x1000)	Under I Demand Setpoint Active
	49	Return Value (x100)	Under VLN Setpoint Return
	50	Return Value (x100)	Under VLL Setpoint Return
	51	Return Value (x1000)	Under Current Setpoint Return
	52	Return Value	Under ∑kW Setpoint Return
	53	Return Value	Under ∑kvar Setpoint Return
	54	Return Value (x1000)	Under ∑P.F. Setpoint Return
	55	Return Value	Under Voltage THD Setpoint Return

		(x10000)	
	56	Return Value (x10000)	Under Current THD Setpoint Return
	57	Return Value (x10000)	Under Voltage TEHD Setpoint Return
	58	Return Value (x10000)	Under Current TEHD Setpoint Return
	59	Return Value (x10000)	Under Voltage TOHD Setpoint Return
	60	Return Value (x10000)	Under Current TOHD Setpoint Return
	61	Return Value (x1000)	Under ∑kW Demand Setpoint Return
	62	Return Value (x1000)	Under ∑kvar Demand Setpoint Return
	63	Return Value (x1000)	Under ∑kVA Demand Setpoint Return
	64	Return Value (x1000)	Under I Demand Setpoint Return
	65	Bit 31*	DO(s) Triggered by DI Setpoint 1=Close 0=Open
		Bits 16 to 30	Specify the DI that triggered the DO(s) 1=DI1 2=DI2 3=DI3 4=DI4 5=DI5 6-DI6
		Bits 4 to 15	Reserved
		Bits 0 to 3	Indicate which DO(s) are triggered by the specified DI Bit 0 = DO1 Bit 1 = DO2 Bit 2 = DO3 Bit 3 = DO4
	66	Trigger Value (x100)	I residual ALARM Active
	67	Trigger Value (x100)	I residual TRIP Active
	68	Return Value (x100)	I residual ALARM Return
	69	Return Value (x100)	I residual TRIP Return
4	1	0	Power On

	2	0	Power Off
	3	0	Setup Changes via Front Panel
	4	0	Setup Changes via Communications
	5	0	Clear DI Counter Communications
	6	0	Clear SOE via Front Panel
	7	0	Clear SOE via Communications
	8	0	Clear Energy via Front Panel
	9	0	Clear Energy via Communications
	10	0	Clear Peak Demand of This Month via Front Panel
	11	0	Clear Peak Demand of This Month via Communications
	12	0	Clear Max/Min Log of This Month via Front Panel
	13	0	Clear Max/Min Log of This Month via Communications
	14	N (1 to 16)	Clear Data Recorder #N via Communications
5	1	0	Va WF Capture
	2	0	Ia WF Capture
	3	0	Vb WF Capture
	4	0	Ib WF Capture
	5	0	Vc WF Capture
	6	0	Ic WF Capture
6	1	0	WF Recording Triggered by Remote Control
	2	0	WF Recording Triggered by DI1
	3	0	WF Recording Triggered by DI2
	4	0	WF Recording Triggered by DI3
	5	0	WF Recording Triggered by DI4
	6	0	WF Recording Triggered by DI5
	7	0	WF Recording Triggered by DI6
	8		Reserved
	9		Reserved
	10*	Setpoint # X (X = 1 to 9)	WF Recording Triggered by Setpoint #X
	11	0	WF Recording Triggered by Va (Vab) Transient Setpoint
	12	0	WF Recording Triggered by Ia Transient Setpoint
	13	0	WF Recording Triggered by Vb (Vbc) Transient Setpoint
	14	0	WF Recording Triggered by Ib Transient Setpoint
	15	0	WF Recording Triggered by Vc (Vca) Transient Setpoint
	16	0	WF Recording Triggered by Ic Transient Setpoint
	17*	Setpoint # X (X = 1 to 9)	Data Recording Triggered by Setpoint #X

