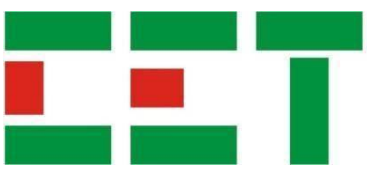
iMeter 6

Advanced Power Quality Analyzer

User Manual

Version: V1.1

March 16, 2022



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

Chapter 1 Introduction

This manual explains how to use the iMeter 6 Advanced Power Quality Meter. Throughout the manual the term "meter" generally refers to all models.

This chapter provides an overview of the iMeter 6 meter and summarizes many of its key features.

1.1 Overview

The iMeter 6 is CET's latest offer for the advanced Power Quality Monitoring of Incomers and Critical Feeders for Utilities, Data Centers, High-Tech Manufacturing Facilities and Heavy Industries. Housed in an industry-standard DIN form factor measuring 96x96x119.5mm, the iMeter 6's compact size is perfectly suited for today's space restricting environment. The iMeter 6 features quality construction with metal enclosure, advanced Power Quality and Revenue-Accurate measurements, high-resolution Waveform Recording capabilities, comprehensive Data Logging with 1GB memory, extensive I/O and a user friendly, IPS Color Dot-Matrix Display @ 320x240. It also provides either an I4 Input for Neutral Current measurement or a 0/4-20mA Analog Input for measuring external transducer signal such as Residual or Leakage Current. With a standard 100BaseT Ethernet Port and a RS-485 port supporting multiple protocols, the iMeter 6 becomes a vital component of an intelligent Power Quality Monitoring System.

Following is a list of typical applications for the iMeter 6:

- Class 0.2S Revenue Metering
- Power Quality Monitoring of Main Incomer or Critical Feeder
- Utility, Industrial and Commercial Metering
- Substation, Building and Factory Automation
- Low, Medium and High Voltage applications
- Neutral (I4) and Residual Current (Ir) Monitoring

Contact CET Technical Support should you require further assistance with your application.

1.2 Features

Ease of use

- Large, backlit, Color Dot-Matrix IPS display with wide viewing angle
- Password protected setup via Front Panel and on-board Web Server
- Easy installation with mounting slide bar, no tools required

Basic True RMS Measurements (1 second update)

- 3-Phase U, I, Neutral-Earth Voltage (Ung) and Power measurements
- Neutral Current (I4), Calculated Residual Current (Ir) and Frequency
- kWh, kvarh Import/Export/Net/Total, kVAh Total and kvarh Q1-Q4
- Interval Energy
- Voltage and Current Phase Angles
- Device Operating Time (Running Hours)
- DI Pulse Counters
- Optional AI measurements

High-speed RMS Measurements

- 3-phase U @ ½ cycle, 3-phase I, Neutral Current (I4), Power and PF@ 1 cycle

Power Quality

- IEC 61000-4-30 Ed. 3 Class S Compliance and EN50160 Report~
- Waveform Recording (WFR & DWR~) in COMTRADE format
- Fundamental U, I, I4, P, Q, S and Displacement PF
- U and I Unbalance, Sequence Components, Voltage and Freq. Deviation
- THD, TOHD, TEHD, Crest Factor, K-Factor and TDD
- Individual Harmonics up to 63rd
- Dips, Swells, Interruptions Detection and Transients Capture
- Disturbance Direction Indicator~

~Available in Firmware V3.10.00 or later

Demands

- Present/Predicted Demands for 3-phase U, I, P, Q, S, PF, as well as I4, Frequency, U & I Unbalance and THD
- Max. Demands with Timestamp for Ull, Uln & Current per phase and average as well as Power of This Month and Last Month (or Since Last Reset and Before Last Reset)
- Max./Min. values per Demand Interval
- Demand synchronization with DI

Setpoints

- 16 Standard (1s) and 8 High-Speed (1 cycle) Setpoints
- Extensive monitoring sources including U, I, P, Q, S, PF, Current Demands, THD, Unbalance, Sequence Components, Phase Loss/Reversal, etc.
- Configurable thresholds and time delays
- 6 Logical Modules supporting AND/OR/NAND/NOR operations
- SOE, WFR, DWR, Data Recorder, DO, and Email Alarm trigger

Log memory

- 1GB on-board memory
- DR Logs, WFR Logs, DWR Logs, IER Logs and Demand Logs

Multi-Tariff TOU Capability

- Two independent sets of TOU Schedules
  - Up to 12 Seasons
  - 90 Holidays or Alternate Days
  - 20 Daily Profiles, each with 12 Periods at min. 15-minute interval
  - 8 Tariffs, each providing kWh, kvarh Import/Export and kVAh
- Switching between two TOU schedules according to pre-programmed time and logged as SOE event

Data Recorder (DR) Log

- 28 Standard DR Logs and 4 High-Speed DR Logs
- Recording Interval from 1s to 40 days for Standard DR Log and 1 to 60 cycles for High-Speed DR Log.
- Up to 16 parameters for each DR Log with programmable sources including most Real-time measurements, Demands, Energy, Harmonics, Unbalance and Modbus Slave's Real-time measurements
- Configurable Depth and Recording Offset
- Support FIFO or Stop-When-Full Recording Mode
- BEC2018 Compliant Data Recording for 3 years at 15-minute interval

Real-Time Waveform Capture (WFC) and Waveform Recorder (WFR)

- Real-time WFC @ 128 samples/cycle x 4 cycles, Event Waveforms and ITIC/SEMI F47 Curves~ via Front Panel and Web Interface
- WFR with 128 entries
- Simultaneous capture of 3-phase Voltage and Current signals
- Programmable formats and pre-fault cycles from 256x20 to 16x320
- Support FIFO Recording Mode
- Scheduled WFR with max. repetition of 10000 times and programmable schedule from 1 to 960 hours
- COMTRADE file format, downloadable from the on-board Web/FTP Server

Disturbance Waveform Recording (DWR)~

- 128 entries
- Simultaneous recording of 3-Phase Voltage and Current Inputs
  - Initial Fault: 35 cycles @ 256 samples/cycle
  - Extended Fault: Up to 150 cycles @ 16 samples/cycle
  - Steady State: Up to 360 seconds of 1-cycle absolute peak values
  - Post Fault: 15 cycles @ 256 samples/cycle

~Supported via Firmware V3.10.00 or later

Interval Energy Recorder (IER)

- Support recording of kWh/kvarh Import/Export and kVAh Total
- Programmable Recording Interval from 1 min to 65535 mins
- Max. Recording Depth @ 65535 records
- Support FIFO or Stop-When-Full Recording Mode

SOE Log

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

PQ Log

- 512 entries time-stamped to ±1ms resolution
- Dips, Swells, Interruptions and Transients detection

Max./Min. Log

- Logging of Max./Min. values for measurements such as Voltage, Current, Frequency, P, Q, S, PF, Unbalance, K-Factor and THD with Timestamp for This Month and Last Month (or Since Last Reset and Before Last Reset)

Digital Inputs

- 6 channels, volts free dry contact, 24VDC internally wetted
- 1000Hz sampling for status monitoring with programmable debounce
- Pulse counting with programmable weight for each channel for collecting WAGES (Water, Air, Gas, Electricity, Steam) information
- Demand Synchronization
- Tariff switching based on DI status

Digital Outputs

- Up to 3 channels Form A Mechanical Relays Outputs for alarming and control
- 5A @ 250VAC/30VDC

Analog Input (Optional)

- Optional 1xAI, 0/4-20mA DC input with programmable zero and full scales
- Can be used to measure external transducer signal such as Residual or Leakage Current

Communications

RS-485 (P1)

- Optically isolated RS-485 port with baud rate from 1200 to 38,400 bps
- Modbus RTU, Ethernet Gateway and Modbus Master
- Supports up to 31 downstream Modbus Slave Devices

Ethernet (P2)

- 10/100BaseT Ethernet Port with RJ45 connection
- Built-in Web Server for easy data viewing and setup configuration
- Modbus TCP, HTTP/HTTPS~, SMTP/SMTPS~, SNTP, FTPS, SNMP~, IEC 61850 over Ethernet~

~Supported in Firmware V3.10.00 or later

Real-time clock

- Battery-backed Real-time Clock with 6ppm accuracy (<0.5s per day)
- Time Sync. via Modbus RTU/TCP, SNTP, GPS and IRIG-B~

~Supported in Firmware V3.10.00 or later

System Integration

- Supported by CET's PecStar® iEMS
- Easy integration into other Automation or SCADA systems via Modbus RTU and Modbus TCP protocols
- The on-board password protected Web Server provides user-friendly access to its data and supports the configuration for most of the setup parameters via a standard web browser

1.3 iMeter 6's Application in Power and Energy Management Systems

The iMeter 6 can be used to monitor Wye or Delta connected power system. Modbus communications allow real-time data, events, DI status, Data Logs, Waveform and other information to be transmitted to an Integrated Energy Management System such as PecStar® iEMS.

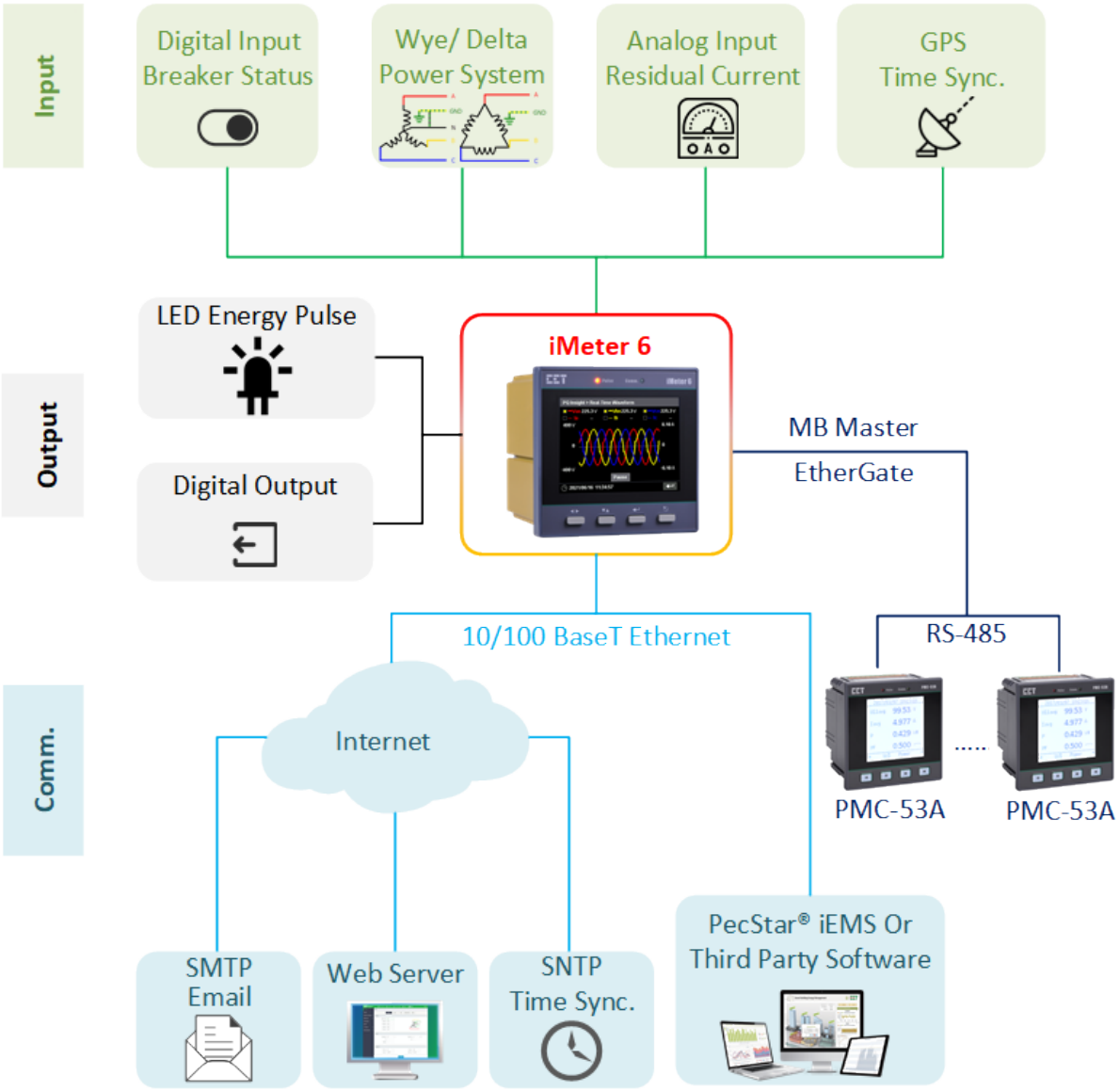


Figure 1-1 Typical Applications

1.4 Getting more information

Additional information is available from CET via the following sources:

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

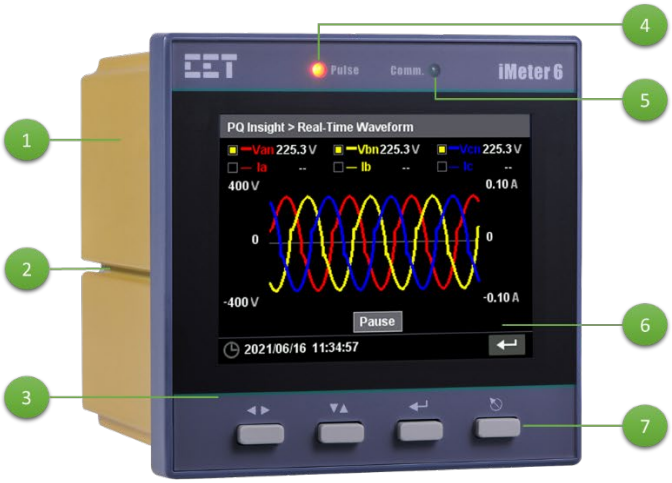
Chapter 2 Installation

Caution

Installation of the iMeter 6 should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

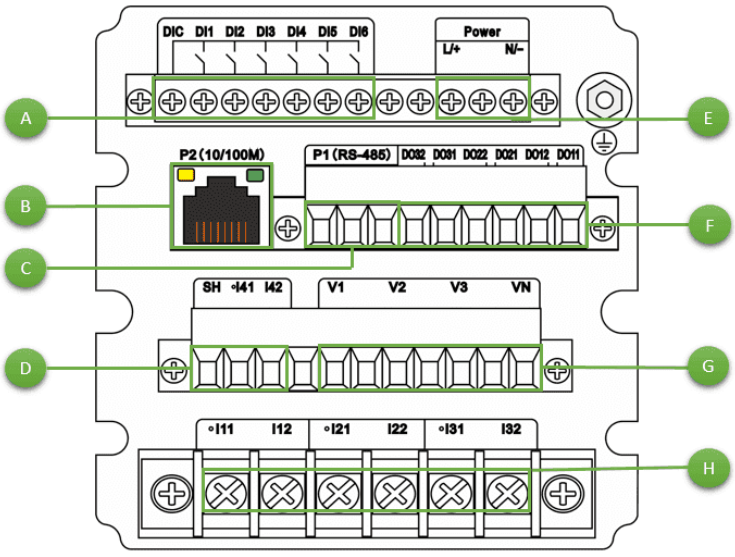
During the operation of the meter, hazardous voltages are present at the input terminals. Failure to observe precautions can result in serious or even fatal injury and equipment damage.

2.1 Appearance



1 Enclosure
2 Mounting Slide Bar
3 Front Panel
4 LED Pulse Output
5 Comm. LED Indicator
6 LCD (IPS) Display
7 Buttons

Figure 2-1 Appearance



A 6xDigital Input
B 1x10/100 BaseT Ethernet Port
C 1xRS-485 Port
D 1xI4 Input
E Power Supply
F 3xDigital Output
G 3-Ø Voltage Input
H 3-Ø Current Input

Figure 2-2 Rear Panel

2.2 Unit Dimensions

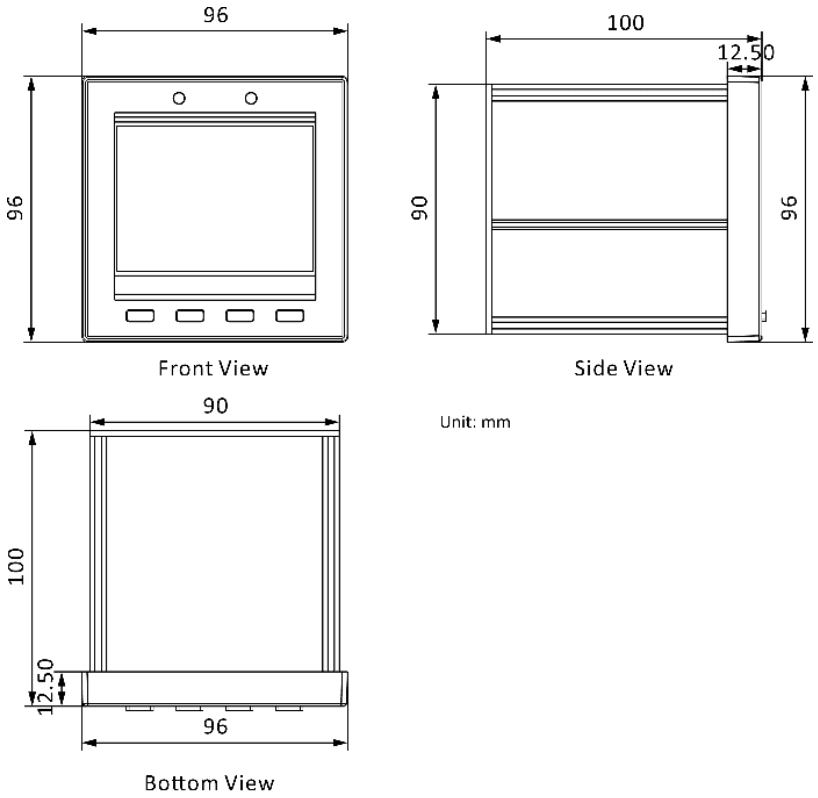
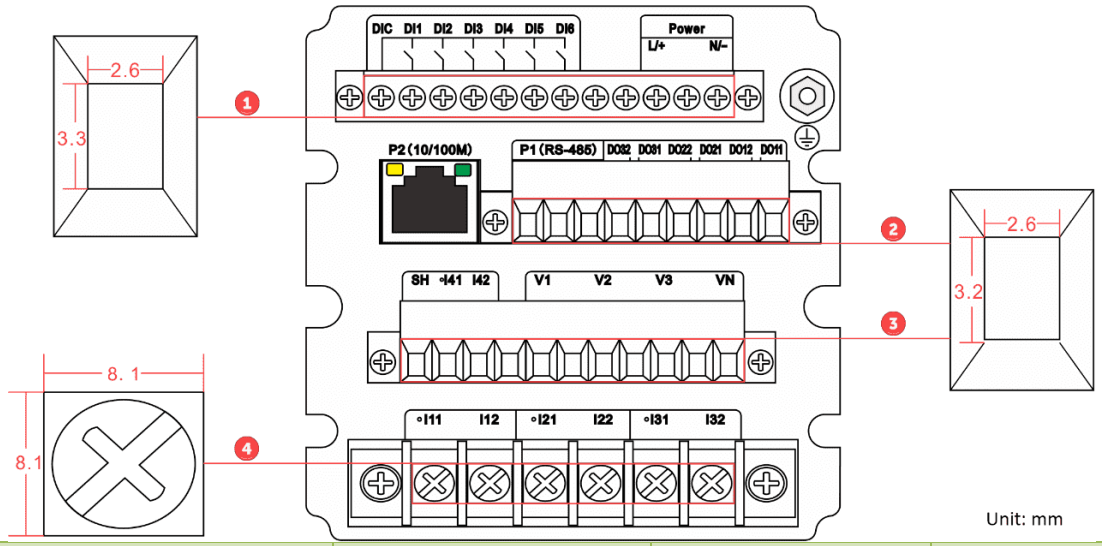


Figure 2-3 Unit Dimensions

2.3 Terminal Dimensions



No.	Terminal	Terminal Dimensions	Wire Size	Max. Torque
1	DI	2.6mm x 3.3mm	1.5mm²	5 kgf.cm/M3 (4.3 lb-in)
	Power Supply			
2	RS-485	2.6mm x 3.2mm		
	DO			
3	I4 Input			
	Voltage Input			
4	Current Input	8.1mm x 8.1mm	1.0mm² - 2.5mm² (14AWG - 22AWG)	18.0 kgf.cm/M4 (15.6 lb-in)

Figure 2-4 Terminal Dimensions

2.4 Mounting

The iMeter 6 should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise sources.

Installation steps:

- Remove the mounting slide bars from the meter
- Fit the meter through a 92mmx92mm cutout as shown in Figure 2-5
- Re-install the mounting slide bars and tighten the screws against the panel to secure the meter

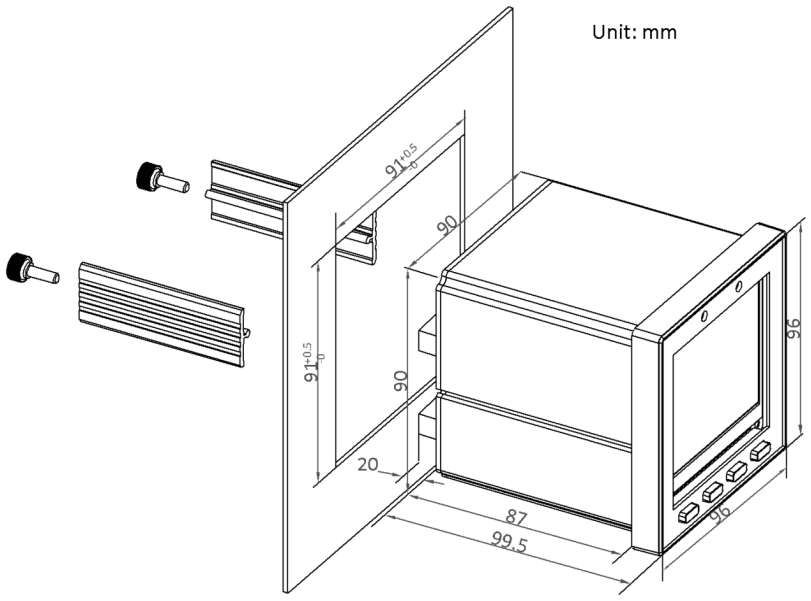


Figure 2-5 Panel Cutout

2.5 Wiring Connections

iMeter 6 can satisfy almost any three phase power systems. Please read this section carefully before installation and choose the correct wiring method for your power system. The following **Wiring Modes** are supported:

- 3-Phase 4-Wire Wye Direct Connections with 3CTs or 4CTs
- 3-Phase 4-Wire Wye with 3PTs and 3CTs or 4CTs
- 3-Phase 3-Wire Grounded Wye Connections
- 3-Phase 3-Wire Direct Connections with 3CTs or 2CTs
- 3-Phase 3-Wire with 2PTs and 3CTs or 2CTs
- 1-Phase 3-Wire Direct Connections with 2CTs
- 1-Phase 2-Wire L-N Direct Connections with 1CT
- 1-Phase 2-Wire L-L Direct Connections with 1CT

Caution

Under no circumstances should the PT secondary be shorted.

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

2.5.2 3-Phase 4-Wire Wye Direct Connections with 3CTs or 4CTs

Please consult the serial number label to ensure that the rated system phase voltage is less than or equal to the meter's rated **Phase** voltage input specification. Set the **Wiring Mode** to **3P4W**.

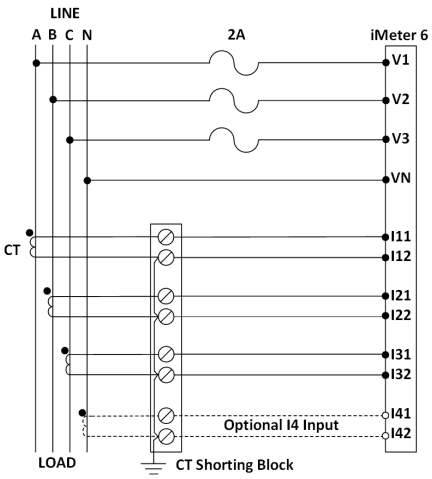


Figure 2-6 3P4W Wye Direct Connections with 3CTs or 4CTs (Optional I4 Input)

2.5.3 3-Phase 4-Wire Wye with 3PTs and 3CTs or 4CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's rated **Phase** voltage input specification. Set the **Wiring Mode** to **3P4W**.

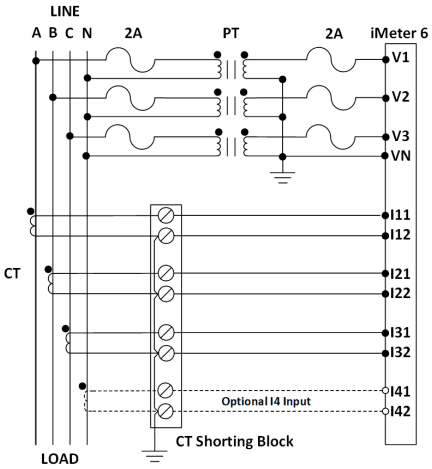


Figure 2-7 3P4W Wye with 3PTs and 3CTs or 4CTs (Optional I4 Input)

2.5.4 3-Phase 3-Wire Grounded Wye Connections

Please consult the serial number label to ensure that the system phase voltage is less than or equal to the meter's rated **Phase** voltage input specification. Set the **Wiring Mode** to **3P3W**.

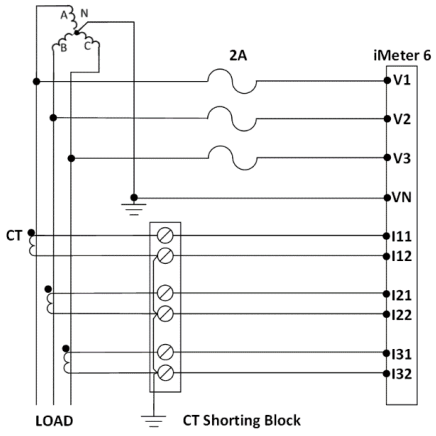


Figure 2-8 3P3W Grounded Wye with no PTs & 3CTs

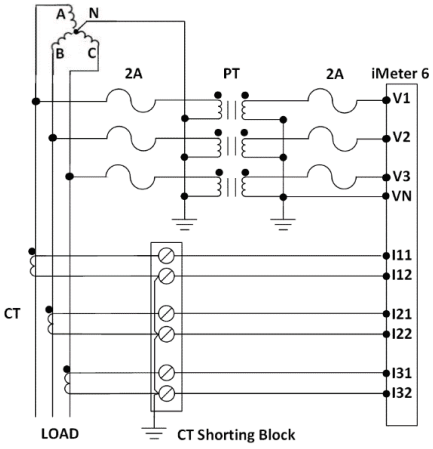


Figure 2-9 3P3W Grounded Wye with 3PTs & 3CTs

2.5.5 3-Phase 3-Wire Direct Connections with 3CTs or 2CTs

Please consult the Serial Number Label to ensure that the rated Ull voltage is less than or equal to the meter's rated **Line** voltage input specification. Set the **Wiring Mode** to **3P3W**.

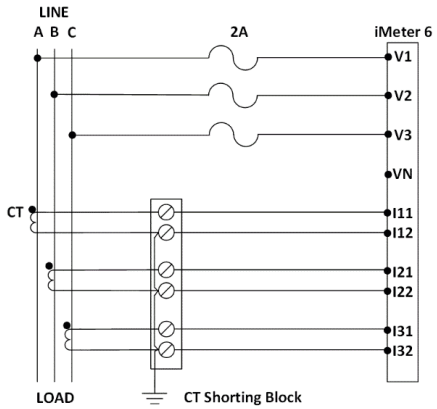


Figure 2-10 3P3W Direct Connections with 3CTs

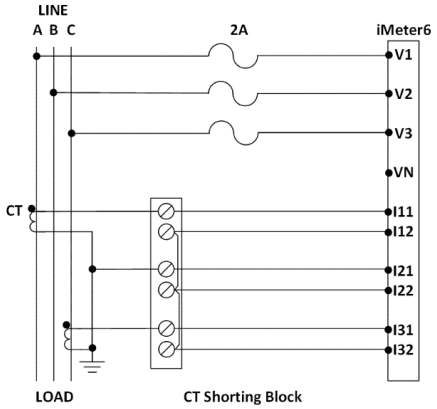


Figure 2-11 3P3W Direct Connections with 2CTs

2.5.6 3-Phase 3-Wire with 2PTs and 3CTs or 2CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's rated **Phase** voltage input specification. Set the **Wiring Mode** to **3P3W**.

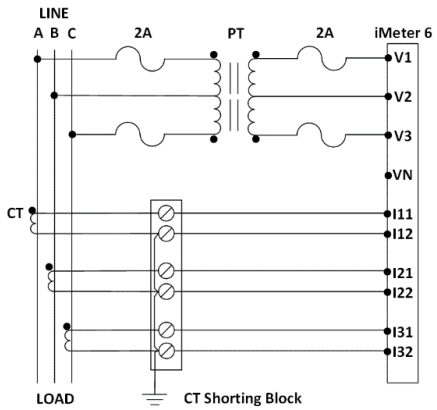


Figure 2-12 3P3W with 2PTs & 3CTs

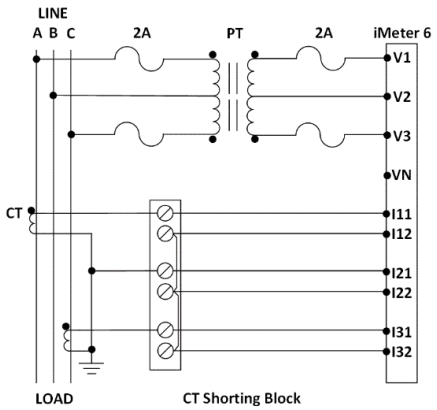


Figure 2-13 3P3W with 2PTs & 2CTs

2.5.7 1-Phase 3-Wire Direct Connections with 2CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's rated **Phase** voltage input specification. Set the **Wiring Mode** to **1P3W**.

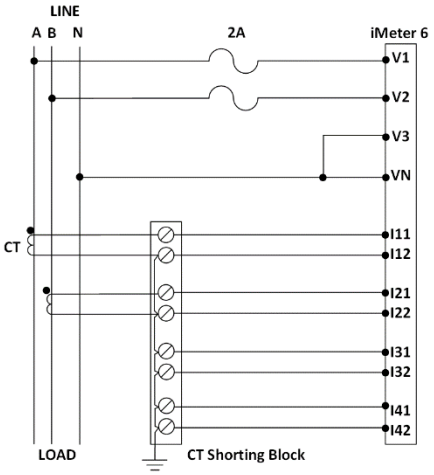


Figure 2-14 1-Phase 3-Wire Direct Connections with 3CTs or 2CTs

2.5.8 1-Phase 2-Wire L-N Direct Connections with 1CT

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's rated **Phase** voltage input specification. Set the **Wiring Mode** to **1P2W L-N**.

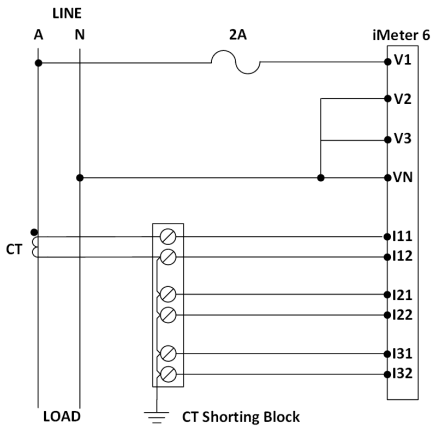


Figure 2-15 1-Phase 2-Wire L-N Direct Connections with 1CT

2.5.9 1-Phase 2-Wire L-L Direct Connections with 1CT

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's rated **Phase** voltage input specification. Set the **Wiring Mode** to **1P2W L-L**.

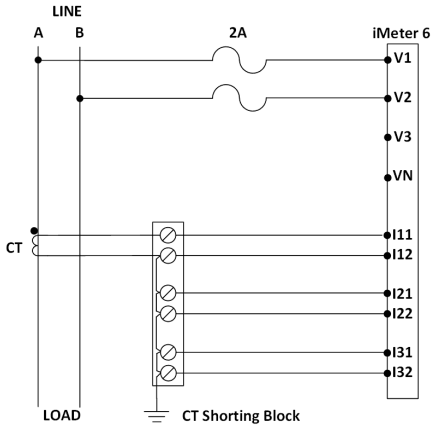


Figure 2-16 1-Phase 2-Wire L-L Direct Connections with 1CT

2.6 Communications Wiring

2.6.1 RS-485 Port

The iMeter 6 provides one RS-485 port and supports the Modbus RTU protocol. Up to 32 devices can be connected on a RS-485 bus. The overall length of the RS-485 cable connecting all devices should not exceed 1200m.

If the master station does not have a RS-485 communications port, a RS232/RS-485, USB/RS-485 or Ethernet/RS-485 converter with optically isolated outputs and surge protection should be used.

The following figure illustrates the RS-485 communications connections on the iMeter 6:

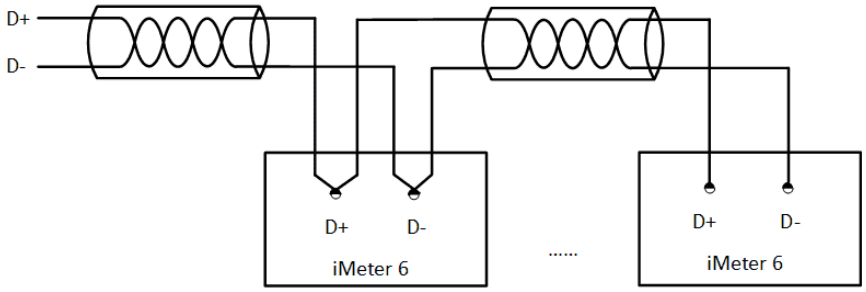


Figure 2-17 RS-485 Communications Connections

2.6.2 Ethernet Port (10/100BaseT)

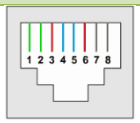
RJ45 Connector	Pin	Meaning
	1	Transmit Data+
	2	Transmit Data-
	3	Receive Data+
	4,5,7,8,	NC
	6	Receive Data-

Table 2-1 RJ45 Connector Pin Description for 10/100BaseT Applications

2.7 Digital Input Wiring

The following figure illustrates the Digital Input connections on the iMeter 6:

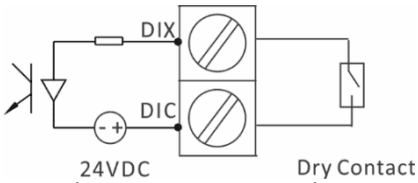


Figure 2-18 DI Connections

2.8 GPS 1PPS Input wiring

The DI6 on the iMeter 6 can be used for time synchronization with a GPS 1PPS output. The following figure illustrates the wiring connections:

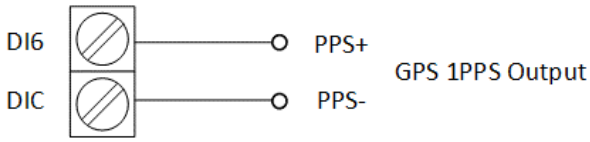


Figure 2-19 Time Sync. Connections

2.9 Digital Output Wiring

The following figure illustrates the Digital Output connections on the iMeter 6:

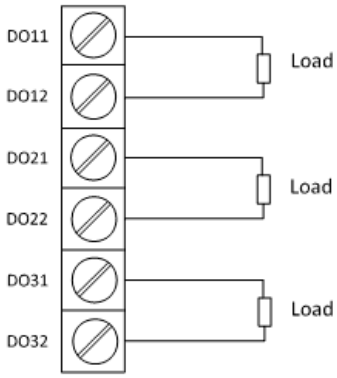


Figure 2-20 DO Connections

2.10 Energy Pulse Output Wiring

The following figure illustrates the Energy Pulse Output connections when the DO mode is programmed for Energy Pulsing.

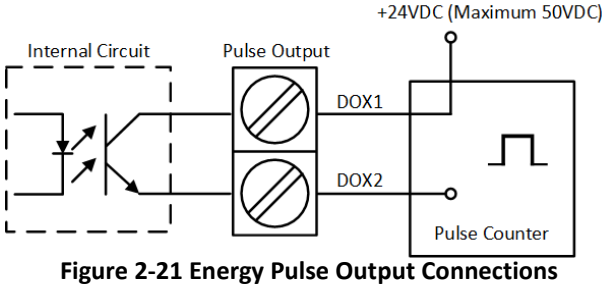


Figure 2-21 Energy Pulse Output Connections

2.11 Analog Input Wiring

The following figure illustrates the optional Analog Input connections.

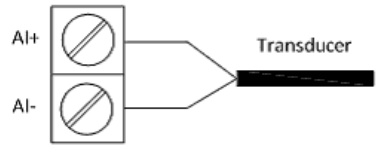


Figure 2-22 AI Connections

2.12 Power supply Wiring

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

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

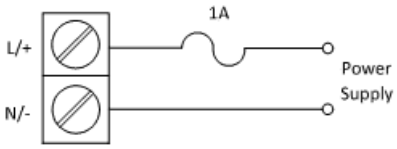


Figure 2-23 Power Supply Connections

2.13 Chassis Ground Wiring

Connect the G terminal to earth ground.

Figure 2-24 Chassis Ground connection

Chapter 3 User Interface

3.1 Front Panel Interface

The following screen capture shows the Real-Time Waveform Capture display on the iMeter 6, which is equipped with a stunning, 320x240 IPS Color Dot-Matrix Display. There are two LED indicators which are used for Energy Pulsing and Communication activities, respectively. The iMeter 6 also provides four buttons for data display and setup configuration.

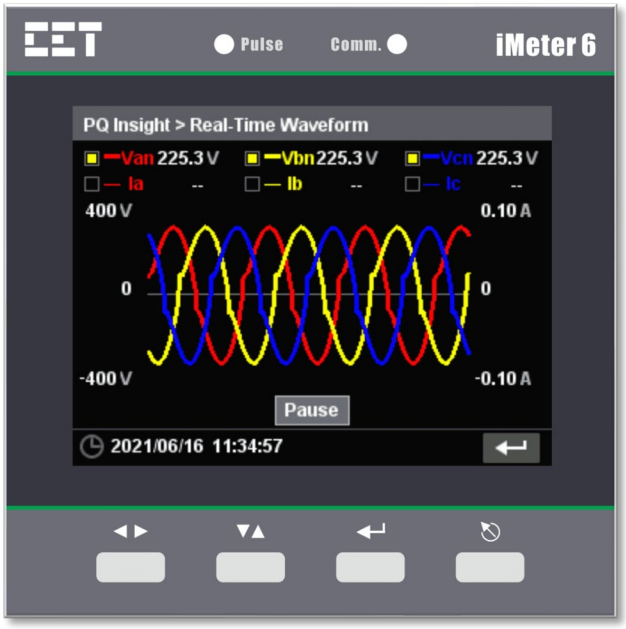


Figure 3-1 Front Panel

3.1.1 Front Panel LED Indicators

The meanings for the two indicators are described as below:

LED Indicator	Color	Status	Description
Pulse	Red	Pulsing based on the rate of Energy Consumption	Energy Pulse Output
Comm.	Green	Blinking	Receiving data or Transmitting data
		Off	No Communication

Table 3-1 Font Panel LED Indicators

3.1.2 Front Panel Button Navigations

The iMeter 6 provides four buttons, <◀ ▶>, <▼▲>, <↵> and <⏲> for data display and setup configuration. The following table describes the basic functions for each button:

Button	Description
◀ ▶	Move the cursor from left to right
▼▲	Move the cursor downward or increment the selected numeric value
↵	Enter the selected menu item or confirm the setup change
⏲	Return to the previous menu level or cancel the setup change

Table 3-2 Front Panel Button Descriptions

3.1.3 Front Panel Display

The Front Panel Display allows the user to view data and perform basic configuration. The main menu consists of 6 items, **Metering**, **Power Quality**, **PQ Insight**, **Events**, **MB Master** (if the RS-485 port is set to MB Master) and **Setup**. Each item consists of sub-menus for detailed data viewing or setup configuration. All data and setup parameters can be viewed without a password, but a valid **Front Panel Password** is required for making setup changes. The default **Front Panel Password** is 1.

The iMeter 6 can be set **Auto-Scroll** mode which can be set to display Phasor, Voltage, Current, Power, etc. The **Auto-Scroll** setup parameter can be set via Front Panel, Web or through communications.

The following figure provides an overview of the Front Panel User Interface.

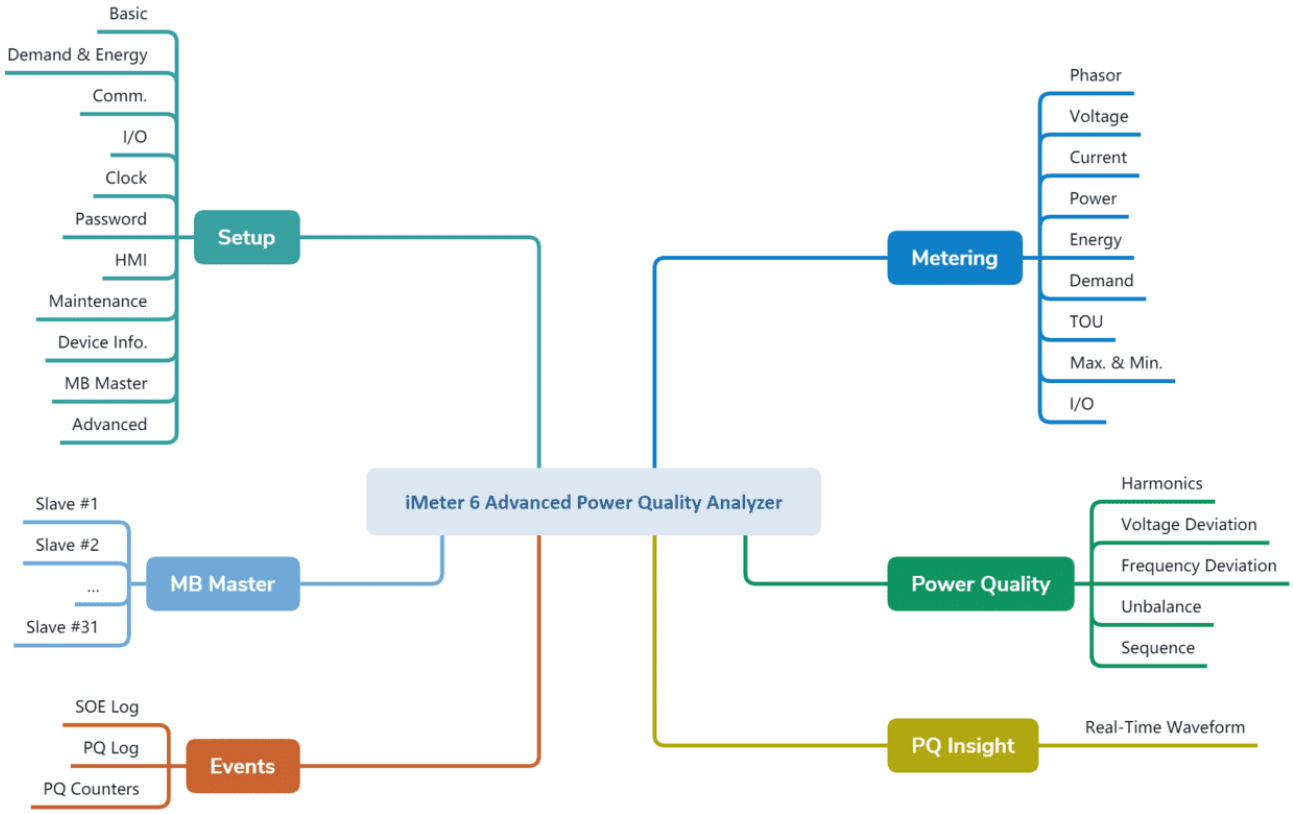


Figure 3-2 Overview for Front Panel Operation

3.1.3.1 Metering

The **Metering** menu consists of **Phasor, Voltage, Current, Power, Energy, Demand, TOU, Max. & Min.** and **I/O**. The following sections provide an overview of this sub-menu.

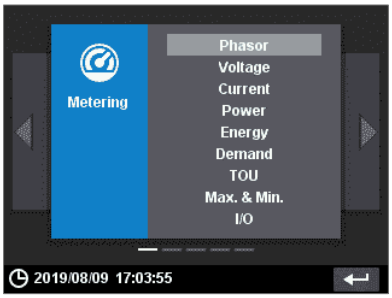


Figure 3-3 Metering Menu

3.1.3.1.1 Phasor

Enter the **Phasor** sub-menu and the following screen appears which displays the Magnitude and Phase Information.

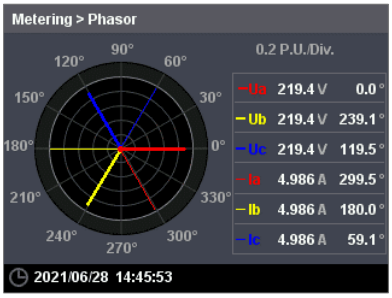


Figure 3-4 Phasor

3.1.3.1.3 Voltage

Enter the **Voltage** sub-menu and the following screens are available. Use the <▼▲> button to scroll to the different displays for 3Φ Uln, 3Φ Ull, Average, Ung (Neutral-to-Ground Voltage) and Frequency.

