PMC-592

Multi Circuit Power Monitor

User Manual

Version: V1.1

November 21, 2018

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

- CET 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

Glossary

ATS	= Automatic Transfer Switch
CET	= CET Electric Technology
DI	= Digital Input
DMD	= Present Demand
DO	= Digital Output
FIFO	= First In First Out
Fund.	= Fundamental
GB	= Giga Byte
HMI	= Human Machine Interface
Hn	= nth order Harmonic, integer multiple (n) of the Fundamental Frequency (50Hz or 60Hz)
IHn	= nth order Interharmonic represents all components between the (n-1)th and nth harmonic orders in RMS
HDn	= nth order Harmonic Distortion
IHDn	= nth order Interharmonic Distortion
IER	= Interval Energy Recorder
I4	= Zero Sequence Current
LED	= Light Emitting Diode
MB	= Mega Byte
MIB	= Management Information Base
MCPM	= Multi Circuit Power Monitor
MMR	= Max/Min Recorder
MXR	= Max Recorder
NMS	= Network Management System
OID	= Object Identifier
PQ	= Power Quality
RTC	= Real Time Clock
RTD	= Resistance Temperature Detector
SCCT	= Split-core CT
SM	= Sub Meter
SNMP	= Simple Network Management Protocol
SOE	= Sequence Of Events
STS	= Static Transfer Switch
TDD	= Total Demand Distortion
TODD	= Total Odd Demand Distortion
TEDD	= Total Even Demand Distortion
TH	= Total Harmonic in RMS, excluding Fundamental
THD	= Total Harmonic Distortion
TOHD	= Total Odd Harmonic Distortion
TEHD	= Total Even Harmonic Distortion
VM	= Virtual Meter
WF	= Waveform
WFR	= Waveform Recorder
Udin	= Declared input voltage - Value obtained from the declared supply voltage by a transducer ratio
Usr	= Sliding Reference Voltage

Chapter 1 Introduction

This manual explains how to use the PMC-592 MCPM Multi-Circuit Power Monitor.

This chapter provides an overview of the PMC-592 and summarizes many of its key features.

1.1 Overview

The PMC-592 MCPM is the ultimate solution for PDU, LVDB and Load Center application that require multi circuit monitoring. Housed in a compact metal enclosure, the PMC-592 is perfectly suited for applications that require high density metering. The PMC-592 features quality construction with multifunction and high-accuracy measurements, two Mains Inputs (each with 3 Voltage and 4 Current Inputs), up to 84 Branch Circuit Inputs and an optional 7" Touch-Screen HMI. The PMC-592 comes standard with two Digital Inputs or optionally four Digital Inputs for status monitoring, two Relay Outputs for control or alarming as well as two RTD Inputs for temperature measurements. The standard SOE Log records all Setup changes, Setpoint alarms and DI/DO operations in 1ms resolution. With Ethernet and dual RS-485 as standard feature supporting Modbus RTU/TCP as well as SNMP, the PMC-592 becomes a vital component of an intelligent, multifunction monitoring solution for Data Center and Utility applications.

Typical Applications

- Data Center PDUs
- Clean room LVDB (Low-Voltage Distribution Board)
- Load Center Monitoring
- Ring Main Unit Metering
- Motor Control Center metering
- Commercial & Residential LV High-Density Multi-Circuit monitoring

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

- Status LEDs - Run, Fault, P1 and P2 (Comm. Activities)
- Self-Diagnostic function
- Password-protected setup via its built-in Web Interface or optional HMI Display
- Surface Mount

Dual Mains Inputs

- 3-Ø Voltage Inputs for 120VLN/208VLL, 220-240VLN/380-415VLL and 277VLN/480VLL systems
- 4-Ø Current Inputs for 5A or 1A CT, Starting current at 0.3% In

Branch CT Inputs

- 100A Solid-Core CT Strip for new PDU installations
- Optional 5A Solid-Core CT Strip for interfacing with standard external CTs with 5A secondary for LVDB/Load Center applications
- Supported CT Strips include 21x100A, 21x10A, 12x100A or 12x10A
- 100A, 200A, 400A and 800A Split-Core CTs for retrofit applications

Flexible Configuration

- Programmable CT Ratio, CT Polarity, Sub-Meter (SM) Reference Voltage for each SM
- Configurable CT Strip Orientation (Sequential or Crossover) and CT Strip Direction (Top or Bottom)
- Configurable 2-Ø & 3-Ø SM Ordering based on out-of-sequence 1-Ø SM
- Support Single, Dual and Custom Panel Modes
- Programmable Label for Device, Panel, 1-Ø SMs and VMs

Metering

- **Mains Measurements**
  - 2 Mains, each supporting 3 Voltage and 4 Current Inputs
  - ULN and ULL per phase and average
  - I per phase and average, measured Neutral Current (I4)
  - kW, kvar, kVA, PF per phase and total
  - Frequency
  - Loading Factor per phase
  - kWh Import/Export, kvarh Import/Export, kVAh Total
  - Dual Tariff Energy Metering that is switchable by DI Status and provides T1/T2 kWh Import/Export, T1/T2 kvarh Import/Export, T1/T2 kVAh Total in Firmware V1.00.10 or later
- **Branch Circuits Measurements**
  - 21, 42, 63 or 84 Branch Current Inputs
  - I, kW, kvar, kVA, PF, Loading Factor, kWh, kvarh, kVAh per 1-Ø SM

Demand Measurements

- I per phase, kW Total, kvar Total, kVA Total for Mains-I and Mains-II
- I, kW, kvar, kVA per 1-Ø SM and kW Total, kvar Total and kVA total per 2-Ø or 3-Ø SM
- RTD 1 and RTD 2 Temperature Demand in Firmware V1.00.04 or later
- Max Demands with timestamp for Historical, This Month and Last Month

Sub Meters (SM)

- Support configurable 1-Ø, 2-Ø and 3-Ø Sub Meters
- I Average, Loading Factor, kW/kvar/kVA/PF Total, kWh/kvarh Import and kVAh Total
- Demand Values for I Average, kW, kvar and kVA
- Max Demands with timestamp for Historical, This Month and Last Month

Virtual Meters (VM)

- 10 configurable Virtual Meters for arbitrary aggregation from Mains and any of the 84 1-Ø SMs
- Support both Addition and Subtraction
- kW, kWh/kvarh Import and kVAh per VM
- Dual Tariff Energy Metering that is switchable by DI Status and provides T1/T2 kWh, kvarh and kVAh for Main and GenSet Supply

Power Quality Features

- **Mains Inputs**
  - U and I Unbalance based on Sequence Components
  - U and I THD, TOHD, TEHD and Individual harmonics to 31st
  - Current TDD, K-Factor and Crest Factor
  - Dip/Swell and Interruption detection with Waveform Recording
- **Branch Inputs**

- Current THD for each 1-Ø SM

Non-Volatile Memory and Logs

- 1GB On-Board Non-Volatile Memory

Interval Energy Recorder (IER) Log

- Complete energy profiling of Mains-I/II, 1-Ø, 2-Ø and 3-Ø SMs, VMs as well as the Mains-I/II and VMs for Tariffs T1 and T2
- Programmable Interval at 5, 10, 15, 30 or 60 minute intervals
- Fixed Log Depth at 10,000 entries, capable of recording for 3 months @ 15-min interval or 1 year @ 60-min interval

Max/Min Log

- Mains U & I, Frequency, kW, kvar, kVA, Loading Factor, PF, Unbalance, THD, TOHD, TEHD
- 1-Ø SMs: I, kW, kvar, kVA, PF, Loading Factor and I THD
- 2-Ø and 3-Ø SMs: I avg, kW, kvar, kVA, PF and Loading Factor
- RTD1 and RTD2
- Max./Min. Timestamp for Historical, This Month and Last Month

SOE Log

- 1000 FIFO events time-stamped to ±1ms resolution
- Setup changes, Power-On/Off, Alarms, Diagnostics and I/O operations

Data Recorder (DR) Log

- 10 Data Recorders of 64 parameters each for a total of 640 Real-time parameters
- Programmable Log Depth (65535 max.) and Recording Interval (60-345600s)

Waveform Recorder (WFR) Log

- Support up to 16 WFR Log entries
- Record V1-V3 and I1-I3 for both Mains-I and Mains-II
- Programmable resolutions (samples/cycle x # of cycles) at 64x150, 64x75, 32x300, 32x150, 16x600 and 16x300
- Triggered by Dip/Swell and Interruption Setpoints

Alarming

- Support powerful alarming functions for Mains, Branches, RTDs and DIs
- Support High-High, High, Low, Low-Low and OFF Alarms
- Configurable Threshold and Time Delay for each branch
- Support Current, Voltage, Power, PF, Frequency, Unbalance, Harmonic Distortion, Temperature and DI status change Alarms and their respective Alarm Counters
- Support Dip/Swell and Interruption Setpoint Alarms, Phase Reversal Alarm and Phase Loss Alarm since Firmware V1.00.05
- All alarms are recorded in the SOE Log

Inputs and Outputs

- **Digital Inputs**
  - 2 standard or 4 optional* DI channels, volts free dry contact, 24VDC internally wetted
  - Support up to 4 External DI Modules from CET (e.g. PMC-521D) via Port 2 (RS-485)
  - 1000Hz sampling for status monitoring with programmable debounce

- Tariff Switching between T1 and T2~ for Main and GenSet Supply based on the status of a DI

- **Digital Outputs**
  - 2 Channels Form A mechanical relays - 5A @ 250VAC / 30VDC
- **RTD Input#**
  - 2 Channels PT100 (sensor not included)

* Available in Firmware V1.00.08 or later
# Available in Firmware V1.00.04 or later
~ Available in Firmware V1.00.10 or later

Communications

P1/HMI - DB9 Connector*

- Modbus RTU
- Compatible with RS-232/422/485
- 1200 to 38,400 bps

*The P1 connector has been changed from a plug-in terminal to DB9 since Hardware V1.01.00

P2 - RS-485

- Modbus RTU
- Optically isolated
- 1200 to 38,400 bps
- Optional connection with up to 4 external DI Modules from CET since Firmware V1.00.03

P3 - Ethernet Ports

- 10/100BaseT
- Modbus TCP and Modbus RTU over TCP protocols
- HTTP, SMTP, SNTP, SNMP and FTP
- Firmware upgrade via Ethernet port
- Configurable IP Port No. for HTTP, Modbus TCP and RTU over TCP/IP since Firmware V1.00.10

Time Synchronization

- Battery-backed real-time clock @ 6ppm (≤ 0.5s/day)
- Time Synchronization via SNTP protocol

System Integration

PecStar iEMS

The PMC-592 is supported by CET's PecStar iEMS. It can also be easily integrated into other 3rd party systems with its support of multiple communications ports and different industry standard protocols.

3rd Party System Integration

- Easy integration into Automation, Energy Management or SCADA systems via Modbus RTU, Modbus TCP or SNMP
- The on-board Web Server allows complete access to its data and supports the configuration for most of the setup parameters via a web browser without the use of any proprietary software

1.3 Getting more information

Additional information is available from CET via the following sources:

- Visit www.cet-global.com
- Contact your local CET representative
- Contact CET directly via email @ support@cet-global.com

Chapter 2 Installation

Caution

Installation of the PMC-592 should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The device must be installed in accordance with all local and national electrical codes.

During the operation of the device, 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

2.1.1 Main Unit

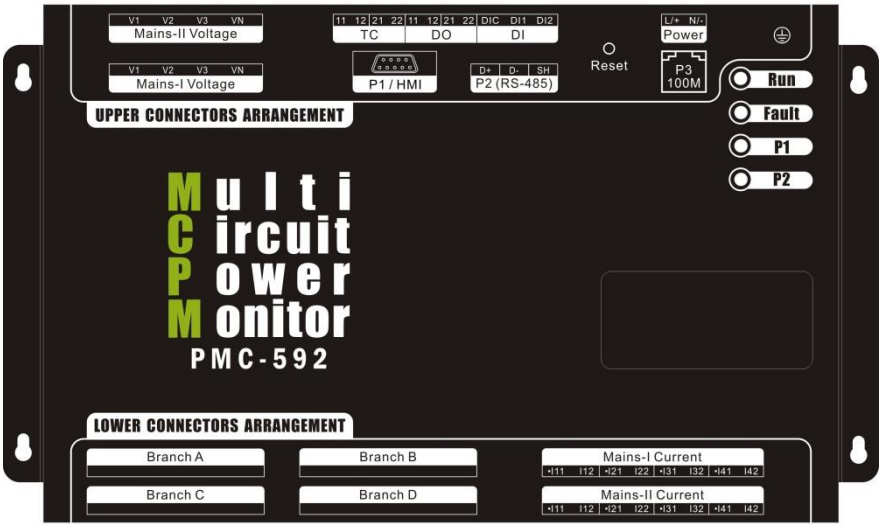


Figure 2-1 Main Unit

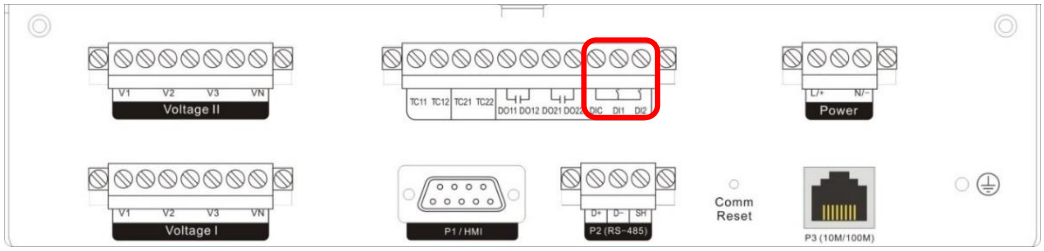


Figure 2-2 Upper Connector's Arrangement with standard 2xDI

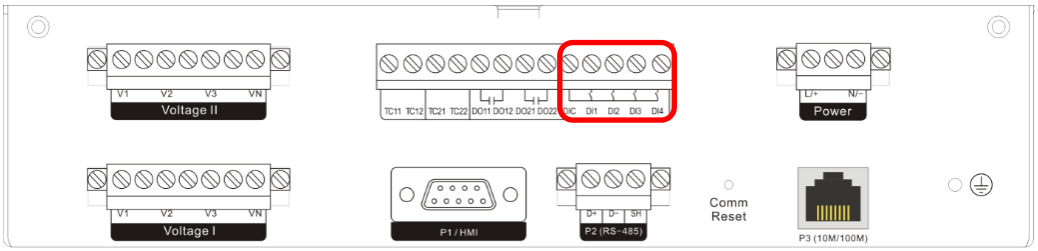


Figure 2-3 Upper Connector's Arrangement with optional 4xDI

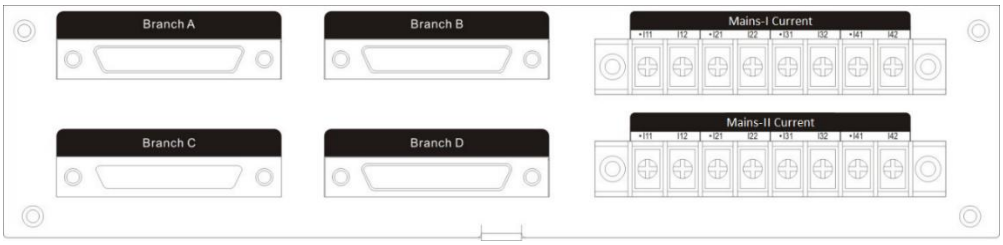


Figure 2-4 Lower Connector's Arrangement

2.1.2 HMI and LCD Display (Optional)

Figure 2-5 7" Touch Screen HMI and Basic LCD Display

2.1.3 Accessories

CT Strips **Branch SCCT Adapter Board**

Figure 2-6 CT Strips and Branch SCCT Adapter Board

Mains SCCT **Branch SCCT** **Branch Cable**

Figure 2-7 Mains SCCT, Branch SCCT and Branch Cable

Figure 2-8 External Digital Input Module (PMC-521D)

2.2 Dimensions

2.2.1 Main Unit

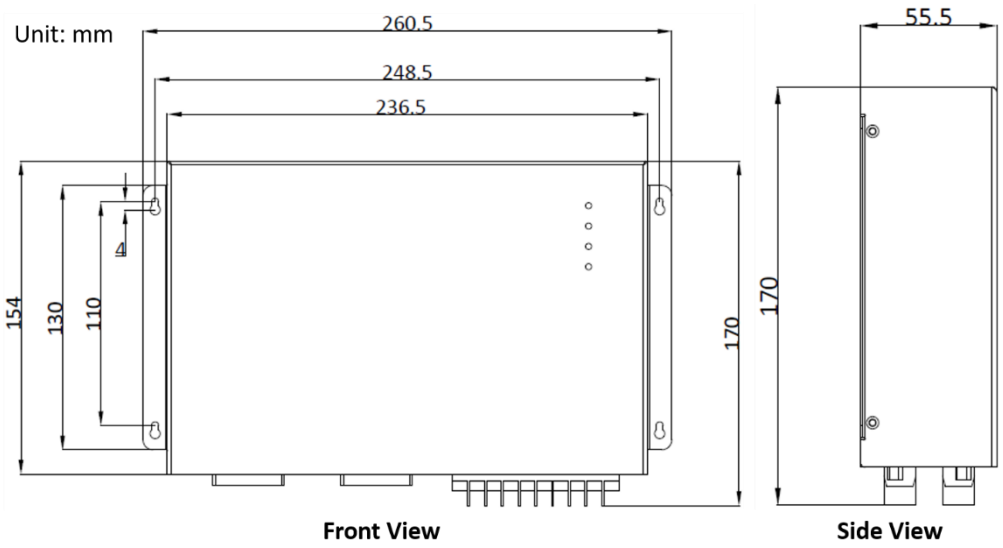


Figure 2-9 Main Unit Dimensions

2.2.2 HMI (Optional)

The following sections provide dimensions for the three HMI models: TK6070iH, TK6070iQ and TK6071iQ.

2.2.2.1 TK6070iH

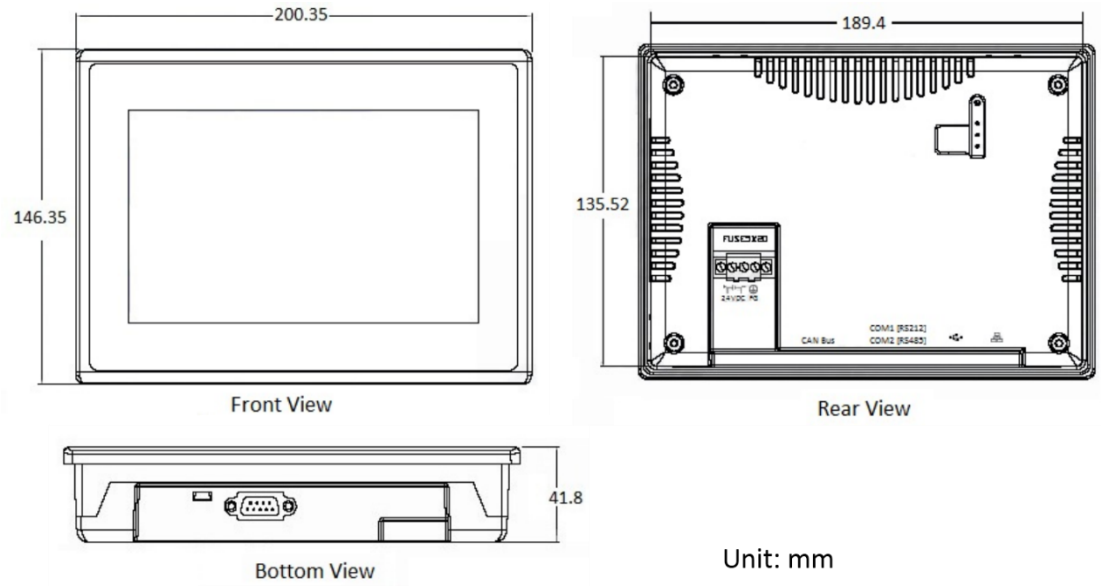


Figure 2-10 TK6070iH Dimensions

2.2.2.2 TK6070iQ and TK6071iQ

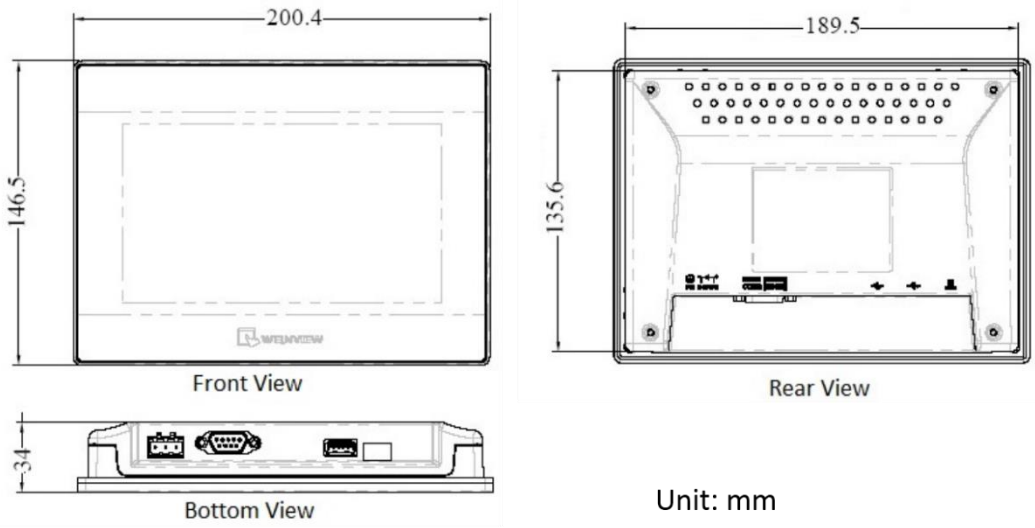
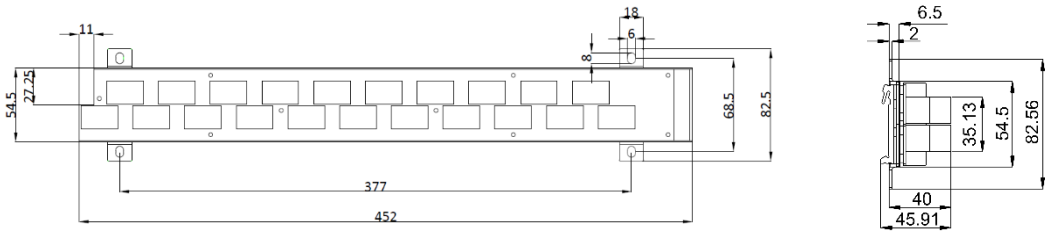


Figure 2-11 TK6070iQ and TK6071iQ Dimensions

2.2.3 21-CT Strip with ¾" Spacing

Unit: mm

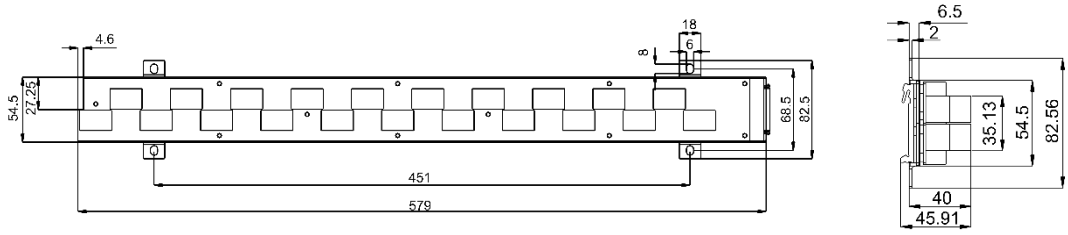


Top View **Side View**

Figure 2-12 Dimensions of the 21-CT Strip with ¾" Spacing

2.2.4 21-CT Strip with 1" Spacing

Unit: mm

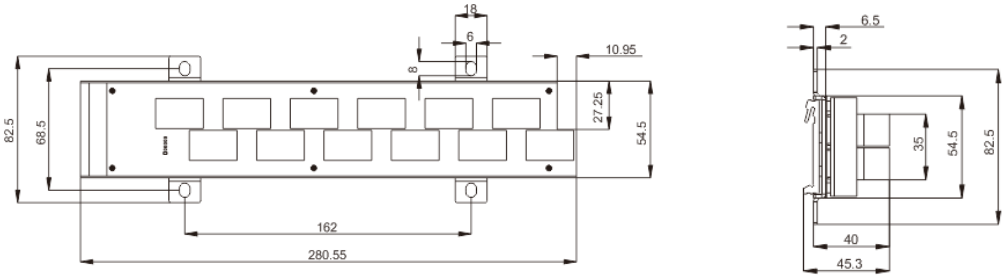


Top View **Side View**

Figure 2-13 Dimensions of the 21-CT Strip with 1" Spacing

2.2.5 12-CT Strip with ¾" Spacing

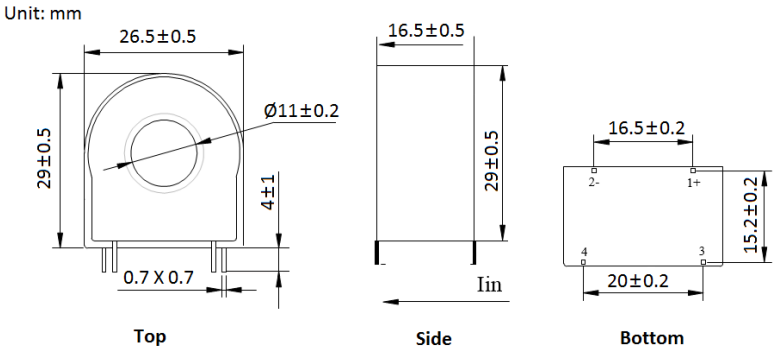
Unit: mm



Top View **Side View**

Figure 2-14 Dimensions of the 12-CT Strip with ¾" Spacing

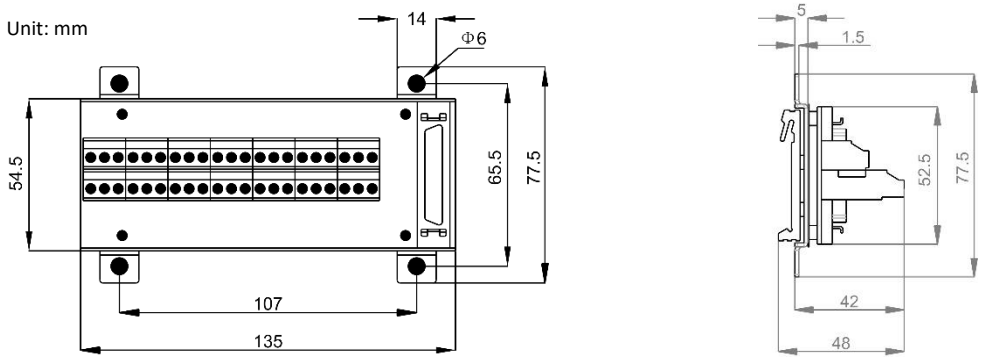
2.2.6 CT Strip's Solid-Core CT



Top **Side** **Bottom**

Figure 2-15 Dimensions of the CT Strip's Solid-Core CT

2.2.7 SCCT Adapter Board



Top View **Side View**

Figure 2-16 Dimensions of the Branch SCCT Adapter Board

2.2.8 Mains SCCT

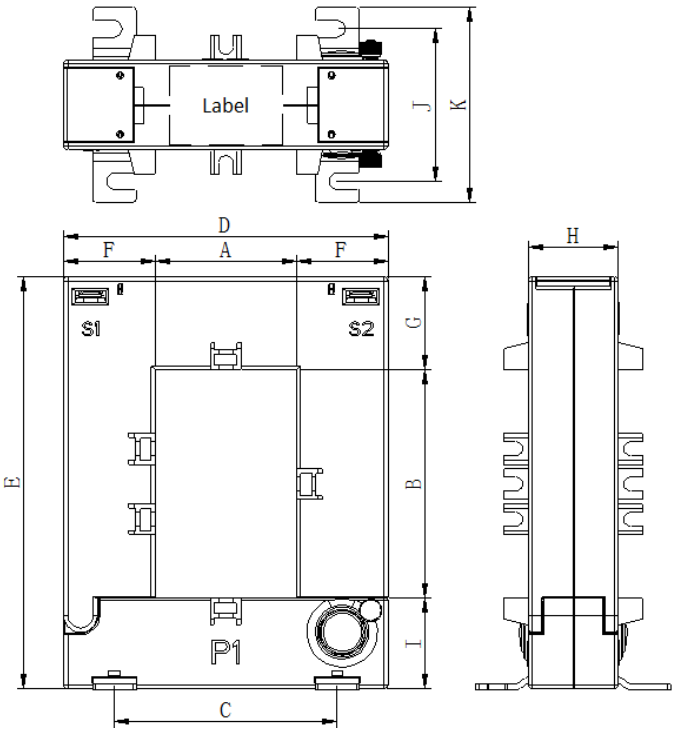


Figure 2-17 Mains SCCT Dimensions

There are four Mains SCCT models: PMC-SCCT-400A-1A-A, PMC-SCCT-600A-1A-A, PMC-SCCT-800A-1A-A and PMC-SCCT-1000A-1A-A. The dimensions are described below.

Mode	A	B	C	D	E	F	G	H	I	J	K
PMC-SCCT-400A-1A-A	20	30	50	89	110	34	47	40	32	52.5	67.5
PMC-SCCT-600A-1A-A	50	80	78	114	145	32	32	32	33	52.5	67.5
PMC-SCCT-800A-1A-A	80	80	108	144	145	32	32	32	33	52.5	67.5
PMC-SCCT-1000A-1A-A	80	120	108	144	185	32	32	32	33	52.5	67.5

Unit: mm

Table 2-1 Mains SCCT Dimensions

2.2.9 Branch SCCT

2.2.9.1 100A/40mA SCCT

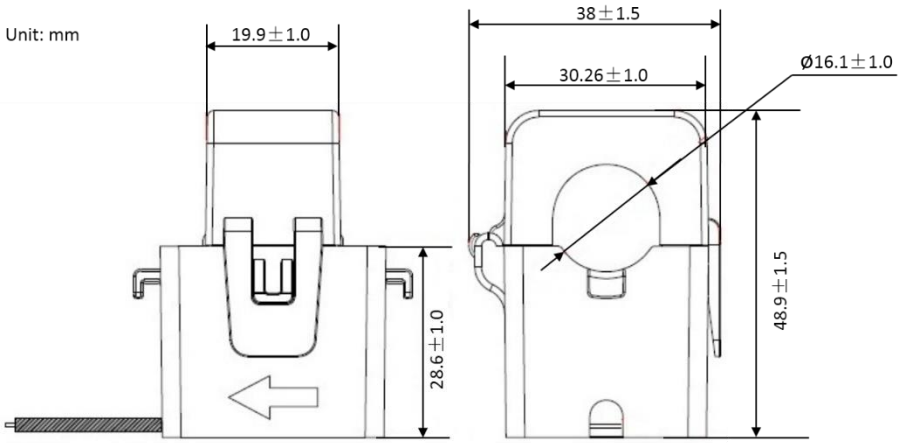


Figure 2-18 Dimensions of 100A/40mA SCCT

2.2.9.2 200A/40mA SCCT

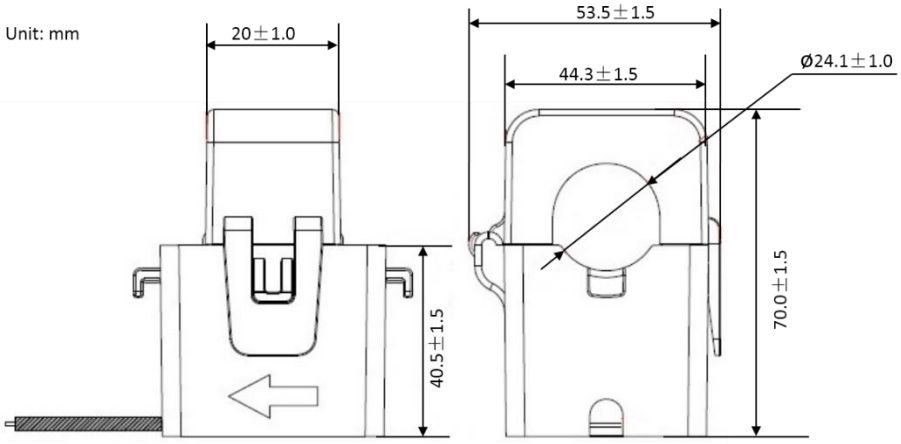


Figure 2-19 Dimensions of 200A/40mA SCCT

2.2.9.3 400A/40mA SCCT

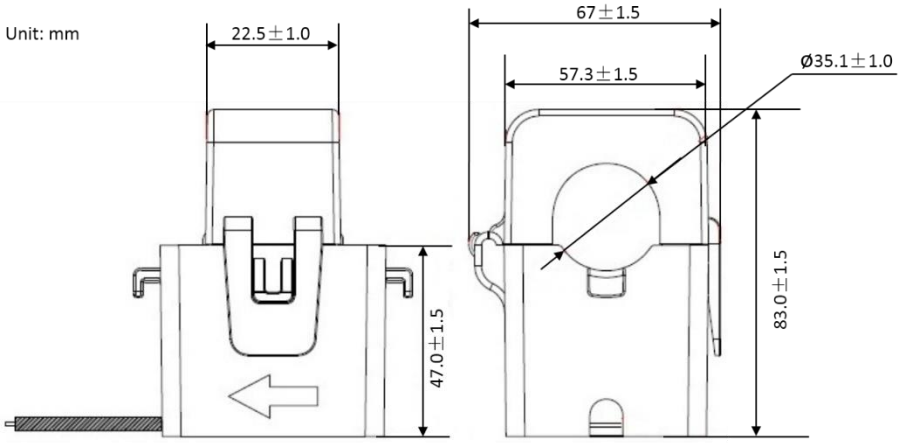


Figure 2-20 Dimensions of 400A/40mA SCCT

2.2.9.4 800A/40mA SCCT

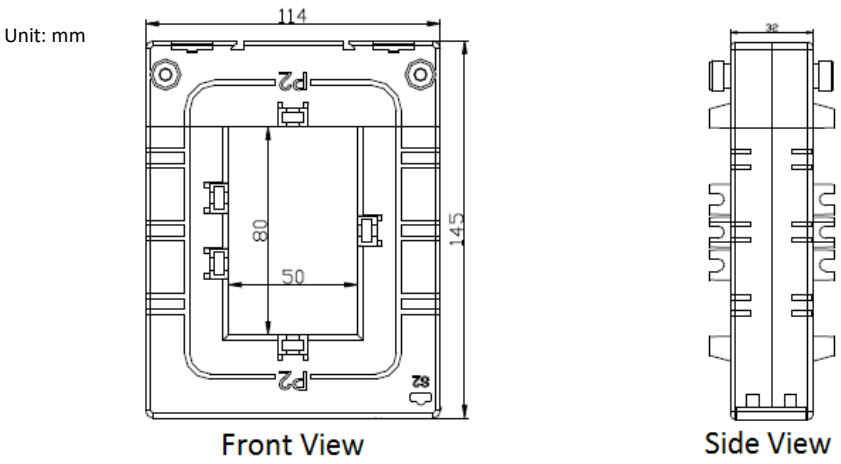


Figure 2-21 Dimensions of 800A/40mA SCCT

2.3 Mounting

The PMC-592 should be installed in a dry environment without dust and kept away from heat, radiation and electrical noise sources. The PMC-592 is usually installed inside the PDU cabinet. Please reserve enough room for other accessories and make it convenient for future maintenance.

2.3.1 Mounting the Main Unit

Installation steps:

- Pre-drill the mounting holes based on the mounting diagrams below.
- Mount the device by affixing the supplied screws to the mounting holes.

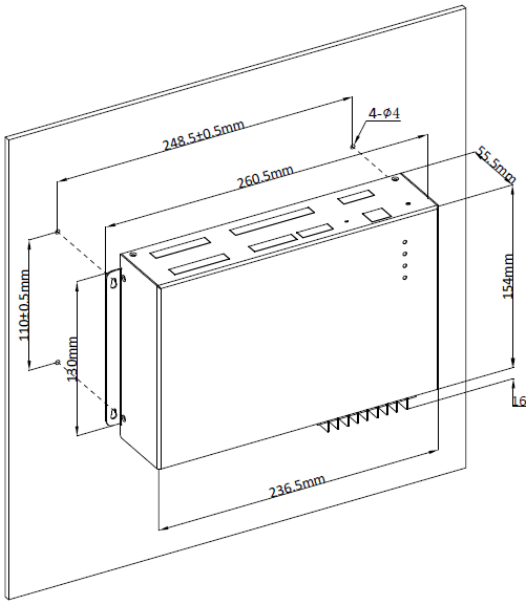


Figure 2-22 Mounting Main Unit

2.3.2 Mounting the Branch CTs

There are two types of Branch CT: Solid-Core CTs on a CT Strip and Split-Core CTs. Select the appropriate mounting instructions below based on the type of Branch CTs used.

2.3.2.1 Mounting the Branch CT Strip

The CT Strip supports two types of mounting – Surface and DIN Rail. Depending on the actual installation requirements, the settings for the **CT Strip Polarity**, **CT Strip Installation Direction** and **Installation Mode** may be different. Please refer to Section **2.4.3 Branch Circuit Wiring and Sub Meter Assignment** for more information.

Surface Mounting

- Pre-drill the mounting holes based on the mounting diagrams below.
- Mount the device by affixing the supplied screws to the mounting holes through the CT Strip's mounting flange and then securing the CT Strip into position.

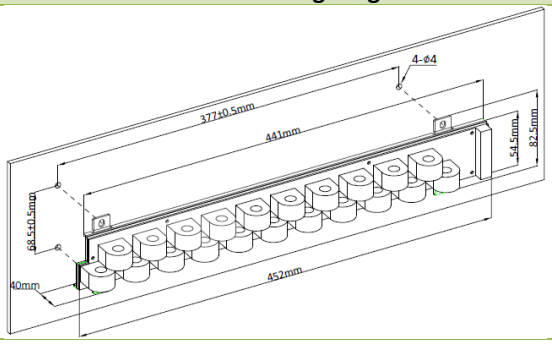
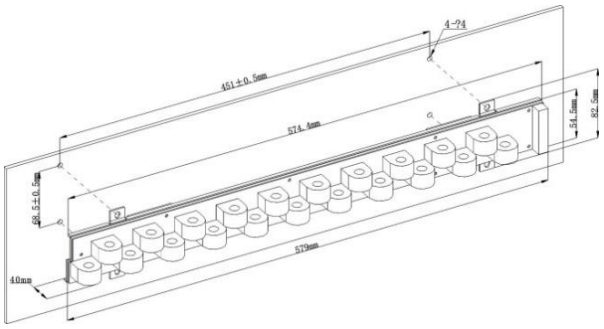
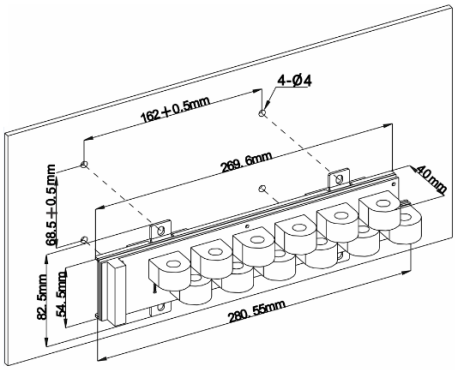
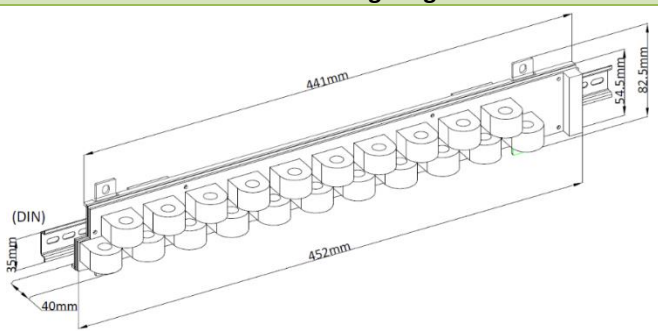
CT Strip Type	Surface Mounting Diagram
21-CT Strip with ¾" spacing between CTs	
21-CT Strip with 1" spacing between CTs	
12-CT Strip with ¾" spacing between CTs	

Table 2-2 Surface Mounting of CT Strip

DIN-Rail Mounting

- The following description assumes the DIN Rail is mounted horizontally. The mounting orientation may be different in the actual situation.
- Before installation, make sure that the 35mm DIN-Rail is already in place.
- Align the top of the mounting clip at the back of the CT Strip at an angle against the top of the DIN rail as shown in the figure below.
- Rotate the bottom of the CT Strip towards the back while applying a slight downward pressure at the top to make sure that the device is completely and securely fixed on to the DIN rail.

CTs Strip Type	DIN-Rail Mounting Diagram
21 CTs Strip with ¾" spacing between CTs	

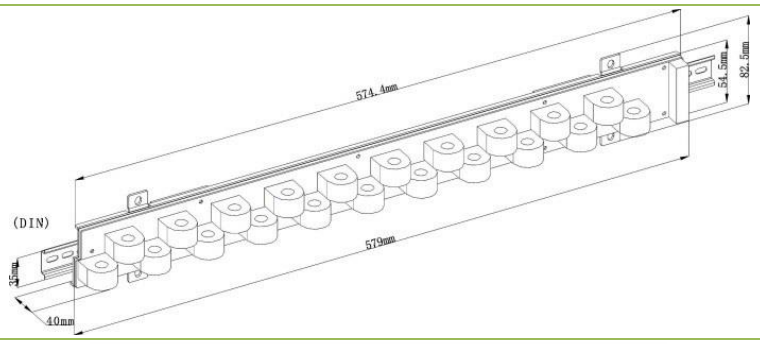
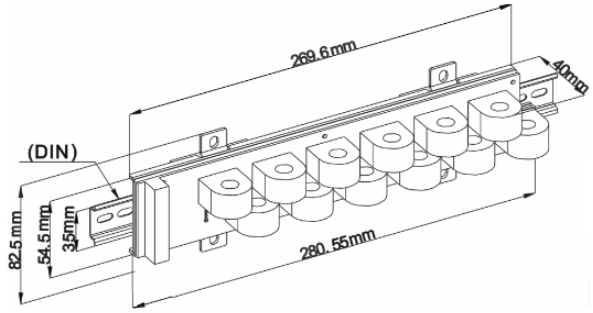
21 CTs Strip with 1" spacing between CTs	
12 CTs Strip with ¾" spacing between CTs	

Table 2-3 DIN-Rail Mounting of CT Strip

2.3.2.2 Mounting the Branch SCCT Adapter Board

Surface Mounting

- Pre-drill the mounting holes based on the mounting diagrams below.
- Mount the device by affixing the supplied screws to the mounting holes through the SCCT Adapter Board's mounting flange and then securing the adapter board into position.

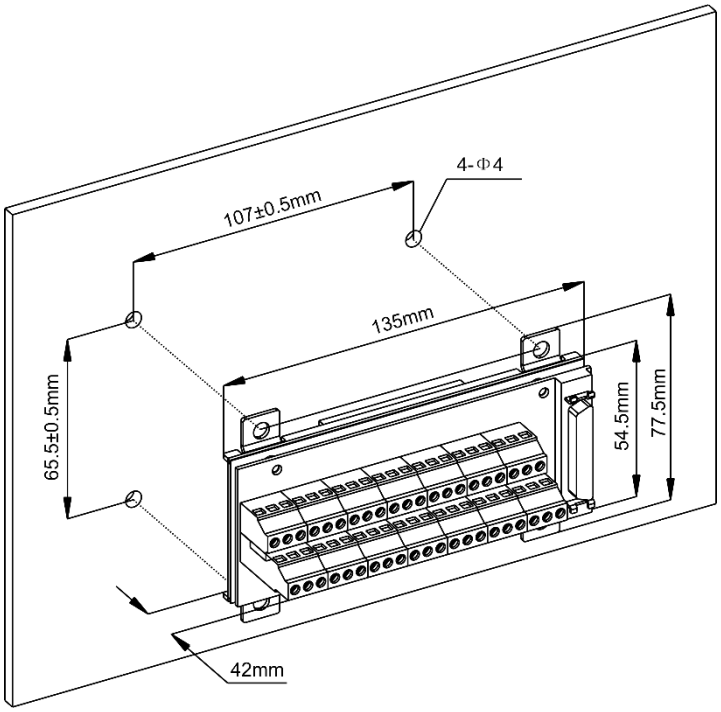


Figure 2-23 Surface Mounting of SCCT Adapter Board

DIN-Rail Mounting

- The following description assumes the DIN Rail is mounted horizontally. The mounting orientation may be different in the actual situation.

- Before installation, make sure that the 35mm DIN-Rail is already in place.
- Align the top of the mounting clip at the back of the adapter board at an angle against the top of the DIN rail as shown in the figure below.
- Rotate the bottom of the adapter board towards the back while applying a slight downward pressure at the top to make sure that the device is completely and securely fixed on to the DIN rail.

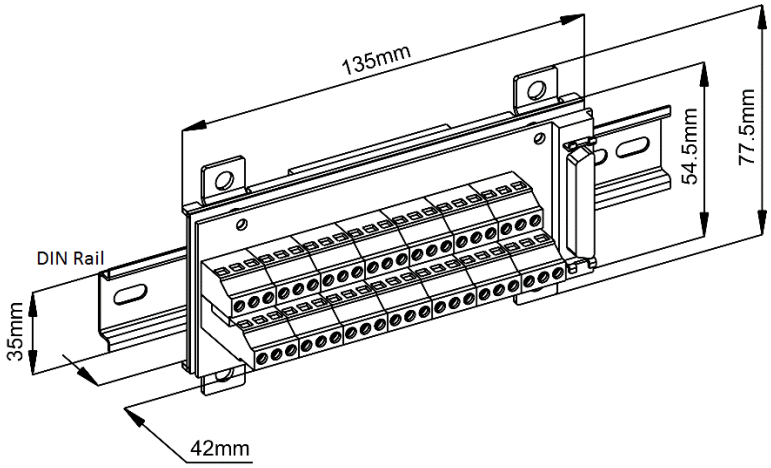


Figure 2-24 DIN-Rail Mounting of SCCT Adapter Board

2.3.2.3 Installing Mains SCCTs

The following instructions and figures describe the installation of the Mains SCCTs.

1. If SCCTs are used for the Mains Current Inputs, please ensure to select the 1A Mains Current Input option for the PMC-592. Before installing the Mains SCCTs, please ensure that SCCT's contact surface is clean and without contaminants for best accuracy performance.
2. It's very important to first connect the SCCT's output wires to the Mains Current Inputs before mounting the SCCT. Connect the White wire to the Ix1 terminal and the Black wire to the Ix2 terminal as shown below where x=1, 2, 3 or 4. Apply the correct torque to tighten the screws.
3. The SCCT's load direction as indicated by the arrow symbol on the CT and should be consistent with the Current flow of the Mains circuits. The **Mains CT Polarity** can also be configured via the Web interface (Setup => Basic Setup) or through Modbus Register # 6008.

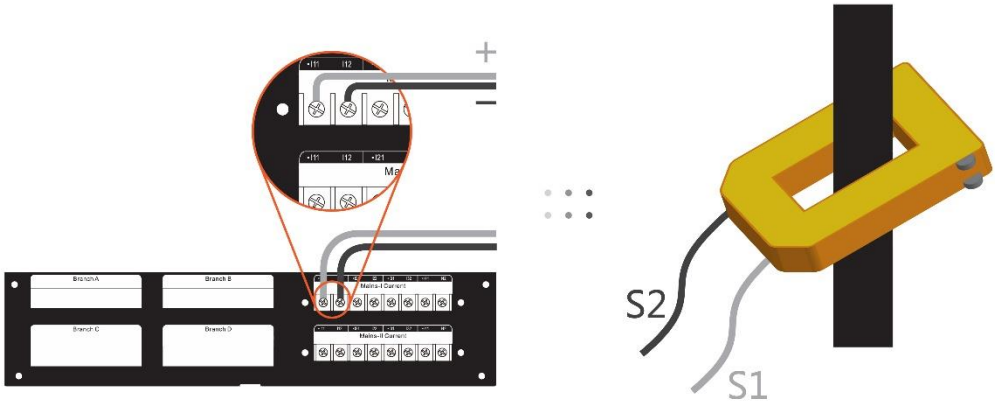


Figure 2-25 Connecting the Mains SCCT's output wires to the Mains Current Inputs

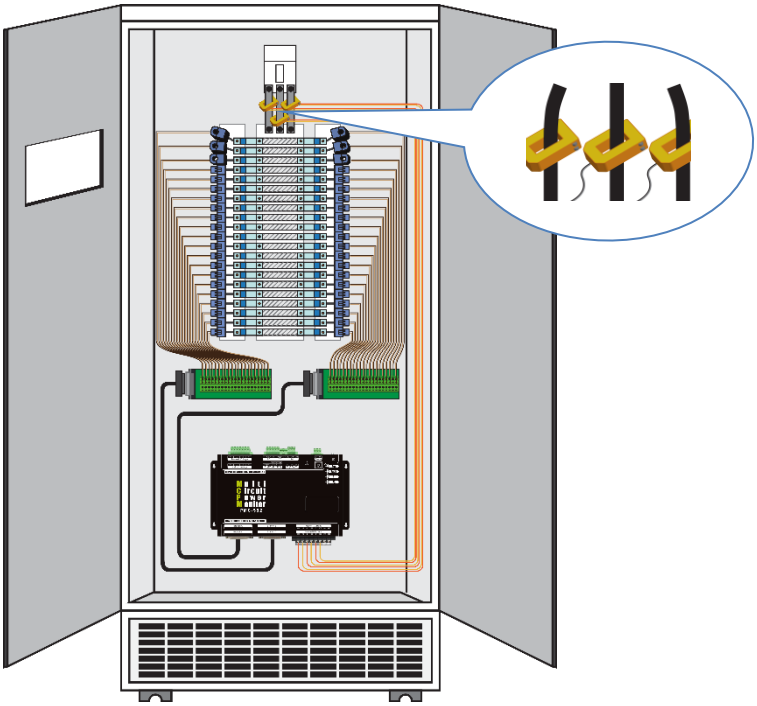


Figure 2-26 Mounting the Mains SCCT

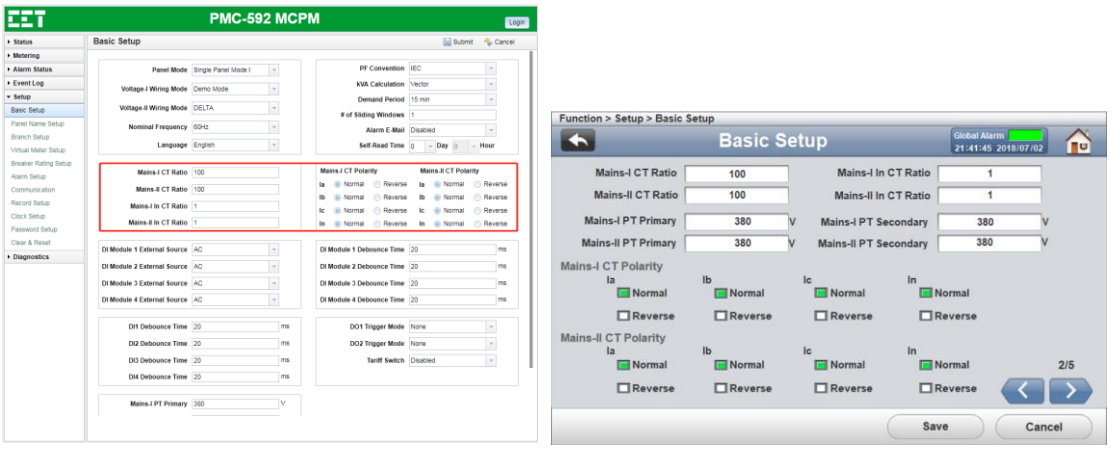


Figure 2-27 Setting the Mains CT's Ratio and Polarity via Web or HMI

2.3.2.4 Installing Branch SCCTs

The following instructions and figures describe the installation of the Branch SCCTs.

1. Before installing Branch SCCT, please ensure that the SCCT's contact surface is clean and without contaminants for best accuracy performance.
2. It's very important to first connect the SCCT's output wires to the SCCT Adapter Board before mounting the Branch SCCT. Connect the White wire to the '+' terminal and the Black wire to the '-' terminal as shown below at the appropriate branch circuit inputs. Apply the correct torque to tighten the screws.
3. The SCCT's load direction as indicated by the arrow symbol should be consistent with the Current flow of the branch circuits while mounting the SCCT.

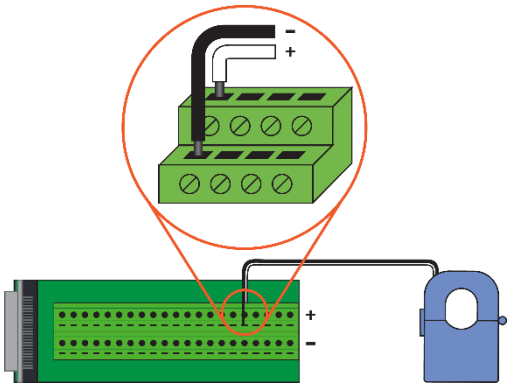


Figure 2-28 Connecting the Branch SCCT's output wires to the Adapter Board

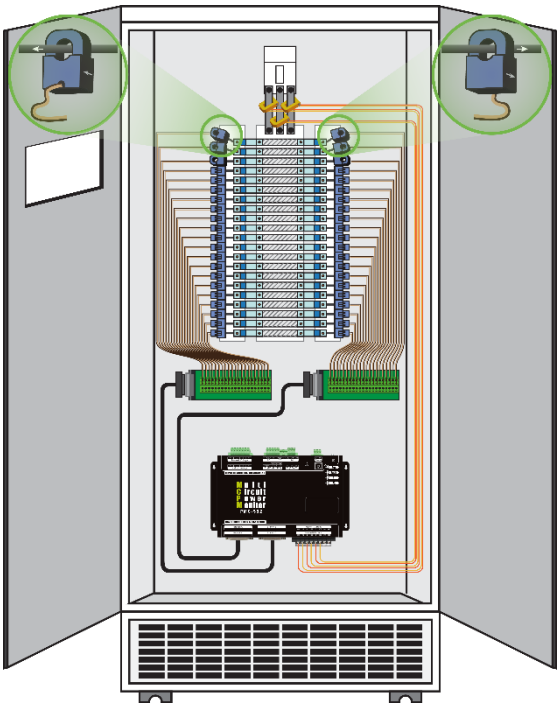


Figure 2-29 Installing the Branch Cable

2.3.3 Mounting the Optional 7" Touch-Screen HMI

The HMI should be mounted on the cabinet door with a minimum clearance of 105mm from the door to the inside components.

1. Put the HMI through the cutout.
2. Install the installation clips as per the diagram below.
3. Affix the supplied screws through the hole of the installation clips.
4. Tighten the screws against the back of the panel until the HMI is mounted securely in place.

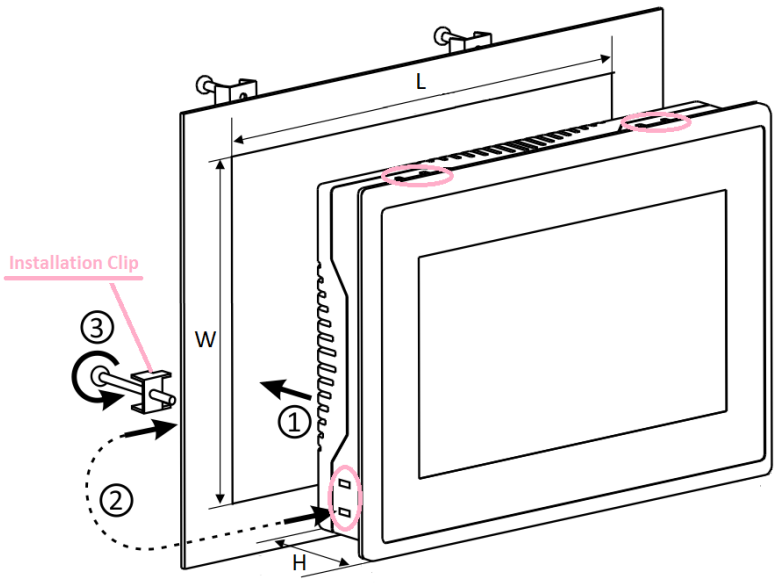


Figure 2-30 Mounting the Optional 7" Touch-Screen HMI

HMI Model	Mounting Dimensions (Unit: mm)		
	L	W	H
TK-6070iH	192	138	41.8
TK6070iQ, TK6071iQ	192	138	34

Table 2-4 Mounting Optional HMI Dimensions

2.3.4 Mounting the Optional LCD Display

The following instructions and figures describe the installation of LCD Display.

1. Remove the installation clips from the LCD Display.
2. Fit the LCD Display through a 103mm x 54mm cutout as shown in figure below.
3. Re-install the installation clips and push the clips tightly against the panel to secure the LCD Display.

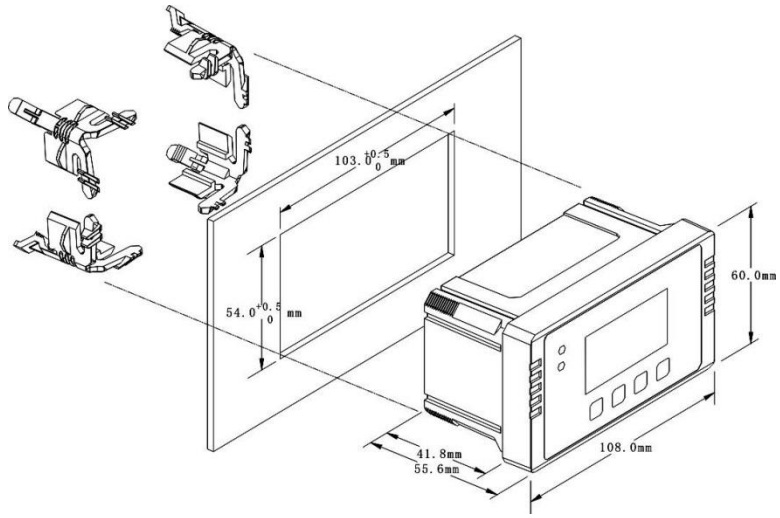


Figure 2-31 Mounting the Optional LCD Display

2.3.5 Mounting the Optional External DI Module (PMC-521D)

The following instructions and figures describe the installation of the external DI Module.

1. Before installation, please make sure that the DIN rail is already in place.

2. Move the installation clip at the bottom of the PMC-521D downward to the “unlock” position.
3. Mount the PMC-521D on the DIN Rail.
4. Push the installation clip upward to the “lock” position to secure the PMC-521D on to the DIN Rail.

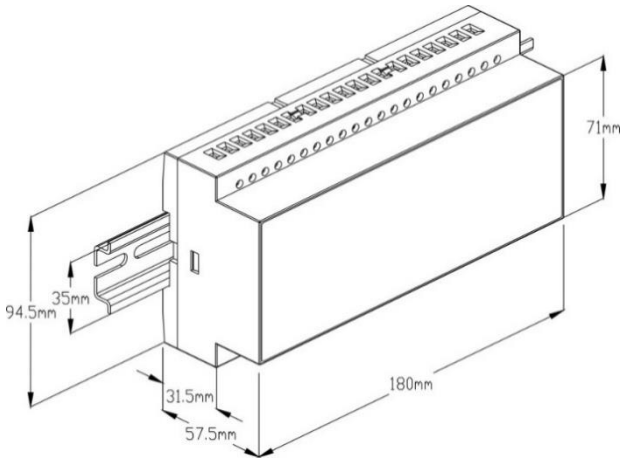


Figure 2-32 DIN-Rail Mounting the Optional PMC-521D

2.4 Wiring Connections

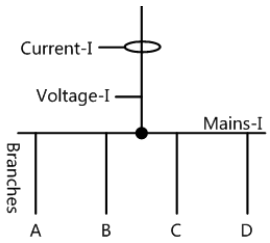
2.4.1 Panel Mode and Wiring

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.

The PMC-592 supports six **Panel Modes**. Please read this section carefully before installation and choose the correct wiring method for your panel.

<table>
<tr><th>Panel Mode</th><th>Application, Power Calculation and Applicable Alarms</th></tr>
<tr><td>Single Panel Mode I with One Mains Only</td><td>
Application:
This configuration is the most common and applies to systems with a Single Mains (Mains-I) only.
V1 = Mains-I Voltage Inputs
I1 = Mains-I Current Inputs
V2 = Mains-II Voltage Inputs (Not Used)
I2 = Mains-II Current Inputs (Not Used)
Power Calculation:
Mains-I Power = V1 × I1 (Wye, Delta or 1P3W)
Branch Power = V1 × Branch Current A/B/C/D
Mains-II Power = Not Available
Applicable Alarms:
<table>
<tr><th></th><th>Global</th><th>Mains-I</th><th>Mains-II</th></tr>
<tr><td>Voltage-I</td><td>●</td><td>○</td><td>○</td></tr>
<tr><td>Voltage-II</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>Current/Power-I</td><td>●</td><td>○</td><td>○</td></tr>
<tr><td>Current/Power-II</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>CT Strip A/B</td><td>●</td><td>○</td><td>○</td></tr>
<tr><td>CT Strip C/D</td><td>●</td><td>○</td><td>○</td></tr>
<tr><td>Frequency</td><td>●</td><td>○</td><td>○</td></tr>
<tr><td>DI</td><td>●</td><td>○</td><td>○</td></tr>
<tr><td>RTD</td><td>●</td><td>○</td><td>○</td></tr>
</table>


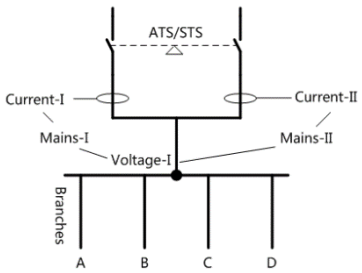
</td></tr>
</table>

Single Panel Mode I with Two Mains

Application:

This configuration applies to systems with **Two Mains** that are controlled by an ATS (Automatic Transfer Switch) or STS (Static Transfer Switch) such that only one Mains is active at a time.

V1 = Mains-I Voltage Inputs
I1 = Mains-I Current Inputs
V2 = Mains-II Voltage Inputs (Not Used)
I2 = Mains-II Current Inputs



Power Calculation:

Mains-I Power = V1 × I1 (Wye, Delta or 1P3W)
Mains-II Power = V1 × I2 (Wye, Delta or 1P3W)
Branch Power = V1 × Branch Current A/B/C/D

Applicable Alarms:

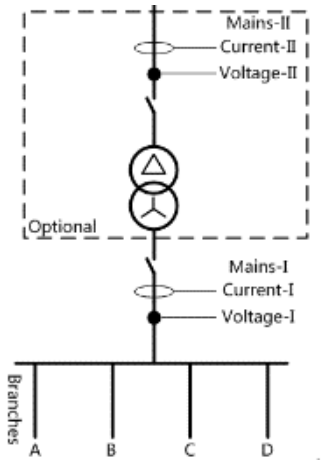
	Global	Mains-I	Mains-II
Voltage-I	●	O	O
Voltage-II	●	O	O
Current/Power-I	●	O	O
Current/Power-II	●	O	O
CT Strip A/B	●	O	O
CT Strip C/D	●	O	O
Frequency	●	O	O
DI	●	O	O
RTD	●	O	O

Single Panel Mode II

Application:

This configuration applies to systems with a **Single Mains (Mains-I)** only. However, Mains-II can be used to measure the electrical parameters before the Delta-Wye Isolation Transformer.
Voltage-II and Current-II do not need to be connected if the PDU does not have an Isolation Transformer. This would be equivalent to the Single Panel Mode I with One Mains Only.

V1 = Mains-I Voltage Inputs
I1 = Mains-I Current Inputs
V2 = Mains-II Voltage Inputs
I2 = Mains-II Current Inputs



Power Calculation

Mains-I Power = V1 × I1 (Wye)
Mains-II Power = V2 × I2 (Delta)
Branch Power = V1 × Branch Current A/B/C/D

Applicable Alarms

	Global	Mains-I	Mains-II
Voltage-I	●	O	O
Voltage-II	●	O	O
Current/Power-I	●	O	O
Current/Power-II	●	O	O
CT Strip A/B	●	O	O
CT Strip C/D	●	O	O
Frequency	●	O	O
DI	●	O	O
RTD	●	O	O

Dual Panel Mode I

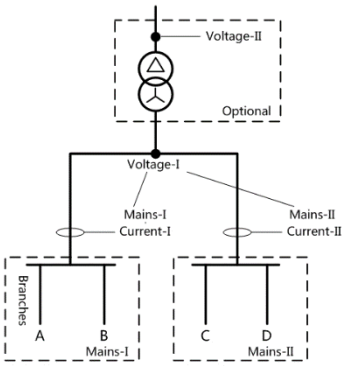
Application:

This configuration applies to systems with a **Single Mains** that are split into two Panels. Branches A and B belong to Mains-I while Branches C and D belong to Mains-II, as illustrated in the diagram below. Mains-I and Mains-II are used to measure electrical parameters for Panel-I and Panel-II, respectively.

V1 = Mains-I Voltage Inputs
I1 = Mains-I Current Inputs
V2 = Optional (may be used to measure the ULL Inputs before the Isolation Transformer)
I2 = Mains-II Current Inputs

Power Calculation:

Mains-I Power = V1 × I1 (Wye)
Mains-II Power = V1 × I2 (Wye)
Branch Power = V1 × Branch Current A/B/C/D



Applicable Alarms:

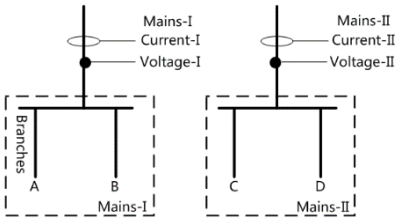
	Global	Mains-I	Mains-II
Voltage-I	●	○	○
Voltage-II	●	○	○
Current/Power-I	●	●	○
Current/Power-II	●	○	●
CT Strip A/B	●	●	○
CT Strip C/D	●	○	●
Frequency	●	○	○
DI	●	○	○
RTD	●	○	○

Dual Panel Mode II

Application:

This configuration allows a single PMC-592 to monitor two independent PDU panels simultaneously and makes the PMC-592 the most economical product in the market.

V1 = Mains-I Voltage Inputs
I1 = Mains-I Current Inputs
V2 = Mains-II Voltage Inputs
I2 = Mains-II Current Inputs



Power Calculation

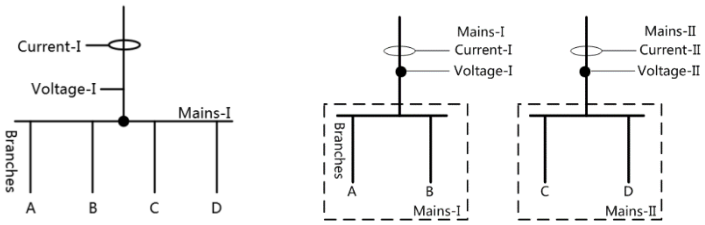
Mains-I Power = V1 × I1 (Wye, Delta or 1P3W)
Mains-II Power = V2 × I2 (Wye, Delta or 1P3W)
Branch A, B Power = V1 × Branch Current A/B
Branch C, D Power = V2 x Branch Current C/D

Applicable Alarms:

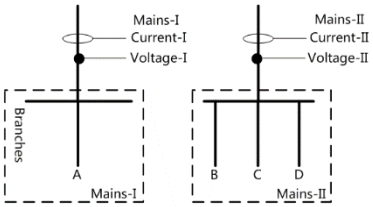
	Global	Mains-I	Mains-II
Voltage-I	●	●	○
Voltage-II	●	○	●
Current/Power-I	●	●	○
Current/Power-II	●	○	●
CT Strip A/B	●	●	○
CT Strip C/D	●	○	●
Frequency	●	○	○
DI	●	○	○
RTD	●	○	○

Custom Panel Mode

Typical Wiring Application Modes:



Typical Application Modes I and II



Typical Application Mode III

Application:

This configuration allows a single PMC-592 to monitor one or two independent PDU panels simultaneously. Users have the flexibility to pair any Branch Input (A, B, C or D) with any Mains Input (Mains-I/II) using any Wiring Mode.

V1 = Mains-I Voltage Inputs

I1 = Mains-I Current Inputs

V2 = Mains-II Voltage Inputs (Applicable for **Typical Application Modes II & III**)

I2 = Mains-II Current Inputs (Applicable for **Typical Application Modes II & III**)

Power Calculation:

The Branch Power calculation is associated with its voltage source. For example, the following Branch Power calculation is applicable for **Typical Application Mode III**:

Mains-I Power = V1 × I1 (Wye, Delta or 1P3W)

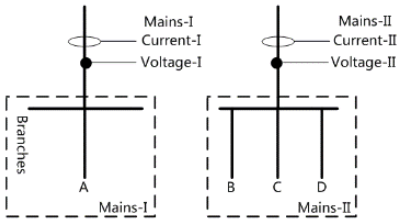
Mains-II Power = V2 × I2 (Wye, Delta or 1P3W)

Branch A Power = V1 x Branch Current A

Branch B Power = V2 x Branch Current B

Branch C Power = V2 x Branch Current C

Branch D Power = V2 x Branch Current D



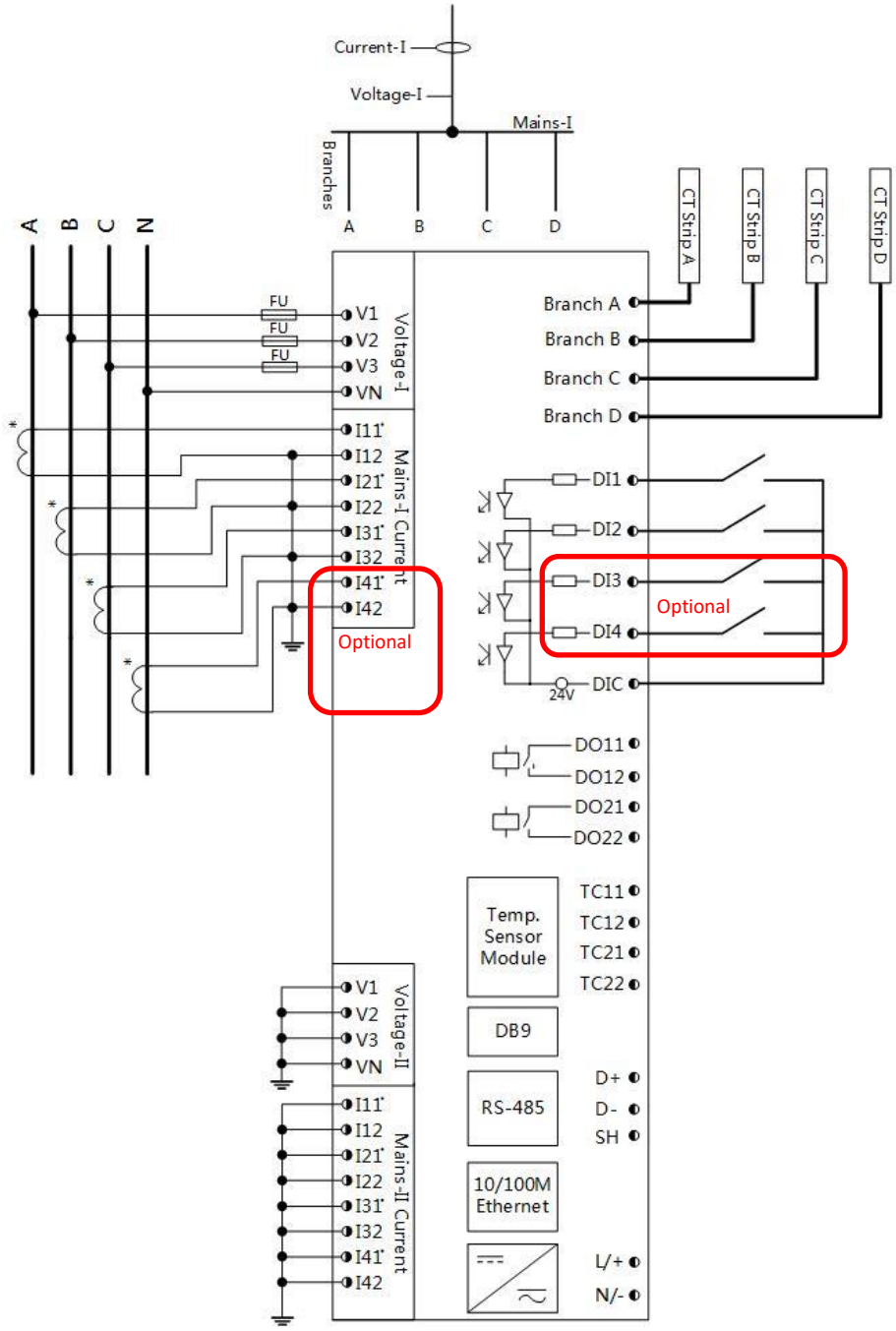
Applicable Alarm:

	Global	Mains-I	Mains-II
Voltage-I	●	●	○
Voltage-II	●	○	●
Current/Power-I	●	●	○
Current/Power-II	●	○	●
CT Strip A/B/C/D	●	Custom	Custom
Frequency	●	○	○
DI	●	○	○
RTD	●	○	○

Table 2-5 Panel Mode Description

2.4.1.1 Single Panel Mode I

2.4.1.1.1 Single Panel Mode I with One Mains Only (Wye)



Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) All spare terminals that are Not Used, which include Mains-II Voltage and Current Inputs, should be connected to Ground.