* Available in Firmware Version V2.0x.03 or later

Appendix C - Technical Specifications

Voltage Inputs (V1, V2, V3, VN)	
Standard (Un)	240VLN/415VLL
Optional (Un)	69VLN/120VLL, 400VLN/690VLL
Range	10% to 120% Un
PT Ratio	1-2200
Overload	1.2xUn continuous, 2xUn for 10s
Burden	<0.5VA @ 240V
Frequency	45-65Hz
Current Inputs (I11, I12, I21, I22, I31, I32)	
Standard (In/Imax)	5A / 10A
Optional (In/Imax)	1A / 2A
Range	0.1% Imax to 120% Imax
CT Ratio	1-6,000 (5A), 1-30,000 (1A)
Overload	2xIn continuous, 20xIn for 1s
Burden	<0.25VA @ 5A
Power Supply (L+, N-)	
Standard	95-250VAC/DC ± 10%, 47-440Hz
Burden	< 4W
Digital Inputs (DI1, DI2, DI3, DI4, DI5, DI6, DIC)	
Type	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Debounce	1-1,000ms programmable
Digital Outputs (DO11, DO12, DO21, DO22, DO3, M34, DO4)	
Type	Form A Mechanical Relay
Loading	8A@250VAC / 8A@24VDC, 5A@30VDC for DO1 5A@250VAC / 5A@30VDC for DO2, DO3 and DO4
Pulse Outputs (kWh, kvarh)	
Type	Form A Solid State Relay
Isolation	Optical
Max. Load Voltage	80V
Max. Forward Current	50mA
Pulse Constant	1000/3200/5000/6400/12800 imp/kxh
I residual Input (I41, I42)	
Nominal Input	1V
Range	1% to 120% Nominal
Analog Input (I41, I42)	
Type	0-20 / 4-20mA DC
Overload	24mA
Analog Output (AO+, AO-)	
Type	0-20 / 4-20mA DC
Loading	500Ω maximum
Overload	24mA maximum
I residual CT (Zero-sequence CT)	

Nominal Current	1A
Output	1V
Overload	1.2A
Accuracy	1%
Frequency	50/60Hz
Line Length	4000mm
Dielectric Strength	2.5kV @ 1 minute
I residual CT Models	PMC-MIR-35, PMC-MIR-50, PMC-MIR-75, PMC-MIR-120
Environmental conditions	
Operating Temp.	-25°C to +70°C
Storage Temp.	-40°C to +85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	70 kPa to 106 kPa
Pollution Degree	2
Measurement Category	CAT III
Mechanical Characteristics	
Enclosure	Aluminum Alloy
Panel Cutout	92x92mm (3.62''x3.62'')
Unit Dimensions	96x96x125mm (3.78''x3.78''x4.92'')
Shipping Dimensions	170x145x155mm (6.69''x5.71''x6.10'')
Shipping Weight	1.0kg
IP Rating	52

Accuracy

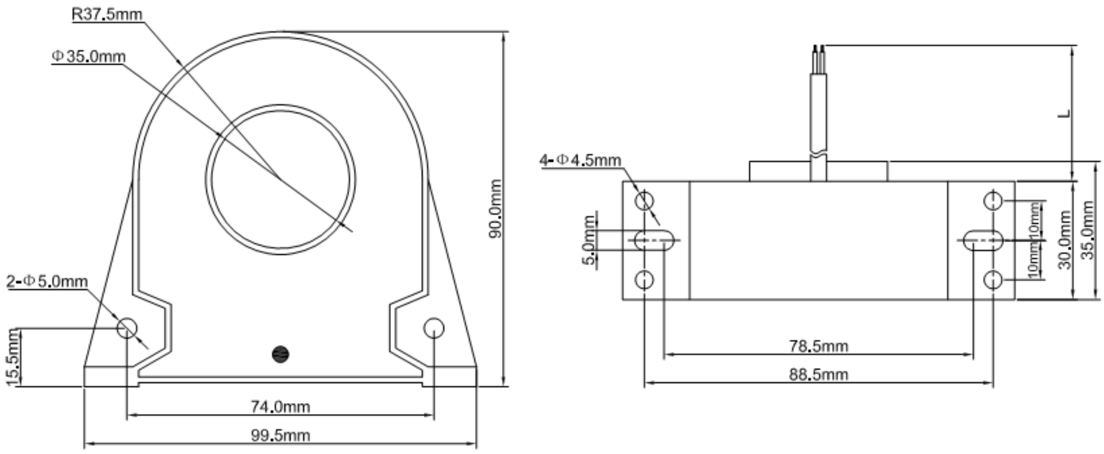
Parameters	Accuracy	Resolution
Voltage	±0.2% reading	0.01V
Current	±0.2% reading + 0.05%FS	0.001A
I4 Calculated	1.0% F.S.	0.001A
kW, kVA	IEC 62053-22 Class 0.5S	0.001k
kWh, kVAh	IEC 62053-22 Class 0.5S	0.01kXh
kvar, kvarh	IEC 62053-23 Class 2	0.001k / 0.01kvarh
P.F.	IEC 62053-22 Class 0.5S	0.001
Frequency	±0.02 Hz	0.01Hz
Harmonics	IEC 61000-4-7 Class B	0.01%
K-Factor	IEC 61000-4-7 Class B	0.1
Phase angles	±1°	0.1°
I residual	±1% F.S.	0.01mA
AI	±1% F.S.	-
AO	±1% F.S.	-