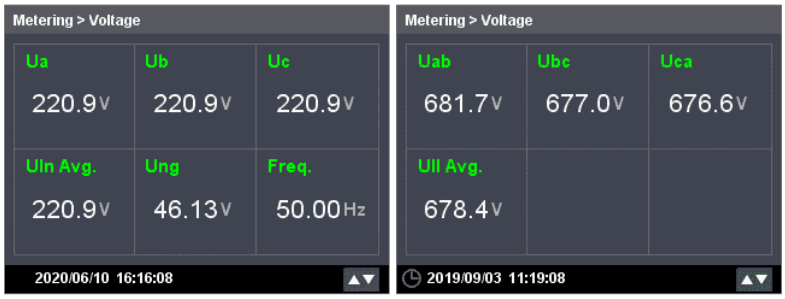


Figure 3-5 Voltage Measurements

3.1.3.1.4 Current

Enter the **Current** sub-menu and the following screens are available. Use the <▼▲> button to scroll to the different displays for 3Φ Current, Average, I4 (optional), In, Ir and OT (Operating Time).

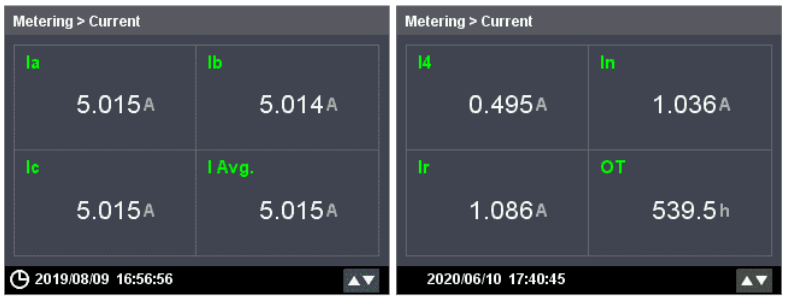


Figure 3-6 Current Measurements

3.1.3.1.5 Power

Enter the **Power** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll to the different displays for 3Φ P/Q/S/PF and Total.

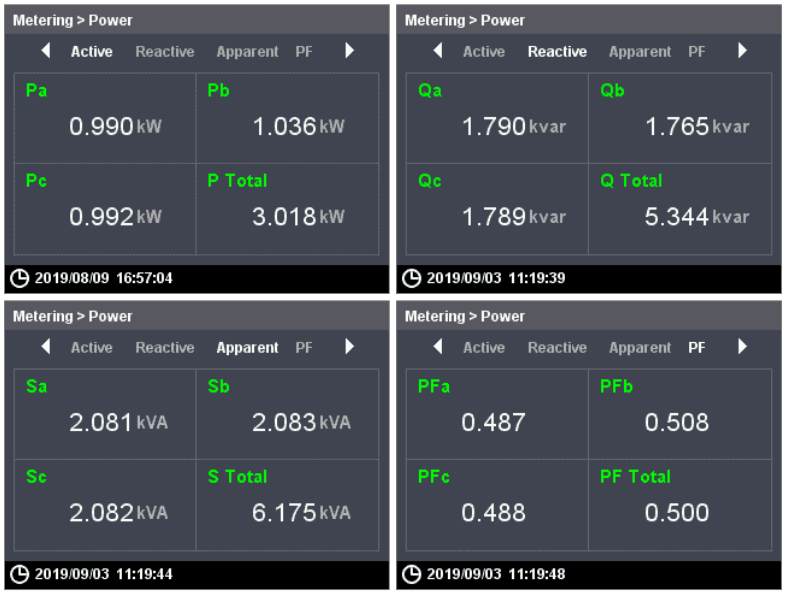


Figure 3-7 Power Measurements

3.1.3.1.6 Energy

Enter the **Energy** sub-menu and the following screens are available. Use the <▼▲> button to scroll to the different displays for kWh, kvarh Import/Export/Net/Total and kVAh Total.

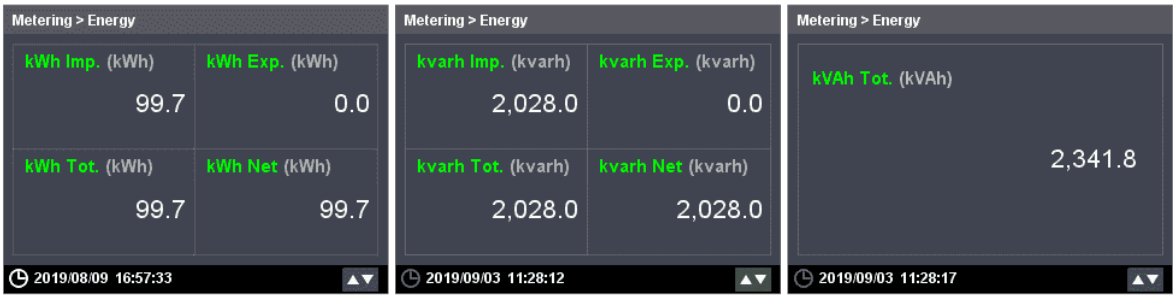


Figure 3-8 Energy Measurements

3.1.3.1.7 Demand

Enter the **Demand** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll among **Present Demand**, **Predicted Demand**, **This Max.** and **Last Max.** Under **Present/Predicted** Demand, use the <▼▲> button to scroll to the different parameters for P, Q, S, PF and 3Φ Currents, Uln, Ull and Average as well as optional I4.

Figure 3-9 Present/Predicted Demand Measurements

Under **This Max./Last Max.** Demand, use the <▼▲> button to scroll to the different parameters for P, Q, S, and 3Φ Currents, Uln, Ull and Average.

Figure 3-10 This Max./Last Max. Demand Measurements

3.1.3.1.8 TOU

Enter the **TOU** sub-menu and the following screens are available, which display the Present Tariff/Season/Daily Profile and the corresponding kWh/kvarh Import/Export and kVAh. Use the <◀ ▶> button to scroll among the different Tariffs.

Figure 3-11 TOU Measurements

3.1.3.1.9 Max. & Min.

Enter the **Max. & Min.** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **Max.** and **Min.** Use the <▼▲> button to scroll to the different Max. & Min. measurements with timestamps. **Table 4-19 Max./Min. Log** illustrates all the parameters monitored.

Figure 3-12 Max. & Min. Measurements

3.1.3.1.10 I/O

Enter the **I/O** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **DI**, **DO** and **AI** (optional).

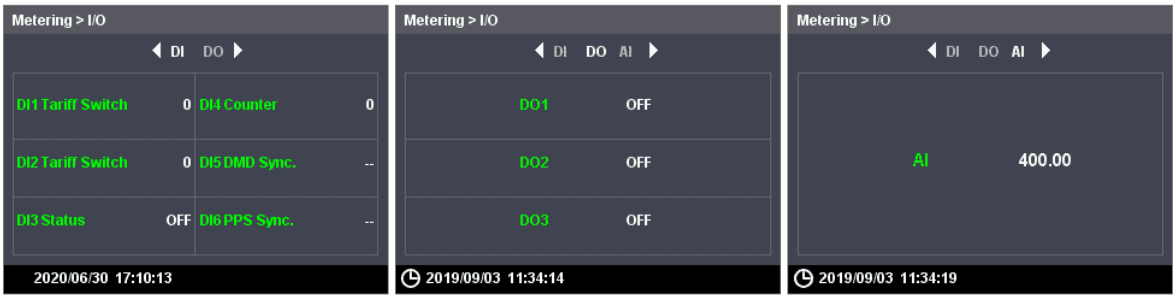


Figure 3-13 I/O

3.1.3.2 Power Quality

The **Power Quality** menu includes **Harmonics**, **Voltage Deviation**, **Frequency Deviation**, **Unbalance** and **Sequence**. The following sections provide a quick overview of these screens.

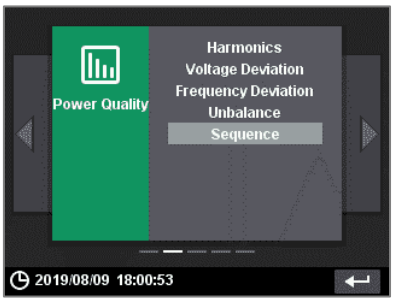


Figure 3-14 Power Quality Menu

3.1.3.2.1 Harmonics

Enter the **Harmonics** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between the **Harmonic Spectrum** for the 3Φ Voltages and Currents.

- Press <↵> to view the THD, TOHD, TEHD and Crest Factor measurements and use the <▼▲> button to view the TDD, TDD Odd, TDD Even and K-Factor measurements for Currents.
- Press <↵> again to view the Individual Harmonics and use the <▼▲> button to view the Individual Harmonic measurements from 1st to 63rd.
- Press <↵> again to return to the **Harmonic Spectrum** display.

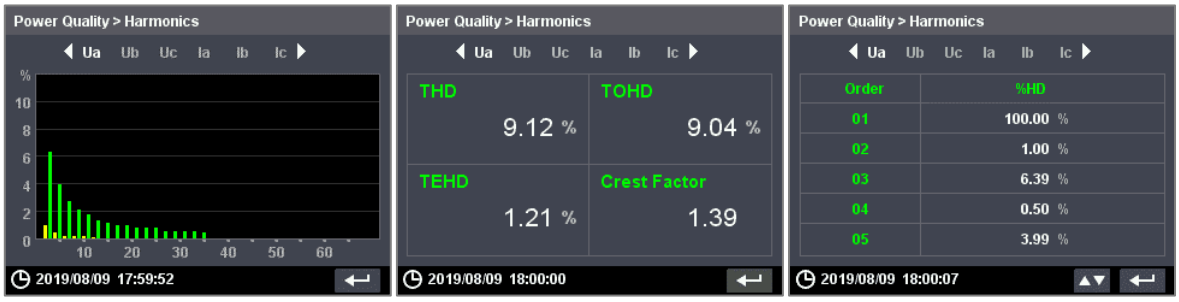


Figure 3-15 Harmonics Display

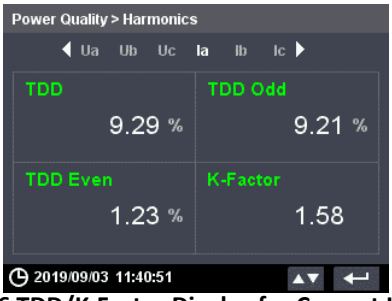


Figure 3-16 TDD/K-Factor Display for Current Harmonics

3.1.3.2.2 Voltage Deviation

Enter the **Voltage Deviation** sub-menu and the following screens are available. Use the <▼▲> button to scroll through the displays for 3Φ Uln, Ull Over/Under Deviation.

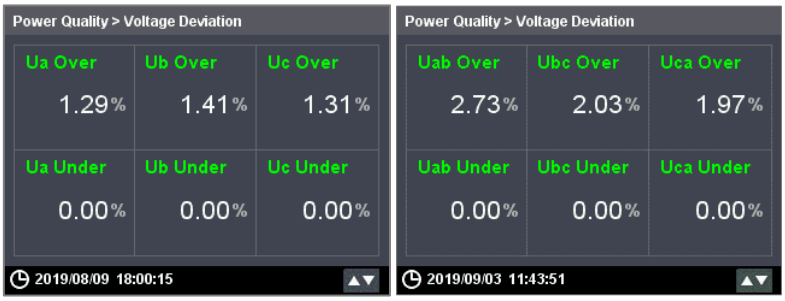


Figure 3-17 Voltage Deviation

3.1.3.2.3 Frequency Deviation

Figure 3-18 Frequency Deviation

3.1.3.2.4 Unbalance

Enter the **Unbalance** sub-menu and the following screen appears which displays the Negative (U2/I2) and Zero (U0/I0) Sequence Unbalance measurements for Voltage and Current.

Figure 3-19 Unbalance

3.1.3.2.5 Sequence

Enter the **Sequence** sub-menu and the following screen appears which display the Positive (U1/I1), Negative (U2/I2) and Zero (U0/I0) Sequence Components for Voltage and Current.

Figure 3-20 Sequence

3.1.3.3 PQ Insight

The **PQ Insight** menu mainly provides the Real-Time Waveform display.

Figure 3-21 PQ Insight Menu

3.1.3.3.1 Real-Time Waveform Capture

This screen shows the Real-Time Waveform Capture for 3Ø Voltages and Currents at 128 samples/cycle for 4 cycles that is updated every second. Press <↵> to enter the display and then use the <◀ ▶>, <▼▲> and <↵> buttons to navigate around the screen to select/de-select the display of the Voltage and Current channels or to Pause/Refresh the waveform update.

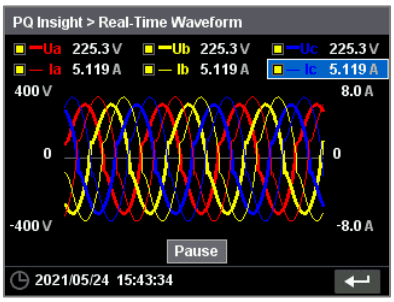


Figure 3-22 Real-time Waveform

3.1.3.4 Events

The **Events** menu consists of **SOE Log**, **PQ Log** and **PQ Counters**. The following section provides a quick overview of these screens.

Figure 3-23 Events Menu

3.1.3.4.1 SOE Log

Enter the **SOE Log** sub-menu and the following screens are available. The **SOE Log** screen starts with the most recent events. Use the <◀ ▶> button to quickly move through the Event pages. Press <↵> to enter an Event page and then use the <▼▲> button to scroll through the event list. Press <↵> to select and view the event details.

Please refer to **Appendix C** for a complete description of the Event types and definitions.

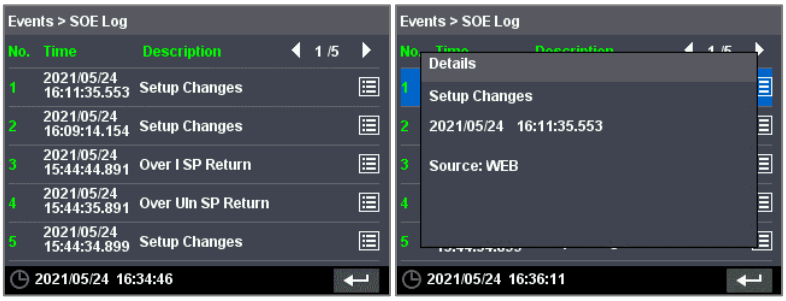


Figure 3-24 SOE Log

If the selected event recorded a WFR and/or DWR waveform, the detailed dialog box will provide the options for displaying the WFR and/or DWR waveform. Press <◀ ▶> to select the option and then press <↵> to select and view the respective display.

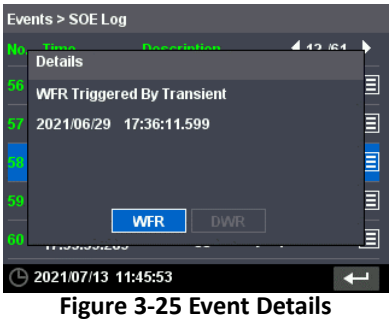


Figure 3-25 Event Details

Here is an example for the waveform display:

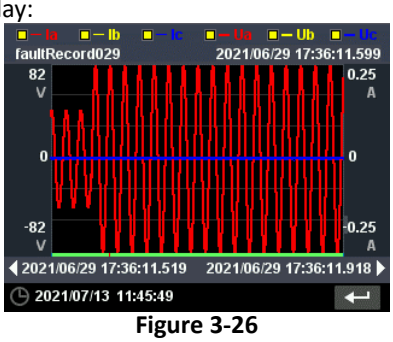


Figure 3-26

Inside the waveform display, press <▼▲> to zoom in/out of the waveform or press <◀ ▶> to scroll backward/forward of the waveform on the time scale.

3.1.3.4.2 PQ Log

Enter the **PQ Log** sub-menu and the following screens are available. The **PQ Log** screen starts with the most recent events. Use the <◀ ▶> button to quickly move through the Event pages. Press <↵> to enter an Event page and then use the <▼▲> button to scroll through the event list. Press <↵> to select and view the event details.

Please refer to **Table 5-30 PQ Log Classification** for a complete description of the Event types and definitions.

Figure 3-27 PQ Log

In Firmware V3.10.00 or later, if the selected PQ Event recorded a WFR and/or DWR waveform, the detailed dialog box will provide the options for displaying the WFR and/or DWR waveform (same operations as the SOE Log above). The Swell events will have the option of showing the ITIC plot while the Dip/Interruption events will have the option of showing both the ITIC and SEMI F47 plots, along with the WFR/DWR waveform.

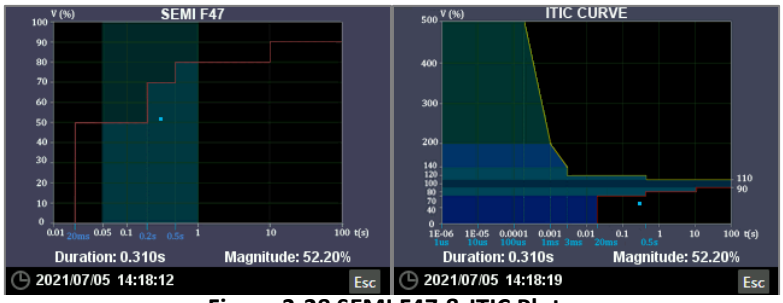


Figure 3-28 SEMI F47 & ITIC Plots

3.1.3.4.3 PQ Counters

Enter the **PQ Counters** sub-menu and the following screen appears which displays the different PQ Event counters.

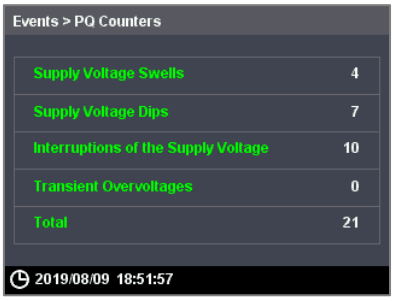


Figure 3-29 PQ Counters

3.1.3.5 MB Master

The MB Master Menu (supported in Firmware V3.00.06 or later) consists of up to 31 ModBus Slaves. Use the <▼▲> button to scroll through the MB Slaves list and press <↵> to view the measurements for the selected MB Slave.

Figure 3-30 MB Master menu

The measurements display for each slave may be different due to the device type with different parameters. Please refer to **Section 4.12** for more information. Here are some available measurement displays for PMC-53A as the slave.

Figure 3-31 Slave Measurements for PMC-53A

3.1.3.6 Setup

The **Setup** menu consists of **Basic**, **Demand & Energy**, **Comm.**, **I/O**, **Clock**, **Password**, **HMI**, **Maintenance**, **Device Info.**, **MB Master** and **Advanced** (supported in Firmware V3.10.00 or later). The following sections provide a quick overview for these screens.

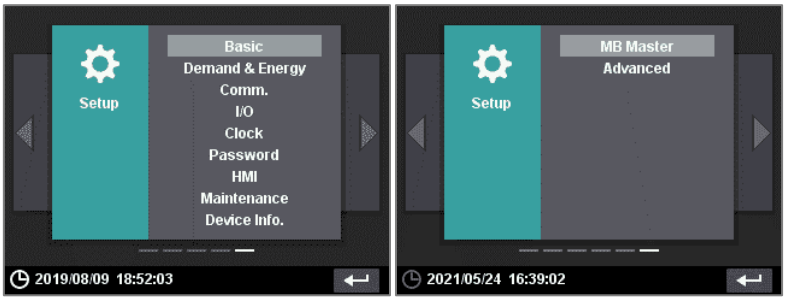


Figure 3-32 Setup menu

3.1.3.6.1 Basic

Enter the **Basic** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **Wiring**, **PT/CT**, and **Algorithm**. Press <↵> to enter a screen and then use the <◀ ▶> and <▼▲> buttons to navigate around and select the desired parameter for modification. The **Front Panel Password** is required for any setup changes. Please refer to **Section 5.10.1** for the setup range and the default values.

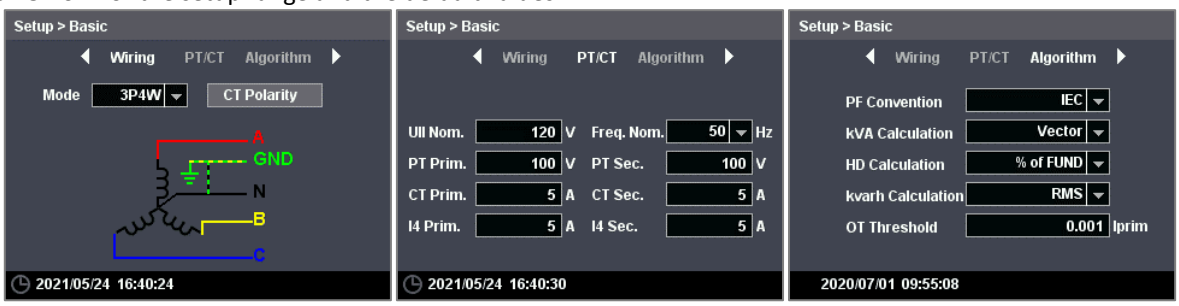


Figure 3-33 Basic Setup Screens

3.1.3.6.2 Demand & Energy

Enter the **Demand & Energy** sub-menu and following screens are available. Use the <◀ ▶> button to scroll between **Demand** and **Energy**.

Please refer to **Section 5.10.1** for more information about the different parameters.

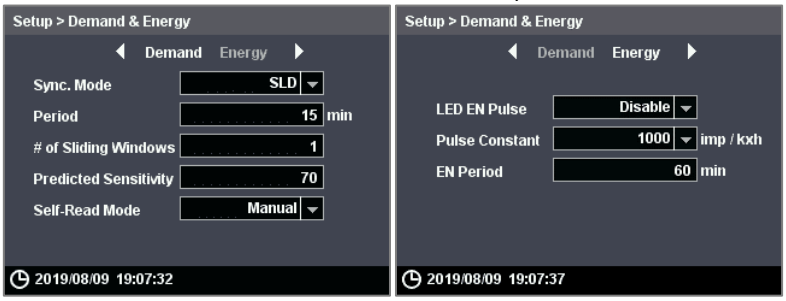


Figure 3-34 Demand & Energy Setting Screens

3.1.3.6.3 Comm.

Enter the **Comm.** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **P1 (RS-485)** and **P2 (Ethernet)**. Please refer to **5.10.1** for more information about the different parameters.

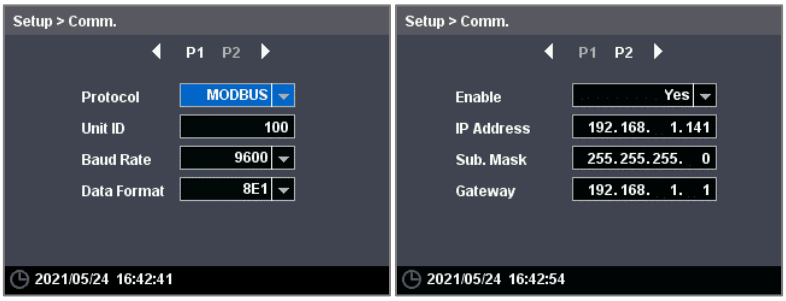


Figure 3-35 Comm. Setup Screens

3.1.3.6.4 I/O

Enter the **I/O** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **DI**, **DO** and **AI** (optional). Please refer to **Table 5-41 Basic Setup Parameters -** register 6025 to 6058 for more information.

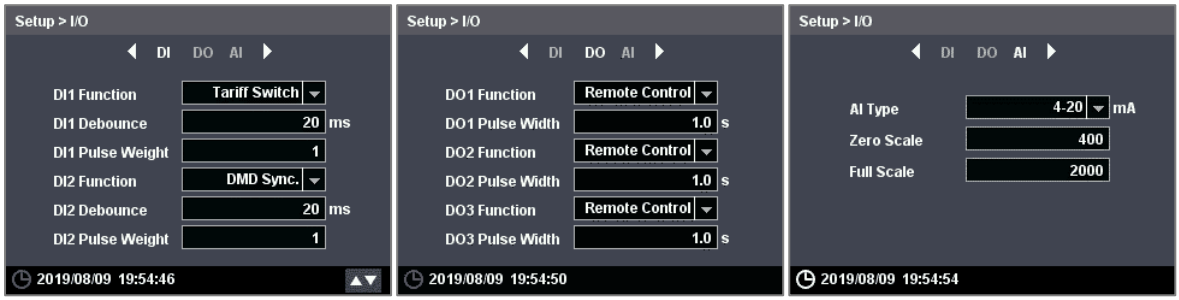


Figure 3-36 I/O Settings Screens

3.1.3.6.5 Clock

Enter the **Clock** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **Time** and **Source/SNTP**. Please refer to **Section 4.8**

Figure 3-37 Clock Setting Screens

3.1.3.6.6 Password

Enter the **Password** sub-menu and the following screen appears which allows the **Front Panel Password** to be modified.

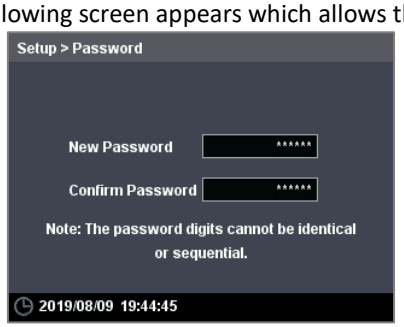


Figure 3-38 Password Setting

3.1.3.6.7 HMI

Enter **HMI** sub-menu and the following screens appear. Use the <◀ ▶> button to scroll between **Basic** (such as Language, LCD Timeout) and **Auto-Scroll** (Please refer to **Section 4.6** for more information). Please note that the **Voltage Symbol**, **Phase Label**, and **Auto-Scroll** settings are supported in Firmware V3.10.00 or later.

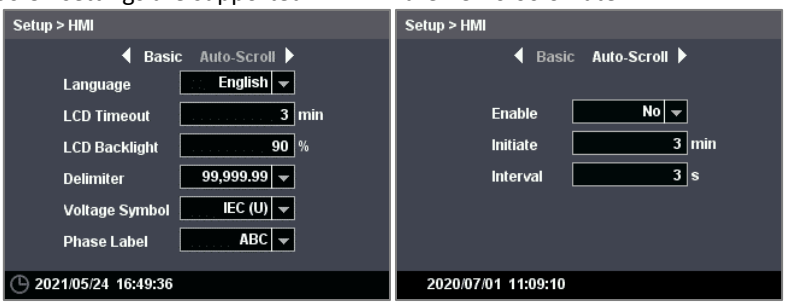


Figure 3-39 HMI Settings

3.1.3.6.8 Maintenance

Enter the **Maintenance** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **DO** and **Clear**. Please confirm to reboot the device after **All Logs** have been cleared.

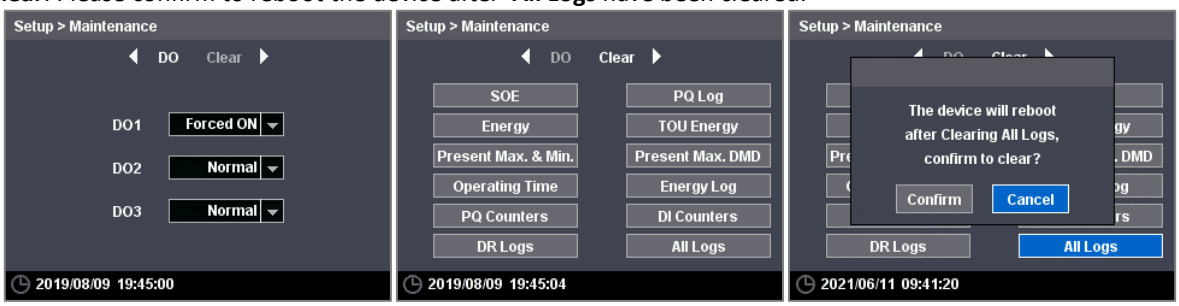


Figure 3-40 Maintenance Setting

3.1.3.6.9 Device Info.

Enter the **Device Info.** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **Basic**, **Version** and **Self Diagnostics** information.

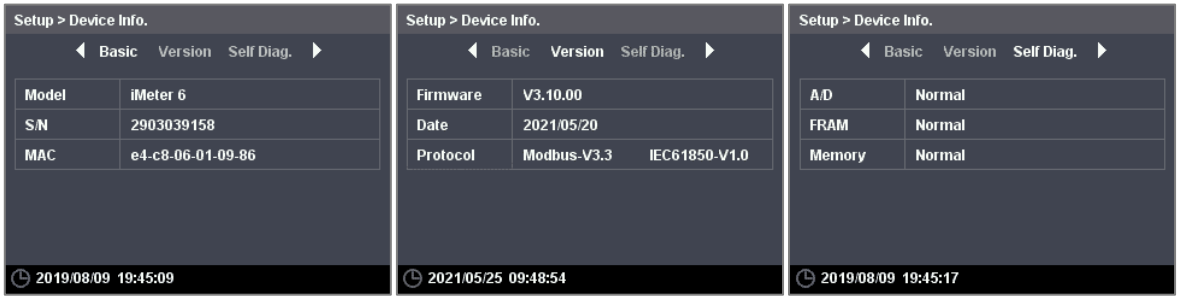


Figure 3-41 Device Info.

3.1.3.6.10 MB Master

Enter the **MB Master** sub-menu and use the <◀ ▶> buttons to navigate around and select the desired MB Slave for configuration. For more information, please refer to **Section 4.12**

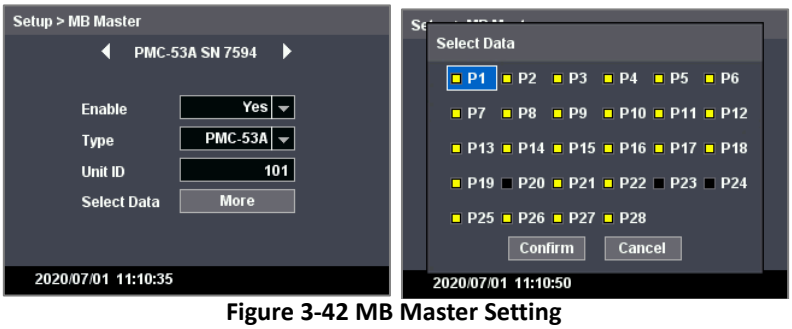


Figure 3-42 MB Master Setting

3.1.3.6.11 Advanced

Enter the **Advanced** (supported in Firmware V3.10.00 or later) sub-menu and use the <◀ ▶> buttons to navigate around and select the desired parameters for configuration. Please consult with the qualified personnel before making changes to these advanced parameters. Please be reminded to reboot the device if changes have been made to any of the parameters.

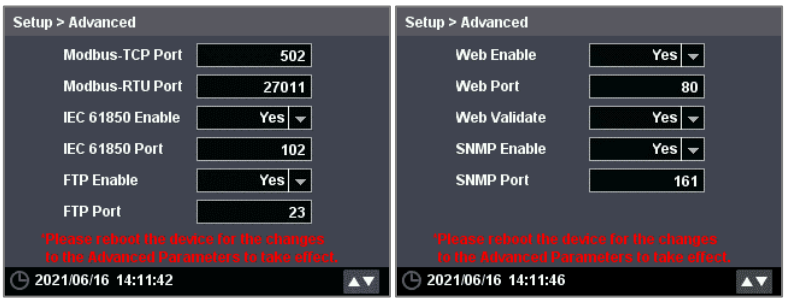


Figure 3-43 Advanced settings

3.2 On-board Web Interface

The iMeter 6's Web Interface is compatible with various web browsers.

Browser	Version
Internet Explorer	IE10 and above
Firefox	V24.0 and above
Google Chrome	V35.0 and above

Table 3-3 Web Browser Supported

The default IP Address of the iMeter 6's Ethernet Port is 192.168.0.100. Please make sure to configure the **IP Address**, **Subnet Mask** and **Default Gateway** such that it's on the same subnet as the PC that is being used to connect with the iMeter 6.

3.2.1 Setting PC's IP Address

To determine the PC's IP Address, click the Start icon, then the Settings button on Windows 10 (for other MS Windows systems, please refer to this link for more instructions).

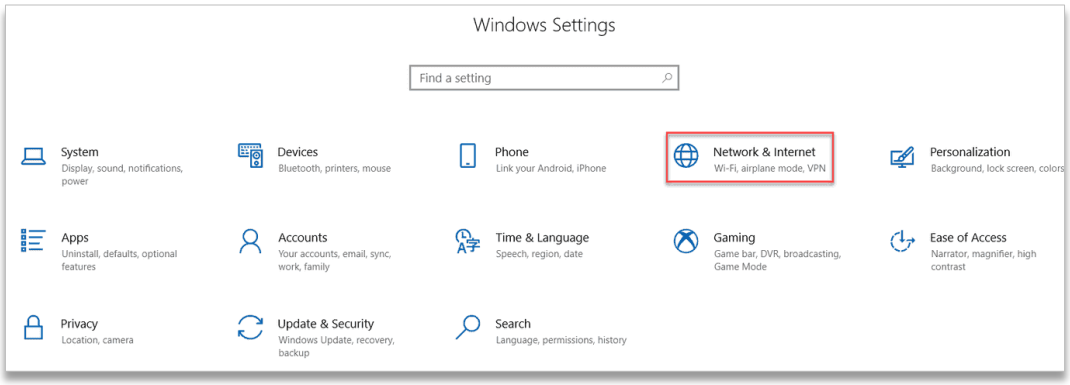


Figure 3-44 Settings-> Network & Internet

Click **Network & Internet**, select **Change adapter options** and then find the appropriate Ethernet connection.

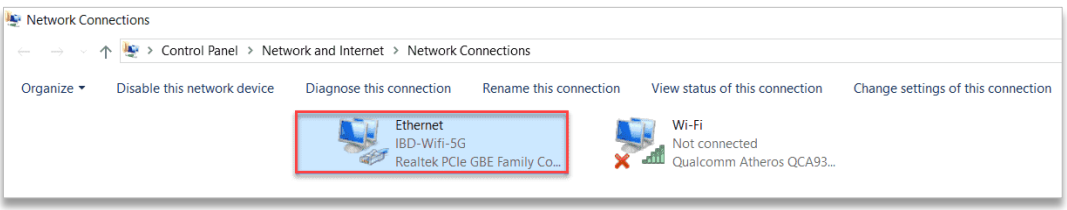


Figure 3-45 Network and Sharing Center

Right-click on it and select **Properties**. Then double-click on **Internet Protocol Version 4 (TCP/IPv4)** to show its IP configuration.

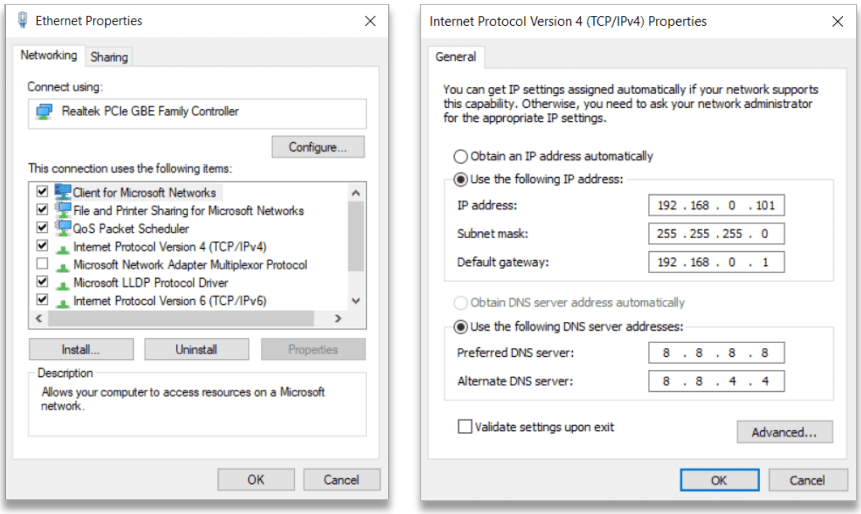


Figure 3-46 Setting PC's IP Address

3.2.2 Configure iMeter 6's IP Address

To configure the **IP Address**, navigate to **Setup**-> **Comm.** -> **P2** on the Front Panel to enter the appropriate settings for **IP Address**, **Sub. Mask** and **Gateway**.

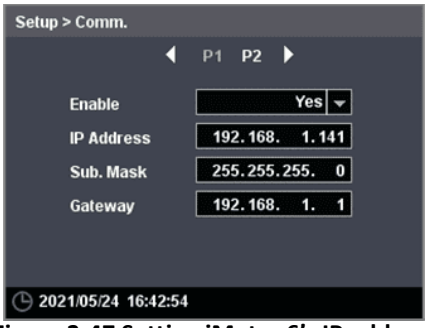


Figure 3-47 Setting iMeter 6's IP address

3.2.3 Accessing Web Interface

1) Enter the IP Address of the iMeter 6 in the Address area of **Google Chrome** and then press **<Enter>**.

Figure 3-48 Web Logon

2) The iMeter 6's logon page appears.

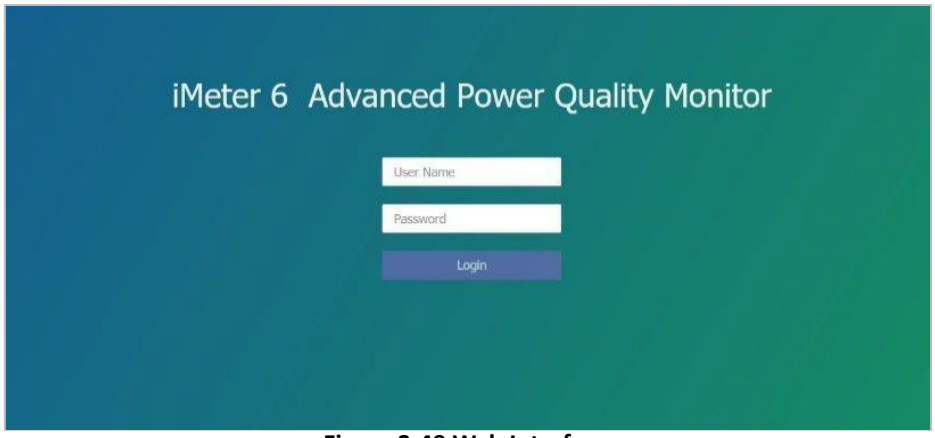


Figure 3-49 Web Interface

3) The user is required to login to the web interface to view data or change setup parameters. The figure below lists the different users and the corresponding authorities.

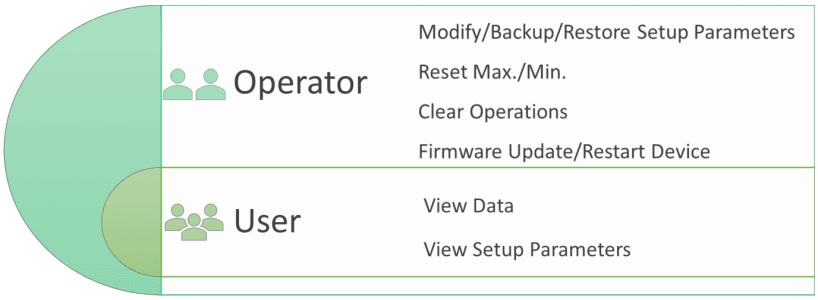


Figure 3-50 Authorities with their Permission Levels

As the figure shown, **Operator** has a higher permission than **User**. The default **Login Info.** for the **Operator** & **User** accounts are listed below:

Accounts	Username	Password
Operator	operator	abcd1234-
User	user	abcd1234-

Table 3-4 Default Username and Password for Operator and User accounts

The iMeter 6's Web Interface appears after login. There are six items at the **Title Bar** – **PQ Insight**, **Metering, Power Quality, Events, MB Master** (if the RS-485 port is set to MB Master) and **Setup.**

Figure 3-51 Title Bar

4) The Web Interface's login password can be changed by clicking **user** at the upper right-hand corner of the page and then selecting **Change Password** as shown below. The new password must be between 6 and 16 characters and consist of a combination of numbers, letters (case-sensitive) and ASCII special characters.

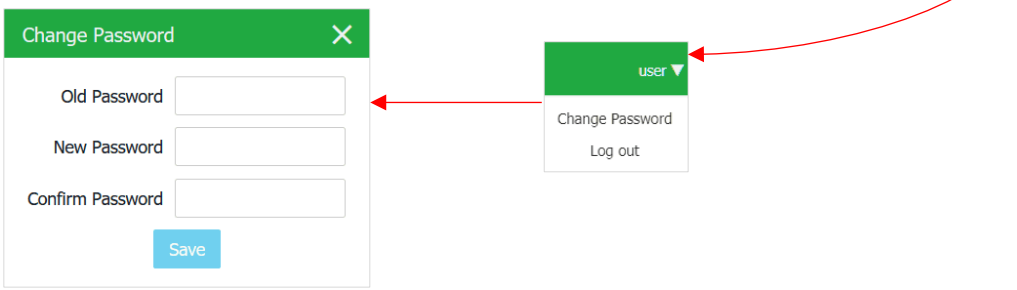
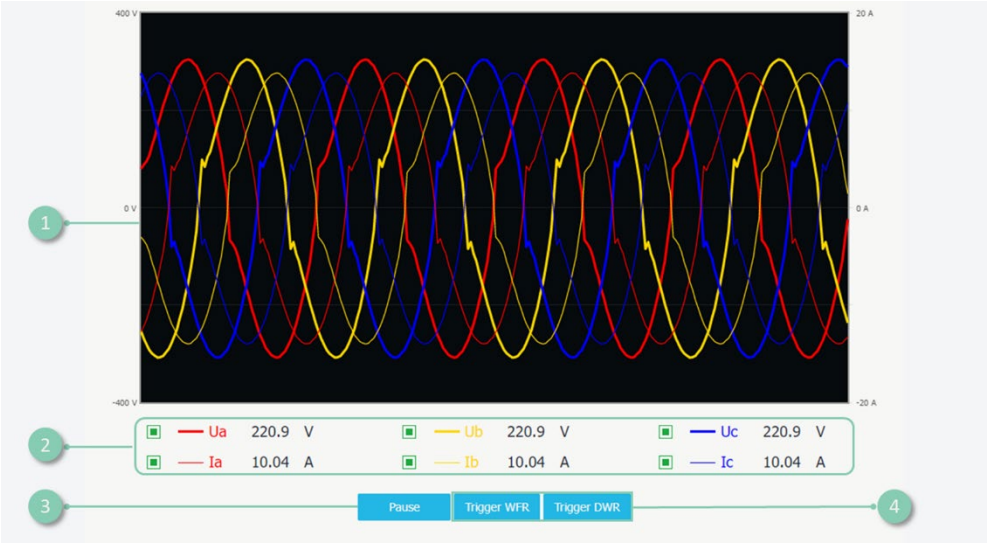


Figure 3-52 Modify the Web Interface Password

3.2.3.1 PQ Insight

The **PQ Insight** page is the first page displayed upon user login and includes the following information and operations:



1	Voltage & Current Waveform	3	Toggles between <Pause> & <Refresh> for waveform update
2	Select/De-select Voltage/Current Channels	4	Manual Trigger WFR / DWR

Figure 3-53 PQ Insight Interface

3.2.3.2 Metering

Click **Metering** at the **Title Bar** and its sub-menu appears on the left-hand pane which includes **Phasor**, **Basic, Energy, Demand, TOU, Max./Min.** and **I/O.** The following sections provide an overview for these sub-menus.

3.2.3.2.1 Phasor

Click **Phasor** on the left-hand pane and the following screen appears which displays the Magnitude and Phase information for Ua/Ub/Uc (3P4W) or Uab/Ubc/Uca (3P3W) and Ia/Ib/Ic. Click **Export** to save the Phasor data to a .csv file at the default Download folder for the Web Browser.

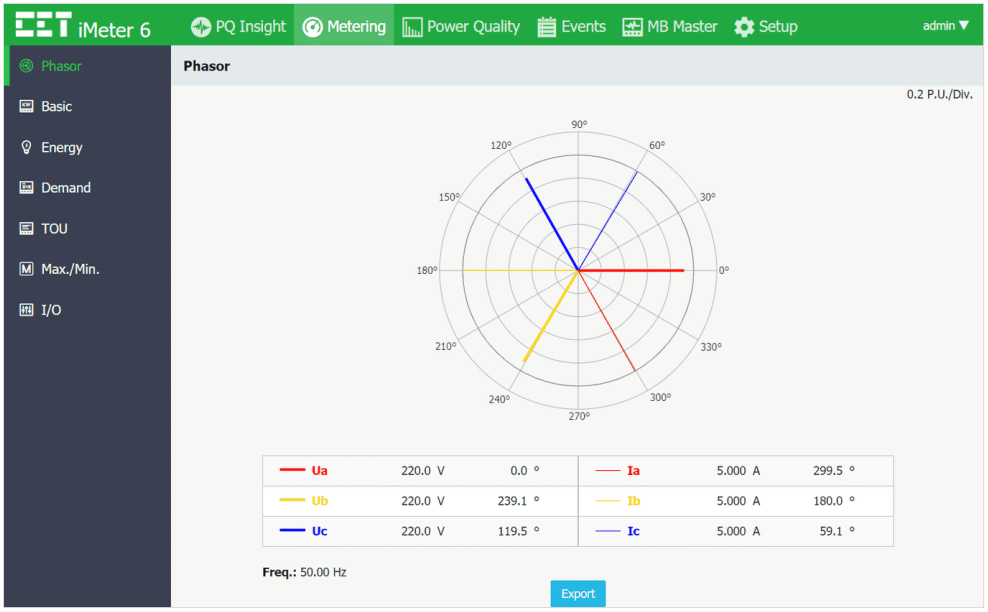


Figure 3-54 Phasor Diagram

3.2.3.2.2 Basic

Click **Basic** on the left-hand pane and the following screen appears which shows the basic real-time readings for 3-phase Voltage, Current, Power, Power Factor, OT (Operating Time), Frequency, Ung (Neutral-to-Ground Voltage), In, I4, and Ir. Click **Export** to save the data on this page to .csv file at the default Download folder.