Figure 2-33 Single Panel Mode I with One Mains Only (Wye)

2.4.1.1.2 Single Panel Mode I with One Mains Only (Delta)

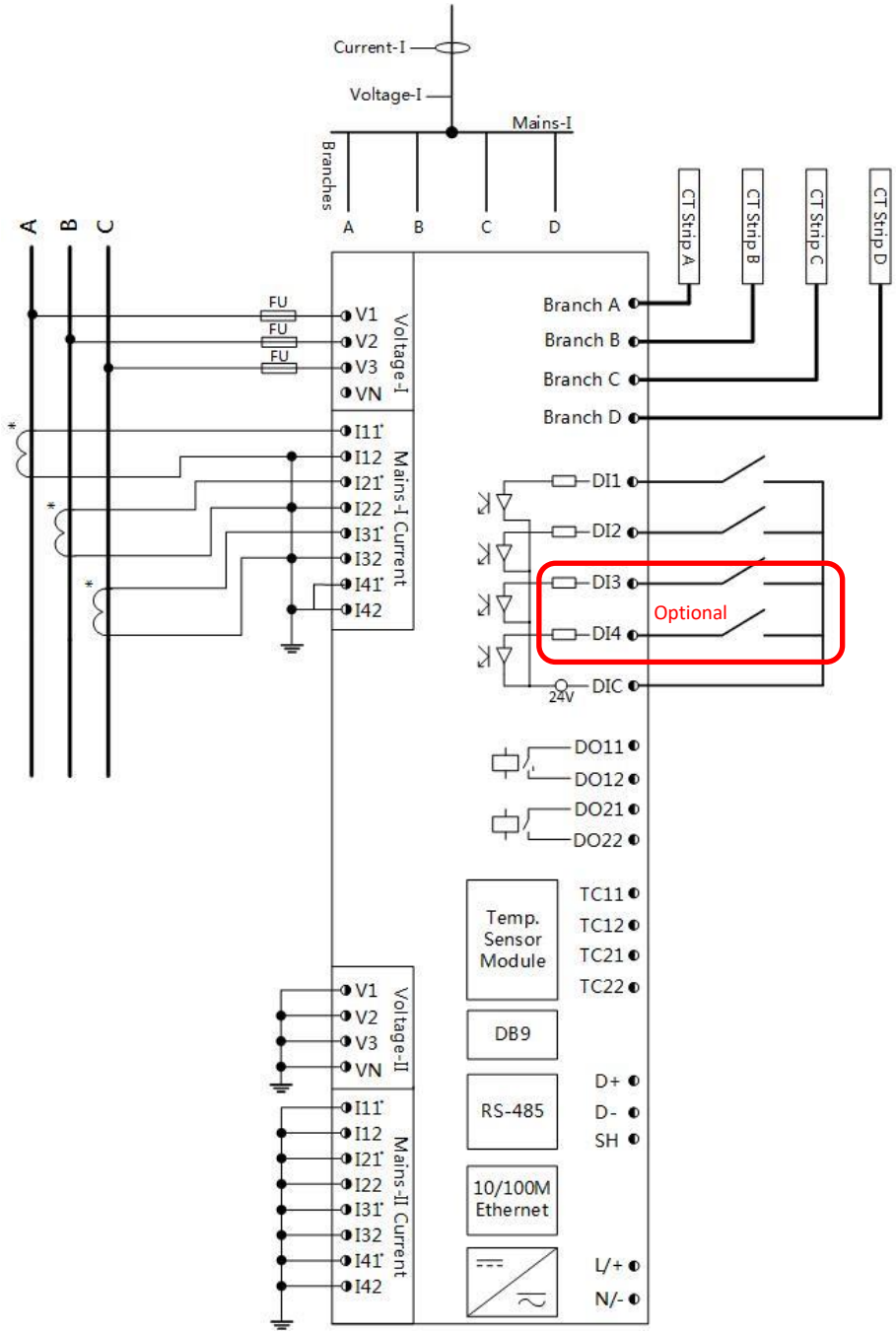


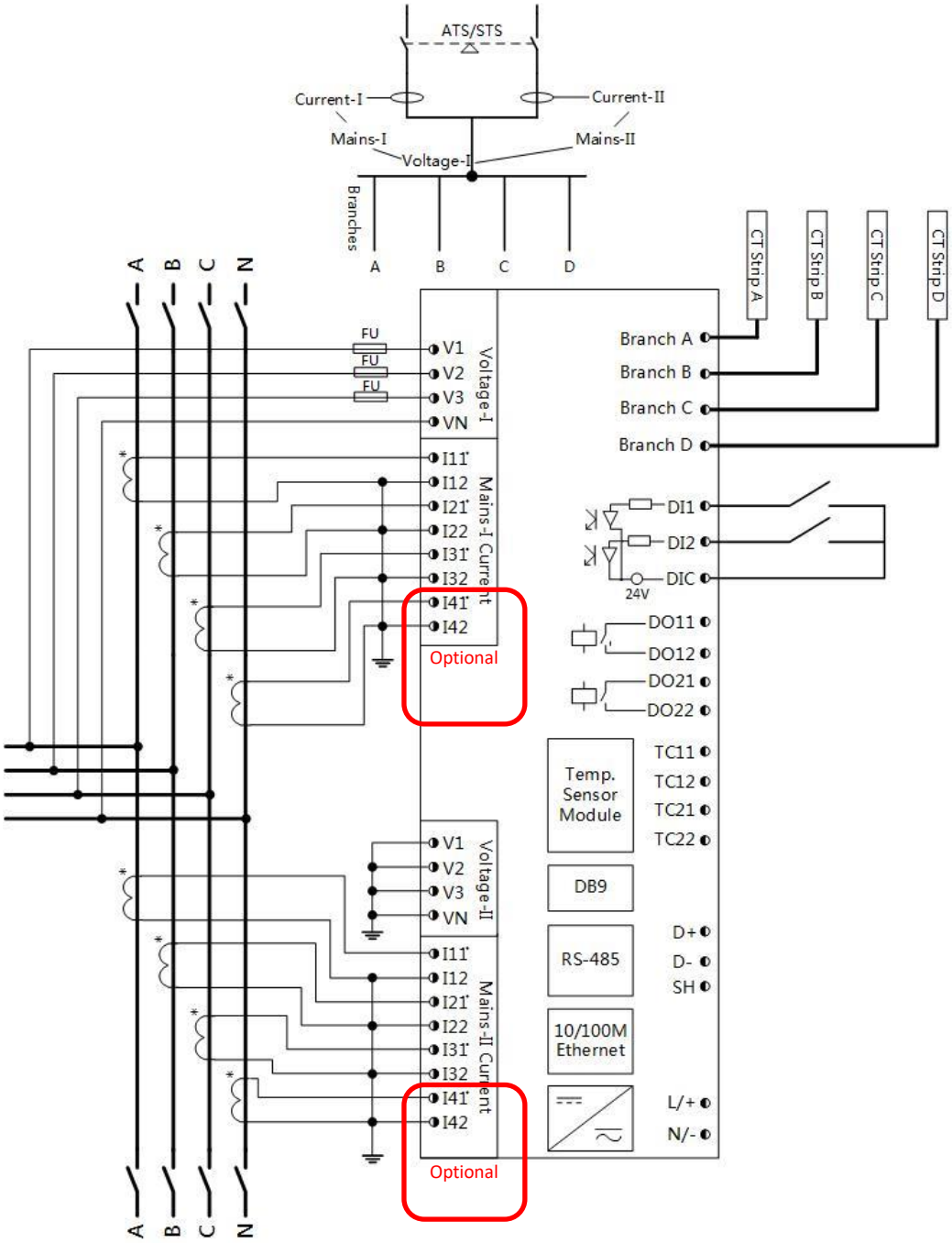
Figure 2-34 Single Panel Mode I with One Mains Only (Delta)

Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) All spare terminals that are Not Used, which include Mains-II Voltage and Current Inputs, should be connected to Ground.

2.4.1.1.3 Single Panel Mode I with Two Mains (Wye)



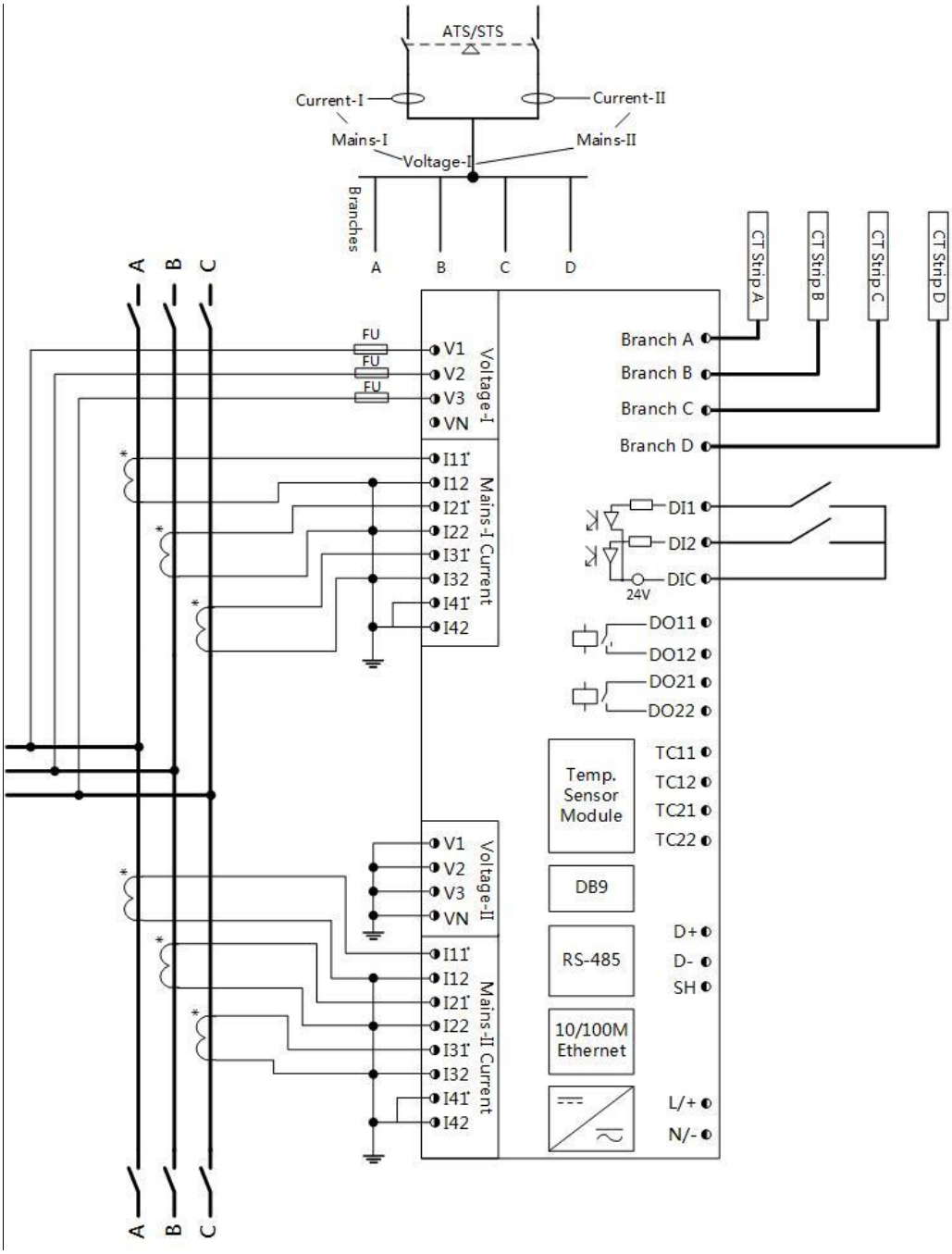
Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) The spare Mains-II Voltage terminals should be connected to Ground.

Figure 2-35 Single Panel Mode I with Two Mains (Wye)

2.4.1.1.4 Single Panel Mode I with Two Mains (Delta)



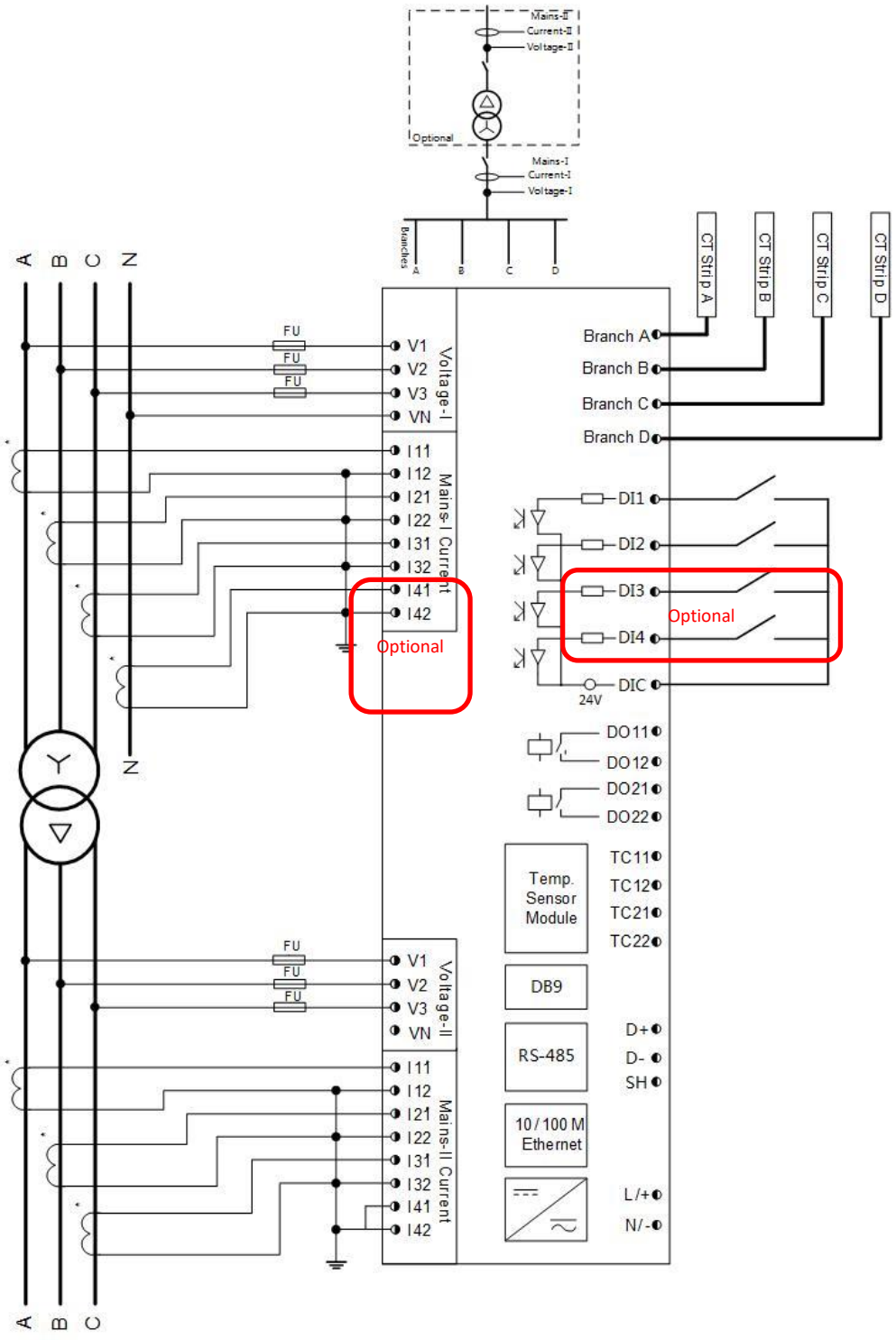
Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) The spare Mains-II Voltage terminals should be connected to Ground.

Figure 2-36 Single Panel Mode I with Two Mains (Delta)

2.4.1.2 Single Panel Mode II (Mains-I = Wye, Mains-II = Delta)



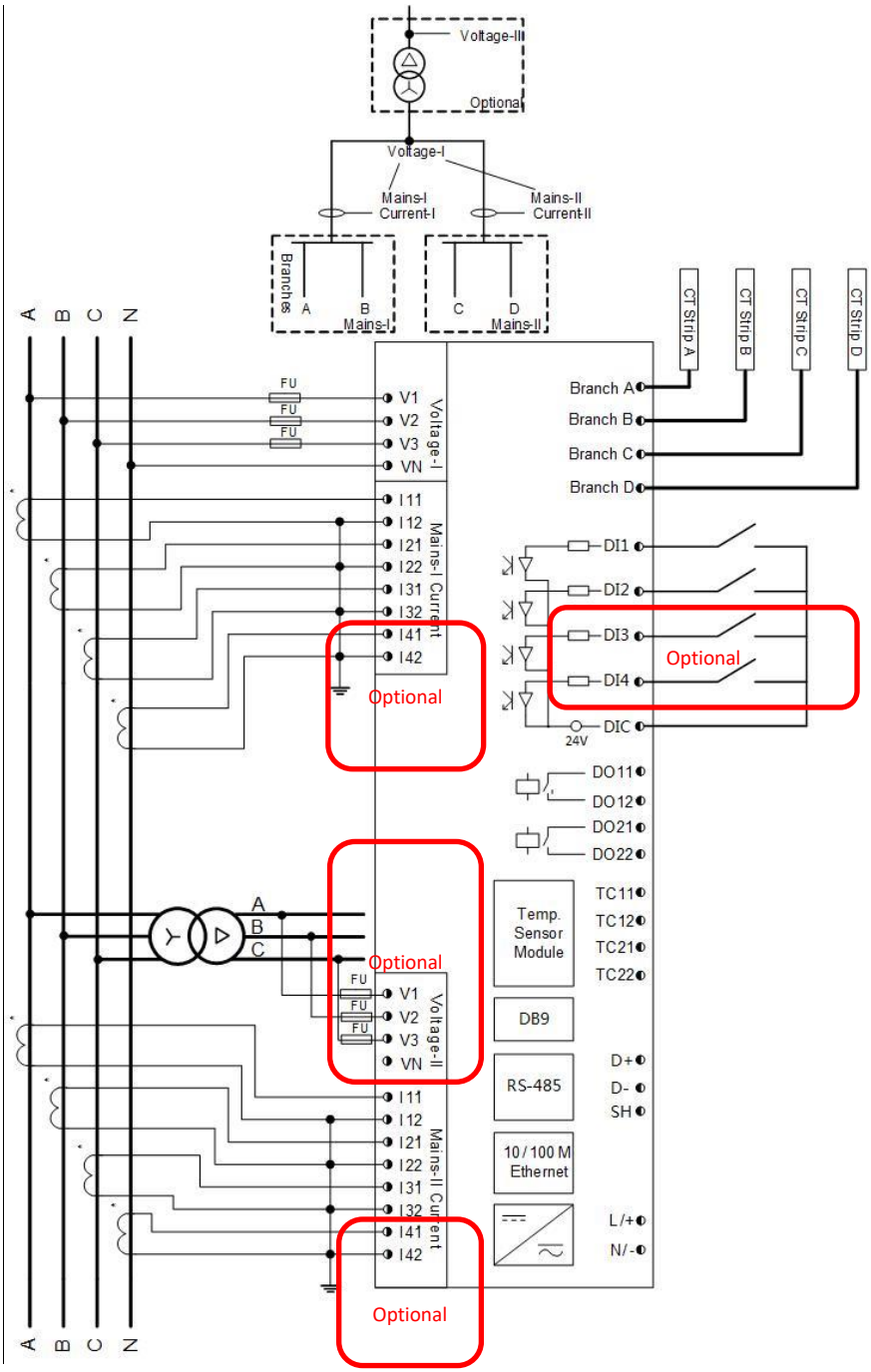
Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) The Mains Voltage Inputs support a maximum voltage of 480V for direct ULL connections.

Figure 2-37 Single Panel Mode-II (Mains I = Wye, Mains -II = Delta)

2.4.1.3 Dual Panel Mode I (Mains-I/II = Wye, Optional Voltage-II = Delta Only)



Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

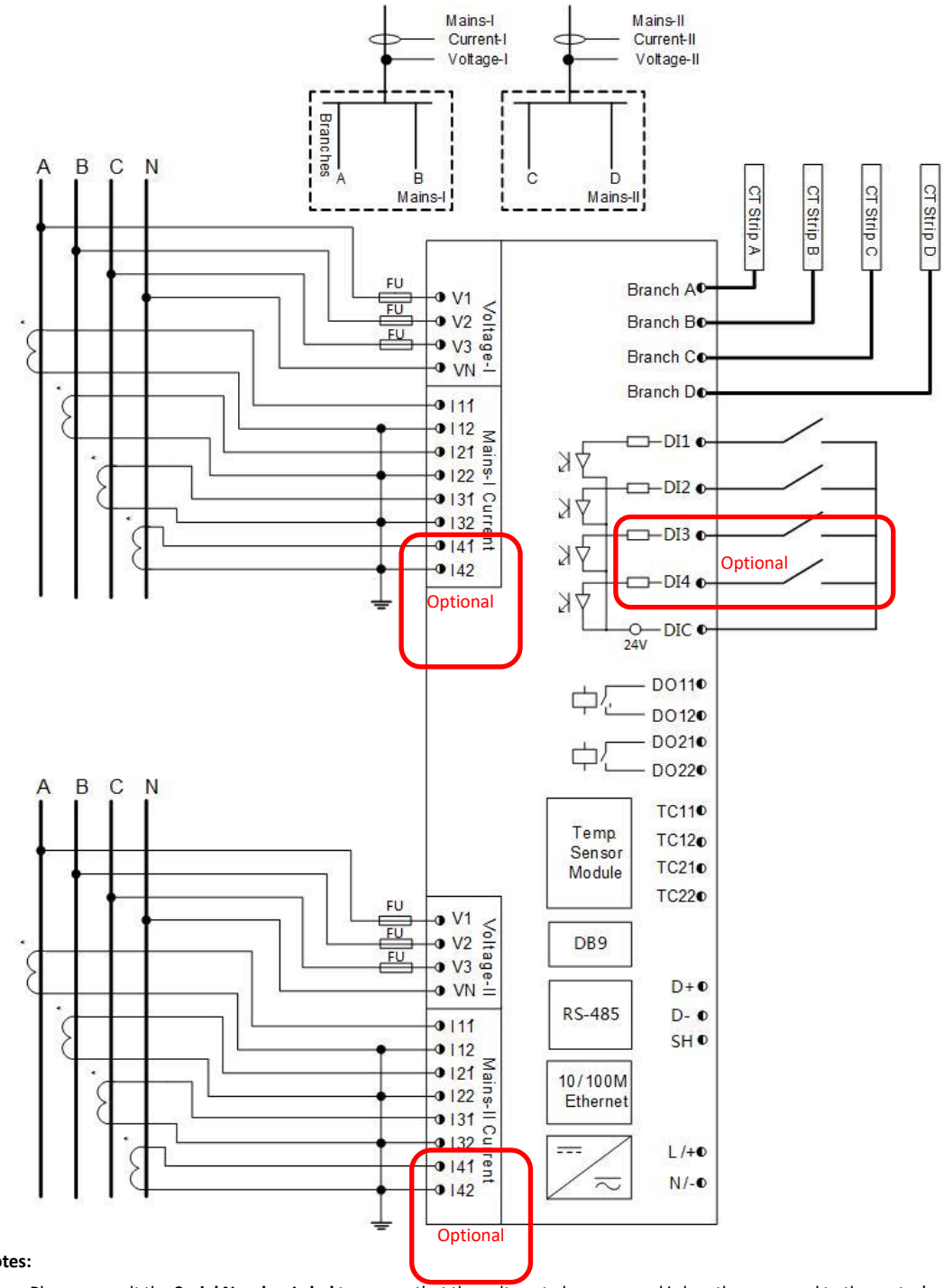
2) The optional Mains-II Voltage terminals should be connected to Ground if not used.

3) The Mains Voltage Inputs support a maximum voltage of 480V for direct ULL connections.

Figure 2-38 Dual Panel Mode I (Mains-I/II = Wye, Optional Voltage-II = Delta only)

2.4.1.4 Dual Panel Mode II

2.4.1.4.1 Dual Panel Mode II (Mains-I/II = Wye)



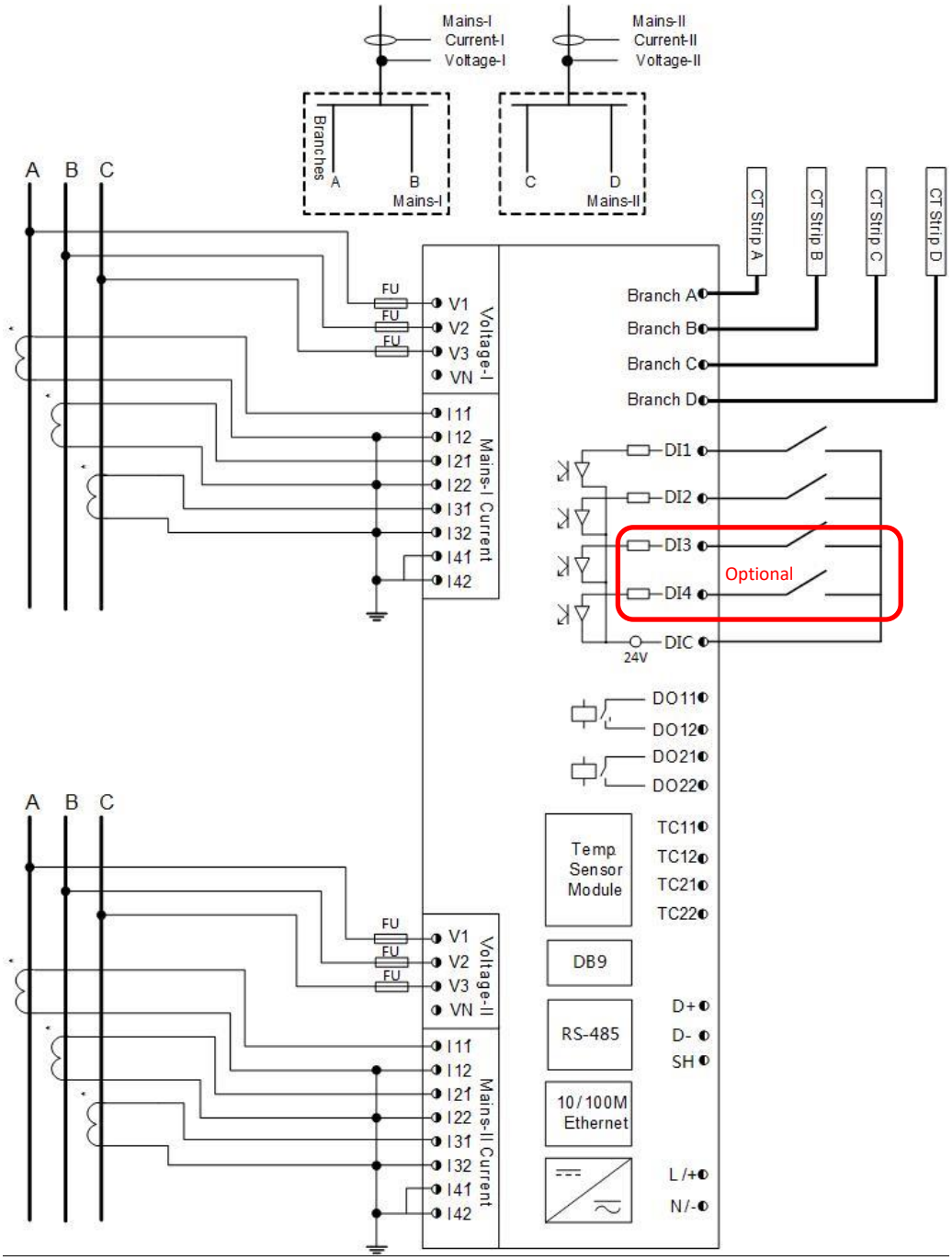
Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) All spare Voltage and Current terminals that are not used should be connected to ground.

Figure 2-39 Dual Panel Mode II (Wye)

2.4.1.4.2 Dual Panel Mode II (Mains-I/II = Delta)



Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) All spare Voltage and Current terminals that are not used should be connected to ground.

Figure 2-40 Dual Panel Mode II (Delta)

2.4.1.4.3 Dual Panel Mode II (Mains-I/II = 1P3W Direct Connection)

The **1-Phase 3-Wire (1P3W)** may only be used with **Dual Panel Mode II** where Mains-I and Mains-II (if used) may be wired in 1P3W mode as illustrated below.

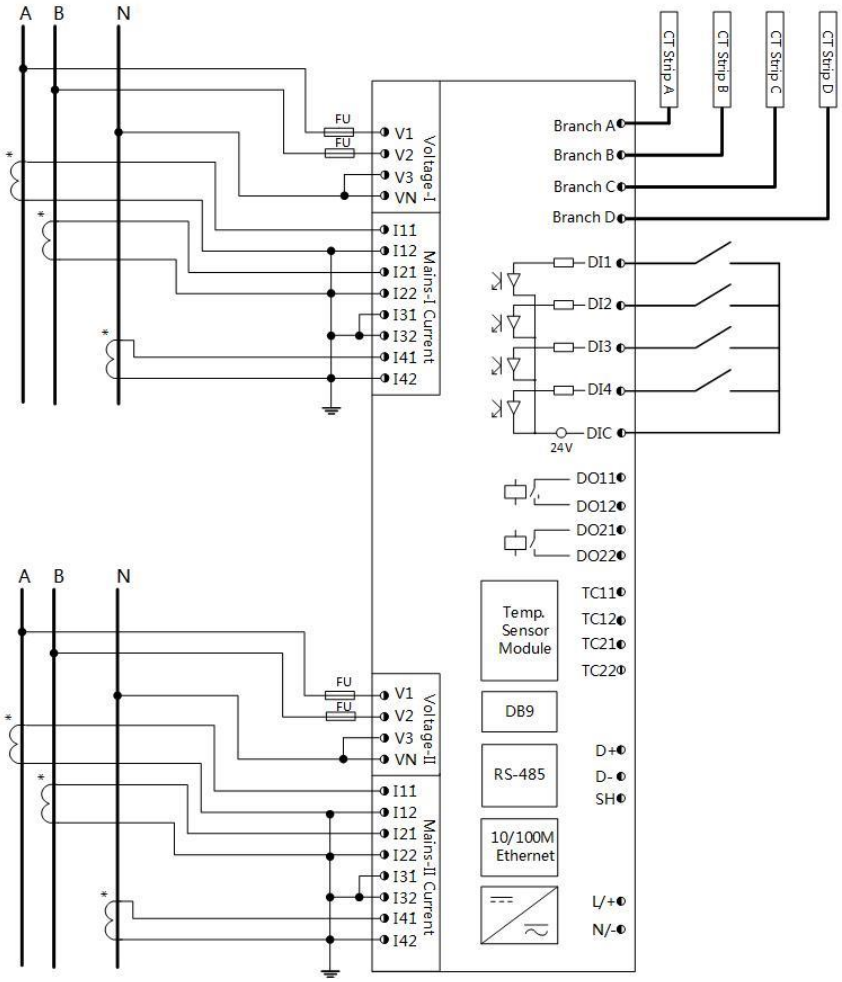


Figure 2-41 Dual Panel Mode II (Mains-I/II = 1P3W Direct Connection)

Notes:

1) Please consult the **Serial Number Label** to ensure that the voltage to be measured is less than or equal to the meter's rated Voltage Input specification.

2) All spare Voltage and Current terminals that are not used should be connected to ground.

2.4.1.5 Custom Panel Mode

The Custom Panel Mode allows the users to freely pair any Branch Input (A, B, C or D) with any Mains Input (Mains-I/II) using any Wiring Mode (Wye, Delta or 1P3W) with complete flexibility based on the actual PDU installation, without being restricted by the default Single and Dual Panel Modes that are supported by the PMC-592. Please refer to the Wiring Diagrams in Sections 2.4.1.1, 2.4.1.2, 2.4.1.3 and 2.4.1.4 for more information on how to connect the PMC-592 in Wye, Delta or 1P3W wiring modes.

2.4.2 Wiring for 5A/10A CT Strip with External CTs

The PMC-592 has been designed for Data Center's PDU monitoring where the Branch Circuits are normally under 100A (using the 100A CT Strips or 100A SCCTs). However, for applications such as LV Distribution Board and Load Center monitoring where the Branch Circuits' Loading may be higher than 100A. The PMC-592 can be equipped with 5A/10A (5A nominal with 100% over-range) CT Strips to

interface with external CTs with 5A output. The PMC-592 also supports the ability to configure individual CT Ratio for each Branch Circuit, thus allowing the users to connect various load types with different Primary Currents to the PMC-592's Branch Circuits. Please refer to the following diagram on how to connect external CTs with 5A output to PMC-592's 5A CT Strip.

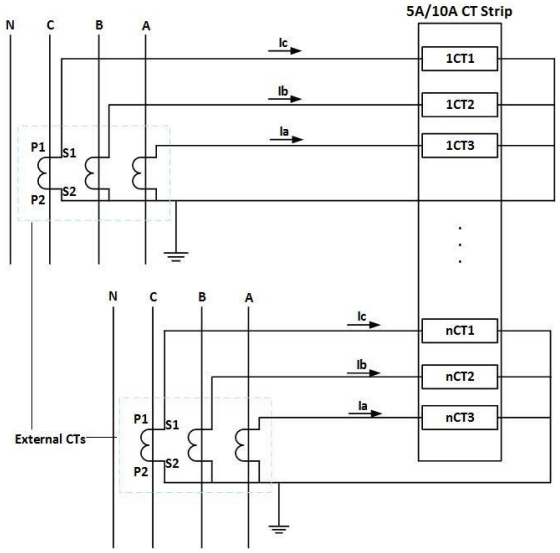


Figure 2-42 How to wire External CTs with 5A output with PMC-592's 5A/10A CT Strip

2.4.3 Branch Circuit Wiring and Sub Meter Assignment

The PMC-592 supports two **Installation Modes** for CT Strips – Sequential and Cross-over. The following sections illustrate the relationship between each Branch CT and its corresponding Sub Meter (SM) assignment. The numbers inside each of the CT Strips are the Branch CT numbers. The numbers outside the CT Strip represent their respective 1-Ø SM assignments based on the **Installation Mode (Sequential or Cross-over)**, **CT Strip Installation Direction (Top or Bottom)** and **CT Strip Polarity (Normal or Reverse)**.

2.4.3.1 Sequential Installation Mode

The PMC-592 supports three **Sequential** installation modes. The following diagrams illustrate the details.

Note:

The CT Strips are located next to the breakers, and the spacing between CTs and breakers should be consistent.

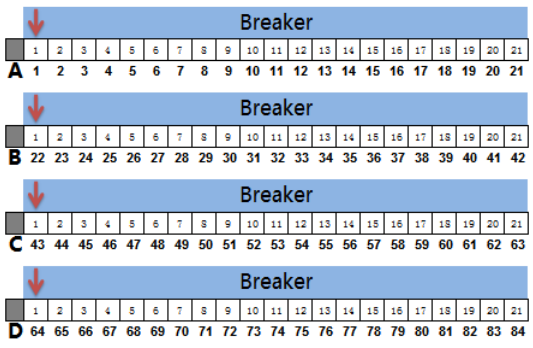
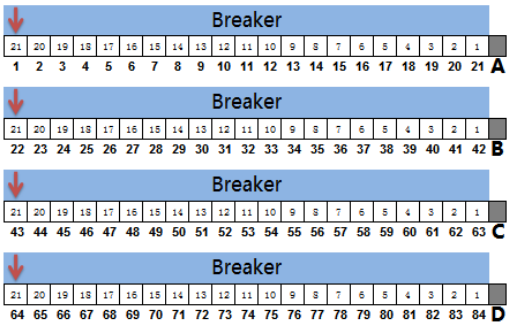
	**Horizontal Configuration:** Installation Mode (Reg. # 6520): 0 = **Sequential Mode** CT Strip A Installation Direction (Reg. # 6525): 0 = **Top** CT Strip B Installation Direction (Reg. # 6526): 0 = **Top** CT Strip C Installation Direction (Reg. # 6527): 0 = **Top** CT Strip D Installation Direction (Reg. # 6528): 0 = **Top** CT Strip A Polarity (Reg. # 6521): 0 = **Normal** CT Strip B Polarity (Reg. # 6522): 0 = **Normal** CT Strip C Polarity (Reg. # 6523): 0 = **Normal** CT Strip D Polarity (Reg. # 6524): 0 = **Normal**

Table 2-6 Sequential Mode I



Horizontal Configuration:

Installation Mode (Reg. # 6520): 0 = **Sequential Mode**

CT Strip A Installation Direction (Reg. # 6525): 1 = **Bottom**

CT Strip B Installation Direction (Reg. # 6526): 1 = **Bottom**

CT Strip C Installation Direction (Reg. # 6527): 1 = **Bottom**

CT Strip D Installation Direction (Reg. # 6528): 1 = **Bottom**

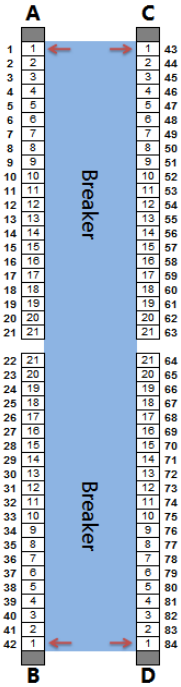
CT Strip A Polarity (Reg. # 6521): 1 = **Reverse**

CT Strip B Polarity (Reg. # 6522): 1 = **Reverse**

CT Strip C Polarity (Reg. # 6523): 1 = **Reverse**

CT Strip D Polarity (Reg. # 6524): 1 = **Reverse**

Table 2-7 Sequential Mode II



Vertical Configuration:

Installation Mode (Reg. # 6520): 0 = **Sequential Mode**

CT Strip A Installation Direction (Reg. # 6525): 0 = **Top**

CT Strip B Installation Direction (Reg. # 6526): 1 = **Bottom**

CT Strip C Installation Direction (Reg. # 6527): 0 = **Top**

CT Strip D Installation Direction (Reg. # 6528): 1 = **Bottom**

CT Strip A Polarity (Reg. # 6521): 0 = **Normal**

CT Strip B Polarity (Reg. # 6522): 1 = **Reverse**

CT Strip C Polarity (Reg. # 6523): 1 = **Reverse**

CT Strip D Polarity (Reg. # 6524): 0 = **Normal**

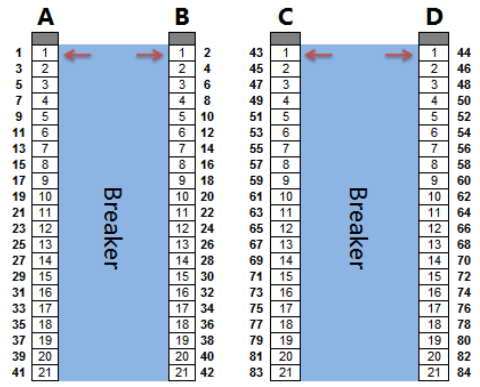
Table 2-8 Sequential Mode III

2.4.3.2 Cross-over Installation Mode

The PMC-592 supports three **Cross-over** installation modes. The following diagrams illustrate the details.

Note:

The CT Strips are located next to the breakers, and the spacing between CTs and breakers should be consistent.



Vertical Configuration:

Installation Mode (Reg. # 6520): 1 = **Cross-over Mode**

CT Strip A Installation Direction (Reg. # 6525): 0 = **Top**

CT Strip B Installation Direction (Reg. # 6526): 0 = **Top**

CT Strip C Installation Direction (Reg. # 6527): 0 = **Top**

CT Strip D Installation Direction (Reg. # 6528): 0 = **Top**

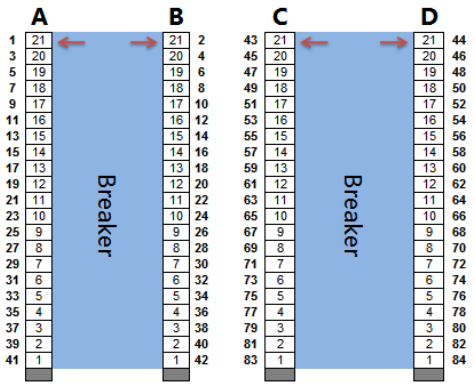
CT Strip A Polarity (Reg. # 6521): 0 = **Normal**

CT Strip B Polarity (Reg. # 6522): 1 = **Reverse**

CT Strip C Polarity (Reg. # 6523): 0 = **Normal**

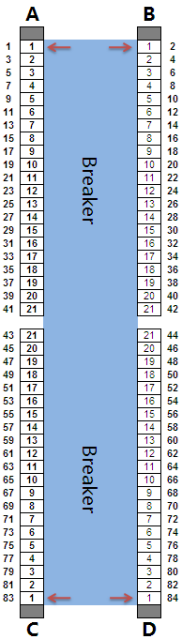
CT Strip D Polarity (Reg. # 6524): 1 = **Reverse**

Table 2-9 Cross-over Mode I



Vertical Configuration:
Installation Mode (Reg. # 6520): 1 = **Cross-over Mode**
CT Strips A Installation Direction (Reg. # 6525): 1 = **Bottom**
CT Strips B Installation Direction (Reg. # 6526): 1 = **Bottom**
CT Strips C Installation Direction (Reg. # 6527): 1 = **Bottom**
CT Strips D Installation Direction (Reg. # 6528): 1 = **Bottom**
CT Strips A Polarity (Reg. # 6521): 1 = **Reverse**
CT Strips B Polarity (Reg. # 6522): 0 = **Normal**
CT Strips C Polarity (Reg. # 6523): 1 = **Reverse**
CT Strips D Polarity (Reg. # 6524): 0 = **Normal**

Table 2-10 Cross-over Mode II



Vertical Configuration:
Installation Mode (Reg. # 6520): 0 = **Cross-over Mode**
CT Strip A Installation Direction (Reg. # 6525): 0 **= Top**
CT Strip B Installation Direction (Reg. # 6526): 0 = **Top**
CT Strip C Installation Direction (Reg. # 6527): 1 = **Bottom**
CT Strip D Installation Direction (Reg. # 6528): 1 = **Bottom**
CT Strip A Polarity (Reg. # 6521): 0 = **Normal**
CT Strip B Polarity (Reg. # 6522): 1 = **Reverse**
CT Strip C Polarity (Reg. # 6523): 1 = **Reverse**
CT Strip D Polarity (Reg. # 6524): 0 = **Normal**

Table 2-11 Cross-over Mode III

2.5 Communications Wiring

2.5.1 Ethernet Port (10/100BaseT)

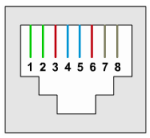
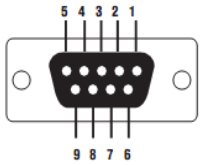
RJ45 Connector	Pin	Meaning
	1	Transmit Data+
	2	Transmit Data-
	3	Receive Data+
	4, 5, 7, 8	NC
	6	Receive Data-

Table 2-12 RJ45 Connector Pin Description for 10/100BaseT Applications

2.5.2 P1/HMI (RS485/RS422/RS232) Wiring

The P1/HMI port of PMC-592 is a DB9 Female connector since Hardware V1.01.00 and can be used as a RS-232/422/485 port since Firmware V1.00.04. It is typically used to work with one of two optional Display Modules: a 7" Touch-Screen HMI or a small Dot-Matrix LCD display (with limited display capability). The P1/HMI port supports the Modbus RTU protocol. Please refer to the following table for a complete description of the pin definitions.

DB9 Female Connector	Pin	Description	Pin	Description
	1	NC	6	RX- (RS-422 Rx- signal)
	2*	RXD (RS-232 send signal)	7	RX+ (RS-422 Rx+ signal)
	3*	TXD (RS-232 receive signal)	8	TX-/D-(RS-422 Tx-/RS-485 D- signal)
	4*	5V (Power for LCD HMI)	9	TX+/D+ (RS-422 Tx+/RS-485 D+ signal)
	5	GND		

* Pins 2, 3 and 4 are only used for the small Dot-Matrix LCD display

Table 2-13 DB9 Connector Pin Description for P1/HMI

The 7" Touch-Screen HMI is equipped with a DB9 Male connector that supports RS-422. The DB9 cable that comes with the HMI connects the PMC-592's P1/HMI port (DB9 Female connector) with the HMI's DB9 Male connector (HMI). The following diagram illustrates the display cable's internal wiring:

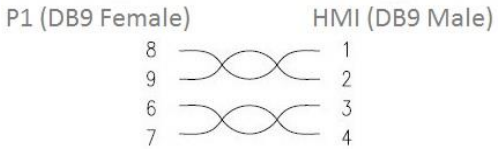


Figure 2-43 Display Cable's Internal Wiring

2.5.3 P2 (RS485) Wiring

The PMC-592 provides a second RS485 port (P2). Up to 32 devices can be connected on a RS485 bus where 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, USB/RS485 or Ethernet/RS485 converter with optical isolation and surge protection should be used. The following figure illustrates the RS485 communications connections on the PMC-592:

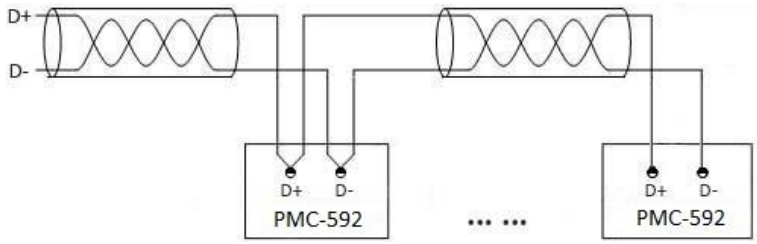


Figure 2-44 P2 (RS485) Communications Connections

2.5.4 PMC-592 External DI Module Wiring

The optional external PMC-521D Digital Input Module can be connected via P2 since Firmware V1.00.03. Up to four PMC-521Ds can be connected when the **P2 Operating Mode** setup parameter (Modbus register # 6381) is configured as **External DI Module** instead of **Modbus RTU**. The following figure illustrates the P2 (RS485) communications connections with the PMC-521D:

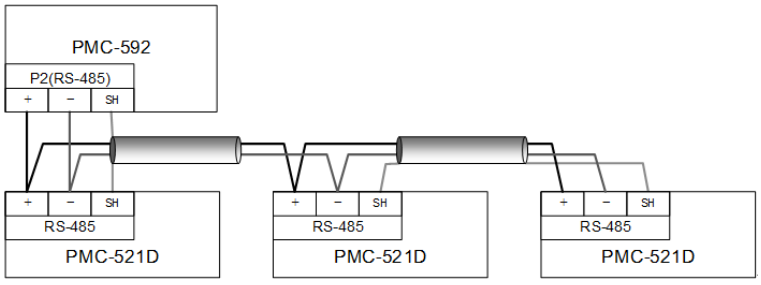


Figure 2-45 P2 (RS485) Communications Connections with PMC-521D

2.6 Digital Input Wiring

The following figure illustrates the Digital Input connections on the PMC-592:

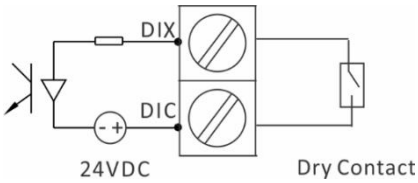


Figure 2-46 DI Connections

2.7 Digital Output Wiring

The following figure illustrates the Digital Output connections on the PMC-592:

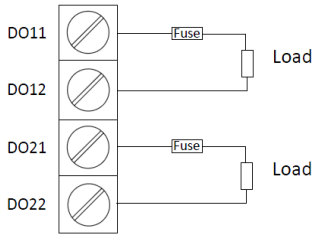


Figure 2-47 DO Connections

2.8 RTD Input Wiring

The following figure illustrates the Temperature Input connections on the PMC-592:

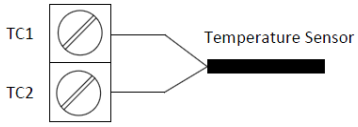


Figure 2-48 Temperature Input Connections

2.9 Main Unit 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.

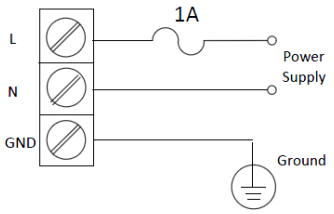


Figure 2-49 Power Supply Connections

2.10 HMI Power Supply Wiring

For DC supply, connect the positive wire to the L/+ terminal and the negative wire to the N/- terminal. Please be reminded that the HMI requires a 24VDC power supply.

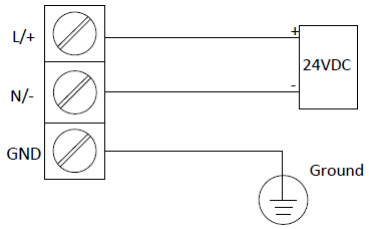


Figure 2-50 HMI Power Supply Connection

2.11 Chassis Ground Wiring

Connect the G terminal to earth ground.

Figure 2-51 Chassis Ground connection

Chapter 3 User Interface

3.1 Front Panel LED Indicators

There are four LED indicators on the PMC-592's front panel as described in the following table.

LED Indicator	Color	Status	Description
Run	Green	Blinking once per second	System is running normally
Fault	Red	On	Abnormal Self-Diagnostics
		Blinking once per 0.5s	CT Strips Installation Error
P1/HMI (RS422/RS485/RS322)	Green	Blinking	Receiving data
	Red	Blinking	Transmitting data
P2 (RS485)	Green	Blinking	Receiving data
	Red	Blinking	Transmitting data

Table 3-1 Front Panel LED Indicators

3.2 Web Interface

The default IP Address of the PMC-592's Ethernet Port (P3) is 192.168.0.100. Please make sure to configure the IP Addresses and Subnet Mask for the PMC-592 and the PC so that they are in the same subnet.

3.2.1 Setting PC's IP Address

To determine the PC's IP Address, go to **Control Panel**, double-click on **Network and Sharing Center** and the **Network Connections** folder appears.

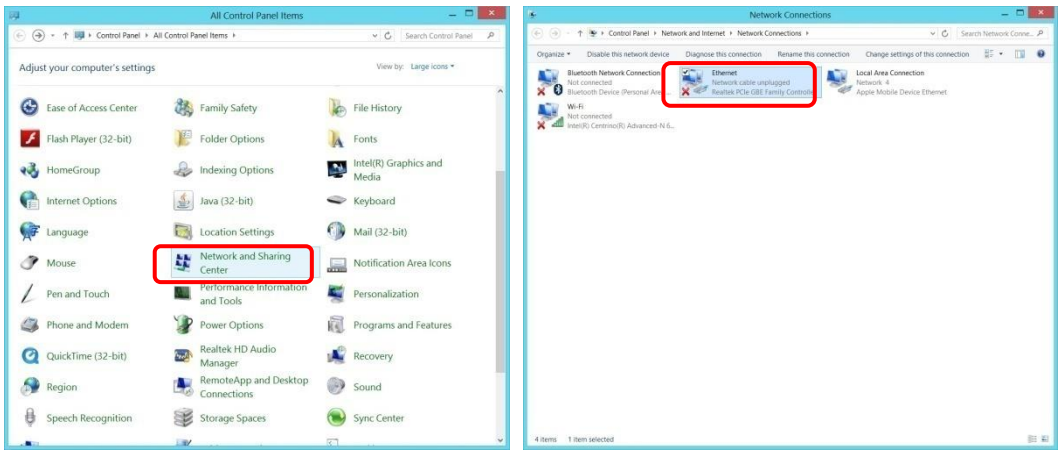


Figure 3-1 Control Panel and Network Connections

Double-click on the **Ethernet** adapter to open its dialog box. Then double-click on **Internet Protocol Version 4 (TCP/IPv4)** to show the PC's IP configuration.

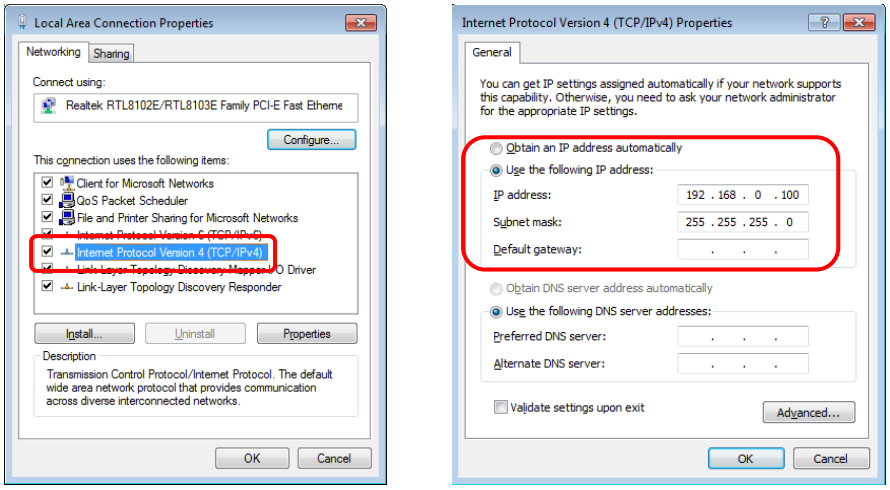


Figure 3-2 Setting PC's IP Address

3.2.2 Configure PMC-592's IP Address using the Touch-Screen HMI

To configure the PMC-592's IP Address, touch the **Setup** icon on the Main page, and then touch **Communication** icon to enter **Communication Setup**. Enter the IP Address, Subnet Mask and Gateway at the highlighted section below.

Figure 3-3 Configure PMC-592's IP Address

3.2.3 Accessing PMC-592's Web Interface via Mobile Devices

The PMC-592 with Firmware V1.00.10 or later supports the browsing of its webpage via mobile devices, such as iPhone, iPad or Android Devices. Before browsing the PMC-592's web interface via mobile devices, a basic LAN (Local Area Network) should be set up where the PMC-592 is connected to a wireless access point or router with the correct IP Address and Subnet Mask. A simple network structure providing wireless access to the PMC-592 is illustrated below.

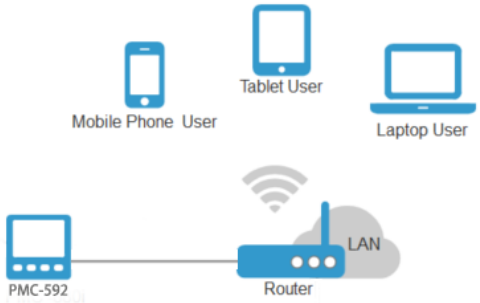


Figure 3-4 LAN Structure

The following screen captures provide some examples of the PMC-592 web pages from a mobile device.

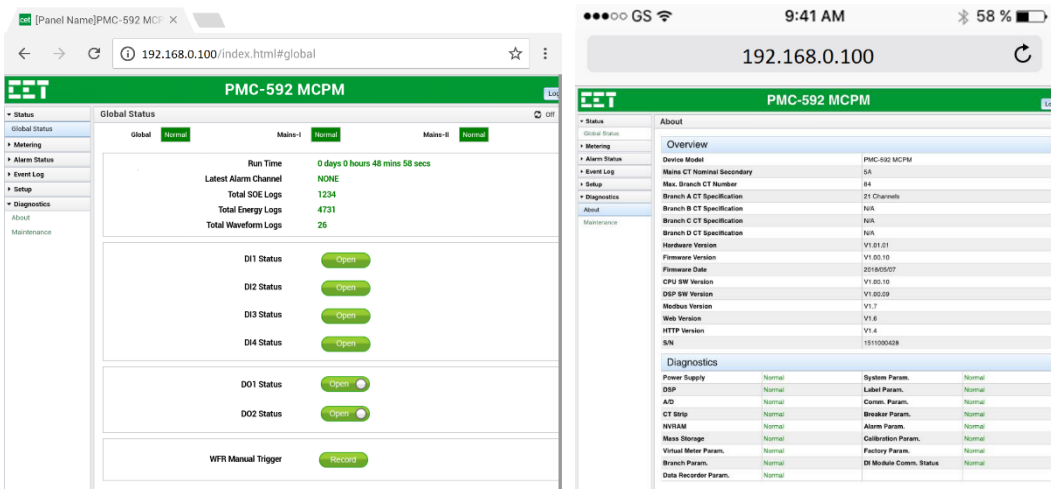


Figure 3-5 Mobile Device Web Interfaces

3.2.4 Accessing PMC-592's Web Interface

1) Enter the IP Address of the PMC-592 in the Address area of your Internet Explorer and then press **<Enter>**.
2) The PMC-592's Web Interface appears. There are six **Main Menu** items on the left-hand pane – **Global Status, Metering, Alarm Status, Event Log, Setup** and **Diagnostics**.
3) The user is not required to login to the Web interface to view data. Login is only required if the user intends to make changes to the setup parameters.

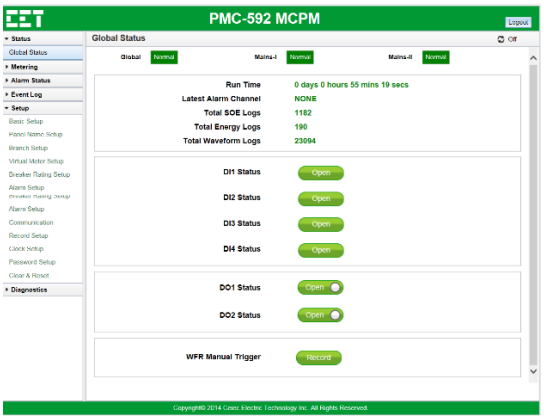


Figure 3-6 PMC-592's Web Interface

3.2.4.1 Global Status

The **Global Status** page includes following information:

Parameter	Description
Global/Mains-I/Mains-II	Displays the Global, Mains-I or Mains-II Alarms.
Run Time	Displays Main Unit's run time since the last power on. Click the **Refresh** icon at the upper right-hand corner and below the Logout button to enable/disable the **Auto Refresh** function.
Latest Alarm Channel	Displays the latest alarm location.
Total SOE Logs	Displays the current value of the SOE Log Pointer.
Total Energy Log	Displays the current value of the Energy Log Pointer.
Total Waveform Logs	Displays the current value of the Waveform Log Pointer.
DI1/DI2/DI3/DI4 Status	Displays the DI1 to DI4 status. DI3 and DI4 only appear if the PMC-592 Is equipped with the 4xDIs option.
DO1/DO2 Status	Displays the DO1 and DO2 status.
WFR Manual Trigger	Click **Record** to trigger WFR manually. If **Auto Refresh** is turned on, the **Total Waveform Logs** number should be incremented.

Table 3-2 Global Status Description

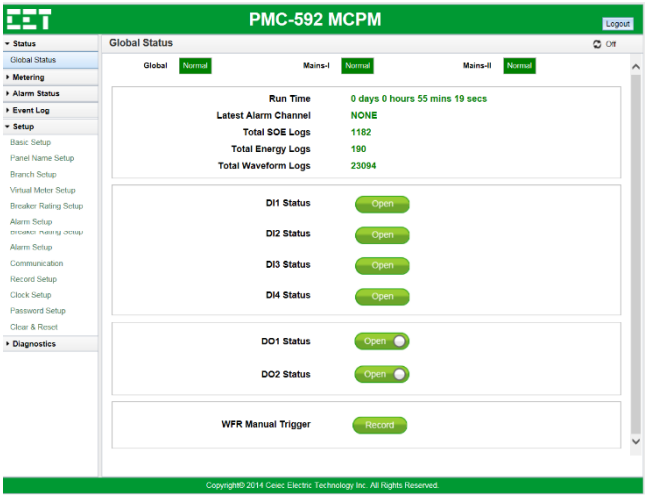


Figure 3-7 Status Interface

3.2.4.2 Metering

Click on the **Arrow** icon besides **Metering** to expand its sub-menu, which includes **Real Time, Energy, Demand, Harmonics, Max/Min** and **I/O.** The following sections provide a quick overview of the information available under **Metering**.

3.2.4.2.1 Real-Time

Click **Real-Time** on the left-hand pane and the following pages appear on the right-hand pane: **Mains**, **1-Phase (1-42)**, **1-Phase (43-84)**, **2-Phase**, **3-Phase** and **Virtual Meter**.

Tab	Function
Mains	Displays the parameters for Mains-I and Mains-II, which include Loading Factor, Voltage, Current, kW, kvar, kVA, PF, Current Unbalance and Temperature.
1-Phase (1-42)	Displays Current, Loading Factor, kW, kvar, kVA and PF for 1-Ø SM1 to SM42.
1-Phase (43-84)	Displays Current, Loading Factor, kW, kvar, kVA and PF for 1-Ø SM43 to SM84.
2-Phase	Displays Current, Loading Factor, kW, kvar, kVA and PF for 2-Ø SM1 to SM42.
3-Phase	Displays Current, Loading Factor, kW, kvar, kVA and PF for 3-Ø SM1 to SM28.
Virtual Meter	Displays kW for VM1 to VM10.

Table 3-3 Real-time Description

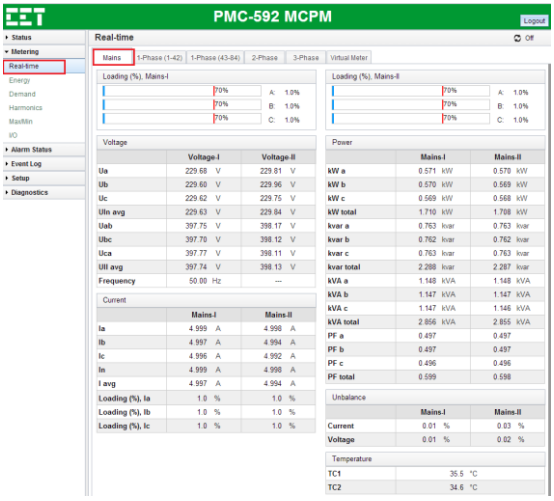


Figure 3-8 Mains Real-Time Interface

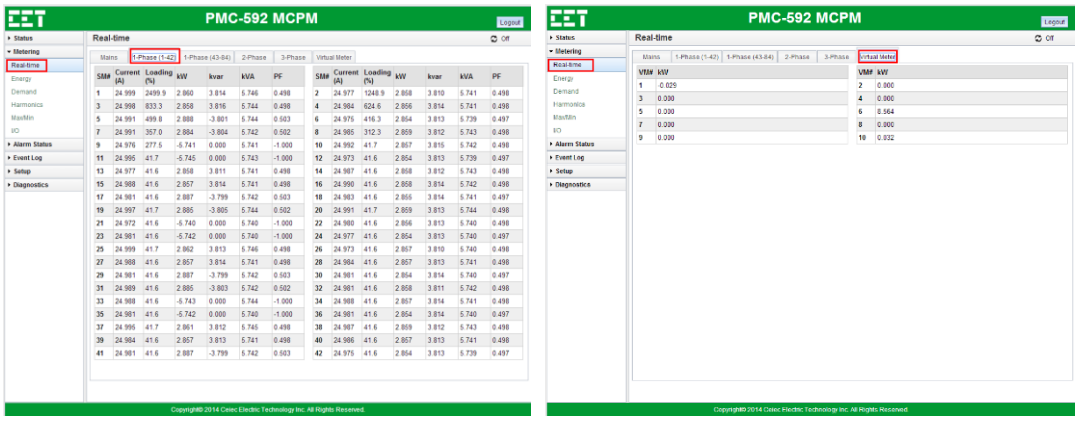


Figure 3-9 1-Ø (1-42) and Virtual Meter Real-Time Interface

3.2.4.2.2 Energy

Click **Energy** on the left-hand pane and the following pages appear on the right-hand pane: **Mains**, **1-Phase (1-42)**, **1-Phase (43-84)**, **2-Phase**, **3-Phase, Virtual Meter, T1** and **T2**.

Tab	Function
Mains	Displays kWh Imp/kWh Exp/kvarh Imp/kvarh Exp/kVAh Total for Mains-I and Mains-II.
1-Phase (1-42)	Displays kWh/kvarh/kVAh for 1-Ø SM1 to SM42.
1-Phase (43-84)	Displays kWh/kvarh/kVAh for 1-Ø SM43 to SM84.
2-Phase	Displays kWh/kvarh/kVAh for 2-Ø SM1 to SM42.
3-Phase	Displays kWh/kvarh/kVAh for 3-Ø SM1 to SM28.
Virtual Meter	Displays kWh/kvarh/kVAh for VM1 to VM10.
T1/T2*	Displays following T1/T2 energy measurements for Mains-I/II and VMs: **Mains-I/II:** ▪ kWh Imp/Exp ▪ kvarh Imp/Exp ▪ kVAh Total **VM1 to VM10:** ▪ kWh ▪ kvarh ▪ kVAh

* Available in Firmware V1.00.10 or later

Table 3-4 Energy Page Description

Click the **Reset** icon on the right-most column to clear the specific energy measurements. Click the **Reset All** icon on the upper right-hand corner beside the **Refresh** icon to clear energy measurements for Mains-I, Mains-II, all Sub Meters and Virtual Meters.

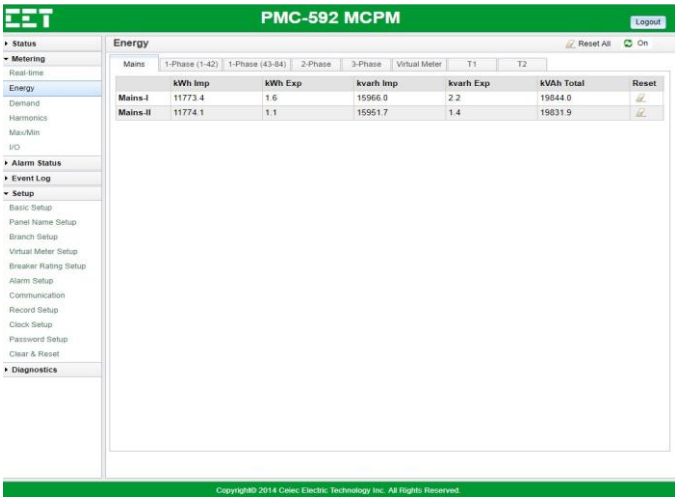


Figure 3-10 Mains Energy Interface

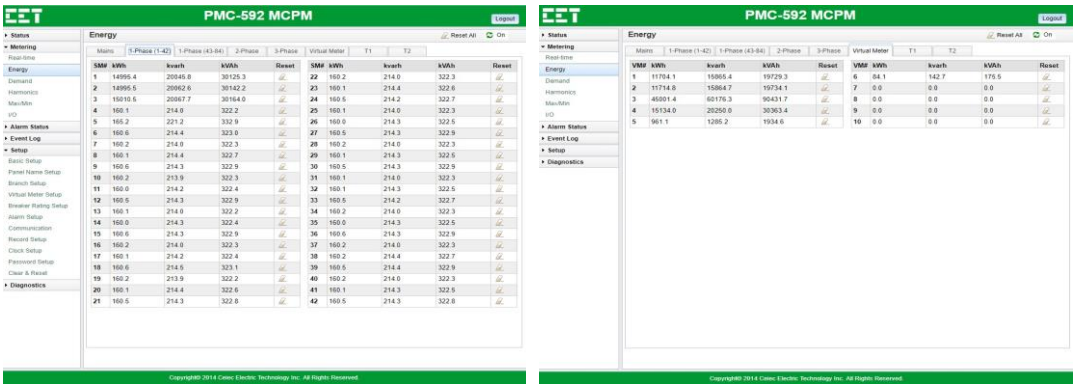


Figure 3-11 1-Ø (1-42) and Virtual Meter Energy Interface

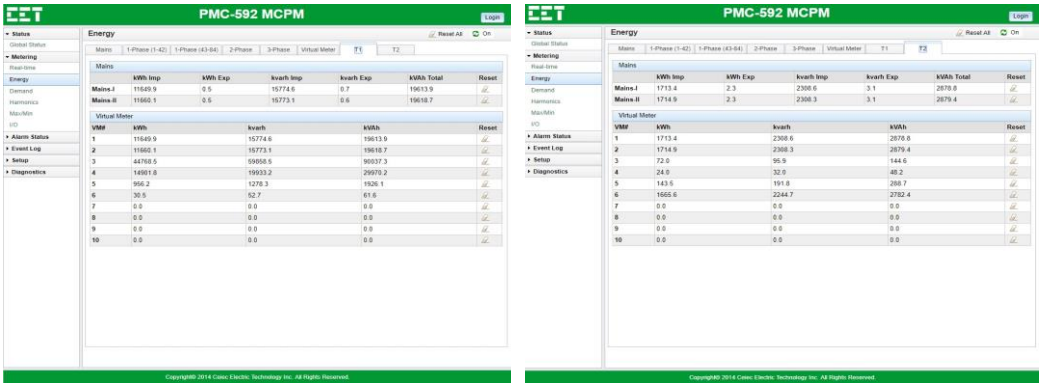


Figure 3-12 T1 and T2 Energy Interface

3.2.4.2.3 Demand

Click **Demand** on the left-hand pane and the following pages appear on the right-hand pane: **Mains**, **1-Phase (1-42)**, **1-Phase (43-84)**, **2-Phase**, **3-Phase** and **Temperature.** The **Demand** drop box at the upper left-hand corner of the right-hand pane provides the following measurement options for a particular page: **Demand of Real-time, Historical Max Demand, Max Demand of This Month** and **Max Demand of Last Month.** The page displays the **Demand of Real Time** for Current, kW, kvar and kVA by default.

Tab	Function
Mains	Displays the Demand measurements for Mains-I and Mains-II.
1-Phase (1-42)	Displays the Demand measurements for the 1-Ø SM1 to SM42.
1-Phase (43-84)	Displays the Demand measurements for the 1-Ø SM43 to SM84.
2-Phase	Displays the Demand measurements for the 2-Ø SM1 to SM42.
3-Phase	Displays the Demand measurements for the 3-Ø SM1 to SM28.
Temperature*	Displays the Demand measurements for RTD 1 and RTD 2.

* Available in Firmware V1.00.04 or later

Table 3-5 Demand Description

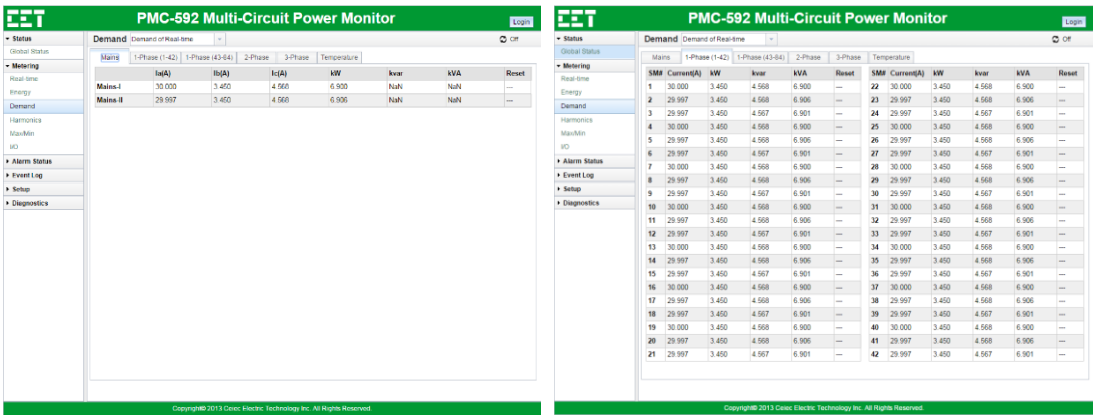


Figure 3-13 Demand Interface

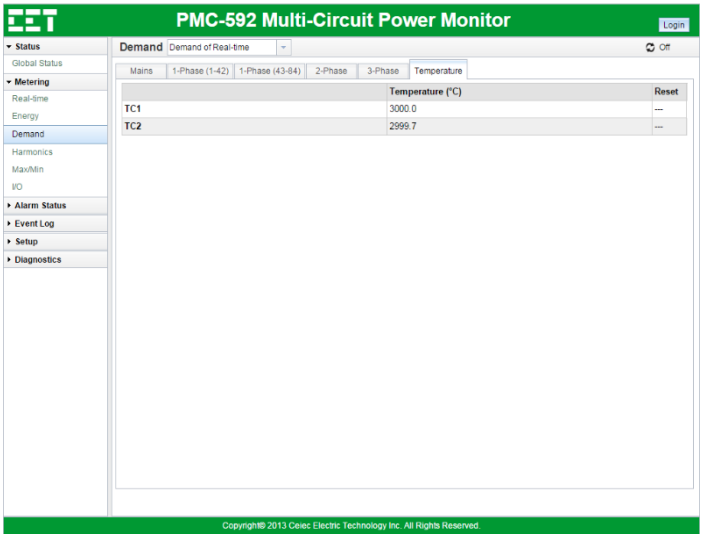


Figure 3-14 Temperature Demand

3.2.4.2.4 Harmonics

Click **Harmonics** on the left-hand pane and the following pages appear on the right-hand pane: **Mains** and **Branches**.

Tab	Function
Mains	There are two drop boxes on the upper left-hand corner. The first drop box provides the following options: **Voltage-I, Voltage-II, Current-I, Current-II**. The second drop box provides the following options: **Ia/Ib/Ic** for **Current-I** and **Current-II, Ua/Uab, Ub/Ubc, Uc/Uca** for **Voltage-I** and **Voltage-II**. The web page shows the following measurements: • The Harmonic Histogram • Voltage THD, TOHD and TEHD • Current K-Factor • Voltage and Current Crest Factor* • Current TDD, TDD Odd and TDD Even* • Individual Harmonics from H02 to H31 for the selected option * Available in Firmware V1.00.05 or later
Branches	Displays Current THD for the SM1 to SM84 Sub Meters.