Appendix D - Residual Current Sensor

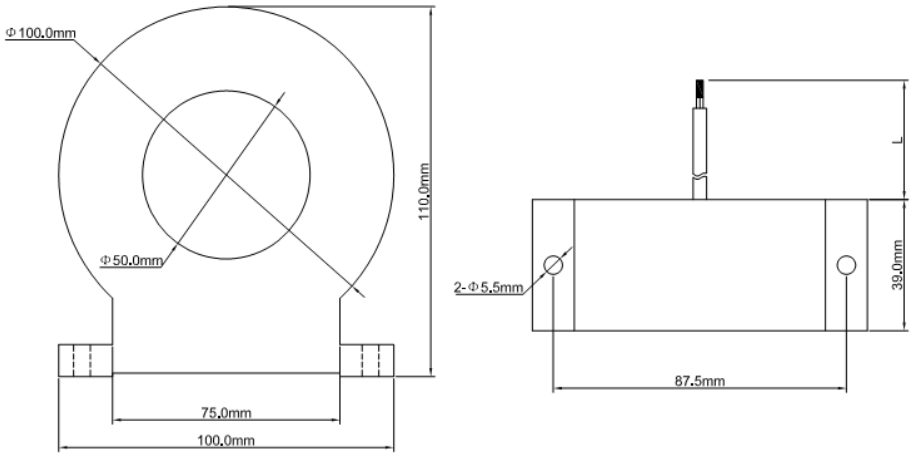
Ordering Guide

Model	Diameter of cable hole	Range of Phase current	Weight
PMC-MIR-35	35mm	0A to 63A	<400g
PMC-MIR-50	50mm	63A to 125A	<800g
PMC-MIR-75	75mm	125A to 250A	<1200g
PMC-MIR-120	120mm	250A to 1000A	<1500g
Technical Specification			
Primary current		1A (r.m.s)	
Overload		1.2A	
Second Voltage		1V (r.m.s)	
Accuracy		1%	
Frequency		50/60HZ	
Line length		4000mm	
Environmental Condition			
Operation Temperature		-35°C to 65°C	
Storage Temperature		-40°C to 75°C	
Testing			
Dielectric Strength		2.5kV (3mA/1Min)	

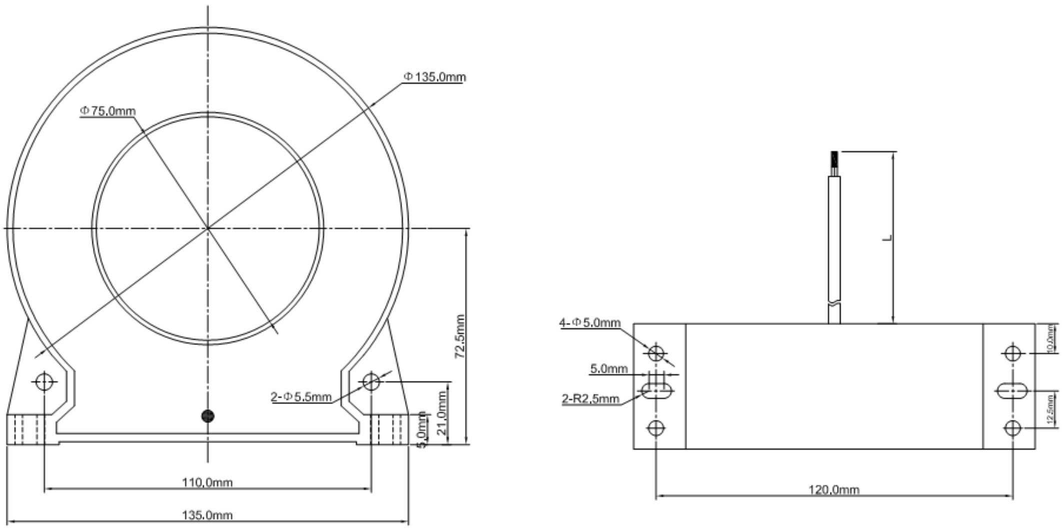
1) PMC-MIR-35, the hole diameter is 35mm