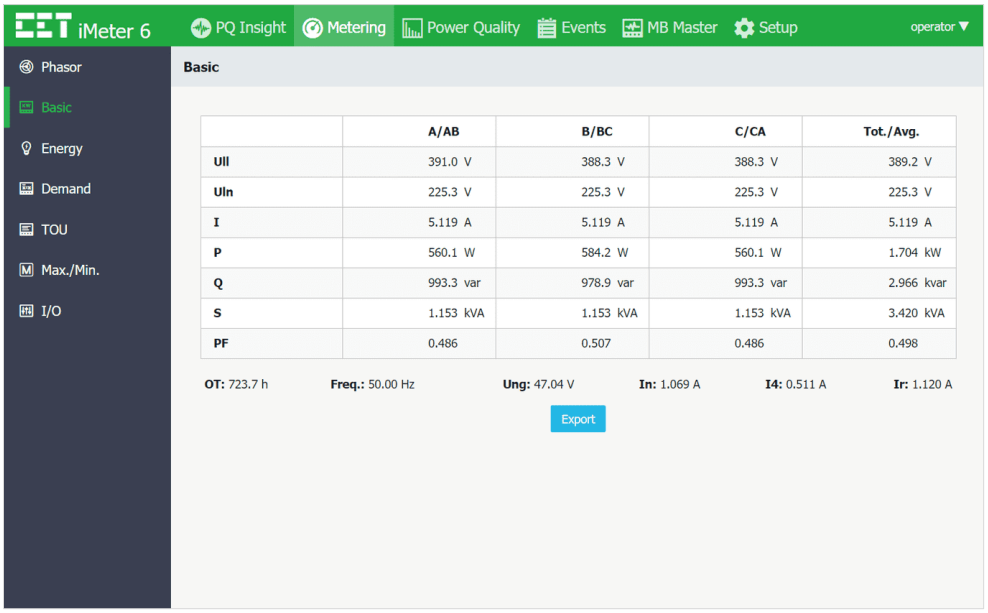


Figure 3-55 Basic Measurements

3.2.3.2.3 Energy

Click **Energy** on the left-hand pane and the following screen appears which shows the **kWh** and **kvarh** for **Import/Export/Net/Total** as well as the **Total kVAh** for the total of 3 Phases. Click **Phase A/B/C** to view the Energy information for the individual phases.

Click **Export** to save all the Energy information to a .csv file at the default Download folder.

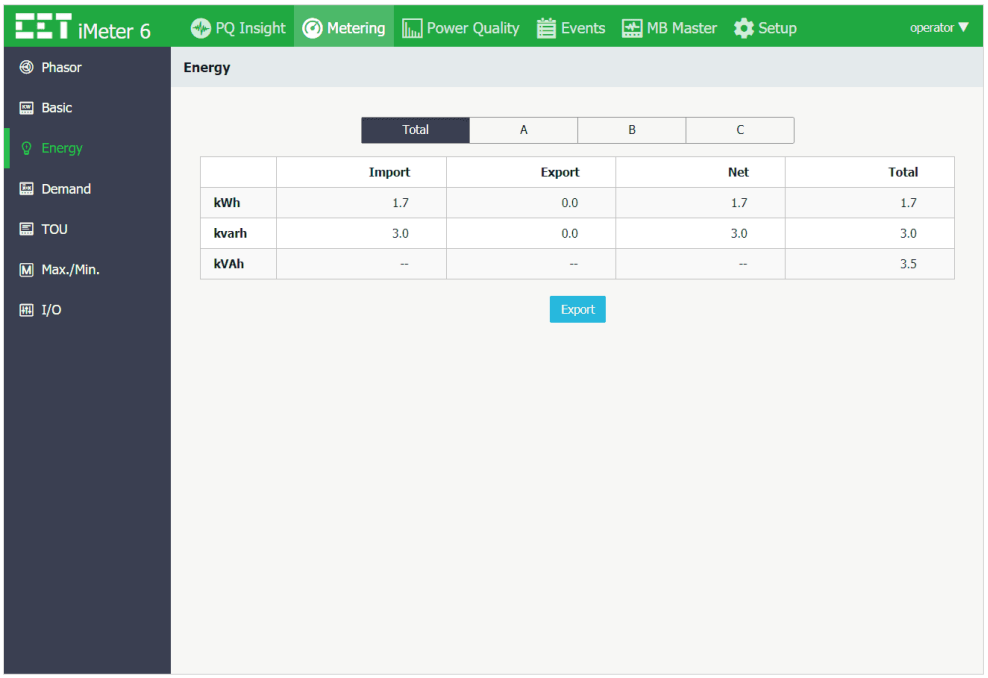


Figure 3-56 Energy Measurements

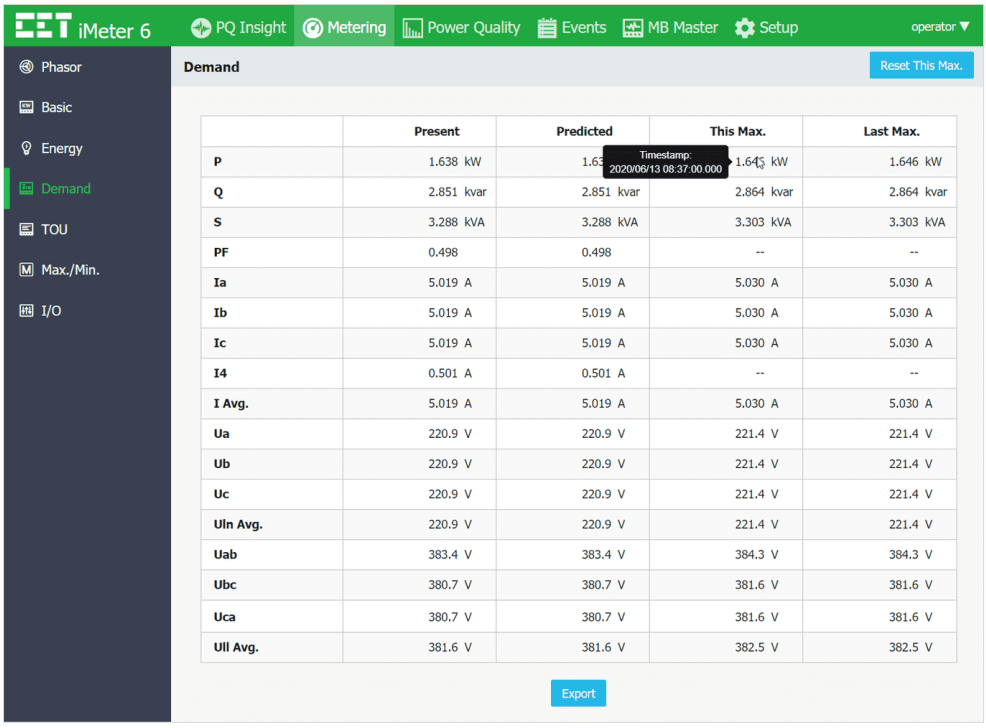
3.2.3.2.4 Demand

Click **Demand** on the left-hand pane and the following screen appears which shows the readings for **Present Demand, Predicted Demand, This Max** and **Last Max.** Depending on the setting of the **Self-Read Time**, **This Max.** and **Last Max.** could mean the Max. Demand of This Month/Last Month or Since/Before Last Reset.

Move the mouse pointer over the readings for **This Max.** and **Last Max.** to show the corresponding timestamp.

Click **Export** to save the **Demand** data on this page to a .csv file at the default Download folder.

Click **Reset This Max.** (only accessible for **Operator**) to manually reset the Max. Demand of This Month or Since Last Reset. It should be noted that it's not possible to manually reset the **Last Max.**, which is the Max. Demand of Last Month or Before Last Reset.



	Present	Predicted	This Max.	Last Max.
P	1.638 kW	1.63	1.64 kW	1.646 kW
Q	2.851 kvar	2.851 kvar	2.864 kvar	2.864 kvar
S	3.288 kVA	3.288 kVA	3.303 kVA	3.303 kVA
PF	0.498	0.498	--	--
Ia	5.019 A	5.019 A	5.030 A	5.030 A
Ib	5.019 A	5.019 A	5.030 A	5.030 A
Ic	5.019 A	5.019 A	5.030 A	5.030 A
I4	0.501 A	0.501 A	--	--
I Avg.	5.019 A	5.019 A	5.030 A	5.030 A
Ua	220.9 V	220.9 V	221.4 V	221.4 V
Ub	220.9 V	220.9 V	221.4 V	221.4 V
Uc	220.9 V	220.9 V	221.4 V	221.4 V
Uln Avg.	220.9 V	220.9 V	221.4 V	221.4 V
Uab	383.4 V	383.4 V	384.3 V	384.3 V
Ubc	380.7 V	380.7 V	381.6 V	381.6 V
Uca	380.7 V	380.7 V	381.6 V	381.6 V
Ull Avg.	381.6 V	381.6 V	382.5 V	382.5 V

Figure 3-57 Demand Measurements

3.2.3.2.5 TOU

Click **TOU** on the left-hand pane to view the present TOU information for all 8 Tariffs. The **Present Tariff**, **Present Season** and **Present Daily Profile** are displayed at the top of the page.

Select from the drop-down list underneath **Present Tariff** to display the respective Tariff information for kWh Import, kWh Export, kvarh Import, kvarh Export and kVAh.

Click **Export** to save the TOU data to a .csv file at the default Download folder.

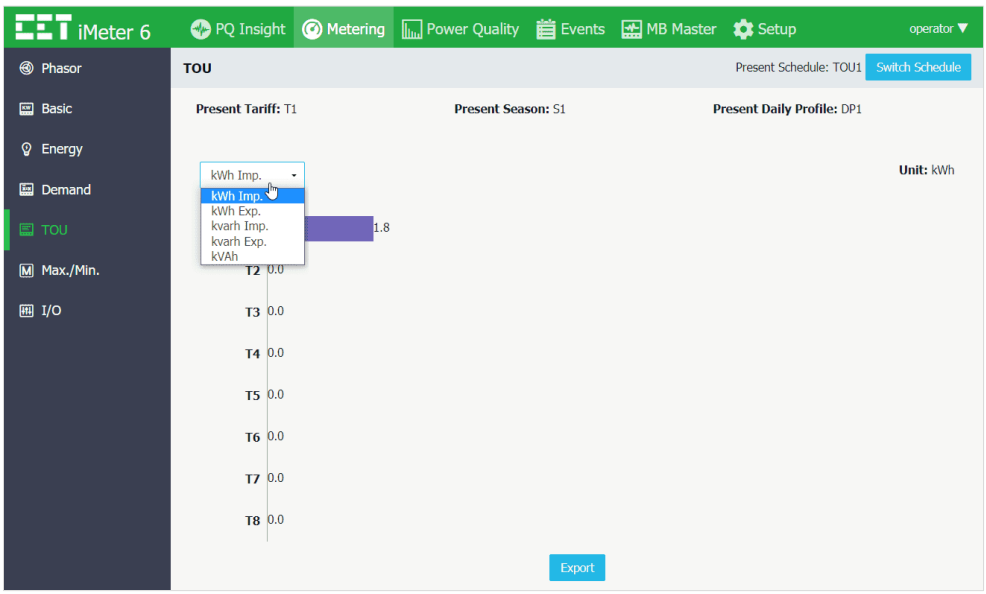


Figure 3-58 TOU Measurement

3.2.3.2.6 Max./Min.

Click **Max./Min.** on the left-hand pane and the following screen appears which displays the **Max./Min.** Log information of **This Max.** (This Month or Since Last Reset) and **Last Max.** (Last Month or Before Last Reset), depending on the **Self-Read Time** setup.

Click **Export** to save the **Max.** or **Min.** data displayed on the current page to a .csv file at the default Download folder.

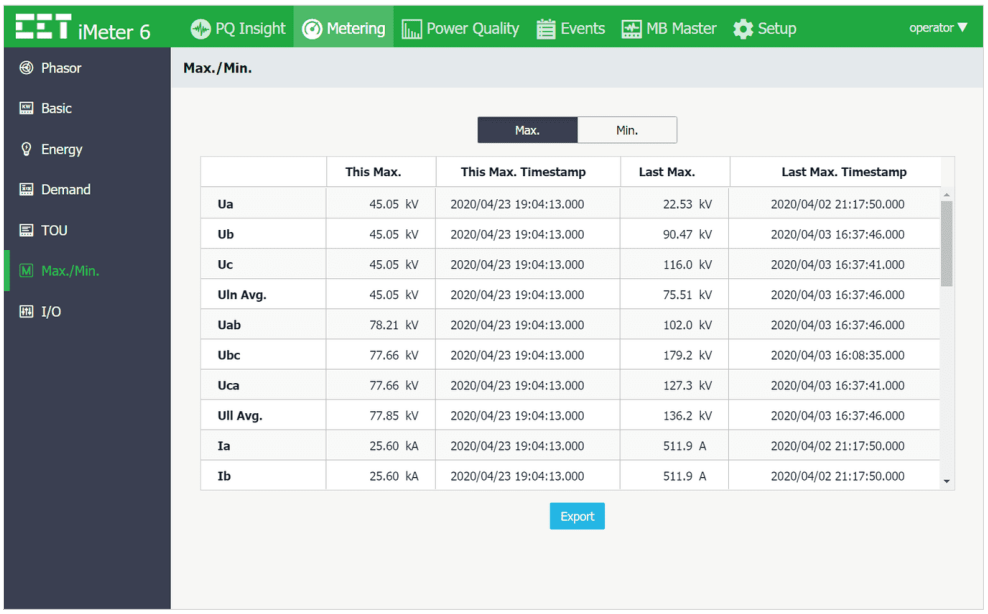


Figure 3-59 Max./Min. Measurements

3.2.3.2.7 I/O

Click **I/O** on the left-hand pane and the following screen appears which displays the status or measurements for DI, DO and AI (Optional).

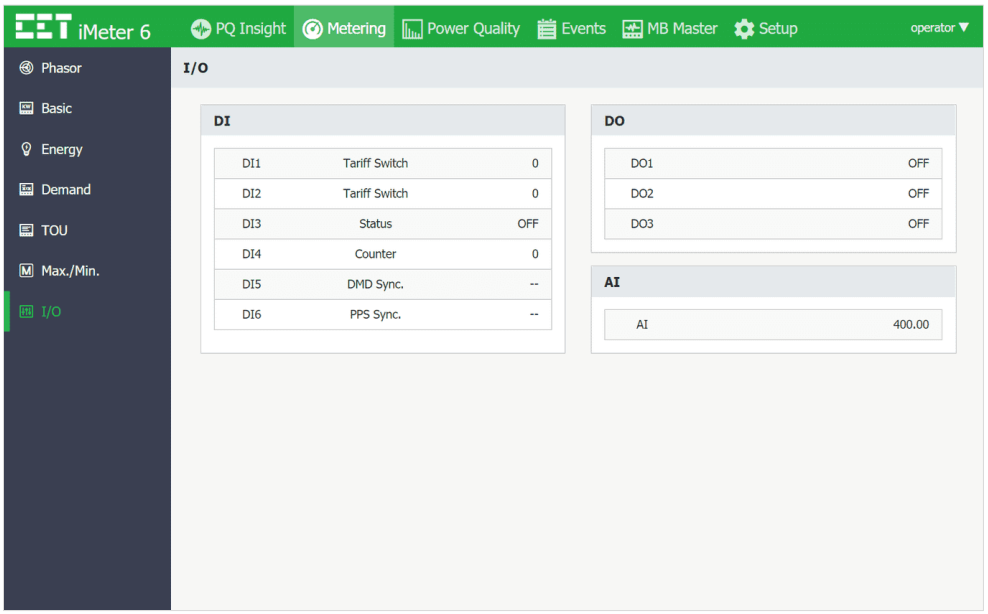


Figure 3-60 I/O Display

3.2.3.3 Power Quality

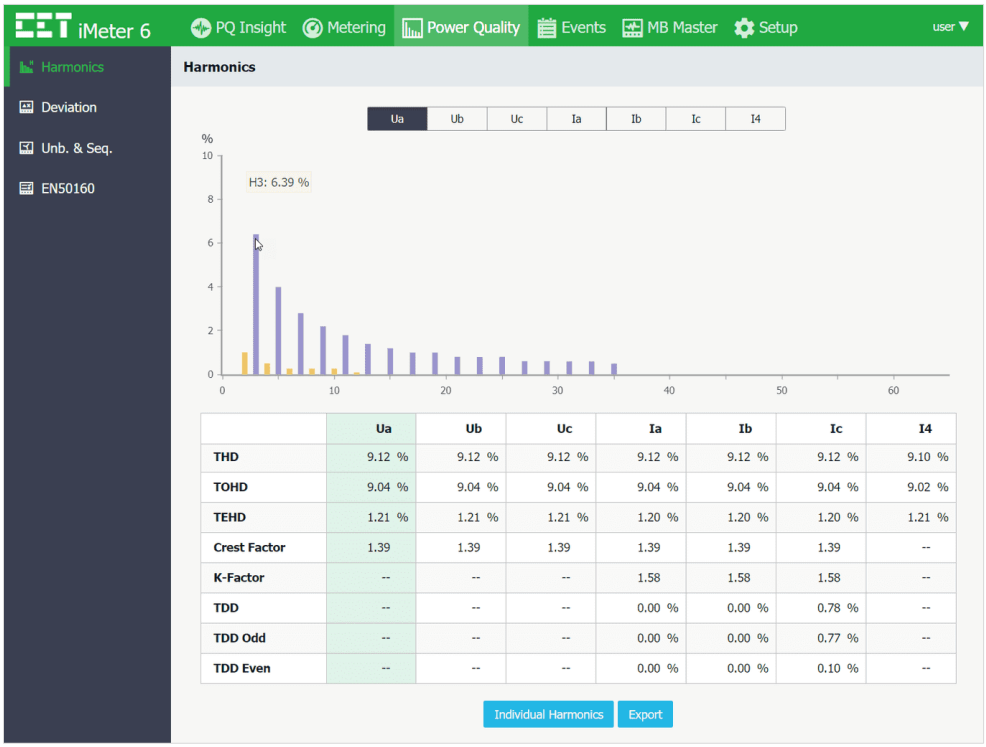
Click **Power Quality** at the **Title Bar** and its sub-menu appears on the left-hand pane which includes **Harmonics, Deviation,** and **Unb. & Seq.** The following sections provide a quick overview of these web pages.

3.2.3.3.1 Harmonics

Click **Harmonics** on the left-hand pane and the following screen appears which displays the Harmonic Spectrum and the following parameters: **THD, TOHD, TEHD, Crest Factor, K-Factor, TDD, TDD Odd** and **TDD Even**. Click **Ua**, **Ub**, **Uc**, **Ia**, **Ib**, **Ic** and **I4** at the top of the page to view the respective Harmonics data.

Move the mouse pointer over an individual histogram to show their harmonic order and value.

Click **Export** to export all the harmonic data to a .csv file at the default Download folder.



	Ua	Ub	Uc	Ia	Ib	Ic	I4
THD	9.12 %	9.12 %	9.12 %	9.12 %	9.12 %	9.12 %	9.10 %
TOHD	9.04 %	9.04 %	9.04 %	9.04 %	9.04 %	9.04 %	9.02 %
TEHD	1.21 %	1.21 %	1.21 %	1.20 %	1.20 %	1.20 %	1.21 %
Crest Factor	1.39	1.39	1.39	1.39	1.39	1.39	--
K-Factor	--	--	--	1.58	1.58	1.58	--
TDD	--	--	--	0.00 %	0.00 %	0.78 %	--
TDD Odd	--	--	--	0.00 %	0.00 %	0.77 %	--
TDD Even	--	--	--	0.00 %	0.00 %	0.10 %	--

Figure 3-61 Harmonics Measurements

Click **Individual Harmonics** at the bottom of the page to view the data in a Table format.

Order	%HD	Order	%HD
02	1.00 %	33	0.59 %
03	6.39 %	34	0.00 %
04	0.50 %	35	0.49 %
05	3.99 %	36	0.00 %
06	0.26 %	37	0.00 %
07	2.79 %	38	0.00 %
08	0.26 %	39	0.00 %
09	2.19 %	40	0.00 %
10	0.26 %	41	0.00 %
11	1.79 %	42	0.00 %
12	0.09 %	43	0.00 %
13	1.39 %	44	0.00 %
14	0.00 %	45	0.00 %
15	1.19 %	46	0.00 %

Figure 3-62 Individual Harmonic Measurements

3.2.3.3.2 Deviation

Click **Deviation** on the left-hand pane and the following screen appears which displays the **Over/Under Deviation** measurements for **Ua, Ub, Uc, Uab, Ubc** and **Uca** as well as the **Freq. Deviation**.

Click **Export** to save the data to a .csv file at the default Download folder.

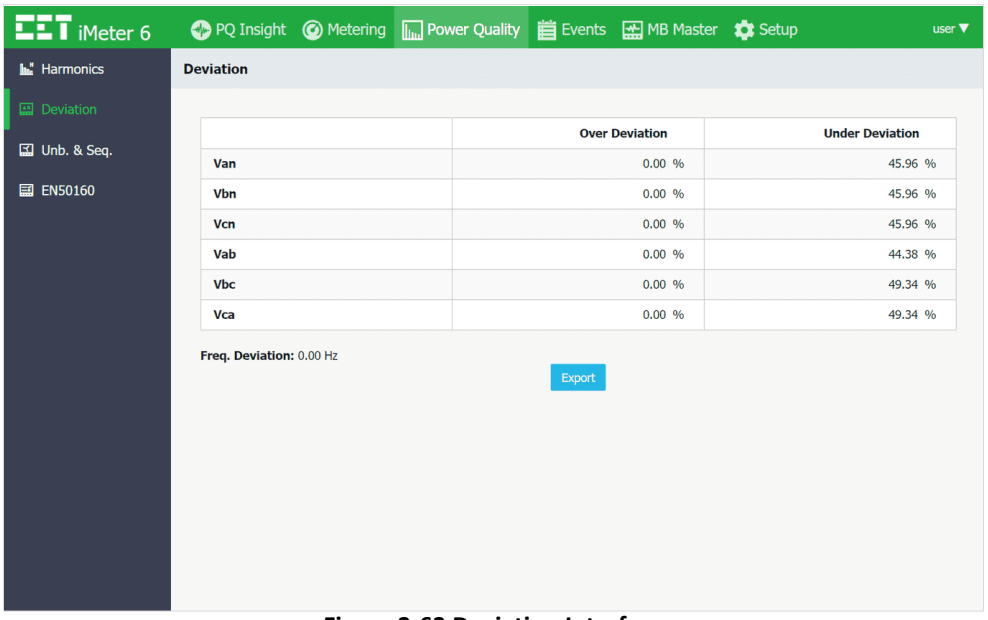


Figure 3-63 Deviation Interface

3.2.3.3.3 Unb. & Seq. (Unbalance and Sequence Components)

Click **Unb. & Seq.** on the left-hand pane and the following screen appears which displays the Negative/Zero/Positive Sequence as well as the Negative/Zero Sequence Unbalance for Voltage and Current.

Click **Export** to save the data to a .csv file at the default Download folder.

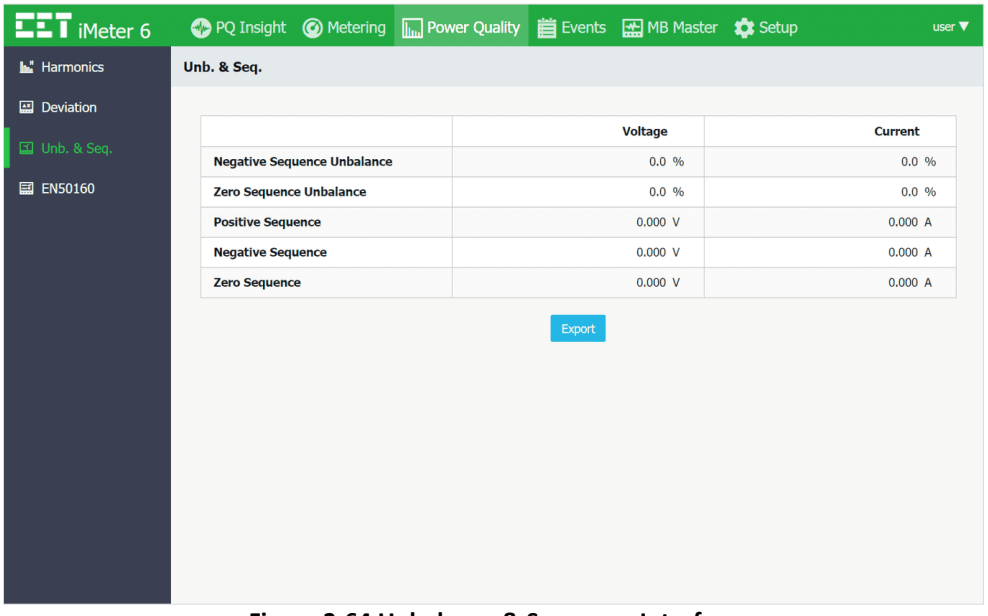


Figure 3-64 Unbalance & Sequence Interface

3.2.3.3.4 EN50160

Click **EN50160** (supported in Firmware V3.10.00 or later) on the left-hand pane and the following screen appears. Click on the drop-down list on the top left to select the period for the desired EN50160 Summary Report. As shown in Figure 3-65, ✔ denotes the positive evaluation while ✕ denotes the negative evaluation for the parameter. Click on a particular parameter to view the report details. Click **Export** to download the EN50160Report_Weekxx.xls file for the currently selected period.

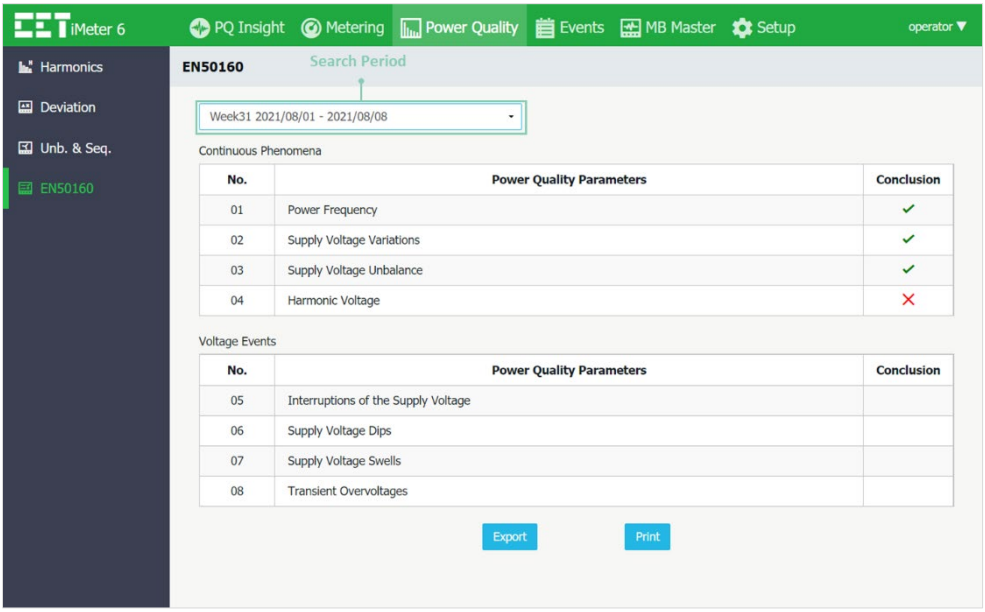


Figure 3-65 EN50160 Summary

The following screenshots provide a quick overview of the summary details for each parameter.

- **Power Frequency**

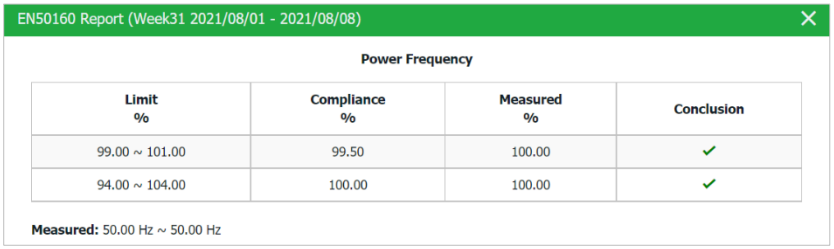


Figure 3-66 Power Frequency

- **Supply Voltage Variations**

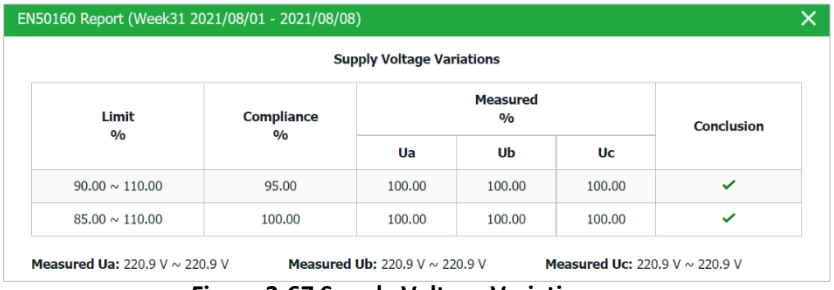


Figure 3-67 Supply Voltage Variations

- **Supply Voltage Unbalance**

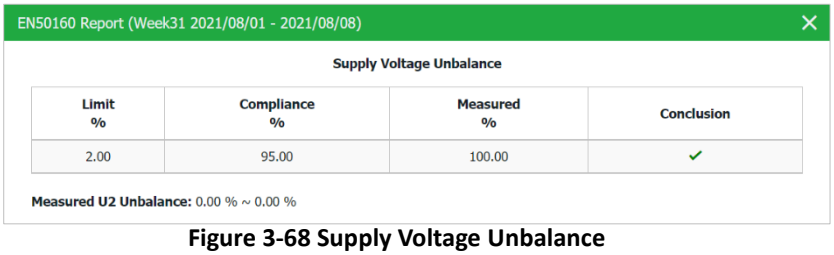


Figure 3-68 Supply Voltage Unbalance

- **Harmonic Voltage**

EN50160 Report (Week31 2021/08/01 - 2021/08/08)

Harmonic Voltage

Order h	Limit %	CP95 %			Compliance %	Measured %			Conclusion
		Ua	Ub	Uc		Ua	Ub	Uc	
THD	8.00	9.12	9.12	9.12	95.00	0.00	0.00	0.00	✗
Odd Harmonics (Not Multiples of 3)									
H05	6.00	3.99	3.99	3.99	95.00	100.00	100.00	100.00	✓
H07	5.00	2.79	2.79	2.79	95.00	100.00	100.00	100.00	✓
H11	3.50	1.79	1.79	1.79	95.00	100.00	100.00	100.00	✓
H13	3.00	1.39	1.39	1.39	95.00	100.00	100.00	100.00	✓
H17	2.00	0.99	0.99	0.99	95.00	100.00	100.00	100.00	✓
H19	1.50	0.99	0.99	0.99	95.00	100.00	100.00	100.00	✓
H23	1.50	0.79	0.79	0.79	95.00	100.00	100.00	100.00	✓
H25	1.50	0.79	0.79	0.79	95.00	100.00	100.00	100.00	✓
Odd Harmonics (Multiples of 3)									
H03	5.00	6.39	6.39	6.39	95.00	0.00	0.00	0.00	✗
H09	1.50	2.19	2.19	2.19	95.00	0.00	0.00	0.00	✗
H15	0.50	1.19	1.19	1.19	95.00	0.00	0.00	0.00	✗
H21	0.50	0.79	0.79	0.79	95.00	0.00	0.00	0.00	✗
Even Harmonic									
H02	2.00	1.00	1.00	1.00	95.00	100.00	100.00	100.00	✓
H04	1.00	0.50	0.50	0.50	95.00	100.00	100.00	100.00	✓
H06	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H08	0.50	0.25	0.25	0.25	95.00	100.00	100.00	100.00	✓
H10	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H12	0.50	0.09	0.09	0.09	95.00	100.00	100.00	100.00	✓
H14	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H16	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H18	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H20	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H22	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H24	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓

Figure 3-69 Harmonic Voltages

- **Interruptions of the Supply Voltage**

EN50160 Report (Week31 2021/08/01 - 2021/08/08)

Interruptions of the Supply Voltage

Duration	t ≤ 1s	1s < t ≤ 3min	3min < t
Count	0	0	0

Figure 3-70 Interruptions of the Supply Voltage

- **Supply Voltage Dips**

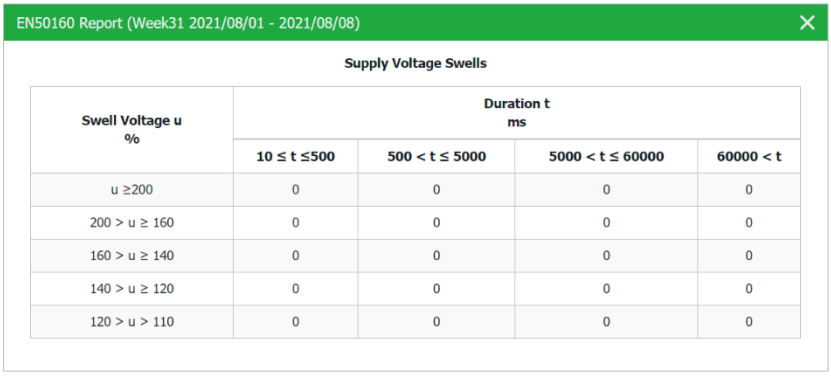
EN50160 Report (Week31 2021/08/01 - 2021/08/08)

Supply Voltage Dips

Residual Voltage u %	Duration t ms					
	10 ≤ t ≤200	200 < t ≤ 500	500 < t ≤ 1000	1000 < t ≤ 5000	5000 < t ≤ 60000	60000 < t
90 > u ≥80	0	0	0	0	0	0
80 > u ≥ 70	0	0	0	0	0	0
70 > u ≥ 40	0	0	0	0	0	0
40 > u ≥ 5	0	0	0	0	0	0
5 > u	0	0	0	0	0	0

Figure 3-71 Supply Voltage Dips

- **Supply Voltage Swells**

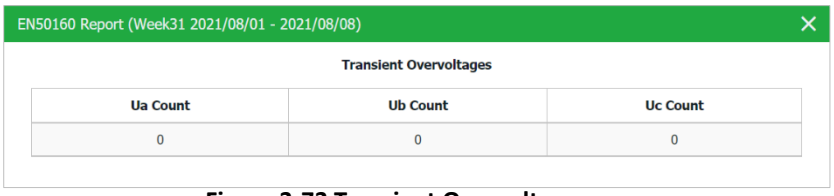

EN50160 Report (Week31 2021/08/01 - 2021/08/08)

Supply Voltage Swells

Swell Voltage u %	Duration t ms			
	10 ≤ t ≤500	500 < t ≤ 5000	5000 < t ≤ 60000	60000 < t
u ≥200	0	0	0	0
200 > u ≥ 160	0	0	0	0
160 > u ≥ 140	0	0	0	0
140 > u ≥ 120	0	0	0	0
120 > u > 110	0	0	0	0

Figure 3-72 Supply Voltage Swells

- **Transient Overvoltages**

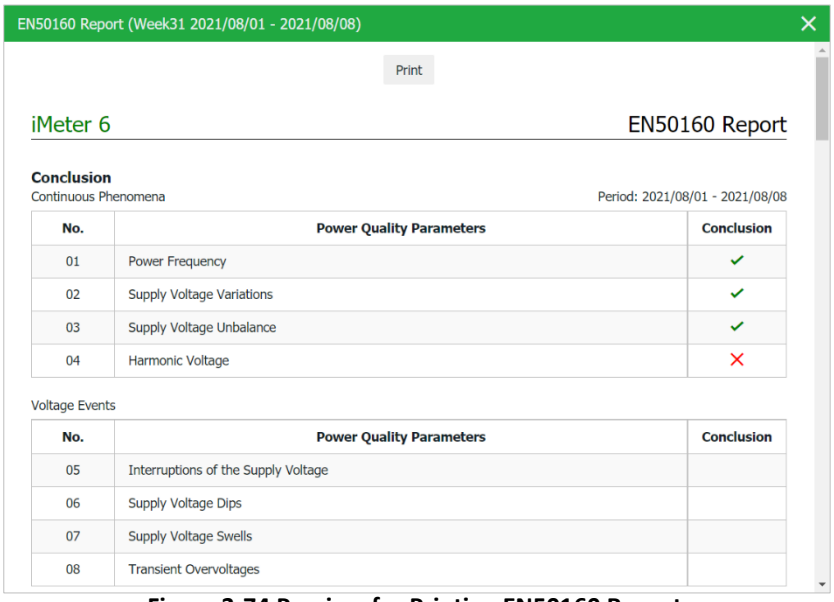

EN50160 Report (Week31 2021/08/01 - 2021/08/08)

Transient Overvoltages

Ua Count	Ub Count	Uc Count
0	0	0

Figure 3-73 Transient Overvoltages

Click **Print** to open the preview window. Then click **Print** at the top of the window to confirm the printing of the report, which includes the conclusion page and the details page for each item.


EN50160 Report (Week31 2021/08/01 - 2021/08/08)

Print

iMeter 6 EN50160 Report

Conclusion

Continuous Phenomena Period: 2021/08/01 - 2021/08/08

No.	Power Quality Parameters	Conclusion
01	Power Frequency	✓
02	Supply Voltage Variations	✓
03	Supply Voltage Unbalance	✓
04	Harmonic Voltage	✗

Voltage Events

No.	Power Quality Parameters	Conclusion
05	Interruptions of the Supply Voltage	
06	Supply Voltage Dips	
07	Supply Voltage Swells	
08	Transient Overvoltages	

Figure 3-74 Preview for Printing EN50160 Report

3.2.3.4 Events

Click **Events** at the **Title Bar** and its sub-menu appears on the left-hand pane which includes **SOE**, **PQ Log** and **PQ Counters**. The following sections provide a quick overview of these web pages.

3.2.3.4.1 SOE

Click **SOE** on the left-hand pane and the following screen appears on the right-hand pane. This web page displays the SOE Log starting with the most recent events.

Also, the interface supports the following filtering mechanism for the display of events**.**

Search Period: Use the drop-down box on the left to select a specific period.

Event Type: User the drop-down box in the middle to select a particular event type such as DI, DO, Setpoint, System Fault, Operation, Record and Other.

Keyword Search: Enter a keyword in the text box on the right to search for events that contain the specified keyword.

Click on the icon under **Detail** to display the Waveform Recording or the icon to display the event details.

Click **Export** to save all SOE events to a .csv file at the default Download folder.

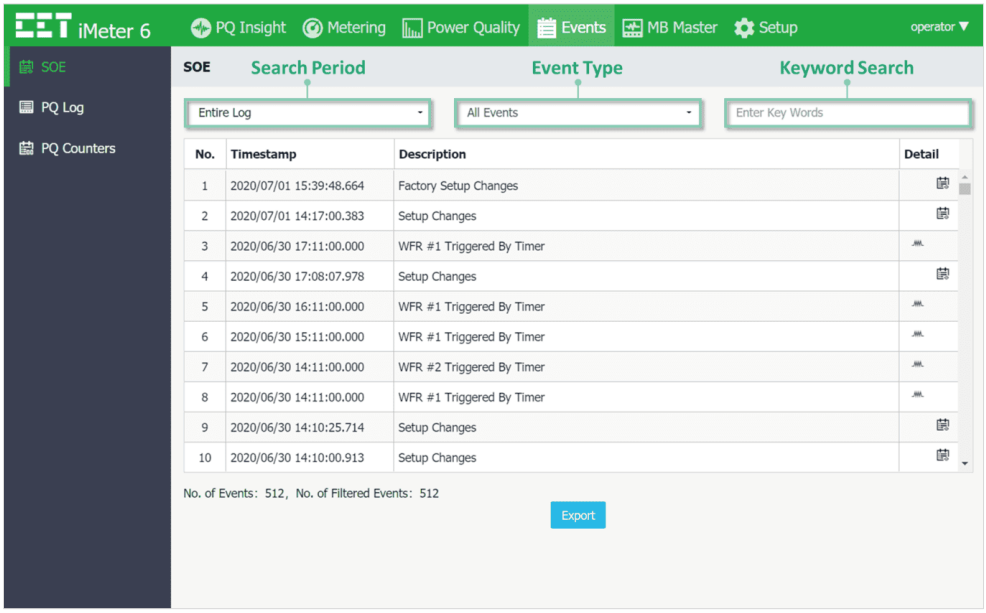


Figure 3-75 SOE Interface

Here are several examples for the SOE Details:

1) Over Uln Setpoint

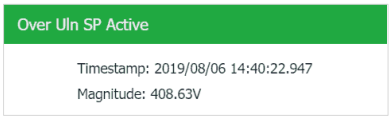


Figure 3-76 SOE Detail about Over Uln Setpoint

2) DWR Triggered by Dip/Swell.

Figure 3-77 SOE Detail about DWR Triggered by Dip/Swell

Inside the waveform display, there are four control icons .

These two icons are used to zoom in and out of the waveforms based on the time scale.

This icon is used to reset the waveform display back to its default resolution.

This icon is used to export the waveform CFG (Configuration) and DAT (Data) file in COMTRADE format to a compressed folder.

There is also a scroll bar at the bottom that allows the waveform to be scrolled forward and backward.

3) Clear Present Max./Min.

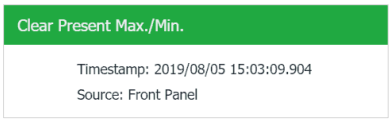


Figure 3-78 SOE Detail about Clear Present Max./Min.

3.2.3.4.2 PQ Log

Click **PQ Log** on the left-hand pane and the following screen appears on the right-hand pane. This web page displays the PQ Log for **Dip/Swell**, **Disturbance Direction**, and **Transient** events, starting with the most recent events.

Also, the interface supports the following filtering mechanism for the display of PQ events**.**

Search Period: Use the drop-down box on the left to select a specific period.

Event Type: Use the drop-down box in the middle to select a particular event type such as Voltage Swell, Voltage Dip, Disturbance Direction or Transient.

Keyword Search: Enter a keyword in the text box on the right to search for events that contain the specified keyword.

Click on the icon under **Detail** to display the Waveform Recording or the icon to display the event details.

Click **Export** to save all PQ events to a .csv file at the default Download folder.

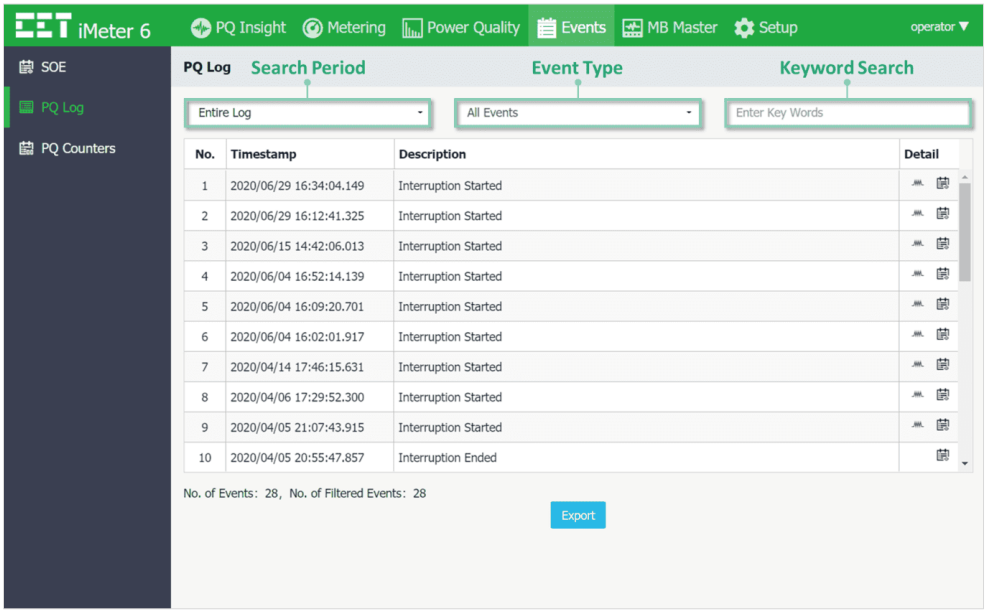


Figure 3-79 PQ Log Interface

3.2.3.4.3 PQ Counters

Click **PQ Counters** on the left-hand pane and the following screen appears on the right-hand pane. This web page displays the counters for the different PQ events such as **Swells, Dips, Interruptions,** and **Transients**.