Table 3-6 Harmonic Description

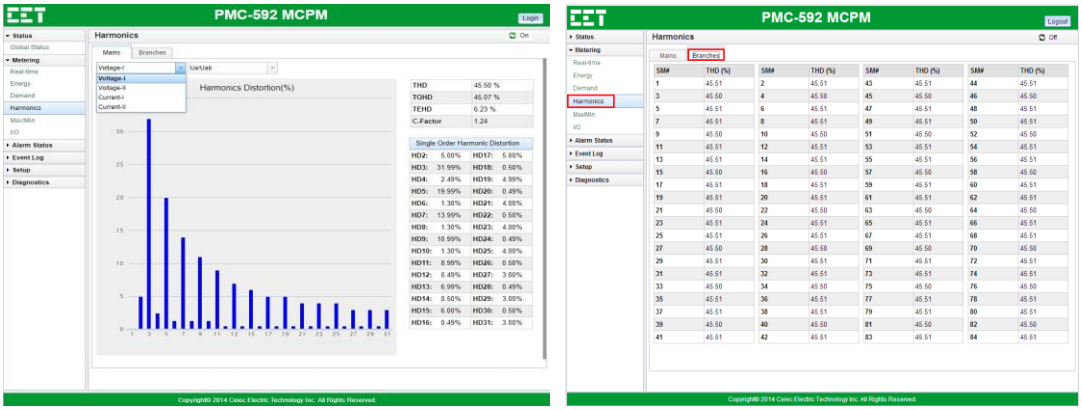


Figure 3-15 Harmonics Interface

3.2.4.2.5 Max/Min

Click **Max/Min** on the left-hand pane and the following pages appear on the right-hand pane: **Mains**, **1-Phase (1-42)**, **1-Phase (43-84)**, **2-Phase**, **3-Phase, Mains PQ** and **Branches PQ.** The **Max/Min** drop box at the upper left-hand corner of the right-hand pane provides the following options: **Historical Max, Historical Min, Max of This Month, Max of Last Month, Min of This Month,** and **Min of Last Month.**

Tab	Function
Mains	Displays the Max/Min for the following parameters for Mains-I and Mains-II, respectively: Voltage, Current, Loading Factor, kW, kvar, kVA, PF, Unbalance and RTD.
1-Phase (1-42)	Displays the Max/Min for the following parameters for the 1-Ø SM1 to SM42: Current, Loading Factor, kW, kvar, kVA and PF.
1-Phase (43-84)	Displays the Max/Min for the following parameters for the 1-Ø SM43 to SM84: Current, Loading Factor, kW, kvar, kVA and PF.
2 Phase	Displays the Max/Min for the following parameters for the 2-Ø SM1 to SM42: Current, Loading Factor, kW, kvar, kVA and PF.
3-Phase	Displays the Max/Min for the following parameters for the 1-Ø SM1 to SM28: Current, Loading Factor, kW, kvar, kVA and PF.
Mains PQ	Displays the Max/Min for the following parameters for Mains-I and Mains-II: Voltage THD/TOHD/TEHD/Crest Factor and Current THD/TOHD/TEHD/K-Factor/Crest Factor/TDD/TDD Odd/TDD Even. **Note:** The Voltage and Current Crest Factor, Current TDD/TDD Odd/TDD Even are available since Firmware V1.00.05.
Branches PQ	Displays the Max/Min for the following parameters for the SM1 to SM84: Current THD.

Table 3-7 Description of Max/Min Page

Click the **Reset All** icon at the upper right-hand corner beside the **Refresh** icon to clear all **Max/Min** log.

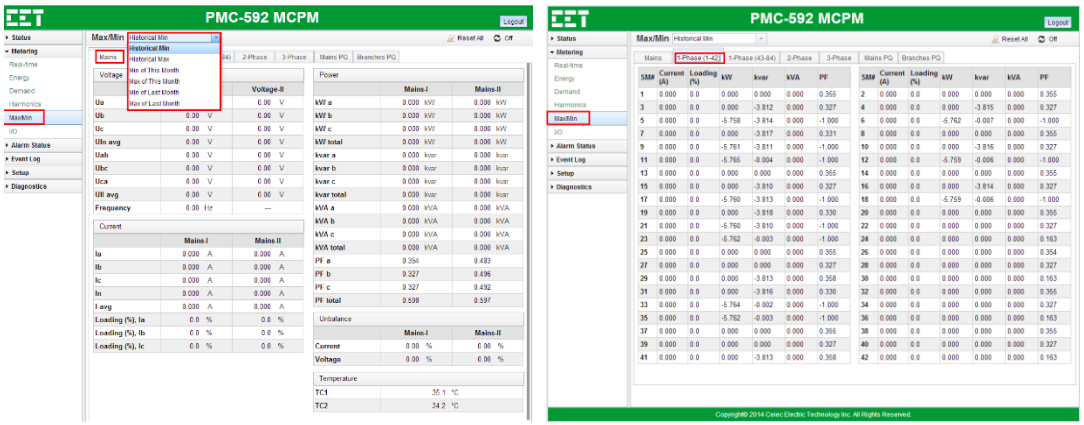


Figure 3-16 Mains and 1-Ø (1-42) Interface

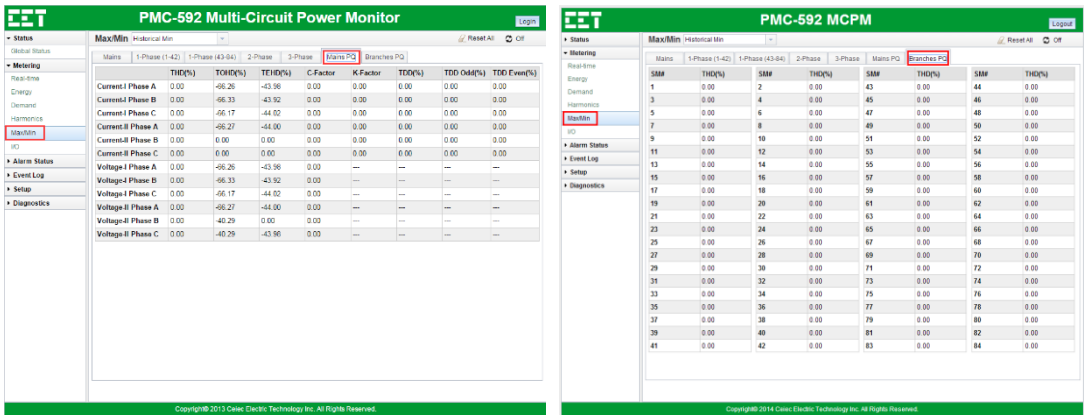


Figure 3-17 Mains and Branch PQ Interface

3.2.4.2.6 I/O

Click **I/O** on the left-hand pane and the following page appears on the right-hand pane, which displays the following information: **DI Status, DO Status** and **DI Module 1** to **DI Module 4 Status** if connected. The DI3 and DI4 status only appear when the PMC-592 is equipped with the 4xDIs option, and **DI Module 1** to **DI Module 4 Status** are supported since Firmware V1.00.03.

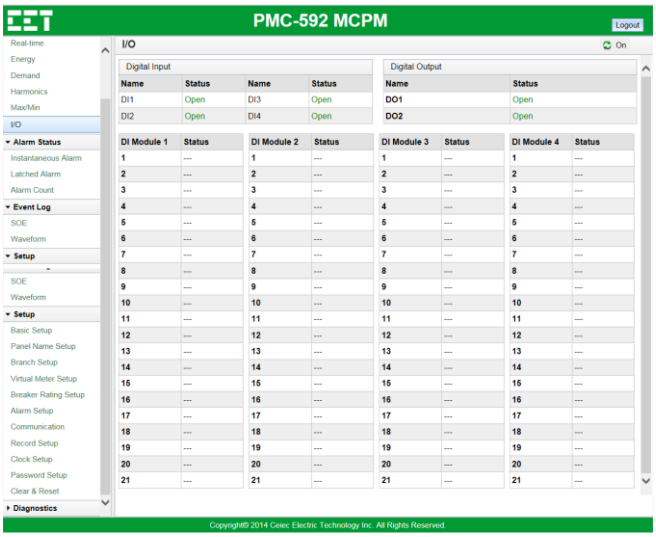


Figure 3-18 I/O Interface

3.2.4.3 Alarm Status

Click the **Arrow** icon beside **Alarm Status** on the left-hand pane to expand its sub-menu, which includes **Instant Alarm, Latched Alarm** and **Alarm Count.** The following sections provide a quick overview of the web pages available under **Alarm Status.**

3.2.4.3.1 Instantaneous Alarm

The **Instantaneous Alarm** page has two tabs: **Mains** and **Branches**.

Tab	Function
Mains	Displays the Instantaneous Alarm status for Global Alarm, Mains-I Alarm, Mains-II Alarm as well as the following alarms for each of the two Mains: Voltage, Frequency, Current, Current Demands, kW, kvar, kVA, PF, kW Demand, kvar Demand, kVA Demand, U & I Harmonics, U & I Unbalance, DI, Temperature, Phase Reversal and Phase Loss. **Note:** The Phase Reversal and Phase Loss alarms are available since Firmware V1.00.05.
Branches	Displays the Instantaneous Alarm status for the SM1 to SM84 Sub Meters' Current.

Table 3-8 Description of Instantaneous Alarm Page

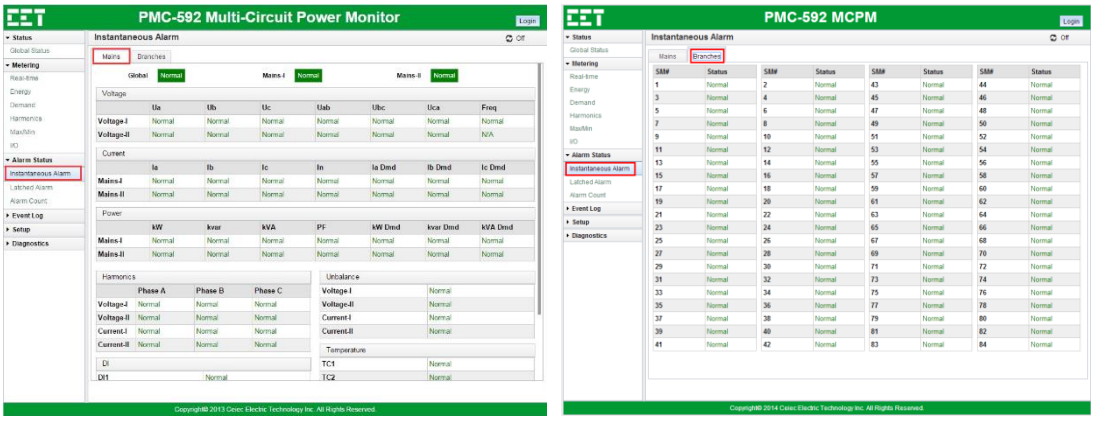


Figure 3-19 Instantaneous Alarm Interface

3.2.4.3.2 Latched Alarm

The **Latched Alarm** page has two tabs: **Mains** and **Branches**.

Tab	Function
Mains	Displays the Latched Alarm status for Global Alarm, Mains-I Alarm, Mains-II Alarm, as well as the following parameters for each of the two Mains: Voltage, Frequency, Current, Current Demands, kW, kvar, kVA, PF, kW Demand, kvar Demand, kVA Demand, U & I Harmonics, U & I Unbalance, DI, Temperature, Phase Reversal and Phase Loss. **Note:** The Phase Reversal and Phase Loss alarms are available since Firmware V1.00.05.
Branches	Displays the Latched Alarm status for the SM1 to SM84 Sub Meters' Current.

Table 3-9 Latched Alarm Description

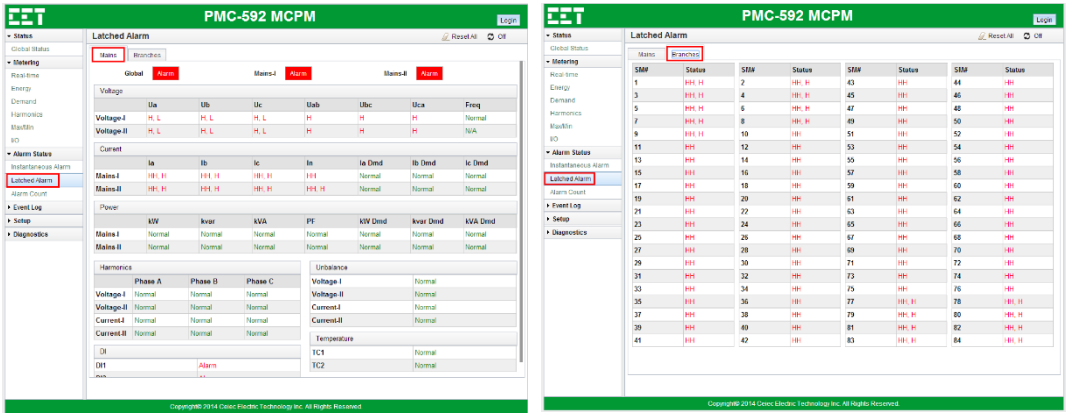


Figure 3-20 Latched Alarm Interface

Click the **Reset** icon after left-clicking on the corresponding alarm **Status** cell to reset a specific latched alarm or alarms. Click **Reset All** at the upper right-hand corner and beside the **Off** icon to clear all latched alarms.

3.2.4.3.3 Alarm Count

The **Alarm Count** page has two tabs: **Mains** and **Branches**.

Tab	Function
Mains	Displays all Mains' Alarm Counters.
Branches	Displays the Alarm counters for the SM1 to SM84 Sub Meters.

Table 3-10 Alarm Count Description

Click the **Reset** icon on the right-hand column to reset the specific counter. Click **Reset All** at the upper right-hand corner and beside the **Refresh** icon to clear all counters.

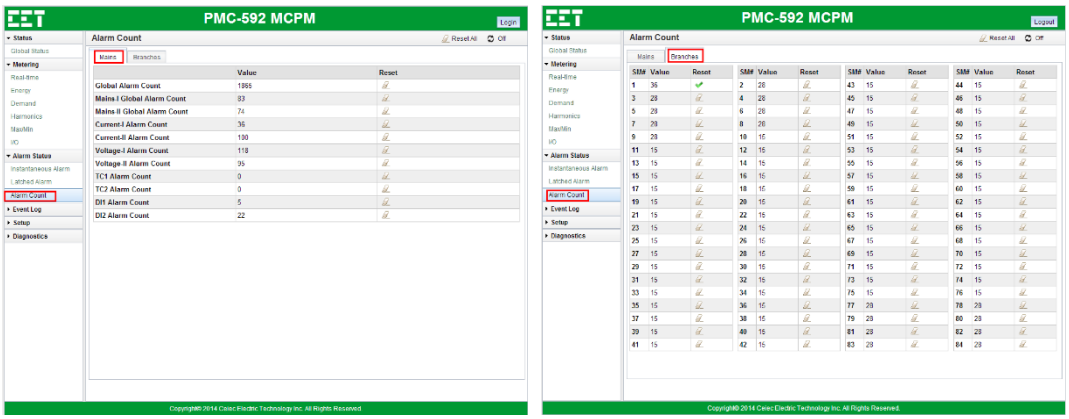


Figure 3-21 Alarm Counter Interface

3.2.4.4 Log

3.2.4.4.1 SOE

Click **SOE** on the left-hand pane and the following screen appears on the right-hand pane. Click the **Clear All** icon at the upper right-hand corner and beside the **Refresh** icon to clear the SOE Log. Caution should be exercised when taking this action.

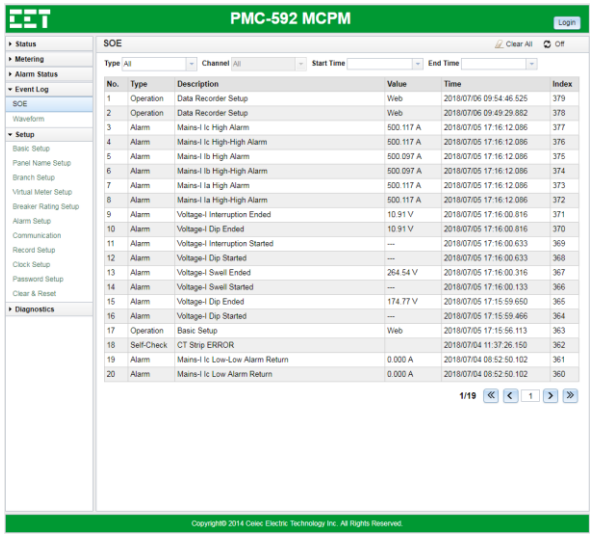


Figure 3-22 SOE Interface

Use the **Type** drop box to filter events based on alarm type. There are six options as shown in the following picture: **All, DI, DO, Alarm, Operation** and **Self-Check**. The event filtering can be further narrowed by setting the Start Time and End Time as shown in the following picture.

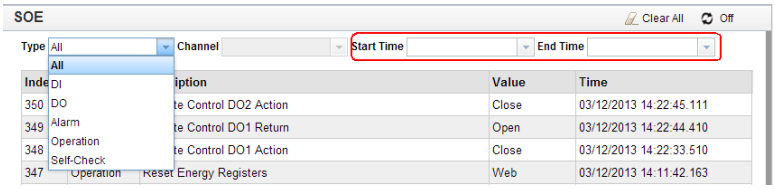


Figure 3-23 SOE Type Interface

Click the **Channel** drop box to filter events based on **Event Type**. The following picture shows the available options: **Mains-I/II power, Mains-I/II Voltage, Mains-I/II Current, Mains-I/II Voltage Unbalance, Mains-I/II Current Unbalance, Frequency, TC1/TC2 Temperature, DIs** and **SM1 to SM84**.

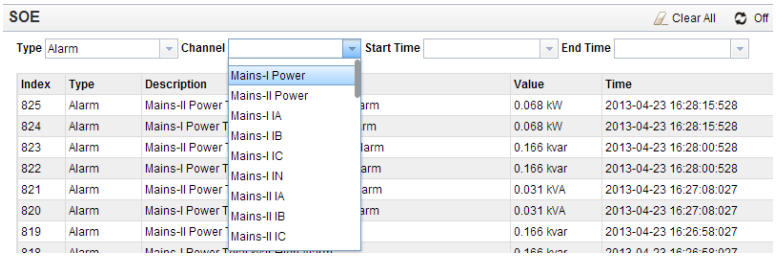


Figure 3-24 SOE Channel Interface

3.2.4.4.2 Waveform

Click **Waveform** on the left-hand pane and the following screen appears on the right-hand pane where the Waveform files in COMTRADE format (**.CFG** and **.DAT)** can be downloaded, and click **Waveform** to show the recorded waveforms in details. Click the **Clear All** icon at the upper right-hand corner and beside the **Refresh** icon to clear the Waveform Log. Caution should be exercised when taking this action.

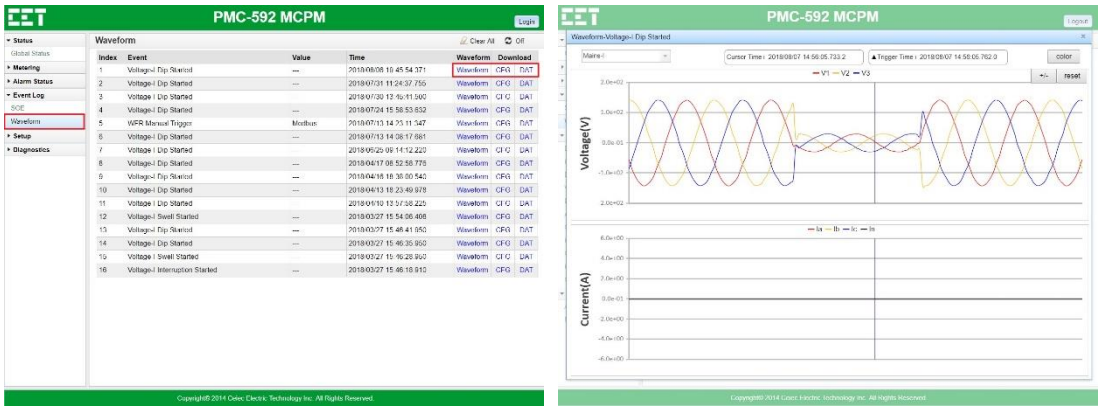


Figure 3-25 Waveform Interface

The following introduce the basic operations on the **Waveform** details page.

- **Zooming In & Out**: Move the mouse pointer to the target area, hold down the left mouse button and then drag it to the right to zoom into the selected area. To zoom out, hold down the left mouse button and then drag it to the left. After zooming in or out, the **<+/->** and **<reset>** buttons appear at the upper right-hand corner and beneath the **<color>** button. The **<+/->** button indicates that it's currently in the **Zoom** mode.
- **Scrolling the Waveform**: While in the **Zoom** mode, the user can change it to the **Scroll** mode by clicking on the **<+/->** button, and it will change to the **<←→>** "scroll" button. Now the waveform can be scrolled backward or forward by holding down the left mouse button anywhere on the waveform and dragging it left or right. Clicking on the **<←→>** button again will return to the **Zoom** mode again.
- **Resetting Waveform**: Click <**reset>** to return the waveform to its original "non zoomed-in" state.
- **Changing Color**: click the <**color>** button to select different colors for the three phases as shown in the **color setup** dialog box. The setting will take effect immediately after clicking the <**submit>** button. Click **<cancel>** to cancel your configuration and exit the dialog box.

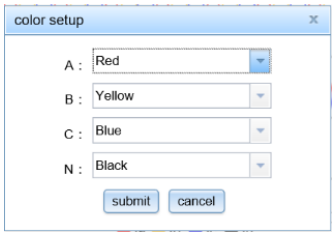


Figure 3-26 Color Setup Dialog Box

3.2.4.5 Setup

Click the **Arrow** icon beside **Setup** on the left-hand pane to expand its sub-menu, which includes **Basic Setup, Panel Name Setup, Branch Setup, Virtual Meter Setup, Breaker Rating Setup, Alarm Setup, Communication, Record Setup, Clock Setup, Password Setup** and **Clear & Reset**.

In order to make changes, the user is required to log in to the web interface by entering the password (default password of 'user' = 0000) at the **Login** dialog box before any changes can be made.

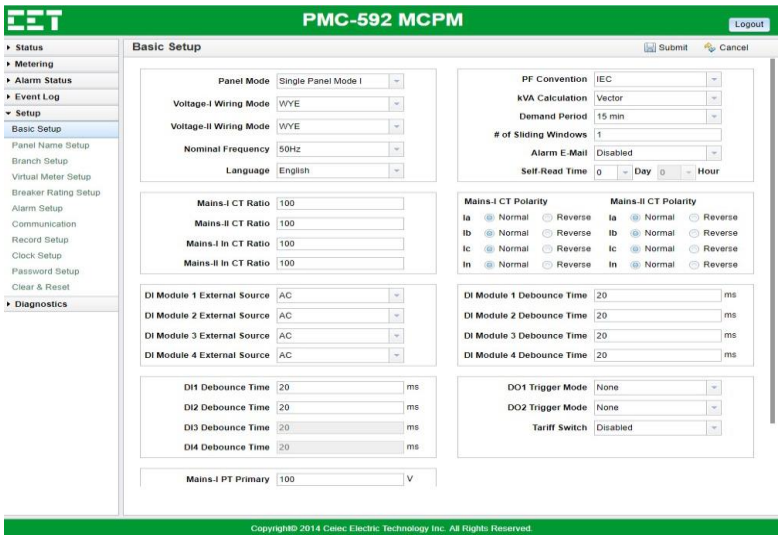


Figure 3-27 Basic Setup Interface

3.2.4.5.1 Basic Setup

Click **Basic Setup** on the left-hand pane and the above screen appears on the right-hand pane where the following basic parameters can be changed. Click **Submit** to save your changes or **Cancel** to cancel your changes.

Parameter	Description	Options/Default*
Panel Mode	Specifies the Panel mode. Please refer to section **2.4.1 Panel Mode and Wiring** for more information.	• Single Panel Mode I* • Single Panel Mode II • Dual Panel Mode I • Dual Panel Mode II • Custom^
Voltage-I Wring Mode	Specifies the wiring mode for Mains-I.	• WYE* • 1P3W˜ • Demo Mode • DELTA^
Voltage-II Wiring Mode	Specifies the wiring mode for Mains-II.	• WYE* • 1P3W˜ • DELTA
Nominal Frequency	Specifies the system's nominal frequency.	• 50Hz* • 60Hz
Language	Specifies the displayed language.	• Simplified Chinese

		• English* • Traditional Chinese
PF Convention	Specifies the Power Factor Convention. Please refer to Section **5.8.1 System Parameters** for more information.	• IEC* • IEEE • –IEEE
kVA Calculation	Specifies the kVA Calculation method. Please refer to Section **5.8.1 System Parameters** for more information.	• Vector* • Scalar
Demand Period	Demand Cycle = # of Sliding Window x Demand Period.	1 to 60 minutes, 15*
# of Sliding Windows		1* to 15
Alarm E-Mail	Specifies if the SMTP alarm email is enabled.	• Disabled* • Enabled
Self-Read Time	Specifies the time to transfer the Peak Demands and the Max/Min values from This Month to Last Month.	
Mains-I/Mains-II CT Ratio	Specifies the CT Ratio of Mains-I/Mains-II.	1A: 1* to 30000 5A: 1* to 6000
Mains-I/Mains-II In CT Ratio	Specifies the In (or I4) CT Ratio of Mains-I/Mains-II.	1* to 10000
Mains-I CT Polarity	Specifies the Mains-I/Mains-II's Current Polarities for Ia, Ib, Ic and In.	• Normal* • Reverse
Mains-II CT Polarity		
DI Module *x* External Source[#]	Specifies the excitation source of the external DI Modules.	DC*, AC
DI Module *x* Debounce Time[#]	Specifies the minimum duration the DI Module must remain in the Active or Inactive state before a DI Module state change is considered to be valid.	1 to 9999 (ms), 20ms*
DI1/DI2/DI3/DI4 Debounce Time (DI3 & DI4 are available since Firmware V1.00.08)	Specifies the minimum duration the DI must remain in the Active or Inactive state before a DI state change is considered to be valid.	1 to 9999 (ms), 20ms*
DO1/DO2 Trigger Mode	Specifies which alarm would trigger DO1/DO2.	• None • Mains-I Instant. Alarm • Mains-II Instant. Alarm • Mains-I Latched Alarm • Mains-II Latched Alarm • Global Latched Alarm • Global Instant. Alarm • Voltage-I Phase Reversal^ • Voltage-II Phase Reversal^ • Voltage-I Phase Loss^ • Voltage-II Phase Loss^ • TC1 Alarm^ • TC2 Alarm^ • DI1 Alarm^ • DI2 Alarm^ • DI3 Alarm (4 DIs option Only) ^ • DI4 Alarm (4 DIs option Only)^
Tariff Switch^	Specifies to which Tariff (T1/T2) the energy measurements will be accumulated based on the specified DIx. If DIx is Inactive, the energy will be accumulated to T1. If DIx is Active, the energy will be accumulated to T2.	• Disabled • DI1 • DI2 • DI3 (4 DIs option Only) • DI4 (4 DIs option Only)
Mains-I PT Primary^	Specifies Mains-I PT Primary Ratio (in ULL value)	1 to 1,000,000 V, 380*
Mains-I PT Secondary^	Specifies Mains-I PT Secondary Ratio (in ULL value)	1 to 480, 380*
Mains-II PT Primary^	Specifies Mains-II PT Primary Ratio (in ULL value)	1 to 1,000,000 V, 380*
Mains-II PT Secondary^	Specifies Mains-II PT Secondary Ratio (in ULL value)	1 to 480, 380*
Branch A/B/C/D^	Specifies which Mains-I/II Voltage would be paired with Branch A/B/C/D. This parameter is valid only when the **Panel Mode** is set to **Custom**.	• Mains-I* • Mains-II

˜1P3W may only be used with Dual Panel Mode II in Firmware Version V1.00.09 or earlier.
[#]Available in Firmware V1.00.03 or later.
^Available in Firmware V1.00.10 or later.

Table 3-11 Basic Setup Description

3.2.4.5.2 Panel Name Setup

Click **Panel Name Setup** on the left-hand pane and the following screen appears on the right-hand pane where the **Device Name** and **Mains-I/II's Panel Names** can be specified. Click **Submit** to save your changes or **Cancel** to cancel your changes.

Parameter	Description	Value
Device Name	Specifies the device name.	Default: PMC-592 MCPM
Mains-I Name	Specifies the Mains-I panel name.	Default: MCPM Panel #1
Mains-II Name	Specifies the Mains-II panel name.	Default: MCPM Panel #2

Table 3-12 Panel Name Setup Description

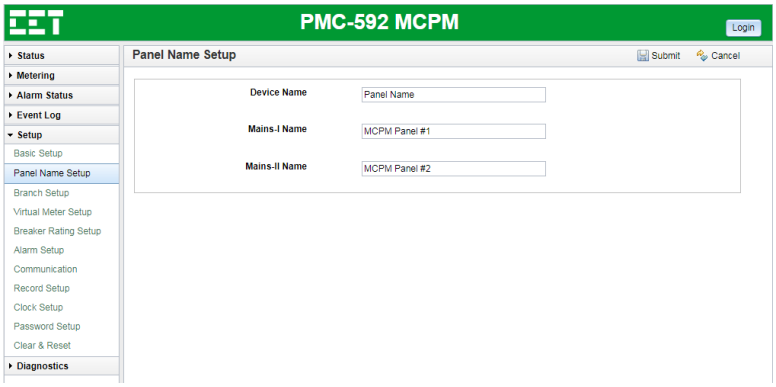


Figure 3-28 Panel Name Setup Interface

3.2.4.5.3 Branch Setup

Click on **Branch Setup** on the left-hand pane and the following screen appears on the right-hand pane where the following parameters can be changed: **CT Strip Installation Mode**, **Installation Direction**, **CT Phase** (Voltage Phase), **CT Type**, **CT Polarity**, **CT Ratio** and **Branch Labels**. Click **Submit** to save your changes or **Cancel** to cancel your changes.

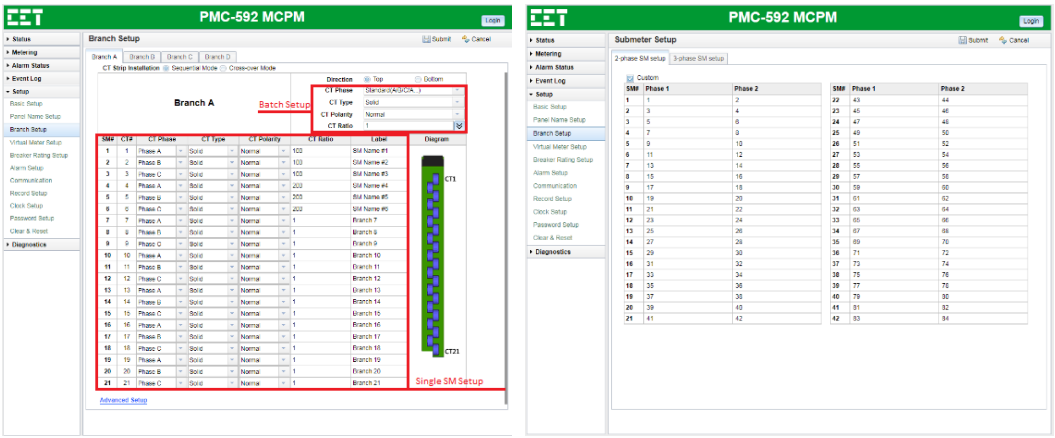


Figure 3-29 Branch Setup Interface

Parameter	Description	Options/Default*
CT Strip Installation	Specifies the CT Strip Installation Mode. Please refer to Section **2.4.3 Branch Circuit Wiring and Sub Meter Assignment** for more information.	• Sequential Mode • Cross-over Mode
Direction	Specifies the CT Strip Installation Direction. Please refer to Section **2.4.3 Branch Circuit Wiring and Sub Meter Assignment** for more information.	• Top • Bottom
Batch Setup		•
CT Phase (Changed from **Branch Setup** since Firmware V1.00.10)	Specifies the **CT Phase** (Voltage Phase) for each Branch Circuit of a CT Strip by batch with respect to the Mains Inputs (Mains-I/II) according to the **Panel Mode** setting. This batch setup only supports the Phase pairing of the Branch CTs with the line-to-neutral voltages. If the **Wiring Mode** for Mains-I/II is Delta, the **CT Phase** for each Branch CT must be configured individually.	• ------ (Not Used) • Standard (A/B/C/A…) • Reversed (C/B/A/C…) • 1P3W (A/B/A/B…) • Phase A (Ua) • Phase B (Ub) • Phase C (Uc)
CT Type^	Specifies the CT Type, Solid-Core or Split-Core.	• ------ (Not Used)

		• Solid • Split
CT Polarity	Specifies the CT Strip's Polarity (direction of current flow). The Diagram in the web page will update accordingly based on the selection. Please refer to Section **2.4.3 Branch Circuit Wiring and Sub Meter Assignment** for more information.	• ------(Not Used) • Normal • Reverse
CT Ratio^	Specifies CT Ratio for each Branch Circuit.	Range: 1* to 400
1-Ø SM Setup		
CT Phase (Voltage Phase)	Specifies the CT Phase (Voltage Phase) for each Branch Circuit. Please refer to **Note 1** below for more information on how to configure the SMs for a Delta-connected 3-Ø Branch Circuit.	• ------ (Not Used) • Phase A • Phase B • Phase C • Phase AB • Phase BC • Phase CA
CT Ratio^	Specifies CT Ratio for each Circuit.	Range: 1* to 400
CT Polarity	Specifies the CT Strip's Polarity (direction of current flow). The Diagram in the web page will update accordingly based on the selection. Please refer to Section **2.4.3 Branch Circuit Wiring and Sub Meter Assignment** for more information.	• ------(Not Used) • Normal • Reverse
Label^	Specifies the Branch Label for each Branch Circuit.	Up to 20 characters, including a~z, A~Z, 0~9 and the following symbols: (space), `, ~, !, @, #, $, %, ^, &, *, (,), -, _, +, =, [,], {, }, \, |, ;, ', :, ", ,, ., /, <, > and ?.
Advanced Setup~	Customize which 1-Ø SM would be used for the 2-Ø and 3-Ø SMs based on the actual wiring. This allows the users to correct any potential wiring mistake in the field that would cause the mis-alignment of the standard 2-Ø and 3-Ø SM arrangement.	-

~Available in Firmware V1.00.06 or later.
^Available in Firmware V1.00.10 or later.

Table 3-13 Branch Setup Description

Note:

1) If the Branch Circuit is a 3-Phase **Delta** Load, Phase AB/BC/CA Voltage should be selected as the CT Phase (Voltage Phase) for each of the 1-Ø SM associated with the 3-Ø SM of the 3-Ø Branch Circuit. In addition, the corresponding 1-Ø and 2-Ø SMs would be meaningless under a 3-Phase **Delta** Load.

   For example, the following diagram illustrates a 3-Phase Delta-connected Branch Circuit (please refer to Section **4.5 Sub-Meters** to make sure that a 3-Ø SM consists of three 1-Ø SMs):

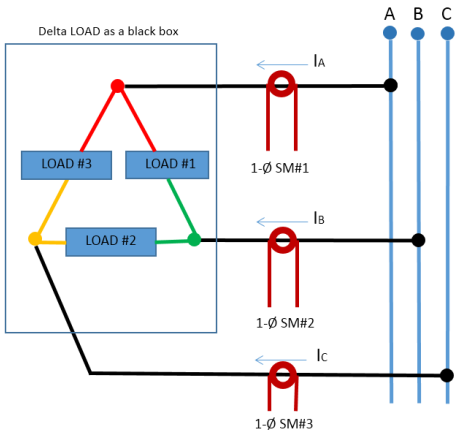


Figure 3-30 3-Phase Branch Circuit Wiring for a Delta Load

The 2-wattmeter method is the common way for measuring 3-Ø Power for a Delta Load:

$$\text{Power} = \vec{I}_A \times \vec{V}_{AB} + \vec{I}_C \times \vec{V}_{CB}$$
$$= \vec{I}_A \times \vec{V}_{AB} + \vec{I}_C \times (-\vec{V}_{BC})$$
$$= \vec{I}_A \times \vec{V}_{AB} + (-\vec{I}_C) \times \vec{V}_{BC}$$

According to **Figure 3-30** above, I_A, I_B and I_c are connected to 1-Ø SM#1, 1-Ø SM#2 and 1-Ø SM#3, respectively. **Figure 3-31** below illustrates the **CT Phase** (Voltage Phase) configuration for correctly calculating the total power for a Delta-connected Branch Circuit. Based on the 2-wattmeter method above, the **CT Phase** setup for SM#1, SM#2 and SM#3 should be configured as **Phase AB**, **-------** (None) and **Phase BC**, respectively. In addition, the **CT Polarity** for SM#3 should be configured as **Reverse** to satisfy the total power calculation using the 2-wattmeter method.

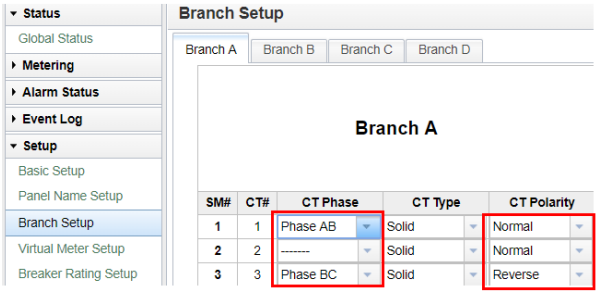


Figure 3-31 CT Phase and CT Polarity configuration for a 3-Phase Delta Branch Circuit

The table below lists the valid **CT Phase** options for the different Mains-I/II Wiring Modes & Branch Circuits:

Mains-I/II Wiring Mode	Branch Circuits		
	WYE (3P4W)	**Delta (3P3W)**	**2-Phase**
WYE	Phase A Phase B Phase C	Phase AB Phase BC Phase CA	Phase A Phase AB Phase B Phase BC Phase C Phase CA Depends on taking ULN or ULL
Delta	-	Phase AB Phase BC Phase CA	Phase AB Phase BC Phase CA

Table 3-14 Valid CT Phase Options

3.2.4.5.4 Virtual Meter Setup

Click **Virtual Meter Setup** on the left-hand pane and the following page appears on the right-hand pane.

1. Select a Virtual Meter by clicking on the VM's radio button, for example VM1. The VM's name can be programmed since Firmware V1.00.10.
2. Choose the Sub Meters or Mains-I/II (Mains-I/II can be selected in Firmware V1.00.10 or later) that are to be aggregated for the selected VM by clicking on the check boxes of the Sub Meters in the **Virtual Meter *x* Settings** area. After each selection, the **Number of Branches** count to the right of the selected **VMx** will be updated immediately.
3. Specifies **Subtraction** or **Addition** for each selection by clicking on the "**+**" or "**-**" symbol. This feature is available in Firmware V1.00.10 or later.
4. Click **Submit** to save your changes or **Cancel** to cancel your changes. The user is required to log in to the web interface before any changes can be made.

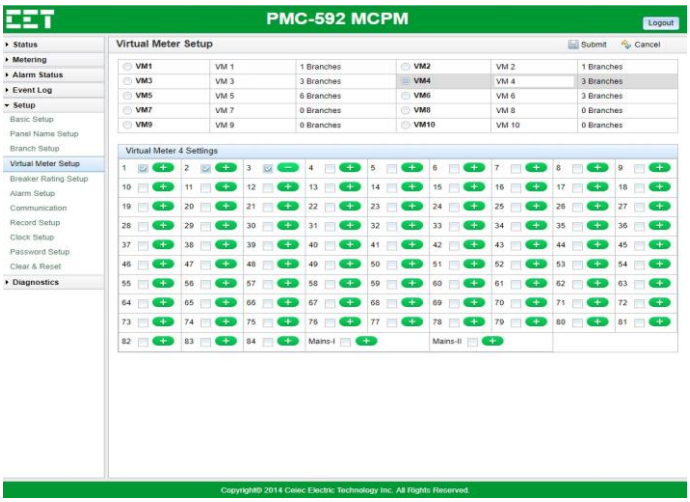


Figure 3-32 Virtual Meter Setup Interface

3.2.4.5.5 Breaker Rating Setup

Click **Breaker Rating Setup** on the left-hand pane and the following screen appears on the right-hand pane where the Breaker Ratings for the Mains and Branches can be configured. The Breaker Ratings are used for calculating the % Loading Factors for the corresponding channels. Batch setup can be performed at the bottom of the page by entering the Breaker Rating for each Branch circuit. Enter the Breaker Ratings based on the actual situation. Click **Submit** to save your changes or click **Cancel** to cancel your changes.

Notes:

1) The range of the Mains breaker and Branch breaker rating is between 1 and 10,000A.

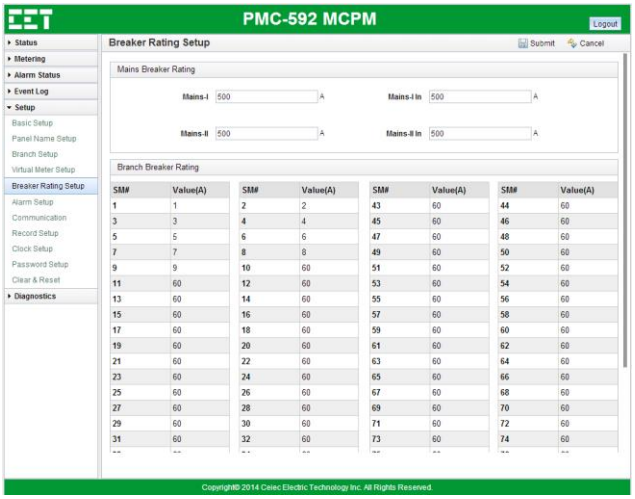


Figure 3-33 Breaker Rating Setup Interface

3.2.4.5.6 Alarm Setup

Click **Alarm Setup** on the left-hand pane and the following screen appears on the right-hand pane where the Current Alarm, Voltage Alarm, Power Alarm, PQ Alarm, PF Alarm, Temperature Alarm, DI Alarm, Phase Loss Alarm and Phase Reversal Alarm can be configured. Click **Submit** to save your changes or **Cancel** to cancel your changes. Please refer to **Section 4.3 Alarm Setpoints** for a more detailed description.

Global Alarm Settings, Current and Current Demand Alarm

Parameter	Description	Range/Default*
Global Alarm Setting		
Universal Hysteresis	The hysteresis rate for calculating the Return Threshold for all Alarms	Range: 0.0 to 10.0%, 2.0%*
Current OFF Alarm Enable	Specifies if the Current L or LL Alarms will continue to be Active when the Current transitions from the ON to OFF state due to a Trip event.	• Disabled* • Enabled
ON/OFF Threshold	The ON Threshold that applies to all Current channels for switching from the OFF to ON state.	Range: 0 to 10%, 5.0%*
ON Time	The time delay for the Current ON status.	Range: 0 to 9999s, 10*
OFF Time	The time delay for the Current OFF status.	Range: 0 to 9999s, 30*
Current		
Alarm Enable	Specifies if the Current Alarm is enabled for **Mains-I**, **Mains-II** and **Branches**.	• Mains-I* • Mains-II • Branches
Threshold	Specifies the threshold for the following Alarm Levels: **High-High**, **High**, **Low** and **Low-Low**. High-High and High are considered to be Over Setpoints while Low and Low-Low are Under Setpoints.	Range: 0 to 100%
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s
Current Demand		
Alarm Enable	Specifies if the Current Demand Alarm is enabled.	Mains-I, Mains-II
Threshold	Specifies the threshold for the following Alarm Levels: **High-High**, **High**, **Low** and **Low-Low**. High-High and High are considered to be Over Setpoints while Low and Low-Low are Under Setpoints.	Range: 0 to 100%
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s

Table 3-15 Current Alarm Description

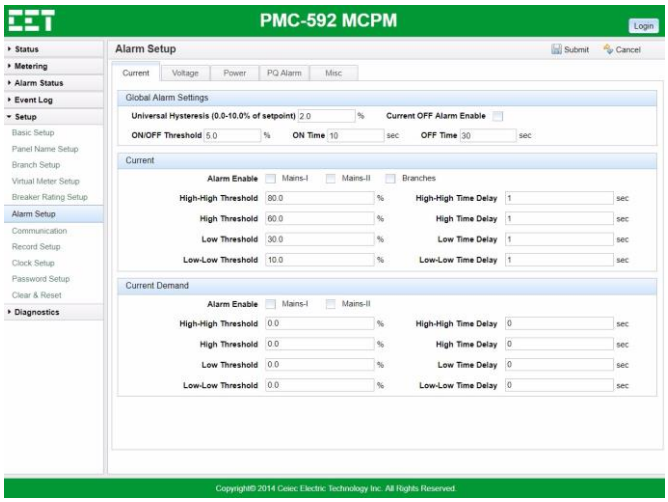


Figure 3-34 Current Alarm Setup Interface

Voltage Alarm

Parameter	Description	Value
Voltage LN		
Alarm Enable	Specifies if the Voltage LN Alarm is enabled.	Voltage-I, Voltage -II
Threshold	Specifies the threshold for the following Alarm Levels: **High** and **Low**.	Range: 0 to 300V
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s
Voltage LL		
Alarm Enable	Specifies if the Voltage LL Alarm is enabled.	Voltage-I, Voltage -II
Threshold	Specifies the threshold for the following Alarm Levels: **High** and **Low**.	Range: 0 to 500V
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s
Frequency		
Threshold	Specifies the threshold for the following Alarm Levels: **High** and **Low**.	Range: 45 to 65Hz
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s
Phase Loss (Available in Firmware V1.00.05 or later)		
Alarm Enable	Specifies if the Phase Loss Alarm is enabled.	Mains-I, Mains-II
Phase Loss Time Delay	Specifies the time delay for the Phase Loss alarms.	0 to 9999(s)

Table 3-16 Voltage Alarm Description

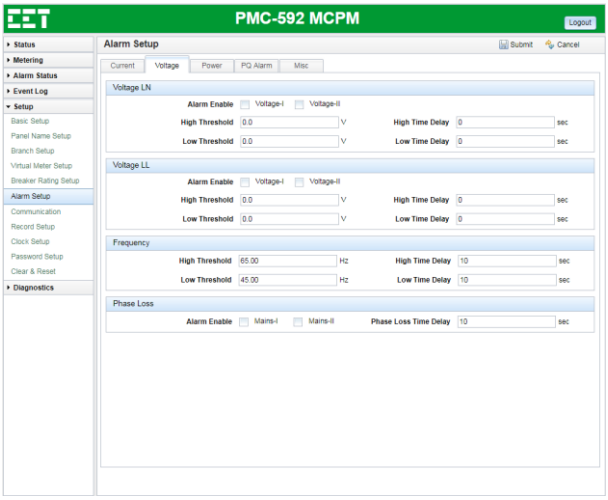


Figure 3-35 Voltage Alarm Setup Interface

Power Alarm

Parameter	Description	Value
Power		
Alarm Enable	Specifies if the Power Alarm is enabled.	Mains-I, Mains-II
Threshold	Specifies the threshold for the following Alarm Levels for kW, kvar and kVA: **High** and **Low**.	Range: 0 to 100%
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s
Demand		
Alarm Enable	Specifies if the kW/kvar/kVA Demand Alarm is enabled.	Mains-I, Mains -II
Threshold	Specifies the threshold for the following Alarm Levels for kW, kvar, kVA Demands: **High** and **Low**.	Range: 0 to 100%
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s

Table 3-17 Power Alarm Description

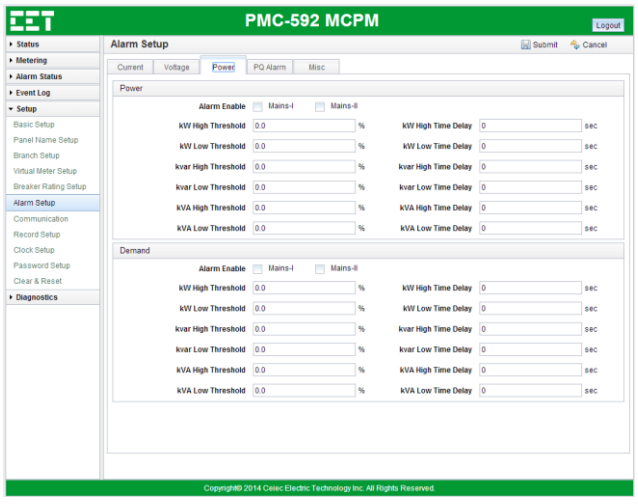


Figure 3-36 Power Alarm Setup Interface

PQ Alarm

Parameter	Description	Value
Voltage Unbalance		
Alarm Enable	Specifies if the Voltage Unbalance Alarm is enabled.	Voltage-I, Voltage-II
Voltage Unb. Threshold	Specifies the threshold for the Voltage Unbalance Alarm.	Range: 0 to 100%
Voltage Unb. Time Delay	Specifies the time delay for the Voltage Unbalance Alarm.	Range: 0 to 9999s
Current Unbalance		
Alarm Enable	Specifies if the Current Unbalance Alarm is enabled.	Current-I, Current-II
Current Unb. Threshold	Specifies the threshold for the Current Unbalance Alarm.	Range: 0 to 100%
Current Unb. Time Delay	Specifies the time delay for the Current Unbalance Alarm.	Range: 0 to 9999s
Harmonics		

Alarm Enable	Specifies if the Harmonics Alarm is enabled.	Current-I, Current-II, Voltage-I, Voltage-II
Threshold	Specifies the threshold for the THD/TOHD/TEHD Alarms.	Range: 0 to 100%
Time Delay	Specifies the time delay for the THD/TOHD/TEHD Alarms.	Range: 0 to 9999s
Dip/Swell (Available in Firmware V1.00.05 or later)		
Alarm Enable	Specifies if the Dip/Swell Alarm is enabled.	Voltage-I, Voltage-II
Swell Threshold	Specifies the threshold for the Swell Alarm.	101% to 200%
Swell Hysteresis	Specifies the hysteresis rate for calculating the Return Threshold for the Swell Alarm.	0 to 100%
Dip Threshold	Specifies the threshold for the Dip Alarm.	1% to 99%
Dip Hysteresis	Specifies the hysteresis rate for calculating the Return Threshold the Dip Alarm.	0 to 100%
Interruption Threshold	Specifies the threshold for the Interruption Alarms.	0 to 50%
Interruption Hysteresis	Specifies the hysteresis rate for calculating the Return Threshold the Interruption Alarm.	0 to 100%

Table 3-18 PQ Alarm Description

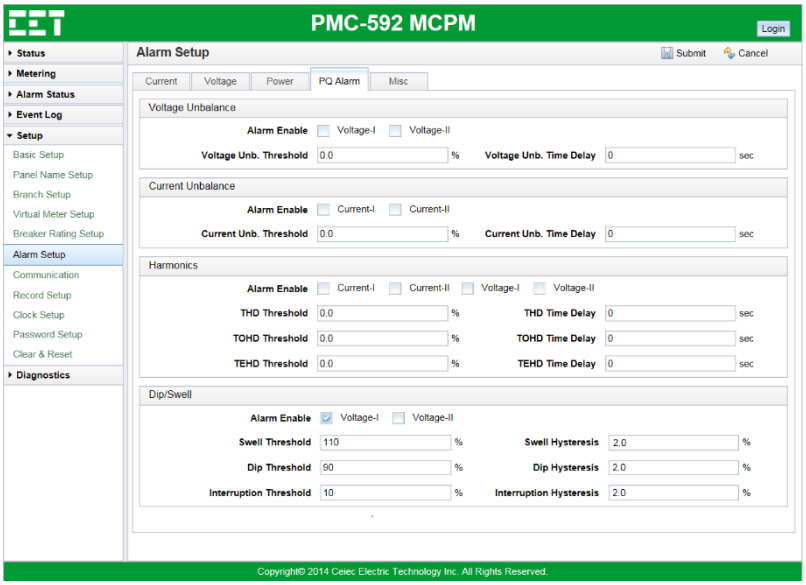


Figure 3-37 PQ Alarm Setup Interface

Misc Alarm

Parameter	Description	Value
PF		
Alarm Enable	Specifies if the Power Factor Alarm is enabled.	Mains-I, Mains-II
Threshold	Specifies the threshold for the following Alarm Levels for PF: **High** and **Low**.	Range: 0.0000 to 1.0000
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s
Temperature		
Threshold	Specifies the threshold for the following Alarm Levels for TC1 and TC2: **High-High** and **High**.	Range: 0 to 200°C
Time Delay	Specifies the time delay for the various alarms.	Range: 0 to 9999s
DI		
Alarm Mode	Specifies if the DI1, DI2, DI3 or DI4 Alarms are enabled. DI3 Alarm and DI4 Alarm are only valid when the PMC-592 is equipped with the 4xDIs option.	DI1, DI2, DI3, DI4
Time Delay	Specifies the time delay for the DI1 and DI2 Alarms.	Range: 0 to 9999s
Phase Reversal (Available in Firmware V1.00.05 or later)		
Alarm Enable	Specifies if the Phase Reversal Alarm is enabled.	Current-I, Current-II Voltage-I, Voltage-II

Table 3-19 Misc Alarm Description

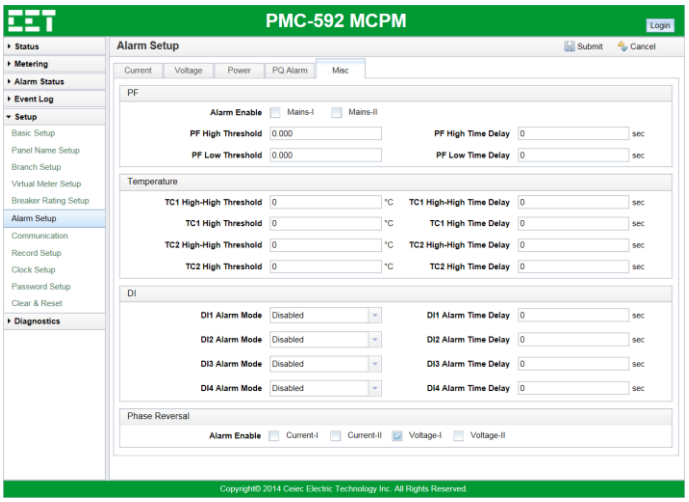


Figure 3-38 Misc. Alarm Setup Interface

3.2.4.5.7 Communication Setup

Click **Communication Setup** on the left-hand pane and the following screen appears on the right-hand pane where the P1/P2/P3 communication parameters, Email settings and SNMP settings can be configured. Click **Submit** to save your changes or **Cancel** to cancel your changes.

Parameter	Description	Range/Default*
P1 (RS-422/485)		
Unit ID	Specifies the Unit ID of P1.	Range: 1 to 247, 100*
Baud rate	Specifies the Baud rate for P1.	1200, 2400, 4800, 9600, 19200, 38400*
Data Format	Specifies the Data Format for P1.	8N2, 8O1, 8E1*, 8N1, 8O2, 8E2
P2 (RS-485)		
Unit ID	Specifies the Unit ID of P2.	Range: 1 to 247, 101*
Baud rate	Specifies the Baud rate of P2.	1200, 2400, 4800, 9600, 19200, 38400*
Data Format	Specifies the Data Format of P2.	8N2, 8O1, 8E1*, 8N1, 8O2, 8E2
Operating Mode~	Specifies the operating mode of P2.	Modbus RTU*, DI Module Interface
External DI Module Number~	Specifies the number of the external DI Module. This is available in Firmware V1.00.03 or later.	0* to 4
DI Module 1 ID~	Specifies the Unit ID of the DI module x. The x is determined by the **External DI Module Number.**	1 to 247, 100*
DI Module 2 ID~		
DI Module 3 ID~		
DI Module 4 ID~		
P3 (Ethernet)		
IP Address	Specifies the IP address for P3.	Default: 192.168.0.100
Subnet Mask	Specifies the Subnet Mask for P3.	Default: 255.255.255.0
Gateway	Specifies the Gateway Address for P3.	Default: 192.168.0.1
HTTP Port Number^	Specifies the IP Port Number of HTTP.	1 to 65535, 80*
MODBUS TCP Port Number^	Specifies the IP Port Number of Modbus TCP.	1 to 65535, 502*
MODBUS RTU Port Number^	Specifies the IP Port Number of Modbus RTU.	1 to 65535, 27011*
SNMP Notification		
Subscribe Event	Specifies which type of SOE events will be sent via SNMP.	• DI Events* • DO Events • Alarm Events • Operation Events • Self-Check Events
Receive IP	Specifies the SNMP Client's IP Address that will receive the subscribed SOE events via SNMP.	Default: 0.0.0.0
E-mail Settings		
SMTP Server IP	Specifies the of SMTP Server's IP address.	Default: 0.0.0.0
Sender's Name	Specifies the of Sender's Name.	-
Sender's E-mail Address	Specifies the Sender's Email Address.	Default: sender@example.com
Sender's E-mail Password	Specifies the Email password.	-
Receiver's E-mail Address	Specifies the Receiver's Email address.	Default: receiver@example.com

~ Available in Firmware V1.00.03 or later
^ Available in Firmware V1.00.10 or later

Table 3-20 Communication Setup Description

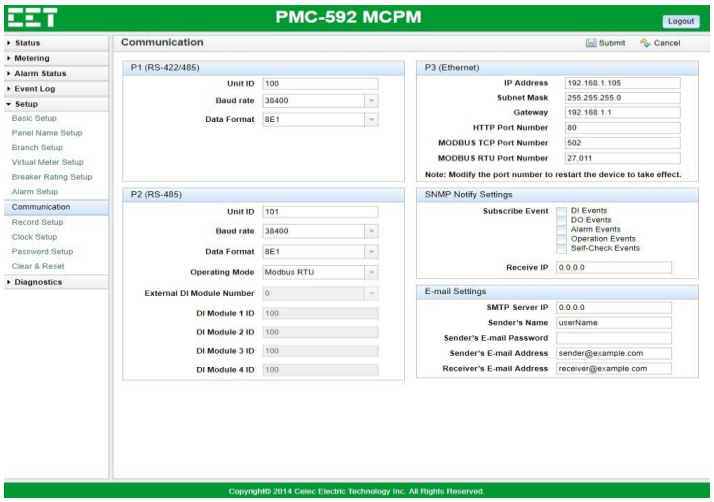


Figure 3-39 Communication Setup Interface

3.2.4.5.8 Record Setup

Click **Record Setup** on the left-hand pane and the following screen appears on the right-hand pane where the Waveform Recorder (WFR), Interval Energy Recorder (IER) and Data Recorder (DR) settings can be configured. Click **Submit** to save your changes or click **Cancel** to cancel your changes. The following table describes each parameter.

Parameter	Description	Options/Default*
Waveform Record Setup (WFR)		
Waveform Format	Specifies the WRF Format in # of Samples x # of Cycles	• 64 Samples x 75 Cycles* • 64 Samples x 150 Cycles • 32 Samples x 75 Cycles • 32 Samples x 300 Cycles • 16 Samples x 300 Cycles • 16 Samples x 600 Cycles
Pre-fault Cycles	Specifies the number of pre-fault cycles.	1 to 10 Cycles, 5*
Trigger Setup	Specifies which event (more than one event can be selected at the same time) would trigger the Waveform recording.	• Dip/Swell • Voltage/Current • Unbalance/Harmonic • Power • Frequency • DI
Energy Log Setup (Interval Energy Recorder)		
Recording Mode	Specifies the IER's (Interval Energy Recorder) Recording Mode.	• Disabled* • Stop-When-Full • First-In-First-Out (Circular)
Recording Depth	Specifies the IER's Recording Depth. This would provide a maximum energy recording for 35 days @ 5 min, 104 days @ 15 min or 417 days @ 60min.	0 to 10,000*
Recording Interval	Specifies the IER's Recording Interval.	• 5mins* • 10mins • 15mins • 30mins • 60mins
Start Time	Specifies when to start the IER. This is useful if the user wants to record the energy consumption for a specific period of time in conjunction with the Stop-When-Full Recording Mode.	Format: DD/MM/YYYY HH:MM:SS
Data Log Setup (DR Setup via the Web Interface is available in Firmware V1.00.05 or later)		
Data Log #x	Select a Data log for configuration.	Range: Data Log #1 to Data Log #10
Data Log #x Setup		
Start Mode	Specify if the selected Data Recorder is enabled.	• Disabled* • Enabled
Recording Mode	Specify the recording mode for the selected Data Recorder.	• Stop-When-Full* • First-In-First-Out
Recording Depth	Specify the recording depth (i.e. number of logs) for the selected Data Recorder.	0 to 65535, 52704*

Recording Interval	Specify the recording interval for the selected Data Recorder.	60 to 345600s, 600s*
Offset Time	Specify the offset time for the selected Data Recorder.	0* to 43200s
Variable Setup	Specify the parameters to record for the selected Data Recorder.	See **Section 5.8.11 Data Recorder Setup**

Table 3-21 Record Setup Description

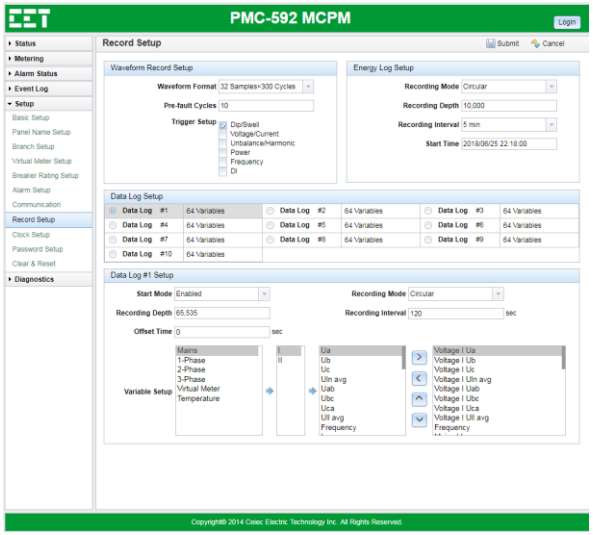


Figure 3-40 Record Setup Interface

3.2.4.5.9 Clock Setup

Click **Clock Setup** on the left-hand pane and the following screen appears on the right-hand pane where the device time and SNTP Time Sync. mechanism can be configured.

Parameter	Description	Value/Default*
Device Time		
PC's Date & Time	Check the **Sync with PC** checkbox to synchronize device time with PC time.	N/A
Device Time	Present time on device.	N/A
Device Date	Present date on device.	N/A
Time Zone	Specifies the device's Time Zone.	Default: GMT +08:00
Date Format	Specifies the device's Date Format.	YYYY/MM/DD* MM/DD/YYYY DD/MM/YYYY
SNTP Time Sync.		
SNTP Time Sync	Specifies if SNTP Time Sync. is enabled	Enabled, Disabled*
SNTP Time Sync Period	Specify the SNTP Time Sync. Interval.	10 to 1440 min, 60 min*
SNTP Server IP	Specify SNTP Sever IP Address.	Default: 0.0.0.0

Table 3-22 Clock Setup Description

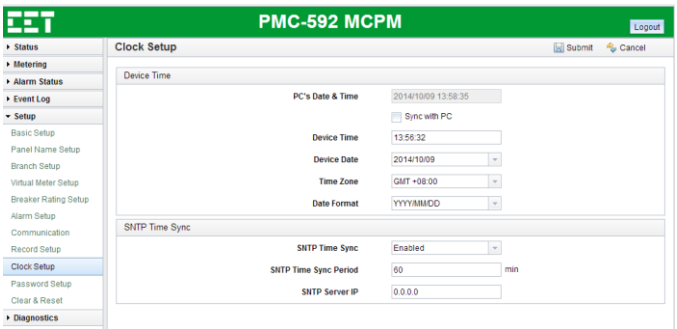


Figure 3-41 Clock Setup Interface

3.2.4.5.10 Password Setup

Choose **Setup => Password Setup** on the left-hand pane and the following screen appears on the right-

hand pane.

1. Enter the Old Password, New Password and Confirm New Password.
2. Click **Submit** to save your changes or click **Cancel** to cancel your changes.

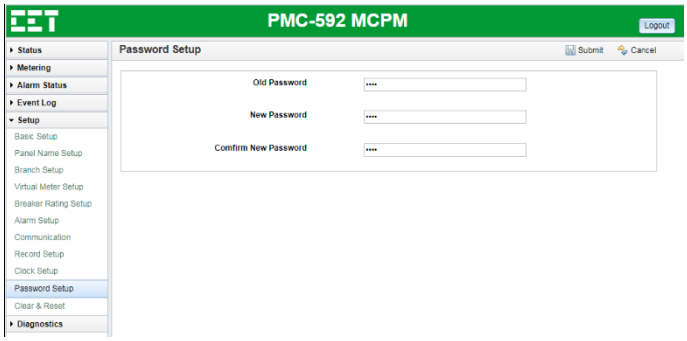


Figure 3-42 Password Setup Interface

3.2.4.5.11 Clear & Reset

Click **Clear & Reset** on the left-hand pane and the following screen appears on the right-hand pane.

1. Click the **Reset** icon on the right-hand column for the specific item and a Confirmation dialog box appears.
2. Click **OK** to confirm or **Cancel** to cancel the **Reset** operation.

Note:

1) All Alarms, Counters and Logs will be reset via **Reset & Clear All**. Caution should be exercised when taking this action.

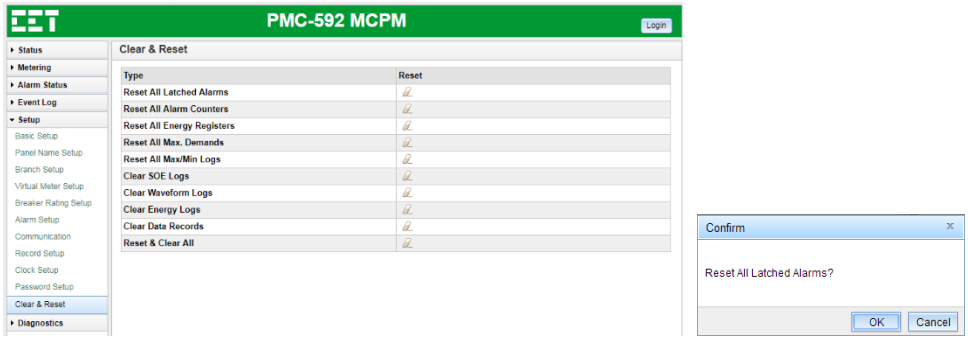


Figure 3-43 Clear & Reset Interface

3.2.4.6 Diagnostics

3.2.4.6.1 About

Click **About** on the left-hand pane and the following screen appears on the right-hand pane to show the **Overview** and **Diagnostics**.

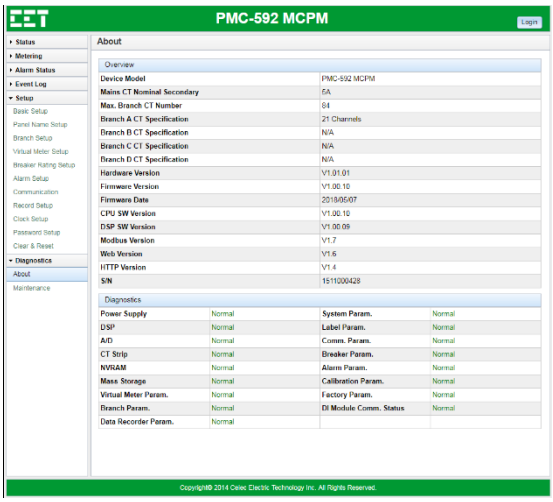


Figure 3-44 About Interface

3.2.4.6.2 Maintenance

Click **Maintenance** on the left-hand pane and the following screen appears on the right-hand pane. The table below illustrates each page's function.

Tab	Function
Backup & Restore	Backup or restore the device configuration.
Factory Defaults	Reset the device configuration to Factory Defaults. Internal calibration and any factory-used only parameters would not be reset.
Firmware Upgrade	Perform firmware upgrade.
Misc.	Reboot device, Test sending Alarm E-mail, Download MIB file.

Table 3-23 Maintenance Interface Description

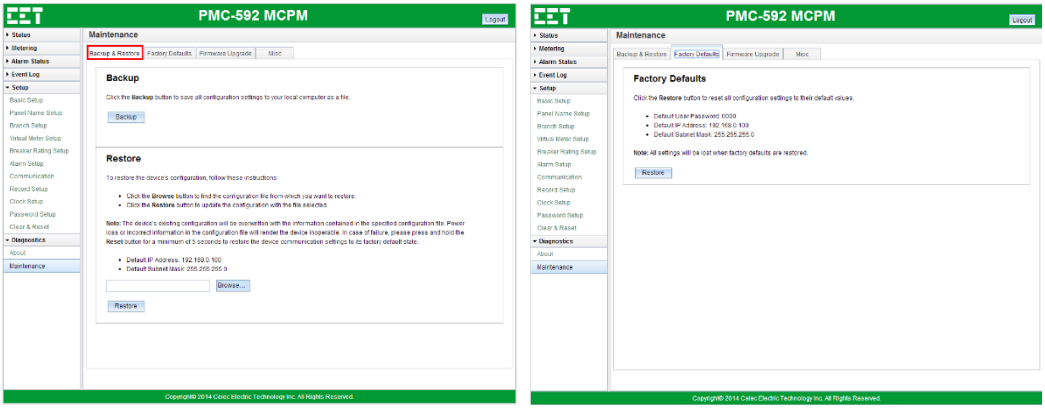


Figure 3-45 Backup & Restore and Factory Defaults Interface

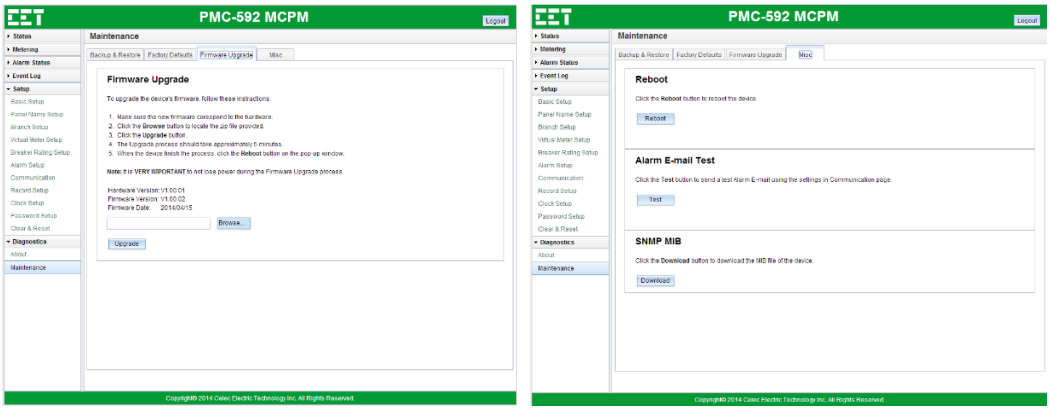


Figure 3-46 Firmware Upgrade and Misc. Interface

3.3 HMI Display (Optional)

The PMC-592 may be equipped with an optional 7” touch-screen HMI. The following figure illustrates the Main Display of the HMI.

Figure 3-47 HMI’s Main Display

3.3.1 Display Hierarchy and Menu Tree

Category **Topic** **Page**

Figure 3-48 Hierarchy of Menu

The HMI Display is organized in a hierarchy that consists of **Categories**, **Topics** and **Pages**. There are 10 icons in the **Main Display**, and each icon represents a **Category**. Each **Category** displays a specific type of information and may have one or more **Topics**. Each **Topic** may provide one or more **Pages** of measurement information.