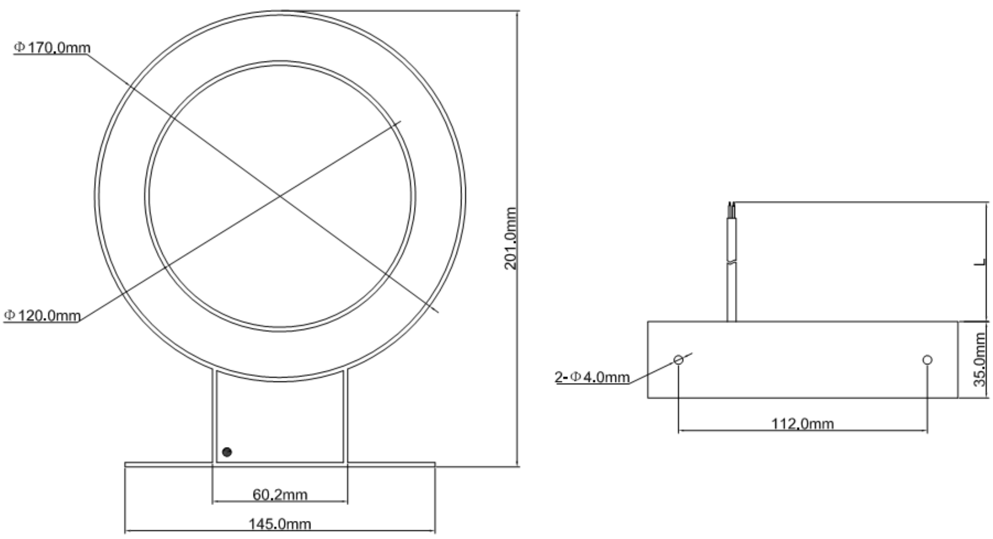
2) PMC-MIR-50, the hole diameter is 50mm



3) PMC-MIR-75, the hole diameter is 75mm



4) PMC-MIR-120, the hole diameter is 120mm



Appendix E - Standards Compliance

Safety Requirements	
LVD Directive 2006/95/EC	EN61010-1-1-2001
Insulation	IEC 60255-5-2000
Dielectric test	2kV @ 1 minute
Insulation resistance	>100MΩ
Impulse voltage	5kV, 1.2/50µs
Electromagnetic Compatibility EMC Directive 2004/108/EC (EN 61326: 2006)	
Immunity Tests	
Electrostatic discharge	IEC 61000-4-2: 2008 Level III
Radiated fields	IEC 61000-4-3: 2008 Level III
Fast transients	IEC 61000-4-4: 2004 Level IV
Surges	IEC 61000-4-5: 2005 Level IV
Conducted disturbances	IEC 61000-4-6: 2008 Level III
Magnetic Fields	IEC 61000-4-8: 2009 Level IV
Oscillatory waves	IEC 61000-4-12: 2006 Level III
Electromagnetic Emission	IEC 60255-25: 2000
Emission Tests	
Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment	EN 55011: 2009 (CISPR 11)
Limits and methods of measurement of radio disturbance characteristics of information technology equipment	EN 55022: 2006+A1: 2007 (CISPR 22)
Limits for harmonic current emissions for equipment with rated current ≤16 A	EN 61000-3-2: 2006+A1: 2009
Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16 A	EN 61000-3-3: 2006
Emission standard for residential, commercial and light-industrial environments	EN 61000-6-3: 2007
Electromagnetic Emission Tests for Measuring Relays and Protection Equipment	IEC 60255-25: 2000

Mechanical Tests		
Vibration Test	Response	IEC 60255-21-1:1998 Level I
	Endurance	IEC 60255-21-1:1998 Level I
Shock Test	Response	IEC 60255-21-2:1998 Level I
	Endurance	IEC 60255-21-2:1998 Level I
Bump Test		IEC 60255-21-2:1998 Level I

CE

Appendix F - Ordering Guide

Ceiec Electric Technology

Version 20111231

Product Code	Description
PMC-630 Series Advanced Multifunction Meter	
Basic Function	
A	Basic model with 3-Phase Metering, Demands, Peak Demands, Min/Max, SOE Log, Ind. Har to 31st
B	Model A + 16 Data Recorders (2MB Memory) + TOU
C	Model B + WF Recording + Transient Detection
Display Screen	
A	Integrated LCD Screen
Input Current	
5	5A
1	1A
Input Voltage	
1	69V/120V
3	240V/415V
9*	400V/690V
Power Supply	
2	95-250VAC/DC, 47-440Hz
System Frequency	
5	50Hz
6	60Hz
DI/DO/AO	
A	6DI + 2DO
B*	6DI + 2DO + 2 SS Pulse Outputs
C*	6DI + 4DO
D*	6DI + 2DO + 1AO (0-20mA or 4-20mA)
AI	
X	No
A*	1 Analog Input (0-20mA or 4-20mA)
B*	I residual Input (0-1V)
Communications	
A	1 RS-485 port
B*	2 RS-485 ports
C*	1 Profibus-DP port (Model A only)[#]

PMC-630	A	-	A	5	3	2	5	A	X	A	**PMC-630A-A5325AXA (Standard Model)**

* Additional charges apply

With Comm. options C, DI/DO/AO options B and C are not available

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