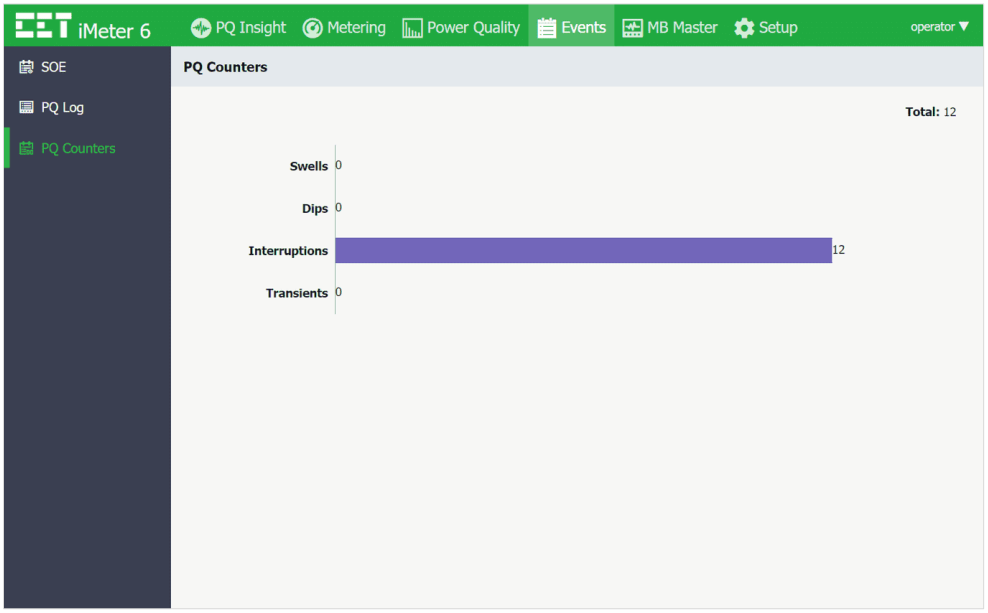


Figure 3-80 PQ Counters Interface

3.2.3.5 MB Master

Click **MB Master** (supported in Firmware V3.00.06 or later) on the **Title Bar** and **Slave #01** to **Slave #31** appear on the left-hand pane. Under the **Title Bar**, the **Slave ID** and **Connection Status** (**Connected** – omitted, **Not Responding!** and **Not Enabled!**) are displayed on the left-hand side with the **Device Name** on the right-hand side. Providing that the slave is connected and communicating, the **Basic**, **Energy**, **Demand**, **Unbalance & Sequence**, **Harmonics** and **I/O** data will be uploaded to the iMeter 6. Click **Export** to save the slave's data displayed on the current page to a .csv file at the default Download folder.

The measurements displayed may be different for each MB Slave due to the **Device Type** and the parameters selected for display. Please refer to **Section 4.12** for more information.

The following screenshots illustrate the default data display for a PMC-53A.

- **Basic**

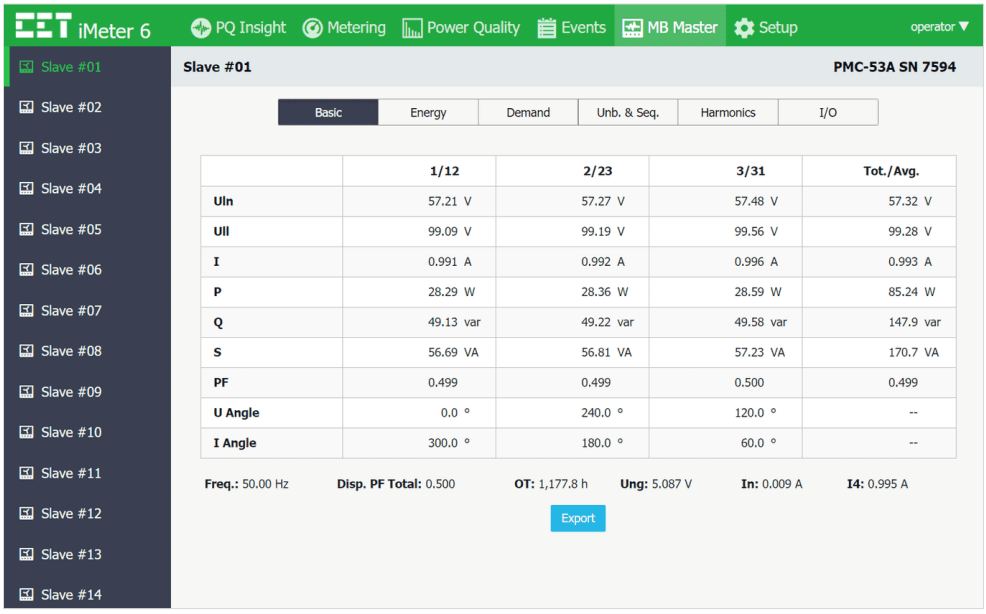


Figure 3-81 Basic Measurements for Slave #1 PMC-53A

- **Energy**

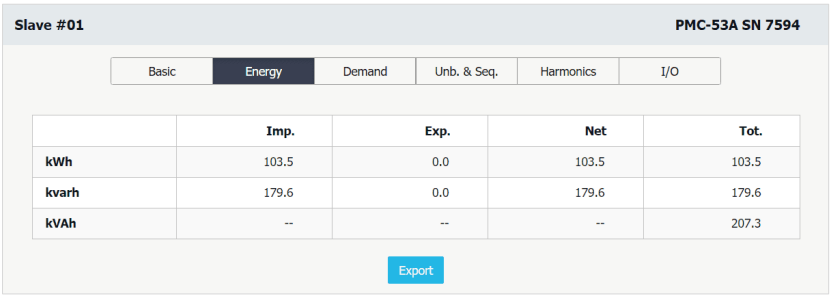


Figure 3-82 Energy Data for Slave #1 PMC-53A

- **Demand**

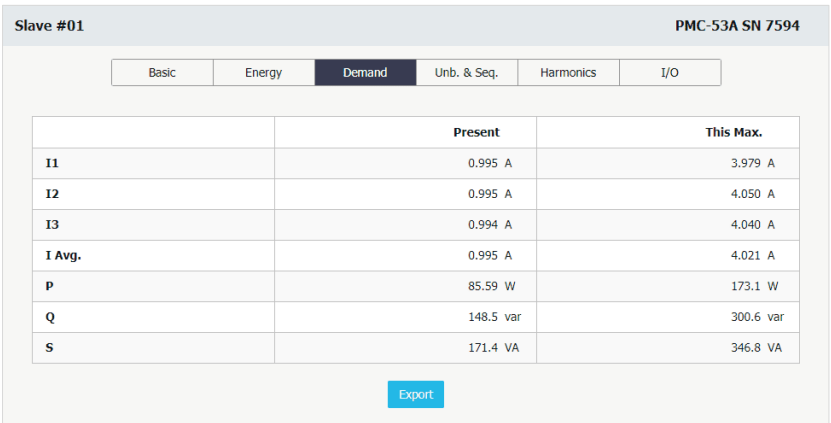


Figure 3-83 Demand Data for Slave #1 PMC-53A

- **Unb. & Seq.**

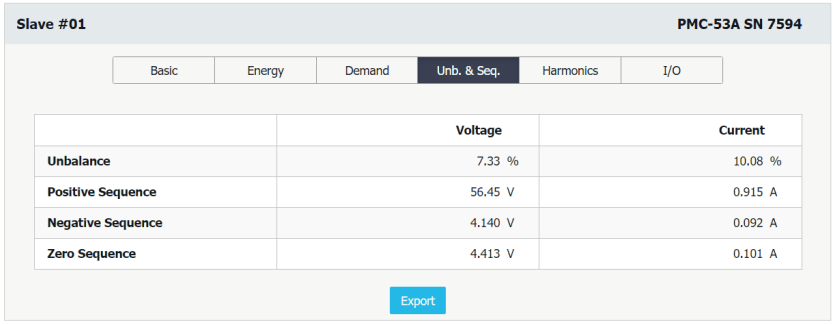


Figure 3-84 Unb. & Seq. Data for Slave #1 PMC-53A

- **Harmonics**

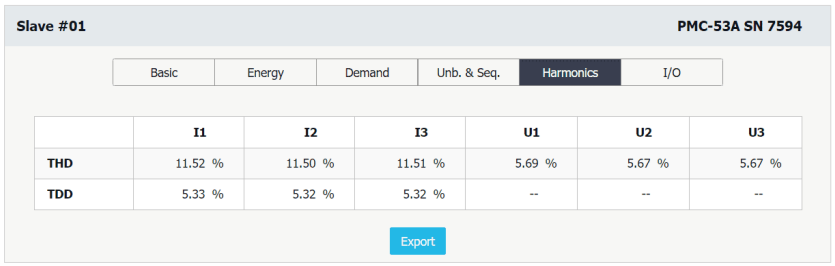


Figure 3-85 Harmonics Data for Slave #1 PMC-53A

- **I/O**

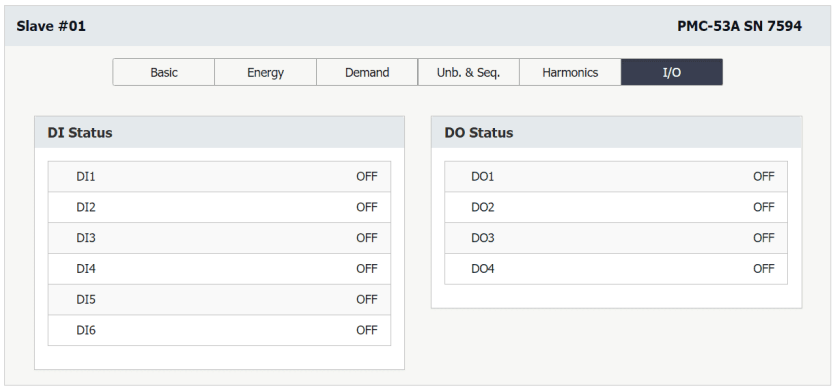


Figure 3-86 I/O Status for Slave #1 PMC-53A

3.2.3.6 Setup

Click **Setup** at the **Title Bar** and its sub-menu appears on the left-hand pane which includes **Basic**, **PQ, Dmd. & Energy, Record, Setpoint, I/O, HMI, Others** and **Diagnostics.**

3.2.3.6.1 Basic

Click **Basic** on the left-hand pane and the following screen appears which has the five tabs: **Basic, Comm., Time, Others** and **MB Master**.

- **Basic**

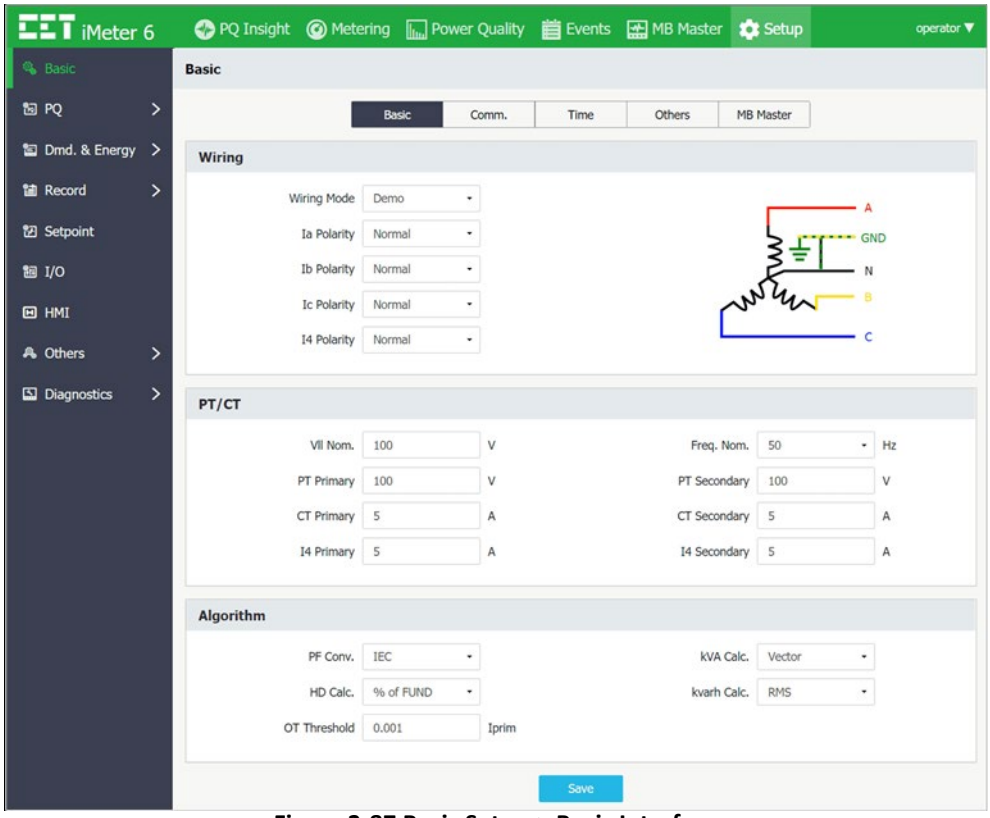


Figure 3-87 Basic Setup-> Basic Interface

Click on the wiring graphics on the right-hand side to set the **Channels Color**:

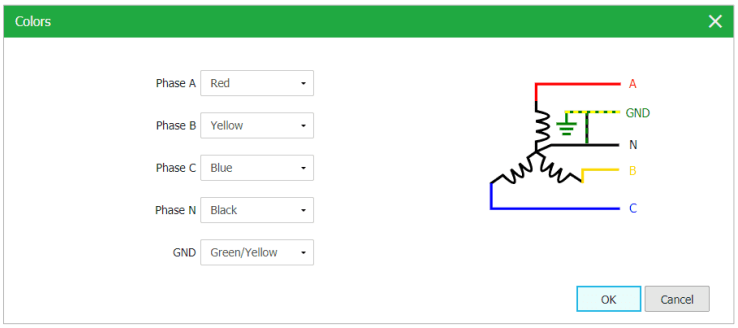


Figure 3-88 Channel Color Settings

- **Comm.**
  The iMeter 6 comes standard with one RS-485 port (P1) and one Ethernet port (P2) supporting multiple protocols. Click on the **Comm.** tab at the top of the right-hand pane and the following screen appears. Set the **Comm.** parameters as required.

  The **White List** (supported in Firmware V3.10.00 or later) is used for controlling access of specific clients in the LAN. The clients out of the White List are forbidden to log into the on-board Web server and FTP server. The iMeter 6 supports up to 10 devices access the meter with White List enabled. Please refer to **Section 5.10.1** for more information.

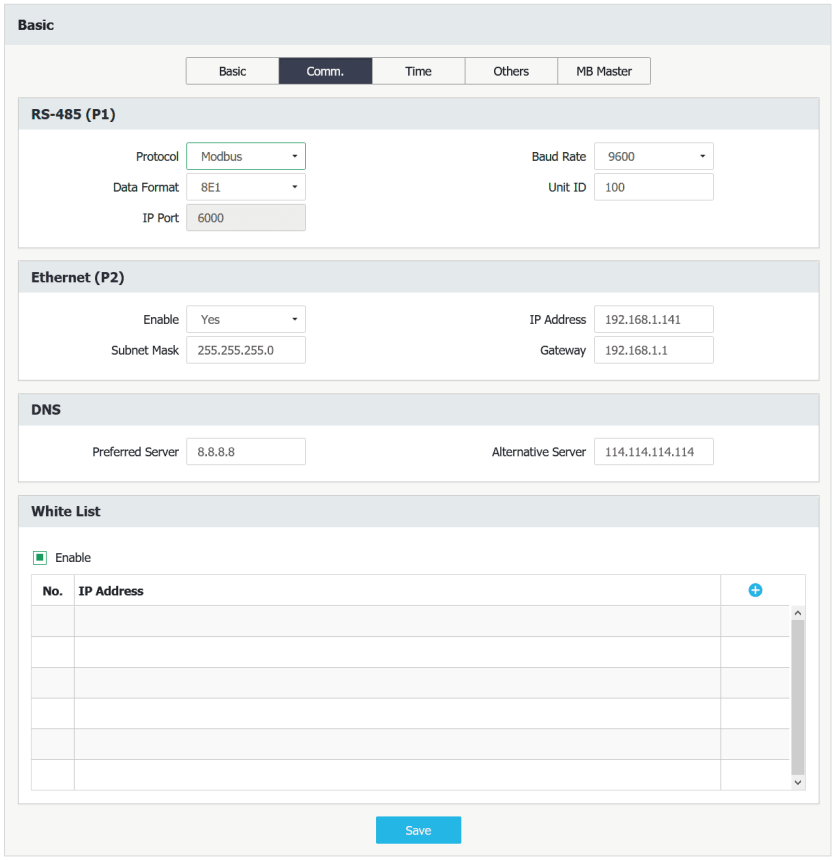


Figure 3-89 Comm. Setup Interface

- **Time**
  Click **Time** at the top of the right-hand pane and the following screen appears. This web page shows two areas: **Date** and **Time Sync**. The date and time can be updated manually or synchronized with a local PC by simply checking the **Sync. with PC** box.

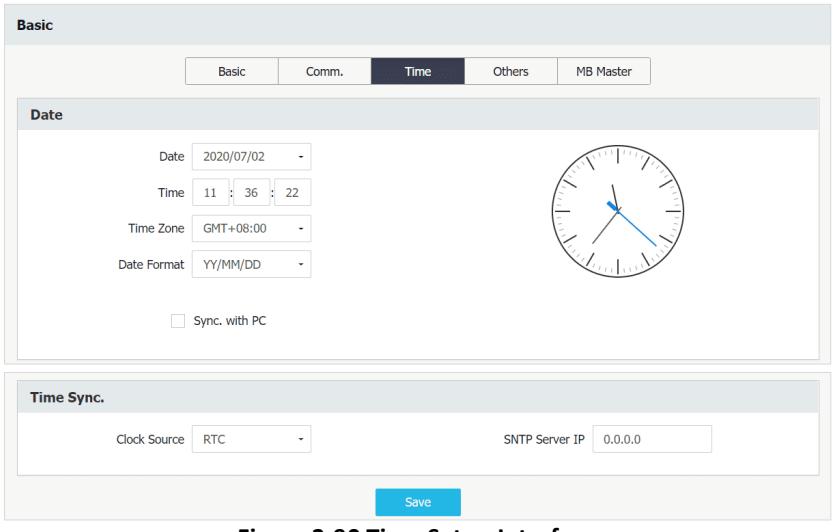


Figure 3-90 Time Setup Interface

- **Others**

  Click **Others** at the top of the right-hand pane and the following screen appears which allows the users to setup **Language**, **Delimiter**, **Voltage Symbol** and **Phase Label**.

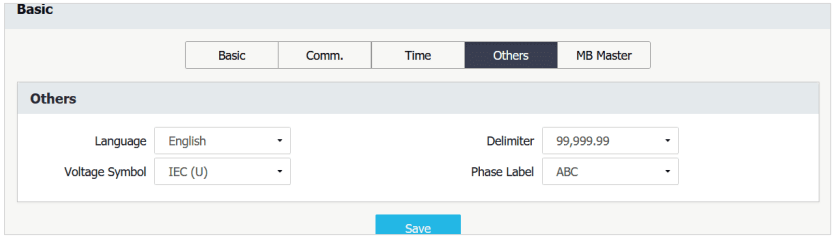


Figure 3-91 Basic-> Others Setup Interface

- **MB Master**

  Click **MB Master** (supported in Firmware V3.00.06 or later) at the top right-hand corner and the following screen appears which allows the user to configure **Slave #01** to **Slave #31**. For more information, please refer to **Section 4.12**

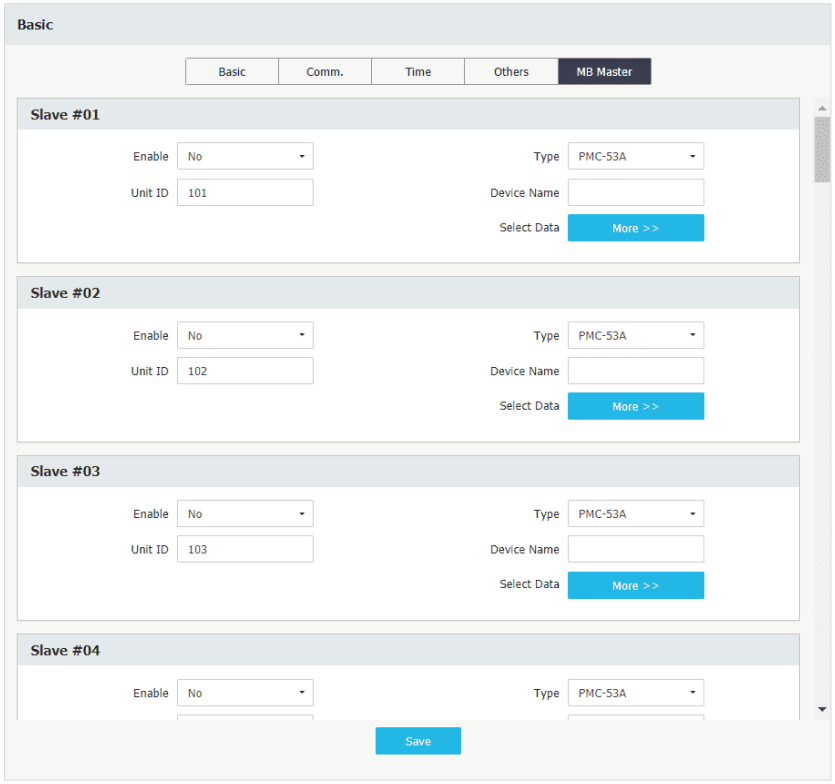


Figure 3-92 Basic-> MB Master Setup Interface

Click **More >>** to choose the measurements to be displayed on the Front Panel and Web Interface. Please refer to Table 4-32 for the measurement details for Page 1 to 28. The user can quickly select/de-select all pages by clicking **Select All**/**Clear All** or duplicate existing settings from a specific MB Slave by selecting it from the **Import from** list.

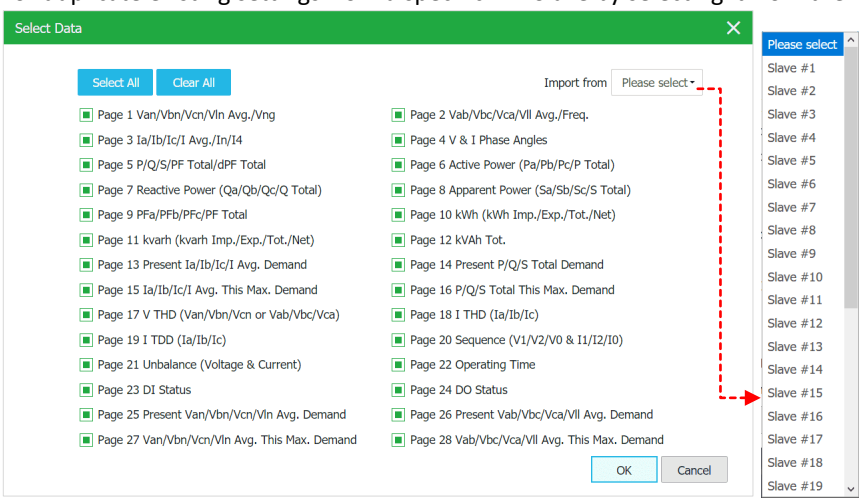


Figure 3-93 Select Data settings

3.2.3.6.2 PQ

Click **PQ** on the left-hand pane to expand the **Settings** (applied to IEC 61000-4-30 standard) and **EN50160** setup parameters.

3.2.3.6.2.1 PQ -> Settings

- **Dip/Swell**

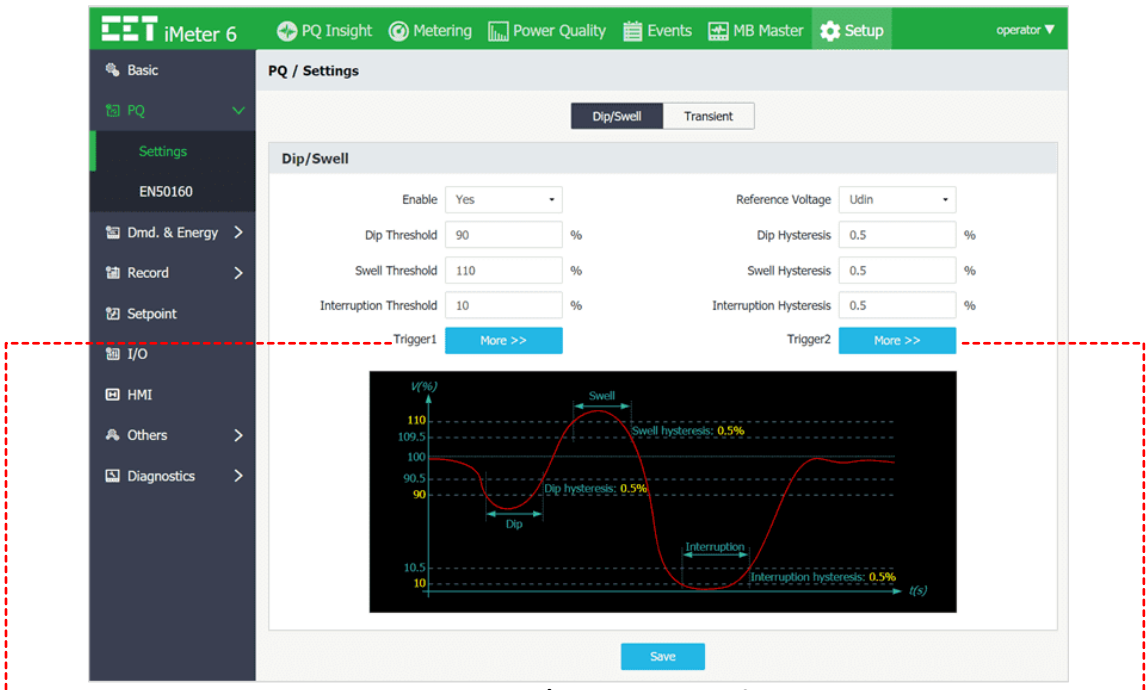


Figure 3-94 Dip/Swell Setup Interface

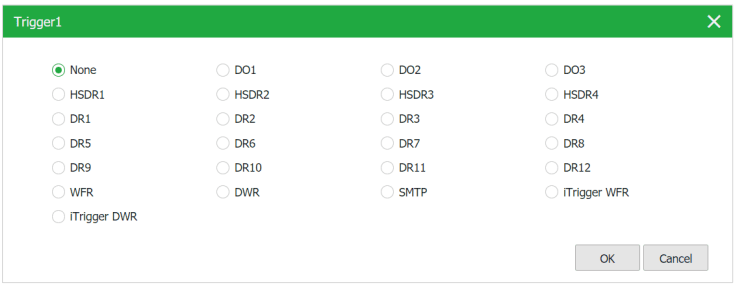


Figure 3-95 Trigger 1 / 2 Options

- **Transient**

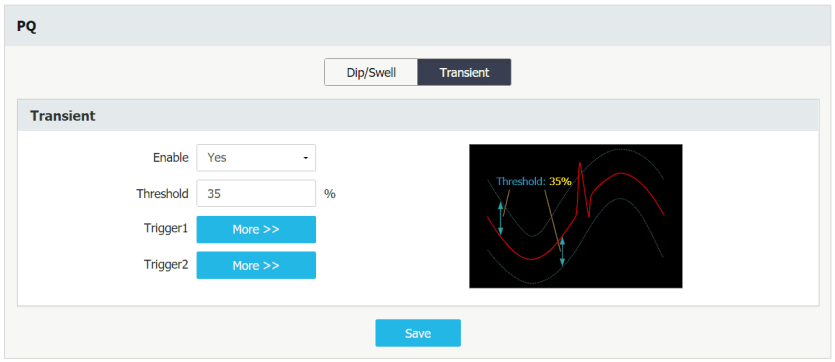


Figure 3-96 Transient Setup Interface

3.2.3.6.2.2 PQ -> EN50160

This page allows the users to setup the **Voltage Level** and **First Day of Week** for the EN50160 reporting.

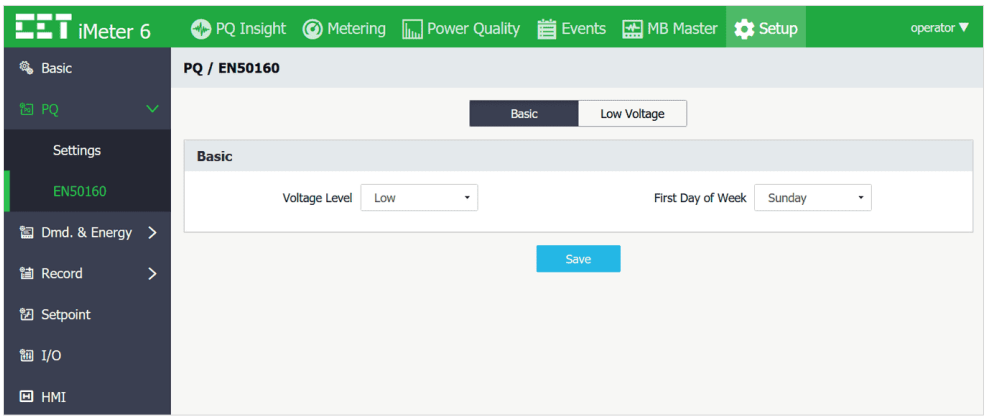


Figure 3-97 EN50160 Basic Setup Interface

Figures below illustrate the default limits of the EN50160 parameters according to the Voltage Level settings above.

- **Power Frequency**

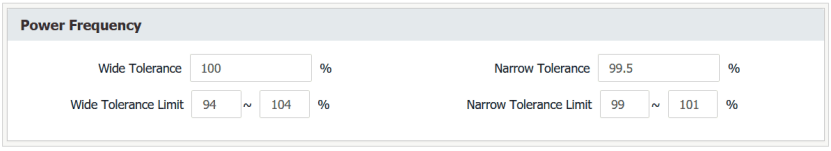


Figure 3-98 Power Frequency

- **Supply Voltage Variations**

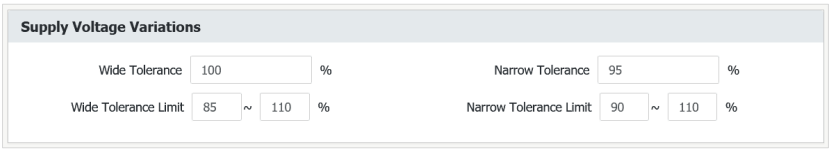


Figure 3-99 Supply Voltage Variations

- **Supply Voltage Unbalance**

Figure 3-100 Supply Voltage Unbalance

- **Voltage Harmonic Limits**

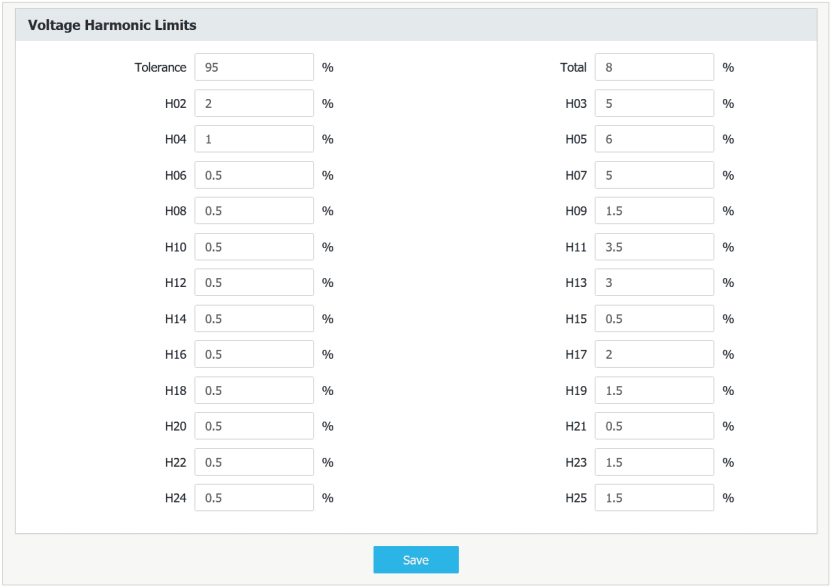


Figure 3-101 EN50160 Voltage Harmonic Limits

3.2.3.6.3 Dmd. & Energy

Click **Dmd. & Energy** on the left-hand pane to expand its sub-menu, which includes **Demand**, **Energy** and **TOU**.

3.2.3.6.3.1 Demand

Please refer to **Section 4.2.5** for more information.

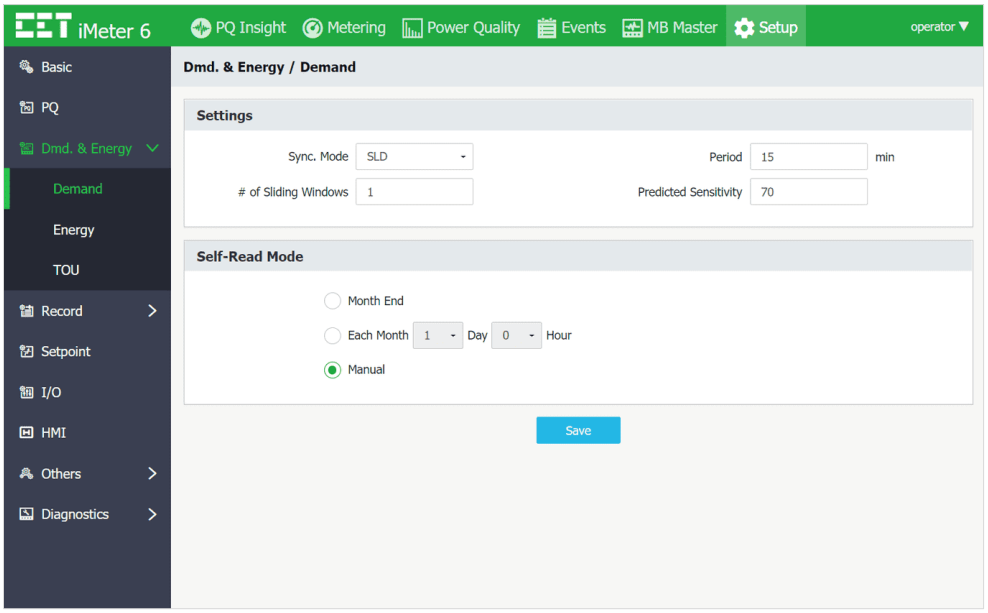


Figure 3-102 Demand Setup Interface

3.2.3.6.3.2 Energy

Click **Energy** on the left-hand pane and the following screen appears which allows the setup parameters for **Interval Energy**, **Energy Preset**, **Energy Pulse** and **IER** (Interval Energy Recorder) to be configured.

- **Interval Energy** allows the configuration of **EN Period**, which has a range of 5 to 60 minutes (default = 60 min).

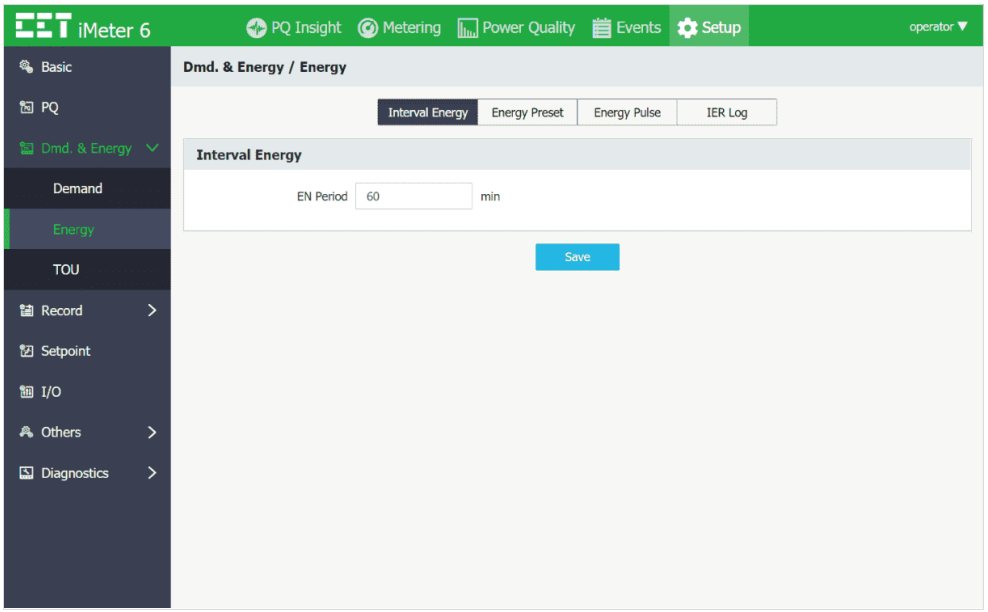


Figure 3-103 Interval Energy Setup Interface

- **Energy Preset** supports the presetting of values for kWh Import/Export, kvarh Import/Export and kVAh for the Total and individual phases.

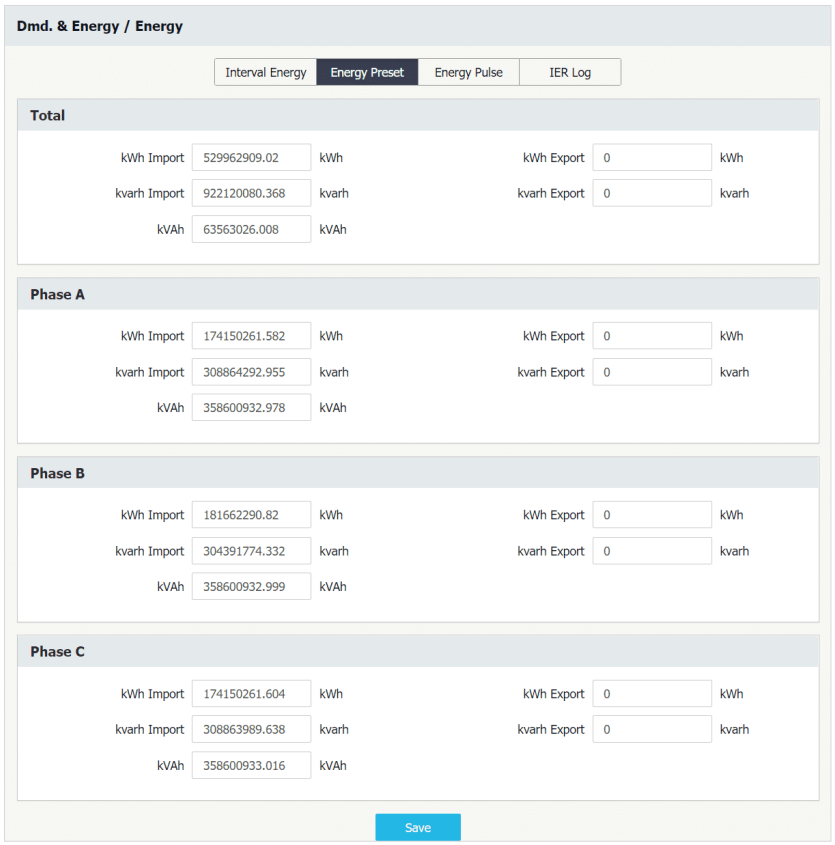


Figure 3-104 Energy Preset Interface

- **Energy Pulse** supports the configuration of the **LED EN Pulse** and **Pulse Constant** setup parameters.

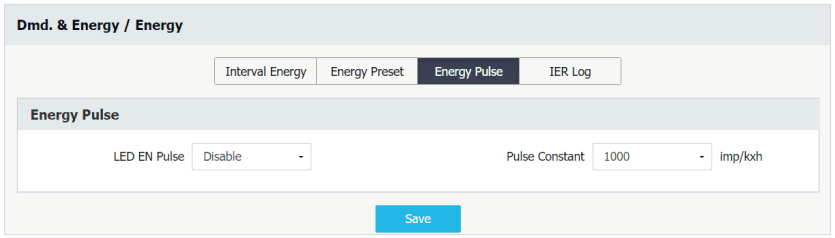


Figure 3-105 Energy Pulse Setup Interface

- **IER Log** supports the configuration of the IER (Interval Energy Recorder) Log.

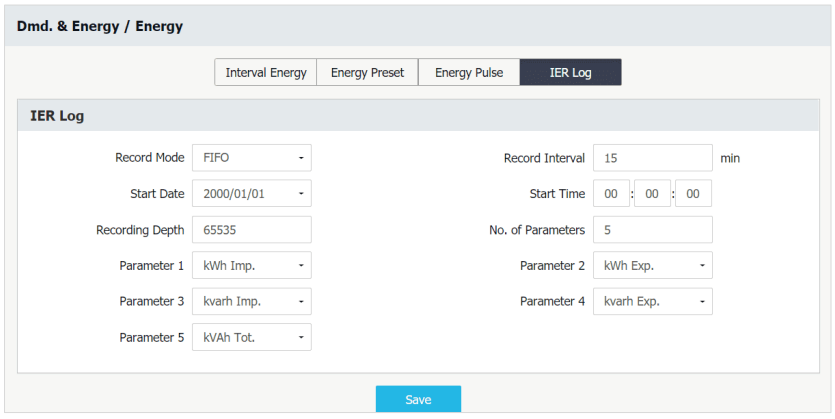


Figure 3-106 IER Log Setup Interface

3.2.3.6.3.3 TOU

Click **TOU** on the left-pane and the following screen appears which allows the TOU setup parameters to be configured. The 4 tabs are **Basic**, **Daily Profiles**, **Seasons** and **Alternate Days**. Please refer to **Section 4.7.12** for more information.

- **Basic**

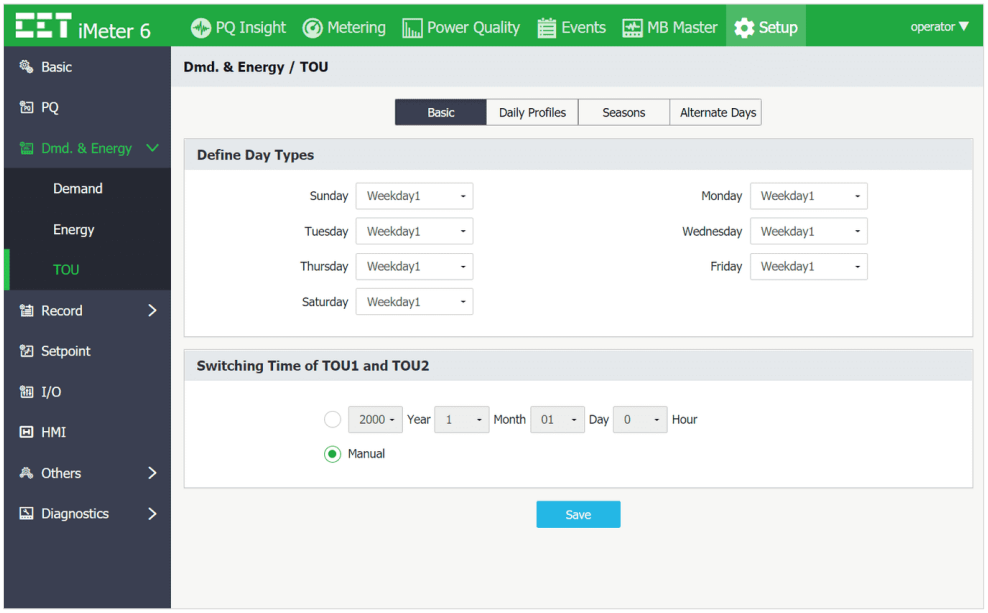


Figure 3-107 TOU – Basic Settings

- **Daily Profiles**

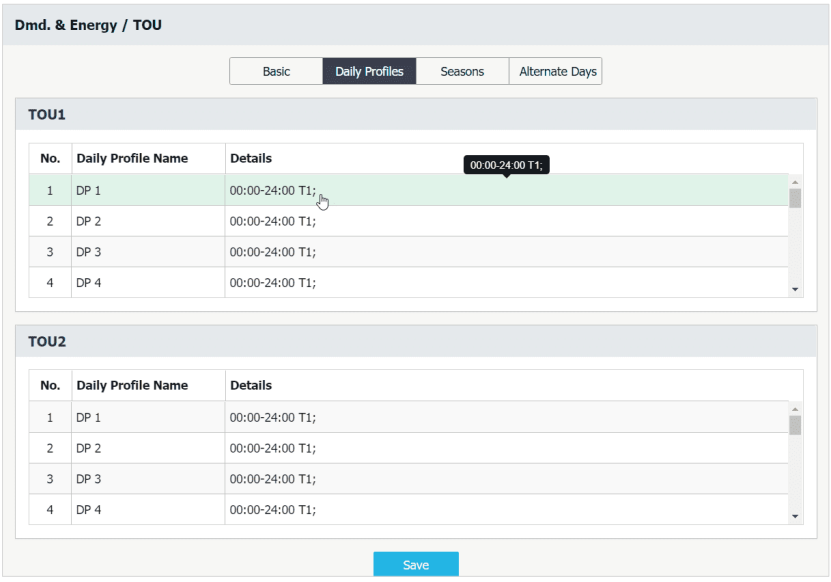


Figure 3-108 TOU – Daily Profile

Click on a particular **Daily Profile** and the following dialog box appears which allows the **Start Time** and **Tariff** for each **Period** to be defined until the entire day has been filled. As **Figure 3-109 TOU – DP1 Setting** shown, the **Start Time** for the first **Period** is fixed at 00:00 and cannot be modified. Each **Daily Profile** supports a maximum of 20 **Periods** in 15-minute resolution. The **Start Time** of the next **Period** defines the end time of the previous **Period**. Click ⊕ to add a new **Period** or 🗑 to clear the current **Period's** settings. The last defined **Period** will end at 24:00.