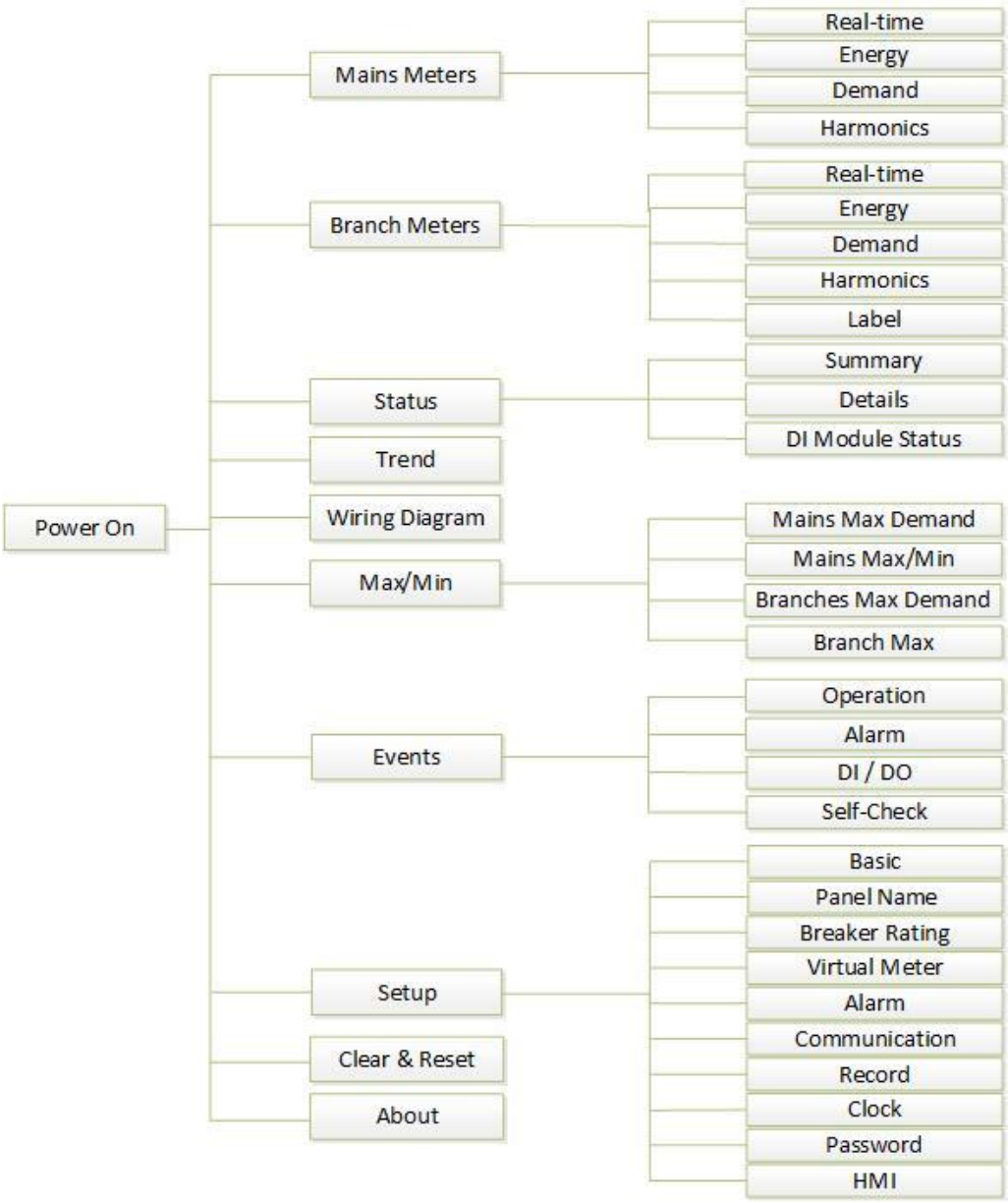
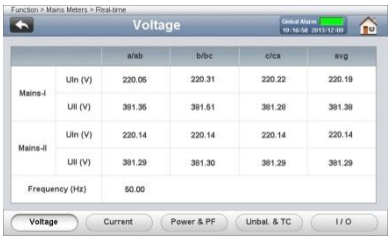
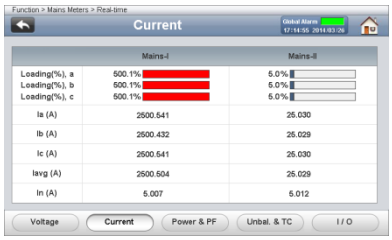
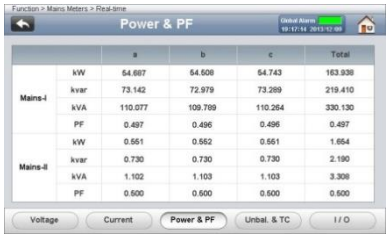
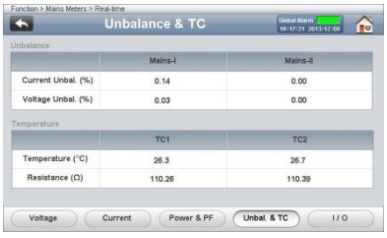
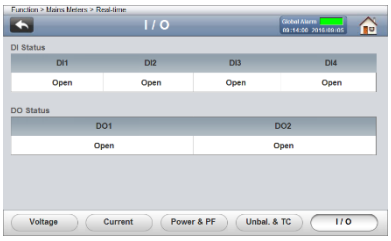
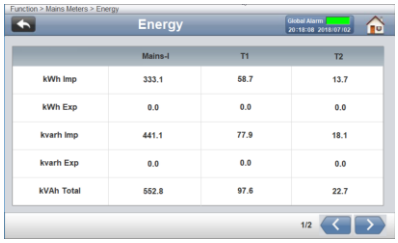
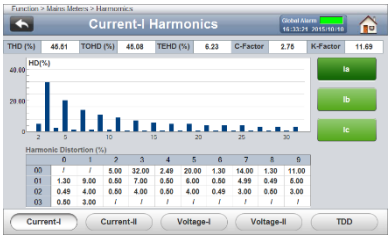
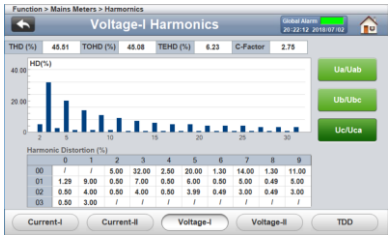
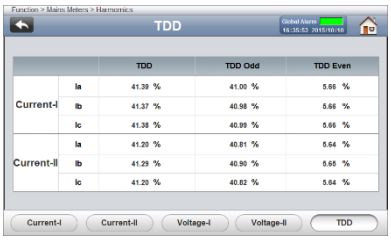


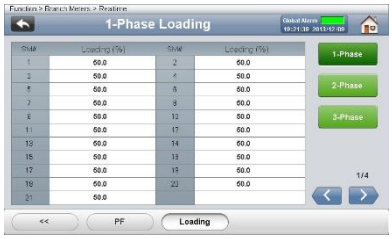
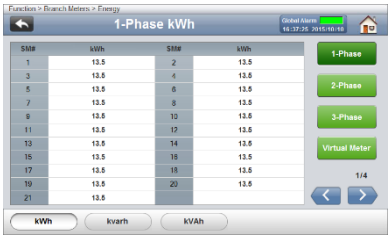
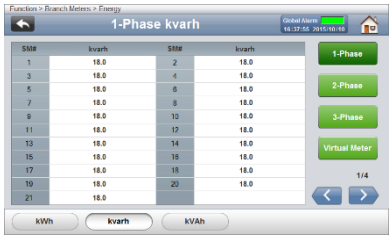
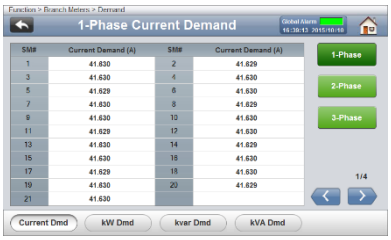
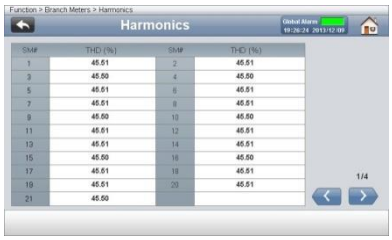
Figure 3-49 Menu Tree

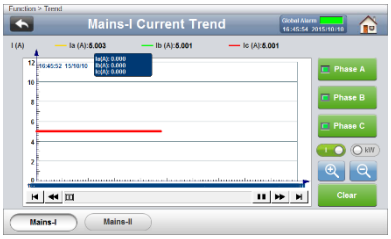
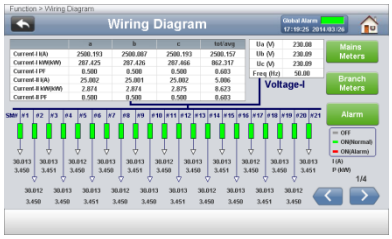
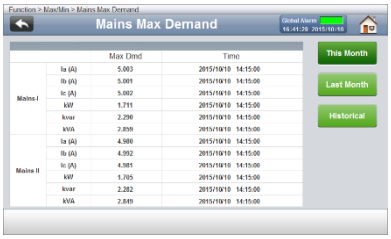
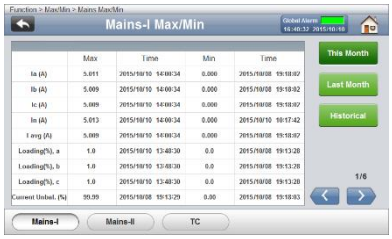
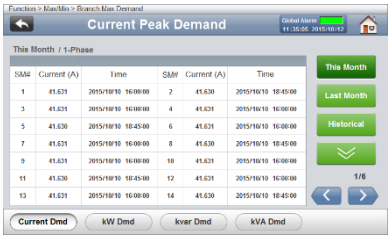
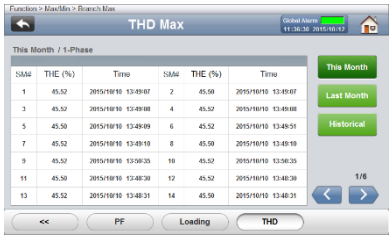
3.3.2 HMI

The PMC-592 features an optional 7" touch-screen HMI with an intuitive graphical user interface that makes it extremely simple to operate. Touch an icon in the Main Display page to display the measurement information for a particular **Category**. For example, touch **Mains Meters** to see its available **Topics**, which include **Real-time, Energy, Demand** and **Harmonics**. Touch the **Real-time** icon to display the available **Pages** or sub-menu, which include **Voltage**, **Current**, **Power & PF**, **Unbal & TC** and **IO**. At the **Page** level, there may be other buttons which would allow the user to select the Voltage or Current Phase as well as **Left** and **Right** Arrows to display additional information.

The following table provides an overview of the GUI's hierarchy. Please note that the PMC-592 features implemented in later firmware versions may not be supported on the HMI with older firmware versions. Please refer to **Appendix G - PMC-592 Firmware and HMI Version Compatibility** for more information about the firmware versions compatibility between PMC-592 and HMI**.**

Category > Topic	Pages
Mains Meter > Real-time	 Voltage  Current  Power & PF  Unbalance & TC  I/O
Mains Meter > Energy/Demand	 Energy  Demand
Mains Meter > Harmonics	 Current  Voltage  TDD (Available in Firmware V1.00.05 or later)

Branch Meters > Realtime	 Current	 kW
	 kvar	 kVA
	 PF	 Loading
Branch Meters > Energy	 kWh	 kvarh
Branch Meters > Demand & Harmonics	 Demand	 Harmonics
Alarm > Summary	 Summary	 Details

Trend & Wiring Diagram	 **Trend**	 **Wiring Diagram**
Max/Min	 **Mains Max Demand**	 **Mains Max/Min**
	 **Branch Max Demand**	 **Branch Max**
Events	 **Events**	
Setup	 **Login**	 **Basic Setup**
	 **Panel Name Setup**	 **Breaker Rating Setup**

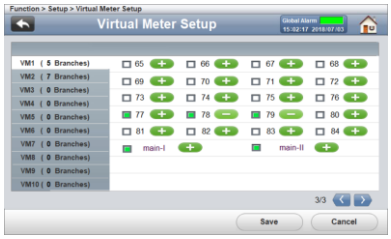
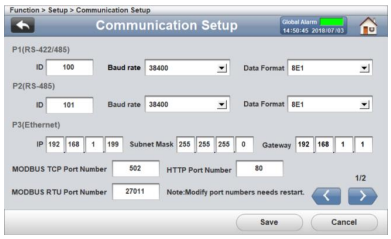
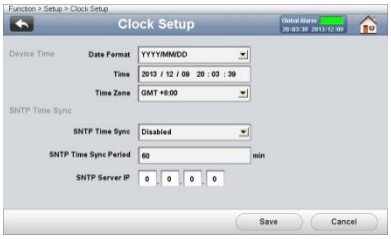
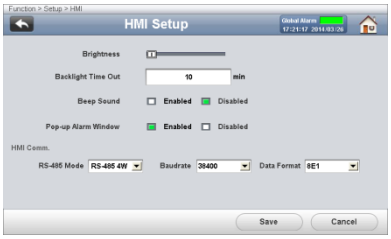
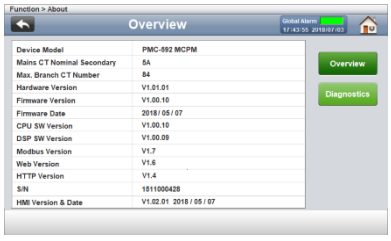
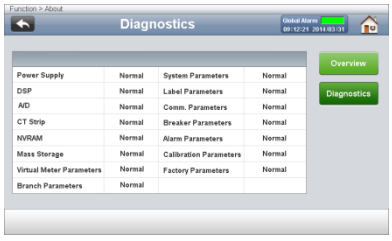
	 Virtual Meter Setup	 Alarm Setup
	 Communication Setup	 Record Setup
	 Clock Setup	 Change Password
	 HMI Setup	
Clear & Reset	 Clear & Reset	
About	 Overview	 Diagnostics

Table 3-24 Display Hierarchy

Chapter 4 Applications

4.1 Inputs and Outputs

4.1.1 Digital Inputs

The PMC-592 provides two or optionally four self-excited **Digital Inputs** (**DIs**) that are internally wetted at 24 VDC. DIs 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 DIs are available on the Web Interface, HMI as well as through communications. Changes in DI status are stored as events in the SOE Log in 1 ms resolution. Each **DI** has the following setup parameters:

Setup Parameter	Definition	Options/Default*
DIx Mode	The **DI** can ONLY be configured as a Status Input.	0 = Status Input*
DIx Debounce	Specifies the minimum duration the **DI** must remain in the Active or Inactive state before a DI state change is considered to be valid.	1 to 9999 (ms) 20ms*

Table 4-1 Definition for DI Parameters

In addition, the PMC-592 can be configured for monitoring the breaker status for each Branch Circuit via the external DI module such as PMC-521D in Firmware V1.00.03 or later. Up to 4 DI Modules (or PMC-521D) may be connected where each PMC-521D can be used for monitoring 21 breaker status of each Branch Input. The breaker status is read by the PMC-592 over RS485 (P2) when the **P2 Operation Mode** is set to **External DI Module**. Each DI Module has the following setup parameters which can be programed via the Web interface, HMI or through communication:

Setup Parameter	Definition	Options/Default*
External DI Module Number	Specifies how many DI Modules (PMC-521D) are connected.	0* to 4
DI Module #x ID	Specifies the Unit ID for each DI Module.	1 to 247, 100*
DI Module #x Debounce	Specifies the minimum duration the **DI** must remain in the Active or Inactive state before a DI state change is considered to be valid.	1 to 9999 (ms) 20ms*
DI Module #x External Source	Specifies whether Excitation Source of the DI Module is DC or AC.	0=DC*, 1=AC

Table 4-2 Definition for DI Module Parameters

The following figures illustrate how to program a particular DI or DI Module for Status monitoring via the Web or HMI.

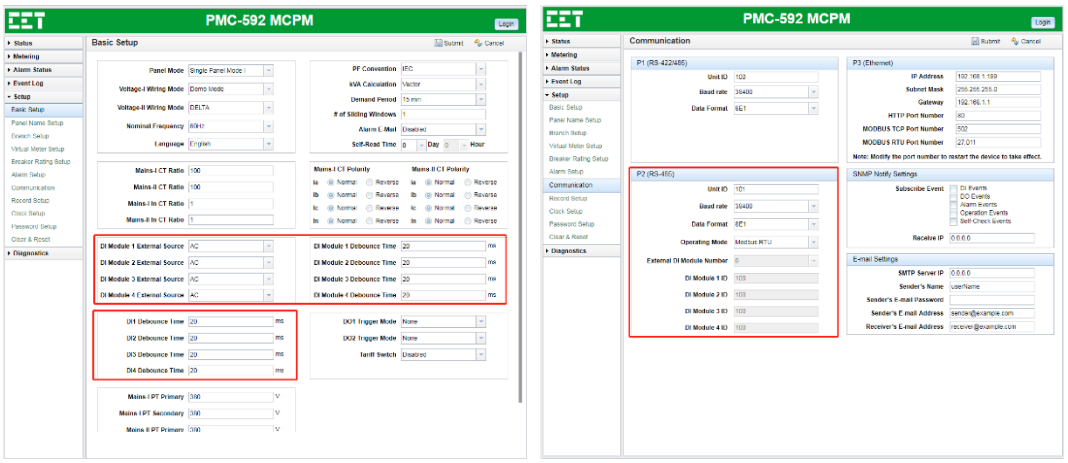


Figure 4-1 Programming the On-Board DI or External DI Modules via the Web Interface

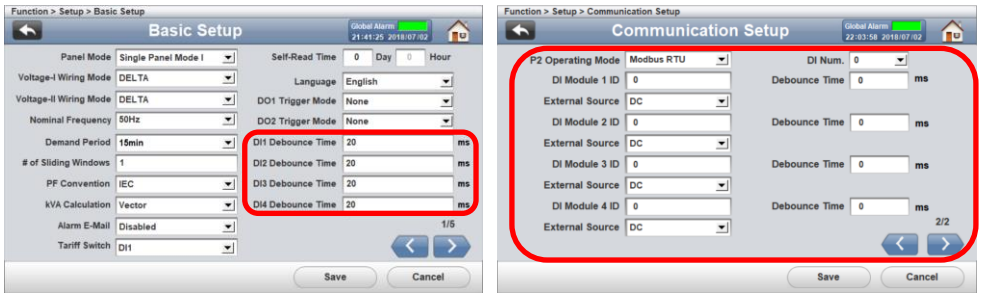


Figure 4-2 Programming the On-Board DI or External DI Modules via the HMI

4.1.2 Digital Outputs

The PMC-592 comes standard with two Form A Electrometrical Relays. Digital Outputs are normally used for Setpoints alarming and manual control.

DOs on the PMC-592 can be programmed to be triggered by the following options:

- Manual control via the Web Interface
- Mains-I/II Instantaneous Alarm
- Mains-I/II Latched Alarm
- Global Latched Alarm
- Global Instantaneous Alarm
- Voltage-I/II Phase Reversal Alarm*
- Voltage-I/II Phase Loss Alarm*
- TC1/TC2 Alarm*
- DI1/DI2 Alarm*
- DI3/DI4 Alarm* (4xDIs option only)

*Available in Firmware V1.00.10 or later

The following figures illustrate where to program the DO Trigger Mode via the Web Interface or HMI.

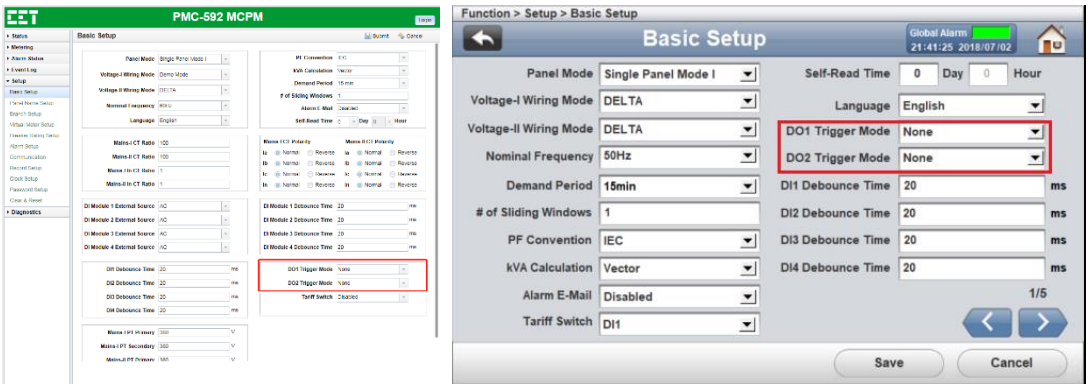


Figure 4-3 Programming the DO Trigger Mode via the Web and HMI

4.2 Power, Energy and Demand

4.2.1 Basic Measurements

The PMC-592 provides the following basic measurements with 1 second update rate:

	Parameter	Phase A	Phase B	Phase C	Total	Average	Neutral
Mains-I/II	ULN	●	●	●	○	●	○
	ULL	●	●	●	○	●	○
	Current	●	●	●	○	●	●

	Parameter	Phase A	Phase B	Phase C	Total	Average	Neutral
	Loading Factor	●	●	●	○	○	○
	kW	●	●	●	●	○	○
	kvar	●	●	●	●	○	○
	kVA	●	●	●	●	○	○
	PF	●	●	●	●	○	○
	Frequency	●	○	○	○	○	○
TC1/TC2				●			
Branch	Current	●	●	●	○	○	○
	Loading Factor	●	●	●	○	○	○
	kW	●	●	●	●	○	○
	kvar	●	●	●	●	○	○
	kVA	●	●	●	●	○	○
	PF	●	●	●	●	○	○

Table 4-3 Basic Measurement

4.2.2 Energy Measurements

The PMC-592's Energy measurements include active energy (kWh), reactive energy (kvarh) and apparent energy (kVAh) with a resolution of 0.1 and a maximum value of 100,000,000.0. 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 HMI or via communications. The PMC-592 provides the following energy measurements:

	kWh Import	kWh Export	kvarh Import	kvarh Export	kVAh Total
Mains-I/II	●	●	●	●	●
Branch	●	○	●	○	●

Table 4-4 Energy Measurements

The PMC-592 with Firmware V1.00.10 or later provides the following Tariff (T1/T2) energy measurements for Mains-I/II and VMs if the **Tariff Switch** is enabled.

	kWh Import	kWh Export	kvarh Import	kvarh Export	kVAh Total
Mains-I/II	●	●	●	●	●
VMs	●	○	●	○	●

Table 4-5 T1/T2 Energy Measurements

Tariff Energy for T1/T2 can be enabled by selecting a particular DI to be a **Tariff Switch**.

Tariff Switch Mode	DIx Status	Tariff
Disabled	None	None
DIx	Inactive	T1
	Active	T2

Table 4-6 Tariff Switch Mode

The following figures illustrate where to enable a particular DI as a Tariff Switch via the Web Interface or HMI.

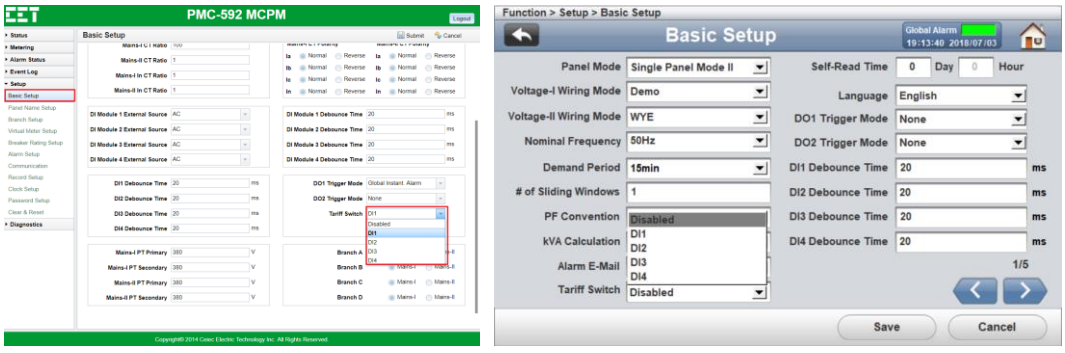


Figure 4-4 Enabling a DI as a Tariff Switch via the Web and HMI

4.2.3 Demands

Demand is defined as the average power consumption over a fixed interval (usually 15 minutes). The PMC-592 provides present demand for Mains, SMs and Temperature measurements. In addition, the PMC-592 records the Max Demand for This Month, Last Month and Historical which are stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The PMC-592 supports the sliding window demand calculation and has the following setup parameters:

Setup Parameter	Value or Description
# of Sliding Windows (Reg. # 6012)	1 to 15 (Default = 1)
Demand Period (Reg. # 6011)	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. (Default = 15)
Self-Read Time (Reg. # 6021)	The **Self-Read Time** allows the user to specify the time and day of the month for the Demand Log Self-Read operation. At the specified time in each month, the Max Demand of **This Month** is transferred to the Max Demand 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. (Default=0)

Table 4-7 Demand Setup Parameters

The PMC-592 provides the following Demand and Max Demand parameters:

Demand and Max Demand Parameters			
Mains-I Ia	Mains-I Ib	Mains-I Ic	RTD1 Temperature*
Mains-I kW Total	Mains-I kvar Total	Mains-I kVA Total	RTD2 Temperature*
Mains-II Ia	Mains-II Ib	Mains-II Ic	-
Mains-II kW Total	Mains-II kvar Total	Mains-II kVA Total	-
1-Ø SM1 I	1-Ø SM2 I	…	1-Ø SM84 I
2-Ø SM1 I	2-Ø SM2 I	…	2-Ø SM42 I
3-Ø SM1 I	3-Ø SM2 I	…	3-Ø SM28 I
1-Ø SM1 kW	1-Ø SM2 kW	…	1-Ø SM84 kW
2-Ø SM1 kW	2-Ø SM2 kW	…	2-Ø SM42 kW
3-Ø SM1 kW	3-Ø SM2 kW	…	3-Ø SM28 kW
1-Ø SM1 kvar	1-Ø SM2 kvar	…	1-Ø SM84 kvar
2-Ø SM1 kvar	2-Ø SM2 kvar	…	2-Ø SM42 kvar
3-Ø SM1 kvar	3-Ø SM2 kvar	…	3-Ø SM28 kvar
1-Ø SM1 kVA	1-Ø SM2 kVA	…	1-Ø SM84 kVA
2-Ø SM1 kVA	2-Ø SM2 kVA	…	2-Ø SM42 kVA
3-Ø SM1 kVA	3-Ø SM2 kVA	…	3-Ø SM28 kVA

* Available in Firmware V1.00.04 or later

Table 4-8 Demand Parameters

Notes:

1) The Mains or SMx Max Demands can be reset manually through communications, the built-in Web Interface or the optional HMI.

4.3 Alarm Setpoints

The PMC-592 provides powerful alarming functions for the Mains and Branch Inputs as well as for different parameters. Each Alarm Type has an independent enable switch, which allows the alarms for Mains-I, Mains-II and Branch to be enabled separately as needed. The alarms may also be disabled by setting the alarm threshold to 0.

4.3.1 Alarm Status

The PMC-592 supports both the ***Instantaneous Alarm*** and ***Latched Alarm***, which are defined below.

Instantaneous Alarm

The Instantaneous Alarm becomes Active when the alarm condition is met and is automatically reset to NORMAL when the alarm condition is no longer met. Instantaneous Alarm cannot be reset manually.

Latched Alarm

On the other hand, the Latched Alarm becomes Active when the alarm condition is met and will remain in the ALARM state even after the alarm condition is no longer met. The Latched Alarm must be reset manually. However, the Latched Alarm cannot be reset while the alarm condition remains.

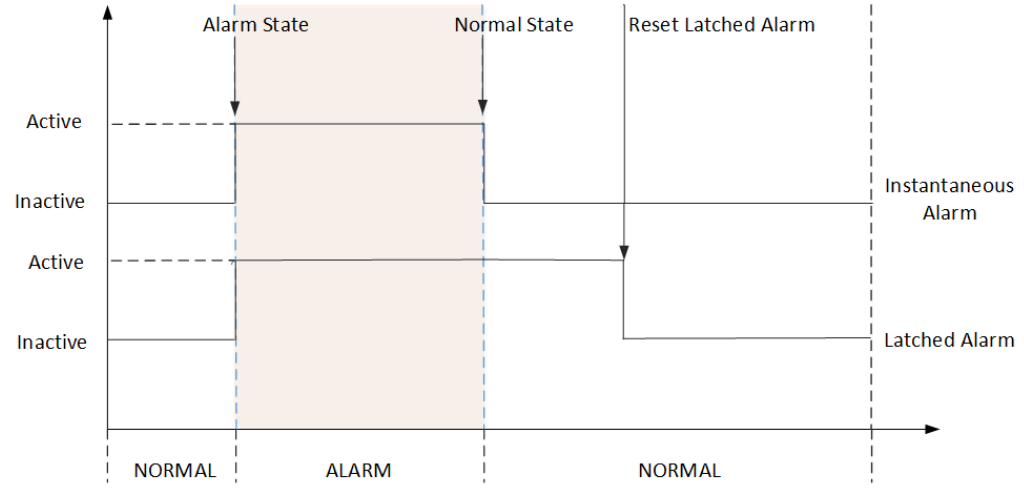


Figure 4-5 Alarm Status

4.3.2 Alarm Counters

The PMC-592 is equipped with the following Alarm Counters which will increment every time a specific alarm condition is met.

Counter Name	Description
Global Alarm Counter	Increment by 1 when any measurement has an alarm
Mains-I Global Alarm Counter	Increment by 1 when any Mains-I measurement has an alarm
Mains-II Global Alarm Counter	Increment by 1 when any Mains-II measurement has an alarm
Current-I Alarm Counter	Increment by 1 when any of the following Mains-I parameters has an alarm: I, I Demand, I Harmonics, I Unbalance
Current-II Alarm Counter	Increment by 1 when any of the following Mains-II parameters has an alarm: I, I Demand, I Harmonics, I Unbalance
Voltage-I Alarm Counter	Increment by 1 when any of the following Mains-I parameters has an alarm: U, U Harmonics, U Unbalance
Voltage-II Alarm Counter	Increment by 1 when any of the following Mains-II parameters has an alarm: U, U Harmonics, U Unbalance
RTD1 Alarm Counter	Increment by 1 when RTD1 has an alarm
RTD2 Alarm Counter	Increment by 1 when RTD2 has an alarm
DI1 Alarm Counter	Increment by 1 when DI1 has an alarm
DI2 Alarm Counter	Increment by 1 when DI2 has an alarm
DI3 Alarm Counter*	Increment by 1 when DI3 has an alarm
DI4 Alarm Counter*	Increment by 1 when DI4 has an alarm

* Only valid when the PMC-592 is equipped with 4xDIs option and is available in Firmware V1.00.08 or later.

Table 4-9 Alarm Counters

4.3.3 Universal Hysteresis and Current ON/OFF Status

The Universal Hysteresis is a global parameter that is valid for all alarms except Dip/Swell and Interruption alarms, which have their own Hysteresis parameters. The Current ON Threshold, Current ON Delay and Current OFF are global parameters that are valid for all Mains and Branch Inputs.

Parameters	Description	Range/Default*

Universal Hysteresis	The hysteresis rate for calculating the Return Threshold for all Alarms, except for Dip/Swell and Interruption Alarms.	0 to 10%, 2%*
Current ON Threshold	The ON Threshold that applies to all Mains and Branch Current Inputs for switching from the OFF to ON state.	0 to 10%, 5%*
Current ON Delay	The minimum duration that the Current of a particular Current Input must exceed the Current ON Threshold before the Status would switch from OFF to ON.	0 to 9999(s) 10s*
Current OFF Delay	The minimum duration that the Current of a particular Current Input must fall below the Current OFF Threshold before the Status would switch from ON to OFF.	0 to 9999(s) 30s*

Table 4-10 Global Parameters

The Universal Hysteresis is a global parameter that is used to prevent an alarm from fluctuating between the Active and Inactive states around the threshold point.

*It should be noted that the **Current ON Limit** is calculated based on the Breaker Rating parameters. **Therefore, it's critical to set the Breaker Rating correctly for each Current channel for the Current Alarms to work properly.***

Current ON Limit = Channel's Breaker Rating x Current On Threshold (%)
Current OFF Limit = Current ON Limit x (1 - Universal Hysteresis)

The PMC-592 provides an internal Current ON/OFF status for each Current channel to indicate whether the channel is ON (Loaded) or OFF (No Load). If the channel status is OFF and has never been ON, it means that the channel has no load and would prevent the Low and Low-Low alarms from activating.

In Firmware V1.00.10 or later, the **Current OFF Alarm Enable** parameter (Modbus Register 6394) has been added to ensure that the Current L/LL Alarms would remain Active even when the Current transitions from the ON to OFF state if **Current OFF Alarm Enable** is enabled. The Current L/LL Alarms would be reset only if the Current returns to the ON state. For Firmware V1.00.09 or earlier, the Current L/LL Alarms would be reset immediately when the Current transitions from the ON to OFF state, similar to having the **Current OFF Alarm Enable** parameter disabled.

The following figures illustrate the logic diagram of the Current ON/OFF status, respectively.

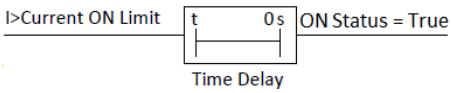


Figure 4-6 Current ON Logic Diagram

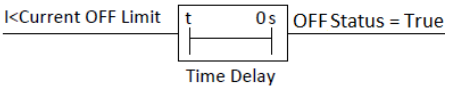


Figure 4-7 Current OFF Logic Diagram

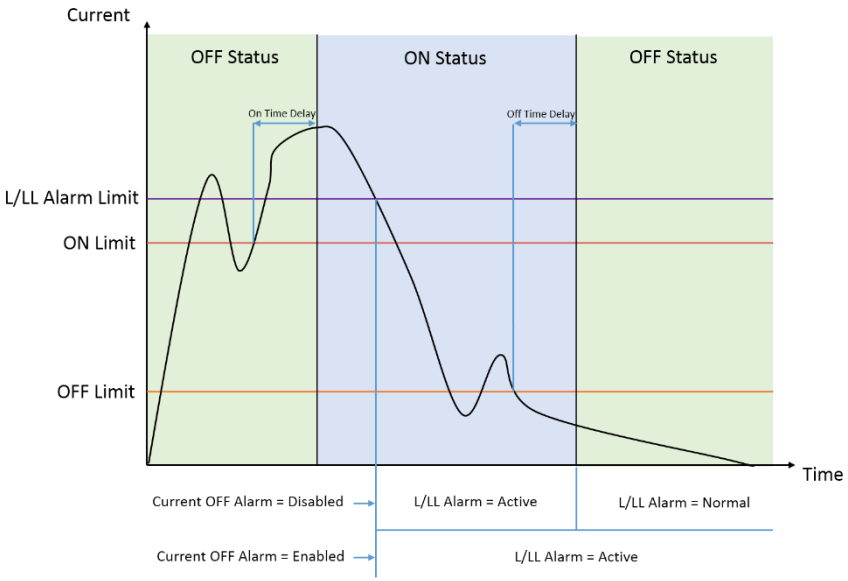


Figure 4-8 Current ON/OFF Status (L/LL Alarm Time Delay=0)

Please refer to **Figure 3-32 Current Alarm Setup Interface** and the **Setup => Alarm Setup** in **Section 3.3.2** to see where to configure the **Current OFF Alarm Enable** in the Web Interface and HMI, respectively.

4.3.4 Current Alarms

PMC-592 provides four Current alarm levels (High-High, High, Low, Low-Low) for the Mains and Branch Currents as well as the associated Current Demands with Time Delay parameters.

*It should be noted that the **Alarm Limit** is calculated based on the **Breaker Rating** parameters. **Therefore, it's critical to set the Breaker Rating correctly for each Current channel for the Current Alarms to work properly.***

Channel Alarm Limit = Channel's Breaker Rating x Alarm Threshold (%)

For High and High-High Alarms, which are conceptually similar to Over Setpoint:

Channel Alarm Return Limit = Channel Alarm Limit x (1 – Universal Hysteresis)

For Low and Low-Low Alarms, which are conceptually similar to Under Setpoint:

Channel Alarm Return Limit = Channel Alarm Limit x (1 + Universal Hysteresis)

The following table illustrates the Current Alarm setup parameters, which apply to both Mains-I/II and all the Branch Circuits.

Parameters	Description	Range/Option	Default Value
Current Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II Bit 2 = Branch, Bits 3 - 15 = Reserved	0 = Disabled 1 = Enabled	0
Current HH Alarm Threshold (%)	Current HH Alarm Threshold	0 to 100%	80%
Current HH Alarm Time Delay (s)	Current HH Alarm Time Delay	0 to 9999 (s)	10s
Current H Alarm Threshold (%)	Current H Alarm Threshold	0 to 100%	60%
Current H Alarm Time Delay (s)	Current H Alarm Time Delay	0 to 9999 (s)	10s
Current L Alarm Threshold (%)	Current L Alarm Threshold	0 to 100%	0
Current L Alarm Time Delay (s)	Current L Alarm Time Delay	0 to 9999 (s)	0
Current LL Alarm Threshold (%)	Current LL Alarm Threshold	0 to 100%	0
Current LL Alarm Time Delay (s)	Current LL Alarm Time Delay	0 to 9999 (s)	0
Current Demand Alarm Enable	Bit 0 = Mains-I Bit 1 = Mains-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
Current Demand HH Alarm Threshold (%)	Current Demand HH Alarm Threshold	0 to 100%	0
Current Demand HH Alarm Time Delay (s)	Current Demand HH Alarm Time Delay	0 to 9999 (s)	0

Current Demand H Alarm Threshold (%)	Current Demand H Alarm Threshold	0 to 100%	0
Current Demand H Alarm Time Delay (s)	Current Demand H Alarm Time Delay	0 to 9999 (s)	0
Current Demand L Alarm Threshold (%)	Current Demand L Alarm Threshold	0 to 100%	0
Current Demand L Alarm Time Delay (s)	Current Demand L Alarm Time Delay	0 to 9999 (s)	0
Current Demand LL Alarm Threshold (%)	Current Demand LL Alarm Threshold	0 to 100%	0
Current Demand LL Alarm Time Delay (s)	Current Demand LL Alarm Time Delay	0 to 9999 (s)	0
Current OFF Alarm Enable	Specifies if the Current L/LL Instantaneous Alarms will remain Active when the Current transitions from the ON to OFF status.	0 = Disabled 1 = Enabled	0

Table 4-11 Current Alarm Parameters

The logic diagram of the Current HH Alarm is illustrated in Figure 4-9.

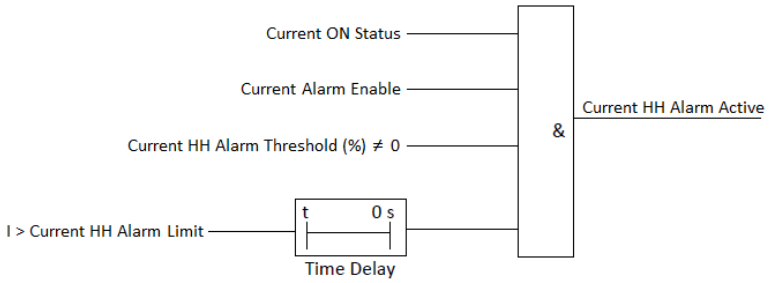


Figure 4-9 Current HH Alarm Logic Diagram

The logic diagram of the Current H Alarm is illustrated in Figure 4-10.

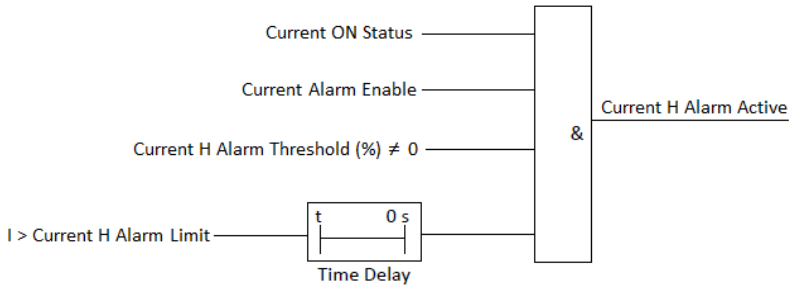


Figure 4-10 Current H Alarm Logic Diagram

The logic diagram of Current L Alarm is illustrated in Figure 4-11.

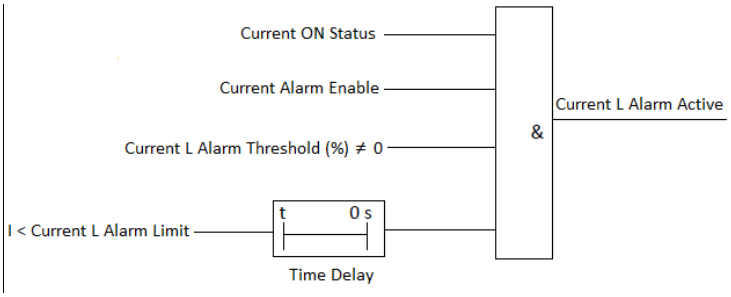


Figure 4-11 Current L Alarm Logic Diagram

The logic diagram of the Current LL Alarm is illustrated in Figure 4-12.

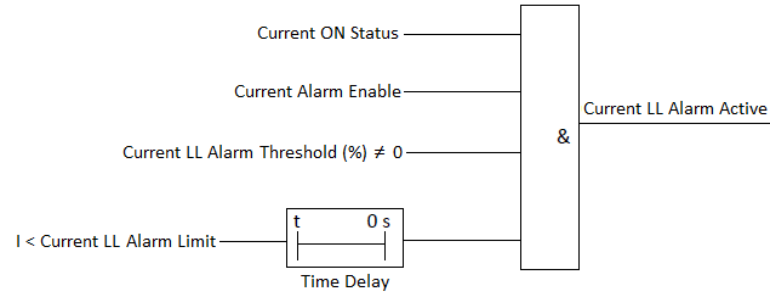


Figure 4-12 Current LL Alarm Logic Diagram

4.3.5 Voltage Alarm

PMC-592 provides an internal **Voltage On/OFF** status as well as two **Voltage Alarm levels (High and Low)** for the Mains-I/II ULN and ULL. The Voltage H/L Alarms will only be evaluated if it's determined that the **Voltage ON** status is **TRUE**.

*It should be noted that the **Voltage ON and Voltage Alarm Limits** are calculated based on **Nominal Voltage**, which is defined as the*

- ***a)*** *Nominal ULN Voltage (Modbus Register 6001) **in Firmware V1.00.09 or before**.*
- ***b)*** *Mains-I/II PT Secondary (ULL) (Modbus Registers 6043 and 6046, respectively) **in Firmware V1.00.10 or later,** replacing Nominal ULN Voltage in pervious Firmware versions. The Mains-I and Mains-II Voltage Alarms will be evaluated against their respective Mains-I/II PT Secondary (ULL) values. Also, the Nominal Voltage will be adjusted internally for the ULN and ULL Alarms accordingly, where ULL-I/II Nominal Voltage = Mains-I/II PT Secondary and ULN-I/II Nominal Voltage = Mains-I/II PT Secondary ÷ √3.*

*Therefore, it's critical to set the **Nominal Voltage** correctly for the **Voltage ON/OFF Status, Voltage Alarms,** as well as the **Dip/Swell** and **Interruption Alarms** (discussed in Section 4.3.12) to work properly.*

Voltage-I/II ON Limit = Mains-I/II Nominal Voltage x 10%

Voltage-I/II OFF Limit = Voltage-I/II ON Limit x (1 – Universal Hysteresis)

Voltage H/L Alarm Limits are specified in Volt as illustrated in the Table below.

Voltage H Alarm Return Limit = Voltage H Alarm Limit x (1 – Universal Hysteresis)

Voltage L Alarm Return Limit = Voltage L Alarm Limit x (1 + Universal Hysteresis)

The following table illustrates the Voltage Alarm parameters, which apply to both Mains-I and Mains-II.

Parameters	Description	Range/Option	Default Value
ULN Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
ULN H Alarm Limit (V)	ULN H Alarm Limit	0 to 300V	0
ULN H Alarm Time Delay (s)	ULN H Alarm Time Delay	0 to 9999(s)	0
ULN L Alarm Limit (V)	ULN L Alarm Limit	0 to 300V	0
ULN L Alarm Time Delay (s)	ULN L Alarm Time Delay	0 to 9999(s)	0
ULL Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
ULL H Alarm Limit (V)	ULL H Alarm Limit	0 to 500V	0
ULL H Alarm Time Delay (s)	ULL H Alarm Time Delay	0 to 9999(s)	0
ULL L Alarm Limit (V)	ULL L Alarm Limit	0 to 500V	0
ULL L Alarm Time Delay	ULL L Alarm Time Delay	0 to 9999(s)	0

Table 4-12 Voltage Alarm Parameters

The following figures illustrate the logic diagram of the Voltage Alarm ON/OFF status, respectively.

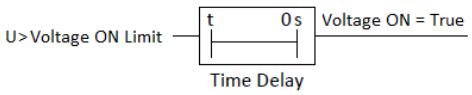


Figure 4-13 Voltage Alarm ON Logic Diagram

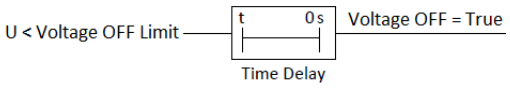


Figure 4-14 Voltage Alarm OFF Logic Diagram

The logic diagram of Voltage H Alarm is illustrated in Figure 4-15.

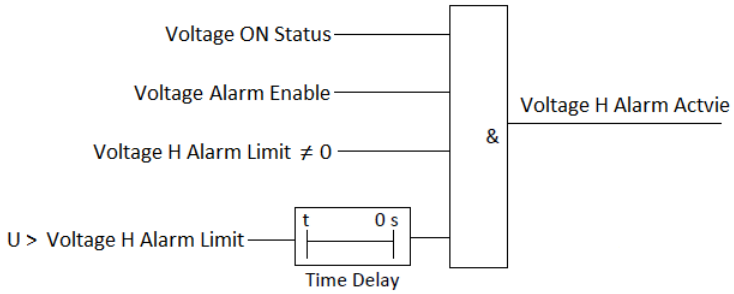


Figure 4-15 Voltage H Alarm Logic Diagram

The logic diagram of Voltage L Alarm is illustrated in Figure 4-16.

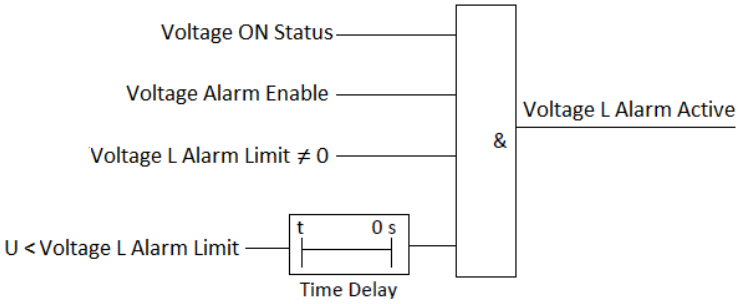


Figure 4-16 Voltage L Alarm Logic Diagram

4.3.6 Power and Power Factor Alarms

PMC-592 provides an internal **Power On/OFF** status as well as **two Power Alarm levels (High and Low)**. The **Power H/L Alarms** will only be evaluated if it's determined that the **Power ON** status is **TRUE**. *The Power and Power Factor Alarms only apply to the Mains Inputs*.

*It should be noted that the **Power Alarm On** and **Power Alarm Threshold** are calculated based on the **Nominal Voltage, Breaker Rating** and **Current ON Threshold** parameters. Therefore, it's critical to set these parameters correctly for the **Power ON** and **Power Alarms** to work properly.*

a) For Firmware V1.00.09 or earlier

Power Alarm ON Limit = Channel Breaker Rating x Nominal Voltage x 3 x Current ON Threshold

Power H/L Alarm Limit = Channel Breaker Rating x Nominal Voltage x 3 x Power H/L Alarm Threshold

where Nominal Voltage = Nominal ULN Voltage (Modbus Register 6001)

b) For Firmware V1.00.10 or later

Power Alarm ON Limit = Channel Breaker Rating x (Nominal Voltage ÷ √3) x 3 x Current ON Threshold

Power H Alarm Limit = Channel Breaker Rating x (Nominal Voltage ÷ √3) x 3 x Power H Alarm Threshold

Power L Alarm Limit = Channel Breaker Rating x (Nominal Voltage ÷ √3) x 3 x Power L Alarm Threshold

where Nominal Voltage = Mains-I/II PT Secondary (ULL Voltage) (Modbus Registers 6043 and 6046)

Power OFF Limit = Power ON Limit x (1 – Universal Hysteresis)

Power H Alarm Return Limit = Power H Alarm Limit x (1 – Universal Hysteresis)

Power L Alarm Return Limit = Power L Alarm Limit x (1 + Universal Hysteresis)

Parameters	Description	Range/Option	Default Value
Power Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
kW Total H Alarm Threshold (%)	kW Total H Alarm Threshold	0 to 100%	0
kW Total H Alarm Time Delay (s)	kW Total H Alarm Time Delay	0 to 9999 (s)	0
kW Total L Alarm Threshold (%)	kW Total L Alarm Threshold	0 to 100%	0
kW Total L Alarm Time Delay (s)	kW Total L Alarm Time Delay	0 to 9999 (s)	0
kvar Total H Alarm Threshold (%)	kvar Total H Alarm Threshold	0 to 100%	0
kvar Total H Alarm Time Delay (s)	kvar Total H Alarm Time Delay	0 to 9999 (s)	0
kvar Total L Alarm Threshold (%)	kvar Total L Alarm Threshold	0 to 100%	0
kvar Total L Alarm Time Delay (s)	kvar Total L Alarm Time Delay	0 to 9999 (s)	0
kVA Total H Alarm Threshold (%)	kVA Total H Alarm Threshold	0 to 100%	0
kVA Total H Alarm Time Delay (s)	kVA Total H Alarm Time Delay	0 to 9999 (s)	0
kVA Total L Alarm Threshold (%)	kVA Total L Alarm Threshold	0 to 100%	0
kVA Total L Alarm Time Delay (s)	kVA Total L Alarm Time Delay	0 to 9999 (s)	0
PF Total Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
PF Total H Alarm Threshold (%)	PF Total H Alarm Threshold	0 to 100%	0
PF Total H Alarm Time Delay (s)	PF Total H Alarm Time Delay	0 to 9999 (s)	0
PF Total L Alarm Threshold (%)	PF Total L Alarm Threshold	0 to 100%	0
PF Total L Alarm Time Delay (s)	PF Total L Alarm Time Delay	0 to 9999 (s)	0

Power Demand Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
kW Total Demand H Alarm Threshold (%)	kW Total Demand H Alarm Threshold	0 to 100%	0
kW Total Demand H Alarm Time Delay (s)	kW Total Demand H Alarm Time Delay	0 to 9999 (s)	0
kW Total Demand L Alarm Threshold (%)	kW Total Demand L Alarm Threshold	0 to 100%	0
kW Total Demand L Alarm Time Delay (s)	kW Total Demand L Alarm Time Delay	0 to 9999 (s)	0
kvar Total Demand H Alarm Threshold (%)	kvar Total Demand H Alarm Threshold	0 to 100%	0
kvar Total Demand H Alarm Time Delay (s)	kvar Total Demand H Alarm Time Delay	0 to 9999 (s)	0
kvar Total Demand L Alarm Threshold (%)	kvar Total Demand L Alarm Threshold	0 to 100%	0
kvar Total Demand L Alarm Time Delay (s)	kvar Total Demand L Alarm Time Delay	0 to 9999 (s)	0
kVA Total Demand H Alarm Threshold (%)	kVA Total Demand H Alarm Threshold	0 to 100%	0
kVA Total Demand H Alarm Time Delay (s)	kVA Total Demand H Alarm Time Delay	0 to 9999 (s)	0
kVA Total Demand L Alarm Threshold (%)	kVA Total Demand L Alarm Threshold	0 to 100%	0
kVA Total Demand L Alarm Time Delay (s)	kVA Total Demand L Alarm Time Delay	0 to 9999 (s)	0

Table 4-13 Power Alarm Parameters

The following figures illustrate the logic diagrams of the Power Alarm On/OFF, respectively.

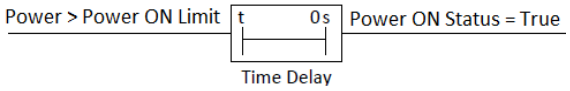


Figure 4-17 Power Alarm ON Logic Diagram

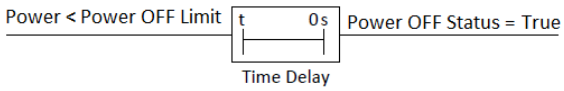


Figure 4-18 Power Alarm OFF Logic Diagram

The logic diagram of Power H Alarm is illustrated in Figure 4-19.

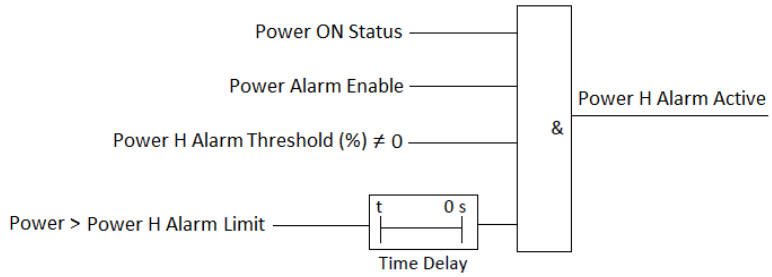


Figure 4-19 Power H Alarm Logic Diagram

The logic diagram of Power L Alarm is illustrated in Figure 4-20.

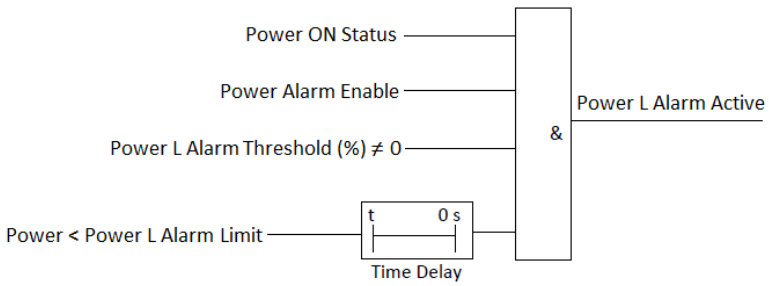


Figure 4-20 Power L Alarm Logic Diagram

The logic diagram of PF H Alarm is illustrated in Figure 4-21.

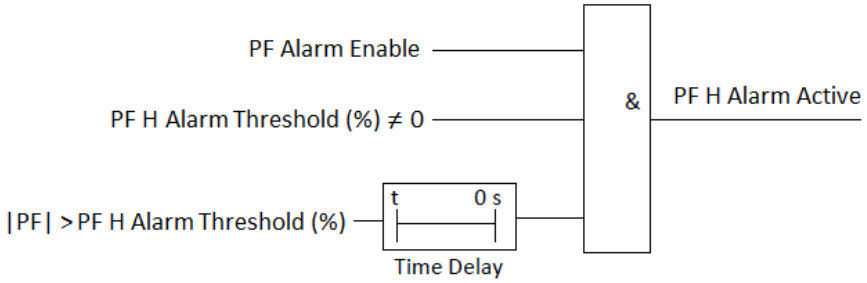


Figure 4-21 PF H Alarm Logic Diagram

The logic diagram of PF L Alarm is illustrated in Figure 4-22.

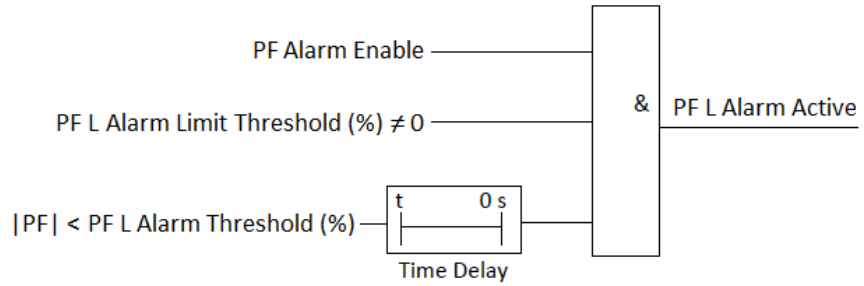


Figure 4-22 PF L Alarm Logic Diagram

4.3.7 Frequency Alarm

Since PMC-592 measures its frequency based on Uan/Uab of Mains-I only, the Frequency Alarm is activated when Mains-I's Uan/Uab **Voltage ON Status** = **TRUE**.

The following table illustrates the Frequency Alarm parameters.

Parameters	Description	Range	Default Value
FREQ H Alarm Limit (Hz)	FREQ H Alarm Limit	45 to 65 (Hz)	65 (Hz)
FREQ H Alarm Time Delay (s)	FREQ H Alarm Time Delay	0 to 9999(s)	10s
FREQ L Alarm Limit (Hz)	FREQ L Alarm Limit	45 to 65 (Hz)	45 (Hz)
FREQ L Alarm Time Delay (s)	FREQ L Alarm Time Delay	0 to 9999(s)	10 (s)

Table 4-14 Frequency Alarm Parameters

The FREQ H/L Alarm Return Limits are illustrated below:

FREQ H Alarm Return Limit = FREQ H Alarm Limit – 0.1Hz

FREQ L Alarm Return Limit = FREQ L Alarm Limit + 0.1Hz

The logic diagram of FREQ H Alarm is illustrated in Figure 4-23.

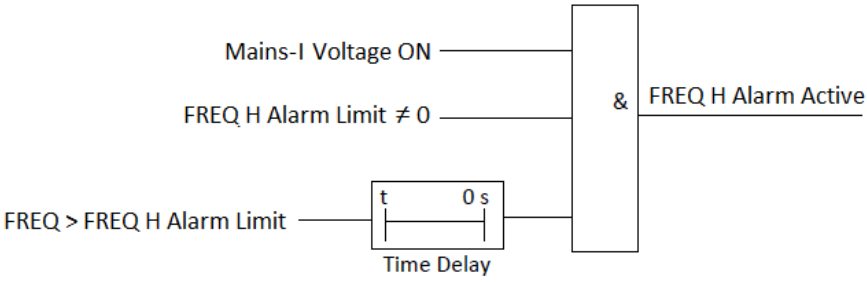


Figure 4-23 FREQ H Alarm Logic Diagram

The logic diagram of FREQ L Alarm is illustrated in Figure 4-24.

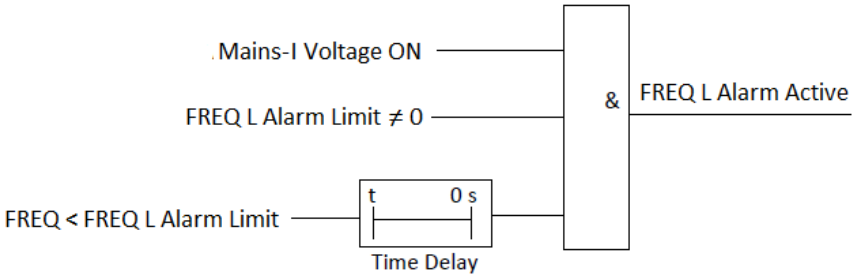


Figure 4-24 FREQ L Alarm Logic Diagram

4.3.8 Unbalance Alarm

The following table illustrates the Unbalance Alarm parameters.

Parameters	Description	Range	Default Value
I Unb. Alarm Enable	Bit 0 = Current-I, Bit 1 = Current-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
I Unb. H Alarm Threshold (%)	Current Unb. H Alarm Threshold	0 to 100%	0
I Unb. H Alarm Time Delay (s)	Current Unb. H Alarm Time Delay	0 to 9999 (s)	0
U Unb. Alarm Enable	Bit 0 = Voltage-I, Bit 1 = Voltage-II Bits 2 - 15 = Reserved	0 = Disabled 1 = Enabled	0
U Unb. H Alarm Threshold (%)	Voltage Unb. H Alarm Threshold	0 to 100%	0
U Unb. H Alarm Time Delay (s)	Voltage Unb. H Alarm Time Delay	0 to 9999 (s)	0

Table 4-15 Unbalance Alarm Parameters

The U/I Unb. Alarm Return Limits are illustrated below:

U/I Unb. Alarm Return Limit = U/I Unb. Alarm Limit x (1 – Universal Hysteresis)

The logic diagram of Unbalance Alarm is illustrated in Figure 4-25.

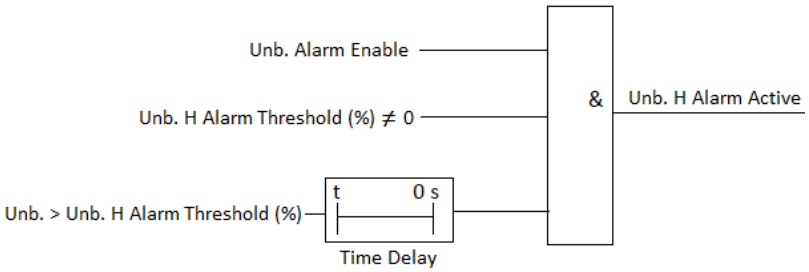


Figure 4-25 Unbalance Alarm Logic Diagram

4.3.9 Harmonic Distortion Alarm

The following table illustrates the Harmonic Distortion Alarm parameters.

Parameters	Description	Range	Default Value
Harmonic Alarm Enable	Bit 0 = Current-I, Bit 1 = Current-II Bit 2 = Voltage-I, Bit 3 = Voltage-II Bits 4 - 15 = Reserved	0 = Disabled 1 = Enabled	0
THD H Alarm Threshold (%)	THD H Alarm Threshold	0 to 100%	0
THD H Alarm Time Delay (s)	THD H Alarm Time Delay	0 to 9999 (s)	0
TOHD H Alarm Threshold (%)	TOHD H Alarm Threshold	0 to 100%	0
TOHD H Alarm Time Delay (s)	TOHD H Alarm Time Delay	0 to 9999 (s)	0
TEHD H Alarm Threshold (%)	TEHD H Alarm Threshold	0 to 100%	0
TEHD H Alarm Time Delay (s)	TEHD H Alarm Time Delay	0 to 9999 (s)	0

Table 4-16 Harmonic Distortion Alarm Parameters

The THD/TOHD/TEHD Alarm Return Limits are illustrated below:

THD/TOHD/TEHD Alarm Return Limit = THD/TOHD/TEHD Alarm Limit x (1 – Universal Hysteresis)

The logic diagram of Harmonic Distortion Alarm is illustrated in Figure 4-26.

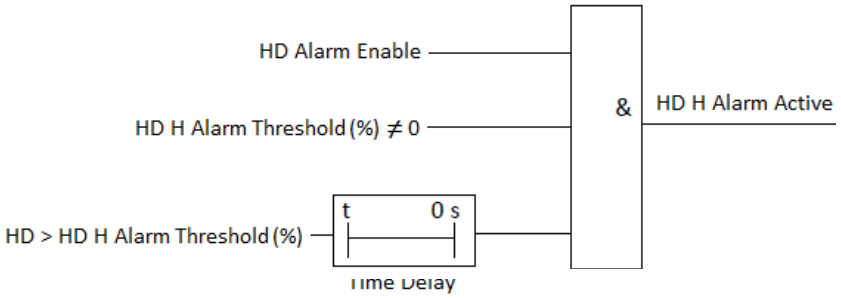


Figure 4-26 Harmonic Distortion Alarm Logic Diagram

4.3.10 Temperature Alarm

The following table illustrates the Temperature Alarm parameters.

Parameters	Description	Range	Default Value
RTD1 HH Alarm Limit (°C)	RTD1 Temp. HH Alarm Limit	0 to 200°C	0
RTD1 HH Alarm Time Delay (s)	RTD1 Temp. HH Alarm Time Delay	0 to 9999 (s)	0
RTD1 H Alarm Limit (°C)	RTD1 Temp. H Alarm Limit	0 to 200°C	0
RTD1 H Alarm Time Delay (s)	RTD1 Temp. H Alarm Time Delay	0 to 9999 (s)	0
RTD2 HH Alarm Limit (°C)	RTD2 Temp. HH Alarm Limit	0 to 200°C	0
RTD2 HH Alarm Time Delay (s)	RTD2 Temp. HH Alarm Time Delay	0 to 9999 (s)	0
RTD2 H Alarm Limit (°C)	RTD2 Temp. H Alarm Limit	0 to 200°C	0
RTD2 H Alarm Time Delay (s)	RTD2 Temp. H Alarm Time Delay	0 to 9999 (s)	0

Table 4-17 Temperature Alarm Parameters

The RTD1/2 HH/H Alarm Return Limits are illustrated below:

RTD1/2 HH/H Alarm Return Limits = RTD1/2 HH/H Alarm Limits x (1 – Universal Hysteresis)

The logic diagram of Temperature HH Alarm is illustrated in Figure 4-27.

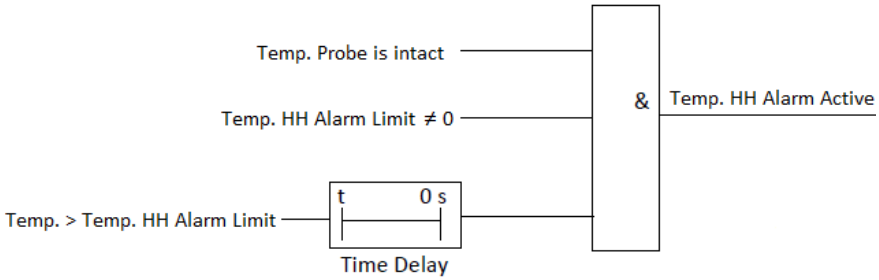


Figure 4-27 Temperature HH Alarm Logic Diagram

The logic diagram of Temperature H Alarm is illustrated in Figure 4-28.

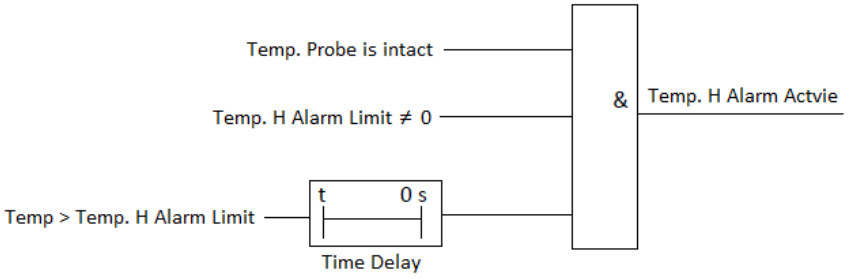


Figure 4-28 Temperature H Alarm Logic Diagram

4.3.11 DI Alarm

The following table illustrates the DI Alarm parameters.

Parameters	Description	Range/Option	Default Value
DI1 Alarm Type	Disabled / DI1 Closed Trigger / DI1 Open Trigger	Disabled	Disabled

		DI1 Closed Trigger DI1 Open Trigger	
DI1 Alarm Time Delay (s)	DI1 Alarm Time Delay	0 to 9999(s)	0
DI2 Alarm Type	Disable / DI2 Closed Trigger / DI2 Open Trigger	Disabled DI2 Closed Trigger DI2 Open Trigger	Disabled
DI2 Alarm Time Delay (s)	DI2 Alarm Time Delay	0 to 9999(s)	0
DI3* Alarm Type	Disable / DI3 Closed Trigger / DI1 Open Trigger	Disabled DI3 Closed Trigger DI3 Open Trigger	Disabled
DI3* Alarm Time Delay (s)	DI3 Alarm Time Delay	0 to 9999(s)	0
DI4* Alarm Type	Disable / DI4 Closed Trigger / DI4 Open Trigger	Disabled DI4 Closed Trigger DI4 Open Trigger	Disabled
DI4* Alarm Time Delay (s)	DI4 Alarm Time Delay	0 to 9999(s)	0

* Only valid when the PMC-592 is equipped with the 4xDIs option and is available in Firmware v1.00.08 or later.

Table 4-18 DI Alarm Parameters

The logic diagram of DI Closed Alarm is illustrated in Figure 4-29.

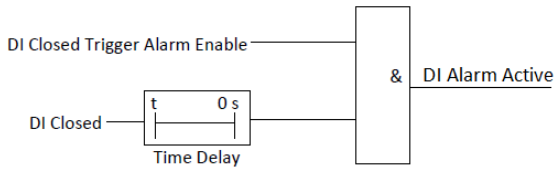


Figure 4-29 DI Closed Alarm Logic Diagram

The logic diagram of DI Open Alarm is illustrated in Figure 4-30.

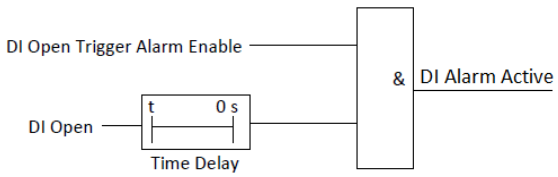


Figure 4-30 DI Open Alarm Logic Diagram

4.3.12 Dip, Swell and Interruption Alarm

The PMC-592 with Firmware V1.00.05 or later supports Dip/Swell and Interruption Alarms according to IEC 61000-4-30 with 1-cycle update instead of ½-cycle as specified by the standard. The following table illustrates the Dip/Swell and Interruption Alarm parameters and their respective default values.

Parameters	Description	Range/Option	Default Value
Dip/Swell Alarm Enable	Bit 0 = Mains-I Bit 1 = Mains-II	0 = Disabled 1 = Enabled	1
Dip Alarm Threshold (%)	Dip Alarm Threshold	1% to 99%	90%
Dip Alarm Hysteresis (%)	Dip Alarm Hysteresis	0 to 100%	2.0%
Swell Alarm Threshold (%)	Swell Alarm Threshold	101% to 200%	110%
Swell Alarm Hysteresis (%)	Swell Alarm Hysteresis	0 to 100%	2.0%
Interruption Alarm Threshold (%)	Interruption Alarm Threshold	0 to 50%	10%
Interruption Alarm Hysteresis (%)	Interruption Alarm Hysteresis	0 to 100%	2.0%

Table 4-19 Dip/Swell Alarm Parameters

*It should be noted that the **Dip/Swell/Interruption Alarm Limits** are calculated based on **Nominal Voltage**, which is defined as the*

- ***a)*** *Nominal ULN Voltage (Modbus Register 6001) **in Firmware V1.00.09 or before**.*
- ***b)*** *Mains-I/II PT Secondary (ULL) (Modbus Registers 6043 and 6046, respectively) **in Firmware V1.00.10 or later,** replacing Nominal ULN Voltage in pervious Firmware versions**.** The Mains-I*

and Mains-II Dip/Swell/Interruption Alarms will be evaluated against their respective Mains-I/II PT Secondary (ULL) values. Also, the Nominal Voltage will be adjusted internally for Wye and Delta modes accordingly, where ULL-I/II Nominal Voltage = Mains-I/II PT Secondary and ULN-I/II Nominal Voltage = Mains-I/II PT Secondary ÷ √3.

*Therefore, it's critical to set the **Nominal Voltage** correctly for the Dip/Swell/Interruption Alarms to work properly.*

Dip/Swell/Interruption Alarm Limit = Nominal Voltage x Dip/Swell/Interruption Alarm Threshold

Dip/Interruption Alarm Return Limit = Dip/Interruption Alarm Limit x (1 + Universal Hysteresis)

Swell Alarm Return Limit = Swell Alarm Limit x (1 – Universal Hysteresis)

The logic diagram of Dip and Swell Alarms are illustrated in Figure 4-31 and Figure 4-32, respectively.

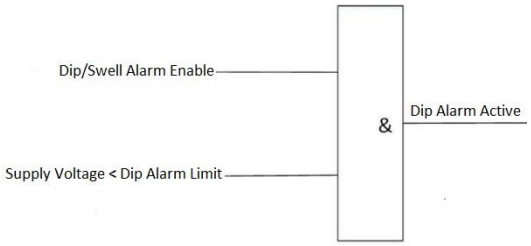


Figure 4-31 Dip Alarm Logic Diagram

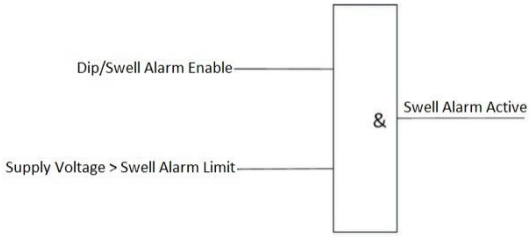


Figure 4-32 Swell Alarm Logic Diagram

The logic diagram of Interruption Alarm is illustrated in Figure 4-33.

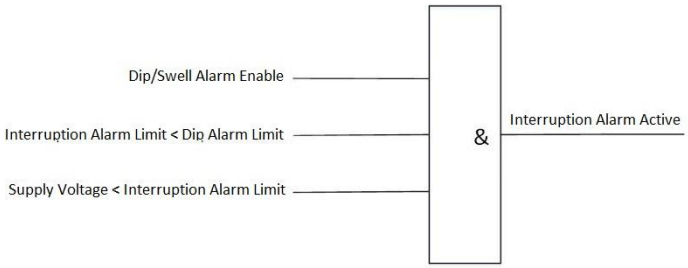
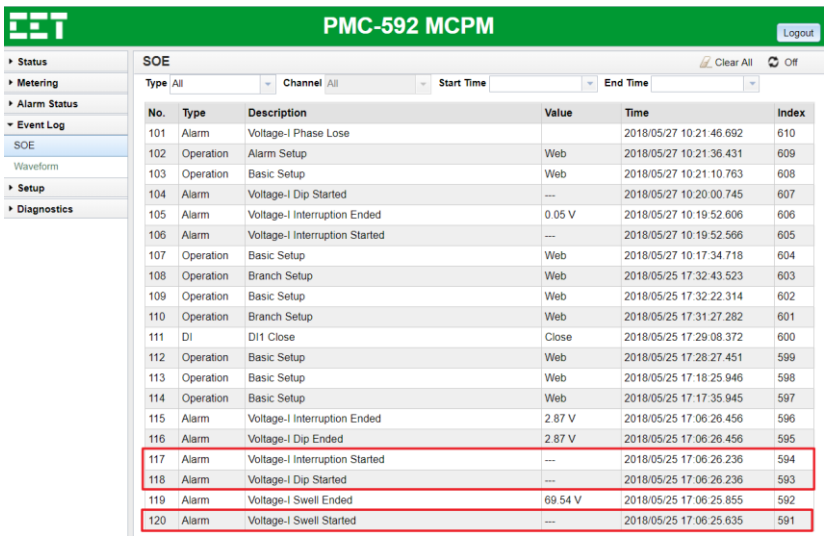


Figure 4-33 Interruption Alarm Logic Diagram

Dip/Swell and Interruption Alarms trigger both the SOE log and Waveform Recorder. The SOE and Waveform Logs can be accessed via **Event Log => SOE/Waveform** on the Web Interface.



No.	Type	Description	Value	Time	Index
101	Alarm	Voltage-I Phase Lose		2018/05/27 10:21:46.692	610
102	Operation	Alarm Setup	Web	2018/05/27 10:21:36.431	609
103	Operation	Basic Setup	Web	2018/05/27 10:21:10.763	608
104	Alarm	Voltage-I Dip Started	---	2018/05/27 10:20:00.745	607
105	Alarm	Voltage-I Interruption Ended	0.05 V	2018/05/27 10:19:52.606	606
106	Alarm	Voltage-I Interruption Started	---	2018/05/27 10:19:52.566	605
107	Operation	Basic Setup	Web	2018/05/27 10:17:34.718	604
108	Operation	Branch Setup	Web	2018/05/25 17:32:43.523	603
109	Operation	Basic Setup	Web	2018/05/25 17:32:22.314	602
110	Operation	Branch Setup	Web	2018/05/25 17:31:27.282	601
111	DI	DI1 Close	Close	2018/05/25 17:29:08.372	600
112	Operation	Basic Setup	Web	2018/05/25 17:28:27.451	599
113	Operation	Basic Setup	Web	2018/05/25 17:18:25.946	598
114	Operation	Basic Setup	Web	2018/05/25 17:17:35.945	597
115	Alarm	Voltage-I Interruption Ended	2.87 V	2018/05/25 17:06:26.456	596
116	Alarm	Voltage-I Dip Ended	2.87 V	2018/05/25 17:06:26.456	595
117	Alarm	Voltage-I Interruption Started	---	2018/05/25 17:06:26.236	594
118	Alarm	Voltage-I Dip Started	---	2018/05/25 17:06:26.236	593
119	Alarm	Voltage-I Swell Ended	69.54 V	2018/05/25 17:06:25.855	592
120	Alarm	Voltage-I Swell Started	---	2018/05/25 17:06:25.635	591

Figure 4-33 Dip/Swell Triggered SOE

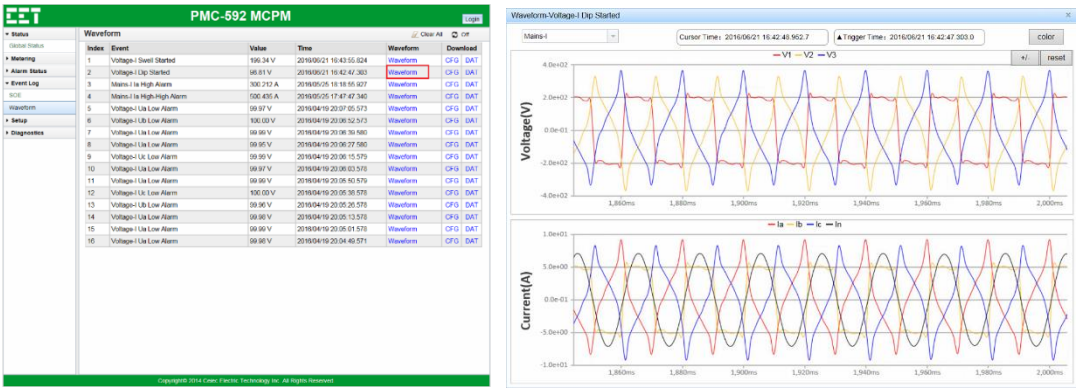


Figure 4-34 Dip/Swell Triggered Waveform

4.3.13 Phase Reversal and Phase Loss Alarm

The PMC-592 supports the Phase Reversal and Phase Loss Alarms since Firmware V1.00.05.
The following table illustrates the Phase Reversal and Phase Loss Alarm parameters and their respective default values.

Parameters	Description	Range/Option	Default Value
Phase Reversal Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II	0 = Disable, 1 = Enable	0
Phase loss Alarm Enable	Bit 0 = Mains-I, Bit 1 = Mains-II	0 = Disable, 1 = Enable	0
Phase loss Alarm Time Delay	Phase loss Alarm Time Delay	0 to 9999(s)	10s

Table 4-20 Phase Reversal and Phase Loss Alarm Parameters

The logic diagrams of Phase Reversal and Phase Loss Alarm are illustrated in Figure 4-34 and Figure 4-35, respectively. Please be informed that the Phase Reversal Alarm assumes that the “normal” Phase Rotation is based on **Positive** or **Clockwise** rotation (ABC).

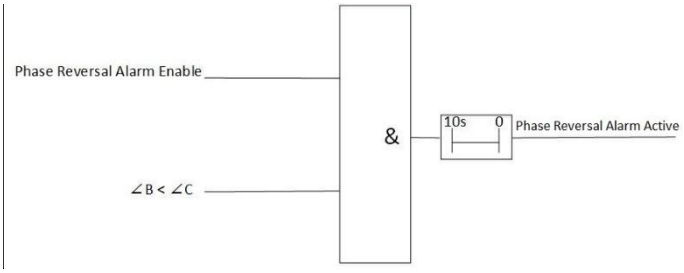


Figure 4-34 Phase Reversal Alarm Logic Diagram

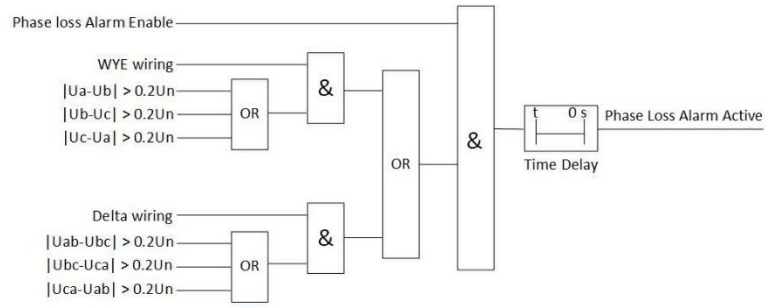


Figure 4-35 Phase Loss Alarm Logic Diagram

4.4 Power Quality Parameters

4.4.1 Unbalance

The PMC-592 measures the Voltage and Current Unbalances based on the following:

$$\text{Voltage Unbalance} = \frac{V_2}{V_1} \times 100\% \qquad \text{Current Unbalance} = \frac{I_2}{I_1} \times 100\%$$

Where

U_1 is Positive Sequence Voltage and U_2 is Negative Sequence Voltage.
and
I_1 is Positive Sequence Current and I_2 is Negative Sequence Current.

Under 1P3W wiring mode, the calculation method is listed below:

$$\text{Voltage Unbalance} = \frac{|Ua - Ub|}{(Ua + Ub)} \times 100\% \qquad \text{Current Unbalance} = \frac{|Ia - Ib|}{(Ia + Ib)} \times 100\%$$

4.4.2 Harmonics

The PMC-592 provides the following Harmonic parameters:

Mains-I/II Inputs

- U & I THD/TOHD/TEHD
- U & I Individual Harmonics up to the 31st order
- Current K-factor
- Current TDD, TODD and TEDD since Firmware Version V1.00.05
- U & I Crest Factor since Firmware V1.00.05

Branch Inputs

- Current THD

All Harmonic parameters are available through communications, the built-in Web Interface and the optional HMI Display.

The following equations illustrate how to calculate the individual harmonic distortion:

Fundamental Method:

$$\text{Voltage } K^{th} \text{ Harmonic Distortion} = \frac{V_K}{V_1} \times 100\% \qquad \text{Current } K^{th} \text{ Harmonic Distortion} = \frac{I_k}{I_1} \times 100\%$$

Where

V_1 / I_1 are the Fundamental Voltage/Current RMS and

V_k / I_k is the k_{th} Harmonic Voltage/Current RMS

The PMC-592 provides the following Harmonic measurements:

	Mains-I	Mains-II	Branch
Harmonics-Voltage	Uan/Ubn/Ucn THD (WYE) Uab/Ubc/Uca THD (Delta)	Uan/Ubn/Ucn THD (WYE) Uab/Ubc/Uca THD (Delta)	SM1 to SM84 THD
	Uan/Ubn/Ucn TEHD (WYE) Uab/Ubc/Uca TEHD (Delta)	Uan/Ubn/Ucn TEHD (WYE) Uab/Ubc/Uca TEHD (Delta)	
	Uan/Ubn/Ucn TOHD (WYE) Uab/Ubc/Uca TOHD (Delta)	Uan/Ubn/Ucn TOHD (WYE) Uab/Ubc/Uca TOHD (Delta)	
	Uan/Ubn/Ucn Crest-Factor	Uan/Ubn/Ucn Crest-Factor	
	Uan/Ubn/Ucn HD02 (WYE) Uab/Ubc/Uca HD02 (Delta)	Uan/Ubn/Ucn HD02 (WYE) Uab/Ubc/Uca HD02 (Delta)	

	...	...	
	Uan/Ubn/Ucn HD31 (WYE) Uab/Ubc/Uca HD31 (Delta)	Uan/Ubn/Ucn HD31 (WYE) Uab/Ubc/Uca HD31 (Delta)	
Harmonics-Current	Ia/Ib/Ic THD	Ia/Ib/Ic THD	
	Ia/Ib/Ic TEHD	Ia/Ib/Ic TEHD	
	Ia/Ib/Ic TOHD	Ia/Ib/Ic TOHD	
	Ia/Ib/Ic TDD	Ia/Ib/Ic TDD	
	Ia/Ib/Ic TEDD	Ia/Ib/Ic TEDD	
	Ia/Ib/Ic TODD	Ia/Ib/Ic TODD	
	Ia/Ib/Ic K-Factor	Ia/Ib/Ic K-Factor	
	Ia/Ib/Ic Crest-Factor	Ia/Ib/Ic Crest-Factor	
	Ia/Ib/Ic HD02	Ia/Ib/Ic HD02	
	...	...	
	Ia/Ib/Ic HD31	Ia/Ib/Ic HD31	

Table 4-21 Harmonics Measurements

Total Demand Distortion (TDD)

TDD the ratio of the root mean square (rms) of the harmonic current to the root mean square value of the rated or maximum demand fundamental current, expressed as a percent.

TDD of the current I is calculated by the formula below:

$$TDD = \frac{\sqrt{\sum_{h=1}^{h=\infty} (I_h)^2}}{I_L}$$

where

I_L = maximum demand of fundamental current which calculated via FFT (Fast Fourier Transform)

h = harmonic order (1, 2, 3, 4, etc.)

I_h = rms load current at the harmonic order h

K-Factor and Crest Factor

K-factor is defined as the weighted sum of the harmonic load currents according to their effects on transformer heating, as derived from ANSI/IEEE C57.110. A **K-Factor** of 1.0 indicates a linear load (no harmonics). The higher the **K-Factor**, the greater the harmonic heating effects.

The calculation method of K-Factor is listed below:

$$K-Factor = \frac{\sum_{h=1}^{h=h_{max}} (I_h h)^2}{\sum_{h=1}^{h=h_{max}} (I_h)^2}$$

I_h = h_{th} Harmonic Current in RMS

h_{max} = Highest harmonic order

h = Harmonic order

Crest Factor is defined as the **Peak to Average Ratio (PAR)**, and its calculation is listed below:

$$C = \frac{|X|_{peak}}{X_{rms}}$$

$|X|_{peak}$ = Peak amplitude of the waveform

X_{rms} = RMS value

The following screen captures display the Crest Factor and TDD parameters on the Web Interface and optional HMI.

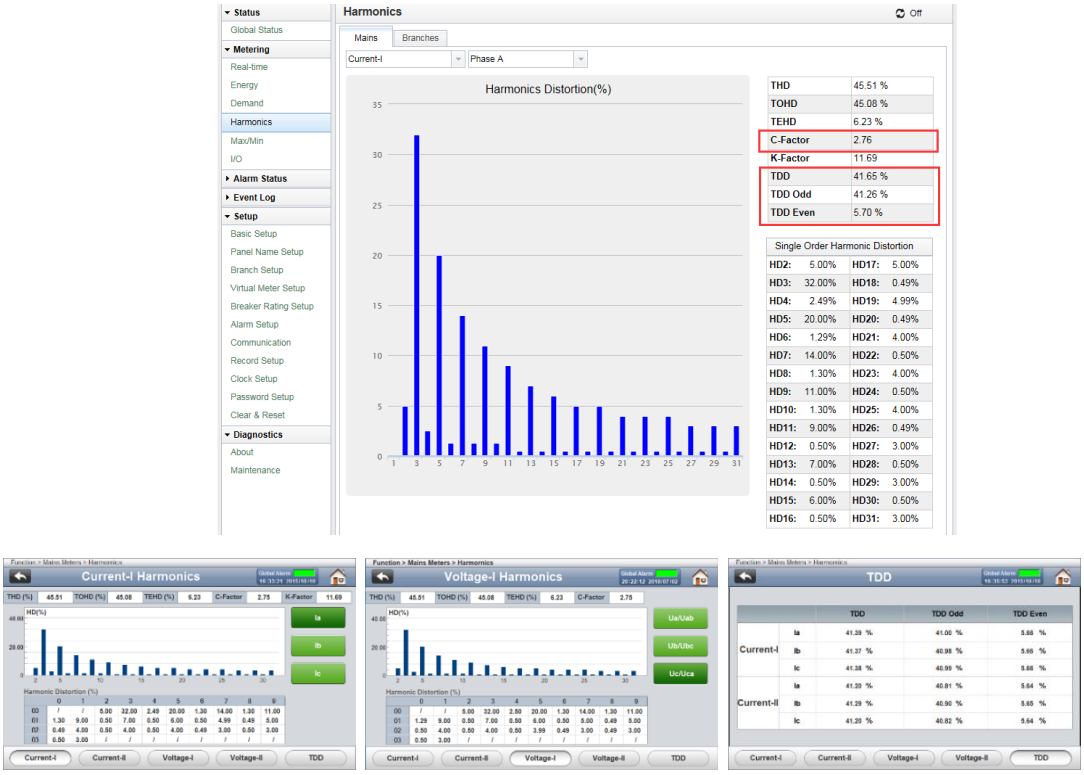


Figure 4-36 Harmonics Measurements

4.4.3 Supply Voltage Dips/Swells and Interruptions

The PMC-592 supports the detection of the **Supply Voltage Dip/Swell** and **Interruption** using a method that is in accordance with Section 5.4 of IEC 61000-4-30 Power Quality Standard for Class A performance since Firmware V1.00.05. The PMC-592 provides Dip/Swell detection on a per phase basis and can trigger the following parameters at the same time: WFR, SOE and Alarm Setpoints. The timestamp, duration and Maximum and Minimum of three phase voltage of each Dip/Swell would be recorded by PMC-592.

4.5 Sub-Meters (SM)

4.5.1 SM Overview

The PMC-592 provides 1-Ø, 2-Ø and 3-Ø SMs automatically with no configuration requirements.

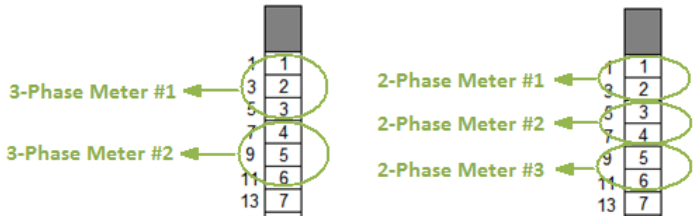


Figure 4-37 2-Ø and 3-Ø SM Examples

Tables 4-22 and 4-23 provide examples of SM assignment for Sequential and Cross-over Modes, respectively.

1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM
1	1	1	22	11	8	43	22	15	64	32	22

2			23			44			65		
3	2		24	12		45	23		66	33	
4		2	25		9	46		16	67		23
5	3		26	13		47	24		68	34	
6			27			48			69		
7	4	3	28	14	10	49	25	17	70	35	24
8			29			50			71		
9	5		30	15		51	26		72	36	
10		4	31		11	52		18	73		25
11	6		32	16		53	27		74	37	
12			33			54			75		
13	7	5	34	17	12	55	28	19	76	38	26
14			35			56			77		
15	8		36	18		57	29		78	39	
16		6	37		13	58		20	79		27
17	9		38	19		59	30		80	40	
18			39			60			81		
19	10	7	40	20	14	61	31	21	82	41	28
20			41			62			83		
21	21		42	21		63	42		84	42	

Table 4-22 SM Assignment in Sequential Installation Mode

1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM
1	1	1	2	2	2	43	22	15	44	23	16
3			4			45			46		
5	3		6	4		47	24		48	25	
7		3	8		4	49		17	50		18
9	5		10	6		51	26		52	27	
11			12			53			54		
13	7	5	14	8	6	55	28	19	56	29	20
15			16			57			58		
17	9		18	10		59	30		60	31	
19		7	20		8	61		21	62		22
21	11		22	12		63	32		64	33	
23			24			65			66		
25	13	9	26	14	10	67	34	23	68	35	24
27			28			69			70		
29	15		30	16		71	36		72	37	
31		11	32		12	73		25	74		26
33	17		34	18		75	38		76	39	
35			36			77			78		
37	19	13	38	20	14	79	40	27	80	41	28
39			40			81			82		
41	21		42	21		83	42		84	42	

Table 4-23 SM Assignment in Cross-over Installation Mode

For applications that require 12-CT Strips, it is not recommended to assign SM from 1 to 48 (with 4x12-CT Strips). Instead, use the default SM assignment as if the 21-CT Strips were used and leave gaps in the SMs. The data from the un-used SMs would all be 0. In addition, it is strongly recommended to install all 12-CT Strips using the **Top** Installation Direction; otherwise, there will be an invalid 2-Ø SM for each CT Strip as shown below:

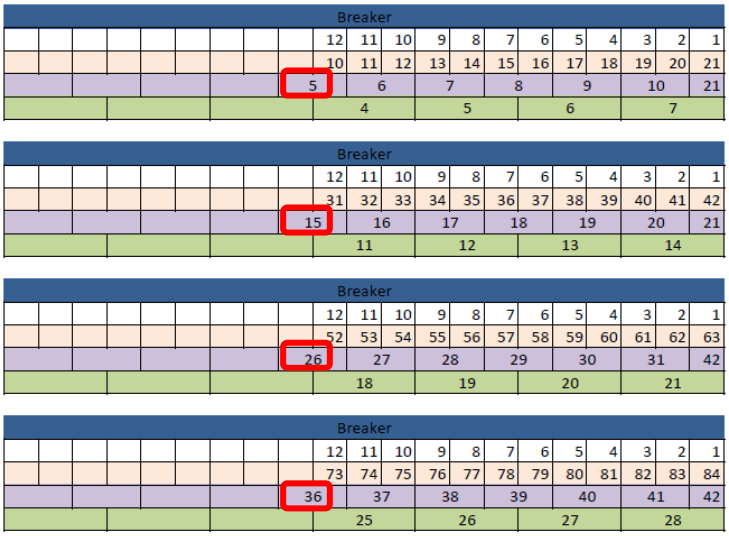


Figure 4-38 2-Ø SM Assignment is invalid for Bottom Installation Direction

Tables 4-24 and 4-25 provide examples of SM assignment for Sequential and Cross-over Installation Modes.

1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM
1	1	1	22	11	8	43	22	15	64	32	22
2			23			44			65		
3	2		24	12		45	23		66	33	
4		2	25		9	46		16	67		23
5	3		26	13		47	24		68	34	
6			27			48			69		
7	4	3	28	14	10	49	25	17	70	35	24
8			29			50			71		
9	5		30	15		51	26		72	36	
10		4	31		11	52		18	73		25
11	6		32	16		53	27		74	37	
12			33			54			75		

Table 4-24 12-CT SM Assignment in Top Installation & Sequential Mode

1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM	1-Ø SM	2-Ø SM	3-Ø SM
1	1	1	2	2	2	43	22	15	44	23	16
3			4			45			46		
5	3		6	4		47	24		48	25	
7		3	8		4	49		17	50		18
9	5		10	6		51	26		52	27	
11			12			53			54		
13	7	5	14	8	6	55	28	19	56	29	20
15			16			57			58		
17	9		18	10		59	30		60	31	
19		7	20		8	61		21	62		22
21	11		22	12		63	32		64	33	
23			24			65			66		

Table 4-25 12-CT SM Assignment in Top Installation & Cross-over Mode

The PMC-592 provides the following measurements for 1-Ø, 2-Ø and 3-Ø SMs:

Real-time:	Current, kW, kvar, kVA, PF, Loading Factor, ON/OFF Status
Demands and Max Demands:	Current, kW, kvar, kVA
Energy:	kWh, kvarh, kVAh

Please note that the Alarming features only work with 1-Ø SMs for Branch Circuits.

4.5.2 Flexible Configuration for 2-Ø and 3-Ø SM Grouping

PMC-592 with Firmware V1.00.06 or later supports the flexible configuration for 2-Ø and 3-Ø SM grouping. Previously, the 2-Ø and 3-Ø SM assignment principle follows a fixed sequence that is not programmable so only adjacent circuits that are in a certain order are automatically configured as 2-Ø and 3-Ø SMs by default. For example, 3-Ø SMs were automatically configured based on the following grouping of 1-Ø SMs: [1,2,3], [4,5,6], [7,8,9], [10,11,12], [13,14,15], [16,17,18] and [19,20,21]. Therefore, it is extremely important to allocate the 2-Ø and 3-Ø circuits during installation that meet this fixed and inflexible assignment principle. If a 3-Ø circuit is installed with SM6, SM7 and SM8, it will be impossible for the PMC-592 with Firmware V1.00.05 or earlier to provide 3-Ø SM readings because the wiring does not follow the pre-determined 3-Ø SM grouping. The only way to solve this problem would be with Virtual Meters (VM). However, if there are many similar assignment mistakes in a single PMC-592, there would not be enough VMs to solve all the wiring problem. Firmware V1.00.06 or later solves this dilemma by supporting the flexible grouping of any 1-Ø SMs as 2-Ø or 3-Ø SMs.

The following provides guidelines on how to customize 2-Ø and 3-Ø SMs via the built-in web.

1. Login the Web.
2. Click on **Branch Setup** on the left-hand.
3. Configure **CT Strip Installation, Direction, CT Phase, CT Type, CT Polarity** and **CT Ratio** in batches by editing areas with red rectangle. Users can also configure **CT Phase, CT Type, CT Polarity, CT Ratio** and **Label** for every 1-Ø SM. Click **Submit** to save your changes.

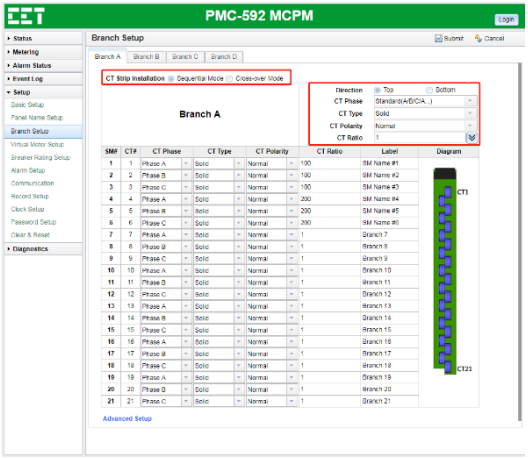


Figure 4-39 Branch Setup page

4. Click **Advanced Setup** to customize 2-Ø and 3-Ø SMs based on the actual wiring for your 2-Ø and 3-Ø circuits. Click **Submit** to save your changes.

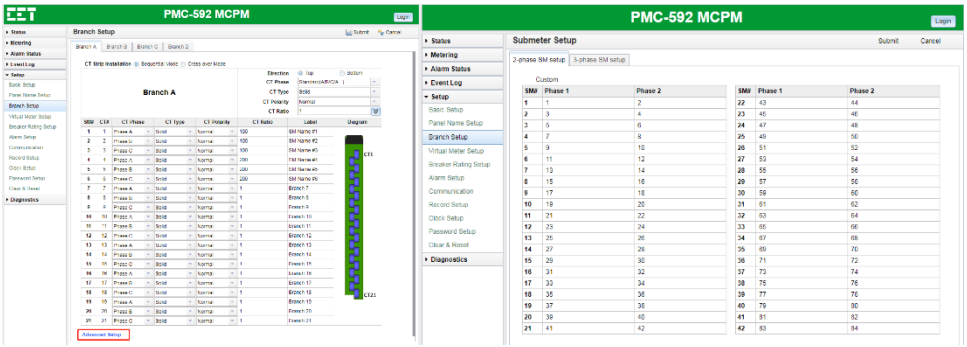


Figure 4-40 Custom SM pages

5. Return to the **Branch Setup** page by selecting **Branch Setup** on the left-hand pane to configure **Voltage Phase** and **CT Ratio** for each SM according to the actual wiring at site.
6. Configure **Breaker Rating** by selecting **Breaker Rating Setup** on the left-hand pane.

Note:

The Breaker Rating range for Mains and Branch Inputs is between 1 and 10,000A.

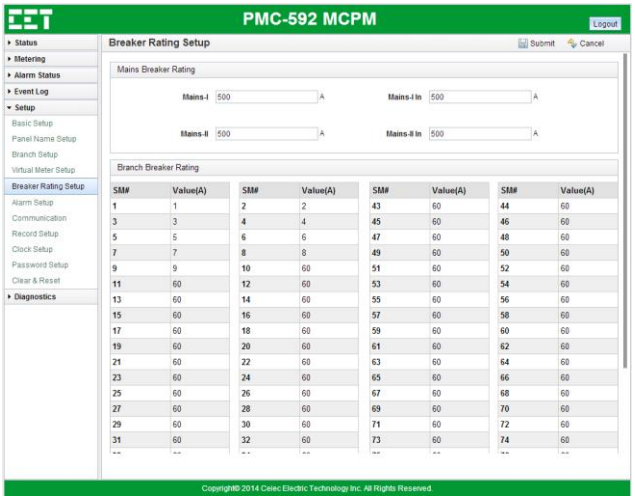


Figure 4-41 Breaker Rating Setup page

The PMC-592 with Firmware V1.00.10 or later supports of customizing 2-Ø and 3-Ø SMs via the optional HMI (Firmware V1.02.01 or V1.03.05) via **Setup => Basic Setup (Page 5).**

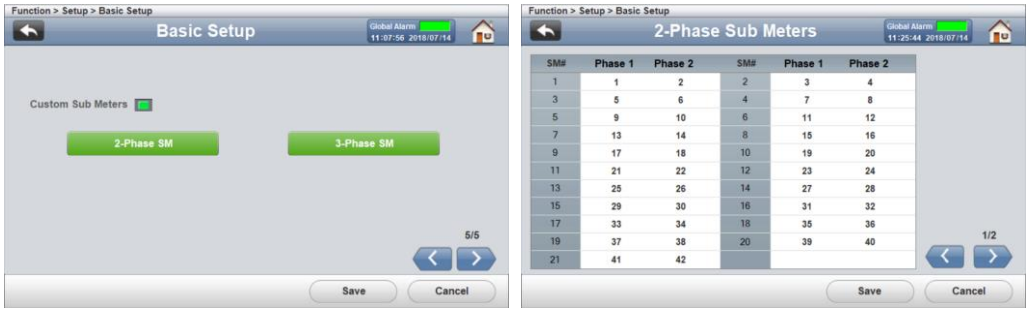


Figure 4-42 Custom SM pages

4.6 Virtual Meters (VM)

The PMC-592 with Firmware V1.00.09 or earlier supports up to ten Virtual Meters (VM1 to VM10) which can be used to perform arbitrary aggregation (Addition only) from any of the 84 individual 1-Ø SMs. The following figure is an example of 3 Virtual Meters:

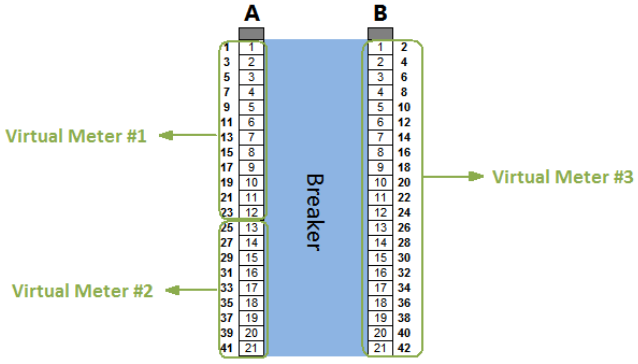


Figure 4-43 Virtual Meter Example

Firmware V1.00.10 or later has added the following enhancement:

1) The Virtual Meter now supports Mains-I and Mains-II as selections.

2) In addition to **Addition** function, the PMC-592 now supports **Subtraction** function for VM. As illustrated in the following example, SM81 = Mains-I – SM82 - SM83 - SM84. **Please note that the calculated value of VM will be set to zero if the result is a negative value.**

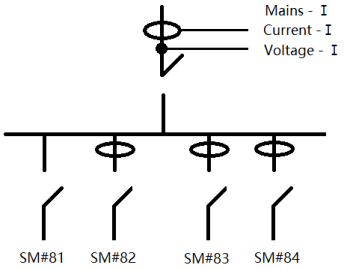


Figure 4-44 Virtual Meter Example

Each VM provides the following parameters as the aggregated values: kW Total, kWh Total, kvarh Total, kVAh Total, T1/T2 kWh, T1/T2 kvarh and T1/T2 kVAh. VM energy measurements are separated from the SM or Mains energy measurements so clearing the energy measurements of any SM or Mains would not affect the VM energy measurements that consists of that particular SM or Mains.

4.7 Data Logging

4.7.1 SOE Recorder

The PMC-592's **SOE Log** can store up to 1000 events such as Power-On, Power-Off, Alarms, Relay actions, Digital Input status changes, Diagnostics and Setup changes in non-volatile memory. Each event includes a cause, its relevant parameter values and a timestamp in 1ms resolution.

The SOE Log can be viewed from the built-in Web Interface and the optional HMI as well as retrieved via communications. If there are more than 1000 events, the newest event will replace the oldest event on a FIFO basis. The SOE Log can also be reset through the Web Interface, optional HMI or via communications.

4.7.2 Max/Min Recorder

The PMC-592 records the Max and Min values for real-time and THD measurements for This Month, Last Month and Historical. The Max/Min Log is stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The **Self-Read Time** allows the user to specify the time and day of the month for the 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 PMC-592 provides the Max/Min values for the following parameters for This Month, Last Month and Historical:

Mains-I and Mains-II Max/Min Parameters		
Uan/Ubn/Ucn/ULN Avg.	Uab/Ubc/Uca/ULL Avg.	Ia/Ib/Ic/I Avg./In
Ia/Ib/Ic Loading %	kWa/kWb/kWc/kW Total	kvara/kvarb/kvarc/kvar Total
kVAa/kVAb/kVAc/kVA Total	PFa/PFb/PFc/PF Total	FREQ
U/I Unbalance	RTD1/RTD2	
Ia THD/TOHD/TEHD	Ib THD/TOHD/TEHD	Ic THD/TOHD/TEHD
Mains-I Uan THD/TOHD/TEHD	Mains-I Ubn THD/TOHD/TEHD	Mains-I Ucn THD/TOHD/TEHD
Mains-II Uan/Uab THD/TOHD/TEHD	Mains-II Ubn/Ubc THD/TOHD/TEHD	Mains-II Ucn/Uca THD/TOHD/TEHD
SM Max/Min Parameters		
1-Ø SM1 to SM84 I	2-Ø SM1 to SM42 I	3- Ø SM1 to SM28 I
1- Ø SM1 to SM84 kW	2- Ø SM1 to SM42 kW	3- Ø SM1 to SM28 kW
1- Ø SM1 to SM84 kvar	2- Ø SM1 to SM42 kvar	3- Ø SM1 to SM28 kvar
1- Ø SM1 to SM84 kVA	2- Ø SM1 to SM42 kVA	3- Ø SM1 to SM28 kVA
1- Ø SM1 to SM84 PF	2- Ø SM1 to SM42 PF	3- Ø SM1 to SM28 PF
1- Ø SM1 to SM84 Loading %	2- Ø SM1 to SM42 Loading %	3- Ø SM1 to SM28 Loading %
SM1 to SM84 ITHD		

Table 4-26 Max/Min Measurements

Max/Min data can be accessed and reset through communications, the Web Interface and the optional HMI.

4.7.3 Interval Energy Recorder (IER)

The PMC-592 provides an IER which is capable of recording the following parameters.

- Mains-I kWh/kvarh Import/Export and kVAh
- Mains-I T1/T2 kWh/kvarh Import/Export and kVAh since Firmware V1.00.10
- Mains-II kWh/kvarh Import/Export and kVAh
- Mains-II T1/T2 kWh/kvarh Import/Export and kVAh since Firmware V1.00.10
- 1-Ø SM1 to SM84 kWh/kvarh Import and kVAh
- 2-Ø SM1 to SM42 kWh/kvarh Import and kVAh
- 3-Ø SM1 to SM28 kWh/kvarh Import and kVAh
- VM1 to VM10 kWh/kvarh Import and kVAh
- VM1 to VM10 T1/T2 kWh/kvarh and kVAh since Firmware V1.00.10

The programming of the IER is supported over communications or the Web Interface. The IER provides the following setup parameters:

Parameter	Range/Option	Default
Recording Mode	0 = Disabled / 1 = Stop-When-Full / 2 = First-In-First-Out	2
Recording Depth	0 to 10000 (entry)	10000
Recording Interval	0 = 5mins / 1 = 10mins / 2 = 15mins / 3 = 30mins / 4 = 60mins	2
Start Time	20YY/MM/DD, HH:MM:SS	

Table 4-27 IER Setup Parameters

The IER is operational when the values of **Recording Mode** and **Recording Depth** are non-zero and the current time meets or exceeds the **Start Time**.

4.7.4 Waveform Recorder (WFR)

The PMC-592's WFR has a log capacity of 16 entries organized in a FIFO basis, with the newest log replacing the oldest one. The WFR Log is stored in non-volatile memory and will not suffer any loss in the event of power failure. Each Waveform Recorder can simultaneously capture 3-phase Voltage and Current signals at a maximum resolution of 64 samples per cycles. The WFR can be triggered manually via communications or by the following alarms if they are enabled: Dip/Swell, Interruption, Mains Voltage, Mains Current, Mains U/I Unbalance, Harmonics, Frequency, Power and DI. WFR is triggered by any alarm going active, and there is no need to do any configuration. The manual trigger command

has a higher priority. When a WFR is already in progress, all other WFR commands will be ignored until the present recording is completed.

The programming of the WFR is supported over communications, the built-in Web Interface and the optional HMI. The WFR provides the following setup parameters:

Parameter	Value
WFR Format	Samples/Cycles x # of Cycles: 0 = 16x600, 1 = 16x300, 2 = 32x300, 3 = 32x150, 4 = 64x150, 5 = 64x75
Pre-fault Cycle	0 to 10 (cycles)
Trigger Setup	Dip/Swell, U & I Alarm, Unbal. & Harmonics, Power Alarm, Freq. Alarm, DI Alarm

Table 4-28 WFR Setup Parameters

WFR Logs can be retrieved via communications by our PecStar® iEMS, displayed on or exported from the Web Interface.

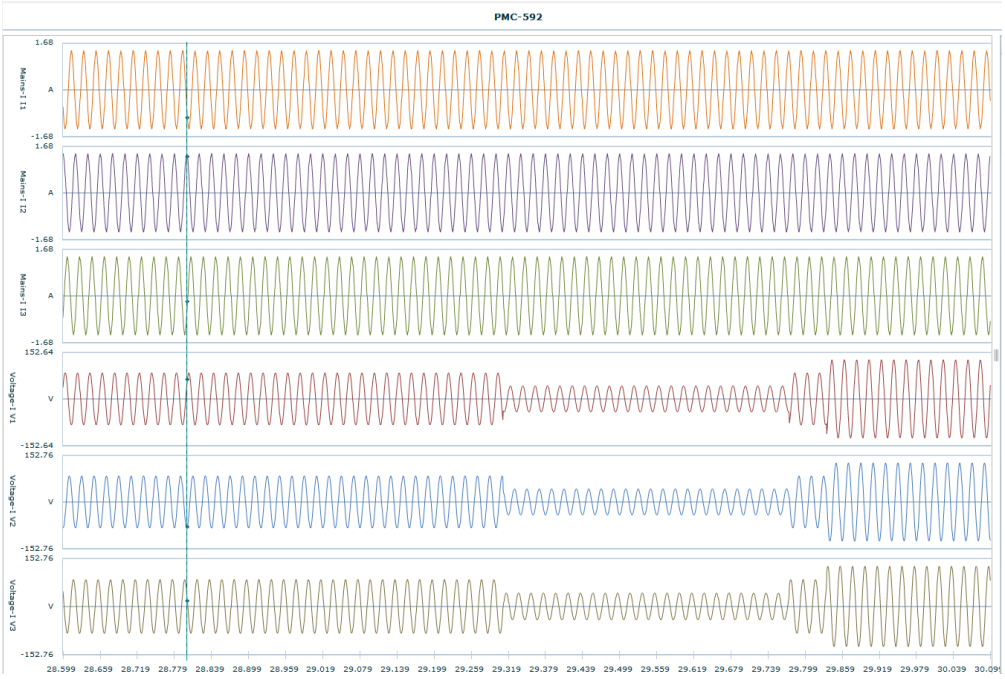


Figure 4-45 Waveform Recording displayed in PecStar®

4.7.5 Data Recorder (DR)

PMC-592's **DR** records the real-time measurement for Mains-I, Mains-II, SMs and VMs since Firmware V1.00.04. There are 10 **DR**s of 64 parameters each that can be individually programmed to record different parameters at different time intervals, which may vary from 60 to 345600 seconds. The PMC-592 can retain the DR Logs for 45 days when the recording interval is set to 1 minutes. The recorded data is stored in non-volatile memory and will not suffer any loss in the event of a power failure. If storage is full, the newest log will replace the oldest on a first-in-first-out basis. Also, recording mode can be set as Stop-When-Full, which means when storage is full, the DR will stop.

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

Setup Parameters	Value/Option	Default
DR Enable	0=Disabled, 1=Enabled	See Appendix B - DR Parameter and Default Setting
Recording Interval	60 to 345600 s	
Recording Mode	0=Stop-When-Full / 1=First-In-First-Out	

Recording Depth	0 to 65535	
Offset Time	0 to 43200s	
Number of Parameters	0 to 64 (user defined)	
Parameters 1 to 64	See **Section 5.8.11 Data Recorder Setup**	

Table 4-29 DR Setup Parameters

The **DR Log** is only operational when the values of **Recording Interval** and **Number of Parameters** are all non-zero.

4.8 Communications

The PMC-592 is equipped with one RS232/422/485 port, one RS485/422 port and one 100BaseT Ethernet port. The RS232/422/485 serial communication port supports the Modbus RTU protocol while the Ethernet port, supports the Modbus TCP, HTTP, SNMP, SMTP and FTP protocols.

4.8.1 Modbus TCP

The PMC-592 supports the Modbus TCP protocol with a configurable IP Port No. that has a default value of 502, which is the standard IP Port No. for Modbus TCP. PMC-592 supports up to a maximum of 10 simultaneous Modbus TCP connections, which means that up to 10 Modbus TCP Master can communicate with the PMC-592 over Modbus TCP simultaneously.

4.8.2 HTTP

The PMC-592 supports an on-board Web Server via the HTTP protocol which allows web browsing using a standard Web Browser such as Internet Explorer. Please refer to **3.2 Web Interface** for more details.

4.8.3 SNMP (Simple Network Management Protocol)

4.8.3.1 Overview

Simple Network Management Protocol (SNMP) is widely used in Network Management Systems (NMS) to monitor and manage network devices for conditions that deserve administrative attention.

There are three main components in a SNMP-managed network: Managed devices, Agents and Network Management System.

- A **Network Management System (NMS)** is a piece of software or hardware that executes applications to monitor and control network devices. It serves as the human-machine interface in an SNMP-managed network.
- An **Agent** is a software module that resides in a managed device and serves as an interface between NMS and the physical device.
- A **Managed Device** is a network node that resides on a managed network and contains an SNMP agent. Managed devices collect and store information which is then made available to NMS via SNMP.

PMC-592's basic measurements and alarm data can be read and sent via SNMP. In addition, event records can be sent to an NMS in **Trap** format. Please refer to Sections **3.2.4.5.7 Communication Setup** or **5.8.2 Communication Setup** for more information. The PMC-592 provides the following information via SNMP.

Parameter	
Information	Device Module, Device Serial Number, Firmware Version, Branch Number, Time of Power Up, PDU Name, Panel1 Name, Panel2 Name

Diagnostics	Check NVRAM, Disk, ADC, CT Strip, Power, Check Battery, Check DSP, Check Setting	
Alarms	Global Alarm Mains-I/Mains-II Global Alarm Mains-I/Mains-II Ia/Ib/Ic/I4 Alarm Mains-I/Mains-II Ia/Ib/Ic Demand Alarm Voltage-I/Voltage-II Uan/Ubn/Ucn/Uab/Ubc/Uca Alarm Frequency Alarm Mains-I/Mains-II kW/kvar/kVA Alarm	Mains-I/Mains-II kW/kvar/kVA Demand Alarm Mains-I/Mains-II PF Alarm Current-I/Current-II Unbalance Alarm Voltage-I/Voltage -II Unbalance Alarm Current-I/Current-II Ia/Ib/Ic Harmonic Alarm Voltage-I/Voltage-II Uan/Ubn/Ucn Harmonic Alarm RTD1/RTD2 Alarm, Branch Alarm
Measurements	Please refer to Section **4.2 Power, Energy and Demand** for a detailed description of the measurements provided.	

Table 4-30 Data Provided by the PMC-592 via SNMP

Note:

The parameter list may be different for different firmware versions. Please refer to the MIB file, which can be downloaded from the Maintenance page of the Web Interface via **Diagnostics => Maintenance => Misc** and then click **Download** in **SNMP MIB** area.

4.8.3.2 Using SNMP

This section provides the guideline for communicating with the PMC-592 with SNMP protocol using PecStar iEMS as the NMS software. It's assumed that the reader is somewhat familiar with SNMP.

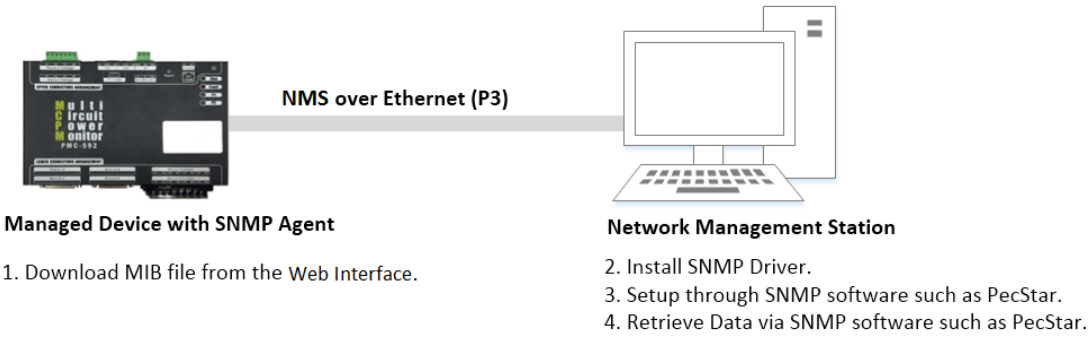


Figure 4-46 Using SNMP with PMC-592

Before communicating with PMC-592 via SNMP, users need to install a custom MIB file browser (e.g. **MG-SOFT MIB Browser**) to view the MIB file downloaded from the PMC-592. Please execute the steps below to communicate with the PMC-592 using the SNMP protocol.

1. Download the MIB (Management Information Base) file from the **Maintenance** page of the Web interface via **Diagnostics => Maintenance => Misc** and then click **Download** under **SNMP MIB**.

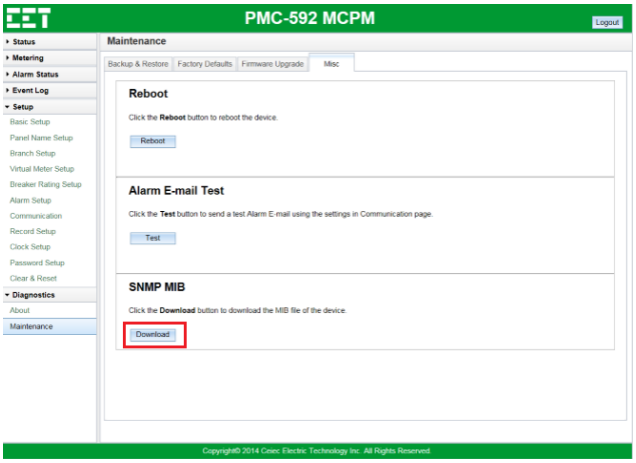


Figure 4-47 Download MIB file from Web

2. Install the SNMP driver in the **Network Management Station (NMS)** such as PecStar iEMS.

3. Setup PecStar iEMS to communicate with the PMC-592 using SNMP

   a. Add a SNMP site and then a SNMP device.

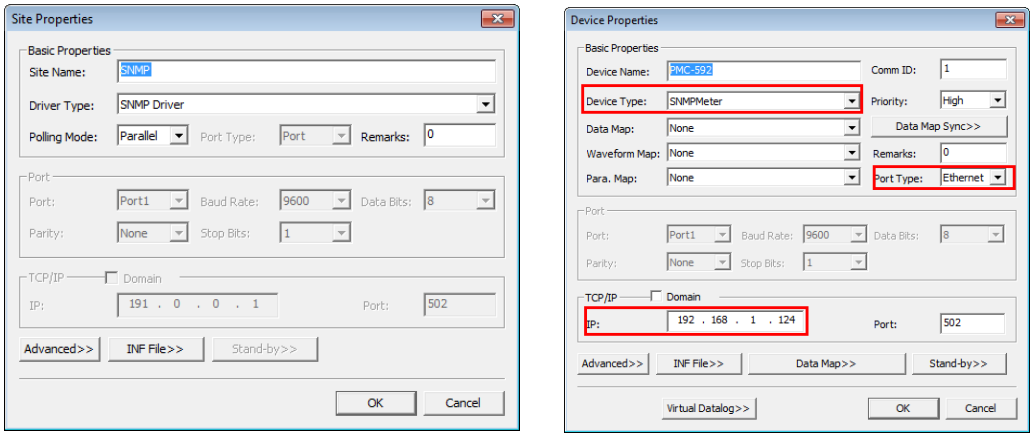


Figure 4-48 Add SNMP Site and SNMP Device

   b. Use the MIB Browser software to browse what SNMP parameters are provided by the PMC-592. When a parameter is selected on the left-hand panel, the corresponding Object Identifier **OID** is displayed on the right-hand pane along with other characteristics.

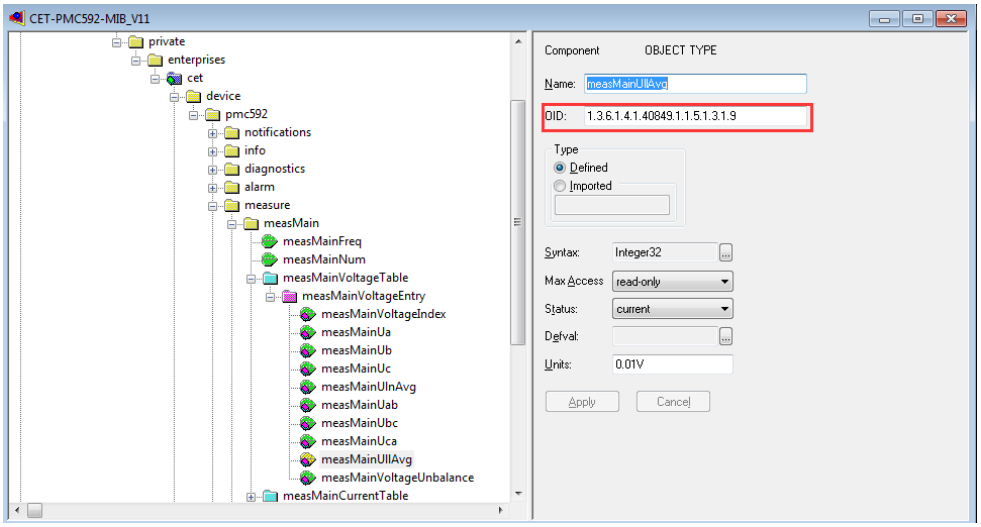


Figure 4-49 PMC-592 MIB File

- Click **INF File>>** in **Device Properties** page and add a parameter by specifying its OID into the INF file. The **MIBNum** should be incremented for every parameter added.

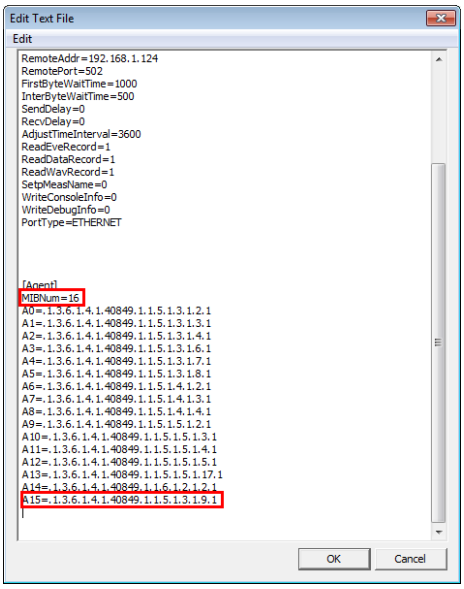


Figure 4-50 Edit INF File

c. Edit and then “Import SNF File” based on the latest INF file. Please refer to the PecStar User Manual for more information.

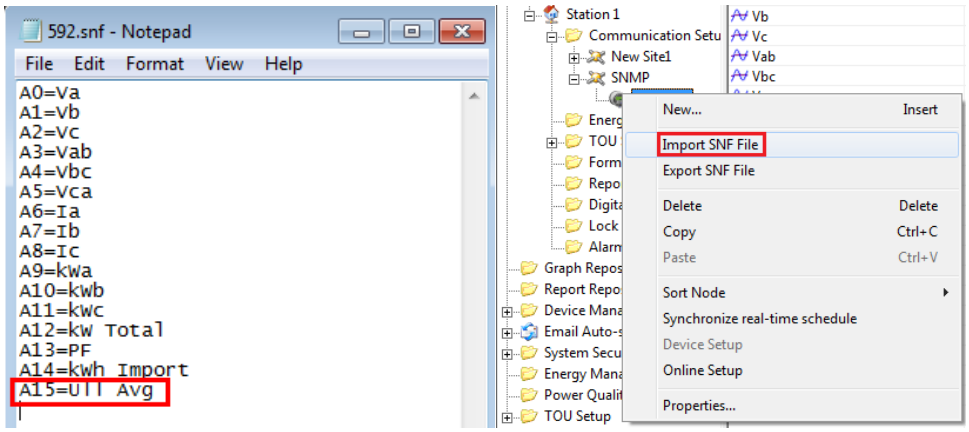


Figure 4-51 Edit SNF File

d. Save the configuration.

4. Retrieve the SNMP data via PecSCADA.

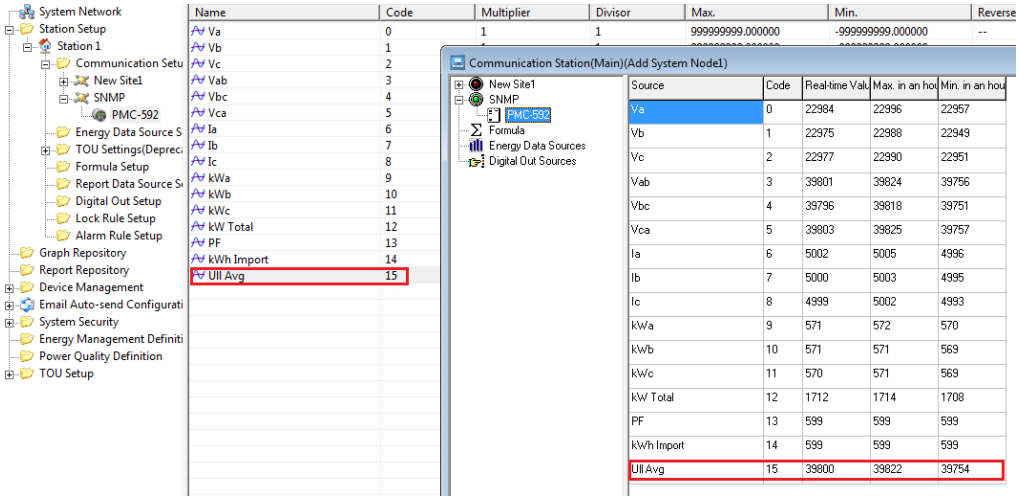


Figure 4-52 Retrieve Data via PecSCADA

4.8.4 SNTP (Simple Network Time protocol)

PMC-592 provides timestamps for all recorded data so it is critical to maintain an accurate clock to achieve precise timing for data, events and power quality analysis. The PMC-592 comes with a 6ppm, battery-backed RTC that has a maximum error of 0.5s per day. If the supply power is lost or removed, the internal backup battery will keep the real-time clock running until power is restored.

The PMC-592's SNTP client can be used to synchronize its internal clock with an external SNTP Server. The programming of the SNTP setup parameters is supported over communications, the Web Interface or the optional HMI.

Setup Parameters	Option/Default*
SNTP Enable	Disabled*/Enabled
Time Zone	GMT-12:00 / GMT-11:00 / GMT-10:00 / GMT-9:00 / GMT-8:00 / GMT-7:00 / GMT-6:00 / GMT-5:00 / GMT-4:00 / GMT-3:30 / GMT-3:00 / GMT-2:00 / GMT-1:00 / GMT-0:00 / GMT+1:00 / GMT+2:00 / GMT+3:00 / GMT+3:30 / GMT+4:00 / GMT+4:30/ GMT+5:00 / GMT+5:30 / GMT+5:45 / GMT+6:00 / GMT+6:30 / GMT+7:00 / GMT+8:00*/ GMT+9:00 / GMT+9:30 / GMT+10:00 / GMT+11:00 / GMT+12:00 / GMT+13:00
Time Sync. Interval	10 to 1440 minutes (Default = 60 minutes)
IP Address of Time Server	Set the IP address of your Time Server

Table 4-31 SNTP Setup Parameters

In addition, the PMC-592's real-time clock can be time synched via **PecStar®**iEMS or set via the Web Interface and the optional HMI. Please refer to **Sections 3.2.4.5.9** and **3.3.2** for more information.

4.8.5 SMTP (Simple Mail Transfer Protocol)

The PMC-592 supports a SMTP Client which enables it to send an alarm Email to a designated Receiver. The programming of the SMTP setup parameters is supported over communications, the Web Interface and the optional HMI.

Setup Parameters	Option
SMTP Server IP	Set the IP Address of your SMTP Server.
Sender's Name	Set the Name of the PMC-592.
Sender Email	Set the Email Address of the PMC-592.
Sender Email Password	Set the Email Password of the PMC-592 for logging on to the SMTP Server.
Receiver Email	Set the Receiver's Email Address.

Table 4-32 SMTP Setup Parameters

The following illustrates how to setup via PMC-592 web.

1. Login PMC-592 web interface and enable **Alarm E-Mail**, click **Submit**.

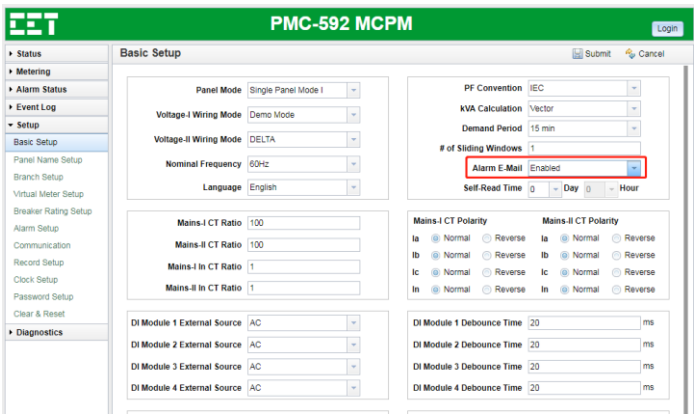


Figure 4-53 Alarm Email Setup

2. Configure E-mail's Settings.

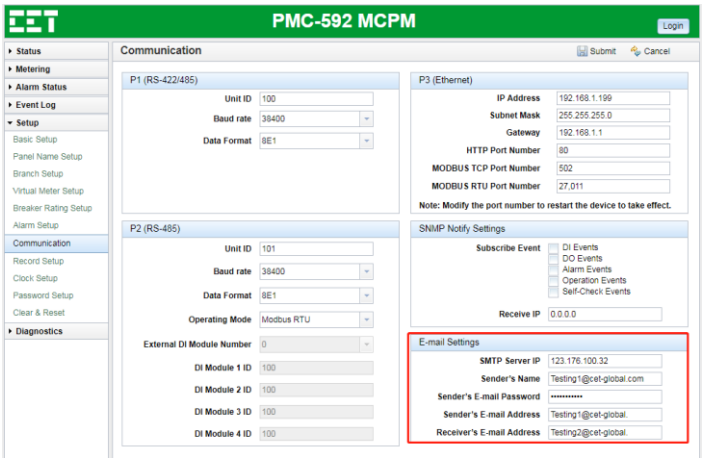


Figure 4-54 Email Setting

The **SMTP Server IP** can be found by pinging e-mail's server, taking cet-global as an example.

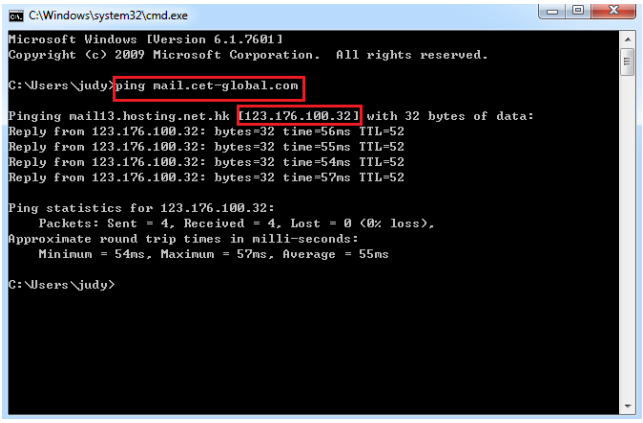


Figure 4-55 Ping Email

3. Test the configuration by clicking the **Test** button via the **Diagnostics => Maintenance => Misc** page. If the configuration is correct, the Receiver will receive a device test e-mail.

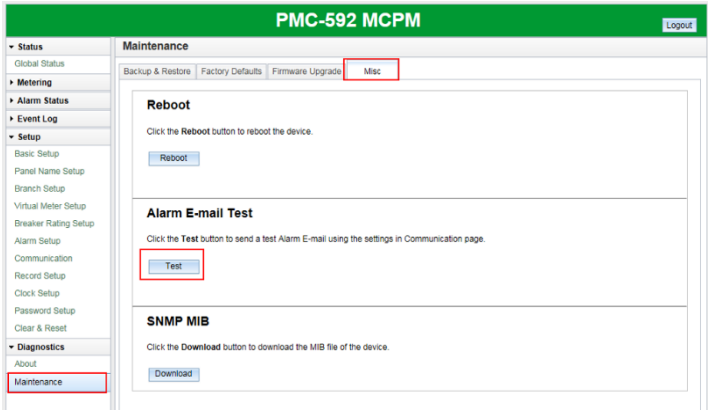


Figure 4-56 Test Page

4.8.6 FTP (File Transfer Protocol)

The PMC-592 can function as an FTP server where one can export certain data files. This section provides instructions on how to connect to PMC-592's FTP server and introduces its Folder structure.

4.8.6.1 Connect to the FTP Server

Configure the IP Addresses, Subnet Masks and Gateway Addresses for the PMC-592 and the PC so that they are in the same subnet.

1. Identify the PC's IP Address.
   i. Go to **Control Panel** and click **Network and Sharing Center**.
   ii. Click **Local Area Connection** and the below dialog box shows.

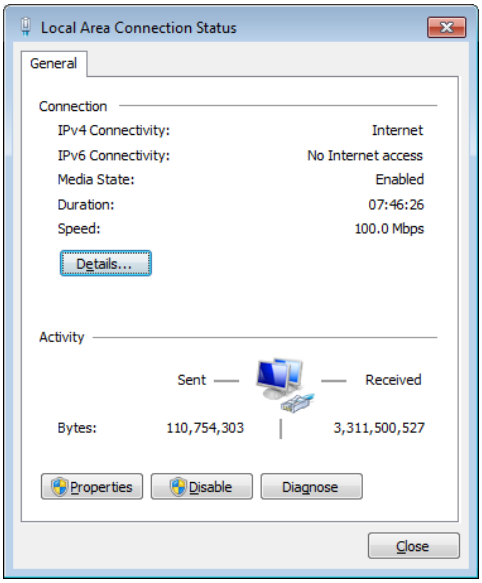


Figure 4-57 Local Area Connection

   iii. Choose **Properties** and double-click **Internet Protocol Version 4 (TCP/IPv4).**

   If the PC is set to obtain its IP via DHCP, one can get the IP Address via following steps.

   a) Click **Home** and input **cmd**, then press <**Enter**>.
   b) Type "**ipconfig"** and then press <**Enter**>.

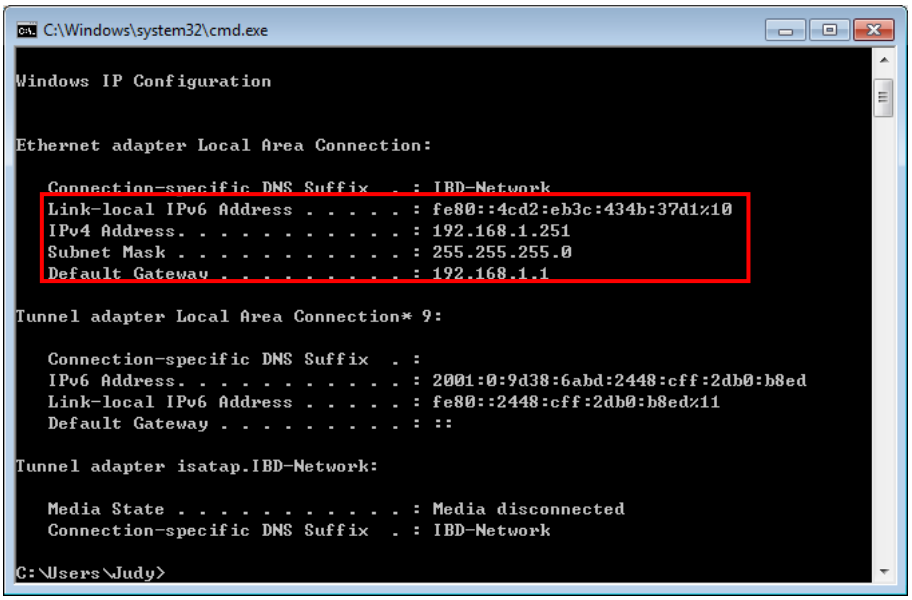


Figure 4-58 ipconfig window

2. Configure the PMC-592's IP Address via the Web Interface or optional HMI and make sure that it's in the same subnet as the PC.

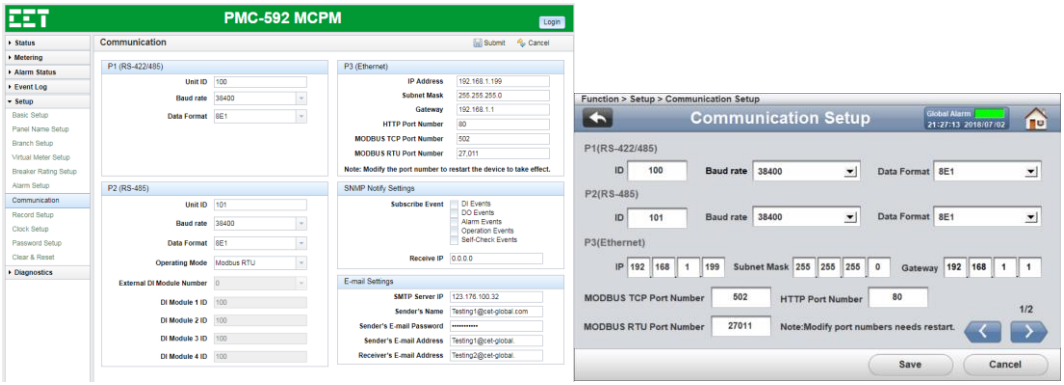


Figure 4-59 Communication setup

4.8.6.2 FTP Folder Structure

1. Open Internet Explorer or My Computer. Type ftp://ip_address in the address bar such as ftp://192.168.1.238.

Figure 4-60 FTP Directory

In order to download files via FTP, the user needs to first login to the FTP server by right-clicking on a blank area and select **Login As**.

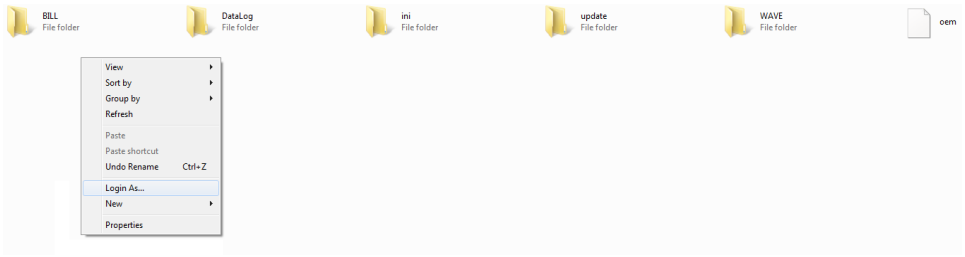


Figure 4-61 Login Dialog

2. Type in the FTP server's **User Name** (default: admin) and **Password** (default: ceiec) and click **OK** to authenticate access.
3. Click the folders that appear on the left or right pane to browse their contents. The contents of the different folders are illustrated in the table below.
4. Please make sure not to access the **update** folder or the **oem** file as doing so may cause damage to the PMC-592.

Folder/File	Content
BILL	IER log bill.dat. Only one file and the newest record will replace the oldest one on a FIFO basis
Datalog	There are 10 folders: Group 1 to Group 10 and each of folder is used to save DR logs (.dat files).
ini	Generated files by operation of **Diagnostics => Maintenance => Backup & Restore => Backup** via web**.**
WAVE	Waveform files, such as W001.cfg (W001.dat), W002.cfg (W002.dat), ...etc.

Table 4-33 Folder Content

Chapter 5 Modbus Register Map

This chapter provides a complete description of the Modbus register map (**Protocol Version 1.7**) for the PMC-592 to facilitate the development of 3rd party Modbus RTU communications driver for accessing information on the PMC-592.

The PMC-592 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 Energy Files (Function Code 0x14)

The following table provides a description of the different data formats used for the Modbus registers:

Format	Description
UINT16/INT16	Unsigned/Signed 16-bit Integer
UINT32/INT32	Unsigned/Signed 32-bit Integer
Float	IEEE 754 32-bit Single Precision Floating Point Number

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

5.1 Status Register

5.1.1 General Status

Register	Property	Description	Format	Note
0000	RO	DI Status[1]	Bitmap	
0001	RO	DO Status[2]	Bitmap	
0002	RO	Latest Alarm Channel	Bitmap	See Appendix A
0003	RO	Diagnostics[3]	Bitmap	
0005	RO	Run Time	UINT32	
0007	RO	SOE Pointer[4]	UINT32	
0009	RO	IER Log Pointer[5]	UINT32	
0011	RO	WFR Log Pointer[6]	UINT32	
0013	RO	WFR Status	UINT16	0 = WFR Disabled 1 = WFR

Table 5-1 General Status

Notes:

1) For the **DI Status** register, the bit values of Bit 0 to Bit 3 represent the states of DI1 to DI4, respectively, with "1" meaning Active (Closed) and "0" meaning Inactive (Open). If the PMC-592 is not equipped with the optional DI3 and DI4, their values have no meaning and their bits are reserved. The remaining bits are reserved.
2) For the **DO Status** register, the bit values of Bit 0 to Bit 1 represent the states of DO1 to DO2, respectively, with "1" meaning Active (Closed) and "0" meaning Inactive (Open). The remaining bits are reserved.
3) The **Diagnostics** register indicates the various system statuses with a bit value of 0 meaning normal and 1 meaning fault. The following table illustrates the details of the Diagnostics register.

Bit	Alarm Event	Bit	Alarm Event
Bit 0	NVRAM Fault	**Bit 10**	Breaker Parameters Incorrect
Bit 1	Disk Fault	**Bit 11**	Alarm Parameters Incorrect
Bit 2	A/D Chips Fault	**Bit 12**	Branch Parameters Incorrect
Bit 3	CT Strip not inserted	**Bit 13**	VM Parameters Incorrect
Bit 4	Internal Power Supply Fault	**Bit 14**	Calibration Parameters Error
Bit 5	Clock battery voltage is low	**Bit 15**	Internal Parameters Error
Bit 6	DSP Fault	**Bit 16**	External DI Module Fault*
Bit 7	System Parameters Error	**Bit 17**	DR Parameters Incorrect~
Bit 8	SM Name Parameters Incorrect	**Bits 18 -31**	Reserved
Bit 9	Communication Parameters Incorrect		

* Available in Firmware V1.00.03 or later
~ Available in Firmware V1.00.04 or later

Table 5-2 Diagnostics Register (Reg. # 0003)

4) 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. The SOE Log capacity is relatively small with only 1000 events in the PMC-592, and it can be reset to zero and then immediately incremented by one with a new ”Clear SOE via Front Panel” or “Clear SOE via Communications” event. When the number of events is larger than 1000, only the latest 1000 events will be stored.

5) The range of the IER Pointer is between 0 and 0xFFFFFFFF. The pointers point to the current logging position and are incremented by one for every new record generated and will roll over to 0 if its current value is 0xFFFFFFFF.

6) The range of the WFR Pointer is between 0 and 0xFFFFFFFF. The pointers point to the current logging position and are incremented by one for every new record generated and will roll over to 0 if its current value is 0xFFFFFFFF.