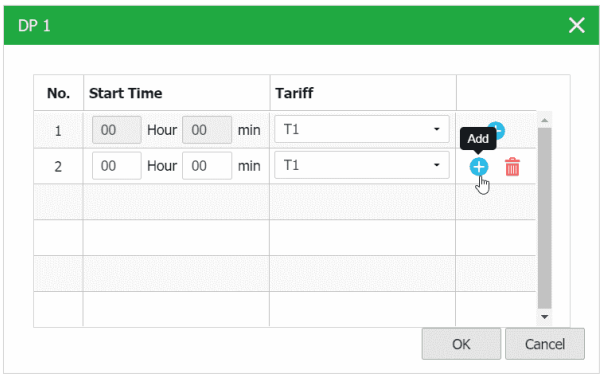


Figure 3-109 TOU – DP1 Setting Dialog

- **Seasons**

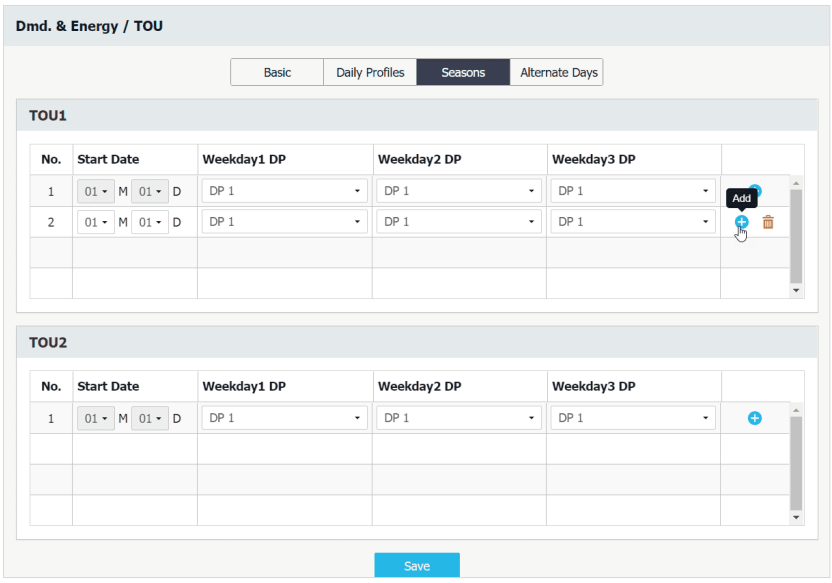


Figure 3-110 TOU – Seasons

Click **Seasons** and the above screen appears which allows the **Start Date, Weekday 1 DP, Weekday2 DP and Weekday 3 DP** each **Season** to be defined until the entire year has been filled. Up to 12 seasons can be defined for each TOU. The **Start Date** for the first **Season** is fixed at 01/01 and cannot be modified. The **Start Date** of the next **Season** defines the end date of the previous **Season**. Click ⊕ to add a new **Season** or 🗑 to clear the current **Season's** settings. The last defined **Season** will end at 12/31.

- **Alternate Days**

Click **Alternate Days** and the following screen appears which allows up to 90 **Alternate Days** to be defined for each **TOU**. Click on the <**Add**> button to start the configuration.

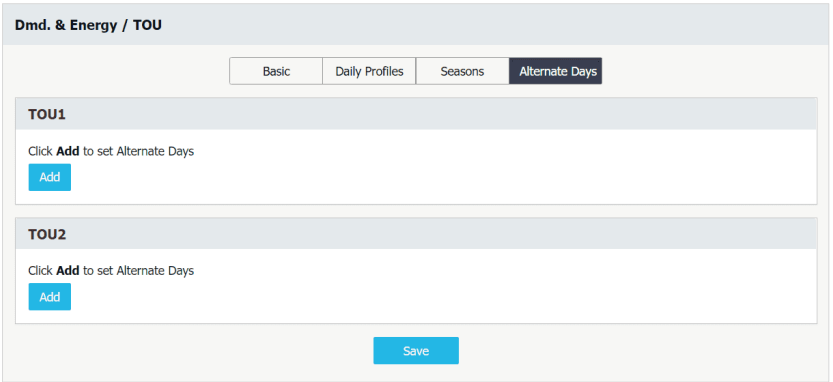


Figure 3-111 TOU – Alternate Days Setup Interface

Click ⊕ to add a new Alternate Day or 🗑 to clear the setting for the current Alternate Day.

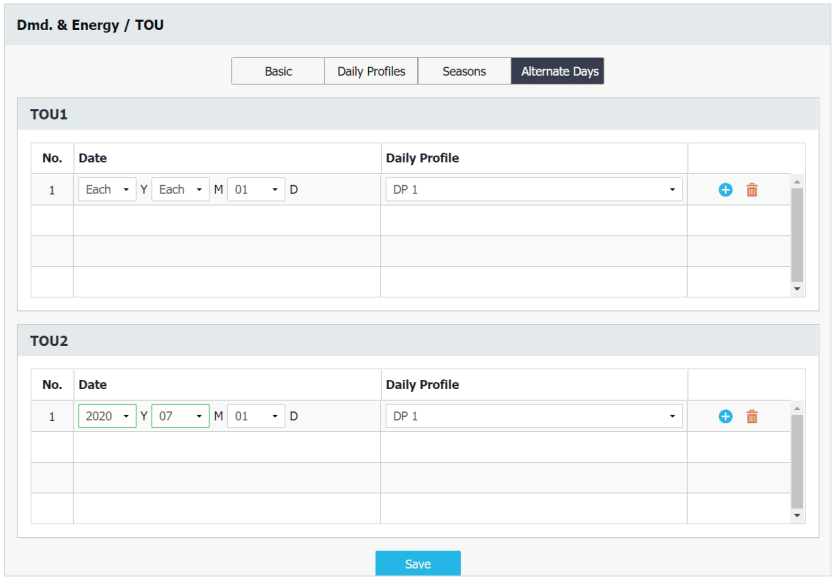


Figure 3-112 TOU – Alternate Days Setup Interface

3.2.3.6.4 Record

Click **Record** on the left-hand pane to expand its sub-menu which includes **Waveform** and **DR** (Data Recorder).

3.2.3.6.4.1 Waveform

Click **Waveform** on the left-hand pane and the following page appears which has four tabs: WFR, DWR, Sche. WFR and iTrigger. Please refer to **Section 4.7.4** for more details.

- **WFR**

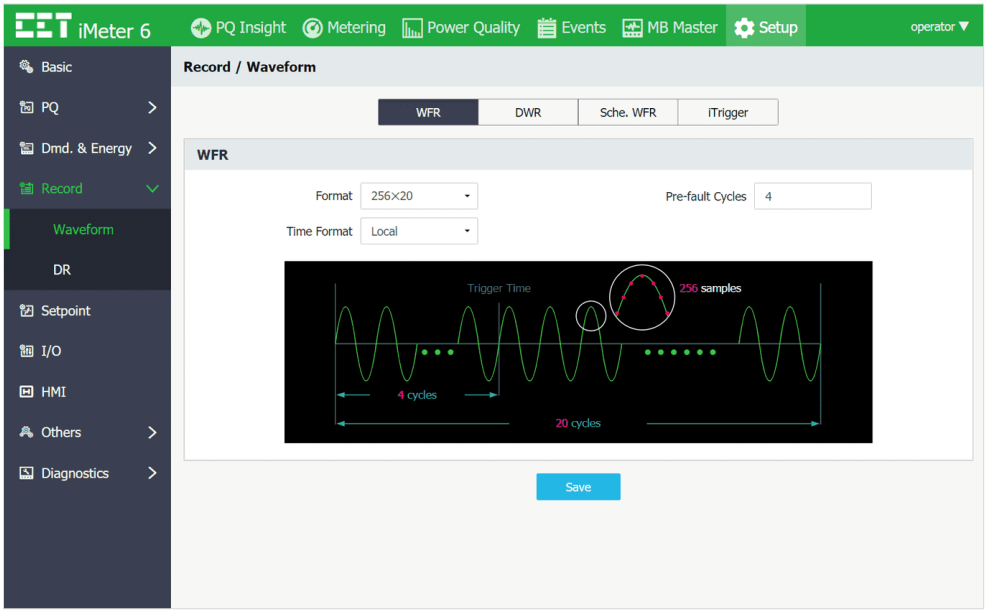


Figure 3-113 Record – WFR Setup Interface

- **DWR**

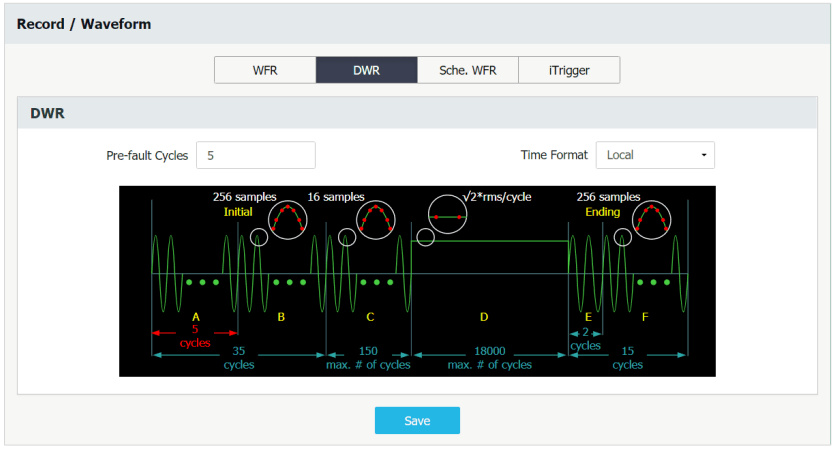


Figure 3-114 Record – DWR Setup Interface

- **Sched. WFR**

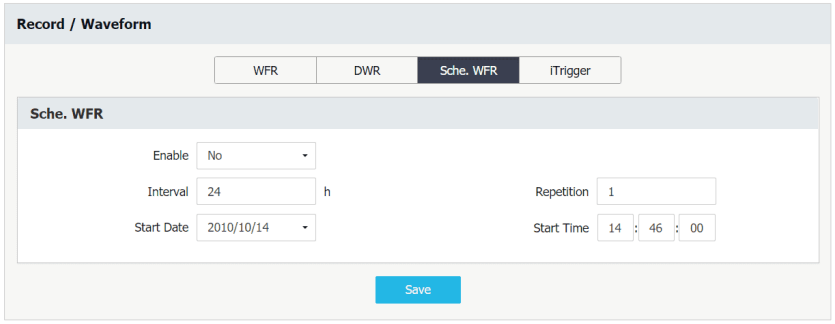


Figure 3-115 Sche. WFR Setup Interface

- **iTrigger** (supported in Firmware V3.10.00 or later)

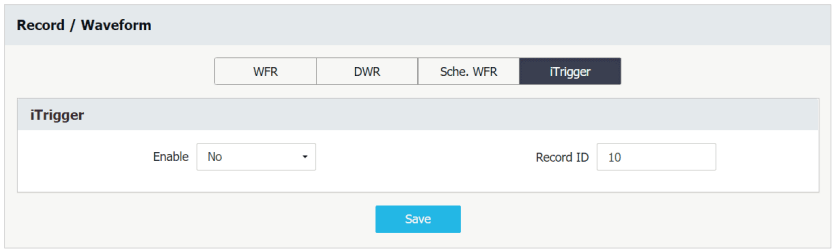


Figure 3-116 iTrigger Setup Interface

3.2.3.6.4.2 DR (Data Recorder)

The iMeter 6 provides 4 High-Speed Data Recorders (**HS DR**) as well as 28 Standard Data Recorders (**DR**) capable of recording up to 16 parameters each. Please refer to **Section 4.7.11** for more information.

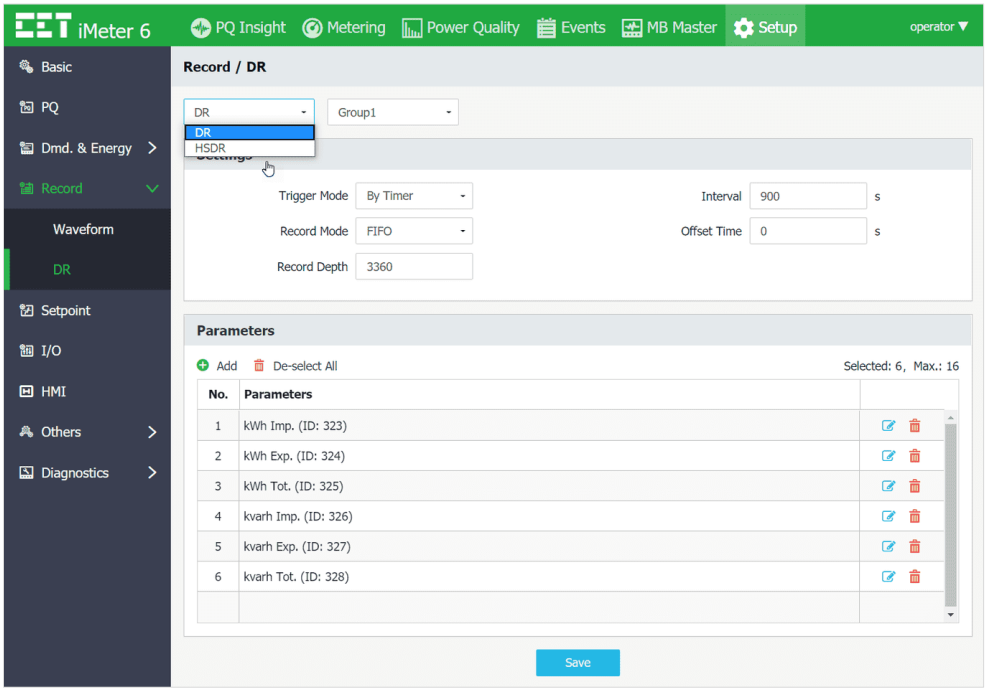


Figure 3-117 Record - DR Setup Interface

Underneath **Parameters**, click (De-select All) to remove all existing parameters or (Add) to add a batch of parameters by selecting one or more desired parameters. Click on the right-hand column to remove a particular parameter or to edit an existing parameter.

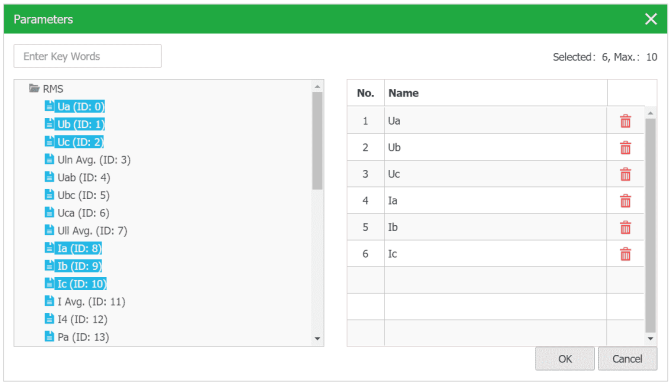


Figure 3-118 DR Source Parameters Setup Dialog Box

3.2.3.6.5 Setpoint

Click **Setpoint** on the left-hand pane and the following screen appears which allows the setup parameters for **Setpoint (Standard Setpoint), HSSP** (**High-speed Setpoint)** and **Logical Module** to be configured as required. Please refer to **Sections 4.4** and **4.5** for more information.

- **Standard Setpoint**

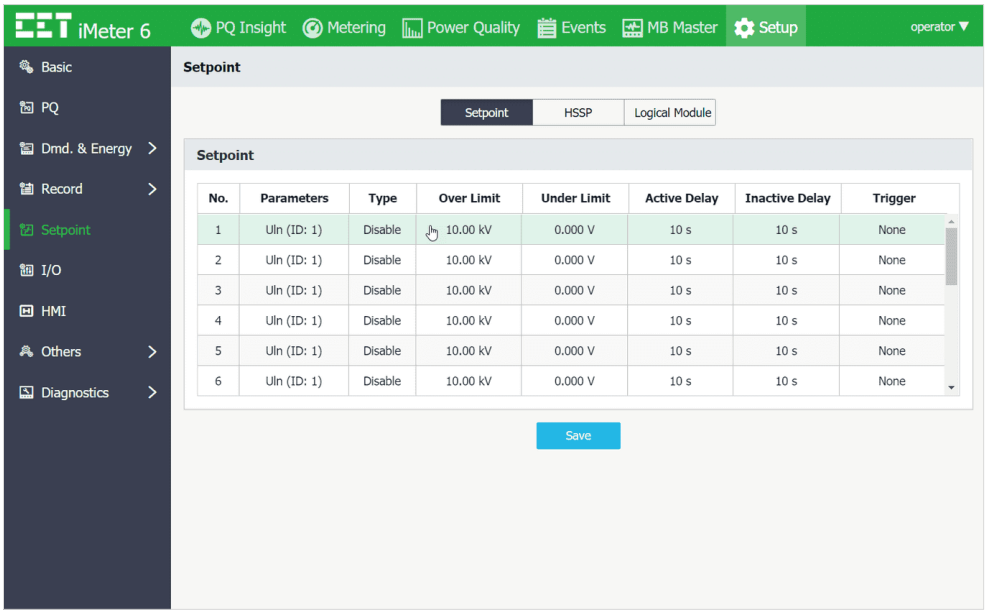


Figure 3-119 Setpoint - Standard Setpoint Settings

Select a particular Setpoint entry and the **Setpoint Settings** dialog box appears. Up to 39 parameters are available for the Standard Setpoint monitoring, including Voltage, Current, Power, DI Status, etc. (Please refer to **Table 4-12 Setpoint Parameters** for more information).

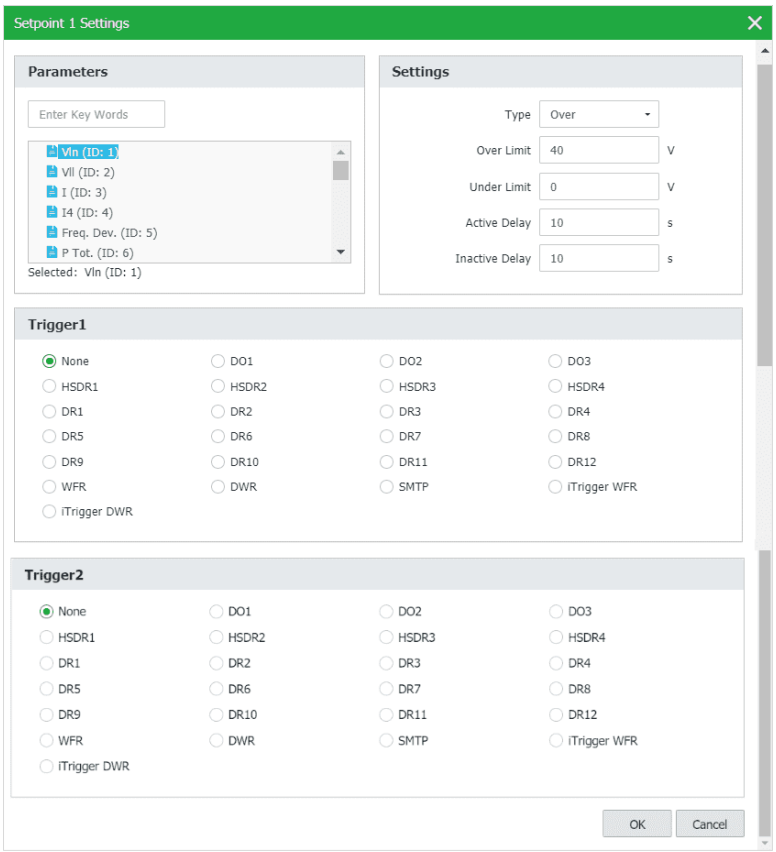


Figure 3-120 Setpoint Settings Dialog

- **HS Setpoint**

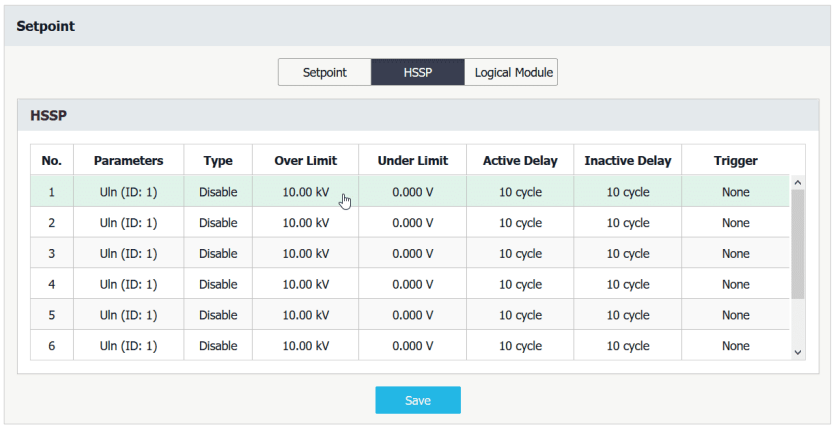


Figure 3-121 Setpoint – HSSP Settings

Click on a particular HS Setpoint and the **HSSP Settings** dialog box appears. Up to 14 parameters are available for the HS Setpoint monitoring, including Uln, Ull, I, I4, Frequency Deviation, kW/kvar total, PF, DI1 to DI6 Status.

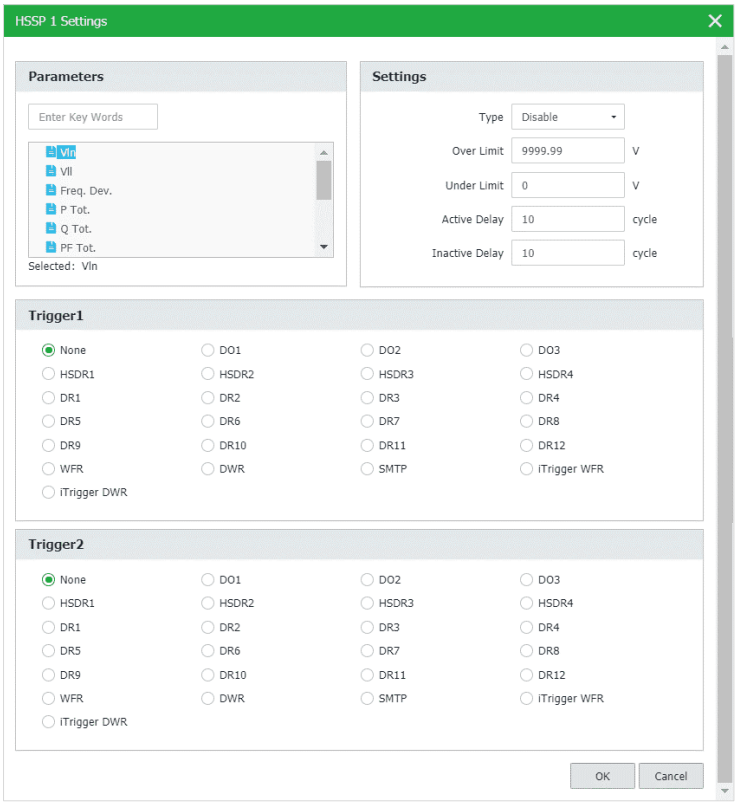


Figure 3-122 HS Setpoint Settings Dialog

- **Logical Module**

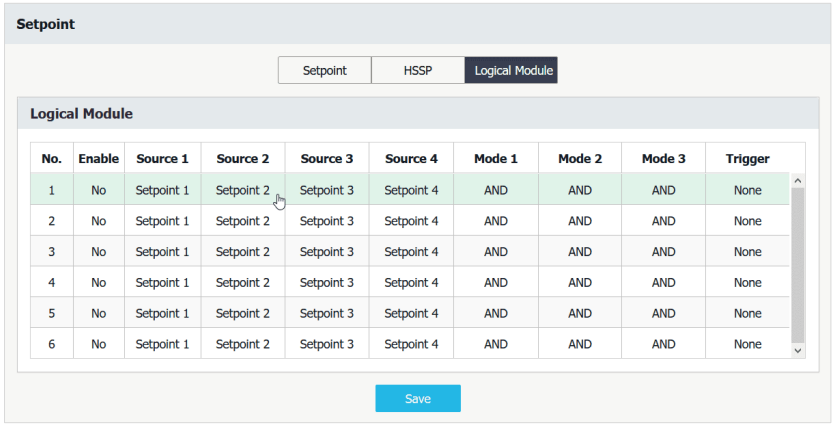


Figure 3-123 Setpoint – Logical Module Settings

The iMeter 6 comes standard with 6 programmable Logical Modules. Click on a particular module and the **Logical Module Settings** dialog box appears which allows up to 4 logical operations to be configured with AND, OR, NAND, or NOR.

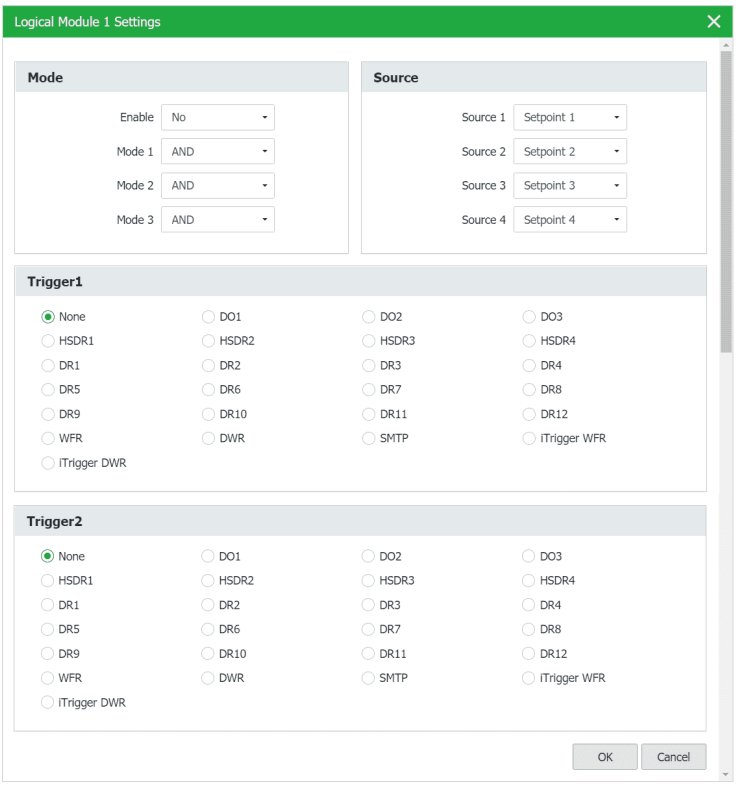


Figure 3-124 Logical Module Setup Interface

3.2.3.6.6 I/O Setup

Click **I/O** on the left-hand pane and the following screen appears which allows the I/O parameters to be configured as required. Please refer to **Section 4.1** for more information.

- **DI**

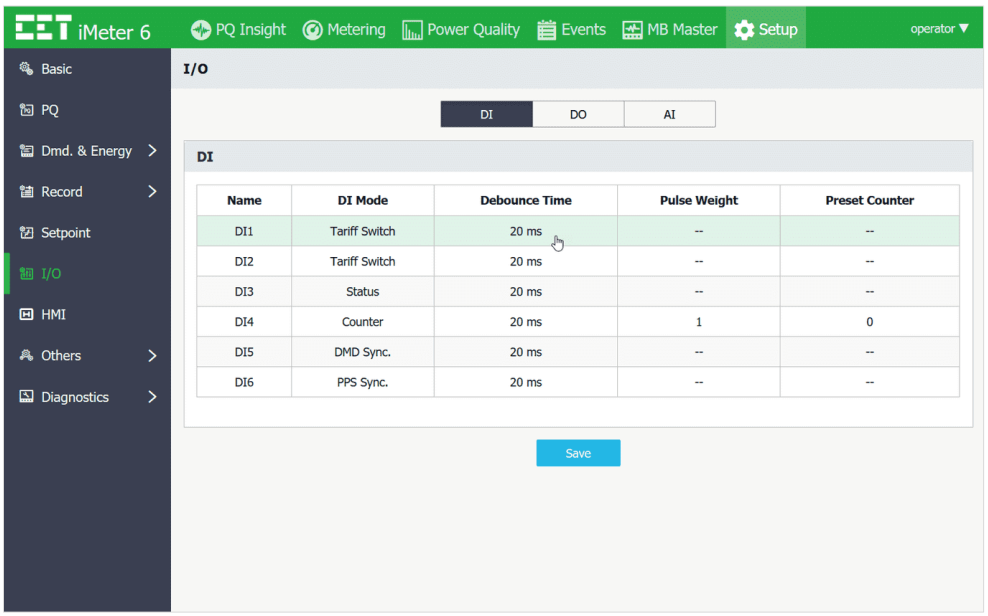


Figure 3-125 DI Setup Interface

Click on a specific DI and the following dialog box appears.

- **DI Mode = Status**

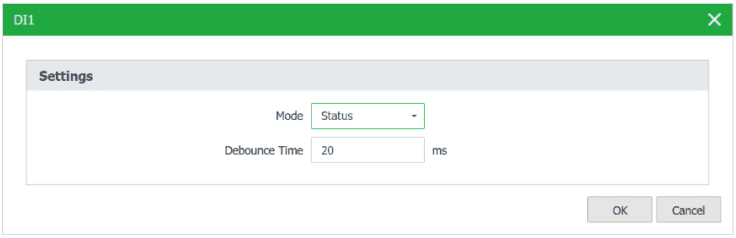


Figure 3-126 DI Status Setup Interface

- **DI Mode = Counter**

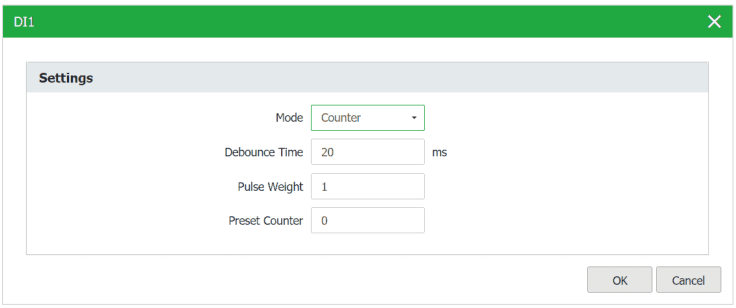


Figure 3-127 DI Counter Setup Interface

- **DI Mode = DMD Sync.**

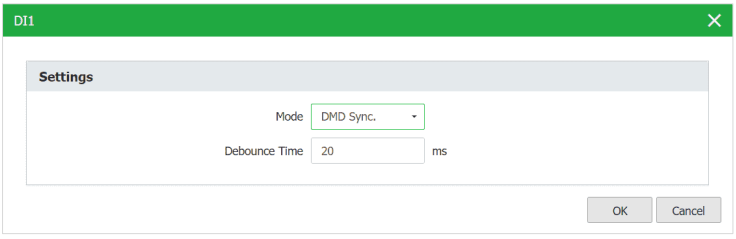


Figure 3-128 DI DMD Sync. Setup Interface

- **DI Mode = PPS Sync.**

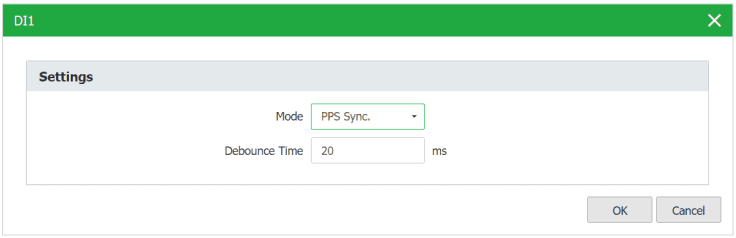


Figure 3-129 DI PPS Sync. Setup Interface

- **DI Mode = Tariff Switch**

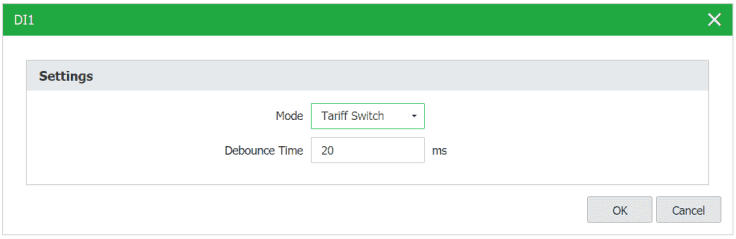


Figure 3-130 DI Tariff Switch Setup Interface

- **DO**

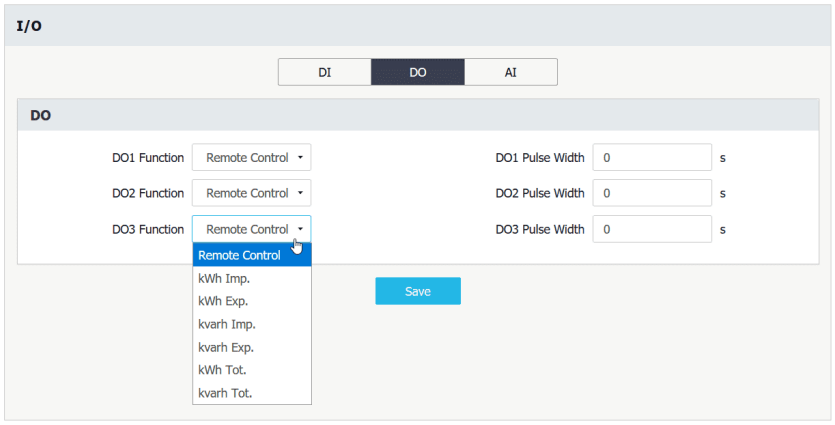


Figure 3-131 DO Setup Interface

- **AI (Optional)**

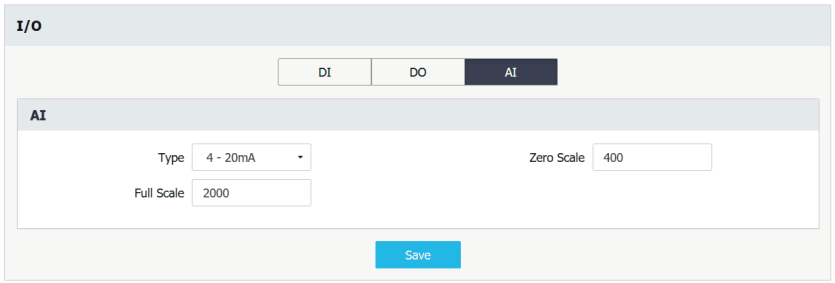


Figure 3-132 Optional AI Setup Interface

3.2.3.6.7 HMI

Click **HMI** on the left-hand pane and the following screen appears which allows the **Auto-Scroll** parameters to be setup.

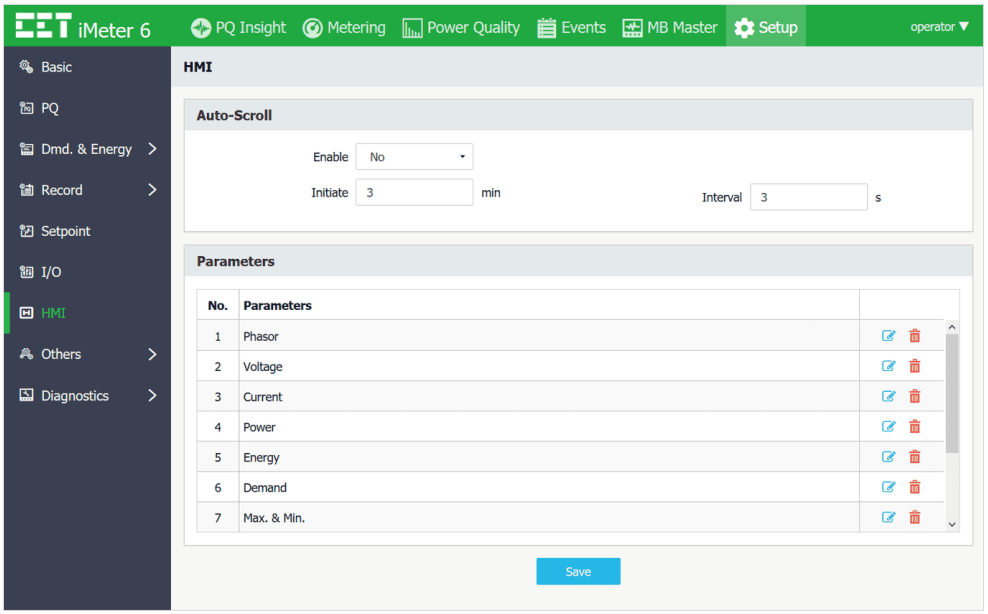


Figure 3-133 HMI Setup Interface

3.2.3.6.8 Others

Click **Others** on the left-hand pane to expand its sub-menus which include **Alarm Email** & **Advanced**.

3.2.3.6.8.1 Alarm Email

- **Settings** Please refer to **Section 4.9** for more details about the configurations.

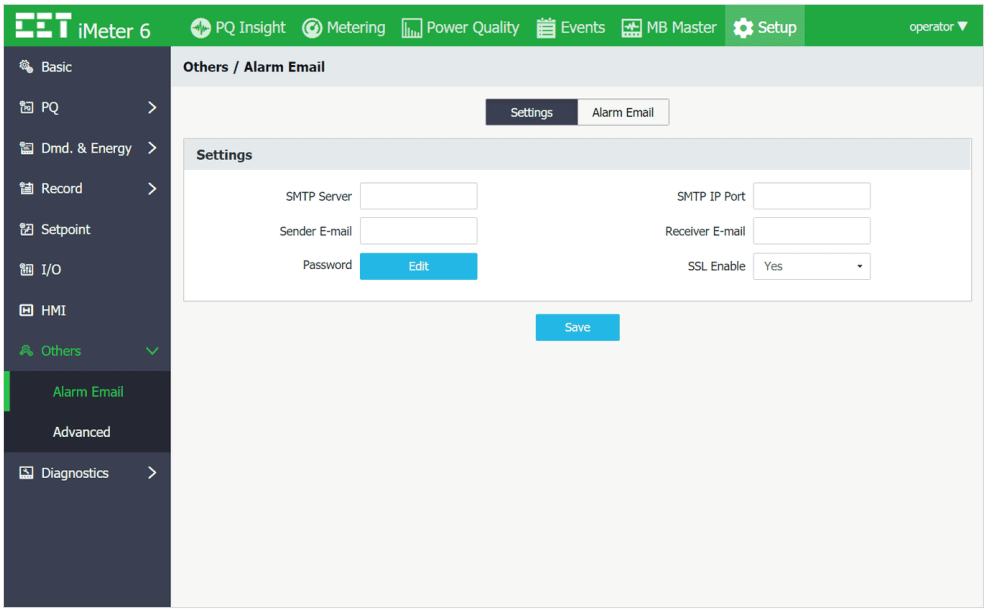


Figure 3-134 Alarm Email Settings Interface

- **Alarm Email** Click **Test** to send a test email to check the correctness of the **Alarm Email** configuration.

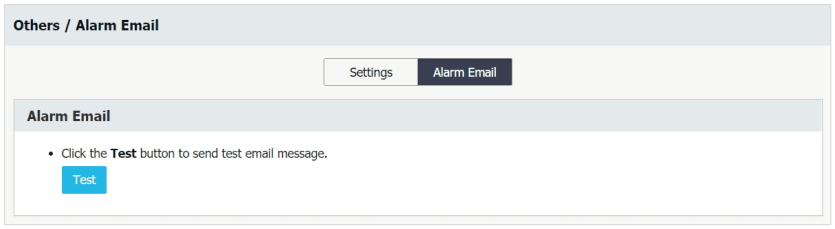


Figure 3-135 Test Alarm Email

3.2.3.6.8.2 Advanced

Click **Advanced** to perform the advanced configuration for the iMeter 6. Please consult qualified personnel before making changes to these parameters. Changes made to the parameters with "*" symbol will require a reboot to take effect.

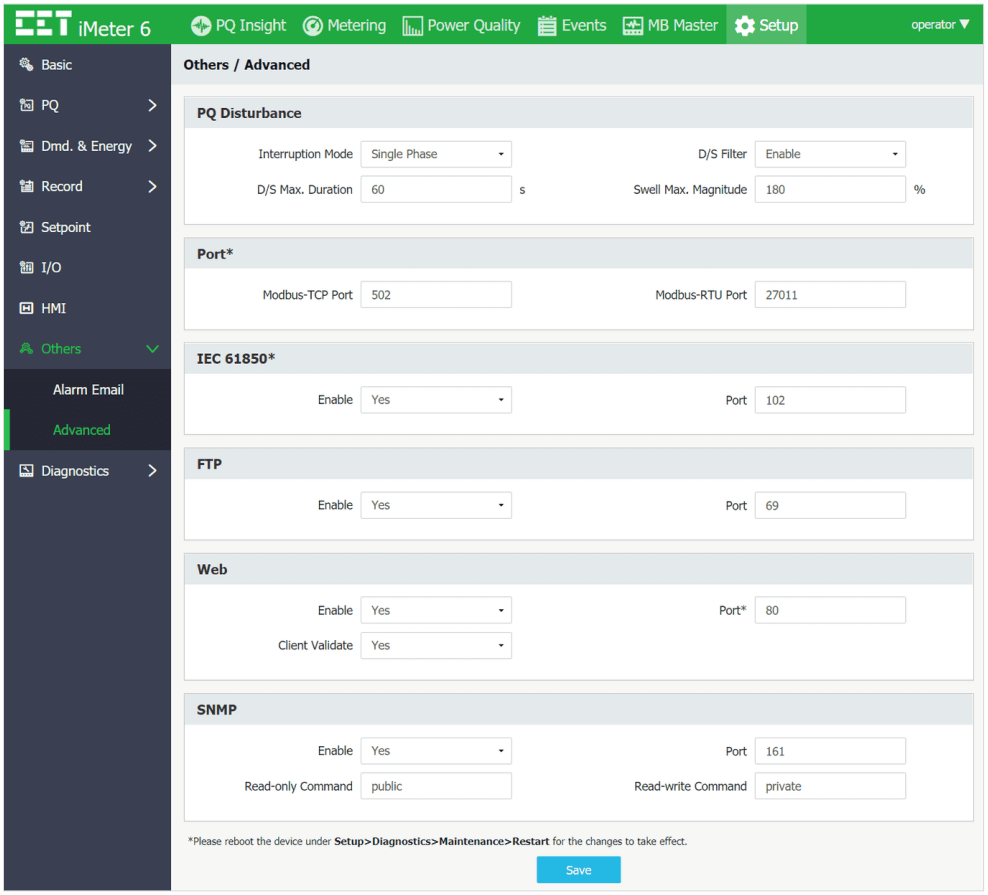


Figure 3-136 Others – Advanced Settings

3.2.3.6.9 Diagnostics

Click **Diagnostics** on the left-hand pane to expand its sub-menu which include **Device Info., User Management,** and **Maintenance.**

3.2.3.6.9.1 Device Info.

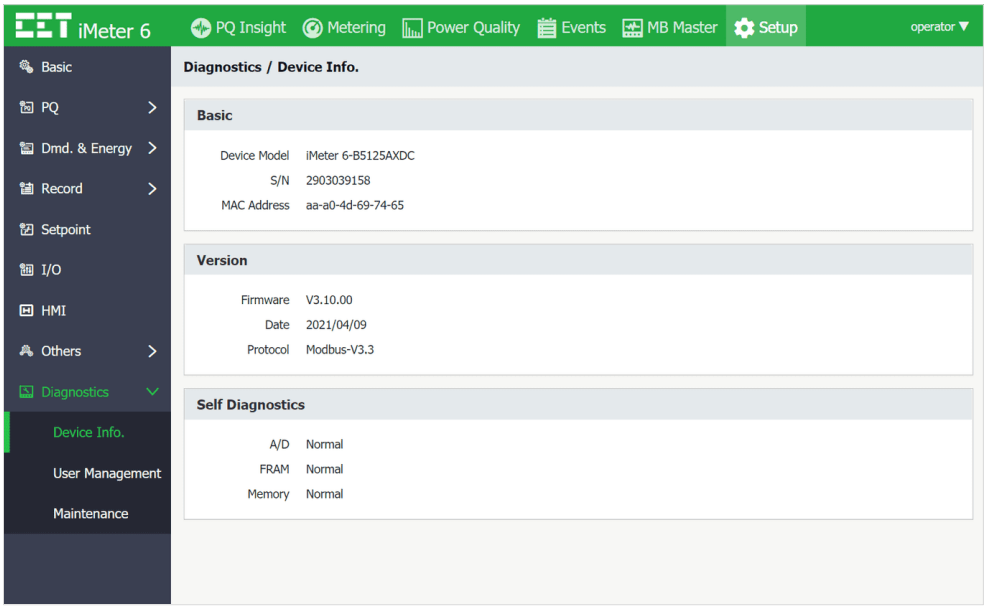


Figure 3-137 Diagnostics – Device Info. Interface

3.2.3.6.9.2 User Management

The user with **Operator** authority can click ⊕ to add a new user account or 🗑 to remove an existing user account.