5.1.2 Instantaneous Alarm

Register	Property	Description	Format	Note
0020	RO	Global Total Alarm Status	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0021	RO	Mains-I, Total Alarm Status		
0022	RO	Mains-II, Total Alarm Status		
0023	RO	Mains-I, Ia Alarm	Bitmap	Bit 0 = HH Alarm Bit 1 = H Alarm Bit 2 = L Alarm Bit 3 = LL Alarm Bits 4 - 15 = Reserved
0024	RO	Mains-I, Ib Alarm		
0025	RO	Mains-I, Ic Alarm		
0026	RO	Mains-I, I4 Alarm		
0027	RO	Mains-I, Ia Demand Alarm		
0028	RO	Mains-I, Ib Demand Alarm		
0029	RO	Mains-I, Ic Demand Alarm		
0030	RO	Mains-II, Ia Alarm		
0031	RO	Mains-II, Ib Alarm		
0032	RO	Mains-II, Ic Alarm		
0033	RO	Mains-II, I4 Alarm		
0034	RO	Mains-II, Ia Demand Alarm		
0035	RO	Mains-II, Ib Demand Alarm		
0036	RO	Mains-II, Ic Demand Alarm		
0037	RO	Mains-I, Uan Alarm	Bitmap	Bit 0 = H Alarm Bit 1 = L Alarm Bits 2 - 15 = Reserved
0038	RO	Mains-I, Ubn Alarm		
0039	RO	Mains-I, Ucn Alarm		
0040	RO	Mains-I, Uab Alarm		
0041	RO	Mains-I, Ubc Alarm		
0042	RO	Mains-I, Uca Alarm		
0043	RO	Mains-II, Uan Alarm		
0044	RO	Mains-II, Ubn Alarm		
0045	RO	Mains-II, Ucn Alarm		
0046	RO	Mains-II, Uab Alarm		
0047	RO	Mains-II, Ubc Alarm		
0048	RO	Mains-II, Uca Alarm		
0049	RO	Freq Alarm		
0050	RO	Mains-I, kW Alarm		
0051	RO	Mains-I, kvar Alarm		
0052	RO	Mains-I, kVA Alarm		
0053	RO	Mains-I, PF Alarm		
0054	RO	Mains-I, kW Demand Alarm		
0055	RO	Mains-I, kvar Demand Alarm		
0056	RO	Mains-I, kVA Demand Alarm		
0057	RO	Mains-II, kW Alarm		
0058	RO	Mains-II, kvar Alarm		
0059	RO	Mains-II, kVA Alarm		
0060	RO	Mains-II, PF Alarm		
0061	RO	Mains-II, kW Demand Alarm		
0062	RO	Mains-II, kvar Demand Alarm		
0063	RO	Mains-II, kVA Demand Alarm		
0064	RO	Mains-I, U Unbalance Alarm	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0065	RO	Mains-II, U Unbalance Alarm		
0066	RO	Mains-I, I Unbalance Alarm		
0067	RO	Mains-II, I Unbalance Alarm		
0068	RO	Mains-I, Uan Harmonic Alarm	Bitmap	Bit 0 = THD Alarm Bit 1 = TOHD Alarm Bit 2 = TEHD Alarm Bits 3 - 15 = Reserved
0069	RO	Mains-I, Ubn Harmonic Alarm		
0070	RO	Mains-I, Ucn Harmonic Alarm		
0071	RO	Mains-II, Uan Harmonic Alarm		
0072	RO	Mains-II, Ubn Harmonic Alarm		

0073	RO	Mains-II, Ucn Harmonic Alarm		
0074	RO	Mains-I, Ia Harmonic Alarm		
0075	RO	Mains-I, Ib Harmonic Alarm		
0076	RO	Mains-I, Ic Harmonic Alarm		
0077	RO	Mains-II, Ia Harmonic Alarm		
0078	RO	Mains-II, Ib Harmonic Alarm		
0079	RO	Mains-II, Ic Harmonic Alarm		
0080	RO	RTD1 Alarm	Bitmap	Bit 0 = HH Alarm Bit 1 = H Alarm Bits 2 - 15 = Reserved
0081	RO	RTD2 Alarm		
0082	RO	DI1 Alarm	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0083	RO	DI2 Alarm		
0084	RO	SM1 Alarm	Bitmap	Bit 0 = HH Alarm Bit 1 = H Alarm Bit 2 = L Alarm Bit 3 = LL Alarm Bits 4 - 15 = Reserved
0085	RO	SM2 Alarm		
0086	RO	SM3 Alarm		
0087	RO	SM4 Alarm		
....		....		
0167	RO	SM84 Alarm		
0168	RO	Mains-I, Phase Reversal Alarm*	Bitmap	Bit 0 = Voltage Phase Reversal Alarm Bit 1 = Current Phase Reversal Alarm Bits 2 - 15 = Reserved
0169	RO	Mains-II, Phase Reversal Alarm*		
0170	RO	Mains-I, Phase loss Alarm*	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0171	RO	Mains-II, Phase loss Alarm*		
0172	RO	DI3 Alarm#	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0173	RO	DI4 Alarm#	Bitmap	

* Available in Firmware V1.00.05 or later
# Available in Firmware V1.00.08 or later

Table 5-3 Instantaneous Alarm

5.1.3 Latched Alarm

Register	Property	Description	Format	Note
0180	RW	Global Total Alarm Status	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0181	RW	Mains-I, Total Alarm Status		
0182	RW	Mains-II, Total Alarm Status		
0183	RW	Mains-I, Ia Alarm	UINT16	Bit 0 = HH Alarm Bit 1 = H Alarm Bit 2 = L Alarm Bit 3 = LL Alarm Bits 4 - 15 = Reserved
0184	RW	Mains-I, Ib Alarm	Bitmap	
0185	RW	Mains-I, Ic Alarm		
0186	RW	Mains-I, I4 Alarm		
0187	RW	Mains-I, Ia Demand Alarm		
0188	RW	Mains-I, Ib Demand Alarm		
0189	RW	Mains-I, Ic Demand Alarm		
0190	RW	Mains-II, Ia Alarm		
0191	RW	Mains-II, Ib Alarm		
0192	RW	Mains-II, Ic Alarm		
0193	RW	Mains-II, I4 Alarm		
0194	RW	Mains-II, Ia Demand Alarm		
0195	RW	Mains-II, Ib Demand Alarm		
0196	RW	Mains-II, Ic Demand Alarm		
0197	RW	Mains-I, Uan Alarm	Bitmap	Bit 0 = H Alarm Bit 1 = L Alarm Bits 2 - 15 = Reserved
0198	RW	Mains-I, Ubn Alarm		
0199	RW	Mains-I, Ucn Alarm		
0200	RW	Mains-I, Uab Alarm		
0201	RW	Mains-I, Ubc Alarm		
0202	RW	Mains-I, Uca Alarm		
0203	RW	Mains-II, Uan Alarm		
0204	RW	Mains-II, Ubn Alarm		
0205	RW	Mains-II, Ucn Alarm		
0206	RW	Mains-II, Uab Alarm		
0207	RW	Mains-II, Ubc Alarm		
0208	RW	Mains-II, Uca Alarm		
0209	RW	Freq Alarm		
0210	RW	Mains-I, kW Alarm		
0211	RW	Mains-I, kvar Alarm		
0212	RW	Mains-I, kVA Alarm		
0213	RW	Mains-I, PF Alarm		
0214	RW	Mains-I, kW Demand Alarm		

0215	RW	Mains-I, kvar Demand Alarm		
0216	RW	Mains-I, kVA Demand Alarm		
0217	RW	Mains-II, kW Alarm		
0218	RW	Mains-II, kvar Alarm		
0219	RW	Mains-II, kVA Alarm		
0220	RW	Mains-II, PF Alarm		
0221	RW	Mains-II, kW Demand Alarm		
0222	RW	Mains-II, kvar Demand Alarm		
0223	RW	Mains-II, kVA Demand Alarm		
0224	RW	Mains-I, U Unbalance Alarm	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0225	RW	Mains-II, U Unbalance Alarm		
0226	RW	Mains-I, I Unbalance Alarm		
0227	RW	Mains-II, I Unbalance Alarm		
0228	RW	Mains-I, Uan Harmonic Alarm	Bitmap	Bit 0 = THD Alarm Bit 1 = TOHD Alarm Bit 2 = TEHD Alarm Bits 3 - 15 = Reserved
0229	RW	Mains-I, Ubn Harmonic Alarm		
0230	RW	Mains-I, Ucn Harmonic Alarm		
0231	RW	Mains-II, Uan Harmonic Alarm		
0232	RW	Mains-II, Ubn Harmonic Alarm		
0233	RW	Mains-II, Ucn Harmonic Alarm		
0234	RW	Mains-I, Ia Harmonic Alarm		
0235	RW	Mains-I, Ib Harmonic Alarm		
0236	RW	Mains-I, Ic Harmonic Alarm		
0237	RW	Mains-II, Ia Harmonic Alarm		
0238	RW	Mains-II, Ib Harmonic Alarm		
0239	RW	Mains-II, Ic Harmonic Alarm		
0240	RW	RTD1 Alarm	Bitmap	Bit 0 = HH Alarm Bit 1 = H Alarm Bits 2 - 15 = Reserved
0241	RW	RTD2 Alarm		
0242	RW	DI1 Alarm	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0243	RW	DI2 Alarm		
0244	RW	SM1 Alarm	Bitmap	Bit 0 = HH Alarm Bit 1 = H Alarm Bit 2 = L Alarm Bit 3 = LL Alarm Bits 4 - 15 = Reserved
0245	RW	SM2 Alarm		
....	RW	....		
0327	RW	SM84 Alarm		
0328	RW	Mains-I, Phase Reversal Alarm*	Bitmap	Bit 0 = Voltage Phase Reversal Alarm Bit 1 = Current Phase Reversal Alarm Bits 2 - 15 = Reserved
0329	RW	Mains-II, Phase Reversal Alarm*		
0330	RW	Mains-I, Phase loss Alarm*	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0331	RW	Mains-II, Phase loss Alarm*		
0332	RW	DI3 Alarm#	Bitmap	Bit 0 = Alarm Bits 1 - 15 = Reserved
0333	RW	DI4 Alarm#		

* Available in Firmware V1.00.05 or later, # Available in Firmware V1.00.08 or later

Table 5-4 Latch Alarm

5.1.4 Alarm Counter

Register	Property	Description	Format
0340	RW	Global Alarm Counter[1]	UINT16
0341	RW	Mains-I, Alarm Counter[1]	UINT16
0342	RW	Mains-II, Alarm Counter[1]	UINT16
0343	RW	Voltage-I, Alarm Counter[1]	UINT16
0344	RW	Voltage-II, Alarm Counter[1]	UINT16
0345	RW	Current-I, Alarm Counter[1]	UINT16
0346	RW	Current-II, Alarm Counter[1]	UINT16
0347	RW	RTD1 Alarm Counter[1]	UINT16
0348	RW	RTD2 Alarm Counter[1]	UINT16
0349	RW	DI1 Alarm Counter[1]	UINT16
0350	RW	DI2 Alarm Counter[1]	UINT16
0351	RW	SM1 Alarm Counter[1]	UINT16
0352	RW	SM2 Alarm Counter[1]	UINT16
....		....	
0434	RW	SM84 Alarm Counter[1]	UINT16
0435	RW	DI3 Alarm Counter[2]*	UINT16
0436	RW	DI4 Alarm Counter[2]*	UINT16

* Available in Firmware V1.00.08 or later

Table 5-5 Alarm Counter

Notes:

1) Writing "0" to the register clear the counter. It is invalid to write any value other than 0 to the register. The register value is non-volatile.
2) This is only meaningful when the PMC-592 is equipped with the 4xDIs option.

5.1.5 External Digital Input Module Status

The support for up to 4 External Digital Input Modules (PMC-521D) with the following status registers have been added since Firmware V1.00.03. These registers are valid only when the **P2 Operating Mode** is **External DI Module**.

Register	Property	Description	Format
0470	RO	DI Module #1 Status[1]	Bitmap
0472	RO	DI Module #2 Status[1]	Bitmap
0474	RO	DI Module #3 Status[1]	Bitmap
0476	RO	DI Module #4 Status[1]	Bitmap

Table 5-6 External DI Module Status

Notes:

1) Bit 0 to Bit 20 indicate the status of the 21xDI on the PMC-521D with 0 meaning Inactive (Open) and 1 meaning Active (Closed). Bit 31 indicates whether the present DI Module's status data is valid with 0 and 1 meaning Valid and Invalid, respectively. Bit 30 indicates the communication status of the External DI Module, with 0 and 1 meaning Normal and Abnormal, respectively. DI Module #x Status has no meaning when Bit 30 or/and Bit 31 is/are 1.

Bit	Description	Bit	Description	Bit	Description
Bit 0	DI Module #x.1	**Bit 8**	DI Module #x.9	**Bit 16**	DI Module #x.17
Bit 1	DI Module #x.2	**Bit 9**	DI Module #x.10	**Bit 17**	DI Module #x.18
Bit 2	DI Module #x.3	**Bit 10**	DI Module #x.11	**Bit 18**	DI Module #x.19
Bit 3	DI Module #x.4	**Bit 11**	DI Module #x.12	**Bit 19**	DI Module #x.20
Bit 4	DI Module #x.5	**Bit 12**	DI Module #x.13	**Bit 20**	DI Module #x.21
Bit 5	DI Module #x.6	**Bit 13**	DI Module #x.14	**Bits 21-29**	Reserved
Bit 6	DI Module #x.7	**Bit 14**	DI Module #x.15	**Bit 30**	Communication Status
Bit 7	DI Module #x.8	**Bit 15**	DI Module #x.16	**Bit 31**	Data Validity

Note: x indicates the Module number

Table 5-7 External DI Module Status Register

5.1.6 Data Recorder Pointer

The Data Recorder Pointer registers have been added since Firmware V1.00.04.

Register	Property	Description	Format
8200	RO	Data Recorder #1 Log Pointer	UINT32
8202	RO	Data Recorder #2 Log Pointer	UINT32
8204	RO	Data Recorder #3 Log Pointer	UINT32
8206	RO	Data Recorder #4 Log Pointer	UINT32
8208	RO	Data Recorder #5 Log Pointer	UINT32
8210	RO	Data Recorder #6 Log Pointer	UINT32
8212	RO	Data Recorder #7 Log Pointer	UINT32
8214	RO	Data Recorder #8 Log Pointer	UINT32
8216	RO	Data Recorder #9 Log Pointer	UINT32
8218	RO	Data Recorder #10 Log Pointer	UINT32

Table 5-8 Data Recorder Pointer

5.2 Basic Measurements

5.2.1 Mains Measurements

Register	Property	Description	Format	Scale	Unit
0500	RO	Mains-I, Uan[2]	UINT32	x100	V
0502	RO	Mains-I, Ubn[2]	UINT32		
0504	RO	Mains-I, Ucn[2]	UINT32		
0506	RO	Mains-I, ULN average	UINT32		
0508	RO	Mains-I, Uab	UINT32		
0510	RO	Mains-I, Ubc	UINT32		
0512	RO	Mains-I, Uca	UINT32		
0514	RO	Mains-I, ULL average	UINT32		

0516	RO	Mains-II, Uan[2]	UINT32		
0518	RO	Mains-II, Ubn[2]	UINT32		
0520	RO	Mains-II, Ucn[2]	UINT32		
0522	RO	Mains-II, ULN average[2]	UINT32		
0524	RO	Mains-II, Uab	UINT32		
0526	RO	Mains-II, Ubc	UINT32		
0528	RO	Mains-II, Uca	UINT32		
0530	RO	Mains-II, ULL average	UINT32		
0532	RO	System Freq (Mains-I, Uan/Uab)	UINT32	x100	Hz
0534	RO	Mains-I, Ia	UINT32	x1000	A
0536	RO	Mains-I, Ib	UINT32		
0538	RO	Mains-I, Ic	UINT32		
0540	RO	Mains-I, I4[3]	UINT32		
0542	RO	Reserved			
0544	RO	Mains-I, I average	UINT32	x1000	A
0546	RO	Mains-I, Ia Loading Factor[4]	UINT32	x10,	%
0548	RO	Mains-I, Ib Loading Factor[4]	UINT32		
0550	RO	Mains-I, Ic Loading Factor[4]	UINT32		
0552	RO	Mains-I, kWa	INT32	x1000	kW
0554	RO	Mains-I, kWb	INT32		
0556	RO	Mains-I, kWc	INT32		
0558	RO	Mains-I, kW Total	INT32		
0560	RO	Mains-I, kvara	INT32	x1000	kvar
0562	RO	Mains-I, kvarb	INT32		
0564	RO	Mains-I, kvarc	INT32		
0566	RO	Mains-I, kvar Total	INT32		
0568	RO	Mains-I, kVAa	INT32	x1000,	kVA
0570	RO	Mains-I, kVAb	INT32		
0572	RO	Mains-I, kVAc	INT32		
0574	RO	Mains-I, kVA Total	INT32		
0576	RO	Mains-I, PFa	INT32	x1000	-
0578	RO	Mains-I, PFb	INT32		
0580	RO	Mains-I, PFc	INT32		
0582	RO	Mains-I, PF Total	INT32		
0584	RO	Mains-II, Ia	UINT32	x1000	A
0586	RO	Mains-II, Ib	UINT32		
0588	RO	Mains-II, Ic	UINT32		
0590	RO	Mains-II, I4	UINT32		
0592	RO	Reserved	UINT32		
0594	RO	Mains-II, I average	UINT32	x1000	A
0596	RO	Mains-II, Ia Loading Factor[3]	UINT32	x10	%
0598	RO	Mains-II, Ib Loading Factor[3]	UINT32		
0600	RO	Mains-II, Ic Loading Factor[3]	UINT32		
0602	RO	Mains-II, kWa	INT32	x1000	kW
0604	RO	Mains-II, kWb	INT32		
0606	RO	Mains-II, kWc	INT32		
0608	RO	Mains-II, kW Total	INT32		
0610	RO	Mains-II, kvara	INT32	x1000	kvar
0612	RO	Mains-II, kvarb	INT32		
0614	RO	Mains-II, kvarc	INT32		
0616	RO	Mains-II, kvar Total	INT32		
0618	RO	Mains-II, kVAa	INT32	x1000	kVA
0620	RO	Mains-II, kVAb	INT32		
0622	RO	Mains-II, kVAc	INT32		
0624	RO	Mains-II, kVA Total	INT32		
0626	RO	Mains-II, PFa	INT32	x1000	-
0628	RO	Mains-II, PFb	INT32		
0630	RO	Mains-II, PFc	INT32		
0632	RO	Mains-II, PF Total	INT32		
0634	RO	Mains-I, Voltage Unbalance	UINT32	x100	%
0636	RO	Mains-II, Voltage Unbalance	UINT32		
0638	RO	Mains-I, Current Unbalance	UINT32		
0640	RO	Mains-II, Current Unbalance	UINT32		
0642	RO	RTD1 Temperature	UINT16	x10	℃
0643	RO	RTD2 Temperature	UINT16		
0644	RO	TC1 Resistance Value	UINT16	x100	Ω

0645	RO	TC2 Resistance Value	UINT16		

Table 5-9 Mains Measurements

Notes:

1) "×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.
2) When the **Wiring Mode** is Delta, the per phase line-to-neutral voltages have no meaning, and their registers are reserved.
3) The calculation method of Ia/Ib/Ic Loading Factor is listed below:

$$\text{Ia/Ib/Ic LoadingFactor} = \frac{\text{Ia/Ib/Ic}}{\text{BreakerRating}} \times 100\%$$

5.2.2 SM Measurements

Register	Property	Description	Format	Scale	Unit
0650	RO	1-Ø SM1 Current	UINT32	x1000	A
0652	RO	1-Ø SM2 Current	UINT32		
....		....			
0816	RO	1-Ø SM84 Current	UINT32		
0818	RO	2-Ø SM1 Current Average	UINT32		
0820	RO	2-Ø SM2 Current Average	UINT32		
....		....			
0900	RO	2-Ø SM42 Current Average	UINT32		
0902	RO	3-Ø SM1 Current Average	UINT32		
0904	RO	3-Ø SM2 Current Average	UINT32		
....		....			
0956	RO	3-Ø SM28 Current Average	UINT32		
0958	RO	1-Ø SM1 kW	INT32	x1000	kW
0960	RO	1-Ø SM2 kW	INT32		
....		....			
1124	RO	1-Ø SM84 kW	INT32		
1126	RO	2-Ø SM1 kW Total	INT32		
1128	RO	2-Ø SM2 kW Total	INT32		
....		....			
1208	RO	2-Ø SM42 kW Total	INT32		
1210	RO	3-Ø SM1 kW Total	INT32		
1212	RO	3-Ø SM2 kW Total	INT32		
....		....			
1264	RO	3-Ø SM28 kW Total	INT32		
1266	RO	1-Ø SM1 kvar	INT32	x1000	kvar
1268	RO	1-Ø SM2 kvar	INT32		
....		....			
1432	RO	1-Ø SM84 kvar	INT32		
1434	RO	2-Ø SM1 kvar Total	INT32		
1436	RO	2-Ø SM2 kvar Total	INT32		
....		....			
1516	RO	2-Ø SM42 kvar Total	INT32		
1518	RO	3-Ø SM1 kvar Total	INT32		
1520	RO	3-Ø SM2 kvar Total	INT32		
....		....			
1572	RO	3-Ø SM28 kvar Total	INT32		
1574	RO	1-Ø SM1 kVA	INT32	x1000	kVA
1576	RO	1-Ø SM2 kVA	INT32		
....		....			
1740	RO	1-Ø SM84 kVA	INT32		
1742	RO	2-Ø SM1 kVA Total	INT32		
1744	RO	2-Ø SM2 kVA Total	INT32		
....		....			
1824	RO	2-Ø SM42 kVA Total	INT32		
1826	RO	3-Ø SM1 kVA Total	INT32		
1828	RO	3-Ø SM2 kVA Total	INT32		
....		....			
1880	RO	3-Ø SM28 kVA Total	INT32		
1882	RO	1-Ø SM1 PF	INT32	x1000	-

1884	RO	1-Ø SM2 PF	INT32		
....		....			
2048	RO	1-Ø SM84 PF	INT32		
2050	RO	2-Ø SM1 PF Total	INT32		
2052	RO	2-Ø SM2 PF Total	INT32		
....		....			
2132	RO	2-Ø SM42 PF Total	INT32		
2134	RO	3-Ø SM1 PF Total	INT32		
2136	RO	3-Ø SM2 PF Total	INT32		
....		....			
2188	RO	3-Ø SM28 PF Total	INT32		
2190	RO	1-Ø SM1 Loading Factor	UINT32	x10	%
2192	RO	1-Ø SM2 Loading Factor	UINT32		
....		....			
2356	RO	1-Ø SM84 Loading Factor	UINT32		
2358	RO	2-Ø SM1 Loading Factor	UINT32		
2360	RO	2-Ø SM2 Loading Factor	UINT32		
....		....			
2440	RO	2-Ø SM42 Loading Factor	UINT32		
2442	RO	3-Ø SM1 Loading Factor	UINT32		
2444	RO	3-Ø SM2 Loading Factor	UINT32		
....		....			
2496	RO	3-Ø SM28 Loading Factor	UINT32		
8000	RO	SM1 Loading Status[1]	UINT32	-	0 = OFF 1 = ON
8002	RO	SM2 Loading Status[1]	UINT32		
....		....			
8166	RO	SM84 Loading Status[1]	UINT32		

Table 5-10 SM Measurements

Notes:

1) When SMx Current > Current Alarm ON Threshold (Reg. # 6391), the SMx Loading Status is ON, otherwise it's OFF.

5.3 Energy Measurements

5.3.1 Mains Energy

Register	Property	Description	Format	Scale	Unit
2500	RO	Mains-I, kWh Import	UINT32	x10	kWh
2502	RO	Mains-I, kWh Export	UINT32		
2504	RO	Mains-I, kvarh Import	UINT32	x10	kvarh
2506	RO	Mains-I, kvarh Export	UINT32		
2508	RO	Mains-I, kVAh	UINT32	x10	kVAh
2510	RO	Mains-II, kWh Import	UINT32	x10	kWh
2512	RO	Mains-II, kWh Export	UINT32		
2514	RO	Mains-II, kvarh Import	UINT32	x10	kvarh
2516	RO	Mains-II, kvarh Export	UINT32		
2518	RW	Mains-II, kVAh	UINT32	x10	kVAh

Table 5-11 Mains Energy

5.3.2 SM Energy

Register	Property	Description	Format	Scale	Unit
2520	RO	1-Ø SM1 kWh	UINT32	x10	kWh
2522	RO	1-Ø SM2 kWh	UINT32		
....		....			
2686	RO	1-Ø SM84 kWh	UINT32		
2688	RO	2-Ø SM1 kWh	UINT32		
2690	RO	2-Ø SM2 kWh	UINT32		
....		....			
2770	RO	2-Ø SM42 kWh	UINT32		
2772	RO	3-Ø SM1 kWh	UINT32		
2774	RO	3-Ø SM2 kWh	UINT32		
....		....			
2826	RO	3-Ø SM28 kWh	UINT32		
2828	RO	1-Ø SM1 kvarh	UINT32	x10	kvarh
2830	RO	1-Ø SM2 kvarh	UINT32		

….		….			
2994	RO	1-Ø SM84 kvarh	UINT32		
2996	RO	2-Ø SM1 kvarh	UINT32		
2998	RO	2-Ø SM2 kvarh	UINT32		
….		….			
3078	RO	2-Ø SM42 kvarh	UINT32		
3080	RO	3-Ø SM1 kvarh	UINT32		
3082	RO	3-Ø SM2 kvarh	UINT32		
….		….			
3134	RO	3-Ø SM28 kvarh	UINT32		
3136	RW	1-Ø SM1 kVAh	UINT32	x10	kVAh
3138	RW	1-Ø SM2 kVAh	UINT32		
….		….			
3302	RW	1-Ø SM84 kVAh	UINT32		
3304	RW	2-Ø SM1 kVAh	UINT32		
3306	RW	2-Ø SM2 kVAh	UINT32		
….		….			
3386	RW	2-Ø SM42 kVAh	UINT32		
3388	RW	3-Ø SM1 kVAh	UINT32		
3390	RW	3-Ø SM2 kVAh	UINT32		
….		….			
3442	RW	3-Ø SM28 kVAh	UINT32		

Table 5-12 Branch Energy

5.3.3 Mains Tariff Energy

The Mains Tariff Energy registers have been added since Firmware V1.00.10.

Register	Property	Description	Format	Scale	Unit
52800	RO	Mains-I T1 kWh Import	UINT32	x10	kWh
52802	RO	Mains-I T1 kWh Export	UINT32		
52804	RO	Mains-I T1 kvarh Import	UINT32	x10	kvarh
52806	RO	Mains-I T1 kvarh Export	UINT32		
52808	RO	Mains-I T1 kVAh	UINT32	x10	kVAh
52810	RO	Mains-II T1 kWh Import	UINT32	x10	kWh
52812	RO	Mains-II T1 kWh Export	UINT32		
52814	RO	Mains-II T1 kvarh Import	UINT32	x10	kvarh
52816	RO	Mains-II T1 kvarh Export	UINT32		
52818	RO	Mains-II T1 kVAh	UINT32	x10	kVAh
52820	RO	Mains-I T2 kWh Import	UINT32	x10	kWh
52822	RO	Mains-I T2 kWh Export	UINT32		
52824	RO	Mains-I T2 kvarh Import	UINT32	x10	kvarh
52826	RO	Mains-I T2 kvarh Export	UINT32		
52828	RO	Mains-I T2 kVAh	UINT32	x10	kVAh
52830	RO	Mains-II T2 kWh Import	UINT32	x10	kWh
52832	RO	Mains-II T2 kWh Export	UINT32		
52834	RO	Mains-II T2 kvarh Import	UINT32	x10	kvarh
52836	RO	Mains-II T2 kvarh Export	UINT32		
52838	RO	Mains-II T2 kVAh	UINT32	x10	kVAh

Table 5-13 Mains Tariff Energy

5.4 Demand

5.4.1 Real-time Demand

5.4.1.1 Mains Present Demand

Register	Property	Description	Format	Scale	Unit
3450	RO	Mains-I, Ia Demand	UINT32	x1000	A
3452	RO	Mains-I, Ib Demand	UINT32		
3454	RO	Mains-I, Ic Demand	UINT32		
3456	RO	Mains-I, kW Total Demand	INT32	x1000	kW
3458	RO	Mains-I, kvar Total Demand	INT32	x1000	kvar
3460	RO	Mains-I, kVA Total Demand	INT32	x1000	kVA
3462	RO	Mains-II, Ia Demand	UINT32	x1000	A
3464	RO	Mains-II, Ib Demand	UINT32		

3466	RO	Mains-II, Ic Demand	UINT32		
3468	RO	Mains-II, kW Total Demand	INT32	x1000	kW
3470	RO	Mains-II, kvar Total Demand	INT32	x1000	kvar
3472	RO	Mains-II, kVA Total Demand	INT32	x1000	kVA

Table 5-14 Mains Present Demand

5.4.1.2 SM Present Demand

Register	Property	Description	Format	Scale	Unit
3474	RO	1-Ø SM1 Current Demand	UINT32	x1000	A
3476	RO	1-Ø SM2 Current Demand	UINT32		
...		...			
3640	RO	1-Ø SM84 Current Demand	UINT32		
3642	RO	2-Ø SM1 Current Demand	UINT32		
3644	RO	2-Ø SM2 Current Demand	UINT32		
...		...			
3724	RO	2-Ø SM42 Current Demand	UINT32		
3726	RO	3-Ø SM1 Current Demand	UINT32		
3728	RO	3-Ø SM2 Current Demand	UINT32		
...		...			
3780	RO	3-Ø SM28 Current Demand	UINT32		
3782	RO	1-Ø SM1 kW Demand	INT32	x1000	kW
3784	RO	1-Ø SM2 kW Demand	INT32		
...		...			
3948	RO	1-Ø SM84 kW Demand	INT32		
3950	RO	2-Ø SM1 kW Demand	INT32		
3952	RO	2-Ø SM2 kW Demand	INT32		
....		....			
4032	RO	2-Ø SM42 kW Demand	INT32		
4034	RO	3-Ø SM1 kW Demand	INT32		
4036	RO	3-Ø SM2 kW Demand	INT32		
....		....			
4088	RO	3-Ø SM28 kW Demand	INT32		
4090	RO	1-Ø SM1 kvar Demand	INT32	x1000	kvar
4092	RO	1-Ø SM2 kvar Demand	INT32		
....		....			
4256	RO	1-Ø SM84 kvar Demand	INT32		
4258	RO	2-Ø SM1 kvar Demand	INT32		
4260	RO	2-Ø SM2 kvar Demand	INT32		
....		....			
4340	RO	2-Ø SM42 kvar Demand	INT32		
4342	RO	3-Ø SM1 kvar Demand	INT32		
4344	RO	3-Ø SM2 kvar Demand	INT32		
....		....			
4396	RO	3-Ø SM28 kvar Demand	INT32		
4398	RO	1-Ø SM1 kVA Demand	INT32	x1000	kVA
4400	RO	1-Ø SM2 kVA Demand	INT32		
....		....			
4564	RO	1-Ø SM84 kVA Demand	INT32		
4566	RO	2-Ø SM1 kVA Demand	INT32		
4568	RO	2-Ø SM2 kVA Demand	INT32		
....		....			
4648	RO	2-Ø SM42 kVA Demand	INT32		
4650	RO	3-Ø SM1 kVA Demand	INT32		
4652	RO	3-Ø SM2 kVA Demand	INT32		
....		....			
4704	RO	3-Ø SM28 kVA Demand	INT32		

Table 5-15 SM Present Demand

5.4.1.3 Present Temperature Demand

The Present Temperature Demand registers have been added since Firmware V1.00.04.

Register	Property	Description	Format	Scale	Unit
4706	RO	RTD 1 Temperature	INT16	x10	°C

4707	RO	RTD 2 Temperature	INT16		

Table 5-16 Present Temperature Demand

5.4.2 Max Demand Log

5.4.2.1 Mains Max Demand

Register	Property	Description	Format
20000-20047	RO	Historical Max Demand	See Section 5.4.2.2 Mains Max Demand Data Structure
20048-20095	RO	Max Demand of This Month	
20096-20143	RO	Max Demand of Last Month	

Table 5-17 Mains Max Demand

5.4.2.2 Mains Max Demand Data Structure

Offset	Property	Description	Format	Scale	Range
+0	RO	Mains-I, Ia	MAX32U[1]	x1000	A
+4	RO	Mains-I, Ib			
+8	RO	Mains-I, Ic			
+12	RO	Mains-I, kW Total	MAX32[2]	x1000	kW
+16	RO	Mains-I, kvar Total		x1000	kvar
+20	RO	Mains-I, kVA Total		x1000	kVA
+24	RO	Mains-II, Ia	MAX32U[1]	x1000	A
+28	RO	Mains-II, Ib			
+32	RO	Mains-II, Ic			
+36	RO	Mains-II, kW Total	MAX32[2]	x1000	kW
+40	RO	Mains-II, kvar Total		x1000	kvar
+44	RO	Mains-II, kVA Total		x1000	kVA

Table 5-18 Mains Max Demand Data Structure

Notes:

1) **MAX32U** means an unsigned 32-bit Max Demand Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	UINT32
+2	RO	Record Time	UNIX Time

Table 5-19 MAX32U Max Demand Log Data Structure

2) **MAX32** means a signed 32-bit Max Demand Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	INT32
+2	RO	Record Time	UNIX Time

Table 5-20 MAX32 Max Demand Log Data Structure

5.4.2.3 SM Max Demand

Register	Property	Description	Format
20144-22607	RO	Historical Max Demand	See Section 5.4.2.4 SM Max Demand Data Structure
22608-25071	RO	Max Demand of This Month	
25072-27535	RO	Max Demand of Last Month	

Table 5-21 SM Max Demand

5.4.2.4 SM Max Demand Data Structure

Offset	Property	Description	Format	Scale	Range
+0	RO	1-Ø SM1 Current	MAX32U[1]	x1000	A
+4	RO	1-Ø SM2 Current			
....		....			
+332	RO	1-Ø SM84 Current			
+336	RO	2-Ø SM1 Current			
+340	RO	2-Ø SM2 Current			
....		....			
+500	RO	2-Ø SM42 Current			
+504	RO	3-Ø SM1 Current			
+508	RO	3-Ø SM2 Current			
....		....			

+612	RO	3-Ø SM28 Current			
+616	RO	1-Ø SM1 kW	MAX32[2]	x1000	kW
+620	RO	1-Ø SM2 kW			
....		....			
+948	RO	1-Ø SM84 kW			
+952	RO	2-Ø SM1 kW			
+956	RO	2-Ø SM2 kW			
....		....			
+1116	RO	2-Ø SM42 kW			
+1120	RO	3-Ø SM1 kW			
+1124	RO	3-Ø SM2 kW			
....		....			
+1228	RO	3-Ø SM28 kW			
+1232	RO	1-Ø SM1 kvar		x1000	kvar
+1236	RO	1-Ø SM2 kvar			
....		....			
+1564	RO	1-Ø SM84 kvar			
+1568	RO	2-Ø SM1 kvar			
+1572	RO	2-Ø SM2 kvar			
....		....			
+1732	RO	2-Ø SM42 kvar			
+1736	RO	3-Ø SM1 kvar			
+1740	RO	3-Ø SM2 kvar			
....		....			
+1844	RO	3-Ø SM28 kvar			
+1848	RO	1-Ø SM1 kVA		x1000	kVA
+1852	RO	1-Ø SM2 kVA			
....		....			
+2180		1-Ø SM84 kVA			
+2184	RO	2-Ø SM1 kVA			
+2188	RO	2-Ø SM2 kVA			
....		....			
+2348		2-Ø SM42 kVA			
+2352	RO	3-Ø SM1 kVA			
+2356	RO	3-Ø SM2 kVA			
....		....			
+2460	RO	3-Ø SM28 kVA			

Table 5-22 SM Max Demand Data Structure

Notes:

1) **MAX32U** means an unsigned 32-bit Max Demand Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	UINT32
+2	RO	Record Time	UNIX Time

Table 5-23 MAX32U Max Demand Log Data Structure

2) **MAX32** means a signed 32-bit Max Demand Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	INT32
+2	RO	Record Time	UNIX Time

Table 5-24 MAX32 Max Demand Log Data Structure

5.4.2.5 Temperature Max Demand

The Temperature Max Demand registers have been added since Firmware V1.00.04.

Register	Property	Description	Format
27536-27541	RO	Historical Max Demand	See Section 5.4.2.6 Temperature Max Demand Data Structure
27542-27547	RO	Max Demand of This Month	
27548-27553	RO	Max Demand of Last Month	

Table 5-25 Temperature Max Demand Log

5.4.2.6 Temperature Max Demand Data Structure

Offset	Property	Description	Format	Scale	Unit
0	RO	RTD 1	MAX16	x10	°C
3	RO	RTD 2	MAX16		

Table 5-26 Temperature Max Demand Data Structure

Notes:

1) **MAX16** means a signed 16-bit Max Demand Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	UINT16
+1	RO	Record Time (UNIX Time)	UINT32

Table 5-27 MAX16 Max Demand Log Data Structure

5.5 Harmonics Measurements

5.5.1 Mains Harmonic Measurements

Register	Property	Description	Format	Scale	Unit
4710	RO	Mains-I, Ia THD	UINT16	x100	%
4711	RO	Mains-I, Ia TOHD	UINT16		
4712	RO	Mains-I, Ia TEHD	UINT16		
4713	RO	Mains-I, Ib THD	UINT16		
4714	RO	Mains-I, Ib TOHD	UINT16		
4715	RO	Mains-I, Ib TEHD	UINT16		
4716	RO	Mains-I, Ic THD	UINT16		
4717	RO	Mains-I, Ic TOHD	UINT16		
4718	RO	Mains-I, Ic TEHD	UINT16		
4719	RO	Mains-II, Ia THD	UINT16		
4720	RO	Mains-II, Ia TOHD	UINT16		
4721	RO	Mains-II, Ia TEHD	UINT16		
4722	RO	Mains-II, Ib THD	UINT16		
4723	RO	Mains-II, Ib TOHD	UINT16		
4724	RO	Mains-II, Ib TEHD	UINT16		
4725	RO	Mains-II, Ic THD	UINT16		
4726	RO	Mains-II, Ic TOHD	UINT16		
4727	RO	Mains-II, Ic TEHD	UINT16		
4728	RO	Mains-I, Uan/Uab THD[1]	UINT16		
4729	RO	Mains-I, Uan/Uab TOHD[1]	UINT16		
4730	RO	Mains-I, Uan/Uab TEHD[1]	UINT16		
4731	RO	Mains-I, Ubn/Ubc THD[1]	UINT16		
4732	RO	Mains-I, Ubn/Ubc TOHD[1]	UINT16		
4733	RO	Mains-I, Ubn/Ubc TEHD[1]	UINT16		
4734	RO	Mains-I, Ucn/Uca THD[1]	UINT16		
4735	RO	Mains-I, Ucn/Uca TOHD[1]	UINT16		
4736	RO	Mains-I, Ucn/Uca TEHD[1]	UINT16		
4737	RO	Mains-II, Uan/Uab THD[1]	UINT16		
4738	RO	Mains-II, Uan/Uab TOHD[1]	UINT16		
4739	RO	Mains-II, Uan/Uab TEHD[1]	UINT16		
4740	RO	Mains-II, Ubn/Ubc THD[1]	UINT16		
4741	RO	Mains-II, Ubn/Ubc TOHD[1]	UINT16		
4742	RO	Mains-II, Ubn/Ubc TEHD[1]	UINT16		
4743	RO	Mains-II, Ucn/Uca THD[1]	UINT16		
4744	RO	Mains-II, Ucn/Uca TOHD[1]	UINT16		
4745	RO	Mains-II, Ucn/Uca TEHD[1]	UINT16		
4746-4775	RO	Mains-I, Ia Individual Harmonic Distortion	See Table 5-29 HD Data Structure		
4776-4805	RO	Mains-I, Ib Individual Harmonic Distortion			
4806-4835	RO	Mains-I, Ic Individual Harmonic Distortion			
4836-4865	RO	Mains-II, Ia Individual Harmonic Distortion			
4866-4895	RO	Mains-II, Ib Individual Harmonic Distortion			
4896-4925	RO	Mains-II, Ic Individual Harmonic Distortion			
4926-4955	RO	Mains-I, Uan/Uab Individual Harmonic Distortion			
4956-4985	RO	Mains-I, Ubn/Ubc Individual Harmonic Distortion[1]			
4986-5015	RO	Mains-I, Ucn/Uca Individual Harmonic Distortion[1]			
5016-5045	RO	Mains-II, Uan/Uab Individual Harmonic Distortion[1]			

5046-5075	RO	Mains-II, Ubn/Ubc Individual Harmonic Distortion[1]			
5076-5105	RO	Mains-II, Ucn/Uca Individual Harmonic Distortion[1]			

Table 5-28 Mains Harmonic Measurements

Notes:

1) Mains-II Line-to-neutral Voltages THD/TOHD/TEHD Max/Min and line-to-line Voltages THD/TOHD/TEHD Max/Min share the same register as these two options are mutually exclusive.

2) The following table illustrates the detail individual harmonics distortion.

Offset	Property	Description	Format	Scale	Unit
+0	RO	HD02	UINT16	x100	%
+1	RO	HD03	UINT16		
+2	RO	HD04	UINT16		
+3	RO	HD05	UINT16		
…	…	…	…		
+27	RO	HD29	UINT16		
+28	RO	HD30	UINT16		
+29	RO	HD31	UINT16		

Table 5-29 HD Data Structure

5.5.2 Branch THD Measurements

Register	Property	Description	Format	Scale	Unit
5106	RO	SM1 Current THD	UINT16	x100	%
5107	RO	SM2 Current THD	UINT16		
….		….			
5189	RO	SM84 Current THD	UINT16		

Table 5-30 Branch Harmonic Measurements

5.5.3 Mains K Factor

Register	Property	Description	Format	Scale
5200	RO	Mains-I, Ia K Factor	UINT16	x100
5201	RO	Mains-I, Ib K Factor	UINT16	x100
5202	RO	Mains-I, Ic K Factor	UINT16	x100
5203	RO	Mains-II, Ia K Factor	UINT16	x100
5204	RO	Mains-II, Ib K Factor	UINT16	x100
5205	RO	Mains-II, Ic K Factor	UINT16	x100

Table 5-31 Mains K Factor

5.5.4 Mains Crest Factor

The Mains Crest Factor registers have been added since Firmware V1.00.05.

Register	Property	Description	Format	Scale
5206	RO	Mains-I, Ia Crest Factor	UINT16	x100
5207	RO	Mains-I, Ib Crest Factor	UINT16	x100
5208	RO	Mains-I, Ic Crest Factor	UINT16	x100
5209	RO	Mains-II, Ia Crest Factor	UINT16	x100
5210	RO	Mains-II, Ib Crest Factor	UINT16	x100
5211	RO	Mains-II, Ic Crest Factor	UINT16	x100
5212	RO	Mains-I, Ua Crest Factor	UINT16	x100
5213	RO	Mains-I, Ub Crest Factor	UINT16	x100
5214	RO	Mains-I, Uc Crest Factor	UINT16	x100
5215	RO	Mains-II, Ua Crest Factor	UINT16	x100
5216	RO	Mains- II, Ub Crest Factor	UINT16	x100
5217	RO	Mains- II, Uc Crest Factor	UINT16	x100

Table 5-32 Mains Crest Factor

5.5.5 Mains TDD Measurements

The Mains TDD Measurements registers have been added since Firmware V1.00.05.

Register	Property	Description	Format	Scale	Unit
5220	RO	Mains-I, Ia TDD	UINT16	x100	%

5221	RO	Mains-I, Ia TODD	UINT16		
5222	RO	Mains-I, Ia TEDD	UINT16		
5223	RO	Mains-I, Ib TDD	UINT16		
5224	RO	Mains-I, Ib TODD	UINT16		
5225	RO	Mains-I, Ib TEDD	UINT16		
5226	RO	Mains-I, Ic TDD	UINT16		
5227	RO	Mains-I, Ic TODD	UINT16		
5228	RO	Mains-I, Ic TEDD	UINT16		
5229	RO	Mains-II, Ia TDD	UINT16		
5230	RO	Mains-II, Ia TODD	UINT16		
5231	RO	Mains-II, Ia TEDD	UINT16		
5232	RO	Mains-II, Ib TDD	UINT16		
5233	RO	Mains-II, Ib TODD	UINT16		
5234	RO	Mains-II, Ib TEDD	UINT16		
5235	RO	Mains-II, Ic TDD	UINT16		
5236	RO	Mains-II, Ic TODD	UINT16		
5237	RO	Mains-II, Ic TEDD	UINT16		

Table 5-33 Mains TDD Measurement

5.6 Log Register

5.6.1 SOE Recorder Log

Register	Property	Description	Format
10000-10008	RO	Event 1	See Table 5-35 SOE Log Data Structure
10009-10017	RO	Event 2	
10018-10026	RO	Event 3	
10027-10035	RO	Event 4	
....		....	
18991-18999	RO	Event 1000	

Table 5-34 SOE Log

Offset	Property	Description	Format	Range/Note
+0	RO	Reserved	UINT16	-
+1	RO	High-order Byte: Event Classification	UINT16	See Appendix A
		Low-order Byte: Sub-Classification		See Appendix A
+2	RO	High-order Byte: Year	UINT16	0-99 (Year-2000)
		Low-order Byte: Month		1 to 12
+3	RO	High-order Byte: Day	UINT16	1 to 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
+5	RO	Millisecond	UINT16	0 to 999
+6	RO	Event Value High Word	INT16	-
+7	RO	Event Value Low Word	INT16	
+8	RO	Channel No.	UINT16	

Table 5-35 SOE Log Data Structure

5.6.2 Max/Min Recorder Log (MMR Log)

5.6.2.1 Mains MMR Log

Register	Property	Description	Format
30000-30397	RO	Mains Max Historical	See Table 5-37 Mains MMR Log Data Structure
30398-30795	RO	Mains Min Historical	
30796-31193	RO	Mains Max of This Month	
31194-31591	RO	Mains Min of This Month	
31592-31989	RO	Mains Max of Last Month	
31990-32387	RO	Mains Min of Last Month	

Table 5-36 Mains Max/Min Log

Notes:

1) The following table illustrates the Mains MMR Log Data Structure

Offset	Property	Description	Format	Scale	Unit
+0	RO	Mains-I, Uan	MM32U[2]	x100	V

+4	RO	Mains-I, Ubn			
+8	RO	Mains-I, Ucn			
+12	RO	Mains-I, ULN Average			
+16	RO	Mains-I, Uab			
+20	RO	Mains-I, Ubc			
+24	RO	Mains-I, Uca			
+28	RO	Mains-I, ULL Average			
+32	RO	Mains-II, Uan			
+36	RO	Mains-II, Ubn			
+40	RO	Mains-II, Ucn			
+44	RO	Mains-II, ULN Average			
+48	RO	Mains-II, Uab			
+52	RO	Mains-II, Ubc			
+56	RO	Mains-II, Uca			
+60	RO	Mains-II, ULL Average			
+64	RO	Freq		x100	Hz
+68	RO	Mains-I, Ia		x1000	A
+72	RO	Mains-I, Ib			
+76	RO	Mains-I, Ic			
+80	RO	Mains-I, I4			
+84	RO	Reserved			
+88	RO	Mains-I, I Average		x1000	A
+92	RO	Mains-I, Ia Loading Factor		x10	%
+96	RO	Mains-I, Ib Loading Factor			
+100	RO	Mains-I, Ic Loading Factor			
+104	RO	Mains-I, kWa	MM32[3]	x1000	kW
+108	RO	Mains-I, kWb			
+112	RO	Mains-I, kWc			
+116	RO	Mains-I, kW Total			
+120	RO	Mains-I, kvara		x1000	kvar
+124	RO	Mains-I, kvarb			
+128	RO	Mains-I, kvarc			
+132	RO	Mains-I, kvar Total			
+136	RO	Mains-I, kVAa		x1000	kVA
+140	RO	Mains-I, kVAb			
+144	RO	Mains-I, kVAc			
+148	RO	Mains-I, kVA Total			
+152	RO	Mains-I, P.F.a		x1000	
+156	RO	Mains-I, P.F.b			
+160	RO	Mains-I, P.F.c			
+164	RO	Mains-I, PF Total			
+168	RO	Mains-II, Ia	MM32U[2]	x1000	A
+172	RO	Mains-II, Ib			
+176	RO	Mains-II, Ic			
+180	RO	Mains-II, I4			
+184	RO	Reserved			
+188	RO	Mains-II, I Average		x1000	A
+192	RO	Mains-II, Ia Loading Factor		x10	%
+196	RO	Mains-II, Ib Loading Factor			
+200	RO	Mains-II, Ic Loading Factor			
+204	RO	Mains-II, kWa	MM32[3]	x1000	kW
+208	RO	Mains-II, kWb			
+212	RO	Mains-II, kWc			
+216	RO	Mains-II, kW Total			
+220	RO	Mains-II, kvara		x1000	kvar
+224	RO	Mains-II, kvarb			
+228	RO	Mains-II, kvarc			
+232	RO	Mains-II, kvar Total			
+236	RO	Mains-II, kVAa		x1000	kVA
+240	RO	Mains-II, kVAb			
+244	RO	Mains-II, kVAc			
+248	RO	Mains-II, kVA Total			
+252	RO	Mains-II, P.F.a		x1000	-
+256	RO	Mains-II, P.F.b			
+260	RO	Mains-II, P.F.c			
+264	RO	Mains-II, PF Total			

+268	RO	Mains-I, I Unbalance	MM32U[2]	x100	%
+272	RO	Mains-II, I Unbalance			
+276	RO	Mains-I, U Unbalance			
+280	RO	Mains-II, U Unbalance			
+284	RO	RTD1 Temp.	MM16U[4]	x10	℃
+287	RO	RTD2 Temp.			
+290	RO	Mains-I, Ia THD		x100	%
+293	RO	Mains-I, Ia TOHD			
+296	RO	Mains-I, Ia TEHD			
+299	RO	Mains-I, Ib THD			
+302	RO	Mains-I, Ib TOHD			
+305	RO	Mains-I, Ib TEHD			
+308	RO	Mains-I, Ic THD			
+311	RO	Mains-I, Ic TOHD			
+314	RO	Mains-I, Ic TEHD			
+317	RO	Mains-II, Ia THD			
+320	RO	Mains-II, Ia TOHD			
+323	RO	Mains-II, Ia TEHD			
+326	RO	Mains-II, Ib THD			
+329	RO	Mains-II, Ib TOHD			
+332	RO	Mains-II, Ib TEHD			
+335	RO	Mains-II, Ic THD			
+338	RO	Mains-II, Ic TOHD			
+341	RO	Mains-II, Ic TEHD			
+344	RO	Mains-I, Uan/Uab THD			
+347	RO	Mains-I, Uan/Uab TOHD			
+350	RO	Mains-I, Uan/Uab TEHD			
+353	RO	Mains-I, Ubn/Ubc THD			
+356	RO	Mains-I, Ubn/Ubc TOHD			
+359	RO	Mains-I, Ubn/Ubc TEHD			
+362	RO	Mains-I, Ucn/Uca THD			
+365	RO	Mains-I, Ucn/Uca TOHD			
+368	RO	Mains-I, Ucn/Uca TEHD			
+371	RO	Mains-II, Uan/Uab THD[5]			
+374	RO	Mains-II, Uan/Uab TOHD[5]			
+377	RO	Mains-II, Uan/Uab TEHD[5]			
+380	RO	Mains-II, Ubn/Ubc THD[5]			
+383	RO	Mains-II, Ubn/Ubc TOHD[5]			
+386	RO	Mains-II, Ubn/Ubc TEHD[5]			
+389	RO	Mains-II, Ucn/Uca THD[5]			
+392	RO	Mains-II, Ucn/Uca TOHD[5]			
+395	RO	Mains-II, Ucn/Uca TEHD[5]			

Table 5-37 Mains MMR Log Data Structure

2) The **MM32U** data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	UINT32
+2	RO	Record Time	UNIX Time

Table 5-38 MM32U Data Structure

3) The **MM32** data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	INT32
+2	RO	Record Time	UNIX Time

Table 5-39 MM32 Data Structure

4) The **MM16U** data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	UINT16
+2	RO	Record Time	UNIX Time

Table 5-40 MM16U Data Structure

5) Mains-II ULN THD/TOHD/TEHD Max/Min and ULL THD/TOHD/TEHD Max/Min share the same register as these two options are mutually exclusive.

5.6.2.2 Branch Max Recorder (MXR) Log

Register	Property	Description	Format
35000-38947	RO	Historical Max	See Table 5-42 Branch MXR Log Data Structure
38948-42895	RO	Max of This Month	
42896-46843	RO	Max of Last Month	

Table 5-41 Branch MXR Log

Offset	Property	Description	Format	Scale	Unit
+0	RO	1-Ø SM1 Current	MAX32U[1]	x1000	A
+4	RO	1-Ø SM2 Current			
....		....			
+332	RO	1-Ø SM84 Current			
+336	RO	2-Ø SM1 Current			
+340	RO	2-Ø SM2 Current			
....		....			
+500	RO	2-Ø SM42 Current			
+504	RO	3-Ø SM1 Current			
+508	RO	3-Ø SM2 Current			
....		....			
+612	RO	3-Ø SM28 Current			
+616	RO	1-Ø SM1 kW	MAX32[2]	x1000	kW
+620	RO	1-Ø SM2 kW			
....		....			
+948	RO	1-Ø SM84 kW			
+952	RO	2-Ø SM1 kW			
+956	RO	2-Ø SM2 kW			
....		....			
+1116	RO	2-Ø SM42 kW			
+1120	RO	3-Ø SM1 kW			
+1124	RO	3-Ø SM2 kW			
....		....			
+1228	RO	3-Ø SM28 kW			
+1232	RO	1-Ø SM1 kvar		x1000	kvar
+1236	RO	1-Ø SM2 kvar			
....		....			
+1564	RO	1-Ø SM84 kvar			
+1568	RO	2-Ø SM1 kvar			
+1572	RO	2-Ø SM2 kvar			
....		....			
+1732	RO	2-Ø SM42 kvar			
+1736	RO	3-Ø SM1 kvar			
+1740	RO	3-Ø SM2 kvar			
....		....			
+1844	RO	3-Ø SM28 kvar			
+1848	RO	1-Ø SM1 kVA	MAX32	x1000	kVA
+1852	RO	1-Ø SM2 kVA			
....		....			
+2180	RO	1-Ø SM84 kVA			
+2184	RO	2-Ø SM1 kVA			
+2188	RO	2-Ø SM2 kVA			
....		....			
+2348	RO	2-Ø SM42 kVA			
+2352	RO	3-Ø SM1 kVA			
+2356	RO	3-Ø SM2 kVA			
....		....			
+2460	RO	3-Ø SM28 kVA			
+2464	RO	1-Ø SM1 PF	MAX32[2]	x1000	-
+2468	RO	1-Ø SM2 PF			
....		....			
+2796	RO	1-Ø SM84 PF			
+2800	RO	2-Ø SM1 PF			
+2804	RO	2-Ø SM2 PF			
....		....			
+2964	RO	2-Ø SM42 PF			
+2968	RO	3-Ø SM1 PF			

+2972	RO	3-Ø SM2 PF			
....		....			
+3076	RO	3-Ø SM28 PF			
+3080	RO	1-Ø SM1 Loading Factor	MAX32U[1]	x10	%
+3084	RO	1-Ø SM2 Loading Factor			
....		....			
+3412	RO	1-Ø SM84 Loading Factor			
+3416	RO	2-Ø SM1 Loading Factor			
+3420	RO	2-Ø SM2 Loading Factor			
....		....			
+3580	RO	2-Ø SM42 Loading Factor			
+3584	RO	3-Ø SM1 Loading Factor			
+3588	RO	3-Ø SM2 Loading Factor			
....		....			
+3692	RO	3-Ø SM28 Loading Factor			
+3696	RO	SM1 THD	MAX16U[3]	x100	%
+3699	RO	SM2 THD			
....		....			
+3945	RO	SM84 THD			

Table 5-42 Branch Max Log Data Structure

Notes:

1) **MAX32U** means an unsigned 32-bit Max Demand Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	UINT32
+2	RO	Record Time	UNIX Time

Table 5-43 MAX32U Branch Max Log Data Structure

2) **MAX32** means a signed 32-bit Max Demand Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	INT32
+2	RO	Record Time	UNIX Time

Table 5-44 MAX32 Branch Max Log Data Structure

3) **MAX16U** means an unsigned 16-bit Max/Min Log, the log data structure is illustrated in the following table.

Offset	Property	Description	Format
+0	RO	Record Value	UINT16
+2	RO	Record Time	UNIX Time

Table 5-45 MAX16U Branch Max Log Data Structure

5.6.3 Data Recorder Log

Register	Property	Description	Format	Unit/Range
52500	RW	DR Log Index (X)	UINT16	
52501	RW	DR Log X Pointer (N)	UINT32	
52503	RO	High-order Byte: Year (0-99) Low-order Byte: Month (1-12)	UINT16	
52504	RO	High-order Byte: Day (1-31) Low-order Byte: Hour (0-23)	UINT16	
52505	RO	High-order Byte: Minute (0-59) Low-order Byte: Second (0-59)	UINT16	
52506	RO	Parameter #1	INT32	
52508	RO	Parameter #2	INT32	
52510	RO	Parameter #3	INT32	
...	RO	...	...	
52632	RO	Parameter #64	INT32	

Table 5-46 DR Log

Notes:

1) The PMC-592' ten Data Recorders share same registers. Writing a value X between 1 and 10 to the **DR Log Index** register and a value N between 0 and 65535 to the **DR Log #X Pointer** register to retrieve the Data Recorder log. The valid **DR Log #X Pointer** is determined by setting of **Recording Depth** (See Section **5.8.11 Data Recorder Setup**) and Data Recorder #X Log Pointer (Section **5.1.6 Data Recorder Pointer**). For example, if **Recording Depth** of DR #1 is 1000 and the Data Recorder #X Log Pointer is 5500, then the valid **DR Log #X Pointer** range is 4501~5500.

2) Writing a pointer value that points to a Log Record that is either already expired or has not been generated yet to the **DR**

Log X Pointer register will generate an exception response with the Illegal Data Value error code (0xFF) as defined by the Modbus protocol.

5.7 VM Data

5.7.1 VM kW Measurements

Register	Property	Description	Format	Scale	Unit
5300	RO	VM1 kW	INT32	x1000	kW
5302	RO	VM2 kW	INT32		
5304	RO	VM3 kW	INT32		
5306	RO	VM4 kW	INT32		
5308	RO	VM5 kW	INT32		
5310	RO	VM6 kW	INT32		
5312	RO	VM7 kW	INT32		
5314	RO	VM8 kW	INT32		
5316	RO	VM9 kW	INT32		
5318	RO	VM10 kW	INT32		

Table 5-47 VM Measurement

5.7.2 VM Energy Measurements

Register	Property	Description	Format	Scale	Unit
5350	RO	VM1 kWh	UINT32	x10	kWh
5352	RO	VM1 kvarh	UINT32	x10	karh
5354	RO	VM1 kVAh	UINT32	x10	kVAh
5356	RO	VM2 kWh	UINT32	x10	kWh
5358	RO	VM2 kvarh	UINT32	x10	karh
5360	RO	VM2 kVAh	UINT32	x10	kVAh
5362	RO	VM3 kWh	UINT32	x10	kWh
5364	RO	VM3 kvarh	UINT32	x10	karh
5366	RO	VM3 kVAh	UINT32	x10	kVAh
5368	RO	VM4 kWh	UINT32	x10	kWh
5370	RO	VM4 kvarh	UINT32	x10	karh
5372	RO	VM4 kVAh	UINT32	x10	kVAh
5374	RO	VM5 kWh	UINT32	x10	kWh
5376	RO	VM5 kvarh	UINT32	x10	karh
5378	RO	VM5 kVAh	UINT32	x10	kVAh
5380	RO	VM6 kWh	UINT32	x10	kWh
5382	RO	VM6 kvarh	UINT32	x10	karh
5384	RO	VM6 kVAh	UINT32	x10	kVAh
5386	RO	VM7 kWh	UINT32	x10	kWh
5388	RO	VM7 kvarh	UINT32	x10	karh
5390	RO	VM7 kVAh	UINT32	x10	kVAh
5392	RO	VM8 kWh	UINT32	x10	kWh
5394	RO	VM8 kvarh	UINT32	x10	karh
5396	RO	VM8 kVAh	UINT32	x10	kVAh
5398	RO	VM9 kWh	UINT32	x10	kWh
5400	RO	VM9 kvarh	UINT32	x10	karh
5402	RO	VM9 kVAh	UINT32	x10	kVAh
5404	RO	VM10 kWh	UINT32	x10	kWh
5406	RO	VM10 kvarh	UINT32	x10	karh
5408	RO	VM10 kVAh	UINT32	x10	kVAh

Table 5-48 VM Energy Measurements

5.7.3 VM Tariff Energy Measurements

The VM Tariff Energy registers have been added since Firmware V1.00.10.

Register	Property	Description	Format	Scale	Unit
52900	RO	VM1 T1 kWh	UINT32	x10	kWh
52902	RO	VM1 T1 kvarh	UINT32	x10	kvarh
52904	RO	VM1 T1 kVAh	UINT32	x10	kVAh
52906	RO	VM2 T1 kWh	UINT32	x10	kWh
52908	RO	VM2 T1 kvarh	UINT32	x10	kvarh
52910	RO	VM2 T1 kVAh	UINT32	x10	kVAh

...	RO	..	UINT32		
52954	RO	VM10 T1 kWh	UINT32	x10	kWh
52956	RO	VM10 T1 kvarh	UINT32	x10	kvarh
52958	RO	VM10 T1 kVAh	UINT32	x10	kVAh
52960	RO	VM1 T2 kWh	UINT32	x10	kWh
52962	RO	VM1 T2 kvarh	UINT32	x10	kvarh
52964	RO	VM1 T2 kVAh	UINT32	x10	kVAh
52966	RO	VM2 T2 kWh	UINT32	x10	kWh
52968	RO	VM2 T2 kvarh	UINT32	x10	kvarh
52970	RO	VM2 T2 kVAh	UINT32	x10	kVAh
...	RO	...	UINT32		
53014	RO	VM10 T2 kWh	UINT32	x10	kWh
53016	RO	VM10 T2 kvarh	UINT32	x10	kvarh
53018	RO	VM10 T2 kVAh	UINT32	x10	kVAh

Table 5-49 VM Tariff Energy

5.8 Setup Parameters

5.8.1 System Parameters

Register	Property	Description	Format	Range/Note/Default*
6000	RW	Panel Mode	UINT16	0 = Single Panel Mode I* 1 = Single Panel Mode II 2 = Dual Panel Mode I 3 = Dual Panel Mode II 4 = Custom^
6001	*RW*	*Nominal Uln Voltage*	*UINT16*	*Valid for Firmware V1.00.09 or before & obsoleted in Firmware V1.00.10 or later and replaced by Mains-I/II PT Secondary (Registers 6043 & 6046)*
6002	RW	Nominal Frequency	UINT16	0 = 50Hz*, 1 = 60Hz
6003	RW	Mains-II Wiring Mode	UINT16	0 = WYE*, 1 = Delta, 2 = 1P3W
6004	RW	Mains-I CT Ratio.	UINT16	1A: 1* to 30000, 5A: 1* to 6000
6005	RW	Mains-I I4 CT Ratio	UINT16	1* to 10000
6006	RW	Mains-II CT Ratio	UINT16	1A: 1* to 30000, 5A: 1* to 6000
6007	RW	Mains-II I4 CT Ratio	UINT16	1* to 10000
6008	RW	Mains CT Ploarity[1]	Bitmap	0* to 255
6009	RW	Power Factor Convention[2]	UINT16	0 = IEC*, 1 = IEEE, 2 = -IEEE
6010	RW	kVA Calculation[3]	UINT16	0 = Vector*, 1 = Scalar
6011	RW	Demand Period	UINT16	1/2/3/5/10/15*/30/60 (min)
6012	RW	Number of Sliding Windows	UINT16	1* to 15
6013	RW	SMTP Alarm Email Enable	UINT16	0 = Disabled*, 1 = Enabled
6014	RW	Time Zone[4]	UINT16	0 to 32, 26*
6015	RW	System Language	UINT16	0 = Simplified Chinese, 1 = English* 2 = Traditional Chinese
6016	RW	DI1 Debounce	UINT16	1 to 9999 (ms), 20*
6017	RW	DI2 Debounce	UINT16	
6018	RW	DO1 Trigger Mode	UINT16	0 = None* 1 = Mains-I Instantaneous Alarm 2 = Mains-II Instantaneous Alarm 3 = Global Total Instantaneous Alarm 4 = Mains-I Latched Alarm 5 = Mains-II Latched Alarm 6 = Global Latched Alarm 7 = Voltage-I Phase Reversal Instantaneous Alarm^ 8 = Voltage-II Phase Reversal Instantaneous Alarm^ 9 = Voltage-I Phase Loss Instantaneous Alarm^ 10 = Voltage-II Phase Loss Instantaneous Alarm^ 11 = RTD1 Instantaneous Alarm^ 12 = RTD2 Instantaneous Alarm^ 13 = DI1 Instantaneous Alarm^ 14 = DI2 Instantaneous Alarm^ 15 = DI3 Instantaneous Alarm[5]^
6019	RW	DO2 Trigger Mode	UINT16	

				16 = DI4 Instantaneous Alarm[5]^
6020	RW	Mains-I Wiring Mode	UINT16	0 = WYE*, 1 = 1P3W 2 = Demo, 3 = Delta^
6021	RW	Self-Read Time[6]	UINT16	0* to 2823, 0xFFFF
6022	RW	Date Format	UINT16	0 = YYYY/MM/DD* 1 = MM/DD/YYYY 2 = DD/MM/YYYY
6023	RW	DI Module #1 Debounce#	UINT16	1 to 9999 (ms), 20*
6024	RW	DI Module #2 Debounce#	UINT16	
6025	RW	DI Module #3 Debounce#	UINT16	
6026	RW	DI Module #4 Debounce#	UINT16	
6027	RW	Ext. DI Module #1 Excitation Source#	UINT16	0*=DC, 1=AC
6028	RW	Ext. DI Module #2 Excitation Source#	UINT16	
6029	RW	Ext. DI Module #3 Excitation Source#	UINT16	
6030	RW	Ext. DI Module #4 Excitation Source#	UINT16	
6031-6034	RW	Reserved	UINT16	
6035	RW	Phase A Color[7]#	UINT16	1-8, 2*
6036	RW	Phase B Color[7]#	UINT16	1-8, 4*
6037	RW	Phase C Color[7]#	UINT16	1-8, 6*
6038	RW	Phase N Color[7]#	UINT16	1-8, 8*
6039	RW	DI3 Debounce[8]~	UINT16	1 to 9999 (ms), 20*
6040	RW	DI4 Debounce[8]~	UINT16	
6041	RW	Mains-I PT Primary[9]^ (Should be specified as Line Voltage)	UINT32	1 to 1,000,000, 380V*
6043	RW	Mains-I PT Secondary[9]^ (should be specified as Line Voltage)	UINT16	1 to 480V, 380V*
6044	RW	Mains-II PT Primary[9]^ (Should be specified as Line Voltage)	UINT32	1 to 1,000,000, 380V*
6046	RW	Mains-II PT Secondary[9]^ (Should be specified as Line Voltage)	UINT16	1 to 480V, 380V*
6047	RW	Branch CT's Mains[10]^	UINT16	0 to 15, 12*
6048	RW	Tariff Switch[11]^	UINT16	0 = Disabled* 1 = DI1, 2 = DI2, 3 = DI3, 4 = DI4

Available in Firmware V1.00.03 or later
~ Available in Firmware V1.00.08 or later
^ Available in Firmware V1.00.10 or later

Table 5-50 Basic Setup Parameters

Notes:

1) The **Mains CT Polarity** register indicates the various Mains current polarities with a bit value of 0 meaning normal and 1 meaning reverse. The following table illustrates the details of the **Mains CT Polarity** register.

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Mains-I Current Polarity	Mains-I Ia	Mains-I Ib	Mains-I Ic	Mains-I I4
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Mains-II Current Polarity	Mains-II Ia	Mains-II Ib	Mains-II Ic	Mains-II I4
Bit	**Bits 8 - 15**			
	Reserved			

Table 5-51 Mains CT Polarity Register (Reg. # 6008)

2) P.F. Convention: -IEEE is the same as IEEE but with the opposite sign.

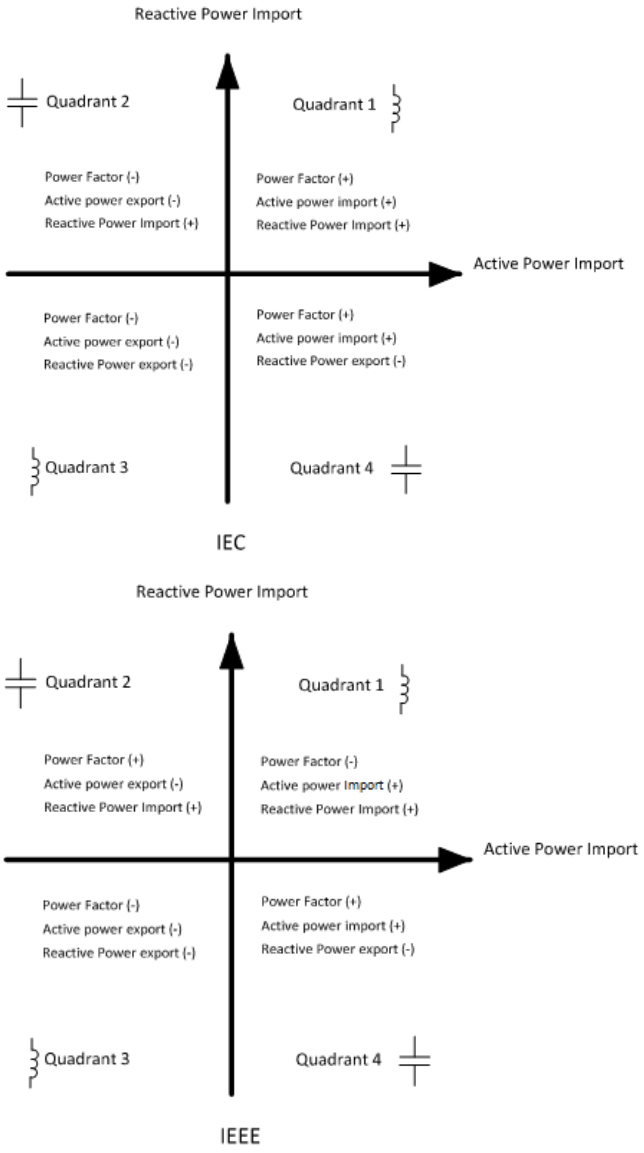


Figure 5-1 Power Factor Definitions

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 = kVAa + kVAb + kVAc**

4) The following table lists the supported Time Zones:

Code	Time Zone	Code	Time Zone	Code	Time Zone
0	GMT-12:00	**11**	GMT-2:00	**22**	GMT+5:45
1	GMT-11:00	**12**	GMT-1:00	**23**	GMT+6:00
2	GMT-10:00	**13**	GMT-0:00	**24**	GMT+6:30
3	GMT-9:00	**14**	GMT+1:00	**25**	GMT+7:00
4	GMT-8:00	**15**	GMT+2:00	**26**	GMT+8:00
5	GMT-7:00	**16**	GMT+3:00	**27**	GMT+9:00
6	GMT-6:00	**17**	GMT+3:30	**28**	GMT+9:30
7	GMT-5:00	**18**	GMT+4:00	**29**	GMT+10:00
8	GMT-4:00	**19**	GMT+4:30	**30**	GMT+11:00
9	GMT-3:30	**20**	GMT+5:00	**31**	GMT+12:00
10	GMT-3:00	**21**	GMT+5:30	**32**	GMT+13:00

Table 5-52 Time Zones

5) DI 3 and DI 4 Instantaneous Alarm are valid only if the PMC-592 is equipped with 4xDIs options.

6) **Self-Read Time** is applied to Max Demand Log and Max/Min Log. There are two types of **Self-Read Time**:

- A zero value 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 2812 means that the Max Demand of Current Month will be transferred to the Max Demand of Last Month register at 12:00pm on the 28th day of each month.

7) **Phase x Color** used to display waveform by each phase on the Web Interface or HMI. When the wiring mode is Delta, Uab, Ubc and Uca corresponds to Phase A, Phase B and Phase C, respectively.

Code	Color	Code	Color	Code	Color
1	Brown	**4**	Yellow	**7**	Gray
2	Red	**5**	Green	**8**	Black
3	Orange	**6**	Blue		

Table 5-53 Phase Color

8) If the PMC-592 isn't equipped with the optional DI3 and DI4, the DI3 and DI4 Debounce registers will be reserved.

9) The value of [PT Primary/PT Secondary] cannot exceed 10000.

10) The **Branch CT's Mains** is only meaningful when the **Panel Mode** is set to **Custom**. The table below illustrates the details of the **Branch CT's Mains** with 0 and 1 meaning Mains-I and Mains-II, respectively.

Bit	Bit 3	Bit 2	Bit 1	Bit 0
Branch	Branch D	Branch C	Branch B	Branch A

Table 5-54 Branch CT's Mains (Reg. # 6047)

11) The table below illustrates the relationship between Tariff and DI status. Only one DI can be set as a Tariff Switch.

Tariff Switch Mode	DIx Status	Tariff
Disabled	None	None
DIx	Inactive	T1
	Active	T2

Table 5-55 Tariff Switch Mode

5.8.2 Communications Setup

Register	Property	Description	Format	Range/Note/Default*
6240	RW	Port 1 unit ID	UINT16	1 to 247, 100*
6241	RW	Port 1 Baud rate	UINT16	0 = 1200, 1 = 2400, 2 = 4800, 3 = 9600, 4 = 19200, 5 = 38400*
6242	RW	Port 1 Configuration	UINT16	0 = 8N2, 1 = 8O1, 2 = 8E1* 3 = 8N1, 4 = 8O2, 5 = 8E2
6243	RW	Port 2 unit ID	UINT16	1 to 247, 101*
6244	RW	Port 2 Baud rate	UINT16	0 = 1200, 1 = 2400, 2 = 4800 3 = 9600, 4 = 19200, 5 = 38400*
6245	RW	Port 2 Configuration	UINT16	0 = 8N2, 1 = 8O1, 2 = 8E1* 3 = 8N1, 4 = 8O2, 5 = 8E2
6246	RW	IP Address(H)	UINT16	If the IP Address is 192.168.0.100, write "0xC0A80064" to this register. (Default = 192.168.0.100)
6247	RW	IP Address(L)	UINT16	
6248	RW	Subnet mask(H)	UINT16	If the Subnet Mask is 255.255.255.0, write "0xFFFFFF00" to this register. (Default = 255.255.255.0)
6249	RW	Subnet mask(L)	UINT16	
6250	RW	Gateway Address(H)	UINT16	If the IP Address is 192.168.0.1, write "0xC0A80201" to this register. (Default = 192.168.2.1)
6251	RW	Gateway Address(L)	UINT16	
6252	RW	SNTP Enable	UINT16	0 = Disabled*, 1 = Enabled
6253	RW	SNTP Time Sync. Interval[1]	UINT16	10 to 1440 (min), 60*
6254	RW	SNTP Server IP Address (H)	UINT16	If address is 192.168.0.100, write "0xC0A80064" to this register (Default = 192.168.0.100)
6255	RW	SNTP Server IP Address (L)	UINT16	
6256	RW	SMTP Server IP Address (H)	UINT16	If address is 191.0.0.6, write "0XBF000006" to this register (Default = 191.0.0.6)
6257	RW	SMTP Server IP Address (L)	UINT16	
6258-6297	RW	SMTP Sender Username	UINT16X40	See Note (2)
6298-6337	RW	SMTP Login Password	UINT16X40	See Note (3)
6338-6377	RW	SMTP Receiver Email Address	UINT16X40	See Note (4)
6378	RW	TRAP Event Subscription[5]	Bitmap	0* to 31
6379	RW	TRAP Event Subscriber IP Address (H)	UINT16	0*
6380	RW	TRAP Event Subscriber IP Address (L)	UINT16	

6381	RW	P2 Operating Mode~	UINT16	0=Modbus RTU* 1=External DI Module
6382	RW	Number of External DI Modules~	UINT16	0* to 4
6383	RW	DI Module #1 ID~	UINT16	1 to 247, 100*
6384	RW	DI Module #2 ID~	UINT16	
6385	RW	DI Module #3 ID~	UINT16	
6386	RW	DI Module #4 ID~	UINT16	
6387	RW	HTTP Port^	UINT16	1 to 65535, 80*
6388	RW	MODBUS TCP Port^	UINT16	1 to 65535, 502*
6389	RW	MODBUS RTU Port^	UINT16	1 to 65535, 27011*
51800-51839	RW	SMTP Sender Email Address	UINT16X40	See Note (6)

~ Available in Firmware V1.00.03 or later, # Available in Firmware 1.00.08 or later, ^ Available in Firmware 1.00.10 or later

Table 5-56 Communication Setup

Notes:

1) The synchronization Interval should be set between 10 and 1440 minutes.