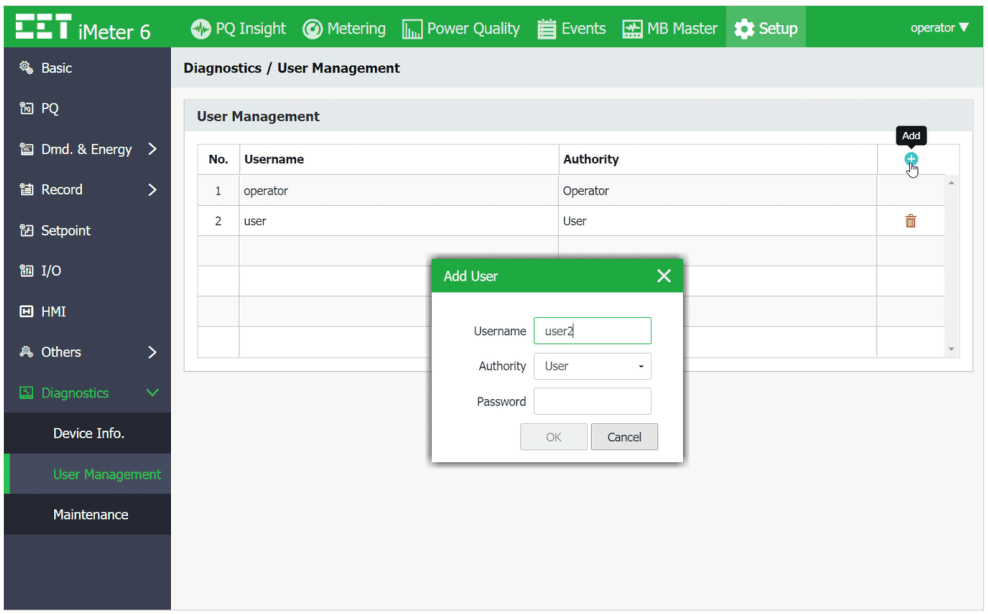


Figure 3-138 Diagnostics – User Management

3.2.3.6.9.3 Maintenance

Click **Maintenance** on the left-hand pane and the following screen appears which provides the options for **DO Control**, **Clear**, **Imp./Exp.**, **Upgrade** and **Restart**.

- **DO Control** Perform manual **DO Control** or **Reset all DOs to Normal**.

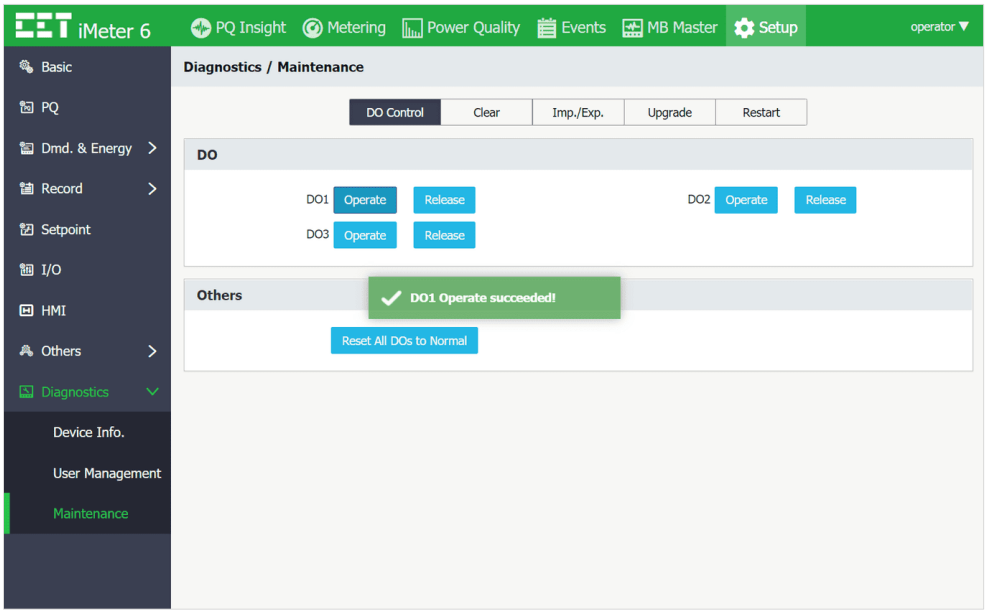


Figure 3-139 Maintenance – DO Control Interface

Depending on the **DO Pulse Width** setting, the DO may behave differently when it is operated manually via the Web Interface. A zero **Pulse Width** means **Latched** operation while non-zero means **Pulsed** operation. For **Latched** operation, the DO will remain in the **Active** state when it's manually operated and will only return to the **Inactive** state when it's manually released. For **Pulsed** operation, the DO will return automatically from the **Active** state to the **Inactive** state after a duration that is equal to the non-zero **Pulse Width** setting, without requiring a manual **Release** operation. In addition, if a DO is already in a **Released** state, the manual **DO Release** command would fail and generate an error message as shown below.

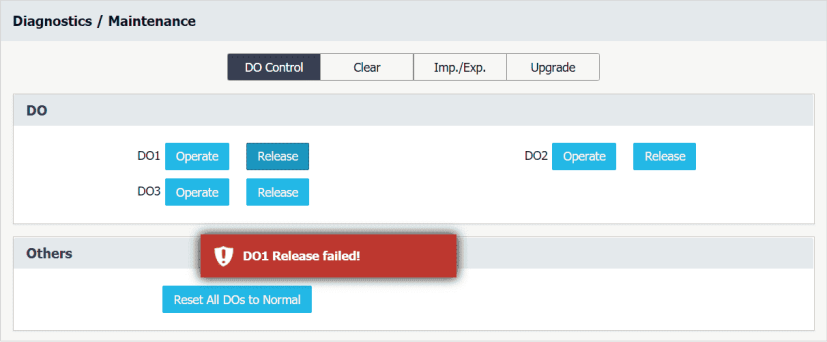


Figure 3-140 Maintenance – DO Release Command Failed

Further, the **DO Forced On/Off** operations from the **Front Panel** have the highest priority as discussed in **Section 4.1.2** . If a DO is accidentally left in the **DO Forced On/Off** state without being returned to the **Normal** state, PQ or other Control Setpoints will no longer be able to trigger it during an alarm situation. To solve this problem, the **Reset All DOs to Normal** has been implemented to allow the resetting of the DO from the **Forced On/Off** state back to the **Normal** state via the Web Interface.

- **Clear** Perform various **Clear** operations by groups or individually. Please be reminded to reboot the device after performing a **Clear All Logs** operation.

Figure 3-141 Maintenance – Clear Operations

- **Imp./Exp.** Import or Export the System Setup Parameters.

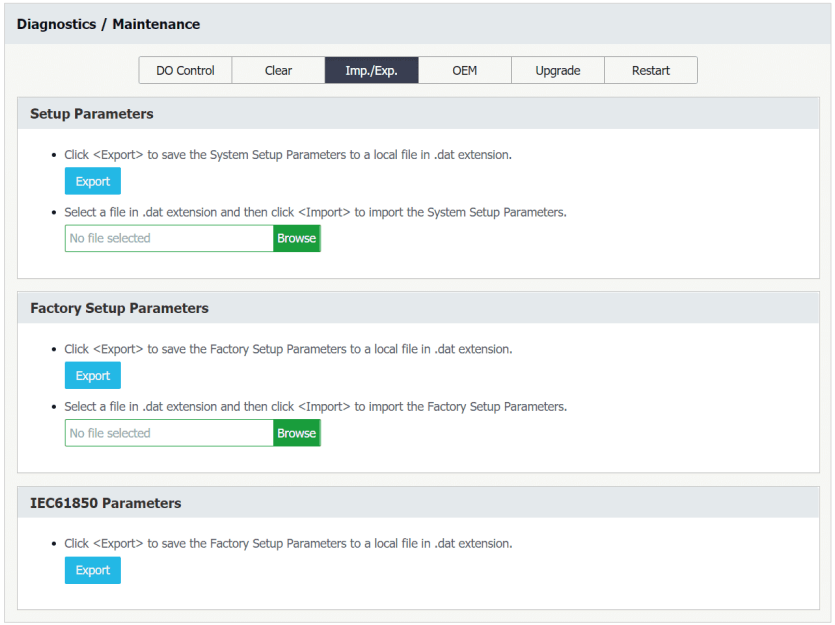


Figure 3-142 Maintenance – Imp./Exp.

- **Upgrade** Click the **Upgrade** tab at the top of the page and it displays the following screen where the users with **Operator** authority can perform a firmware upgrade or import a IEC61850 SCL file. It's highly recommended to clear the web browser's cache after firmware upgrade.

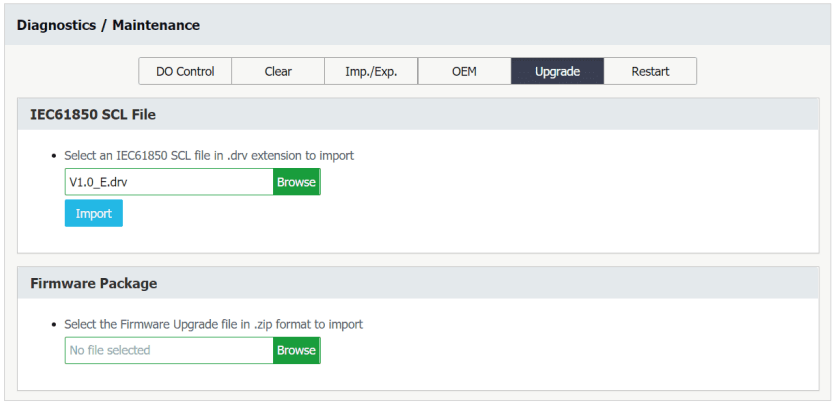


Figure 3-143 Maintenance – Upgrade

- **Restart** Click the Reboot button to remotely restart the meter when required.

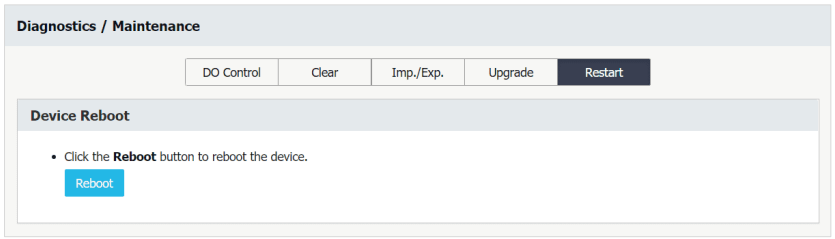


Figure 3-144 Maintenance – Restart

Chapter 4 Applications

4.1 Inputs and Outputs

4.1.1 Digital Inputs

The iMeter 6 comes standard with six self-excited Digital Inputs that are internally wetted at 24 VDC with a sampling frequency of 1000Hz and programmable debounce. The iMeter 6 provides the following programmable functions for its Digital Inputs:

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

2) **Pulse Counting** — Pulse counting is supported with programmable pulse weight and facilitates WAGES (Water, Air, Gas, Electricity and Steam) information collection.

3) **Demand Sync Pulse** — One of the Digital Inputs can be programmed to receive Demand Sync Pulse. Please refer to **Section 4.2.5** for a detailed description. Only the last DI will control the Demand Sync if there are multiple DIs are programmed as **SYNC DI**. For example, if DI2, DI3 and DI5 are all set to Demand Sync Input, only DI5 will be used for Demand Sync.

4) **Time Synchronization** — DI6 can be used as an external time synchronization input. Please refer to **Section 4.8** for a detailed description.

5) **Tariff Switching** — Up to 3 Digital Inputs may be used to select to which of the 8 Tariffs the energy consumption should be accumulated. The 3 Digital Inputs (DI1 to DI3) represent 3 binary digits where Tariff 1=000, Tariff 2=001, …, Tariff 8=111 where DI1 represents the least significant digit and DI3 represents the most significant digit. The **DI1 Function** setup register must first be programmed as a **Tariff Switch** before configuring DI2 with the same function. In other words, if DI1 is configured as a **Digital Input** or **Energy Pulse Counter** and DI2 is configured as a **Tariff Switch**, the TOU will continue to function based on the TOU Schedule.

The following table describes the DI's setup parameters:

Setup Parameter	Definition	Options/*Default
DIx Function	Each **DI** can be configured as a Status Input, Pulse Counter, SYNC DI or 1 PPS. Only DI1 to DI3 can be set as **Tariff Switch**.	0=Status Input* 1=Pulse Counter 2=SYNC DI, 3=1 PPS 4=Tariff Switch
DIx Debounce	Specifies the minimum duration the **DI** must remain in the Active or Inactive state before a state change is considered to be valid.	1 to 1000 (ms), 20*
DIx Pulse Weight	Specifies the incremental value for each received pulse. This is only used when a DI is configured as a Pulse Counter.	1* to 1,000,000

Table 4-1 DI Setup Parameters

4.1.2 Digital Outputs

The iMeter 6 comes standard with three Form A Electromechanical Digital Outputs. Digital Outputs are normally used for setpoint alarming, load control, or Remote Control applications.

Digital Outputs on the iMeter 6 can be used in the following applications:

1) **Front Panel Control** — Manually operated from the Front Panel. Please refer to the **DO Control** setup parameter in **Section 3.1.3.6.8 f**or a detailed description.

2) **Remote Control** — Remotely operated over communications via the built-in Web Interface, our free PMC Setup software or the PecStar® iEMS Integrated Energy Management System.

3) **Control Setpoint** — Control setpoints can be programmed to trigger DO, Data Recorder, Waveform Recorder, Disturbance Waveform Recorder or Alarm Email upon becoming active. Please refer to **Section 4.4** for a detailed description.

4) **Logical Module** Logical Module can be programmed to trigger DO, Data Recorder, Waveform Recorder or Disturbance Waveform Recorder upon becoming active. Please refer to **Section 4.5** for a detailed description.

5) **Dip/Swell Setpoint** Dip/Swell setpoint can be programmed to trigger DO, Data Recorder, Waveform Recorder, Disturbance Waveform Recorder or Alarm Email upon becoming active. Please refer to **Section 4.3.5** for a detailed description.

6) **Transient Setpoint:** Transient setpoint can be programmed to trigger DO, Data Recorder, Waveform Recorder, Disturbance Waveform Recorder or Alarm Email upon becoming active. Please refer to **Section 4.3.6** for a detailed description.

Since there are multiple ways to trigger the Digital Outputs on the iMeter 6, a prioritized scheme has been developed to avoid conflicts between different applications. In general, Front Panel Control has the highest priority and can override other applications. Remote Control, Control Setpoint, Logical Module, Dip/Swell and Transient Setpoint share the same priority, meaning that they can all be programmed to control the same Digital Output. This scheme is equivalent to having an implicit Logical OR operation for the control of a Digital Output and may be useful in providing a generic alarm output signal. However, the sharing of a Digital Output is not recommended if the user intends to generate a control signal in response to a specific setpoint condition.

4.1.3 Energy Pulse Outputs

The iMeter 6 comes standard with one Front Panel LED Pulse Output. Energy Pulse Outputs are typically used for accuracy testing. Energy pulsing can be enabled from the Front Panel through the **Demand & Energy** setup parameter. The pulse constant can be configured as 1000/3200/5000/6400/12800 impulses per kWh or kvarh through the **Pulse Constant** setup parameters.

4.1.4 Analog Input

The iMeter 6 comes optionally with an Analog Input which can be programmed as 0mA to 20mA or 4mA to 20mA input. There are 3 setup parameters:

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

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

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

For example, to measure the oil temperature of a transformer, connect the outputs of the temperature sensor to the AI terminals of the iMeter 6. The temperature sensor outputs 4mA when the temperature is -25°C and 20mA when the temperature is 100°C. As such, the **Type, AI FULL and AI ZERO** setup parameters should be programmed as **4-20mA**, 100 and -25, respectively. Therefore, when the output of the sensor is 20mA, the reading will be 100.00°C. When the output is 4mA, the reading will be -25.00°C. When the output is 12mA, the reading will be (100°C - (-25°C)) x (12mA-4mA) / (20mA-4mA) + (-25°C) = 37.50°C.

4.2 Power and Energy

4.2.1 Basic Measurements

The iMeter 6 provides the following basic parameters with 1 second update rate which are available through the Front Panel or communications.

Parameter	Phase A	Phase B	Phase C	Total	Average
Uln	●	●	●	-	●
Ull	●	●	●	-	●
Current	●	●	●	-	●
Neutral Current	-	-	-	In (Calculated)	I4 (Measured)
Residual Current	-	-	-	Ir (Calculated)	-
Neutral-to-Ground Voltage	-	-	-	Ung	-
kW	●	●	●	●	-
kvar	●	●	●	●	-
kVA	●	●	●	●	-
Power Factor	●	●	●	●	-
Frequency	●	-	-	-	-
U Sequence	U1 (Positive Sequence)		U2 (Negative Sequence)		U0 (Zero Sequence)
I Sequence	I1 (Positive Sequence)		I2 (Negative Sequence)		I0 (Zero Sequence)

Table 4-2 Basic Measurements

4.2.2 Energy Measurements

The iMeter 6 provides Energy parameters for active energy (kWh), reactive energy (kvarh) and apparent energy (kVAh) with a resolution of 0.1 and a maximum value of ±1,000,000,000.00. When the maximum value is reached, the energy registers will automatically roll over to zero. The energy can be reset manually via the Front Panel, Web Interface or through Communications. Further, the Energy can be preset to user-defined values via the Web Interface (See **Section 3.2.3.6.3.2 – Energy Preset**) or through Communications (See **Section 5.2**).

The iMeter 6 provides the following energy measurements:

3-Phase Energy	kWh Import/Export/Net/Total kWh Import/Export of TOU T1-8
	kvarh Import/Export/Net/Total kvarh Import/Export of TOU T1-8 kvarh of Q1/Q2/Q3/Q4
	kVAh Total kVAh Total of TOU T1-8
Per-Phase Energy (Phase A/B/C):	kWh Import/Export/Net/Total kWh of Q1/Q2/Q3/Q4
	kvarh Import/Export/Net/Total kvarh of Q1/Q2/Q3/Q4
	kVAh kVAh of Q1/Q2/Q3/Q4

Table 4-3 Energy Measurement

4.2.3 Interval Energy Measurements

The iMeter 6 provides Interval Energy measurements of kWh Import/Export, kvarh Import/Export and kVAh. The Interval Energy measurements represent the amount of energy consumed during the last completed interval as defined by **EN Period**. The Interval Energy measurements can only be retrieved through communications and are not available on the Front Panel or Web Interface.

The **EN Period** (Interval Energy Period) setup parameter allows the users to specify the interval for which the real-time energy consumption should be accumulated. It has a range of 5 to 60 minutes and can be programmed through the Front Panel, Web Interface or communications. Please note that changing the **EN Period** would clear the present Interval Energy measurements.

4.2.4 High-speed Measurements

The iMeter 6 provides the following high-speed measurements which are available through communications.

- 3-Phase Voltage with ½ cycle update rate
- 3-Phase Current, and Neutral Current (I4) with 1 cycle update rate
- 3-Phase Power and Power Factor with 1 cycle update rate

4.2.5 Demand Measurements

Demand is defined as the average power consumption over an interval. Predicted Demand is typically used for pre-alarming and to help users reduce power consumption using a Setpoint to warn that the Demand limit may be exceeded. The iMeter 6 provides the following setup parameters where * indicates the default value.

Parameter	Definition	Options/Default*
Sync. Mode	**SLD** - Internally synchronized to the meter's real-time clock **SYNC DI** - Externally synchronized to a DI that has been programmed as a Demand Sync Input by setting the **DI Function** as "**DMD Sync**".	0= SLD* 1=SYNC DI
Period	1 to 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.	1 to 60 min, 15*
No. of Sliding Windows	Number of Sliding Windows.	1* to 15
Self-Read Time	The **Self-Read Time** allows the user to specify the time and day of the month for the Maximum Demand Self-Read operation. The **Self-Read Time** supports three 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. • A 0xFFFF value will disable the Self-Read operation and replace it with	0xFFFF*

	manual operation. A manual reset will cause the Maximum Demand of **This Month** to be transferred to the Maximum Demand of **Last Month** and then reset. The terms **This Month** and **Last Month** will become **Since Last Reset** and **Before Last Reset**.	
Predicted Response	The Predicated Response shows the speed of the predicted demand output. A value between 70 and 99 is recommended for a reasonably fast response. Specify a higher value for higher sensitivity.	70* to 99

Table 4-4 Demand Setup

The iMeter 6 provides the following Demand parameters:

Present and Predicted Demand Parameters	
Voltage	Ua / Ub / Uc / Uln average
	Uab / Ubc / Uca / Ull average
Current	Ia / Ib / Ic / I average/ I4[1]
Power	kWa / kWb / kWc /kW Total
	kvara / kvarb / kvarc / kvar Total
	kVAa / kVAb / kVAc / kVA Total
Power Factor	PFa / PFb / PFc /PF Total
Frequency	Frequency
Unbalance	U2 / U0 / I2 / I0 Unbalance
Fundamental	Ia / Ib / Ic
THD	Ua / Ub / Uc THD Uab / Ubc / Uca THD
	Ia / Ib / Ic THD

Table 4-5 Demand Parameters

Notes:

1) **I4** is valid if the meter is equipped with the I4 option, and it will be automatically changed to **In (Calculated Neutral Current)** if the meter is equipped with the AI option.

4.2.6 Max./Min. per Demand Period

The iMeter 6 provides the Max./Min. value per demand period of the following measurements:

- 3-Phase Voltage and Frequency
- 3-Phase Current and Neutral Current (I4)
- 3-Phase Power and Power Factor
- Voltage and Current Unbalance
- Voltage and Current THD
- Current Fundamental

All Max./Min. per Demand Period data can be accessed through communication.

4.3 Power Quality

4.3.1 Phase Angles

Phase analysis is used to identify the angle relationship between 3-phase Voltages and Currents.
For WYE connected systems, the per phase difference of the Current and Voltage angles should correspond to the per phase PF. For example, if the PF is 0.5 Lag and the Voltage phase angles are 0.0°, 240.0° and 120.0°, the Current phase angles should have the values of -60.0°, 180.0° and 60.0°, respectively.

4.3.2 Power Quality Parameters

The iMeter 6 provides the following PQ parameters:

4.3.2.1 Fundamental

The iMeter 6 provides the following Fundamental Components (Displacement RMS values):

Fundamental Components			
dUa	dUb	dUc	dUln average
dUab	dUbc	dUca	dUll average
dIa	dIb	dIc	dI average
dkWa	dkWb	dkWc	dkW Total
dkvara	dkvarb	dkvarc	dkvar Total
dkVAa	dkVAb	dkVAc	dkVA Total
dPFa	dPFb	dPFc	dPF Total
dI4			

Table 4-6 Fundamental Components

4.3.2.2 Harmonics

The following table illustrates the Voltage and Current Harmonic measurements on the iMeter 6.

	Phase A/AB	Phase B/BC	Phase C/CA
Harmonics-Voltage	THD	THD	THD
	TOHD	TOHD	TOHD
	TEHD	TEHD	TEHD
	Crest-factor	Crest-factor	Crest-factor
	2nd Harmonic	2nd Harmonic	2nd Harmonic
	...		
	63rd Harmonic	63rd Harmonic	63rd Harmonic
Harmonics-Current	THD	THD	THD
	TOHD	TOHD	TOHD
	TEHD	TEHD	TEHD
	TDD	TDD	TDD
	TEDD	TEDD	TEDD
	TODD	TODD	TODD
	K-Factor	K-Factor	K-Factor
	Crest-factor	Crest-factor	Crest-factor
	2nd Harmonic	2nd Harmonic	2nd Harmonic
	...		
	63rd Harmonic	63rd Harmonic	63rd Harmonic
	I4 THD/TEHD/TOHD and 2nd to 63rd Harmonics		

Table 4-7 Harmonics Measurements

4.3.2.3 TDD

Total Demand Distortion (TDD) is defined as the ratio of the RMS (Root Mean Square) of the Harmonic Current to the RMS of the Rated or Maximum Fundamental Current Demand.
TDD of Current is calculated by the formula below:

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

where

I_L = Maximum Fundamental Current Demand

h = Harmonic Order (1, 2, 3, 4, etc.)

I_h = RMS Load Current at the n^{th} Harmonic

4.3.2.4 K-Factor

K-Factor is defined as the weighted sum of the Harmonic Load Current 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 effect.

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

where

I_h = h_{th} Harmonic Current in RMS

h_{max} = Highest harmonic order

4.3.2.5 Crest Factor

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

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

where

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

X_{rms} = RMS value

4.3.3 Unbalance and Sequence Components

The iMeter 6 provides Voltage and Current Unbalance measurements. The calculation method of U2/U0 and I2/I0 Unbalances are listed below:

$$\text{U2 Unbalance} = \frac{V2}{V1} \times 100\% \qquad \text{I2 Unbalance} = \frac{I2}{I1} \times 100\%$$

$$\text{I0 Unbalance} = \frac{V0}{V1} \times 100\% \qquad \text{I2 Unbalance} = \frac{I0}{I1} \times 100\%$$

where

V1, V2, V0 are the Positive, Negative Sequence and Zero Components for Voltage, respectively, and
I1, I2, I0 are the Positive, Negative and Zero Sequence Components for Current, respectively.

4.3.4 Deviation

As per Section 5.12 of IEC 61000-4-30:

The 10/12-cycle RMS value Urms can be used to assess the underdeviation and overdeviation parameters in percent of Udin. The underdeviation U_{under} and overdeviation U_{over} parameters are determined by the following equations.

Voltage Overdeviation (%)

$U_{over} = 0$ if $U_{rms} < U_{din}$

$U_{over} = ((U_{rms} - U_{din}) / U_{din}) \times 100\%$ if $U_{rms} \geq U_{din}$

Voltage Underdeviation (%)

$U_{under} = 0$ if $U_{rms} > U_{din}$

$U_{under} = ((U_{din} - U_{rms}) / U_{din}) \times 100\%$ if $U_{rms} \leq U_{din}$

For **Freq. Deviation**, the calculation method is listed below:

Freq. Deviation *= $((F - F_{nominal})/F_{nominal}) \times 100\%$*

where $F_{nominal}$ is the Nominal Frequency

4.3.5 Supply Voltage Dips/Swells and Interruptions

The iMeter 6 supports the detection of **Supply Voltage Dips/Swells** and **Interruptions** using a method that is in accordance with **IEC 61000-4-30** for Class S performance.

The iMeter 6 provides Dip/Swell and Interruption for voltage quality monitoring on a per phase basis based on **½-cycle** and records any detected event in the **PQ Log** with timestamp and event type. Further, the Dip/Swell and Interruption Detection can be programmed to trigger WFR, DWR, DR, DO and Alarm Email. The programming of the Dip/Swell and Interruption setpoint parameters is supported via the Web Interface or communications.

Parameter	Options/Range, Default*	Parameter	Options/Range, Default*
Enable	Yes*, No	Reference Voltage	Udin*, Usr
Swell Threshold	101 to 200 (%) of Udin/Usr, 110*	Swell Hysteresis	1 to 100 (%) of Udin/Usr, 2*
Dip Threshold	1 to 99 (%) of Udin/Usr, 90*	Dip Hysteresis	1 to 100 (%) of Udin/Usr, 2*
Interruption Threshold	0 to 50 (%) of Udin/Usr, 5*	Interruption Hysteresis	1 to 100 (%) of Udin/Usr, 2*
Trigger 1/2	N/A, DO1-DO3, WFR, DWR, SMTP, iTrigger WFR, iTrigger DWR		

Table 4-8 Dip/Swell/Interruption Setup Parameters

For the Dip/Swell and Interruption detection to work correctly, it's critically important to set the *$Ull_{nominal}$* parameter correctly with the nominal line-to-line voltage on the secondary (meter) side.

4.3.6 Transients Voltage

The iMeter 6 provides Transient Capture capability by detecting voltage disturbances with a maximum resolution of 78µs. The iMeter 6 provides transient detection for voltage quality monitoring and records the detected event in the **PQ Log** with timestamp and event type. The programming of the Transient setpoint is supported via the Web Interface or communications. The Transient setpoint provides the following setup parameters:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Threshold	5% to 500% of Udin, 35%*
Trigger 1/2	N/A, DO1-DO3, WFR, DWR, SMTP, iTrigger WFR, iTrigger DWR		

Table 4-9 Transient Setpoint Setup Parameters

For the Transient detection to work correctly, it's critically important to set the *$Ull_{nominal}$* parameter correctly with the nominal line-to-line voltage on the secondary (meter) side.

4.3.7 EN50160 Compliance Report

The EN50160 Standard defines the **Voltage Characteristics of Electricity Supplied by Public Distribution Systems**. It provides the limits within which any customer can expect voltage characteristics to remain. For a complete definition of the non-conformity level for each of the following EN50160 parameters, please consult the EN50160 Standard document.

The iMeter 6 can measure, summarize data and statistical relevant data in accordance with the EN50160 standard. Further, the device will create a report per week for the following PQ parameters and store the report for one year.

- Power Frequency, including Maximum and Minimum
- Supply Voltage Variations, including Maximum and Minimum
- Voltage Unbalance, including Max./Min. and CP95
- Harmonic Voltage, including Max./Min., average and CP95
- Dips and Swells with statistical parameters classified according to characteristic voltage and duration
- Interruptions with statistical parameters classified according to the duration
- Transient

The following table illustrates the default limits for the EN50160 parameters. The users can modify the default values via the Web Server or Communications.

EN50160 Parameter	Setting \ Voltage Level	Low	Medium	High
Power Frequency	Wide Tolerance (%)	100	100	100
	Wide Tolerance Limit (%)	94 ~ 104	94 ~ 104	94 ~ 104
	Narrow Tolerance (%)	99.5	99.5	99.5
	Narrow Tolerance Limit (%)	99 ~101	99 ~101	99 ~101
Supply Voltage Variations	Wide Tolerance (%)	100	100	100
	Wide Tolerance Limit (%)	85 ~ 110	85 ~ 115	85 ~ 115
	Narrow Tolerance (%)	95	99	99
	Narrow Tolerance Limit (%)	90 ~ 110	90 ~ 110	90 ~ 110
Supply Voltage Unbalance	Tolerance (%)	95	95	95
	Limit (%)	2	2	2
Voltage Harmonic Limits	Tolerance (%)	95	95	95
	Total (%)	8	8	8
	H02 (%)	2	2	1.9
	H03 (%)	5	5	3
	H04 (%)	1	1	1
	H05 (%)	6	6	5
	H07 (%)	5	5	4
	H09 (%)	1.5	1.5	1.3
	H11 (%)	3.5	3.5	3
	H13 (%)	3	3	2.5
	H17 (%)	2	2	2
	H19/H23/H25 (%)	1.5	1.5	1.5
	H06/H08/H10/H12/H14/H15/ H16/H18/H20/H21/H22/H24 (%)	0.5	0.5	0.5

Table 4-10 Default Values for EN50160 Settings

The programming of the EN50160 reporting is supported via the Web interface and communications. The EN50160 Report can be accessed through the Front Panel, Web Interface or via communications. The iMeter 6 can store up to 53 weekly reports. If there are more than 52 reports, the newest report will replace the oldest on a FIFO basis. Please refer to **Chapter 3** for an EN50160 sample report.

4.3.8 Disturbance Direction Indicator

Under 3P4W or 3P3W mode, the iMeter 6 provides the Disturbance Direction Indicator whether Upstream or Downstream, with a Confidence level for the disturbance direction of a Dip event and records the information in the PQ Log.

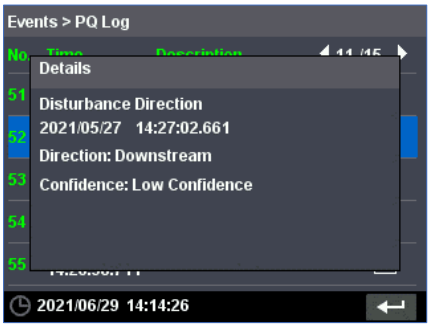


Figure 4-1 Disturbance Direction Indication on the Front Panel

4.4 Setpoints

The iMeter 6 comes with 8 High-Speed and 16 Standard user programmable setpoints which provide extensive control by allowing a user to initiate an action in response to a specific condition. Typical setpoint applications include alarming, fault detection and power quality monitoring.

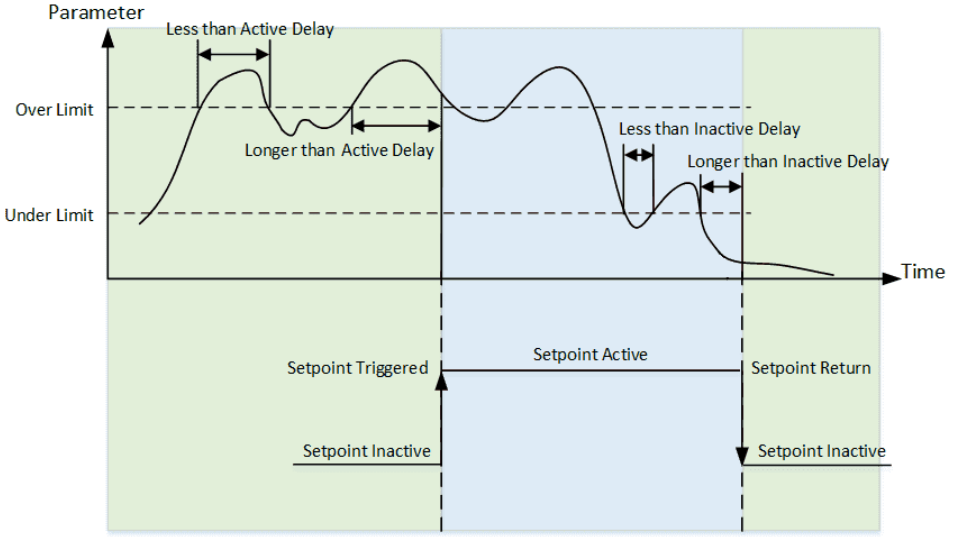


Figure 4-2 Over Setpoint

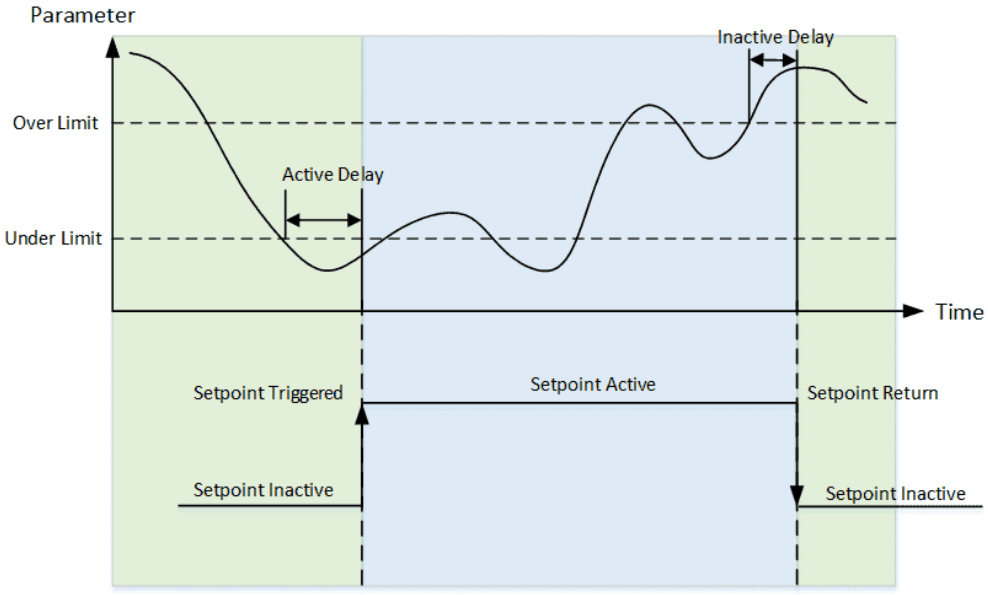


Figure 4-3 Under Setpoint

The setpoints can be programmed via the Web Interface or communications and have the following setup parameters:

Setup Parameters	Definition	Options/*Default
Type	Disabled, Over or Under Setpoint.	0=Disabled* 1=Over Setpoint 2=Under Setpoint
Parameter	Specify the parameter to be monitored.	See **Table 4-12**, 1*
Over Limit	Specify the value that the setpoint parameter must exceed for Over Setpoint to become active or for Under Setpoint to become inactive (Invalid if DIx is monitored).	999,999*
Under Limit	Specify the value that the setpoint parameter must go below for Over Setpoint to become inactive or for Under Setpoint to become active. (Invalid if DIx is monitored).	0*
Active Delay	Specify the minimum duration that the setpoint condition must be met before the setpoint becomes active. An event will be generated and stored in the SOE Log.	0 to 9999 (s) for Standard Setpoint, 10* 0 to 999 (Cycles) for HS Setpoint, 10*
Inactive Delay	Specify the minimum duration that the setpoint return condition must be met before the setpoint becomes inactive. An event will be generated and stored in the SOE Log.	
Trigger 1/2	Specify what action a setpoint would take when it becomes active. Please refer to **Table 4-13** below for a list of Setpoint Triggers.	See **Table 4-13**

Table 4-11 Description for Setpoint Parameters

The iMeter 6 provides the following Setpoint parameters, Standard Setpoint can monitor all parameters while the HS Setpoint only can monitor parameters 1 to 14.

Key	Parameter	Scale/Unit
1	Uln	x100, V
2	Ull	x100, V
3	I	x1000, A
4	I4 (Measured) / In (Calculated)	x1000, A
5	Freq Deviation	x100, Hz
6	kW Total	kW
7	kvar Total	kvar
8	PF	x1000
9 ~ 14	DI1 to DI6	1) For Over Setpoint, the Active Limit is DI Close (**DI=1**), and Inactive Limit is DI Open (**DI=0**). 2) For Under Setpoint, the Active Limit is DI Open (**DI=0**), and Inactive Limit is DI Close (**DI=1**).
15	AI	/
16	kW Total Present DMD	kW
17	kvar Total Present DMD	kvar
18	PF Present DMD	x1000
19	Total kW Predicted DMD	kW
20	Total kvar Predicted DMD	kvar
21	PF Predicted DMD	x1000
22	U THD	x100, %
23	U TOHD	x100, %
24	U TEHD	x100, %
25	I THD	x100, %
26	I TOHD	x100, %
27	I TEHD	x100, %
28	U2 Unbalance	x10, %
29	I2 Unbalance	x10, %
30	U Over Deviation	x100, %
31	U Phase Reversal	Active/Inactive Limit settings are invalid when Voltage Phase Reversal is set as the Setpoint Parameter.
32	Ir Calculated	x1000, A
33	U2 (Negative Sequence)	x100, V
34	U0 (Zero Sequence)	x100, V
35	I Phase Reversal	Active/Inactive Limit settings are invalid when Current Phase Reversal is set as the Setpoint Parameter.
36	Ia DMD	x1000, A
37	Ib DMD	x1000, A
38	Ic DMD	x1000, A
39	I average DMD	x1000, A

Table 4-12 Setpoint Parameters

Key	Action	Key	Action
0	None	**20, 21**	WFR, DWR
1-3	DO1 to DO3	**22**	Alarm Email
4-7	HS DR1 to HS DR4	**23**	iTrigger WFR
8-19	Standard DR1 to Standard DR12	**24**	iTrigger DWR

Note: Only when **DOx Mode** is set to **Remote Control** would setting **Setpoint Trigger** to **DOx** be valid.

Table 4-13 Setpoint Triggers

4.5 Logical Module

The iMeter 6 comes standard with 6 user programmable Logical Modules which may be programmed to perform an AND, NAND, OR or NOR logical operation. The Logical Module provides extensive control by allowing a user to initiate an action based on the combinational logic of up to four different Setpoint conditions.

The Logical Modules can be programmed via the Web Interface or communications and have the following setup parameters:

Setup Parameters	Definition	Options/*Default
Enable Logical Module	Logical Module Enable	0=No*, 1=Yes
Mode 1 to 3	Specify the type of logical evaluation to be performed	0=AND*, 1=OR, 2=NAND, 3=NOR
Source 1 to 4	Specify the source input.	See **Table 4-15**
Trigger 1 **Trigger 2**	Specify what action the Logical Module will take when it becomes active. **Logical Equation** = ((**Source 1** [Mode 1] **Source 2**) [Mode 2] **Source 3**) [Mode 3] **Source 4**	See **Table 4-16**

Table 4-14 Logical Module Parameters

Key	Source	Key	Source
0	None	**13**	Standard Setpoint #13
1	Standard Setpoint #1	**14**	Standard Setpoint #14
2	Standard Setpoint #2	**15**	Standard Setpoint #15
3	Standard Setpoint #3	**16**	Standard Setpoint #16
4	Standard Setpoint #4	**17**	HS Setpoint #1
5	Standard Setpoint #5	**18**	HS Setpoint #2
6	Standard Setpoint #6	**19**	HS Setpoint #3
7	Standard Setpoint #7	**20**	HS Setpoint #4
8	Standard Setpoint #8	**21**	HS Setpoint #5
9	Standard Setpoint #9	**22**	HS Setpoint #6
10	Standard Setpoint #10	**23**	HS Setpoint #7
11	Standard Setpoint #11	**24**	HS Setpoint #8
12	Standard Setpoint #12		

Table 4-15 Logical Module Sources

The iMeter 6 provides the following Logical Module Triggers:

Key	Action	Key	Action
0	None	**20, 21**	WFR, DWR
1-3	DO1 to DO3	**22**	Alarm Email
4-7	HS DR1 to HS DR4	**23**	iTrigger WFR
8-19	Standard DR1 to Standard DR12	**24**	iTrigger DWR

Table 4-16 Logical Module Triggers

4.6 Auto-Scroll

The iMeter 6 can enter **Auto-Scroll** mode, if enabled, where up to 10 Front Panel displays can be selected for automatic scrolling at a pre-programmed **Interval** after a period of inactivity defined by **Initiate**.

The following table illustrates the Auto-Scroll Setup parameters range and default values.

Parameter	Range/Default*	Parameter	Range/Default*
Enable	0=Disable*, 1=Enable	Initiate	1 to 60 (mins), 3*
Interval	1 to 60 (s), 3*	Screen 1	1, See Table 4-18
Screen 2	2, See Table 4-18	Screen 3	3, See Table 4-18
Screen 4	4, See Table 4-18	Screen 5	5, See Table 4-18
Screen 6	6, See Table 4-18	Screen 7	8, See Table 4-18
Screen 8	10, See Table 4-18	Screen 9	13, See Table 4-18
Screen 10	15, See Table 4-18		

Table 4-17 Auto-Scroll Setup Parameters

The following figure illustrates the logical diagram for Auto-Scroll mode. Please note that the Initiate Time for Auto-Scroll should be shorter than the LCD Timeout.

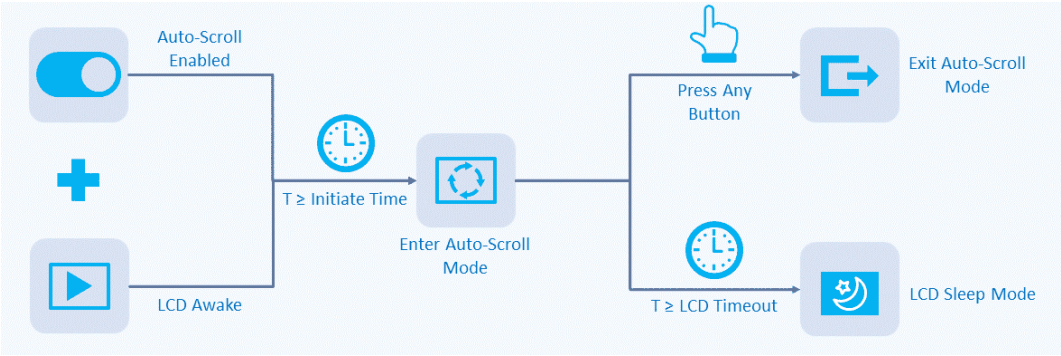


Figure 4-4 Auto-Scroll Logical Diagram

The following table illustrates the available screen options for Auto-Scroll Setup.

ID	Parameter	ID	Parameter	ID	Parameter
0	Null	7	TOU	14	Sequence
1	Phasor	8	Max. & Min.	15	Real-Time Waveform
2	Voltage	9	I/O	16	PQ Log
3	Current	10	Harmonics	17	SOE
4	Power	11	Voltage Deviation	18	PQ Counters
5	Energy	12	Frequency Deviation		
6	Demand	13	Unbalance		

Table 4-18 Auto-Scroll Screen Options

4.7 Logging

4.7.1 Max./Min. Log

The iMeter 6 records the **Max. Log** and **Min. Log** of **This Month (Since Last Reset)** and **Last Month (Before Last Reset)** with timestamp for the parameters in Table 4-19. Each log includes the relevant parameter value and its timestamp. The recorded data is stored in the device's non-volatile memory and will not suffer any loss in the event of power failure. All of the maximum and minimum data can be accessed via the Front Panel, Web Interface or through communications.

Max./Min. Parameters			
Ua	Ub	Uc	Uln avg
Uab	Ubc	Uca	Ull avg
Ia	Ib	Ic	I avg.
kW Total	kvar Total	kVA Total	PF Total
Ua/Uab THD	Ub/Ubc THD	Uc/Uca THD	I4
Ia THD	Ib THD	Ic THD	Frequency
Ia K-Factor	Ib K-Factor	Ic K-Factor	Ir Calculated
I2 Unbalance	U2 Unbalance	I0 Unbalance	U0 Unbalance

Table 4-19 Max./Min. Log

The same **Self-Read Time** for the **Maximum Demand Log** is used to specify the Max./Min. Log self-read operation. Please refer to **Section 4.2.5** for a complete description of the **Self-Read Time** and its operation. The Max./Min. Log of This Month (Since Last Reset) can be reset manually via the Front Panel, Web Interface or communications.

4.7.2 Maximum Demand Log

The iMeter 6 stores the **Maximum Demand** of **This Month (Since Last Reset)** and **Last Month (Before Last Reset)** with timestamp for Ia, Ib, Ic, I4, I avg., Ua, Ub, Uc, Uln avg., Uab, Ubc, Uca, Ull avg., kW Total, kvar Total, kVA Total and PF. All Maximum Demand data can be accessed via the Front Panel, Web Interface or communications. Please refer to **Section 4.2.5** for a complete description of the **Self-Read Time** and its operation.

The Maximum Demand of This Month can be reset manually via the Front Panel, Web Interface or communications.

4.7.3 Interval Energy Recorder (IER) Log

The iMeter 6 provides an **Interval Energy Recorder** capable of recording the interval energy consumption for kWh/kvarh Import/Export and kVAh. If the user wishes to record the accumulative energy values instead of the interval energy consumption, the **Data Recorder** should be used instead. The recorded data is stored in the device's non-volatile memory and will not suffer any loss in the event of power failure. The IER Logs can be retrieved through communications or on-board FTP server.

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

Setup Parameter	Value/Option	Default
Recording Mode	0=Disabled, 1=Stop-When-Full, 2=First-In-First-Out	2
Recording Depth	0 to 65535 (entry)	65535
Recording Interval	0 to 65535 (min)	15
Start Time	20YY/MM/DD, HH:MM:SS	2001/01/01, 00:00:00
Number of Parameters	0 to 5	5
Parameter 1 to 5	kWh Import/Export, kvarh Import/Export and kVAh	--

Table 4-20 IER Setup Parameters

The IER is only operational when the values of **Recording Mode**, **Recording Depth**, **Start Time** and **Number of Parameters** are all non-zero. When the present time meets or exceeds the **Start Time**, the IER will start to record. Please note that changing any of the setup parameters would reset the IER logs.

4.7.4 Waveform Recorder (WFR)

The iMeter 6 provides a Waveform Recorder (**WFR**) with 128 entries. If there are more than 128 logs, the newest log will replace the oldest one based on a First-in-First Out principle. The WFR can simultaneously capture 3-phase Voltage and Current signals at a maximum resolution of 256 samples per cycle. The WFR can be triggered by Setpoints, Dip/Swell and Transient Detection or manually through Front Panel, Web Interface or communications. The manual trigger command has a higher priority. When the WFR is already in progress, other WFR commands will be ignored until the current recording has completed. The waveform data is stored in the device's non-volatile memory and will not suffer any loss in the event of power failure.

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

Setup Parameters	Value/Option	Default
Time Format	Local, UTC	Local
Recording Depth	128 (Fixed)	128
Format (Samples/Cycle)	256x20, 128x40, 64x80, 32x160, 16x320	256x20
Pre-fault Cycles	0 to 20 Cycles	4

Table 4-21 WFR Setup Parameters

The recording depth for WFR is fixed at 128 each. The valid formats (# of samples/cycle x # of cycles) of WFR include 16x320, 32x160, 64x80, 128x40 and 256x20. The "**Pre-fault Cycle**" can be set between 0 and 20.

The WFR logs can be retrieved in COMTRADE file format via the Web Interface or communications with our PecStar® iEMS Software for display.

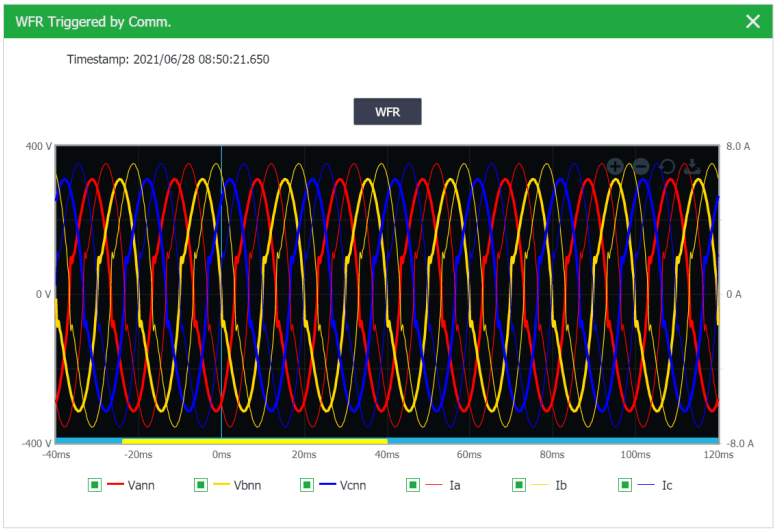


Figure 4-5 WFR Log displayed on iMeter 6's Web Interface

4.7.5 Scheduled Waveform Recorder

The iMeter 6 provides the following settings for Scheduled WFR (supported in Firmware V3.10.00 or later) to trigger the WFR at the pre-configured time. The programming of the Scheduled WFR is supported via the Web Interface or communications.

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Interval	1 to 960 h, 24 h*
Repetition	0 to 1000, 1*	Start Time	2001/01/01 00:00:00*

Table 4-22 Scheduled WFR Setup Parameters

When the present time meets or exceeds the **Start Time**, the Scheduled WFR will be triggered.

4.7.6 DWR (Disturbance Waveform Recorder)

The iMeter 6 supports the Disturbance Waveform Recording of 3-phase Voltages and Currents at a maximum resolution of 256 samples/cycle. The DWR can be triggered by Dips, Swells, Interruptions, Transients, Setpoints, DI Status Changes or even manually via the Web Interface and communications. The DWR log is stored in the devices' non-volatile memory in COMTRADE file format and will not suffer any loss in the event of power failure. The DWR has a capacity of 128 entries organized in a FIFO basis, with the newest DWR log replacing the oldest one. Each DWR log consists of the following stages:

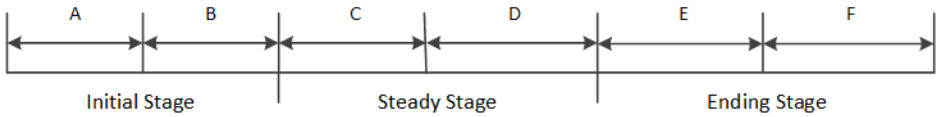
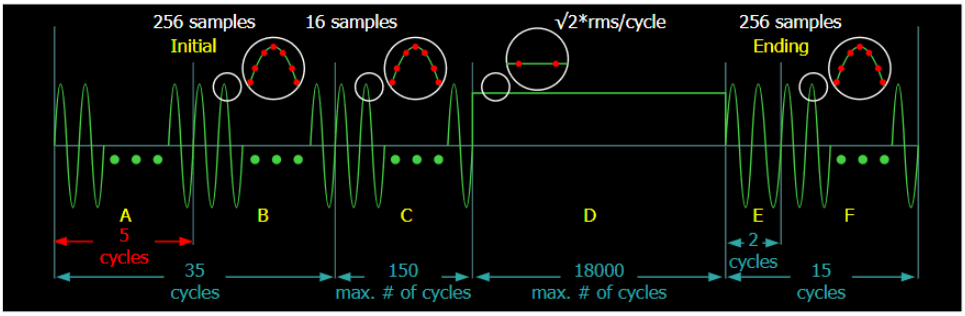


Figure 4-6 DWR Stages



Stage	Description	Recording Length	Recording Frequency
A	Pre-Fault cycles for the Initial Stage	5 to 10 cycles	256 Samples/Cycle
B	Post-Fault cycles for the Initial Stage	25 to 30 cycles	256 Samples/Cycle
C	Extended WFR during the Steady Stage	0 to 150 cycles	16 Samples/Cycle
D	RMS Recording during the Steady Stage	0 to 18,000 cycles	1 Sample/Cycle
E	Pre-Fault cycles of the Ending Stage	2 cycles	256 Samples/Cycle
F	Post-Fault cycles of the Ending Stage	13 cycles	256 Samples/Cycle

Table 4-23 Detailed Description of the DWR Stages

Notes:

1) The data for Stages A, B, D and E are always recorded.
2) For stages C and D:
   If **C** < 150 cycles, then **D** would be 0.
   If **C** = 150 cycles, then the data for stage **D** will be recorded.
   If **D** = 18,000 cycles, the recording of the stage **D** data ends even if the disturbance is not finished.
2) The following figure shows an example of Disturbance Waveform Recording.

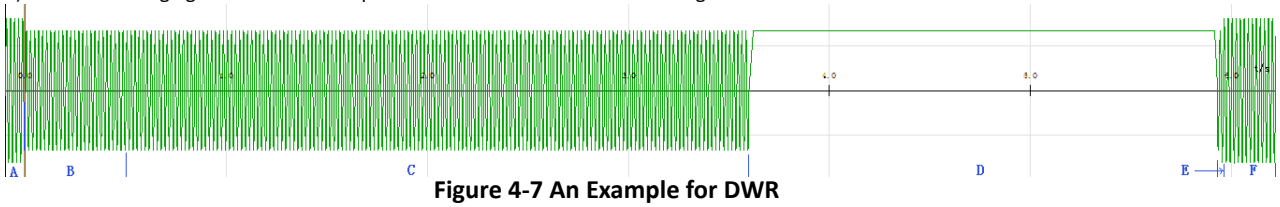


Figure 4-7 An Example for DWR

4.7.7 iTrigger WFR/DWR

The WFR/DWR of iMeter 6 can be cross triggered with **iTrigger** (supported in Firmware V3.10.00 or later) by other iTrigger-enabled devices from CET residing on the same subnet of the LAN (Local Area Network) and configured with the same **iTrigger Record ID**.

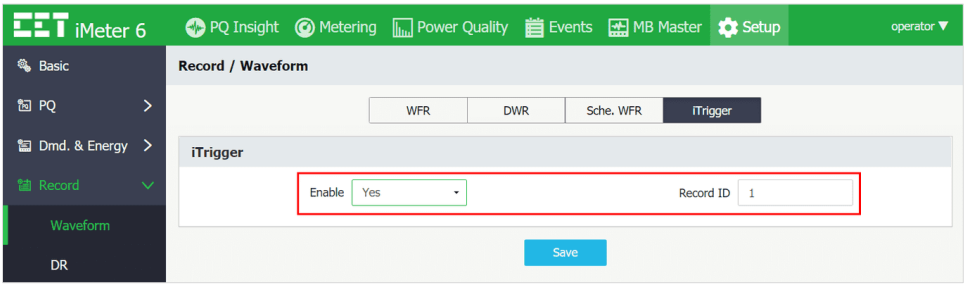


Figure 4-8 Enable the iTrigger Feature

The iMeter 6, as a triggered device, will record the Trigger Source's MAC Address in the SOE Log.

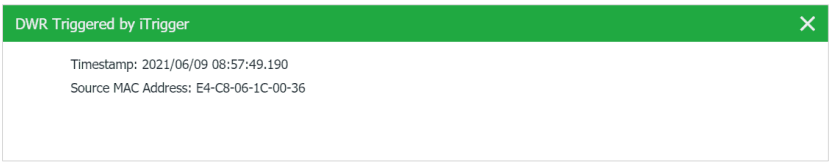


Figure 4-9 Trigger Source MAC Address in SOE Log

The iTrigger WFR/DWR can be triggered by Setpoints, Dip/Swell and Transient Detection or manually through Web interface or communications. The waveform and timestamp linked to the event will be recorded to the SOE.

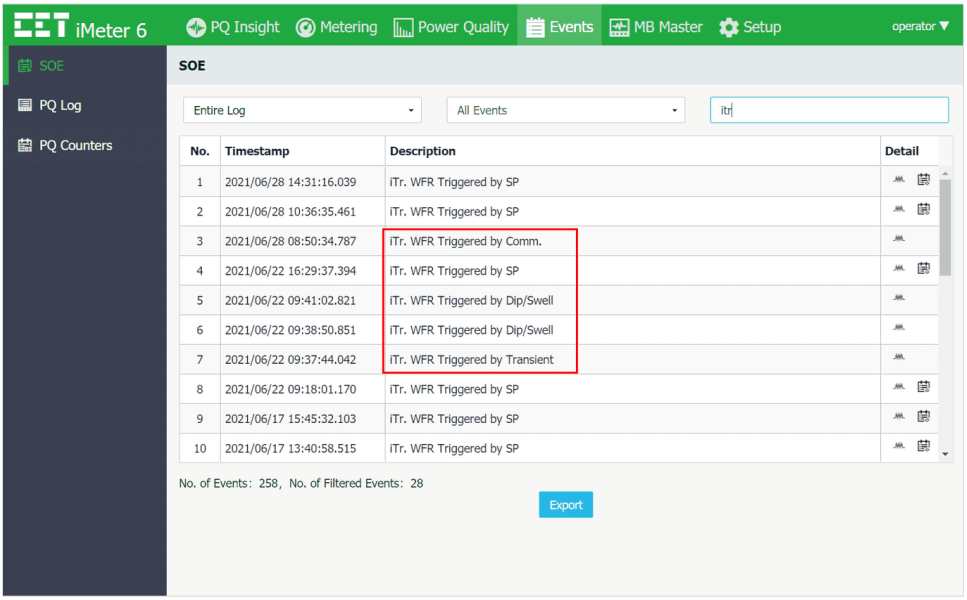


Figure 4-10 iTrigger WFR/DWR Events in SOE

4.7.8 PQ Log

The iMeter 6's **PQ Log** can store up to 512 PQ events such as Dips/Swells and Transients. Each event record includes the event classification, its relevant voltage values and a timestamp in 1ms resolution.

All events can be retrieved via Front Panel, Web Interface or through communications for display. If there are more than 512 events, the newest event will replace the oldest event on a First-In-First-Out basis. The PQ Log can be reset from the Front Panel, Web Interface or via communications.

4.7.9 ITIC/SEMI F47 Curve

When a PQ Setpoint is configured to trigger WFR or DWR, the recorded Swell events will have the option of showing the ITIC plot while the Dip/interruption events will have the option of showing both the ITIC and SEMI F47 plots, along with the recorded WFR/DWR waveform in the PQ Log. The ITIC/SEMI F47 curve are available on both of the Front Panel (See Figure 3-28) and the Web Interface. This feature is supported in Firmware V3.10.00 or later.

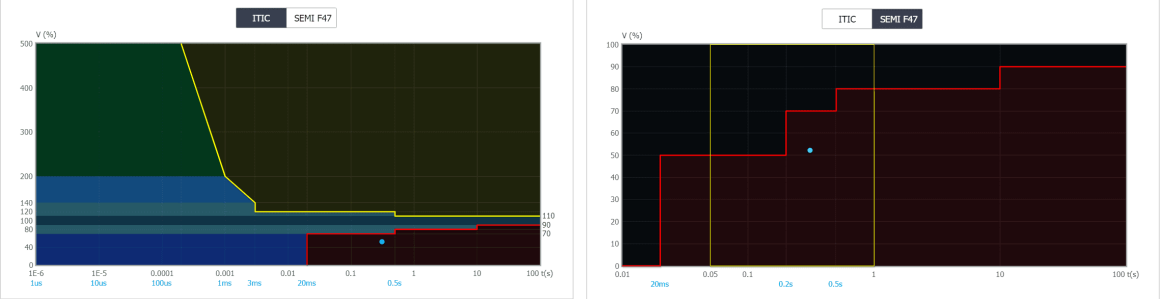


Figure 4-11 ITIC/SEMI F47 Curve for a Dip Event via Web Interface

4.7.10 SOE Log

The iMeter 6's SOE Log can store up to 512 events such as Dips, Swells, Interruptions, Transients, Power-on, Power-off, Setpoint actions, Relay actions, Digital Input status changes and setup changes in its non-volatile memory. Each event record includes the event classification, its relevant parameter values and a timestamp in 1ms resolution. All events can be retrieved via Front Panel, Web Interface or through communications for display. If there are more than 512 events, the newest event will replace the oldest event on a First-In-First-Out basis. The SOE Log can be reset from the Front Panel, Web Interface or via communications.

4.7.11 Data Recorder (DR) Log

The iMeter 6 comes equipped with 1GB of memory and provides 4 High-Speed Data Recorders (**HS DR**) as well as 28 Standard Data Recorders (**DR**) capable of recording 16 parameters each. The recorded data is stored in the device's non-volatile memory and will not suffer any loss in the event of power failure.

The programming of the Data Recorder is supported through the on-board web server or over communications. Each Data Recorder provides the following setup parameters:

Setup Parameters	Value/Option	Default
Trigger Mode	0=Disabled / 1=Triggered by Timer / 2=Triggered by Setpoint	See **Appendix B**
Recording Mode	0=Stop-When-Full / 1=First-In-First-Out	
Recording Depth	1 to 65535 (entry) for HS DR and Standard DR #1 to #26, 1 to 120000 (entry) for Standard DR #27 and #28	
Recording Interval	0 to 3456000 seconds for Standard Data Recorder 0 to 60 cycles for High-Speed Data Recorder	
Offset Time	0 to 43,200 seconds, 0 indicates no offset If the **Trigger Mode** is set to **Triggered by Setpoint**, the **Offset Time** will be disregarded.	
# of Parameters	0 to 16	
Parameter 1 to 16	0 to 370 and 10000 to 40000 for Standard Data Recorder 0 to 28 for High-Speed Data Recorder Please see refer to **Appendix A** for more information.	

Table 4-24 DR Setup Parameters

The DR Log is only operational when the values of **Triggered Mode**, **Recording Mode**, **Recording Depth**, **Recording Interval**, and **Number of Parameters** are all non-zero. Please note that changing any of the setup parameters would reset the DR Logs.

Data Recorder #X can be triggered by clearing the Data Recorder #X when it is full in Stop-When-Full mode.

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

4.7.12 Time of Use (TOU)

TOU is used for electricity pricing that varies depending on the time of day, day of week, and season. The TOU system allows the user to configure an electricity price schedule inside the iMeter 6 and accumulate energy consumption into different TOU tariffs based on the time of consumption.

The TOU feature on iMeter 6 supports two TOU schedules, which can be switched at a pre-defined time. Each TOU schedule supports:

- Up to 12 seasons
- 90 Holidays or Alternate Days
- 20 Daily Profiles, each with 12 Periods in 15-minute interval
- 8 Tariffs

Instead of using the TOU schedule to switch between Tariffs, the iMeter 6 supports Tariff switching based on the status of DI1 to DI3.

The 3 Digital Inputs (DI1, DI2 and DI3) represent 3 binary digits where Tariff 1=000, Tariff 2=001, Tariff 3=010, …Tariff 7=110 and Tariff 8=111 where DI1 represents the least significant digit and DI3 represents the most significant digit. As soon as DI1, DI2 and/or DI3 are configured as **Tariff Switches**, the current **TOU Tariff** will be determined by the status of the DIs, and the TOU Schedule will be ignored. The **DI1 Function** setup register must first be programmed as a **Tariff Switch** before configuring DI2 and DI3 with the same function. In other words, if DI1 is configured as a **Digital Input** or **Energy Pulse Counter**, and DI2 is configured as a **Tariff Switch**, the TOU will continue to function based on the TOU Schedule. The number of Tariffs supported depends on how many DIs are programmed as a Tariff Switch as indicated in the following table.

Tariff	DI Function		
	DI1 = Tariff Switch	DI2 & DI1 = Tariff Switch	DI3, DI2 & DI1 = Tariff Switch
T1	DI1 (0=T1)	DI2 + DI1 (00=T1)	DI3 + DI2 + DI1 (000=T1)
T2	DI1 (1=T2)	DI2 + DI1 (01=T2)	DI3 + DI2 + DI1 (001=T2)
T3	Not Available	DI2 + DI1 (10=T3)	DI3 + DI2 + DI1 (010=T3)
T4	Not Available	DI2 + DI1 (11=T4)	DI3 + DI2 + DI1 (011=T4)
T5	Not Available	Not Available	DI3 + DI2 + DI1 (100=T5)
T6	Not Available	Not Available	DI3 + DI2 + DI1 (101=T6)
T7	Not Available	Not Available	DI3 + DI2 + DI1 (110=T7)
T8	Not Available	Not Available	DI3 + DI2 + DI1 (111=T8)

Table 4-25 DIs and the Number of Tariffs Setup

Each TOU schedule has the following setup parameters and can only be programmed via communications:

Parameters	Definition	Options
Daily Profile #	Specify a daily rate schedule which can be divided into a maximum of 12 periods in 15-min intervals. Up to 20 Daily Profiles can be programmed for each TOU schedule.	1 to 20, the first period starts at 00:00 and the last period ends at 24:00.
Season #	A year can be divided into a maximum of 12 seasons. Each season is specified with a Start Date and ends with the next season's Start Date.	1 to 12, starts from January 1st
Alternate Days #	A day can be defined as an Alternate Day, such as May 1st. Each Alternate Day is assigned a Daily Profile.	1 to 90.
Day Types	Specify the day type of the week. Each day of a week can be assigned a day type such as Weekday1, Weekday2, Weekday3 and Alternate Days. The Alternate Day has the highest priority.	Weekday1, Weekday2, Weekday3 and Alternate Days
Switching Time	Specify when to switch from one TOU schedule to another. Writing 0xFFFFFFFF to this parameter disables switching between TOU schedules.	Format: YYYYMMDDHH Default=0xFFFFFFFF

Table 4-26 TOU Setup Parameters

For each of the 8 Tariff Rates, the iMeter 6 provides the following Energy measurements: kWh Import/Export, kvarh Import/Export, kVAh. T1-T8's kWh Import/Export, kvarh Import/Export and kVAh are available via the Front Panel, Web Interface and communications.

4.8 Time Synchronization

The iMeter 6 provides timestamps for all recorded data so it's extremely important for the clock to be properly synchronized to achieve precise time stamping for Energy, Power Quality and Event analysis. The different time sync. methods are discussed in the following sections.

4.8.1 RTC

The iMeter 6 comes with a 6ppm, battery-backed real-time clock that has a maximum error of 0.5s per day. If the supply power is lost or removed, the internal battery keeps the real-time clock running until power is restored. The **Clock Source Register (6211)** is set to **RTC** by default. This can be changed via the Front Panel, Web Server or communications.

4.8.2 GPS

GPS receivers often provide a 1PPS (1 Pulse per Second) output which the iMeter 6 can be configured to synchronize its millisecond clock using its DI6 port by having the **Clock Source Register** (6211) set to **GPS** and **DI6 Function Register** (6030) set to **PPS**. Please also refer to **Figure 2-19 Time Sync. Connections** for the time synchronization wiring diagram.

4.8.3 IRIG-B

IRIG-B, which stands for Inter-Range Instrumentation Group - Time Code Format B, is a standard format for transferring timing information once a second.

The iMeter 6 can be configured to synchronize its clock with the IRIG-B input via its RS-485 (P1) port by having the **Clock Source Register** (6211) set to **IRIG-B**. The D+/D- terminals of the RS-485 port should be connected to the IRIG-B's P+/P- output terminals. This is supported in Firmware V3.10.00 or later.

Parameters	Option
Clock Source	0=RTC, 1=SNTP, 2=GPS, 3=IRIG-B Set **Clock Source**=3
IRIG-B 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 (default)/ GMT+9:00 / GMT+9:30 / GMT+10:00 / GMT+11:00 / GMT+12:00 / GMT+13:00

Table 4-27 IRIG-B Setup Parameters

4.8.4 SNTP

SNTP (Simple Network Time Protocol) can be used to synchronize the iMeter 6's clock with an external **SNTP Server** through its Ethernet port providing that the network has been properly configured. The programming of the **SNTP** setup parameters is supported via the Front Panel, Web Server or communications.

Parameters	Option
Clock Source	0=RTC, 1=SNTP, 2=GPS, 3=IRIG-B Set **Clock Source**=2
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 (default)/ GMT+9:00 / GMT+9:30 / GMT+10:00 / GMT+11:00 / GMT+12:00 / GMT+13:00
SNTP Server IP	Default=0.0.0.0

Table 4-28 SNTP Setup Parameters

4.8.5 Modbus RTU

The iMeter 6's clock can be synchronized through communications using the Modbus RTU protocol. Please refer to **Section 5.11** for a detailed description**.**

4.8.6 PecStar iEMS

PecStar® iEMS can be configured to provide regular time synchronization by broadcasting time-sync packets over the connected medium, whether it is RS-485 or Ethernet. The default time synchronization interval is 60 minutes. Please consult the PecStar iEMS's user manual for a complete description.

4.9 Alarm Email (SMTP)

The iMeter 6 can be configured to send Alarm Emails based on the Simple Mail Transfer Protocol (SMTP), which may be triggered by Setpoints, Dips/Swells, Interruptions, Transients, etc.

The Alarm Email provides the following information in text format:

1) iMeter 6's serial number and an event counter indicating the number of events in the email
2) Event description and characteristics values
3) Event timestamp

The programming of the Alarm Email is supported via the Web Interface and communications. The iMeter 6 provides the following SMTP setup parameters:

Parameters	Definition/Option
SMTP Server	IP/domain name of the SMTP Server, e.g., smtp.gmail.com
SMTP IP Port	0 to 65535 (Default=25)
Sender Email	Sender's Email Address. This string is up to 35 characters long.
Receiver Email	Receiver's Email address. This string is up to 35 characters long.
Password	Logon password for sender email address. This string is up to 19 characters long.
SSL Enable	Enable the Secure Socket Layer encryption protocol for SMTP - Yes/No. This is supported in Firmware V3.10.00 or later.

Table 4-29 Email Setup Parameters

Here is an example on how to configure an Interruption Setpoint to trigger an Alarm Email.

1. Configure the Threshold and Hysteresis settings for Dip, Swell and Interruption as shown below. Select the SMTP check box in Trigger 1 or 2.

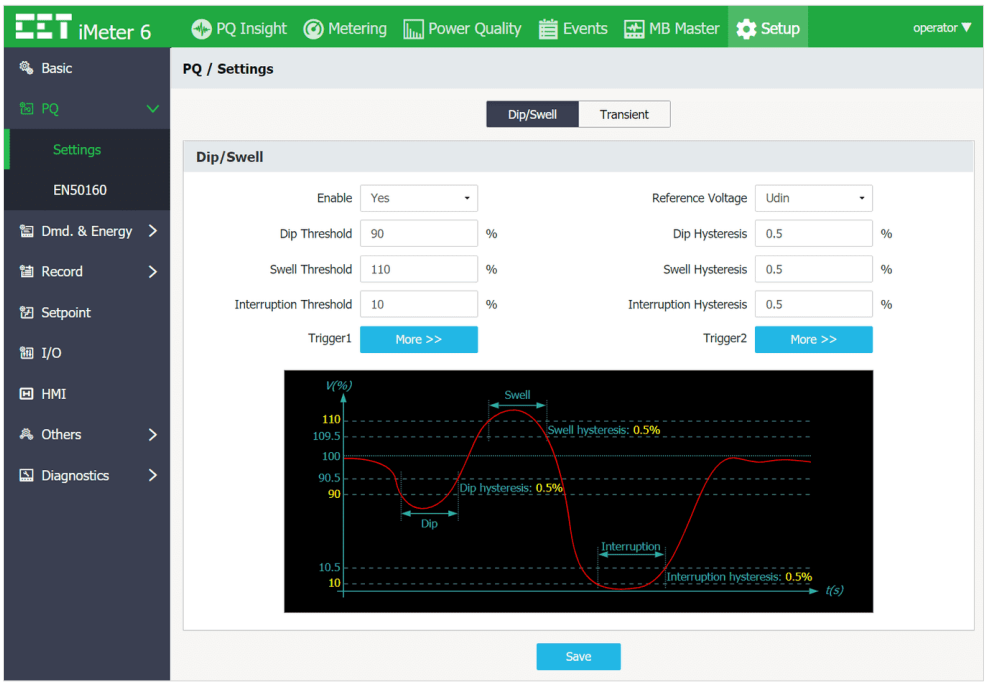


Figure 4-12 Dip, Swell and Interruption Thresholds & Hysteresis

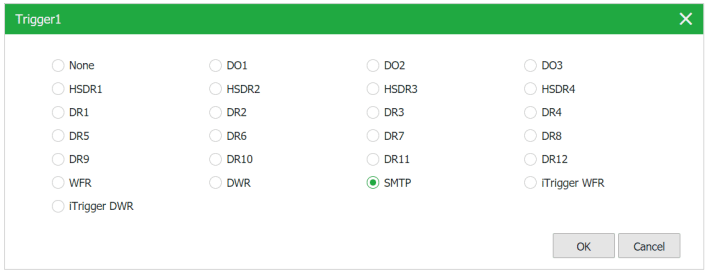


Figure 4-13 Trigger 1 Settings

2. Click **Setup**-> **Others** -> **Alarm Email** -> **Settings** as shown below. Please note that all the SMTP information should be entered correctly (please log into the Sender Email account to confirm the SMTP settings).

   Here are two examples for the SMTP configuration for Gmail and Outlook.

   For Gmail:
   SMTP Server – smtp.gmail.com
   SMTP IP Port – 465
   Sender E-mail – example@gmail.com
   Receiver Email – ****@***.com
   SSL Enable – Yes
   Password – Please see the following guide (the Google account password could not work due to the verification mechanism of Google).

   a. Please log into **Google Account** and under **Security** settings, ensure the 2-Step Verification is turned on as Google suggested.

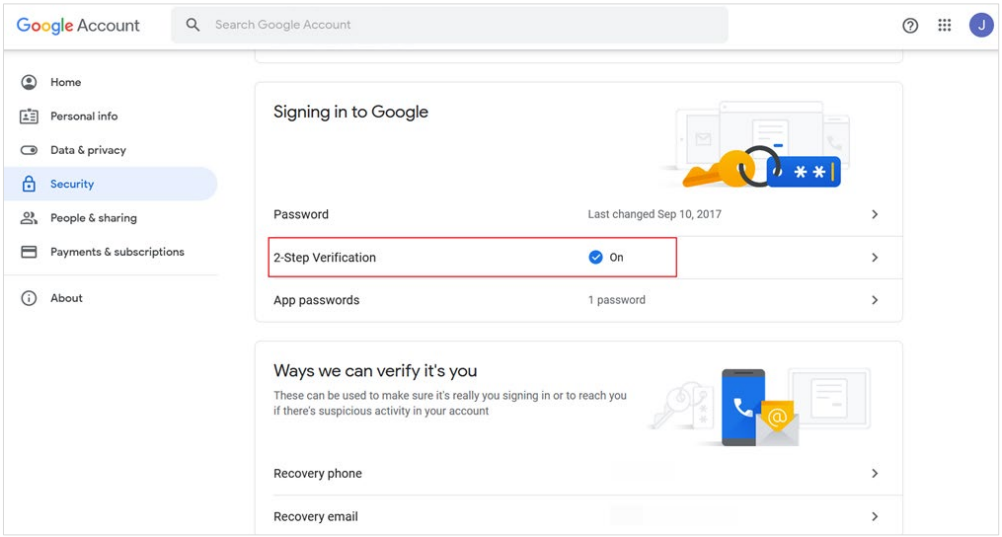


Figure 4-14 2-Step Verification on Google Account

   b. Since iMeter 6 doesn't support **2-Step Verification** with web direction to Gmail, please create an item under **App passwords** (under **2-Step Verification** in the above figure), and Google will provide you with a 16-character app password. Please use this app password in the SMTP configuration of iMeter 6.

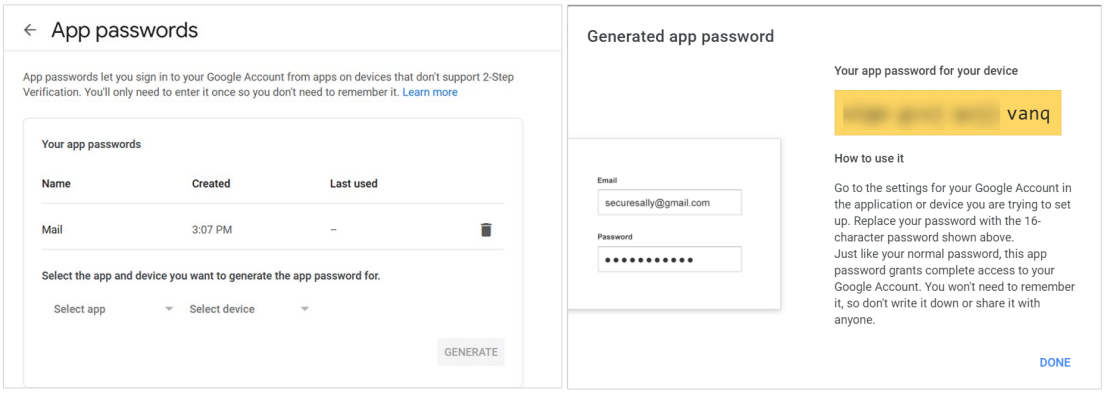


Figure 4-15 Retrieve App Password for Google Account

   For Outlook:
   SMTP Server – smtp.office365.com
   SMTP IP Port – 587
   Sender E-mail – example@outlook.com
   Receiver E-mail – ****@***.com
   SSL Enable: No (Outlook uses STARTTLS for SMTP service so there is no need to enable SSL).
   Password: Please see the following guide (Similarly, the password of Outlook account could not work due to the Verification mechanism of Microsoft).
   a. Please log into **Microsoft account** and go to **Advanced security options** under **Security** tab.

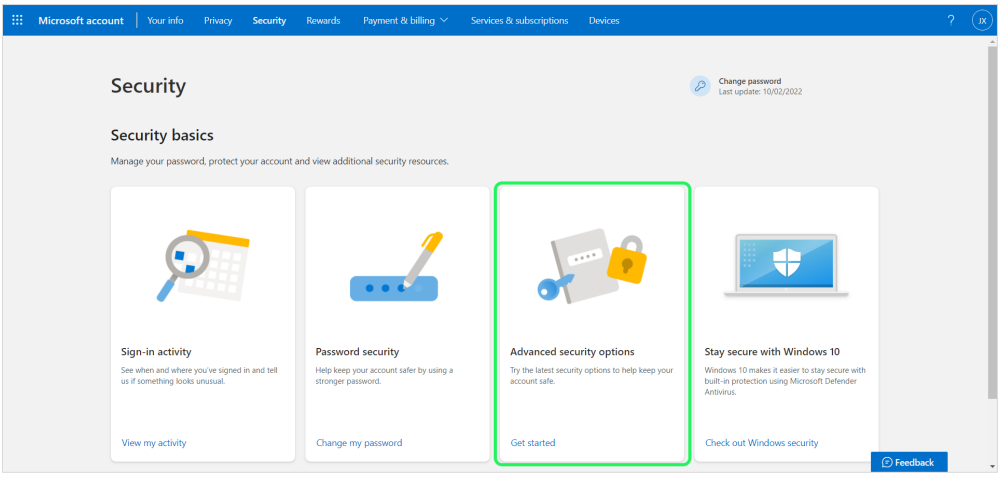


Figure 4-16 Security Setting for Microsoft Account

b. Ensure the **Two-step verification** is turned on as Microsoft suggested. Create a new app password under **App passwords**. Please use this provided App password in the SMTP configuration of iMeter 6.

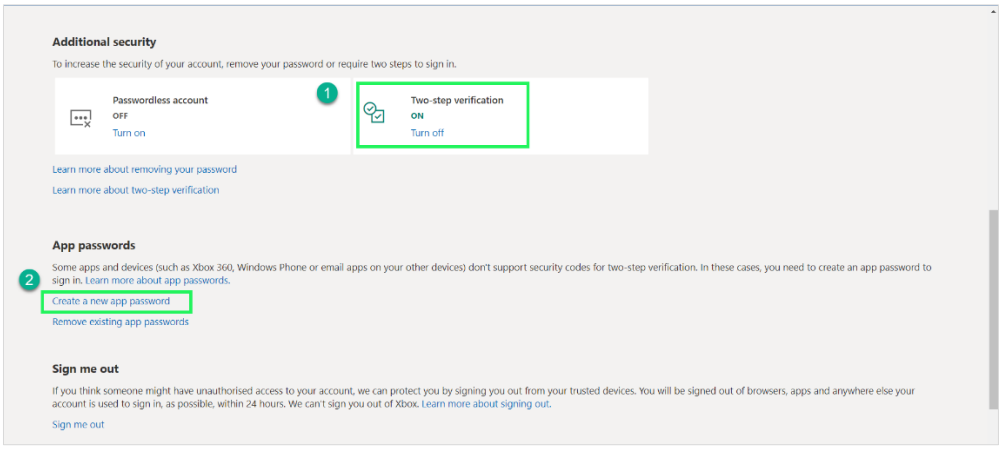


Figure 4-17 Retrieve App Password for Microsoft Account

3. Enter the App Password created from the Google or Microsoft account into the Password setting. Click **Save** to store the configuration in the iMeter 6. The message "**Saved Succeeded**" will appear if the configuration is accepted by the meter.

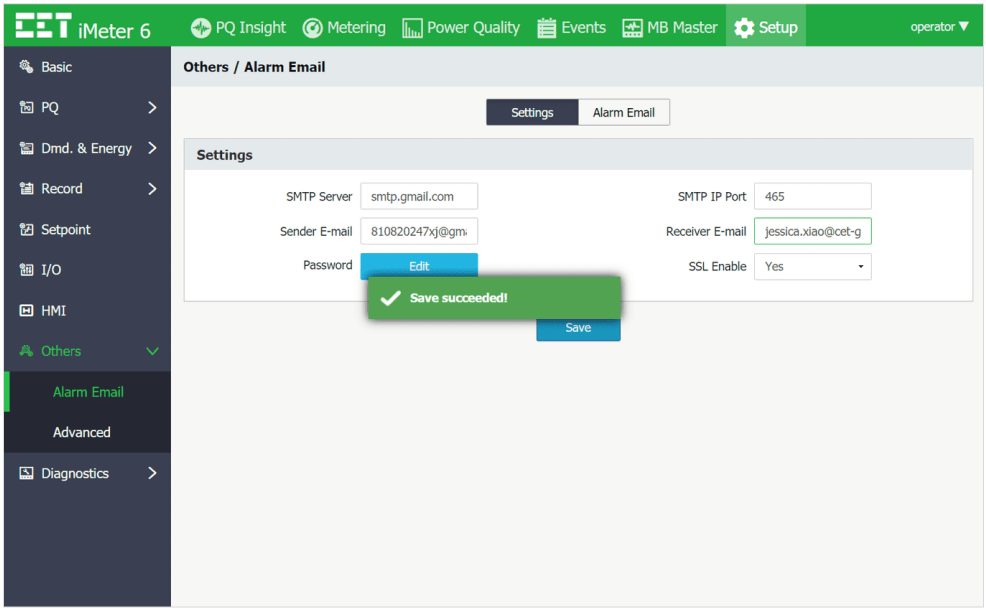


Figure 4-18 Alarm Email Settings via Web Server

4. Click the **Alarm Email** tab to send a Test email by clicking on **Test**. The message "**E-mail has been sent to the specified address**" will appear if a test email has been successfully sent to the **Receiver**. However, if the receiver didn't receive the test email, the Alarm Email settings should be verified to make sure that they are correct, and the iMeter 6 should be checked to make sure that it is connected to the Internet.

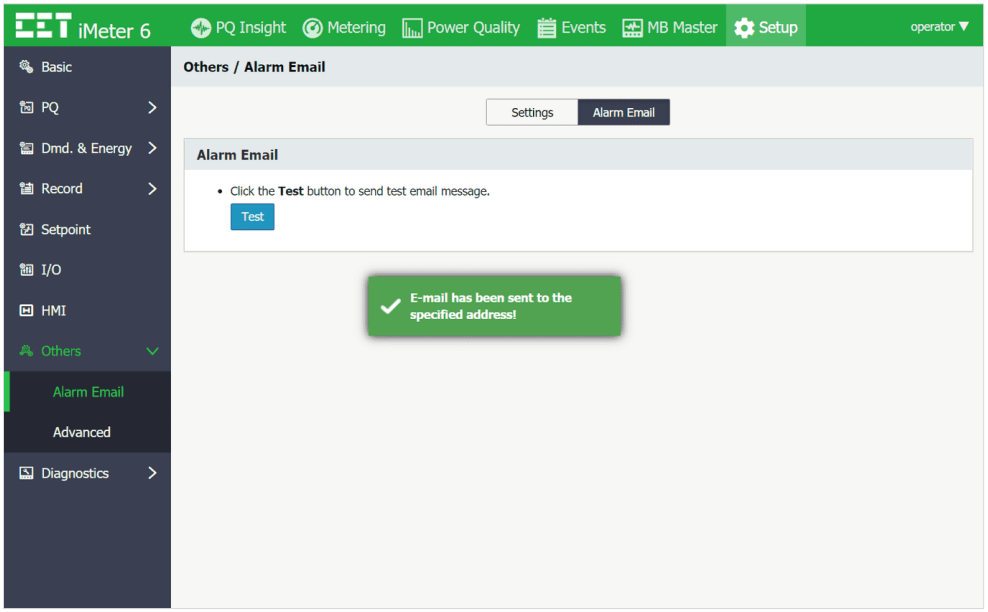


Figure 4-19 Send Test Email

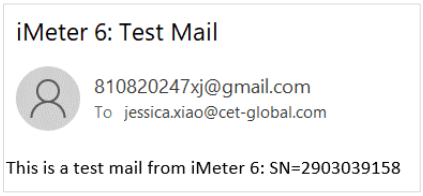


Figure 4-20 An Example of Test Email

5. When a Dip, Swell or Interruption event is captured, an **Alarm Email** will be sent to the **Receiver** by the iMeter 6, providing the SMTP configuration is correct. In addition, an event will be recorded in the **SOE Log** to indicate that an **Alarm Email** has been triggered.

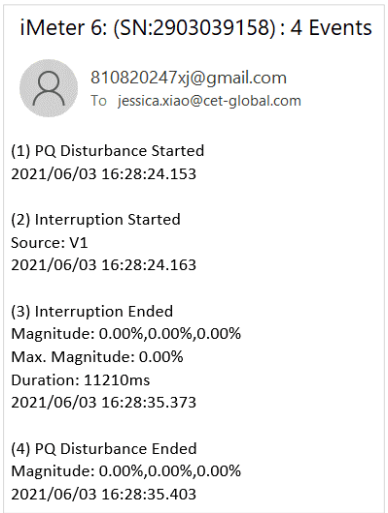


Figure 4-21 Alarm Email

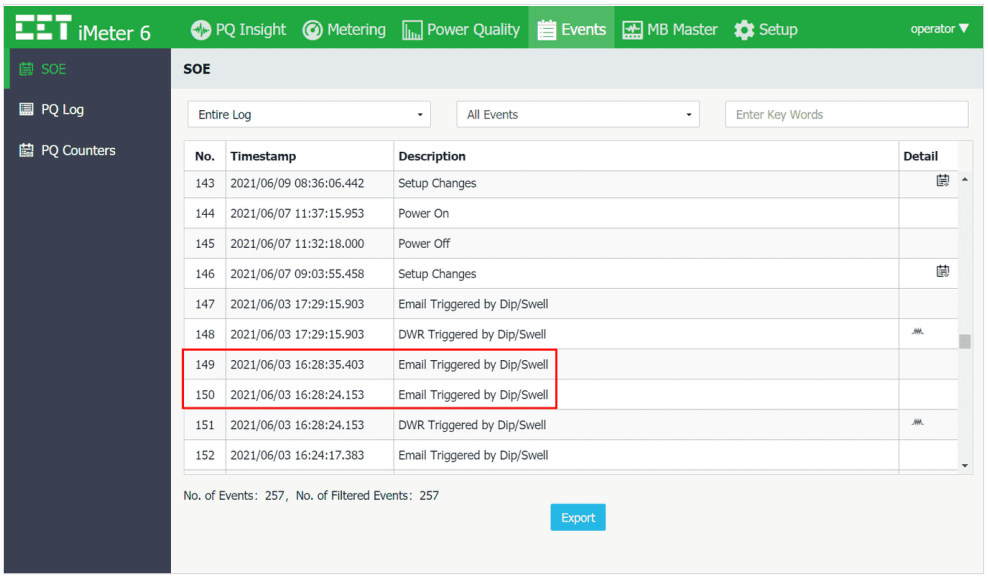


Figure 4-22 Email Triggered Event in SOE

4.10 SNMP

4.10.1 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 an SNMP-managed network: Network Management System, Agent and Managed Device.

- 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.

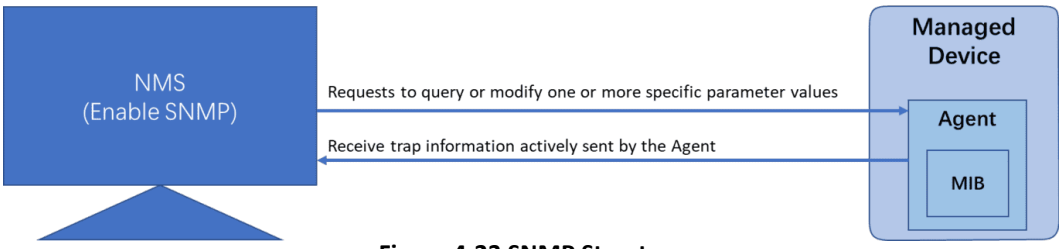


Figure 4-23 SNMP Structure

iMeter 6's basic measurements can be read and sent via SNMP. In addition, event records can be sent to an NMS in Trap format. The iMeter 6 provides the following information via SNMP. This is supported in Firmware V3.10.00 or later.

	Parameters
Device Info.	Device Name, Firmware Version, Firmware Date, Device SN
Status	DI Status, DO Status
Real-time Data	Primary Ua/Ub/Uc/Uln Avg. RMS, Primary Uab/Ubc/Uca/Ull Avg. RMS, Primary Ia/Ib/Ic/I Avg. RMS, Primary I4/In (calculated) RMS, Pa/Pb/Pc/P Total RMS, Qa/Qb/Qc/Q Total RMS, Sa/Sb/Sc/ S Total RMS, PFa/PFb/PFc/PF Total RMS, Frequency, AI
Energy Data	∑kWh Import/Export/Net/Total, ∑kvarh Import/Export/Net/Total, ∑kVAh

Table 4-30 Data Provided by the iMeter 6 via SNMP

4.10.2 Using SNMP

This section provides the guideline for communicating with the iMeter 6 in SNMP protocol using MG-SOFT MIB Browser as the NMS software. It's assumed that the reader is somewhat familiar with SNMP.