2) This string register specifies the username that login the "**Sender Email**" account. This string may be up to 40 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, if the username is "example", set the registers as "00 65 00 78 00 61 00 6D 00 70 00 6C 00 65 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00".

3) This string register specifies the Password to login the "**Sender Email**" account. This string may be up to 40 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, if the password is "example", set the registers as "00 65 00 78 00 61 00 6D 00 70 00 6C 00 65 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00".

4) This string register specifies the destination email address that appears in the "To" field of the email. This string may be up to 40 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, if the email address is receiver@example.com, so set the registers as"00 72 00 65 00 63 00 65 00 69 00 76 00 65 00 72 00 40 00 65 00 78 00 61 00 6D 00 70 00 6C 00 65 00 2E 00 63 00 6F 00 6D".

5) The **SNMP Event Subscription** register indicates which SOE will be send out by Trap format with a bit value of 1 meaning send out by trap.

Bit	Bits 5 - 15	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SOE	Reserved	Self-test Events	Operation Events	Setpoint Events	DO Events	DI Events

Table 5-57 SNMP Event Subscription (Reg. # 6378)

6) This string register specifies the source email address that appears in the "From" field of the email. This string may be up to 40 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, if the email address is sender@example.com, set the registers as"00 73 00 65 00 6E 00 64 00 65 00 72 00 40 00 65 00 78 00 61 00 6D 00 70 00 6C 00 65 00 2E 00 63 00 6F 00 6D 00 00 00 00".

5.8.3 SM Name Setup

Register	Property	Description	Format	Note
6050-6069	RW	Meter Model[1]	UINT16x20	ASCII
6070-6089	RW	Mains-I Name	UINT16x20	
6090-6109	RW	Mains-II Name	UINT16x20	
50000-50019	RW	SM1 Name	UINT16x20	
50020-50039	RW	SM2 Name	UINT16x20	
….		….		
51660-51679	RW	SM84 Name	UINT16x20	
52000-52019	RW	VM1 Name	UINT16x20	
52020-52039	RW	VM2 Name	UINT16x20	
…	RW	…		
52180-52199	RW	VM3 Name	UINT16x20	

Table 5-58 SM Name Register

Notes:

1) The Meter Model appears in registers 6050 to 6069 and contains the ASCII encoding of the string "PMC-592" as shown in the following table.

Register	Value(Hex)	ANSCII
6050	0x50	P
6051	0x4D	M
6052	0x43	C
6053	0x2D	-
6054	0x35	5
6055	0x39	9
6056	0x32	2

6057-6569	0x20	<Null>

Table 5-59 ASCII Encoding of "PMC-592"

5.8.4 Breakers Rating Setup

Register	Property	Description	Format	Range/Default*
6150	RW	Mains-I Breaker Rating	UINT16	1 to 10,000A 500A*
6151	RW	Mains-I I4 Current Rating	UINT16	
6152	RW	Mains-II Breaker Rating	UINT16	
6153	RW	Mains-II I4 Current Rating	UINT16	
6154	RW	SM1 Breaker Rating	UINT16	1 to 10,000A 60A*
6155	RW	SM2 Breaker Rating	UINT16	
....		....		
6237	RW	SM84 Breaker Rating	UINT16	

Table 5-60 Breaker Rating Setup Register

5.8.5 Alarm Setup

Register	Property	Description	Format	Range/Options/Default*
6390	RW	Universal Hysteresis[1]	UINT16	0 to 100 (x0.1%), 20*
6391	RW	Current Alarm ON Threshold[2]	UINT16	0 to 100 (x0.1%), 50*
6392	RW	Current Alarm ON Time Delay	UINT16	0 to 9999 (s), 10s*
6393	RW	Current Alarm OFF Time Delay	UINT16	0 to 9999 (s), 30s*
6394	RW	Current OFF Alarm Enable^	UINT16	0=Disabled*, 1=Enabled
6403	RW	Current Alarm Enable[3]	Bitmap	Note 3
6404	RW	Current HH Alarm Threshold	UINT16	0 to 1000, 800*
6405	RW	Current HH Alarm Time Delay	UINT16	0 to 9999 (s), 10s*
6406	RW	Current H Alarm Threshold	UINT16	0 to 1000, 600*
6407	RW	Current H Alarm Time Delay	UINT16	0 to 9999 (s), 10s*
6408	RW	Current L Alarm Threshold	UINT16	0* to 1000
6409	RW	Current L Alarm Time Delay	UINT16	0* to 9999 (s)
6410	RW	Current LL Alarm Threshold	UINT16	0* to 1000
6411	RW	Current LL Alarm Time Delay	UINT16	0* to 9999 (s)
6412	RW	ULN Alarm Enable[4]	Bitmap	0 = Disabled*, 1 = Enabled
6413	RW	ULN H Alarm Threshold	UINT16	0* to 3000 (x0.1)
6414	RW	ULN H Alarm Time Delay	UINT16	0* to 9999 (s)
6415	RW	ULN L Alarm Threshold	UINT16	0* to 3000 (x0.1)
6416	RW	ULN L Alarm Time Delay	UINT16	0* to 9999 (s)
6417	RW	ULL Alarm Enable[5]	Bitmap	0 = Disabled*, 1 = Enabled
6418	RW	ULL H Alarm Threshold	UINT16	0* to 5000 (x0.1)
6419	RW	ULL H Alarm Time Delay	UINT16	0* to 9999 (s)
6420	RW	ULL L Alarm Threshold	UINT16	0* to 5000 (x0.1)
6421	RW	ULL L Alarm Time Delay	UINT16	0* to 9999 (s)
6422	RW	Power Alarm Enable[6]	Bitmap	0 = Disabled*, 1 = Enabled
6423	RW	kW Total H Alarm Threshold[7]	UINT16	0* to 1000(x0.1)
6424	RW	kW Total H Alarm Time Delay	UINT16	0* to 9999(s)
6425	RW	kW Total L Alarm Threshold	UINT16	0* to 1000(x0.1)
6426	RW	kW Total L Alarm Time Delay	UINT16	0* to 9999(s)
6427	RW	kvar Total H Alarm Threshold	UINT16	0* to 1000(x0.1)
6428	RW	kvar Total H Alarm Time Delay	UINT16	0* to 9999(s)
6429	RW	kvar Total L Alarm Threshold	UINT16	0* to 1000(x0.1)
6430	RW	kvar Total L Alarm Time Delay	UINT16	0* to 9999(s)
6431	RW	kVA Total H Alarm Threshold	UINT16	0* to 1000(x0.1)
6432	RW	kVA Total H Alarm Time Delay	UINT16	0* to 9999(s)
6433	RW	kVA Total L Alarm Threshold	UINT16	0* to 1000(x0.1)
6434	RW	kVA Total L Alarm Time Delay	UINT16	0* to 9999(s)
6435	RW	PF Total Alarm Enable[6]	Bitmap	0 = Disabled*, 1 = Enabled
6436	RW	PF Total H Alarm Threshold	UINT16	0* to 1000(x0.001)
6437	RW	PF Total H Alarm Time Delay	UINT16	0* to 9999(s)
6438	RW	PF Total L Alarm Threshold	UINT16	0* to 1000(x0.001)
6439	RW	PF Total L Alarm Time Delay	UINT16	0* to 9999(s)
6440	RW	Frequency H Alarm Threshold	UINT16	4500 to 6500*(x0.01)
6441	RW	Frequency H Alarm Time Delay	UINT16	0 to 9999(s), 10*
6442	RW	Frequency L Alarm Threshold	UINT16	4500* to 6500 (x0.01)
6443	RW	Frequency L Alarm Time Delay	UINT16	0 to 9999 (s), 10s*
6444	RW	I Demand Alarm Enable[6]	Bitmap	0 = Disabled*, 1 = Enabled

6445	RW	I Demand HH Alarm Threshold	UINT16	0* to 1000 (x0.1)
6446	RW	I Demand HH Alarm Time Delay	UINT16	0* to 9999 (s)
6447	RW	I Demand H Alarm Threshold	UINT16	0* to 1000 (x0.1)
6448	RW	I Demand H Alarm Time Delay	UINT16	0* to 9999 (s)
6449	RW	I Demand L Alarm Threshold	UINT16	0* to 1000 (x0.1)
6450	RW	I Demand L Alarm Time Delay	UINT16	0* to 9999 (s)
6451	RW	I Demand LL Alarm Threshold	UINT16	0* to 1000 (x0.1)
6452	RW	I Demand LL Alarm Time Delay	UINT16	0* to 9999 (s)
6453	RW	Power Demand Alarm Enable[6]	Bitmap	0 = Disabled*, 1 = Enabled
6454	RW	kW Total Demand H Alarm Threshold	UINT16	0* to 1000 (x0.1)
6455	RW	kW Total Demand H Alarm Time Delay	UINT16	0* to 9999 (s)
6456	RW	kW Total Demand L Alarm Threshold	UINT16	0* to 1000 (x0.1)
6457	RW	kW Total Demand L Alarm Time Delay	UINT16	0* to 9999 (s)
6458	RW	kvar Total Demand H Alarm Threshold	UINT16	0* to 1000 (x0.1)
6459	RW	kvar Total Demand H Alarm Time Delay	UINT16	0* to 9999 (s)
6460	RW	kvar Total Demand L Alarm Threshold	UINT16	0* to 1000 (x0.1)
6461	RW	kvar Total Demand L Alarm Time Delay	UINT16	0* to 9999 (s)
6462	RW	kVA Total Demand H Alarm Threshold	UINT16	0* to 1000 (x0.1)
6463	RW	kVA Total Demand H Alarm Time Delay	UINT16	0* to 9999 (s)
6464	RW	kVA Total Demand L Alarm Threshold	UINT16	0* to 1000(x0.1)
6465	RW	kVA Total Demand L Alarm Time Delay	UINT16	0* to 9999 (s)
6466	RW	RTD1 HH Alarm Threshold	UINT16	0* to 200
6467	RW	RTD1 HH Alarm Time Delay	UINT16	0* to 9999 (s)
6468	RW	RTD1 H Alarm Threshold	UINT16	0* to 200
6469	RW	RTD1 H Alarm Time Delay	UINT16	0* to 9999 (s)
6470	RW	RTD2 HH Alarm Threshold	UINT16	0* to 200
6471	RW	RTD2 HH Alarm Time Delay	UINT16	0* to 9999 (s)
6472	RW	RTD2 H Alarm Threshold	UINT16	0* to 200
6473	RW	RTD2 H Alarm Time Delay	UINT16	0* to 9999 (s)
6474	RW	I Unbalance Alarm Enable[8]	Bitmap	0 = Disabled*, 1 = Enabled
6475	RW	I Unbalance H Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6476	RW	I Unbalance H Alarm Time Delay	UINT16	0* to 9999 (s)
6477	RW	U Unbalance Alarm Enable[8]	Bitmap	0 = Disabled*, 1 = Enabled
6478	RW	U Unbalance H Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6479	RW	U Unbalance H Alarm Time Delay	UINT16	0* to 9999 (s)
6480	RW	Harmonic Distortion Alarm Enable[9]	Bitmap	0 = Disabled*, 1 = Enabled
6481	RW	THD H Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6482	RW	THD H Alarm Time Delay	UINT16	0* to 9999 (s)
6483	RW	TOHD H Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6484	RW	TOHD H Alarm Time Delay	UINT16	0* to 9999 (s)
6485	RW	TEHD H Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6486	RW	TEHD H Alarm Time Delay	UINT16	0* to 9999 (s)
6487	RW	DI1 Alarm Configuration	UINT16	0 = Disabled 1 = DI1 Open Trigger 2 = DI1 Closed Trigger
6488	RW	DI1 Alarm Time Delay	UINT16	0* to 9999 (s)
6489	RW	DI2 Alarm Configuration	UINT16	0* = Disabled 1 = DI2 Open Trigger 2 = DI2 Closed Trigger
6490	RW	DI2 Alarm Time Delay	UINT16	0* to 9999 (s)
6491	RW	Dip/Swell Alarm Enable#[10]	Bitmap	0 = Disabled, 1 = Enabled*
6492	RW	Swell Alarm Threshold#	UINT16	101% to 200%, 110%*
6493	RW	Dip Alarm Threshold#	UINT16	1% to 99%, 90%*
6494	RW	Interruption Alarm Threshold#	UINT16	0% to 50%, 10%*
6495	RW	Swell Hysteresis#	UINT16	0 to 1000 (x0.1%), 20*
6496	RW	Dip Hysteresis#	UINT16	0 to 1000 (x0.1%), 20*
6497	RW	Interruption Hysteresis#	UINT16	0 to 1000 (x0.1%), 20*
6498	RW	Phase Reversal Alarm Enable#[11]	Bitmap	0 = Disabled*, 1 = Enabled
6499	RW	Phase Loss Alarm Enable#[12]	Bitmap	0 = Disabled*, 1 = Enabled
6500	RW	Phase Loss Alarm Time Delay#	UINT16	0 to 9999(s), 10s*
6501	RW	DI3~ Alarm Configuration[13]	UINT16	0 = Disabled* 1 = DI3 Open Trigger 2 = DI3 Closed Trigger
6502	RW	DI3~ Alarm Time Delay[13]	UINT16	0* to 9999 (s)
6503	RW	DI4~ Alarm Configuration[13]	UINT16	0 = Disabled* 1 = DI4 Open Trigger

				2 = DI4 Closed Trigger
6504	RW	DI4~ Alarm Time Delay[13]	UINT16	0* to 9999 (s)

Available in Firmware V1.00.05 or later. ~ Available in Firmware V1.00.08 or later. ^ Available in Firmware V1.00.10 or later

Table 5-61 Alarm Setup Parameters

Notes:

1) The calculation method **Universal Hysteresis** is listed below:

$$\text{Universal Hysteresis} = \frac{\left|\text{Alarm Threshold} - \text{Alarm Return Threshold}\right|}{\text{Alarm Threshold}} \times 100\%$$

2) Current Alarm ON value = Breaker Rating x **Current Alarm ON Threshold**

3) The following table illustrates the details of the **Current Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 3 - 15	Bit 2	Bit 1	Bit 0
Current Alarm Enable	Reserved	Branch Current	Mains-II Current	Mains-I Current

Table 5-62 Current Alarm Enabled Register (Reg. # 6403)

4) The following table illustrates the details of the **ULN Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 2 - 15	Bit 1	Bit 0
ULN Alarm Enable	Reserved	Mains-II ULN	Mains-I ULN

Table 5-63 ULN Alarm Enabled Register (Reg. # 6412)

5) The following table illustrates the details of the **ULL Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 2 - 15	Bit 1	Bit 0
ULL Alarm Enable	Reserved	Mains-II ULL	Mains-I ULL

Table 5-64 ULL Alarm Enabled Register (Reg. # 6417)

6) The following table illustrates the details of the **Power/PF/I Demand and Power Demand Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 2 - 15	Bit 1	Bit 0
Power/PF/I Demand/Power Demand Alarm Enable	Reserved	Mains-II	Mains-I

Table 5-65 Power/PF/I Demand and Power Demand Alarm Enabled

7) kW H Alarm Threshold is a percentage of the 3-Ø Power rating. If the H Alarm Threshold is 10%, the rated voltage is 220V and the Breaker Rating is 100A, then the kW H Alarm setting = 220 * 100 * 3 * 10% = 6600W = 6.6kW

8) The following table illustrates the details of the **U/I Unbalance Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 2 - 15	Bit 1	Bit 0
U/I Unbalance Alarm Enable	**Reserved**	**Mains-II U/I Unbalance**	**Mains-I U/I Unbalance**

Table 5-66 U/I Unbalance Alarm Enabled

9) The following table illustrates the details of the **Harmonic Distortion Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 4 - 15	Bit 3	Bit 2	Bit 1	Bit 0
THD/TOHD/TEHD Alarm Enable	Reserved	Mains-II U	Mains-II I	Mains-I U	Mains-I I

Table 5-67 Harmonic Distortion Alarm Enabled (Reg. # 6480)

10) The following table illustrates the details of the **Dip/Swell Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 2 - 15	Bit 1	Bit 0
Dips/Swells Alarm Enable	Reserved	Mains-II Voltage Dip/Swell	Mains-I Voltage Dip/Swell

Table 5-68 Dips/Swells Alarm Enabled (Reg. # 6491)

11) The following table illustrates the details of the **Phase Reversal Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 4 - 15	Bit 3	Bit 2	Bit 1	Bit 0
Phase Reversal Alarm Enable	Reserved	Mains-II U	Mains-II I	Mains-I U	Mains-I I

Table 5-69 Phase Reversal Alarm Enabled (Reg. # 6498)

12) The following table illustrates the details of the **Phase Loss Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 2 - 15	Bit 1	Bit 0
Phase loss Alarm Enable	Reserved	Mains-II	Mains-I

Table 5-70 Phase loss Alarm Enabled (Reg. # 6499)

13) DI3 and DI4 Alarm setup parameters are only meaningful when the PMC-592 is equipped with the 4xDIs option.

5.8.6 Branch Setup Parameters

5.8.6.1 CT Strip Mode, Polarity, Installation Direction and Phase Setup

Register	Property	Description	Format	Range/Options/Default*
6520	RW	CT Strip Mode	UINT16	0 = Sequential Mode* 1 = Cross-over Mode
6521	RW	CT Strip A Polarity	UINT16	0 = Normal*, 1 = Reversed Valid for Firmware V1.00.09 or earlier Obsoleted since Firmware V1.00.10
6522	RW	CT Strip B Polarity	UINT16	
6523	RW	CT Strip C Polarity	UINT16	
6524	RW	CT Strip D Polarity	UINT16	
6525	RW	CT Strip A Installation Direction	UINT16	0 = Top* 1 = Bottom
6526	RW	CT Strip B Installation Direction	UINT16	
6527	RW	CT Strip C Installation Direction	UINT16	
6528	RW	CT Strip D Installation Direction	UINT16	
6529	RW	SM1 CT Phase (Voltage Phase)	UINT16	0 = Not Used 1 = Phase A* 2 = Phase B 3 = Phase C 4 = Phase AB# 5 = Phase BC# 6 = Phase CA#
6530	RW	SM2 CT Phase (Voltage Phase)	UINT16	
6531	RW	SM3 CT Phase (Voltage Phase)	UINT16	
6532	RW	SM4 CT Phase (Voltage Phase)	UINT16	
6533	RW	SM5 CT Phase (Voltage Phase)	UINT16	
6534	RW	SM6 CT Phase (Voltage Phase)	UINT16	
....		....		
6549	RW	SM21 CT Phase (Voltage Phase)	UINT16	
6550	RW	SM22 CT Phase (Voltage Phase)	UINT16	
....		....		
6570	RW	SM42 CT Phase (Voltage Phase)	UINT16	
6571	RW	SM43 CT Phase (Voltage Phase)	UINT16	
....		....		
6591	RW	SM63 CT Phase (Voltage Phase)	UINT16	
6592	RW	SM64 CT Phase (Voltage Phase)	UINT16	
....		....		
6612	RW	SM84 CT Phase (Voltage Phase)	UINT16	

Available in firmware V1.00.06 or later.

Table 5-71 Voltage Phase Parameters Setup

5.8.6.2 SM CT Ratio Setup

The SM CT Ratio registers have been added since Firmware V1.00.04.

Register	Property	Description	Format	Range/Options
6614	RW	SM1 CT Ratio	UINT16	1-400 Default=1
6615	RW	SM2 CT Ratio	UINT16	
6616	RW	SM3 CT Ratio	UINT16	
6617	RW	SM4 CT Ratio	UINT16	
...	...	...	UINT16	
6697	RW	SM84 CT Ratio	UINT16	

Table 5-72 SM Ratio Setup

5.8.6.3 SM CT Setup

Register	Property	Description	Format	Range/Options
6800	RW	SM1 CT Type	UINT16	0 = Solid* 1 = Split
6801	RW	SM2 CT Type	UINT16	
6802	RW	SM3 CT Type	UINT16	
6803	RW	SM4 CT Type	UINT16	
...	...	...	UINT16	
6883	RW	SM84 CT Type	UINT16	
6884	RW	SM1 CT Polarity	UINT16	0 = Normal*

6885	RW	SM2 CT Polarity	UINT16	1 = Reversed
6889	RW	SM3 CT Polarity	UINT16	
6887	RW	SM4 CT Polarity	UINT16	
…		…		
6967	RW	SM84 CT Polarity	UINT16	

Table 5-73 SM CT Setup

5.8.6.4 2-Ø and 3-Ø SM Customization Setup

Register	Property	Description		Format	Range/Options
52300	RW	SM Customization Enable		UINT16	0 =Disabled*, 1 = Enabled
52301~52302	RW	2-Ø SM1 Parameters	+0: 1-Ø SM #x	UINT16x2	x: 1 to 84
			+1: 1-Ø SM #y	UINT16x2	y: 1 to 84
52303~52304	RW	2-Ø SM2 Parameters		UINT16x2	See 2-Ø SM1 Parameters
52305~52306	RW	2-Ø SM3 Parameters		UINT16x2	
…	…	…		UINT16x2	
52383~52384	RW	2-Ø SM42 Parameters		UINT16x2	
52385~52387	RW	3-Ø SM1 Buffer	+0: 1-Ø SM #x	UINT16x3	x: 1 to 84
			+1: 1-Ø SM #y	UINT16x3	y: 1 to 84
			+2: 1-Ø SM #z	UINT16x3	z: 1 to 84
52388~52390	RW	3-Ø SM2 Parameters		UINT16x3	See 3-Ø SM1 Parameters
52391~52393	RW	3-Ø SM3 Parameters		UINT16x3	
…	…	…		…	
52466~52468	RW	3-Ø SM28 Parameters		UINT16x3	

Table 5-74 2-Ø and 3-Ø SM Customization

5.8.7 VM (Virtual Meter) Setup

5.8.7.1 VM Configuration

Register	Property	Description	Format	Range/Options
6700-6705	RW	VM1 Configuration	UINT16	See Note 1) VM Configuration Data Structure
6706-6711	RW	VM2 Configuration	UINT16	
6712-6717	RW	VM3 Configuration	UINT16	
6718-6723	RW	VM4 Configuration	UINT16	
6724-6729	RW	VM5 Configuration	UINT16	
6730-6735	RW	VM6 Configuration	UINT16	
6736-6741	RW	VM7 Configuration	UINT16	
6742-6747	RW	VM8 Configuration	UINT16	
6748-6753	RW	VM9 Configuration	UINT16	
6754-6759	RW	VM10 Configuration	UINT16	

Table 5-75 Total VM Configuration Group

Notes:

1) VM configuration data structure

Offset	Property	Description	Format	Range/Options/Default*
+0	RW	VM Configuration 1^2	Bitmap	0* to 65535
+1	RW	VM Configuration 2^2	Bitmap	
+2	RW	VM Configuration 3^2	Bitmap	
+3	RW	VM Configuration 4^2	Bitmap	
+4	RW	VM Configuration 5^2	Bitmap	
+5	RW	VM Configuration 6^2	Bitmap	0* to 63

Table 5-76 Total VM Configurations

2) Each Bit indicates if a particular SM is included in a VM's aggregation. Setting a bit to 1 includes a SM or to 0 excludes it in the VM's aggregation. The Virtual Meter configuration is supported through communications, the built-in Web Interface and the optional HMI Display.

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM16	SM15	SM14	…	SM3	SM2	SM1

Table 5-77 VM Configuration 1

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM32	SM31	SM30	…	SM19	SM18	SM17

Table 5-78 VM Configuration 2

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM48	SM47	SM46	…	SM35	SM34	SM33

Table 5-79 VM Configuration 3

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM64	SM63	SM62	…	SM51	SM50	SM49

Table 5-80 VM Configuration 4

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM80	SM79	SM78	…	SM67	SM66	SM65

Table 5-81 VM Configuration 5

Bit	Bit 6 to Bit 15	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SMs	Reserved	Mains-II	Mains-I	SM84	SM83	SM82	SM81

Table 5-82 VM Configuration 6

5.8.7.2 VM Sign Configuration

Register	Property	Description	Format	Range/Options
52700-52705	RW	VM1 Sign Configuration	UINT16	See Note 1) VM Configuration Data Structure
52706-52711	RW	VM2 Sign Configuration	UINT16	
52712-52717	RW	VM3 Sign Configuration	UINT16	
52718-52723	RW	VM4 Sign Configuration	UINT16	
52724-52729	RW	VM5 Sign Configuration	UINT16	
52730-52735	RW	VM6 Sign Configuration	UINT16	
52736-52741	RW	VM7 Sign Configuration	UINT16	
52742-52747	RW	VM8 Sign Configuration	UINT16	
52748-52753	RW	VM9 Sign Configuration	UINT16	
52754-52759	RW	VM10 Sign Configuration	UINT16	

Table 5-83 VM Sign Configurations

Notes:

1) VM Sign configuration data structure

Offset	Property	Description	Format	Range/Options/Default*
+0	RW	VM Configuration 1^2	Bitmap	0* to 65535
+1	RW	VM Configuration 2^2	Bitmap	
+2	RW	VM Configuration 3^2	Bitmap	
+3	RW	VM Configuration 4^2	Bitmap	
+4	RW	VM Configuration 5^2	Bitmap	
+5	RW	VM Configuration 6^2	Bitmap	0* to 63

Table 5-84 VM Configurations

2) Each Bit indicates if the operation for the corresponding SM is Addition or Subtraction. Setting a bit to 0 or 1 means Addition or Subtraction, respectively.

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM16	SM15	SM14	…	SM3	SM2	SM1

Table 5-85 VM Sign Configuration 1

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM32	SM31	SM30	…	SM19	SM18	SM17

Table 5-86 VM Sign Configuration 2

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM48	SM47	SM46	…	SM35	SM34	SM33

Table 5-87 VM Sign Configuration 3

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM64	SM63	SM62	…	SM51	SM50	SM49

Table 5-88 VM Sign Configuration 4

Bit	Bit 15	Bit 14	Bit 13	…	Bit 2	Bit 1	Bit 0
SMs	SM80	SM79	SM78	…	SM67	SM66	SM65

Table 5-89 VM Sign Configuration 5

Bit	Bit 6 to Bit 15	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SMs	Reserved	Mains-II	Mains-I	SM84	SM83	SM82	SM81

Table 5-90 VM Sign Configuration 6

5.8.8 WFR Setup

5.8.8.1 WFR Setup Parameters

Register	Property	Description	Format	Range/Options/Default*
7000	RW	WFR Format (# of Samples/Cycles x #of Cycles)	UINT16	0 = 16x600 3 = 32x150 1 = 16x300 4 = 64x150 2 = 32x300* 5 = 64x75
7001	RW	Pre-fault Cycles[1]	UINT16	1 to 10*
7002	RW	Trigger Setup[2]	UINT16	0~0x003F, 1*

Table 5-91 WFR Setup

Notes:

1) Modifying the Setup Parameters of WFRx will clear the WFRx Log and reset WFRx Pointer will be reset to "0".

2) The following table illustrates the details of the Trigger Setup register.

Bit	6~ 15	5	4	3	2	1	0
Trigger Setup	Reserved	DI Alarm	Freq. Alarm	Power Alarm	Unbalance & Harmonics	U & I Alarm	Dip/Swell

Table 5-92 Trigger Setup

5.8.8.2 WFR File Structure

Register	Property	Description	Format
7500-7519	RW	File Name[1]	Char
7520	RO	File Size	UINT32
7522	RW	File Offset[2]	UINT32
7524	RO	Valid Byte Count[3]	UINT16
7525	RO	File Data Buffer 1[4]	Char
…	RO	…	
7646	RO	File Data Buffer 244[4]	

Table 5-93 WFR Log Structure

Notes:

1) You must read out register 7500 to register 7519 for a time to get the whole **File Name**.

   Writing the path strings what you want to read in **File Name** register, and there are the following strings and XXX represents the file number:

   WFR configuration file: COMTRADE/WXXX.cfg

   WFR data file: COMTRADE/WXXX.dat

   If the WFR **File Name** are WAVE/W001.cfg and WAVE/W001.dat, and their string codes are 0x57,0x41,0x56,0x45,0x2F,0x57,0x30,0x30,0x31,0x2E,0x63,0x66,0x67 and 0x57,0x41,0x56,0x45,0x2F,0x57,0x30,0x30,0x31,0x2E,0x64,0x61,0x74 respectively.

2) **File Offset** register defines the offset of the first byte in the data buffer of the current file, it will automatically adjust the file offset when read the **File Offset** register and it also can adjust to the specific offset by writing a relative number to **File Offset** register.

3) It means that the file transfer completed when the **Valid Byte Count** is 0 and **File Offset** is equivalent to the file size.

4) **File Data Buffer 1** to **File Data Buffer 244** can be up to transfer 244 bytes data every time. And you also need to read out all data buffer for a time to get the whole data.

5.8.9 Interval Energy Recorder Setup

5.8.9.1 IER Setup

Register	Property	Description	Format	Range/Options/Default*
7100	RW	Recording Mode	UINT16	0 = Disabled 1 = Stop-When-Full 2 = First-In-First-Out*
7101	RW	Recording Depth[1]	UINT16	0 to 10000*
7102	RW	Recording Interval	UINT16	0 = 5mins, 1 = 10mins 2 = 15mins*, 3 = 30mins 4 = 60mins

7103	RW	Start Time[2]	High-order Byte: Year	UINT16	0-99 (Year-2000)
			Low-order Byte: Month		1 to 12
7104	RW		High-order Byte: Day	UINT16	1 to 31
			Low-order Byte: Hour		0 to 23
7105	RW		High-order Byte: Minute	UINT16	0 to 59
			Low-order Byte: Second		0 to 59

Table 5-94 IER Setup

Notes:

1) If "**Recording Depth**" is set to "**0**, the IER is disabled.

2) When the current time meets or exceeds the **Start Time**, the IER starts to record.

5.8.9.2 IER Log Control

Modbus Holding Register 7120 is used to specify which IER Log to read from the PMC-592 where the high-order byte represents the Meter Type and the low-order byte represents the Meter Number of a particular Meter Type as illustrated in the following two tables.

Register	Property	Description	Format	Note
7120	RW	High Order - IER Log Meter Type	UINT16	See Note 1)
		Low Order - IER Log Meter Number		

Table 5-95 IER Log Control

Note:

1) As to the 16 bit unsigned value (0xXXXX) which be written to the register, different values have different meanings, the following table illustrates the details.

Key	IER Log Meter Type	IER Log Meter Number	Description
1	0x01 (Mains)	0x01	Mains-I IER Logs(0x0101)
		0x02	Mains-II IER Logs(0x0102)
2	0x02 (1-Ø SM)	0x01	1-Ø SM1 IER Logs (0x0201)
		0x02	1-Ø SM2 IER Logs (0x0202)
		0x03	1-Ø SM3 IER Logs (0x0203)
		....	....
		0x54	1-Ø SM84 IER Logs (0x0254)
3	0x03 (2-Ø SM)	0x01	2-Ø SM1 IER Logs (0x0301)
		0x02	2-Ø SM2 IER Logs (0x0302)
		0x03	2-Ø SM3 IER Logs (0x0303)
		....	....
		0x2A	2-Ø SM42 IER Logs (0x032A)
4	0x04 (3-Ø SM)	0x01	3-Ø SM1 IER Logs (0x0401)
		0x02	3-Ø SM2 IER Logs (0x0402)
		0x03	3-Ø SM3 IER Logs (0x0403)
		....	....
		0x1C	3-Ø SM28 IER Logs (0x041C)
5	0x05 (Total VMx)	0x01	Total VM1 IER Logs (0x0501)
		0x02	Total VM2 IER Logs (0x0502)
		....	....
		0x0A	Total VM10 IER (0x020A)
6	0x06 (Mains T1)	0x01	Mains I T1 Energy Log (0x0601)
		0x02	Mains II T1 Energy Log (0x0602)
7	0x07 (Mains T2)	0x01	Mains I T2 Energy Log (0x0701)
		0x02	Mains II T2 Energy Log (0x0702)
8	0x08 (VM T1)	0x01	VM1 T1 Energy Log (0x0801)
		0x02	VM2 T1 Energy Log (0x0802)
		...	...
		0x0A	VM10 T1 Energy Log (0x080A)
9	0x09 (VM T2)	0x01	VM1 T2 Energy Log (0x0901)
		0x02	VM2 T2 Energy Log (0x0902)
		...	...
		0x0A	VM10 T2 Energy Log (0x090A)

Table 5-96 IER Log

5.8.9.3 IER Log Data Structure

The following tables describe the data structure for the IER Log for the Mains Meters, Sub-Meters and Virtual Meters. The actual energy value is 0.1 times of the register value returned. Each request packet can retrieve up to a maximum of 8 log records from the Mains Meter's IER or 11 log records from the Sub-Meter's/Virtual Meter's IER. For example, it's possible to read

1. 8 records from Mains-I's IER
2. 4 records each from Mains-I's and Mains-II's IERs
3. 1 record each from SM1's to SM8's IERs

Mains Meters (14 registers)

Offset	Property	Description		Format	Scale	Unit
+0	RO	Interval kWh Import		UINT32	x10	kWh
+2	RO	Interval kWh Export		UINT32		
+4	RO	Interval kvarh Import		UINT32	x10	kvarh
+6	RO	Interval kvarh Export		UINT32		
+8	RO	Interval kVAh		UINT32	x10	kVAh
+10	RO	Record Time	High-order Byte: Year	UINT16		0 to 38 (Year-2000)
			Low-order Byte: Month			1 to 12
+11	RO		High-order Byte: Day	UINT16		1 to 31
			Low-order Byte: Hour			0 to 23
+12	RO		High-order Byte: Minute	UINT16		0 to 59
			Low-order Byte: Second			0 to 59
+13	RO		Millisecond	UNIT16		0 to 999

Table 5-97 IER Log Data Structure-Mains Meter

Sub-Meters and Virtual Meters (10 registers)

Offset	Property	Description		Format	Scale	Unit
+0	RO	Interval kWh		UINT32	x10	kWh
+2	RO	Interval kvarh		UINT32		kvarh
+4	RO	Interval kVAh		UINT32	x10	kVAh
+6	RO	Record Time	High-order Byte: Year	UINT16		0 to 38 (Year-2000)
			Low-order Byte: Month			1 to 12
+7	RO		High-order Byte: Day	UINT16		1 to 31
			Low-order Byte: Hour			0 to 23
+8	RO		High-order Byte: Minute	UINT16		0 to 59
			Low-order Byte: Second			0 to 59
+9	RO		Millisecond	UNIT16		0 to 999

Table 5-98 IER Log Data Structure-SM and VM

5.8.10 Control Setup

5.8.10.1 DO Control

The PMC-592 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 RO/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"

Table 5-99 DO Control

5.8.10.2 Clear/Reset Control

Register	Property	Description	Format	Note
7200	WO	Clear All Latched Alarms	UINT16	Writing "0xFF00" to the register clears all the Latched Alarms
7201	WO	Clear All Alarm Counters	UINT16	Writing "0xFF00" to the register clears all the Alarm Counters
7202	WO	Clear SOE	UINT16	Writing "0xFF00" to the register clears the SOE Log
7203	WO	Clear Energy[1]	UINT16	1) Writing "0xFFFF" to the register clears all the Energy registers 2) Writing "0x00FF" to the register clears all Mains Energy registers 3) Writing "0x01FF" to the register clears all SM Energy registers 4) Writing "0x02FF" to the register clears all VM Energy registers
7204	WO	Clear Max Demand Logs[2]	UINT16	1) Writing "0xFFFF" to the register clears all the Max Demand Logs and Max Demand Logs of This Month 2) Writing "0x00FF" to the register clears all Mains Max Demand Logs and Max Demand Logs of This Month 3) Writing "0x01FF" to the register clears all SMx Max Demand Logs and Max Demand Logs of This Month
7205	WO	Clear Max/Min Recorder Logs	UINT16	Writing "0xFF00" to the register clears all the Max/Min Logs
7206	WO	Clear WFR Log	UINT16	Writing "0xFF00" to the register clears all the WFR
7207	WO	Clear IER Logs	UINT16	Writing "0xFF00" to the register clears all the energy logs
7208	WO	Trigger WFR	UINT16	Writing "0xFF00" to the register trigger WFR
7209	WO	Voltage Phase for Sequential Mode	UINT16	Writing "0xFF00" to the register configures the Voltage Phase for Sequential Mode
7210	WO	Voltage Phase for Cross-over Mode	UINT16	Writing "0xFF00" to the register configures the Voltage Phase for Cross-over Mode
7211	WO	Voltage Phase 1P3W Mode	UINT16	Writing "0xFF00" to the register configures the Voltage Phase for 1P3W Mode
7212	WO	Test Sending Email[3]	UINT16	Writing "0xFF00" to the Register sends a test Email to the specified Destination Email address.
7213	WO	Clear DR#	UINT16	Writing 0 to 9 to the register clears DR#1 to DR#10, while writing "0xFF00" clears all of the DRs
7220	WO	Clear All[4]	UINT16	Writing "0xFF00" to the register clears all of the above
7221	WO	Reset Device to Default*	UINT16	Writing "0xFF00" to the register reset all parameters to default.

Available in Firmware V1.00.04 or later
* Available in Firmware V1.00.05 or later

Table 5-100 Clear/Reset Control Setup

Notes:

1) The following table provides a detailed description of the different values that can be written to the **Clear Energy** register to clear the different Energy registers such as Mains-I, Mains-II, SMx and VMx.

Key	Clear Energy Register Values		Description
	High Order	Low Order	
0	0x00 (Mains)	0x00	Clear Main-I Energy (0x0000)
		0x01	Clear Main-II Energy (0x0001)
1	0x01 (SMx)	0x00	Clear 1-Ø SM1 Energy (0x0100)
		0x01	Clear 1-Ø SM2 Energy (0x0101)
		0x02	Clear 1-Ø SM3 Energy (0x0102)
		....	....
		0x53	Clear 1-Ø SM84 Energy (0x0153)
		0x54	Clear 2-Ø SM1 Energy (0x0154)
		0x55	Clear 2-Ø SM2 Energy (0x0155)
		0x56	Clear 2-Ø SM3 Energy (0x0156)

		….	….
		0x7D	Clear 2-Ø SM42 Energy (0x017D)
		0x7E	Clear 3-Ø SM1 Energy (0x017E)
		0x7F	Clear 3-Ø SM2 Energy (0x017F)
		0x80	Clear 3-Ø SM3 Energy (0x0180)
		….	….
		0x99	Clear 3-Ø SM28 Energy (0x0199)
2	0x02 (Total VMx)	0x00	Clear VM1 Energy (0x0200)
		0x01	Clear VM2 Energy (0x0201)
		0x02	Clear VM3 Energy (0x0202)
		….	….
		0x09	Clear VM10 Energy (0x0209)
3*	0x03	0x00	Clear Mains-I T1 Energy (0x0300)
		0x01	Clear Mains-II T1 Energy (0x0301)
4*	0x04	0x00	Clear Mains-I T2 Energy (0x0400)
		0x01	Clear Mains-II T2 Energy (0x0401)
5*	0x05	0x00	Clear VM1 T1 Energy (0x0500)
		0x01	Clear VM2 T1 Energy (0x0501)
		0x02	Clear VM3 T1 Energy (0x0502)
		….	….
		0x09	Clear VM10 T1 Energy (0x050A)
6*	0x06	0x00	Clear VM1 T2 Energy (0x0600)
		0x01	Clear VM2 T2 Energy (0x0601)
		0x02	Clear VM3 T2 Energy (0x0602)
		….	….
		0x09	Clear VM10 T2 Energy (0x060A)

* Available in Firmware Version V1.00.10 or later

Table 5-101 Clear Energy Register Values

2) The following table provides a detailed description of the different values that can be written to the **Clear Max Demand Logs** register to clear the different Max Demand Logs such as Mains-I, Mains-II, SMx and VMx.

Key	Clear Max Demand Logs Register Values		Description
	High Order	Low Order	
1	0x00 (Mains)	0x00	Clear Mains-I Max Demand Logs (0x0000)
		0x01	Clear Mains-II Max Demand Logs (0x0001)
2	0x01 (SMx)	0x00	Clear 1-Ø SM1 Max Demand Logs (0x0100)
		0x01	Clear 1-Ø SM2 Max Demand Logs (0x0101)
		0x02	Clear 1-Ø SM3 Max Demand Logs (0x0102)
		….	….
		0x53	Clear 1-Ø SM84 Max Demand Logs (0x0153)
		0x54	Clear 2-Ø SM1 Max Demand Logs (0x0154)
		0x55	Clear 2-Ø SM2 Max Demand Logs (0x0155)
		0x56	Clear 2-Ø SM3 Max Demand Logs (0x0156)
		….	….
		0x7D	Clear 2-Ø SM42 Max Demand Logs (0x017D)
		0x7E	Clear 3-Ø SM1 Max Demand Logs (0x017E)
		0x7F	Clear 3-Ø SM2 Max Demand Logs (0x017F)
		0x80	Clear 3-Ø SM3 Max Demand Logs (0x0180)
		….	….
		0x99	Clear 3-Ø SM28 Max Demand Logs (0x0199)
3	0x02* (RTDx)	0x00	Clear RTD1 Temp. Max Demand (0x0200)
		0x01	Clear RTD2 Temp. Max Demand (0x0201)

* Available in Firmware Version V1.00.04 or later

Table 5-102 Clear Max Demand Logs Register Values

3) The **Test Sending Email** register is used to test whether the SMTP setup is correct. PMC-592 will send a test email to the specified receiver email address when the value 0xFF00 is written to this register.

4) Writing "0xff00" to the register clears all logs, including Latched Alarm, Alarm counter, IER Log, SOE Log, Max/Min Log of This Month, Max/Min Log of Last Month, This Max Demand, Last Max Demand, Waveform Recorder and Energy.

5.8.11 Data Recorder Setup

The Data Recorder Setup registers have been added since Firmware V1.00.04 and Protocol V1.2.

Register	Property	Description		Format	Range/Options/Default*
8250	RW	DR #1	Trigged Mode[1]	UINT16	0=Disabled 1=Triggered by Setup Parameter*
8251	RW		Recording Mode[2]	UINT16	0=Stop-When-Full, 1=First In First Out*
8252	RW		Recording Depth[3]	UINT16	0 to 65535*
8253	RW		Recording Interval	UINT32	60 to 345600s, 900*
8255	RW		Recording Offset[4]	UINT16	0* to 43200s
8256	RW		Parameters Number[5]	UINT16	0* to 64
8257	RW		Parameter1	UINT16	See Appendix B – Data Recorder Parameter
8258	RW		Parameter2	UINT16	
8259	RW		Parameter3	UINT16	
…			…	UINT16	
8320	RW		Parameter64	UINT16	
8321~8391	RW	DR #2		UINT16	Please refer to DR #1
8392~8462	…	DR #3		UINT16	
8463~8533	RW	DR #4		UINT16	
8534~8604	RW	DR #5		UINT16	
8605	RW	DR #6	Trigged Mode[1]	UINT16	0=Disabled* 1=Triggered by Setup Parameter
8606	RW		Recording Mode[2]	UINT16	0=Stop-When-Full, 1=First In First Out*
8607	RW		Recording Depth[3]	UINT16	0 to 65535*
8608	RW		Recording Interval	UINT32	60 to 345600s, 900*
8610	RW		Recording Offset[4]	UINT16	0* to 43200s
8611	RW		Parameters Number[5]	UINT16	0* to 64
8612	RW		Parameter1	UINT16	See Appendix B – Data Recorder Parameter
8613	RW		Parameter2	UINT16	
8614	RW		Parameter3	UINT16	
…			…	UINT16	
8675	RW		Parameter64	UINT16	
8676~8746	RW	DR #7		UINT16	Please refer to DR #6
8747~8817	RW	DR #8		UINT16	
8818~8888	RW	DR #9		UINT16	
8889~8959	RW	DR #10		UINT16	

Table 5-103 DR Parameter Setup

5.9 Time Registers

There are two sets of Time registers supported by the PMC-592 - Year/Month/Day/Hour/Minute/Second (Register # 60000 to 60004) and UTC Time (Reg. # 9000 to 9004). When sending time to the PMC-592 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 60000 to 60004 are being written to at the same time, both Time register sets will be updated to reflect the new time specified in the UTC Time register set (60004) and the time specified in registers 60000-60002 will be ignored. Writing to the Millisecond register (60003) 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
60000	9000	RW	High-order Byte: Year	UINT16	0-38 (Year-2000)
			Low-order Byte: Month		1 to 12
60001	9001	RW	High-order Byte: Day	UINT16	1 to 31
			Low-order Byte: Hour		0 to 23
60002	9002	RW	High-order Byte: Minute	UINT16	0 to 59
			Low-order Byte: Second		0 to 59
60003	9003	RW	Millisecond	UINT16	0 to 999
60004	9004	RW	UTC Time	UINT32	0x386D4380 to 0x 7FE8177F The corresponding time is 2000.01.01 00:00:00 to

					2037.12.31 23:59:59 (GMT 0:00 Time Zone)

Table 5-104 Time Registers

5.10 Meter Information

Register		Property	Description	Format	Note
60200-60219	9800-9819	RO	Meter Model[1]	UINT16x20	Note 1
60220	9820	RO	Firmware Version	UINT16	e.g. 10000 shows the version is V1.00.00
60221	9821	RO	Protocol Version	UINT16	e.g. 10 shows the version is V1.0
60222	9822	RO	Firmware Update Date: Year-2000	UINT16	e.g.120709 means July 9,2012
60223	9823	RO	Firmware Update Date: Month	UINT16	
60224	9824	RO	Firmware Update Date: Day	UINT16	
60225-60226	9825-9826	RO	Serial Number: XX(Year-2000) - XX(Month) - XX(Lot Number) - XXXX(Meter Number)	UINT16	e.g. 1208471895 means that this meter was the 1895th meter manufactured in Lot 47 of August 2012
60227-60228	9827-9828		Reserved	UINT16	-
60229	9829	RO	Feature Code[2]	UINT16	See Note 2)
60230	9830	RO	Branch CT Nominal Primary	UINT16	1 to 20,000 (x0.1A) (Default = 1000)
60231	9831	RO	Branch CT Nominal Secondary	UINT16	1 to 2000 (x0.1mA) (Default = 400)
60232	9832	RO	Mains CT Nominal Secondary	UINT16	1 to 2000 (x0.1mA) (Default = 25mA)
60233	9833	RO	MAC Address	UINT16	
60234	9834	RO		UINT16	
60235	9835	RO		UINT16	
60236	9836	RO	DSP Firmware Version	UINT16	e.g. 10000 shows the version is V1.00.00
60237	9837	RO	CPU Firmware Version	UINT16	e.g. 10000 shows the version is V1.00.00
60238	9838	RO	Hardware Version	UINT16	e.g. 10000 shows the version is V1.00.00
60239	9839	RO	Web Version	UINT16	e.g. 10000 shows the version is V1.00.00
60240	9840	RO	CT Strip A Specification*	UINT16	0 = No CT inserted 12 = Inserted 12 CT Strips 21 = Inserted 12 CT Strips 99 = Inserted SCCT Adapter Board
60241	9841	RO	CT Strip B Specification*	UINT16	
60242	9842	RO	CT Strip C Specification*	UINT16	
60243	9843	RO	CT Strip D Specification*	UINT16	
60244	9844	RO	HTTP Version~	UINT16	

* Available in Firmware Version V1.00.04 or later. ~ Available in Firmware Version V1.00.10 or later.

Table 5-105 Meter Information

Notes:

1) The Meter Model appears in registers 9800 to 9819 (60200 to 60219) and contains the ASCII encoding of the string "PMC-592" as shown in the following table.

Register		Value (Hex)	ASCII
60200	9800	0x50	P
60201	9801	0x4D	M
60202	9802	0x43	C
60203	9803	0x2D	-
60204	9804	0x35	5
60205	9805	0x39	9
60206	9806	0x32	2
60207	9807	0x20	<Null>
60208-60219	9808-9819	0x20	<Null>

Table 5-106 ASCII Encoding of "PMC-592"

2) The PMC-592 provides the following feature code:

Bit	Description	Value	Meaning
Bit 0	Max Demand Enable	0	Disabled
		1	Enabled
Bit 1	Max/Min Enable	0	Disabled
		1	Enabled
Bit 2	Power Quality Enable	0	Disabled
		1	Enabled
Bit 3	WFR Enable	0	Disabled
		1	Enabled
Bit 4	IER Enable	0	Disabled
		1	Enabled
Bit 5	Alarm Email Enable	0	Disabled
		1	Enabled
Bit 6	SNMP Enable	0	Disabled
		1	Enabled
Bit 7	SM CT Ratio Enable	0	Disabled
		1	Enabled
Bit 8	DI Type	0	2xDI
		1	4xDI
Bit 9	SCCT Adapter or CT Strip	0	SCCT Adapter
		1	CT Strip
Bits 10 - 11	Mains CT Type	1	1A CT
		2	5A CT
Bit 12 - Bit 14	Branch Circuits	1	One CT Strip/Adapter Board
		2	Two CT Strips/Adapter Boards
		3	Three CT Strips/Adapter Boards
		4	Four CT Strips/Adapter Boards
Bit 15	CT Strip Specification	0	100A
		1	10A

Table 5-107 Feature Code

Appendix A - SOE Event Classification

Event Classification	Sub-Classification	Channel	Event Value Range/Option/Scale	Description
0	1	0	1/0	DI1 Close/DI1 Open
	2	0	1/0	DI2 Close/DI2 Open
	3	1-21	1/0	External DI Module #1 DI Close/Open
	4	1-21	1/0	External DI Module #2 DI Close/Open
	5	1-21	1/0	External DI Module #3 DI Close/Open
	6	1-21	1/0	External DI Module #4 DI Close/Open
	11	0	1/0	DI3 Close/DI3 Open
	12	0	1/0	DI4 Close/DI4 Open
1	1	0	1/0	DO1 Operated/Released by Remote Control
	2	0	1/0	DO2 Operated/Released by Remote Control
	3	0	1/0	DO1 Operated/Released by Set point
	4	0	1/0	DO2 Operated/Released by Set point
2	1	Alarm Channel[1]	Trigger Value (x1000)	Current HH Alarm Active
	2		Trigger Value (x1000)	Current H Alarm Active
	3		Trigger Value (x1000)	Current L Alarm Active
	4		Trigger Value (x1000)	Current LL Alarm Active
	5		Trigger Value (x100)	Voltage H Alarm Active
	6		Trigger Value (x100)	Voltage L Alarm Active
	7		Trigger Value (x1000)	Mains kW Total H Alarm Active
	8		Trigger Value (x1000)	Mains kW Total L Alarm Active
	9		Trigger Value (x1000)	Mains kvar Total H Alarm Active
	10		Trigger Value (x1000)	Mains kvar Total L Alarm Active
	11		Trigger Value (x1000)	Mains kVA Total H Alarm Active
	12		Trigger Value (x1000)	Mains kVA Total L Alarm Active
	13		Trigger Value (x1000)	Mains PF Total H Alarm Active
	14		Trigger Value (x1000)	Mains PF Total L Alarm Active
	15		Trigger Value (x1000)	Current Demand HH Alarm Active
	16		Trigger Value (x1000)	Current Demand H Alarm Active
	17		Trigger Value (x1000)	Current Demand L Alarm Active
	18		Trigger Value (x1000)	Current Demand LL Alarm Active
	19		Trigger Value (x1000)	Mains kW Total Demand H Alarm Active
	20		Trigger Value (x1000)	Mains kW Total Demand L Alarm Active
	21		Trigger Value (x1000)	Mains kvar Total Demand H Alarm Active
	22		Trigger Value (x1000)	Mains kvar Total Demand L Alarm Active
	23		Trigger Value (x1000)	Mains kVA Total Demand H Alarm Active
	24		Trigger Value (x1000)	Mains kVA Total Demand L Alarm Active
	25		Trigger Value (x100)	Frequency H Alarm Active
	26		Trigger Value (x100)	Frequency L Alarm Active
	27		Trigger Value (x100)	Voltage Unbalance Alarm Active
	28		Trigger Value (x100)	Voltage Unbalance Alarm Active
	29		Trigger Value (x100)	Mains THD Alarm Active
	30		Trigger Value (x100)	Mains TOHD Alarm Active
	31		Trigger Value (x100)	Mains TEHD Alarm Active
	32		Trigger Value (x10)	Temperature HH Alarm Active
	33		Trigger Value (x10)	Temperature H Alarm Active
	34		Trigger Value	DI Status Change Alarm Active
	35	27 - 30	Trigger Value	Phase Reversal Alarm Active
	36	10 - 21	Trigger Value	Phase Loss Alarm Active
	37	27 - 28	Trigger Value	Dip Alarm Active
	38	27 - 28	Trigger Value	Swell Alarm Active
	39	27 - 28	Trigger Value	Interruption Alarm Active
	40-100	Reserved		
	101	Alarm Channel[1]	Return Value (x1000)	Current HH Alarm Return
	102		Return Value (x1000)	Current H Alarm Return
	103		Return Value (x1000)	Current L Alarm Return
	104		Return Value (x1000)	Current LL Alarm Return
	105		Return Value (x100)	Voltage H Alarm Return
	106		Return Value (x100)	Voltage L Alarm Return
	107		Return Value (x1000)	Mains kW Total H Alarm Return
	108		Return Value (x1000)	Mains kW Total L Alarm Return

	109		Return Value (x1000)	Mains kvar Total H Alarm Return
	110		Return Value (x1000)	Mains kvar Total L Alarm Return
	111		Return Value (x1000)	Mains kVA Total H Alarm Return
	112		Return Value (x1000)	Mains kVA Total L Alarm Return
	113		Return Value (x1000)	Mains PF Total H Alarm Return
	114		Return Value (x1000)	Mains PF Total L Alarm Return
	115		Return Value (x1000)	Current Demand HH Alarm Return
	116		Return Value (x1000)	Current Demand H Alarm Return
	117		Return Value (x1000)	Current Demand L Alarm Return
	118		Return Value (x1000)	Current Demand LL Alarm Return
	119		Return Value (x1000)	Mains kW Total Demand H Alarm Return
	120		Return Value (x1000)	Mains kW Total Demand L Alarm Return
	121		Return Value (x1000)	Mains kvar Total Demand H Alarm Return
	122		Return Value (x1000)	Mains kvar Total Demand L Alarm Return
	123		Return Value (x1000)	Mains kVA Total Demand H Alarm Return
	124		Return Value (x1000)	Mains kVA Total Demand L Alarm Return
	125		Return Value (x100)	Frequency H Alarm Return
	126		Return Value (x100)	Frequency L Alarm Return
	127		Return Value (x100)	Voltage Unbalance Alarm Return
	128		Return Value (x100)	Voltage Unbalance Alarm Return
	129		Return Value (x100)	Mains THD Alarm Return
	130		Return Value (x100)	Mains TOHD Alarm Return
	131		Return Value (x100)	Mains TEHD Alarm Return
	132		Return Value (x10)	Temperature HH Alarm Return
	133		Return Value (x10)	Temperature H Alarm Return
	134		Return Value	DI Status Change Alarm Return
	135		Return Value	Phase Reversal Alarm Return
	136		Return Value	Phase Loss Alarm Return
	137		Return Value[3]	Dip Alarm Return
	138		Return Value[3]	Swell Alarm Return
	139		Return Value[3]	Interruption Alarm Return
3	1	0	Method 0: Modbus 1: Web 2: Reset Button	Power On
	2	0		Power Off
	3	0		Set Time
	4	0		Set System Parameters
	5	0		Set Names for Panels, SMs or VMs
	6	0		Set Communication Parameters
	7	0		Set Breaker Ratings
	8	0		Set Alarm Parameters
	9	0		Set Calibration Parameters
	10	0		Set Factory Parameters
	11	0		Set Branch Parameters
	12	0		Set Total VM Parameters
	13	0		Set DR Parameters
	14	0		Set SM Customization Parameters
	15	0		Reset Alarm
	16	0		Clear Alarm Counter
	17	0		Clear Energy
	18	0		Clear Max Demand Logs
	19	0		Clear SOE
	20	0		Clear Max/Min Logs
	21	0		Clear WFR
	22	0		Clear IER Logs
	23	0		Manually Trigger WFR
	24	0		Preset Energy
	25	0-9, 0xFF		Clear DR Log
	26-29	-		Reserved
	30	Parameter Type[2]		Load Factory Default Configuration
	31	0		Clear All Recorder
	32	0		Formatting Ferroelectric
	33	0		Formatting the Disk
	34	0		Importing Configuration Files
	35	0		Exporting the Ferroelectric Memory
	36	0		Importing the Ferroelectric Memory
4	1	0	0	NVRM Fault

	2	0	0	Disk Fault
	3	0	0	A/D Fault
	4	0	0	CT Strip Installation Fault
	5	0	0	Internal Power Fault
	6	-	-	Reserved
	7	0	0	DSP Fault
	8	0	0	System Parameters Fault
	9	0	0	SM Name Parameters Fault
	10	0	0	Communication Parameters Fault
	11	0	0	Breaker Parameters Fault
	12	0	0	Alarm Parameters Fault
	13	0	0	Branch Parameters Fault
	14	0	0	Total VM Parameters Fault
	15	0	0	Calibration Parameters Fault
	16	0	0	Internal Parameters Fault
	17	0	1-4	External DI Module Communication Fault
	18	0	0	DR Parameters Fault

Note:

1) The following table provides a detailed description of the Channel Number.

Channel Number	Description	Channel Number	Description
0	Mains-I, Power	20	Mains-II, Ubc
1	Mains-II, Power	21	Mains-II, Uca
2	Mains-I, Ia	22	System Frequency
3	Mains-I, Ib	23	RTD1
4	Mains-I, Ic	24	RTD2
5	Mains-I, I4	25	DI1
6	Mains-II, Ia	26	DI2
7	Mains-II, Ib	27	Mains-I, Voltage Unbalance
8	Mains-II, Ic	28	Mains- II, Voltage Unbalance
9	Mains-II, I4	29	Mains-I, Current Unbalance
10	Mains-I, Uan	30	Mains- II, Current Unbalance
11	Mains-I, Ubn	31	DI3 (4xDIs option only)
12	Mains-I, Ucn	32	DI4 (4xDIs option only)
13	Mains-I, Uab	33-34	Reserved
14	Mains-I, Ubc	35	SM1
15	Mains-I, Uca	36	SM2
16	Mains-II, Uan	….	….
17	Mains-II, Ubn	34+n	SMn
18	Mains-II, Ucn	117	SM83
19	Mains-II, Uab	118	SM84

2) The following table provides a detailed description of the Parameter Type for loading the Factory Default Configuration.

Parameter Type	Description
0	System parameter
1	SM name parameter
2	Communication parameter
3	Breaker capacity parameter
4	Alarm parameter
5	Branch Voltage Phase parameter
6	Total VM Parameters
7	Calibration Parameters
8	Internal parameter
9	All parameter
10	DR Parameter

3) The **Return Value** of the Dip/Swell and Interruption alarm are:

- Dip: Min. Voltage value
- Swell: Max. Voltage value
- Interruption: Max. Voltage value

Appendix B – DR Parameter and Default DR Setting

Mains-I/Mains-II Real-time and Demand Measurement

Key	Description	Key	Description	Key	Description
1	Voltage-I Ua	29	Mains-I kVAc	57	Mains-II Iavg
2	Voltage-I Ub	30	Mains-I kVA Total	58	Mains-II Ia Loading Factor
3	Voltage-I Uc	31	Mains-I PFa	59	Mains-II Ib Loading Factor
4	Voltage-I ULN average	32	Mains-I PFb	60	Mains-II Ic Loading Factor
5	Voltage-I Uab	33	Mains-I PFc	61	Mains-II kWa
6	Voltage-I Ubc	34	Mains-I PF Total	62	Mains-II kWb
7	Voltage-I Uca	35	Mains-I Current Unbalance	63	Mains-II kWc
8	Voltage-I ULL average	36	Mains-I Voltage Unbalance	64	Mains-II kW Total
9	Freq.	37	Mains-I Ia Dmd	65	Mains-II kvara
10	Mains-I Ia	38	Mains-I Ib Dmd	66	Mains-II kvarb
11	Mains-I Ib	39	Mains-I Ic Dmd	67	Mains-II kvarc
12	Mains-I Ic	40	Mains-I kW Total Dmd	68	Mains-II kvar Total
13	Mains-I In	41	Mains-I kvar Total Dmd	69	Mains-II kVAa
14	Mains-I Ir	42	Mains-I kVA Total Dmd	70	Mains-II kVAb
15	Mains-I Iavg	43	Voltage-II Ua	71	Mains-II kVAc
16	Mains-I Ia Loading Factor	44	Voltage-II Ub	72	Mains-II kVA Total
17	Mains-I Ib Loading Factor	45	Voltage-II Uc	73	Mains-II PF a
18	Mains-I Ic Loading Factor	46	Voltage-IIULN average	74	Mains-II PF b
19	Mains-I kWa	47	Voltage-II Uab	75	Mains-II PF c
20	Mains-I kWb	48	Voltage-II Ubc	76	Mains-II PF Total
21	Mains-I kWc	49	Voltage-II Uca	77	Mains-II Current Unbal.
22	Mains-I kW Total	50	Voltage-II ULL average	78	Mains-II Voltage Unbal.
23	Mains-I kvara	51	Reserved	79	Mains-II Ia Dmd
24	Mains-I kvarb	52	Mains-II Ia	80	Mains-II Ib Dmd
25	Mains-I kvarc	53	Mains-II Ib	81	Mains-II Ic Dmd
26	Mains-I kvar Total	54	Mains-II Ic	82	Mains-II kW Total Dmd
27	Mains-I kVAa	55	Mains-II In	83	Mains-II kvar Total Dmd
28	Mains-I kVAb	56	Mains-II Ir	84	Mains-II kVA Total Dmd

Mains-I/Mains-II PQ measurement

Key	Description	Key	Description	Key	Description
100	Mains-I Ia THD	114	Mains-II Ib TEHD	128	Voltage-I Ub TOHD
101	Mains-I Ia TOHD	115	Mains-II Ic THD	129	Voltage-I Ub TEHD
102	Mains-I Ia TEHD	116	Mains-II Ic TOHD	130	Voltage-I Uc THD
103	Mains-I Ib THD	117	Mains-II Ic TEHD	131	Voltage-I Uc TOHD
104	Mains-I Ib TOHD	118	Mains-I Ia K-factor	132	Voltage-I Uc TEHD
105	Mains-I Ib TEHD	119	Mains-I Ib K-factor	133	Voltage-II Ua/Uab THD
106	Mains-I Ic THD	120	Mains-I Ic K-factor	134	Voltage-II Ua/Uab TOHD
107	Mains-I Ic TOHD	121	Mains-II Ia K-factor	135	Voltage-II Ua/Uab TEHD
108	Mains-I Ic TEHD	122	Mains-II Ib K-factor	136	Voltage-II Ub/Ubc THD
109	Mains-II Ia THD	123	Mains-II Ic K-factor	137	Voltage-II Ub/Ubc TOHD
110	Mains-II Ia TOHD	124	Voltage-I Ua THD	138	Voltage-II Ub/Ubc TEHD
111	Mains-II Ia TEHD	125	Voltage-I Ua TOHD	139	Voltage-II Uc/Uca THD
112	Mains-II Ib THD	126	Voltage-I Ua TEHD	140	Voltage-II Uc/Uca TOHD
113	Mains-II Ib TOHD	127	Voltage-I Ub THD	141	Voltage-II Uc/Uca TEHD

SMs Real-time Measurement

1-Ø SM Real-time Measurements

Key	Description	Key	Description	Key	Description
200	1-Ø SM1	480	1-Ø SM29	760	1-Ø SM57
210	1-Ø SM2	490	1-Ø SM30	770	1-Ø SM58
220	1-Ø SM3	500	1-Ø SM31	780	1-Ø SM59
230	1-Ø SM4	510	1-Ø SM32	790	1-Ø SM60
240	1-Ø SM5	520	1-Ø SM33	800	1-Ø SM61
250	1-Ø SM6	530	1-Ø SM34	810	1-Ø SM62
260	1-Ø SM7	540	1-Ø SM35	820	1-Ø SM63
270	1-Ø SM8	550	1-Ø SM36	830	1-Ø SM64
280	1-Ø SM9	560	1-Ø SM37	840	1-Ø SM65
290	1-Ø SM10	570	1-Ø SM38	850	1-Ø SM66

300	1-Ø SM11	580	1-Ø SM39	860	1-Ø SM67
310	1-Ø SM12	590	1-Ø SM40	870	1-Ø SM68
320	1-Ø SM13	600	1-Ø SM41	880	1-Ø SM69
330	1-Ø SM14	610	1-Ø SM42	890	1-Ø SM70
340	1-Ø SM15	620	1-Ø SM43	900	1-Ø SM71
350	1-Ø SM16	630	1-Ø SM44	910	1-Ø SM72
360	1-Ø SM17	640	1-Ø SM45	920	1-Ø SM73
370	1-Ø SM18	650	1-Ø SM46	930	1-Ø SM74
380	1-Ø SM19	660	1-Ø SM47	940	1-Ø SM75
390	1-Ø SM20	670	1-Ø SM48	950	1-Ø SM76
400	1-Ø SM21	680	1-Ø SM49	960	1-Ø SM77
410	1-Ø SM22	690	1-Ø SM50	970	1-Ø SM78
420	1-Ø SM23	700	1-Ø SM51	980	1-Ø SM79
430	1-Ø SM24	710	1-Ø SM52	990	1-Ø SM80
440	1-Ø SM25	720	1-Ø SM53	1000	1-Ø SM81
450	1-Ø SM26	730	1-Ø SM54	1010	1-Ø SM82
460	1-Ø SM27	740	1-Ø SM55	1020	1-Ø SM83
470	1-Ø SM28	750	1-Ø SM56	1030	1-Ø SM84

2-Ø SM Real-time Measurements

Key	Description	Key	Description	Key	Description
1040	2-Ø SM1	1180	2-Ø SM15	1320	2-Ø SM29
1050	2-Ø SM2	1190	2-Ø SM16	1330	2-Ø SM30
1060	2-Ø SM3	1200	2-Ø SM17	1340	2-Ø SM31
1070	2-Ø SM4	1210	2-Ø SM18	1350	2-Ø SM32
1080	2-Ø SM5	1220	2-Ø SM19	1360	2-Ø SM33
1090	2-Ø SM6	1230	2-Ø SM20	1370	2-Ø SM34
1100	2-Ø SM7	1240	2-Ø SM21	1380	2-Ø SM35
1110	2-Ø SM8	1250	2-Ø SM22	1390	2-Ø SM36
1120	2-Ø SM9	1260	2-Ø SM23	1400	2-Ø SM37
1130	2-Ø SM10	1270	2-Ø SM24	1410	2-Ø SM38
1140	2-Ø SM11	1280	2-Ø SM25	1420	2-Ø SM39
1150	2-Ø SM12	1290	2-Ø SM26	1430	2-Ø SM40
1160	2-Ø SM13	1300	2-Ø SM27	1440	2-Ø SM41
1170	2-Ø SM14	1310	2-Ø SM28	1450	2-Ø SM42

3-Ø SM Real-time Measurements

Key	Description	Key	Description	Key	Description
1460	3-Ø SM1	1560	3-Ø SM11	1660	3-Ø SM21
1470	3-Ø SM2	1570	3-Ø SM12	1670	3-Ø SM22
1480	3-Ø SM3	1580	3-Ø SM13	1680	3-Ø SM23
1490	3-Ø SM4	1590	3-Ø SM14	1690	3-Ø SM24
1500	3-Ø SM5	1600	3-Ø SM15	1700	3-Ø SM25
1510	3-Ø SM6	1610	3-Ø SM16	1710	3-Ø SM26
1520	3-Ø SM7	1620	3-Ø SM17	1720	3-Ø SM27
1530	3-Ø SM8	1630	3-Ø SM18	1730	3-Ø SM28
1540	3-Ø SM9	1640	3-Ø SM19		
1550	3-Ø SM10	1650	3-Ø SM20		

Notes:

Each SM's Real-time measurement meets data structure below:

Offset	Description	Offset	Description
+0	Current	+5	Current Loading Factor
+1	kW	+6	Current Dmd
+2	kvar	+7	kW Dmd
+3	kVA	+8	kvar Dmd
+4	Power Factor	+9	kVA Dmd

VM kWs

Key	Description	Key	Description	Key	Description	Key	Description	Key	Description
1740	VM1	1742	VM3	1744	VM5	1746	VM7	1748	VM9
1741	VM2	1743	VM4	1745	VM6	1747	VM8	1749	VM10

SM Harmonics

Key	Description	Key	Description	Key	Description
1750	1-Ø SM1 THD	1778	1-Ø SM29 THD	1806	1-Ø SM57 THD
1751	1-Ø SM2 THD	1779	1-Ø SM30 THD	1807	1-Ø SM58 THD

1752	1-Ø SM3 THD	1780	1-Ø SM31 THD	1808	1-Ø SM59 THD
1753	1-Ø SM4 THD	1781	1-Ø SM32 THD	1809	1-Ø SM60 THD
1754	1-Ø SM5 THD	1782	1-Ø SM33 THD	1810	1-Ø SM61 THD
1755	1-Ø SM6 THD	1783	1-Ø SM34 THD	1811	1-Ø SM62 THD
1756	1-Ø SM7 THD	1784	1-Ø SM35 THD	1812	1-Ø SM63 THD
1757	1-Ø SM8 THD	1785	1-Ø SM36 THD	1813	1-Ø SM64 THD
1758	1-Ø SM9 THD	1786	1-Ø SM37 THD	1814	1-Ø SM65 THD
1759	1-Ø SM10 THD	1787	1-Ø SM38 THD	1815	1-Ø SM66 THD
1760	1-Ø SM11 THD	1788	1-Ø SM39 THD	1816	1-Ø SM67 THD
1761	1-Ø SM12 THD	1789	1-Ø SM40 THD	1817	1-Ø SM68 THD
1762	1-Ø SM13 THD	1790	1-Ø SM41 THD	1818	1-Ø SM69 THD
1763	1-Ø SM14 THD	1791	1-Ø SM42 THD	1819	1-Ø SM70 THD
1764	1-Ø SM15 THD	1792	1-Ø SM43 THD	1820	1-Ø SM71 THD
1765	1-Ø SM16 THD	1793	1-Ø SM44 THD	1821	1-Ø SM72 THD
1766	1-Ø SM17 THD	1794	1-Ø SM45 THD	1822	1-Ø SM73 THD
1767	1-Ø SM18 THD	1795	1-Ø SM46 THD	1823	1-Ø SM74 THD
1768	1-Ø SM19 THD	1796	1-Ø SM47 THD	1824	1-Ø SM75 THD
1769	1-Ø SM20 THD	1797	1-Ø SM48 THD	1825	1-Ø SM76 THD
1770	1-Ø SM21 THD	1798	1-Ø SM49 THD	1826	1-Ø SM77 THD
1771	1-Ø SM22 THD	1799	1-Ø SM50 THD	1827	1-Ø SM78 THD
1772	1-Ø SM23 THD	1800	1-Ø SM51 THD	1828	1-Ø SM79 THD
1773	1-Ø SM24 THD	1801	1-Ø SM52 THD	1829	1-Ø SM80 THD
1774	1-Ø SM25 THD	1802	1-Ø SM53 THD	1830	1-Ø SM81 THD
1775	1-Ø SM26 THD	1803	1-Ø SM54 THD	1831	1-Ø SM82 THD
1776	1-Ø SM27 THD	1804	1-Ø SM55 THD	1832	1-Ø SM83 THD
1777	1-Ø SM28 THD	1805	1-Ø SM56 THD	1833	1-Ø SM84 THD

RTD Measurements

Key	Description	Key	Description
1834	RTD1 Temp.	1836	RTD1 Temp. Dmd
1835	RTD2 Temp.	1837	RTD1 Temp. Dmd

Energy Measurements

Key	Description	Key	Description	Key	Description
2000	Mains-I kWh Imp	2169	1-Ø SM54 kWh	2338	2-Ø SM26 kvarh
2001	Mains-I kWh Exp	2170	1-Ø SM54 kvarh	2339	2-Ø SM26 kVAh
2002	Mains-I kvarh Imp	2171	1-Ø SM54 kVAh	2340	2-Ø SM27 kWh
2003	Mains-I kvarh Exp	2172	1-Ø SM55 kWh	2341	2-Ø SM27 kvarh
2004	Mains-I kVAh	2173	1-Ø SM55 kvarh	2342	2-Ø SM27 kVAh
2005	Mains-II kWh Imp	2174	1-Ø SM55 kVAh	2343	2-Ø SM28 kWh
2006	Mains-II kWh Exp	2175	1-Ø SM56 kWh	2344	2-Ø SM28 kvarh
2007	Mains-II kvarh Imp	2176	1-Ø SM56 kvarh	2345	2-Ø SM28 kVAh
2008	Mains-II kvarh Exp	2177	1-Ø SM56 kVAh	2346	2-Ø SM29 kWh
2009	Mains-II kVAh	2178	1-Ø SM57 kWh	2347	2-Ø SM29 kvarh
2010	1-Ø SM1 kWh	2179	1-Ø SM57 kvarh	2348	2-Ø SM29 kVAh
2011	1-Ø SM1 kvarh	2180	1-Ø SM57 kVAh	2349	2-Ø SM30 kWh
2012	1-Ø SM1 kVAh	2181	1-Ø SM58 kWh	2350	2-Ø SM30 kvarh
2013	1-Ø SM2 kWh	2182	1-Ø SM58 kvarh	2351	2-Ø SM30 kVAh
2014	1-Ø SM2 kvarh	2183	1-Ø SM58 kVAh	2352	2-Ø SM31 kWh
2015	1-Ø SM2 kVAh	2184	1-Ø SM59 kWh	2353	2-Ø SM31 kvarh
2016	1-Ø SM3 kWh	2185	1-Ø SM59 kvarh	2354	2-Ø SM31 kVAh
2017	1-Ø SM3 kvarh	2186	1-Ø SM59 kVAh	2355	2-Ø SM32 kWh
2018	1-Ø SM3 kVAh	2187	1-Ø SM60 kWh	2356	2-Ø SM32 kvarh
2019	1-Ø SM4 kWh	2188	1-Ø SM60 kvarh	2357	2-Ø SM32 kVAh
2020	1-Ø SM4 kvarh	2189	1-Ø SM60 kVAh	2358	2-Ø SM33 kWh
2021	1-Ø SM4 kVAh	2190	1-Ø SM61 kWh	2359	2-Ø SM33 kvarh
2022	1-Ø SM5 kWh	2191	1-Ø SM61 kvarh	2360	2-Ø SM33 kVAh
2023	1-Ø SM5 kvarh	2192	1-Ø SM61 kVAh	2361	2-Ø SM34 kWh
2024	1-Ø SM5 kVAh	2193	1-Ø SM62 kWh	2362	2-Ø SM34 kvarh
2025	1-Ø SM6 kWh	2194	1-Ø SM62 kvarh	2363	2-Ø SM34 kVAh
2026	1-Ø SM6 kvarh	2195	1-Ø SM62 kVAh	2364	2-Ø SM35 kWh
2027	1-Ø SM6 kVAh	2196	1-Ø SM63 kWh	2365	2-Ø SM35 kvarh
2028	1-Ø SM7 kWh	2197	1-Ø SM63 kvarh	2366	2-Ø SM35 kVAh
2029	1-Ø SM7 kvarh	2198	1-Ø SM63 kVAh	2367	2-Ø SM36 kWh
2030	1-Ø SM7 kVAh	2199	1-Ø SM64 kWh	2368	2-Ø SM36 kvarh
2031	1-Ø SM8 kWh	2200	1-Ø SM64 kvarh	2369	2-Ø SM36 kVAh

2032	1-Ø SM8 kvarh	2201	1-Ø SM64 kVAh	2370	2-Ø SM37 kWh
2033	1-Ø SM8 kVAh	2202	1-Ø SM65 kWh	2371	2-Ø SM37 kvarh
2034	1-Ø SM9 kWh	2203	1-Ø SM65 kvarh	2372	2-Ø SM37 kVAh
2035	1-Ø SM9 kvarh	2204	1-Ø SM65 kVAh	2373	2-Ø SM38 kWh
2036	1-Ø SM9 kVAh	2205	1-Ø SM66 kWh	2374	2-Ø SM38 kvarh
2037	1-Ø SM10 kWh	2206	1-Ø SM66 kvarh	2375	2-Ø SM38 kVAh
2038	1-Ø SM10 kvarh	2207	1-Ø SM66 kVAh	2376	2-Ø SM39 kWh
2039	1-Ø SM10 kVAh	2208	1-Ø SM67 kWh	2377	2-Ø SM39 kvarh
2040	1-Ø SM11 kWh	2209	1-Ø SM67 kvarh	2378	2-Ø SM39 kVAh
2041	1-Ø SM11 kvarh	2210	1-Ø SM67 kVAh	2379	2-Ø SM40 kWh
2042	1-Ø SM11 kVAh	2211	1-Ø SM68 kWh	2380	2-Ø SM40 kvarh
2043	1-Ø SM12 kWh	2212	1-Ø SM68 kvarh	2381	2-Ø SM40 kVAh
2044	1-Ø SM12 kvarh	2213	1-Ø SM68 kVAh	2382	2-Ø SM41 kWh
2045	1-Ø SM12 kVAh	2214	1-Ø SM69 kWh	2383	2-Ø SM41 kvarh
2046	1-Ø SM13 kWh	2215	1-Ø SM69 kvarh	2384	2-Ø SM41 kVAh
2047	1-Ø SM13 kvarh	2216	1-Ø SM69 kVAh	2385	2-Ø SM42 kWh
2048	1-Ø SM13 kVAh	2217	1-Ø SM70 kWh	2386	2-Ø SM42 kvarh
2049	1-Ø SM14 kWh	2218	1-Ø SM70 kvarh	2387	2-Ø SM42 kVAh
2050	1-Ø SM14 kvarh	2219	1-Ø SM70 kVAh	2388	3-Ø SM1 kWh
2051	1-Ø SM14 kVAh	2220	1-Ø SM71 kWh	2389	3-Ø SM1 kvarh
2052	1-Ø SM15 kWh	2221	1-Ø SM71 kvarh	2390	3-Ø SM1 kVAh
2053	1-Ø SM15 kvarh	2222	1-Ø SM71 kVAh	2391	3-Ø SM2 kWh
2054	1-Ø SM15 kVAh	2223	1-Ø SM72 kWh	2392	3-Ø SM2 kvarh
2055	1-Ø SM16 kWh	2224	1-Ø SM72 kvarh	2393	3-Ø SM2 kVAh
2056	1-Ø SM16 kvarh	2225	1-Ø SM72 kVAh	2394	3-Ø SM3 kWh
2057	1-Ø SM16 kVAh	2226	1-Ø SM73 kWh	2395	3-Ø SM3 kvarh
2058	1-Ø SM17 kWh	2227	1-Ø SM73 kvarh	2396	3-Ø SM3 kVAh
2059	1-Ø SM17 kvarh	2228	1-Ø SM73 kVAh	2397	3-Ø SM4 kWh
2060	1-Ø SM17 kVAh	2229	1-Ø SM74 kWh	2398	3-Ø SM4 kvarh
2061	1-Ø SM18 kWh	2230	1-Ø SM74 kvarh	2399	3-Ø SM4 kVAh
2062	1-Ø SM18 kvarh	2231	1-Ø SM74 kVAh	2400	3-Ø SM5 kWh
2063	1-Ø SM18 kVAh	2232	1-Ø SM75 kWh	2401	3-Ø SM5 kvarh
2064	1-Ø SM19 kWh	2233	1-Ø SM75 kvarh	2402	3-Ø SM5 kVAh
2065	1-Ø SM19 kvarh	2234	1-Ø SM75 kVAh	2403	3-Ø SM6 kWh
2066	1-Ø SM19 kVAh	2235	1-Ø SM76 kWh	2404	3-Ø SM6 kvarh
2067	1-Ø SM20 kWh	2236	1-Ø SM76 kvarh	2405	3-Ø SM6 kVAh
2068	1-Ø SM20 kvarh	2237	1-Ø SM76 kVAh	2406	3-Ø SM7 kWh
2069	1-Ø SM20 kVAh	2238	1-Ø SM77 kWh	2407	3-Ø SM7 kvarh
2070	1-Ø SM21 kWh	2239	1-Ø SM77 kvarh	2408	3-Ø SM7 kVAh
2071	1-Ø SM21 kvarh	2240	1-Ø SM77 kVAh	2409	3-Ø SM8 kWh
2072	1-Ø SM21 kVAh	2241	1-Ø SM78 kWh	2410	3-Ø SM8 kvarh
2073	1-Ø SM22 kWh	2242	1-Ø SM78 kvarh	2411	3-Ø SM8 kVAh
2074	1-Ø SM22 kvarh	2243	1-Ø SM78 kVAh	2412	3-Ø SM9 kWh
2075	1-Ø SM22 kVAh	2244	1-Ø SM79 kWh	2413	3-Ø SM9 kvarh
2076	1-Ø SM23 kWh	2245	1-Ø SM79 kvarh	2414	3-Ø SM9 kVAh
2077	1-Ø SM23 kvarh	2246	1-Ø SM79 kVAh	2415	3-Ø SM10 kWh
2078	1-Ø SM23 kVAh	2247	1-Ø SM80 kWh	2416	3-Ø SM10 kvarh
2079	1-Ø SM24 kWh	2248	1-Ø SM80 kvarh	2417	3-Ø SM10 kVAh
2080	1-Ø SM24 kvarh	2249	1-Ø SM80 kVAh	2418	3-Ø SM11 kWh
2081	1-Ø SM24 kVAh	2250	1-Ø SM81 kWh	2419	3-Ø SM11 kvarh
2082	1-Ø SM25 kWh	2251	1-Ø SM81 kvarh	2420	3-Ø SM11 kVAh
2083	1-Ø SM25 kvarh	2252	1-Ø SM81 kVAh	2421	3-Ø SM12 kWh
2084	1-Ø SM25 kVAh	2253	1-Ø SM82 kWh	2422	3-Ø SM12 kvarh
2085	1-Ø SM26 kWh	2254	1-Ø SM82 kvarh	2423	3-Ø SM12 kVAh
2086	1-Ø SM26 kvarh	2255	1-Ø SM82 kVAh	2424	3-Ø SM13 kWh
2087	1-Ø SM26 kVAh	2256	1-Ø SM83 kWh	2425	3-Ø SM13 kvarh
2088	1-Ø SM27 kWh	2257	1-Ø SM83 kvarh	2426	3-Ø SM13 kVAh
2089	1-Ø SM27 kvarh	2258	1-Ø SM83 kVAh	2427	3-Ø SM14 kWh
2090	1-Ø SM27 kVAh	2259	1-Ø SM84 kWh	2428	3-Ø SM14 kvarh
2091	1-Ø SM28 kWh	2260	1-Ø SM84 kvarh	2429	3-Ø SM14 kVAh
2092	1-Ø SM28 kvarh	2261	1-Ø SM84 kVAh	2430	3-Ø SM15 kWh
2093	1-Ø SM28 kVAh	2262	2-Ø SM1 kWh	2431	3-Ø SM15 kvarh
2094	1-Ø SM29 kWh	2263	2-Ø SM1 kvarh	2432	3-Ø SM15 kVAh
2095	1-Ø SM29 kvarh	2264	2-Ø SM1 kVAh	2433	3-Ø SM16 kWh
2096	1-Ø SM29 kVAh	2265	2-Ø SM2 kWh	2434	3-Ø SM16 kvarh
2097	1-Ø SM30 kWh	2266	2-Ø SM2 kvarh	2435	3-Ø SM16 kVAh

2098	1-Ø SM30 kvarh	2267	2-Ø SM2 kVAh	2436	3-Ø SM17 kWh
2099	1-Ø SM30 kVAh	2268	2-Ø SM3 kWh	2437	3-Ø SM17 kvarh
2100	1-Ø SM31 kWh	2269	2-Ø SM3 kvarh	2438	3-Ø SM17 kVAh
2101	1-Ø SM31 kvarh	2270	2-Ø SM3 kVAh	2439	3-Ø SM18 kWh
2102	1-Ø SM31 kVAh	2271	2-Ø SM4 kWh	2440	3-Ø SM18 kvarh
2103	1-Ø SM32 kWh	2272	2-Ø SM4 kvarh	2441	3-Ø SM18 kVAh
2104	1-Ø SM32 kvarh	2273	2-Ø SM4 kVAh	2442	3-Ø SM19 kWh
2105	1-Ø SM32 kVAh	2274	2-Ø SM5 kWh	2443	3-Ø SM19 kvarh
2106	1-Ø SM33 kWh	2275	2-Ø SM5 kvarh	2444	3-Ø SM19 kVAh
2107	1-Ø SM33 kvarh	2276	2-Ø SM5 kVAh	2445	3-Ø SM20 kWh
2108	1-Ø SM33 kVAh	2277	2-Ø SM6 kWh	2446	3-Ø SM20 kvarh
2109	1-Ø SM34 kWh	2278	2-Ø SM6 kvarh	2447	3-Ø SM20 kVAh
2110	1-Ø SM34 kvarh	2279	2-Ø SM6 kVAh	2448	3-Ø SM21 kWh
2111	1-Ø SM34 kVAh	2280	2-Ø SM7 kWh	2449	3-Ø SM21 kvarh
2112	1-Ø SM35 kWh	2281	2-Ø SM7 kvarh	2450	3-Ø SM21 kVAh
2113	1-Ø SM35 kvarh	2282	2-Ø SM7 kVAh	2451	3-Ø SM22 kWh
2114	1-Ø SM35 kVAh	2283	2-Ø SM8 kWh	2452	3-Ø SM22 kvarh
2115	1-Ø SM36 kWh	2284	2-Ø SM8 kvarh	2453	3-Ø SM22 kVAh
2116	1-Ø SM36 kvarh	2285	2-Ø SM8 kVAh	2454	3-Ø SM23 kWh
2117	1-Ø SM36 kVAh	2286	2-Ø SM9 kWh	2455	3-Ø SM23 kvarh
2118	1-Ø SM37 kWh	2287	2-Ø SM9 kvarh	2456	3-Ø SM23 kVAh
2119	1-Ø SM37 kvarh	2288	2-Ø SM9 kVAh	2457	3-Ø SM24 kWh
2120	1-Ø SM37 kVAh	2289	2-Ø SM10 kWh	2458	3-Ø SM24 kvarh
2121	1-Ø SM38 kWh	2290	2-Ø SM10 kvarh	2459	3-Ø SM24 kVAh
2122	1-Ø SM38 kvarh	2291	2-Ø SM10 kVAh	2460	3-Ø SM25 kWh
2123	1-Ø SM38 kVAh	2292	2-Ø SM11 kWh	2461	3-Ø SM25 kvarh
2124	1-Ø SM39 kWh	2293	2-Ø SM11 kvarh	2462	3-Ø SM25 kVAh
2125	1-Ø SM39 kvarh	2294	2-Ø SM11 kVAh	2463	3-Ø SM26 kWh
2126	1-Ø SM39 kVAh	2295	2-Ø SM12 kWh	2464	3-Ø SM26 kvarh
2127	1-Ø SM40 kWh	2296	2-Ø SM12 kvarh	2465	3-Ø SM26 kVAh
2128	1-Ø SM40 kvarh	2297	2-Ø SM12 kVAh	2466	3-Ø SM27 kWh
2129	1-Ø SM40 kVAh	2298	2-Ø SM13 kWh	2467	3-Ø SM27 kvarh
2130	1-Ø SM41 kWh	2299	2-Ø SM13 kvarh	2468	3-Ø SM27 kVAh
2131	1-Ø SM41 kvarh	2300	2-Ø SM13 kVAh	2469	3-Ø SM28 kWh
2132	1-Ø SM41 kVAh	2301	2-Ø SM14 kWh	2470	3-Ø SM28 kvarh
2133	1-Ø SM42 kWh	2302	2-Ø SM14 kvarh	2471	3-Ø SM28 kVAh
2134	1-Ø SM42 kvarh	2303	2-Ø SM14 kVAh	2472	VM1 kWh
2135	1-Ø SM42 kVAh	2304	2-Ø SM15 kWh	2473	VM1 kvarh
2136	1-Ø SM43 kWh	2305	2-Ø SM15 kvarh	2474	VM1 kVAh
2137	1-Ø SM43 kvarh	2306	2-Ø SM15 kVAh	2475	VM2 kWh
2138	1-Ø SM43 kVAh	2307	2-Ø SM16 kWh	2476	VM2 kvarh
2139	1-Ø SM44 kWh	2308	2-Ø SM16 kvarh	2477	VM2 kVAh
2140	1-Ø SM44 kvarh	2309	2-Ø SM16 kVAh	2478	VM3 kWh
2141	1-Ø SM44 kVAh	2310	2-Ø SM17 kWh	2479	VM3 kvarh
2142	1-Ø SM45 kWh	2311	2-Ø SM17 kvarh	2480	VM3 kVAh
2143	1-Ø SM45 kvarh	2312	2-Ø SM17 kVAh	2481	VM4 kWh
2144	1-Ø SM45 kVAh	2313	2-Ø SM18 kWh	2482	VM4 kvarh
2145	1-Ø SM46 kWh	2314	2-Ø SM18 kvarh	2483	VM4 kVAh
2146	1-Ø SM46 kvarh	2315	2-Ø SM18 kVAh	2484	VM5 kWh
2147	1-Ø SM46 kVAh	2316	2-Ø SM19 kWh	2485	VM5 kvarh
2148	1-Ø SM47 kWh	2317	2-Ø SM19 kvarh	2486	VM5 kVAh
2149	1-Ø SM47 kvarh	2318	2-Ø SM19 kVAh	2487	VM6 kWh
2150	1-Ø SM47 kVAh	2319	2-Ø SM20 kWh	2488	VM6 kvarh
2151	1-Ø SM48 kWh	2320	2-Ø SM20 kvarh	2489	VM6 kVAh
2152	1-Ø SM48 kvarh	2321	2-Ø SM20 kVAh	2490	VM7 kWh
2153	1-Ø SM48 kVAh	2322	2-Ø SM21 kWh	2491	VM7 kvarh
2154	1-Ø SM49 kWh	2323	2-Ø SM21 kvarh	2492	VM7 kVAh
2155	1-Ø SM49 kvarh	2324	2-Ø SM21 kVAh	2493	VM8 kWh
2156	1-Ø SM49 kVAh	2325	2-Ø SM22 kWh	2494	VM8 kvarh
2157	1-Ø SM50 kWh	2326	2-Ø SM22 kvarh	2495	VM8 kVAh
2158	1-Ø SM50 kvarh	2327	2-Ø SM22 kVAh	2496	VM9 kWh
2159	1-Ø SM50 kVAh	2328	2-Ø SM23 kWh	2497	VM9 kvarh
2160	1-Ø SM51 kWh	2329	2-Ø SM23 kvarh	2498	VM9 kVAh
2161	1-Ø SM51 kvarh	2330	2-Ø SM23 kVAh	2499	VM10 kWh
2162	1-Ø SM51 kVAh	2331	2-Ø SM24 kWh	2500	VM10 kvarh
2163	1-Ø SM52 kWh	2332	2-Ø SM24 kvarh	2501	VM10 kVAh

2164	1-Ø SM52 kvarh	2333	2-Ø SM24 kVAh		
2165	1-Ø SM52 kVAh	2334	2-Ø SM25 kWh		
2166	1-Ø SM53 kWh	2335	2-Ø SM25 kvarh		
2167	1-Ø SM53 kvarh	2336	2-Ø SM25 kVAh		
2168	1-Ø SM53 kVAh	2337	2-Ø SM26 kWh		

Tariff Energy Measurements

Key	Description	Key	Description	Key	Description
2502	Mains-I T1 kWh Imp	2529	VM2 T1 kvarh	2556	VM6 T2 kvarh
2503	Mains-I T1 kWh Exp	2530	VM2 T1 kVAh	2557	VM6 T2 kVAh
2504	Mains-I T1 kvarh Imp	2531	VM2 T2 kWh	2558	VM7 T1 kWh
2505	Mains-I T1 kvarh Exp	2532	VM2 T2 kvarh	2559	VM7 T1 kvarh
2506	Mains-I T1 kVAh	2533	VM2 T2 kVAh	2560	VM7 T1 kVAh
2507	Mains-I T2 kWh Imp	2534	VM3 T1 kWh	2561	VM7 T2 kWh
2508	Mains-I T2 kWh Exp	2535	VM3 T1 kvarh	2562	VM7 T2 kvarh
2509	Mains-I T2 kvarh Imp	2536	VM3 T1 kVAh	2563	VM7 T2 kVAh
2510	Mains-I T2 kvarh Exp	2537	VM3 T2 kWh	2564	VM8 T1 kWh
2511	Mains-I T2 kVAh	2538	VM3 T2 kvarh	2565	VM8 T1 kvarh
2512	Mains-II T1 kWh Imp	2539	VM3 T2 kVAh	2566	VM8 T1 kVAh
2513	Mains-II T1 kWh Exp	2540	VM4 T1 kWh	2567	VM8 T2 kWh
2514	Mains-II T1 kvarh Imp	2541	VM4 T1 kvarh	2568	VM8 T2 kvarh
2515	Mains-II T1 kvarh Exp	2542	VM4 T1 kVAh	2569	VM8 T2 kVAh
2516	Mains-II T1 kVAh	2543	VM4 T2 kWh	2570	VM9 T1 kWh
2517	Mains-II T2 kWh Imp	2544	VM4 T2 kvarh	2571	VM9 T1 kvarh
2518	Mains-II T2 kWh Exp	2545	VM4 T2 kVAh	2572	VM9 T1 kVAh
2519	Mains-II T2 kvarh Imp	2546	VM5 T1 kWh	2573	VM9 T2 kWh
2520	Mains-II T2 kvarh Exp	2547	VM5 T1 kvarh	2574	VM9 T2 kvarh
2521	Mains-II T2 kVAh	2548	VM5 T1 kVAh	2575	VM9 T2 kVAh
2522	VM1 T1 kWh	2549	VM5 T2 kWh	2576	VM10 T1 kWh
2523	VM1 T1 kvarh	2550	VM5 T2 kvarh	2577	VM10 T1 kvarh
2524	VM1 T1 kVAh	2551	VM5 T2 kVAh	2578	VM10 T1 kVAh
2525	VM1 T2 kWh	2552	VM6 T1 kWh	2579	VM10 T2 kWh
2526	VM1 T2 kvarh	2553	VM6 T1 kvarh	2580	VM10 T2 kvarh
2527	VM1 T2 kVAh	2554	VM6 T1 kVAh	2581	VM10 T2 kVAh
2528	VM2 T1 kWh	2555	VM6 T2 kWh		

DR Default Settings

PMC-592 with firmware V1.00.07 or later has included the default configuration for the Data Recorders as follows:

Parameter	DR 1	DR 2	DR 3	DR 4	DR 5
Trigger Mode	Triggered by Setup Parameter	Triggered by Setup Parameter	Triggered by Setup Parameter	Triggered by Setup Parameter	Triggered by Setup Parameter
Recording Mode	FIFO	FIFO	FIFO	FIFO	FIFO
Recording Depth	65535	65535	65535	65535	65535
Recording Interval	900	900	900	900	900
Recording Offset	0	0	0	0	0
Number of Parameters	64	64	64	64	64
Parameter 1	Mains-I Ua	Mains-II Ua	1-Ø SM1 Current	1-Ø SM65 Current	1-Ø SM45 PF
Parameter 2	Mains-I Ub	Mains-II Ub	1-Ø SM2 Current	1-Ø SM66 Current	1-Ø SM46 PF
Parameter 3	Mains-I Uc	Mains-II Uc	1-Ø SM3 Current	1-Ø SM67 Current	1-Ø SM47 PF
Parameter 4	Mains-I Uln avg	Mains-II Uln avg	1-Ø SM4 Current	1-Ø SM68 Current	1-Ø SM48 PF
Parameter 5	Mains-I Uab	Mains-II Uab	1-Ø SM5 Current	1-Ø SM69 Current	1-Ø SM49 PF
Parameter 6	Mains-I Ubc	Mains-II Ubc	1-Ø SM6 Current	1-Ø SM70 Current	1-Ø SM50 PF
Parameter 7	Mains-I Uca	Mains-II Uca	1-Ø SM7 Current	1-Ø SM71 Current	1-Ø SM51 PF
Parameter 8	Mains-I Ull avg	Mains-II Ull avg	1-Ø SM8 Current	1-Ø SM72 Current	1-Ø SM52 PF
Parameter 9	Frequency	Mains-II Ia	1-Ø SM9 Current	1-Ø SM73 Current	1-Ø SM53 PF
Parameter 10	Mains-I Ia	Mains-II Ib	1-Ø SM10 Current	1-Ø SM74 Current	1-Ø SM54 PF
Parameter 11	Mains-I Ib	Mains-II Ic	1-Ø SM11 Current	1-Ø SM75 Current	1-Ø SM55 PF
Parameter 12	Mains-I Ic	Mains-II In	1-Ø SM12 Current	1-Ø SM76 Current	1-Ø SM56 PF
Parameter 13	Mains-I In	Mains-II Ia loading	1-Ø SM13 Current	1-Ø SM77 Current	1-Ø SM57 PF
Parameter 14	Mains-I Ia Loading Factor	Mains-II Ib loading	1-Ø SM14 Current	1-Ø SM78 Current	1-Ø SM58 PF
Parameter 15	Mains-I Ib Loading Factor	Mains-II Ic loading	1-Ø SM15 Current	1-Ø SM79 Current	1-Ø SM59 PF
Parameter 16	Mains-I Ic Loading Factor	Mains-II kWa	1-Ø SM16 Current	1-Ø SM80 Current	1-Ø SM60 PF
Parameter 17	Mains-I kWa	Mains-II kWb	1-Ø SM17 Current	1-Ø SM81 Current	1-Ø SM61 PF
Parameter 18	Mains-I kWb	Mains-II kWc	1-Ø SM18 Current	1-Ø SM82 Current	1-Ø SM62 PF

Parameter 19	Mains-I kWc	Mains-II ΣkW	1-Ø SM19 Current	1-Ø SM83 Current	1-Ø SM63 PF
Parameter 20	Mains-I ΣkW	Mains-II kvara	1-Ø SM20 Current	1-Ø SM84 Current	1-Ø SM64 PF
Parameter 21	Mains-I kvara	Mains-II kvarb	1-Ø SM21 Current	1-Ø SM1 PF	1-Ø SM65 PF
Parameter 22	Mains-I kvarb	Mains-II kvarc	1-Ø SM22 Current	1-Ø SM2 PF	1-Ø SM66 PF
Parameter 23	Mains-I kvarc	Mains-II Σkvar	1-Ø SM23 Current	1-Ø SM3 PF	1-Ø SM67 PF
Parameter 24	Mains-I Σkvar	Mains-II kVAa	1-Ø SM24 Current	1-Ø SM4 PF	1-Ø SM68 PF
Parameter 25	Mains-I kVAa	Mains-II kVAb	1-Ø SM25 Current	1-Ø SM5 PF	1-Ø SM69 PF
Parameter 26	Mains-I kVAb	Mains-II kVAc	1-Ø SM26 Current	1-Ø SM6 PF	1-Ø SM70 PF
Parameter 27	Mains-I kVAc	Mains-II ΣkVA	1-Ø SM27 Current	1-Ø SM7 PF	1-Ø SM71 PF
Parameter 28	Mains-I ΣkVA	Mains-II PFa	1-Ø SM28 Current	1-Ø SM8 PF	1-Ø SM72 PF
Parameter 29	Mains-I PFa	Mains-II PFb	1-Ø SM29 Current	1-Ø SM9 PF	1-Ø SM73 PF
Parameter 30	Mains-I PFb	Mains-II PFc	1-Ø SM30 Current	1-Ø SM10 PF	1-Ø SM74 PF
Parameter 31	Mains-I PFc	Mains-II ΣPF	1-Ø SM31 Current	1-Ø SM11 PF	1-Ø SM75 PF
Parameter 32	Mains-I ΣPF	Mains-II I unbalance	1-Ø SM32 Current	1-Ø SM12 PF	1-Ø SM76 PF
Parameter 33	Mains-I I unbalance	Mains-II U unbalance	1-Ø SM33 Current	1-Ø SM13 PF	1-Ø SM77 PF
Parameter 34	Mains-I U unbalance	Mains-II Ia Dmd	1-Ø SM34 Current	1-Ø SM14 PF	1-Ø SM78 PF
Parameter 35	Mains-I Ia Dmd	Mains-II Ib Dmd	1-Ø SM35 Current	1-Ø SM15 PF	1-Ø SM79 PF
Parameter 36	Mains-I Ib Dmd	Mains-II Ic Dmd	1-Ø SM36 Current	1-Ø SM16 PF	1-Ø SM80 PF
Parameter 37	Mains-I Ic Dmd	Mains-II kW Total Dmd	1-Ø SM37 Current	1-Ø SM17 PF	1-Ø SM81 PF
Parameter 38	Mains-I kW Total Dmd	Mains-II kvar Total Dmd	1-Ø SM38 Current	1-Ø SM18 PF	1-Ø SM82 PF
Parameter 39	Mains-I kvar Total Dmd	Mains-II kVA Total Dmd	1-Ø SM39 Current	1-Ø SM19 PF	1-Ø SM83 PF
Parameter 40	Mains-I kVA Total Dmd	Mains-II Ia THD	1-Ø SM40 Current	1-Ø SM20 PF	1-Ø SM84 PF
Parameter 41	Mains-I Ia THD	Mains-II Ib THD	1-Ø SM41 Current	1-Ø SM21 PF	1-Ø SM1 THD
Parameter 42	Mains-I Ib THD	Mains-II Ic THD	1-Ø SM42 Current	1-Ø SM22 PF	1-Ø SM2 THD
Parameter 43	Mains-I Ic THD	Mains-II Ia K-factor	1-Ø SM43 Current	1-Ø SM23 PF	1-Ø SM3 THD
Parameter 44	Mains-I Ia K-factor	Mains-II Ib K-factor	1-Ø SM44 Current	1-Ø SM24 PF	1-Ø SM4 THD
Parameter 45	Mains-I Ib K-factor	Mains-II Ic K-factor	1-Ø SM45 Current	1-Ø SM25 PF	1-Ø SM5 THD
Parameter 46	Mains-I Ic K-factor	Mains-II Ua THD	1-Ø SM46 Current	1-Ø SM26 PF	1-Ø SM6 THD
Parameter 47	Mains-I Ua THD	Mains-II Ub THD	1-Ø SM47 Current	1-Ø SM27 PF	1-Ø SM7 THD
Parameter 48	Mains-I Ub THD	Mains-II Uc THD	1-Ø SM48 Current	1-Ø SM28 PF	1-Ø SM8 THD
Parameter 49	Mains-I Uc THD	Reserved	1-Ø SM49 Current	1-Ø SM29 PF	1-Ø SM9 THD
Parameter 50	VM 1 kW	Reserved	1-Ø SM50 Current	1-Ø SM30 PF	1-Ø SM10 THD
Parameter 51	VM 2 kW	Reserved	1-Ø SM51 Current	1-Ø SM31 PF	1-Ø SM11 THD
Parameter 52	VM 3 kW	Reserved	1-Ø SM52 Current	1-Ø SM32 PF	1-Ø SM12 THD
Parameter 53	VM 4 kW	Reserved	1-Ø SM53 Current	1-Ø SM33 PF	1-Ø SM13 THD
Parameter 54	VM 5 kW	Reserved	1-Ø SM54 Current	1-Ø SM34 PF	1-Ø SM14 THD
Parameter 55	VM 6 kW	Reserved	1-Ø SM55 Current	1-Ø SM35 PF	1-Ø SM15 THD
Parameter 56	VM 7 kW	Reserved	1-Ø SM56 Current	1-Ø SM36 PF	1-Ø SM16 THD
Parameter 57	VM 8 kW	Reserved	1-Ø SM57 Current	1-Ø SM37 PF	1-Ø SM17 THD
Parameter 58	VM 9 kW	Reserved	1-Ø SM58 Current	1-Ø SM38 PF	1-Ø SM18 THD
Parameter 59	VM 10 kW	Reserved	1-Ø SM59 Current	1-Ø SM39 PF	1-Ø SM19 THD
Parameter 60	RTD-I Temp. Dmd	Reserved	1-Ø SM60 Current	1-Ø SM40 PF	1-Ø SM20 THD
Parameter 61	RTD-II Temp. Dmd	Reserved	1-Ø SM61 Current	1-Ø SM41 PF	1-Ø SM21 THD
Parameter 62	Reserved	Reserved	1-Ø SM62 Current	1-Ø SM42 PF	1-Ø SM22 THD
Parameter 63	Reserved	Reserved	1-Ø SM63 Current	1-Ø SM43 PF	1-Ø SM23 THD
Parameter 64	Reserved	Reserved	1-Ø SM64 Current	1-Ø SM44 PF	1-Ø SM24 THD

Parameter	**DR 6**	**DR 7**	**DR 8**	**DR 9**	**DR 10**
Trigger Mode	Triggered by Setup Parameter	Triggered by Setup Parameter	Triggered by Setup Parameter	Triggered by Setup Parameter	Triggered by Setup Parameter
Recording Mode	FIFO	FIFO	FIFO	FIFO	FIFO
Recording Depth	65535	65535	65535	65535	65535
Recording Interval	900	900	900	900	900
Recording Offset	0	0	0	0	0
Number of Parameters	64	64	64	64	64
Parameter 1	1-Ø SM25 THD	1-Ø SM5 I Dmd	1-Ø SM69 I Dmd	1-Ø SM49 kW	1-Ø SM29 kvar
Parameter 2	1-Ø SM26 THD	1-Ø SM6 I Dmd	1-Ø SM70 I Dmd	1-Ø SM50 kW	1-Ø SM30 kvar
Parameter 3	1-Ø SM27 THD	1-Ø SM7 I Dmd	1-Ø SM71 I Dmd	1-Ø SM51 kW	1-Ø SM31 kvar
Parameter 4	1-Ø SM28 THD	1-Ø SM8 I Dmd	1-Ø SM72 I Dmd	1-Ø SM52 kW	1-Ø SM32 kvar
Parameter 5	1-Ø SM29 THD	1-Ø SM9 I Dmd	1-Ø SM73 I Dmd	1-Ø SM53 kW	1-Ø SM33 kvar
Parameter 6	1-Ø SM30 THD	1-Ø SM10 I Dmd	1-Ø SM74 I Dmd	1-Ø SM54 kW	1-Ø SM34 kvar
Parameter 7	1-Ø SM31 THD	1-Ø SM11 I Dmd	1-Ø SM75 I Dmd	1-Ø SM55 kW	1-Ø SM35 kvar
Parameter 8	1-Ø SM32 THD	1-Ø SM12 I Dmd	1-Ø SM76 I Dmd	1-Ø SM56 kW	1-Ø SM36 kvar
Parameter 9	1-Ø SM33 THD	1-Ø SM13 I Dmd	1-Ø SM77 I Dmd	1-Ø SM57 kW	1-Ø SM37 kvar
Parameter 10	1-Ø SM34 THD	1-Ø SM14 I Dmd	1-Ø SM78 I Dmd	1-Ø SM58 kW	1-Ø SM38 kvar
Parameter 11	1-Ø SM35 THD	1-Ø SM15 I Dmd	1-Ø SM79 I Dmd	1-Ø SM59 kW	1-Ø SM39 kvar
Parameter 12	1-Ø SM36 THD	1-Ø SM16 I Dmd	1-Ø SM80 I Dmd	1-Ø SM60 kW	1-Ø SM40 kvar
Parameter 13	1-Ø SM37 THD	1-Ø SM17 I Dmd	1-Ø SM81 I Dmd	1-Ø SM61 kW	1-Ø SM41 kvar
Parameter 14	1-Ø SM38 THD	1-Ø SM18 I Dmd	1-Ø SM82 I Dmd	1-Ø SM62 kW	1-Ø SM42 kvar

Parameter 15	1-Ø SM39 THD	1-Ø SM19 I Dmd	1-Ø SM83 I Dmd	1-Ø SM63 kW	1-Ø SM43 kvar
Parameter 16	1-Ø SM40 THD	1-Ø SM20 I Dmd	1-Ø SM84 I Dmd	1-Ø SM64 kW	1-Ø SM44 kvar
Parameter 17	1-Ø SM41 THD	1-Ø SM21 I Dmd	1-Ø SM1 kW	1-Ø SM65 kW	1-Ø SM45 kvar
Parameter 18	1-Ø SM42 THD	1-Ø SM22 I Dmd	1-Ø SM2 kW	1-Ø SM66 kW	1-Ø SM46 kvar
Parameter 19	1-Ø SM43 THD	1-Ø SM23 I Dmd	1-Ø SM3 kW	1-Ø SM67 kW	1-Ø SM47 kvar
Parameter 20	1-Ø SM44 THD	1-Ø SM24 I Dmd	1-Ø SM4 kW	1-Ø SM68 kW	1-Ø SM48 kvar
Parameter 21	1-Ø SM45 THD	1-Ø SM25 I Dmd	1-Ø SM5 kW	1-Ø SM69 kW	1-Ø SM49 kvar
Parameter 22	1-Ø SM46 THD	1-Ø SM26 I Dmd	1-Ø SM6 kW	1-Ø SM70 kW	1-Ø SM50 kvar
Parameter 23	1-Ø SM47 THD	1-Ø SM27 I Dmd	1-Ø SM7 kW	1-Ø SM71 kW	1-Ø SM51 kvar
Parameter 24	1-Ø SM48 THD	1-Ø SM28 I Dmd	1-Ø SM8 kW	1-Ø SM72 kW	1-Ø SM52 kvar
Parameter 25	1-Ø SM49 THD	1-Ø SM29 I Dmd	1-Ø SM9 kW	1-Ø SM73 kW	1-Ø SM53 kvar
Parameter 26	1-Ø SM50 THD	1-Ø SM30 I Dmd	1-Ø SM10 kW	1-Ø SM74 kW	1-Ø SM54 kvar
Parameter 27	1-Ø SM51 THD	1-Ø SM31 I Dmd	1-Ø SM11 kW	1-Ø SM75 kW	1-Ø SM55 kvar
Parameter 28	1-Ø SM52 THD	1-Ø SM32 I Dmd	1-Ø SM12 kW	1-Ø SM76 kW	1-Ø SM56 kvar
Parameter 29	1-Ø SM53 THD	1-Ø SM33 I Dmd	1-Ø SM13 kW	1-Ø SM77 kW	1-Ø SM57 kvar
Parameter 30	1-Ø SM54 THD	1-Ø SM34 I Dmd	1-Ø SM14 kW	1-Ø SM78 kW	1-Ø SM58 kvar
Parameter 31	1-Ø SM55 THD	1-Ø SM35 I Dmd	1-Ø SM15 kW	1-Ø SM79 kW	1-Ø SM59 kvar
Parameter 32	1-Ø SM56 THD	1-Ø SM36 I Dmd	1-Ø SM16 kW	1-Ø SM80 kW	1-Ø SM60 kvar
Parameter 33	1-Ø SM57 THD	1-Ø SM37 I Dmd	1-Ø SM17 kW	1-Ø SM81 kW	1-Ø SM61 kvar
Parameter 34	1-Ø SM58 THD	1-Ø SM38 I Dmd	1-Ø SM18 kW	1-Ø SM82 kW	1-Ø SM62 kvar
Parameter 35	1-Ø SM59 THD	1-Ø SM39 I Dmd	1-Ø SM19 kW	1-Ø SM83 kW	1-Ø SM63 kvar
Parameter 36	1-Ø SM60 THD	1-Ø SM40 I Dmd	1-Ø SM20 kW	1-Ø SM84 kW	1-Ø SM64 kvar
Parameter 37	1-Ø SM61 THD	1-Ø SM41 I Dmd	1-Ø SM21 kW	1-Ø SM1 kvar	1-Ø SM65 kvar
Parameter 38	1-Ø SM62 THD	1-Ø SM42 I Dmd	1-Ø SM22 kW	1-Ø SM2 kvar	1-Ø SM66 kvar
Parameter 39	1-Ø SM63 THD	1-Ø SM43 I Dmd	1-Ø SM23 kW	1-Ø SM3 kvar	1-Ø SM67 kvar
Parameter 40	1-Ø SM64 THD	1-Ø SM44 I Dmd	1-Ø SM24 kW	1-Ø SM4 kvar	1-Ø SM68 kvar
Parameter 41	1-Ø SM65 THD	1-Ø SM45 I Dmd	1-Ø SM25 kW	1-Ø SM5 kvar	1-Ø SM69 kvar
Parameter 42	1-Ø SM66 THD	1-Ø SM46 I Dmd	1-Ø SM26 kW	1-Ø SM6 kvar	1-Ø SM70 kvar
Parameter 43	1-Ø SM67 THD	1-Ø SM47 I Dmd	1-Ø SM27 kW	1-Ø SM7 kvar	1-Ø SM71 kvar
Parameter 44	1-Ø SM68 THD	1-Ø SM48 I Dmd	1-Ø SM28 kW	1-Ø SM8 kvar	1-Ø SM72 kvar
Parameter 45	1-Ø SM69 THD	1-Ø SM49 I Dmd	1-Ø SM29 kW	1-Ø SM9 kvar	1-Ø SM73 kvar
Parameter 46	1-Ø SM70 THD	1-Ø SM50 I Dmd	1-Ø SM30 kW	1-Ø SM10 kvar	1-Ø SM74 kvar
Parameter 47	1-Ø SM71 THD	1-Ø SM51 I Dmd	1-Ø SM31 kW	1-Ø SM11 kvar	1-Ø SM75 kvar
Parameter 48	1-Ø SM72 THD	1-Ø SM52 I Dmd	1-Ø SM32 kW	1-Ø SM12 kvar	1-Ø SM76 kvar
Parameter 49	1-Ø SM73 THD	1-Ø SM53 I Dmd	1-Ø SM33 kW	1-Ø SM13 kvar	1-Ø SM77 kvar
Parameter 50	1-Ø SM74 THD	1-Ø SM54 I Dmd	1-Ø SM34 kW	1-Ø SM14 kvar	1-Ø SM78 kvar
Parameter 51	1-Ø SM75 THD	1-Ø SM55 I Dmd	1-Ø SM35 kW	1-Ø SM15 kvar	1-Ø SM79 kvar
Parameter 52	1-Ø SM76 THD	1-Ø SM56 I Dmd	1-Ø SM36 kW	1-Ø SM16 kvar	1-Ø SM80 kvar
Parameter 53	1-Ø SM77 THD	1-Ø SM57 I Dmd	1-Ø SM37 kW	1-Ø SM17 kvar	1-Ø SM81 kvar
Parameter 54	1-Ø SM78 THD	1-Ø SM58 I Dmd	1-Ø SM38 kW	1-Ø SM18 kvar	1-Ø SM82 kvar
Parameter 55	1-Ø SM79 THD	1-Ø SM59 I Dmd	1-Ø SM39 kW	1-Ø SM19 kvar	1-Ø SM83 kvar
Parameter 56	1-Ø SM80 THD	1-Ø SM60 I Dmd	1-Ø SM40 kW	1-Ø SM20 kvar	1-Ø SM84 kvar
Parameter 57	1-Ø SM81 THD	1-Ø SM61 I Dmd	1-Ø SM41 kW	1-Ø SM21 kvar	Reserved
Parameter 58	1-Ø SM82 THD	1-Ø SM62 I Dmd	1-Ø SM42 kW	1-Ø SM22 kvar	Reserved
Parameter 59	1-Ø SM83 THD	1-Ø SM63 I Dmd	1-Ø SM43 kW	1-Ø SM23 kvar	Reserved
Parameter 60	1-Ø SM84 THD	1-Ø SM64 I Dmd	1-Ø SM44 kW	1-Ø SM24 kvar	Reserved
Parameter 61	1-Ø SM1 I Dmd	1-Ø SM65 I Dmd	1-Ø SM45 kW	1-Ø SM25 kvar	Reserved
Parameter 62	1-Ø SM2 I Dmd	1-Ø SM66 I Dmd	1-Ø SM46 kW	1-Ø SM26 kvar	Reserved
Parameter 63	1-Ø SM3 I Dmd	1-Ø SM67 I Dmd	1-Ø SM47 kW	1-Ø SM27 kvar	Reserved
Parameter 64	1-Ø SM4 I Dmd	1-Ø SM68 I Dmd	1-Ø SM48 kW	1-Ø SM28 kvar	Reserved

Appendix C - Technical Specifications

Main Voltage Inputs (V1, V2, V3, VN)	
Standard (Un)	277VLN / 480VLL
Range	10% to 120% Un
PT Ratio	
Mains I/II-Primary	1-1,000,000V
Mains I/II-Secondary	1-480V
Overload	2xUn continuous, 4xUn for 1s
Burden	< 0.05VA @ 277VLN per phase
Frequency	45-65Hz
Mains Current Inputs	
I Nominal (In)	5A / 1A (CT rated Input)
Range	1% to 120%
Starting Current	0.3% of In
CT Ratio	6000 max. for 5A, 30000 max. for 1A
Overload	1.2xIn continuous, 10xIn for 1s
Burden	<0.3VA per phase
Power Supply for Main Unit (L+, N-)	
Standard	95-277VAC/DC, ±10%, 47-440Hz
Burden	<6W
Branch Inputs	
CT Ratio	400 Max.
Burden	<0.05VA per phase
Starting Current	0.2% Imax
Solid-Core CT Strip	
100A	In=100A, Imax=100A, Range= 0.2-100A
5A	In=5A, Imax=10A, Range= 0.05-10A
Split-Core CT	
100A	In=10A, Imax=120A, Range= 5-120 A
200A	In=200A, Imax=240A, Range= 10-240A
400A	In=400A, Imax=480A, Range= 20-480A
800A	In=800A, Imax=960A, Range= 40-960A
Digital Inputs	
Type	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Debounce	1-9999 ms programmable
Relay Outputs	
Type	Form A Mechanical Relay
Loading	5A @250VAC / 30VDC
RTD Input	
Type	PT100
Range	-40 to 200 °C
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	II
Overvoltage Category	CAT III
Mechanical Characteristics	
Enclosure	Galvanized Steel
Unit Dimensions	260.5*154*55.5
IP Rating	50

Appendix D - Accuracy Specifications

Parameters	Accuracy	Resolution
Mains Voltage	±0.2%	0.01V
Mains I1 - I4	±0.2%	0.001A
kW, kVA	IEC 62053-22 Class 0.5S for Mains IEC 62053-21 Class 1 for Branches	0.001k
kWh, kVAh		0.1kXh
kvar, kvarh	IEC 62053-23 Class 2	0.1kvar/kvarh
P.F.	±1.0%	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	0.01
RTD	±1.0°	0.1°

Appendix E - Standards Compliance

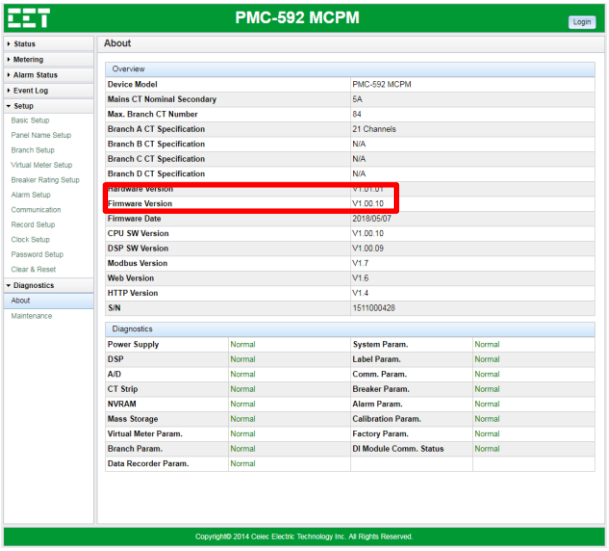
Safety Requirements	
LVD Directive 2006 / 95 / EC	EN61010-1: 2010 EN 61010-2-030: 2010
Insulation AC Voltage Insulation resistance Impulse voltage	 3.5kV @ 1 minute >100MΩ 6kV, 1.2/50µs
Electromagnetic Compatibility EMC Directive 2004 / 108 / EC (EN 61326: 2006)	
Immunity Tests	
Electrostatic discharge	EN 61000-4-2: 2009
Radiated fields	EN 61000-4-3: 2006+A1: 2008+A2: 2010
Fast transients	EN 61000-4-4: 2012
Surges	EN 61000-4-5: 2006
Conducted disturbances	EN 61000-4-6: 2009
Magnetic Fields	EN 61000-4-8: 2010
Voltage Dips and Interruptions	EN 61000-4-11:2004
Oscillatory waves	EN 61000-4-12: 2006
Emission Tests	
Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment	EN 55011: 2009 + A1: 2010 (CISPR 11)
Limits and methods of measurement of radio disturbance characteristics of information technology equipment	EN 55022: 2010 +AC: 2011 (CISPR 22)
Limits for harmonic current emissions for equipment with rated current ≤16 A	EN 61000-3-2: 2006+A1: 2009+A2: 2009
Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16 A	EN 61000-3-3: 2008
Emission standard for industrial environments	EN 61000-6-4: 2007+A1: 2011
Mechanical Tests	
Spring Hammer Test	IEC 62052-11: 2003
Vibration Test	IEC 62052-11: 2003
Shock Test	IEC 62052-11: 2003

Appendix F – Firmware Upgrade

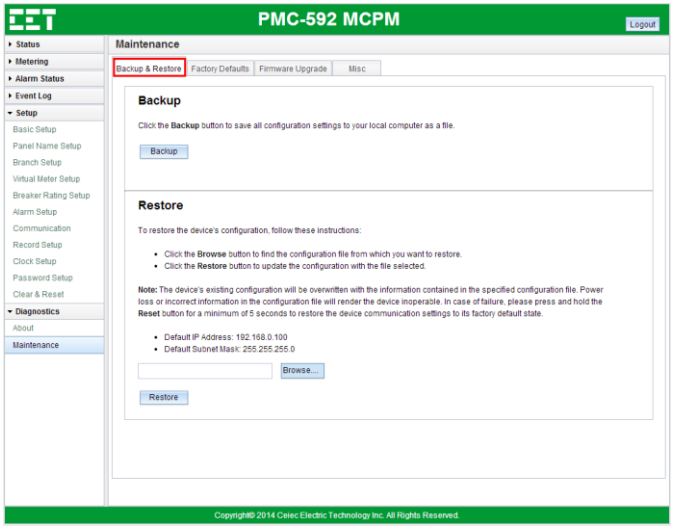
This section provides the instructions on how to upgrade the PMC-592 Firmware to a higher version.

Before upgrading, please make sure that the new Firmware file is already on your computer and that the PMC-592 is on the same IP network as the computer that is being used to perform the upgrade. Contact CET Technical Support at support@cet-global.com should you require further assistance.

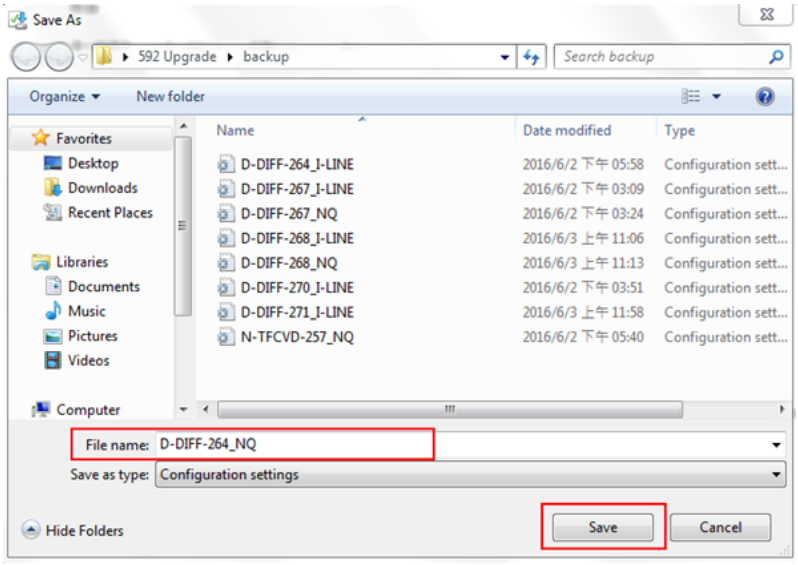
1. Enter the IP Address of the PMC-592 in the Address area of your Internet Explorer and then press **<Enter>**.
2. Log onto the Web Interface by clicking on the **Login** icon at the upper right-hand corner and enter the password (default password of 'user' = 0000) at the Login dialog box.
3. Identify the present firmware version. Click **Diagnostics => About** on the left-hand pane and the following screen appears on the right-hand pane, and then check **Firmware Version** and **Firmware Date**.



4. Backup existing configuration.
   1) Click **Diagnostics => Maintenance => Backup & Restore** on the left-hand pane and the following screen appears on the right-hand pane and then click **Backup.** Select **Save** or **Save as…** from the prompt at the bottom of the page.

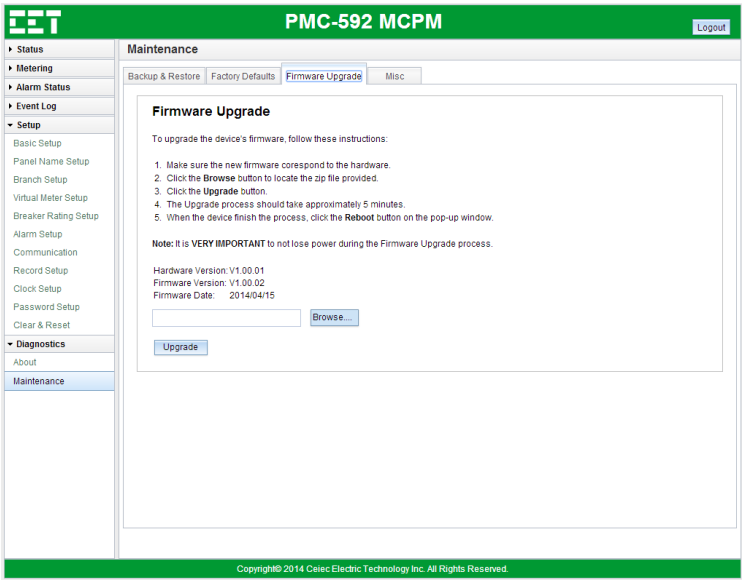


2) Select the destination folder where the file will be saved and give the backup file a meaningful name with the .ini extension. Click **Save.**

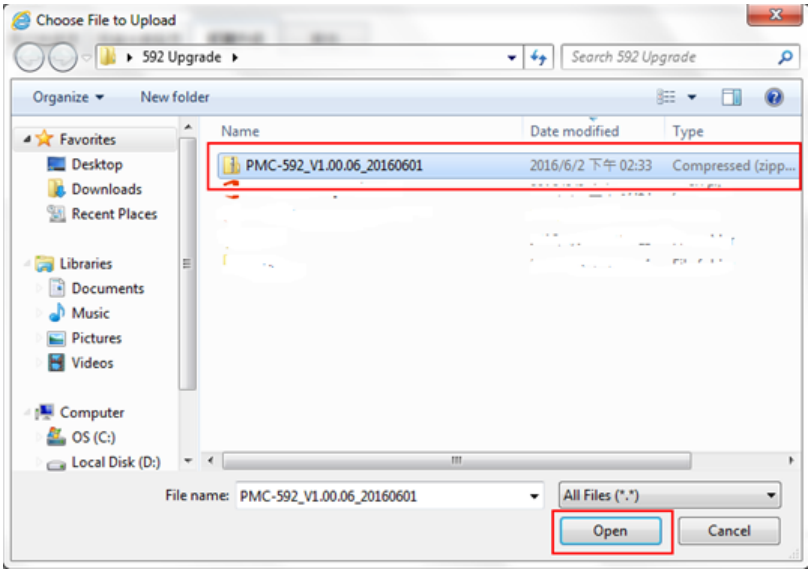


5. Upgrade firmware.

   a. Click **Diagnostics => Maintenance => Firmware Upgrade** and the following screen appears on the right-hand pane.



   b. Click **Browse…** to select the new Firmware file which is in .zip format and then click **Open.** There is no need to decompress the file first.



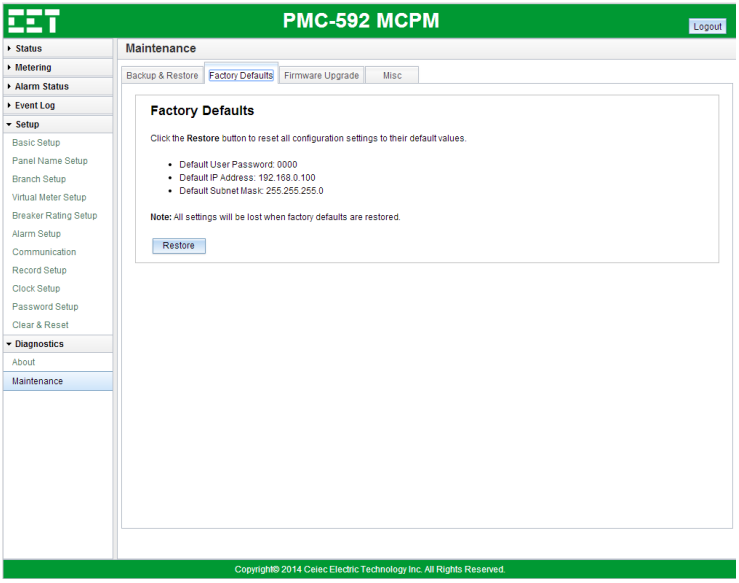
c. Please verify that the power supply is securely connected to the PMC-592 and keep it powered on during the entire upgrade process. Losing power in the middle of the firmware upgrade may render the PMC-592 inoperable.

d. Click **Upgrade** at the bottom of the **Firmware Upgrade** page to initiate the upgrade. The upgrade process will take about 5 minutes to complete.

e. When the upgrade is finished, you will be prompted to reboot the PMC-592.

6. Check the **Firmware Version** by following Step 3 above to confirm that the upgrade is successful.

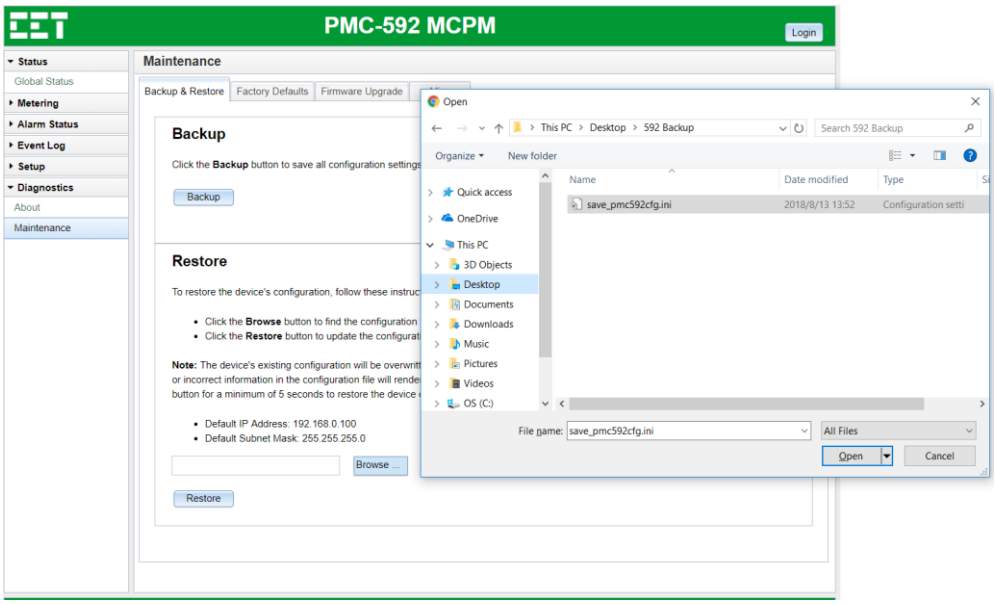
7. Restore the **Factory Defaults** Settings if the PMC-592 is upgraded from V1.00.09 or earlier to V1.00.11 or later due to some minor incompatibilities for the features enhancement in V1.00.11. Click **Diagnostics => Maintenance => Factory Defaults** and the following screen appears on the right-hand pane, then click **Restore.**



8. Restore the previously saved configuration.

a. Click **Diagnostics => Maintenance => Backup & Restore** on the left-hand pane and the following screen appears on the right-hand pane. Click **Restore**, select the previously saved configuration file with the .ini extension and then click **Open**. The PMC-592 will

then be restored with the configuration saved in the selected .ini file.



Appendix G - PMC-592 Firmware and HMI Version Compatibility

The following table illustrates the compatibility between PMC-592 firmware versions and HMI firmware versions.

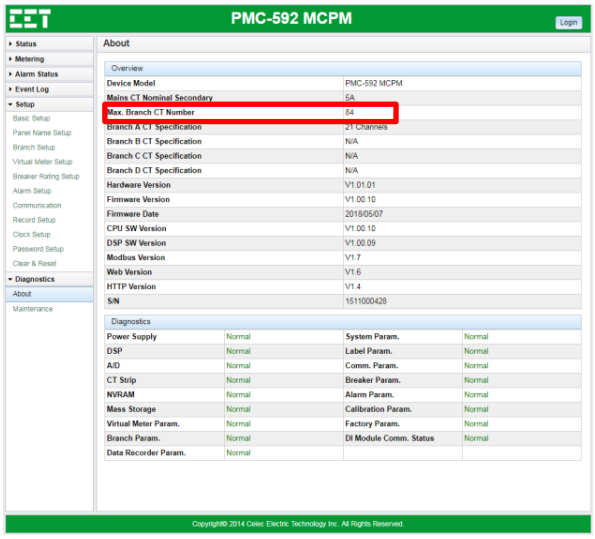
PMC-592 Firmware Version	HMI Model	PMC-592-HMI Firmware Version	HMI Firmware Update Date
V1.00.04	TK6070iQ	V2.00	-
V1.00.05	TK6070iQ	V2.02	-
V1.00.06	TK6070iQ	V2.02	-
V1.00.07	TK6070iQ	V2.02	-
V1.00.08	TK6070iH	V2.03	20160825
	TK6070iQ		20160818
V1.00.09	TK6070iQ	V2.04	-
	TK6071iQ	V1.02.00	-
V1.00.10	TK6070iQ	V1.03.05	-
	TK6071iQ	V1.02.01	-
V1.00.11	TK6070iQ	V1.03.06	-
	TK6071iQ	V1.02.02	-

Notes:

1) It is recommended to use a HMI with the corresponding versions that are listed on the above. Otherwise, a HMI with a lower firmware version may not display the new PMC-592 features in a higher Firmware version. For example, a HMI (TK6070iQ) with V2.04 firmware cannot display and configure new setup parameters in PMC-592 Firmware V1.00.10.
2) The firmware for the PMC-592 should be upgraded first before the HMI.
3) The following illustrates how to identify the HMI Model:
   - HMI Version (V2.03) & Update Version (20160825) **=>** HMI Model = TK6070iH
   - HMI Version (V2.03) & Update Version (20160818) **=>** HMI Model = TK6070iQ
   - HMI Version = V1.03.0X **=>** HMI Model = TK6070iQ
   - HMI Version = V1.02.0X **=>** HMI Model = TK6071iQ
   - HMI Version = V2.0X (except V2.03) = TK6070iQ
4) Please make sure the HMI that will be upgraded and the HMI Model are matched. For example, a HMI with V1.02.00 firmware can only be upgraded to Firmware V1.02.01 or V1.02.02 which is matched to TK6071iQ model for now.
5) HMI Firmware V1.0X is applicable to TK6070iH model (obsoleted now).

Appendix H - FAQ

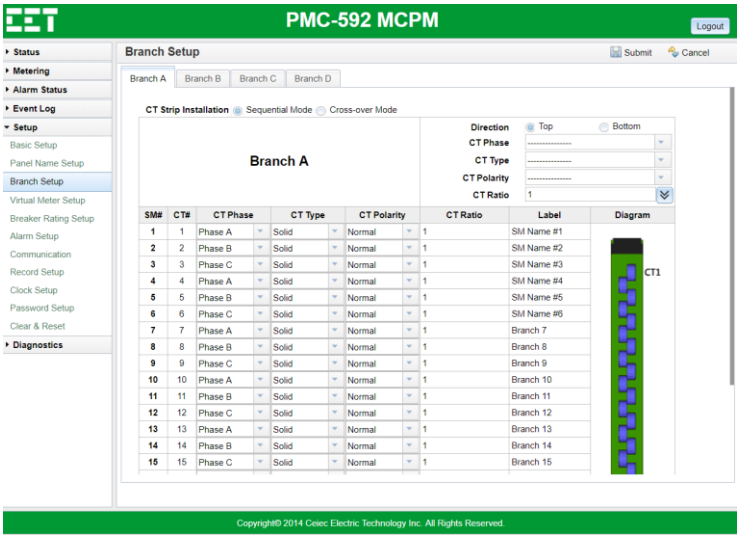
1. **The Fault LED indicator is blinking after power on**
   - Is the Branch Cable securely connected to both the CT Strips and the PMC-592 Base Unit? If not, please fix the connection.
   - Is the number of CT Strips connected consistent with configuration? For example, the default number of SM is 84 (4 CT Strips), but only two CT Strips are connected. Please follow the steps below to check the configuration:
     1) Open Web interface, please refer to Section **3.2.3 Accessing PMC-592's Web Interface**.
     2) Choose **Diagnostics > About** and check the **Max Branch CT Number.** Please make sure that the **Max. Branch CT number** matches the number of CT Strips connected.



     3) The position of the connected CT Strips is incorrect. Only Firmware V1.00.03 or above supports arbitrary CT Strip connection. Please check the PMC-592's firmware version to make sure that the CT strips are connected in order from A, B, C and D, especially for Firmware V1.00.02 or earlier.

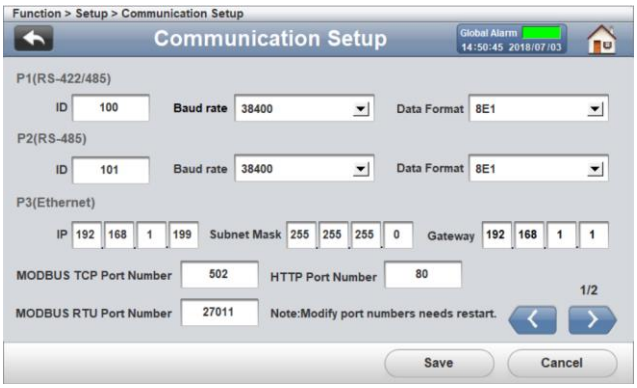
2. **The kW reading of a SM displays negative value**

   Please make sure that the Current flow matches correctly with the Current direction as indicated by the arrow of the CT, the **CT Polarity** is programmed correctly, or the Branch Circuit is correctly paired with the Voltage phase. Please also check to make sure that the **Installation Mode** and **Installation Direction** are correctly programmed according to the actual installation.
   1) Open Web interface, please refer to **Section 3.2.3 Accessing PMC-592's Web Interface**.
   2) Choose **Setup > Branch Setup** and related configuration, make sure all configuration are correct.



3. **Cannot access to Web**

- Has the network been connected successfully? Please check to make sure that the Ethernet cable is securely connected and that the PMC-592 and PC are connected to the same IP network.
- Please check to make sure that the IP address is entered correctly via the HMI.



If the PMC-592's Ethernet configuration are correct, please check to make sure that the PC's IP address is on the same subnet. If confirmed, please try to **Ping** the PMC-592's IP address and other "known" network nodes from inside a Command Shell of the PC to make sure that the PC's Ethernet configuration is correct. If the problem persists, please contact your Network Administrator or CET Technical Support via support@cet-global.com.

4. **The accuracy of an entire CT Strip doesn't meet stated specification**

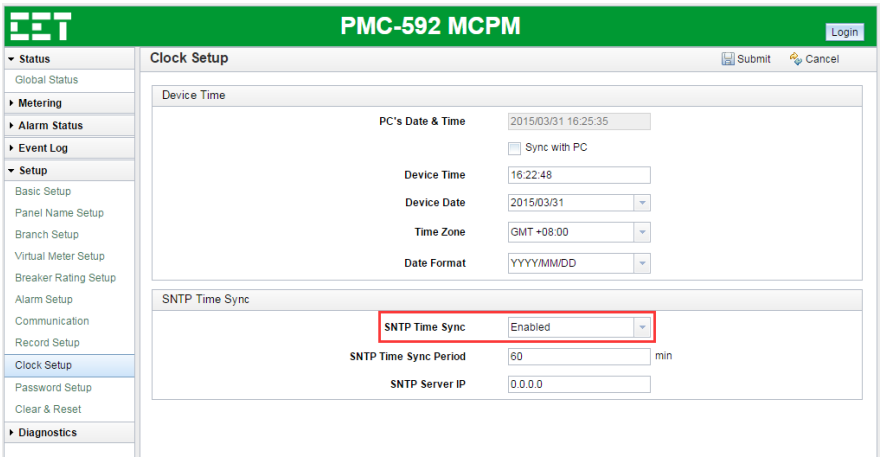
This could happen in older PMC-592s if a CT Strip is inserted to a Branch Input that hasn't been calibrated during production. Please check the firmware version to make sure that it is V1.00.03 or above. For older PMC-592 with firmware version V1.00.02 or earlier, calibration is performed only on the number of Branch Circuits specified during purchasing so additional CT Strips are not supported in the field.

5. **Harmonic, Max/Min or Energy data are always displayed as 0**

Please check if the relevant functions are **Enabled**. There is a problem where some PMC-592s produced in 2014 do not have Harmonic, Max/Min or Energy measurement functions enabled. Please contact CET Technical Support via support@cet-global.com for more information.

6. **SNTP Time Synchronization failed**

- Please check via the Web Interface if the **SNTP Time Sync.** is enabled and that the SNTP function has been properly configured.



- If the SNTP Sever is working normally, please follow guidelines below to set SNTP server on Windows OS.
  1) Set server type as NTP.
     a) Click **Start** and enter **regedit** in **Search** box, press **Enter** and open **Registry Editor** window**.**
     b) Choose HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Parameters\Type.
     c) Right-click **Type** and select **Modify…** in the right window.
     d) Enter **NTP** in the **Editing String** box, and then click **OK.**
  2) Set **AnnounceFlags** as **5**.
     a) In the **Registry Editor** window, choose HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Config\AnnounceFlags
     b) Right-click **AnnounceFlags** and select **Modify…**
     c) Enter **5** in the **Editing String** box, and then click **OK.**
  3) Enable **NTPServer.**
     a) In the **Registry Editor** window, choose HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders\NtpServer
     b) Right-click **Enabled** and select **Modify…**
     c) Enter **1** in the **Editing String** box, and then click **OK.**
  4) Make the configuration take effect immediately.
     a) Exit **Registry Editor**.
     b) Enter **net stop w32time && net start w32time** to restart Windows time server, and then press **Enter**.
- If the network firewall allows the NTP access.
  1) Please check the configuration of the Host Firewall to which the SNTP belongs. For example, permission should be added to the firewall such that the NTP service is accessible from the outside world.

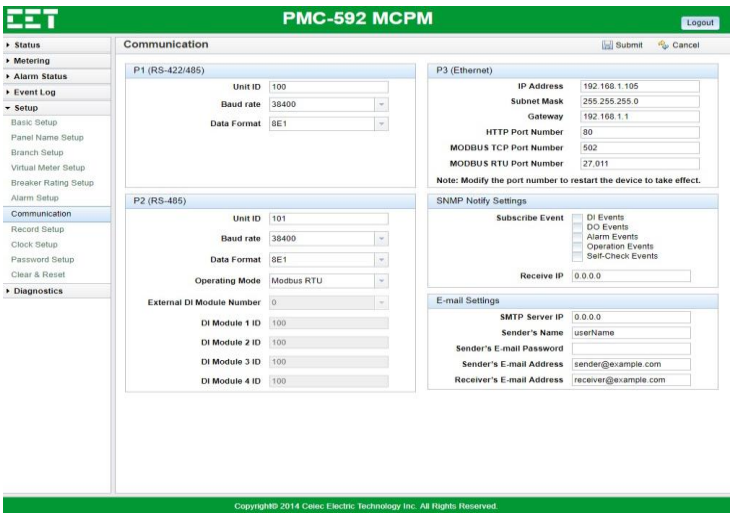
     Coding:

Name	Port	Protocol	Direction
SNTP Timebase	123	UDP	In

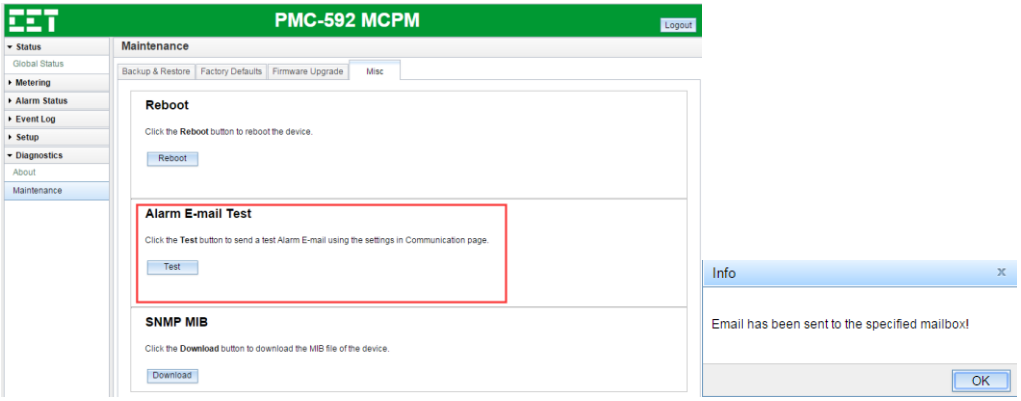
  2) If there are other gateways or firewall devices between SNTP Server and PMC-592, please check to make sure that all these network devices allow SNTP service to pass through.

7. **Failed to send Alarm Email**

- Please check if the **SMTP** parameters have been configured correctly.
  Check SMTP configuration via the Web Interface.



- Cannot access to Email server
  Check Email server parameter through sending test email on the Web.



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