Please execute the steps below.

1. Download the MIB definition (source) file for iMeter 6 from here and save it to the **SMI** folder under the installation path of MG-SOFT.

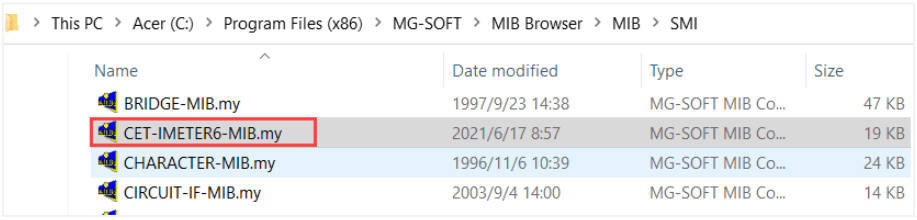


Figure 4-24 Save the MIB Definition File to SMI Folder

2. Run the **MIB Compiler**. Click on in the toolbar and select the CET-IMETER6-MIB.my file to compile.

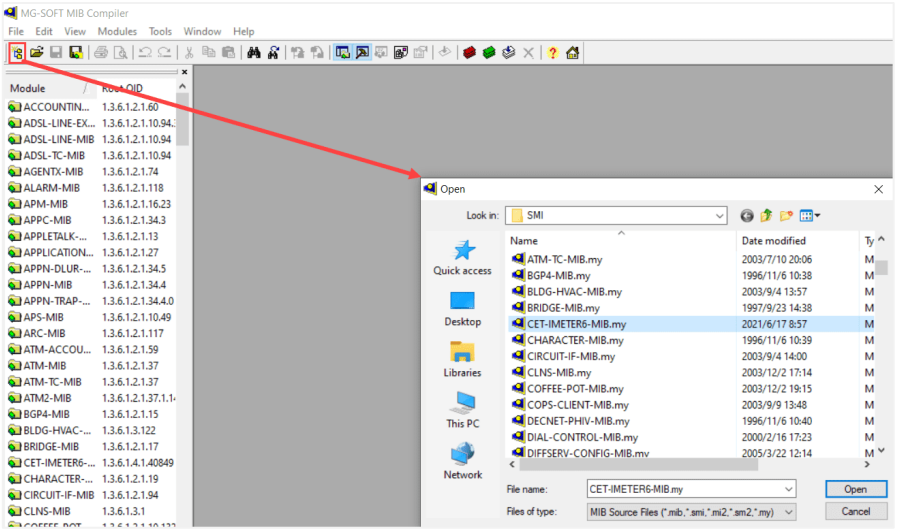


Figure 4-25 Compiler MIB Definition File

3. After a successful compilation, the Compiled MIB Modules dialog box appears which allows the user to save the compiled MIB file.

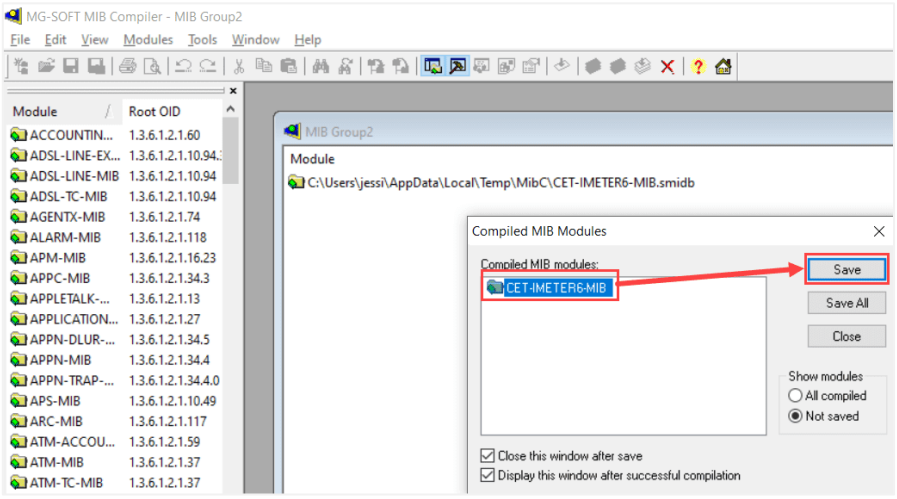


Figure 4-26 Compiled MIB Modules dialog box

The **Save As** dialog box appears to prompt the user where to save the compiled file. It's recommended to save the file to the default folder of MIB Browser.

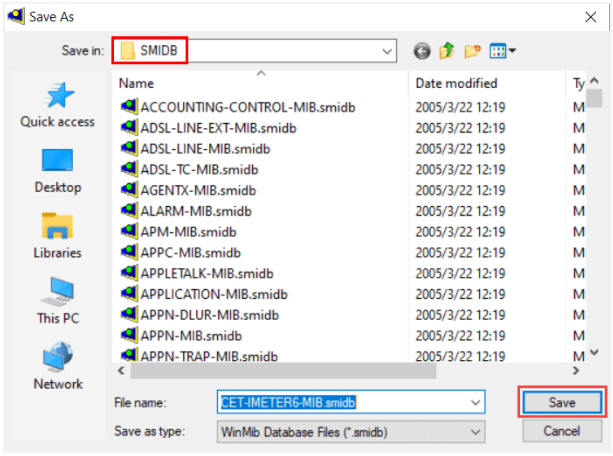


Figure 4-27 Save the Compiled File

4. Run the MIB Browser as Administrator. Click **MIB** tab and select CET-IMETER6-MIB in the **MIB Modules** window and click to upload the selected MIB module.

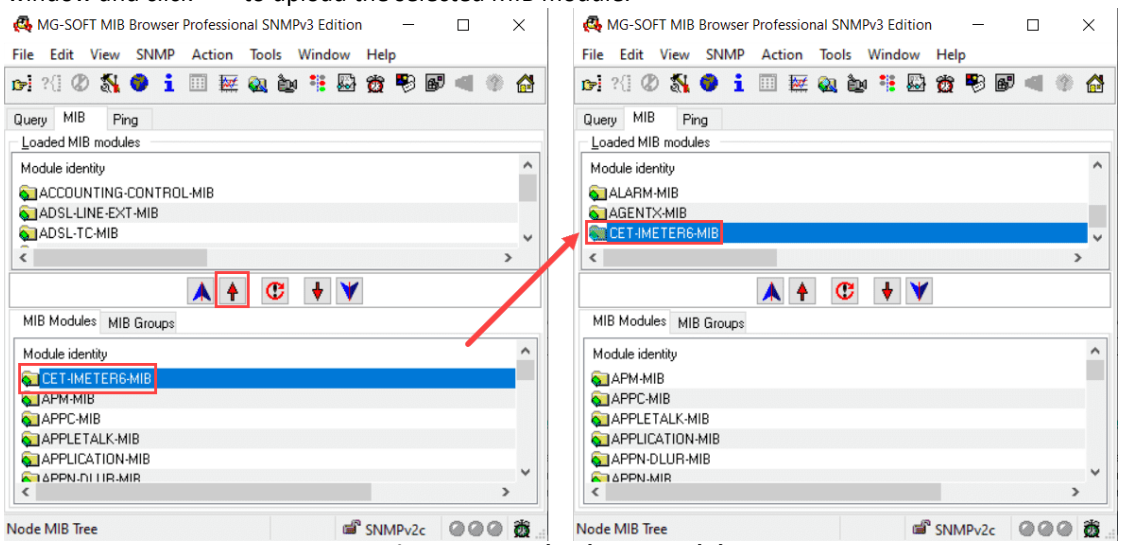


Figure 4-28 Upload MIB Module

5. Click the **Query** tab and enter the IP address of iMeter 6. Click to set the SNMP version and Port number in the SNMP Protocol Preferences dialog box.

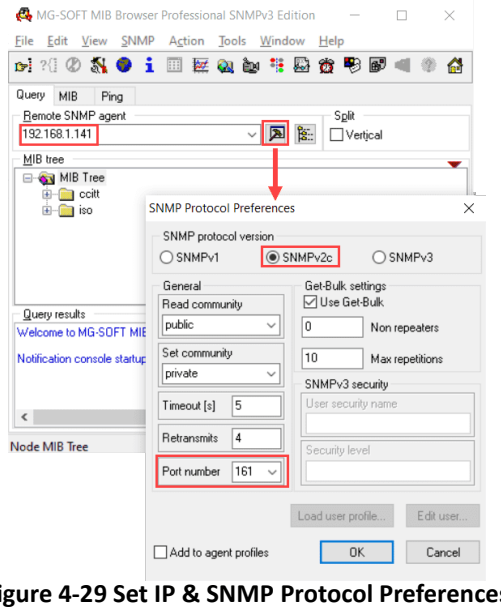


Figure 4-29 Set IP & SNMP Protocol Preferences

6. In the **MIB Tree** panel, expand the MIB Tree and select the iMeter6 node to connect it by right-clicking it and choosing **Contact** from the pop-up context menu.

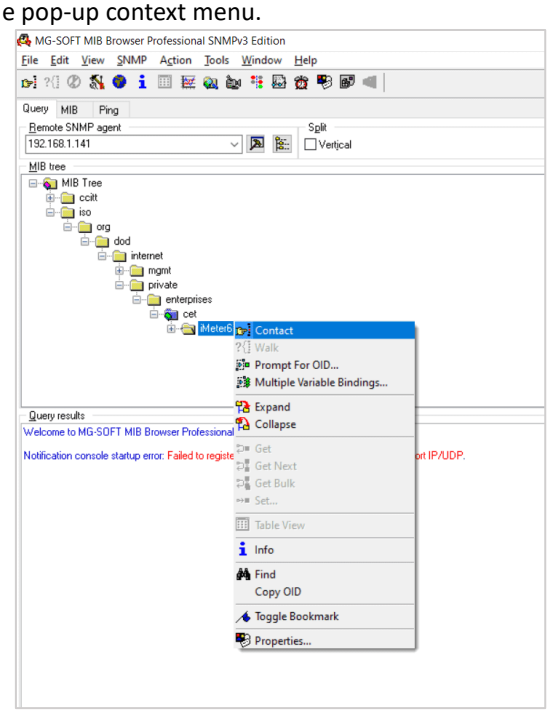


Figure 4-30 Connect the iMeter 6 via SNMP

7. The user can query the Real-time measurements by Walk / Get command. For more instructions on MIB Browser, please refer to the User Manual of MIB Browser.

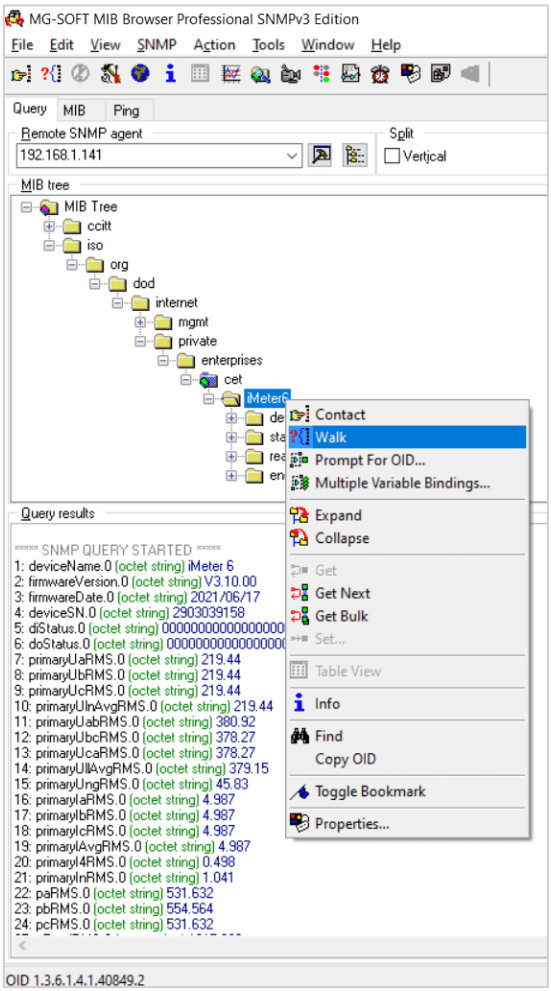


Figure 4-31 Query Real-time Measurements

4.11 Ethernet Gateway

The iMeter 6's Ethernet port together with its RS-485 port can be used as an Ethernet Gateway (EtherGate) to allow communications between a Modbus Master on an Ethernet network and a number of RS-485-enabled devices connected to the iMeter 6's RS-485 port using the **Modbus RTU over TCP/IP** protocol as shown in **Figure 4-32 Topological Graph**.

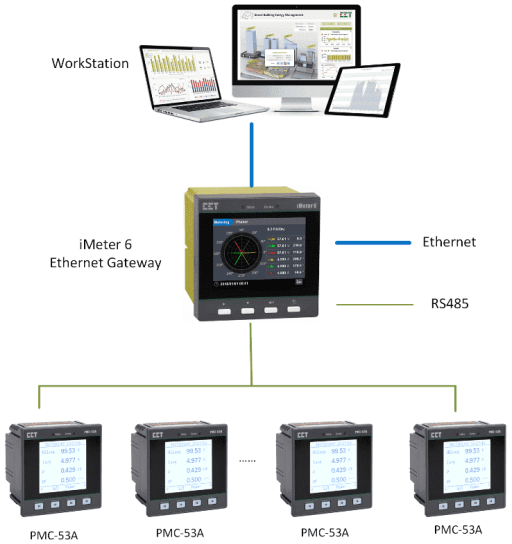


Figure 4-32 Topological Graph

Please follow the below steps to setup the iMeter 6's RS-485 port as an Ethernet Gateway:

1) Set the IP address, Subnet Mask and Gateway Address
2) Set the Protocol of the P1 Port as **EtherGate**
3) Configure the IP Port No. (default=6000) and make sure that it matches that of the Modbus Master Software.
4) Please note that the iMeter 6's Ethernet Gateway is a Transparent Gateway only and not a Modbus TCP to RTU Gateway.

For detailed information on how to use the Ethernet Gateway feature, please refer to PMC Setup's User Manual.

4.12 Modbus Master

4.12.1 Overview

iMeter 6 supports the Modbus Master feature (supported in Firmware V3.00.06 or later) which can periodically communicate with the ModBus Slaves via Modbus RTU.

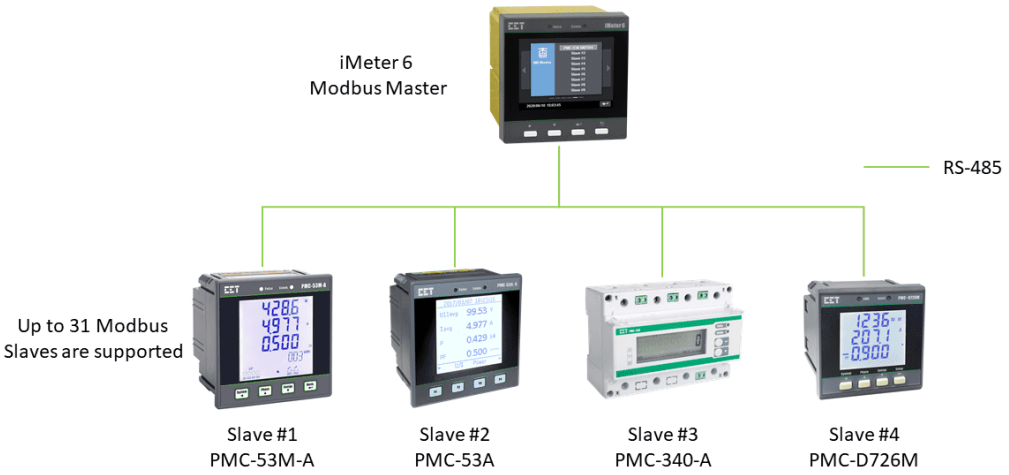


Figure 4-33 Modbus Master-to-Slave Connections

4.12.2 Measurements

Both the Front Panel and the Web Interface support the display for the MB Slave's real-time measurements (See Chapter 3). The following table illustrates the MB Slaves supported by iMeter 6 with the specified Modbus protocol version (PMC-53A with Modbus V1.6) and their accessible parameters via iMeter 6's interface.

Parameters	PMC-53A V1.6	PMC-53A-E V1.1	PMC-53M-E V1.0	PMC-53M-A V1.0	PMC-340-A V1.0/ PMC-340-B V1.3	PMC-D726M V1.3
Ua	✓	✓	✓	✓	✓	✓
Ub	✓	✓	✓	✓	✓	✓
Uc	✓	✓	✓	✓	✓	✓
Uln Avg	✓	✓	✓	✓	✓	✓
Uab	✓	✓	✓	✓	✓	✓
Ubc	✓	✓	✓	✓	✓	✓
Uca	✓	✓	✓	✓	✓	✓
Ull Avg	✓	✓	✓	✓	✓	✓
Ung	✓	✓	×	×	×	×
Ia	✓	✓	✓	✓	✓	✓
Ib	✓	✓	✓	✓	✓	✓
Ic	✓	✓	✓	✓	✓	✓
I Avg	✓	✓	✓	✓	✓	✓
Ua/Uab Angle	✓	✓	✓	✓	✓	✓
Ub/Ubc Angle	✓	✓	✓	✓	✓	✓
Uc/Uca Angle	✓	✓	✓	✓	✓	✓
Ia Angle	✓	✓	✓	✓	✓	✓
Ib Angle	✓	✓	✓	✓	✓	✓
Ic Angle	✓	✓	✓	✓	✓	✓
In (Calculated)	✓	✓	✓	✓	✓	✓
I4	✓	✓	×	×	×	×
dPF	✓	✓	✓	✓	×	×
Device Operating Time	✓	✓	✓	✓	✓	×
U1 (Positive Sequence)	✓	✓	×	✓	×	×
U2 (Negative Sequence)	✓	✓	×	✓	×	×
U0 (Zero Sequence)	✓	✓	×	✓	×	×
I1 (Positive Sequence)	✓	✓	×	✓	×	×
I2 (Negative Sequence)	✓	✓	×	✓	×	×
I0 (Zero Sequence)	✓	✓	×	✓	×	×
kWh Import	✓	✓	✓	✓	✓	✓
kWh Export	✓	✓	✓	✓	✓	✓
kWh Net	✓	✓	✓	✓	✓	×
kWh Total	✓	✓	✓	✓	✓	×
kvarh Import	✓	✓	✓	✓	✓	✓
kvarh Export	✓	✓	✓	✓	✓	✓
kvarh Net	✓	✓	✓	✓	✓	×
kvarh Total	✓	✓	✓	✓	✓	×
kVAh	✓	✓	✓	✓	✓	✓
Ia DMD.	✓	✓	✓	✓	✓	✓
Ib DMD.	✓	✓	✓	✓	✓	✓
Ic DMD.	✓	✓	✓	✓	✓	✓

I average DMD.	✓	✓	×	×	×	×
Ua DMD.	×	✓	×	×	×	×
Ub DMD.	×	✓	×	×	×	×
Uc DMD.	×	✓	×	×	×	×
Uln average DMD.	×	✓	×	×	×	×
Uab DMD.	×	✓	×	×	×	×
Ubc DMD.	×	✓	×	×	×	×
Uca DMD.	×	✓	×	×	×	×
Ull average DMD.	✓	✓	×	×	×	×
kW Total DMD.	✓	✓	×	✓	✓	✓
kvar Total DMD.	✓	✓	✓	✓	✓	✓
kVA Total DMD.	✓	✓	✓	✓	✓	✓
Ia This Max. DMD.	✓	✓	✓	✓	✓	✓
Ib This Max. DMD.	✓	✓	✓	✓	✓	✓
Ic This Max. DMD.	✓	✓	✓	✓	✓	✓
I average This Max. DMD.	✓	✓	×	×	×	×
Ua This Max. DMD.	×	✓	×	×	×	×
Ub This Max. DMD.	×	✓	×	×	×	×
Uc This Max. DMD.	×	✓	×	×	×	×
Uln average This Max. DMD.	×	✓	×	×	×	×
Uab This Max. DMD.	×	✓	×	×	×	×
Ubc This Max. DMD.	×	✓	×	×	×	×
Uca This Max. DMD.	×	✓	×	×	×	×
Ull average This Max. DMD.	✓	✓	×	×	×	×
kW This Max. DMD.	✓	✓	✓	✓	✓	✓
kvar This Max. DMD.	✓	✓	✓	✓	✓	✓
kVA This Max. DMD.	✓	✓	✓	✓	✓	✓
U Unbalance	✓	✓	✓	✓	✓	✓
I Unbalance	✓	✓	✓	✓	✓	✓
Ia TDD	✓	✓	✓	✓	✓	✓
Ib TDD	✓	✓	✓	✓	✓	✓
Ic TDD	✓	✓	✓	✓	✓	✓
Ia THD	✓	✓	✓	✓	✓	✓
Ib THD	✓	✓	✓	✓	✓	✓
Ic THD	✓	✓	✓	✓	✓	✓
Ua THD	✓	✓	✓	✓	✓	✓
Ub THD	✓	✓	✓	✓	✓	✓
Uc THD	✓	✓	✓	✓	✓	✓
DI Status	✓	✓	✓	✓	PMC-340-B only	✓
DO Status	✓	✓	✓	✓	×	✓

Table 4-31 Available Measurements on the Supported MB Slaves

4.12.3 Configurations

The following section describes the steps for configuring a PMC-53A as a MB Slave for iMeter 6.

1. Confirm the Modbus RTU settings on the PMC-53A.

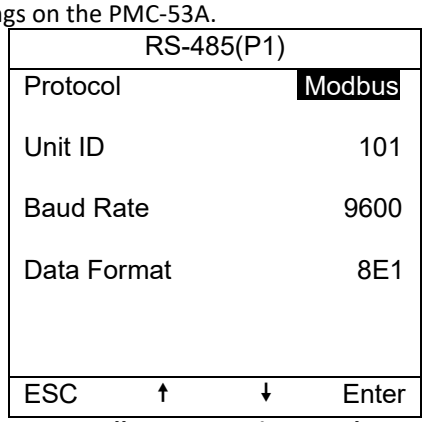


Figure 4-34 Modbus RTU settings on the PMC-53A

2. Set the RS-485 (P1) Protocol of iMeter 6 to **MB Master**.

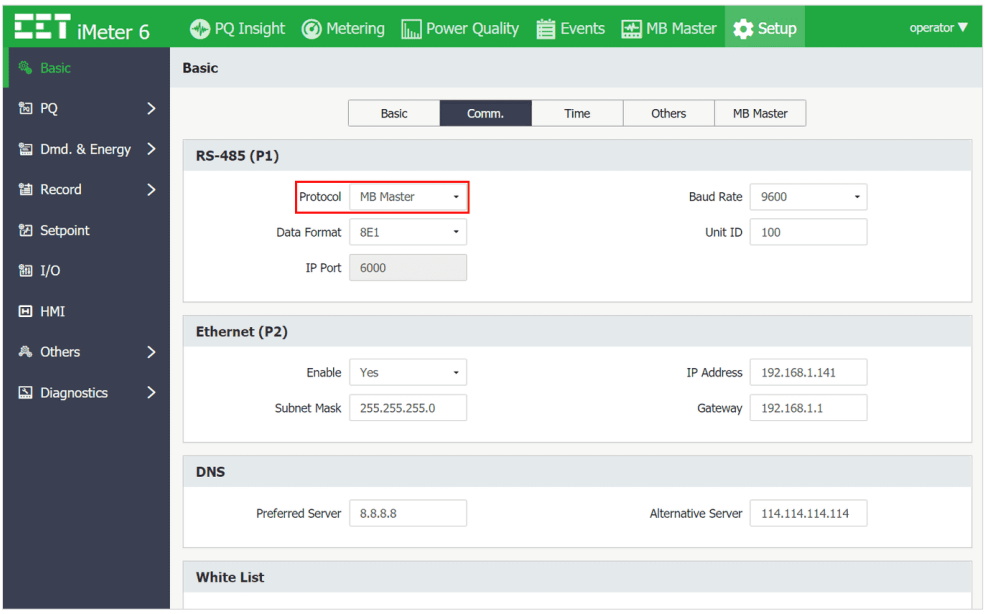


Figure 4-35 P1 (RS-485) Settings on iMeter 6

3. Under **Setup** -> **Basic** -> **MB Master**, configure the Slave settings based on the Modbus RTU parameters of PMC-53A.

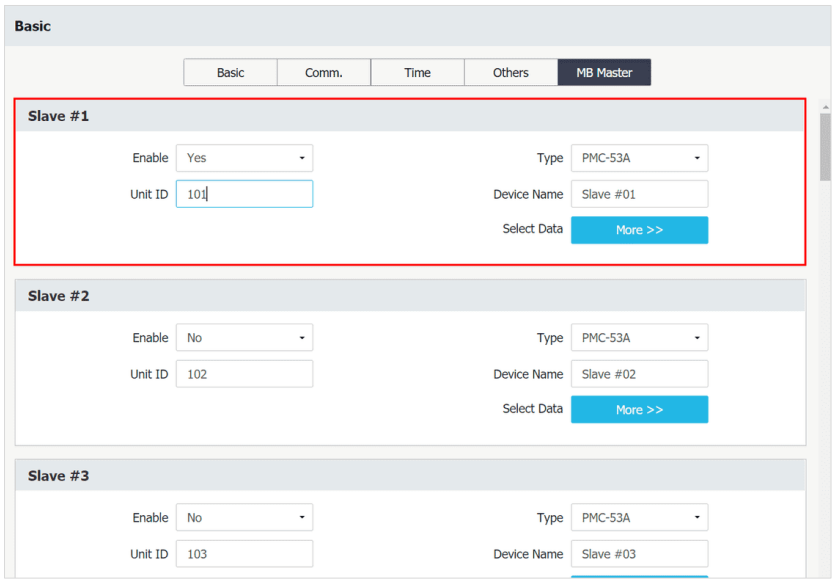


Figure 4-36 MB Master Settings on iMeter 6

4. Click "**More >>**" on **Select Data** filed and select the data desired to display. The user can quickly select/de-select all Pages by clicking **Select All**/**Clear All** or duplicate the existing settings from a specific MB Slave by selecting it from the **Import from** drop-down list.

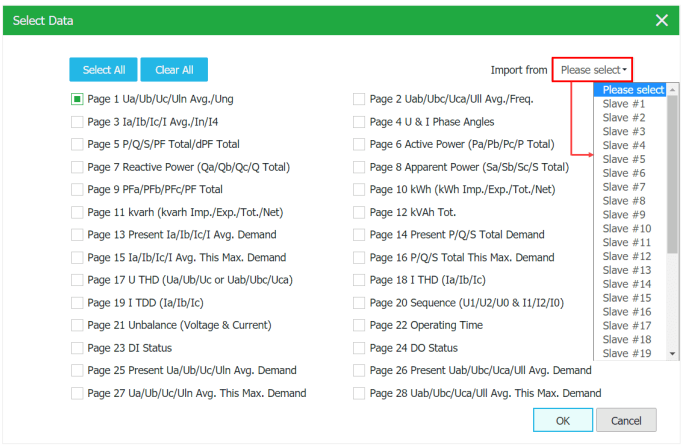


Figure 4-37 Select Data

The following table illustrates the Slave's Data Type details displayed on Page 1 to Page 28.

Page	Data Type
Page 1	Ua / Ub / Uc / Uln Avg. / Ung
Page 2	Uab / Ubc / Uca / Ull Avg. / Freq.
Page 3	Ia / Ib / Ic / I Avg. / In / I4
Page 4	Ua / Uab Angle, Ub / Ubc Angle, Uc / Uca Angle, Ia Angle, Ib Angle, Ic Angle
Page 5	P / Q / S / PF Total / Disp. PF Total
Page 6	P1 / P2 / P3 / P Total
Page 7	Q1 / Q2 / Q3 / Q Total
Page 8	S1 / S2 / S3 / S Total
Page 9	PF1 / PF2 / PF3 / PF Total
Page 10	kWh Imp. / Exp. / Tot. / Net
Page 11	kvarh Imp. / Exp. / Tot. / Net
Page 12	kVAh Tot.
Page 13	Ia / Ib / Ic / I Avg. Present DMD
Page 14	P / Q / S Total Present DMD
Page 15	Ia / Ib / Ic / I Avg. This Max. DMD
Page 16	P / Q / S Total This Max. DMD
Page 17	Ua / Uab THD, Ub / Ubc THD, Uc / Uca THD
Page 18	Ia / Ib / Ic THD
Page 19	Ia / Ib / Ic TDD
Page 20	Ua / Ub / U0 & Ia / Ib / I0 (For Sequence)
Page 21	U Unb., I Unb. (For Unbalance)
Page 22	Operating Time
Page 23	DIx (x=1, 2, 3, ...,6)
Page 24	DOx (x=1, 2, 3, 4)
Page 25	Ua / Ub / Uc / Uln Avg. Present DMD (If supported)
Page 26	Uab / Ubc / Uca / Ull Avg. Present DMD (If supported)
Page 27	Ua / Ub / Uc / Uln Avg. This Max. DMD (If supported)
Page 28	Uab / Ubc / Uca / Ull Avg. This Max. DMD (If supported)

Table 4-32 Details for FP Display Pages

Chapter 5 Modbus Map

This chapter provides a complete description of the Modbus register map (**Protocol Version 3.3**) for the iMeter 6 to facilitate the development of 3rd party communications driver for accessing information on the iMeter 6. For a complete Modbus Protocol Specification, please visit http://www.modbus.org. The iMeter 6 supports the following Modbus functions:

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

The following table provides a description of the different data formats used for the Modbus registers. The iMeter 6 uses the **Big Endian** byte ordering system.

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

5.1 Basic Measurements

Register	Property	Description	Format	Scale	Unit
0000	RO	Ua[1]	Float	x1	V
0002	RO	Ub[1]	Float		
0004	RO	Uc[1]	Float		
0006	RO	Uln average[1]	Float		
0008	RO	Uab	Float		
0010	RO	Ubc	Float		
0012	RO	Uca	Float		
0014	RO	Ull average	Float		
0016	RO	Ia	Float	x1	A
0018	RO	Ib	Float		
0020	RO	Ic	Float		
0022	RO	I average	Float		
0024	RO	kWa[1]	Float	x1	W
0026	RO	kWb[1]	Float		
0028	RO	kWc[1]	Float		
0030	RO	kW Total	Float		
0032	RO	kvara[1]	Float	x1	var
0034	RO	kvarb[1]	Float		
0036	RO	kvarc[1]	Float		
0038	RO	kvar Total	Float		
0040	RO	kVAa[1]	Float	x1	VA
0042	RO	kVAb[1]	Float		
0044	RO	kVAc[1]	Float		
0046	RO	kVA Total	Float		
0048	RO	PFa[1]	Float	x1	-
0050	RO	PFb[1]	Float		
0052	RO	PFc[1]	Float		
0054	RO	PF Total	Float		
0056	RO	Frequency	Float	x1	Hz
0058	RO	I4 Measured	Float	x1	A
0060	RO	In Calculated	Float	x1	A
0062	RO	Ung	Float	x1	V
0064~0069	--	Reserved	--	--	--
0070	RO	U2 (Negative Sequence Voltage) Unbalance	UINT16	×10	%
0071	RO	I2 (Negative Sequence Current) Unbalance	UINT16		
0072	RO	Ua Over Deviation	INT16	x100	%
0073	RO	Ub Over Deviation	INT16		
0074	RO	Uc Over Deviation	INT16		
0075	RO	Frequency Deviation	INT16	x100	Hz
0076	RO	Ua (3P4W)/Uab (3P3W) Angle	UINT16	x100	°
0077	RO	Ub (3P4W)/Ubc (3P3W) Angle	UINT16		
0078	RO	Uc (3P4W)/Uca (3P3W) Angle	UINT16		
0079	RO	Ia Angle	UINT16	x100	°
0080	RO	Ib Angle	UINT16		

0081	RO	Ic Angle	UINT16		
0082	RO	AI	Float		
0084	RO	Reserved	--	--	
0085	RO	DI Status[2]	UINT16		
0086	RO	DO Status[3]	UINT16		
0087	RO	Alarm Status[4]	UINT32		
0089	RO	SOE Pointer[5]	UINT32		
0091	RO	PQ Log Pointer[5]	UINT32		
0093	RO	WFR Log Pointer[5]	UINT32		
0095	RO	DWR Log Pointer[5]	UINT32		
0097	RO	IER Log Pointer[5]	UINT32		
0099	RO	HS DR #1 Pointer[5]	UINT32		
0101	RO	HS DR #2 Pointer[5]	UINT32		
0103	RO	HS DR #3 Pointer[5]	UINT32		
0105	RO	HS DR #4 Pointer[5]	UINT32		
0107	RO	Standard DR #1 Pointer[5]	UINT32		
…	RO	…	UINT32		
0129	RO	Standard DR #12 Pointer[5]	UINT32		
0131~0133	RO	Reserved	--	--	
0135	RO	Device Operating Time[6]	UINT32	x0.1	Hour
0137	RO	Ir (Calculated)	Float	x1	A
0139	RO	U1 (Positive Sequence Voltage)	Float	x1	V
0141	RO	U2 (Negative Sequence Voltage)	Float		
0143	RO	U0 (Zero Sequence Voltage)	Float		
0145	RO	I1 (Positive Sequence Current)	Float	x1	A
0147	RO	I2 (Negative Sequence Current)	Float		
0149	RO	I0 (Zero Sequence Current)	Float		
0151	RO	U0 Unbalance	UINT16	x10	%
0152	RO	I0 Unbalance	UINT16		
0153	RO	Uab Over Deviation	UINT16	x100	%
0154	RO	Ubc Over Deviation	UINT16		
0155	RO	Uca Over Deviation	UINT16		
0156	RO	Ua Under Deviation	UINT16		
0157	RO	Ub Under Deviation	UINT16		
0158	RO	Uc Under Deviation	UINT16		
0159	RO	Uab Under Deviation	UINT16		
0160	RO	Ubc Under Deviation	UINT16		
0161	RO	Uca Under Deviation	UINT16		
0162	RO	Standard DR #13 Pointer[5]	UINT32		
…	RO	…	UINT32		
0192	RO	Standard DR #28 Pointer[5]	UINT32		
0194	RO	EN50160 Log Pointer[7]	UINT32		

Table 5-1 Basic Measurements

Notes:

1. When the **Wiring Mode** is **3P3W (Delta)**, the per phase line-to-neutral Voltages, kWs, kvars, kVAs and PFs have no meaning, and their registers are reserved.
2. For the **DI Status** register, the bit values of B0 to B5 represent the states of DI1 to DI6, respectively, with "1" meaning Closed and "0" meaning Open.
3. For the **DO Status** register, the bit values of B0 to B2 represent the states of DO1 to DO3, respectively, with "1" meaning Operated and "0" meaning Released.
4. The **Alarm Status** register indicates the various Alarm states with a bit value of 1 meaning Active and 0 meaning Inactive. The following table illustrates the details of the **Alarm Status** register.

Bit	Alarm Event	Bit	Alarm Event
B0	Standard Setpoint #1	B16	High-Speed Setpoint #1
B1	Standard Setpoint #2	B17	High-Speed Setpoint #2
B2	Standard Setpoint #3	B18	High-Speed Setpoint #3
B3	Standard Setpoint #4	B19	High-Speed Setpoint #4
B4	Standard Setpoint #5	B20	High-Speed Setpoint #5
B5	Standard Setpoint #6	B21	High-Speed Setpoint #6
B6	Standard Setpoint #7	B22	High-Speed Setpoint #7
B7	Standard Setpoint #8	B23	High-Speed Setpoint #8
B8	Standard Setpoint #9	B24	Logical Module #1
B9	Standard Setpoint #10	B25	Logical Module #2
B10	Standard Setpoint #11	B26	Logical Module #3
B11	Standard Setpoint #12	B27	Logical Module #4
B12	Standard Setpoint #13	B28	Logical Module #5

B13	Standard Setpoint #14	B29	Logical Module #6
B14	Standard Setpoint #15	B30	Reserved
B15	Standard Setpoint #16	B31	Reserved

Table 5-2 Alarm Status Register (0087)

5. The range of the SOE/PQ/WFR/DWR/IER/DR Log Pointer is between 0 and 0xFFFFFFFFH. The pointer is incremented for every new log generated and will roll over to 0 if its current value is 0xFFFFFFFFH. A value of zero indicates that the specific Log does not contain any record. If a **Clear SOE Log/PQ Log/WFR Log/DWR Log/IER Log/DR Log** is performed from the Front Panel/Web Interface or via communications, its corresponding **Log Pointer** will be reset to zero. Use the following equation to determine the latest log location:

   Latest Log Location = Modulo [**Log Pointer / Log Depth**]

   Where **Log Depth** = 512 for **SOE Log** and **PQ Log**, 128 for **WFR Log** and **DWR Log**, **IER Recording Depth** for **IER Log** and **DR Recording Depth** for **DR Log**.
6. The **Device Operating Time** means the accumulated Operating Time (or Running Hours) whenever any per-phase Current has exceeded the **Current on Threshold** (Register 6200). The **Device Operating Time** data is stored in non-volatile memory and will not suffer any loss in the event of a power failure.
7. The EN50160 Log Pointer is supported in Firmware V3.10.00 or later.

5.2 Energy Measurements

5.2.1 Total Energy Measurements

The Energy registers have a maximum value of 1,000,000,000 and will roll over to zero automatically when it is reached. The iMeter 6 also provides energy measurements in fractional values if they are required. Using the "Fractional" registers, having units such as W·sec, var·sec and VA·sec, the user can obtain decimal resolution for achieving higher accuracy. For example, if the value of the kWh fractional register is 3200000 W ·sec, the decimal value is 3200000/3600000=0.8889kWh. If the higher resolution is not required, it is not necessary to read the fractional energy registers. The Fractional registers have a maximum value of 3,600,000 (1kWh) and will roll over to zero automatically when it is reached.

Register	Property	Description	Format	Scale	Unit
0200	RW	kWh Import	UINT32	x1	kWh
0202	RW	kWh Export	UINT32		
0204	RO	kWh Net	INT32		
0206	RO	kWh Total	UINT32		
0208	RW	kvarh Import	UINT32	x1	kvarh
0210	RW	kvarh Export	UINT32		
0212	RO	kvarh Net	INT32		
0214	RO	kvarh Total	UINT32		
0216	RW	kVAh	UINT32	x1	kVAh
0218	RW	kvarh Q1	UINT32	x1	kvarh
0220	RW	kvarh Q2	UINT32		
0222	RW	kvarh Q3	UINT32		
0224	RW	kvarh Q4	UINT32		
0226	RW	kWh Import Fractional	Float	x1	W ·s
0228	RW	kWh Export Fractional	Float		
0230	RO	kWh Net Fractional	Float		
0232	RO	kWh Total Fractional	Float		
0234	RW	kvarh Import Fractional	Float	x1	var ·s
0236	RW	kvarh Export Fractional	Float		
0238	RO	kvarh Net Fractional	Float		
0240	RO	kvarh Total Fractional	Float		
0242	RW	kVAh Fractional	Float	x1	VA ·s
0244	RW	kvarh Q1 Fractional	Float	x1	var ·s
0246	RW	kvarh Q2 Fractional	Float		
0248	RW	kvarh Q3 Fractional	Float		
0250	RW	kvarh Q4 Fractional	Float		

Table 5-3 Energy Measurements

5.2.2 Phase A Energy Measurements

Register	Property	Description	Format	Scale	Unit
4600	RW	kWh Import	UINT32	x1	kWh
4602	RW	kWh Export	UINT32		
4604	RO	kWh Net	INT32		
4606	RO	kWh Total	UINT32		
4608	RW	kvarh Import	UINT32	x1	kvarh
4610	RW	kvarh Export	UINT32		
4612	RO	kvarh Net	INT32		
4614	RO	kvarh Total	UINT32		
4616	RW	kVAh	UINT32	x1	kVAh

4618	RW	kvarh Q1	UINT32	x1	kvarh
4620	RW	kvarh Q2	UINT32		
4622	RW	kvarh Q3	UINT32		
4624	RW	kvarh Q4	UINT32		
4626	RW	kWh Import Fractional	Float	x1	W·s
4628	RW	kWh Export Fractional	Float		
4630	RO	kWh Net Fractional	Float		
4632	RO	kWh Total Fractional	Float		
4634	RW	kvarh Import Fractional	Float	x1	var·s
4636	RW	kvarh Export Fractional	Float		
4638	RO	kvarh Net Fractional	Float		
4640	RO	kvarh Total Fractional	Float		
4642	RW	kVAh Fractional	Float	x1	VA·s
4644	RW	kvarh Q1 Fractional	Float	x1	var·s
4646	RW	kvarh Q2 Fractional	Float		
4648	RW	kvarh Q3 Fractional	Float		
4650	RW	kvarh Q4 Fractional	Float		

Table 5-4 Phase A Energy Measurements

5.2.3 Phase B Energy Measurements

Register	Property	Description	Format	Scale	Unit
4652	RW	kWh Import	UINT32	x1	kWh
4654	RW	kWh Export	UINT32		
4656	RO	kWh Net	INT32		
4658	RO	kWh Total	UINT32		
4660	RW	kvarh Import	UINT32	x1	kvarh
4662	RW	kvarh Export	UINT32		
4664	RO	kvarh Net	INT32		
4666	RO	kvarh Total	UINT32		
4668	RW	kVAh	UINT32	x1	kVAh
4670	RW	kvarh Q1	UINT32	x1	kvarh
4672	RW	kvarh Q2	UINT32		
4674	RW	kvarh Q3	UINT32		
4676	RW	kvarh Q4	UINT32		
4678	RW	kWh Import Fractional	Float	x1	W·s
4680	RW	kWh Export Fractional	Float		
4682	RO	kWh Net Fractional	Float		
4684	RO	kWh Total Fractional	Float		
4686	RW	kvarh Import Fractional	Float	x1	var·s
4688	RW	kvarh Export Fractional	Float		
4690	RO	kvarh Net Fractional	Float		
4692	RO	kvarh Total Fractional	Float		
4694	RW	kVAh Fractional	Float	x1	VA·s
4696	RW	kvarh Q1 Fractional	Float	x1	var·s
4698	RW	kvarh Q2 Fractional	Float		
4700	RW	kvarh Q3 Fractional	Float		
4702	RW	kvarh Q4 Fractional	Float		

Table 5-5 Phase B Energy Measurements

5.2.4 Phase C Energy Measurements

Register	Property	Description	Format	Scale	Unit
4704	RW	kWh Import	UINT32	x1	kWh
4706	RW	kWh Export	UINT32		
4708	RO	kWh Net	INT32		
4710	RO	kWh Total	UINT32		
4712	RW	kvarh Import	UINT32	x1	kvarh
4714	RW	kvarh Export	UINT32		
4716	RO	kvarh Net	INT32		
4718	RO	kvarh Total	UINT32		
4720	RW	kVAh	UINT32	x1	kVAh
4722	RW	kvarh Q1	UINT32	x1	kvarh
4724	RW	kvarh Q2	UINT32		
4726	RW	kvarh Q3	UINT32		
4728	RW	kvarh Q4	UINT32		
4730	RW	kWh Import Fractional	Float	x1	W·s
4732	RW	kWh Export Fractional	Float		

4734	RO	kWh Net Fractional	Float		
4736	RO	kWh Total Fractional	Float		
4738	RW	kvarh Import Fractional	Float	x1	var·s
4740	RW	kvarh Export Fractional	Float		
4742	RO	kvarh Net Fractional	Float		
4744	RO	kvarh Total Fractional	Float		
4746	RW	kVAh Fractional	Float	x1	VA·s
4748	RW	kvarh Q1 Fractional	Float	x1	var·s
4750	RW	kvarh Q2 Fractional	Float		
4752	RW	kvarh Q3 Fractional	Float		
4754	RW	kvarh Q4 Fractional	Float		

Table 5-6 Phase C Energy Measurements

5.2.5 TOU Energy Measurements

Register	Property	Description	Format	Scale	Unit
4000	RW	kWh Import of T1	UINT32	x1	kWh
4002	RW	kWh Export of T1	UINT32		
4004	RW	kvarh Import of T1	UINT32		kvarh
4006	RW	kvarh Export of T1	UINT32		
4008	RW	kVAh of T1	UINT32		kVAh
4010	RW	kWh Import of T2	UINT32		kWh
4012	RW	kWh Export of T2	UINT32		
4014	RW	kvarh Import of T2	UINT32		kvarh
4016	RW	kvarh Export of T2	UINT32		
4018	RW	kVAh of T2	UINT32		kVAh
4020	RW	kWh Import of T3	UINT32		kWh
4022	RW	kWh Export of T3	UINT32		
4024	RW	kvarh Import of T3	UINT32		kvarh
4026	RW	kvarh Export of T3	UINT32		
4028	RW	kVAh of T3	UINT32		kVAh
4030	RW	kWh Import of T4	UINT32		kWh
4032	RW	kWh Export of T4	UINT32		
4034	RW	kvarh Import of T4	UINT32		kvarh
4036	RW	kvarh Export of T4	UINT32		
4038	RW	kVAh of T4	UINT32		kVAh
4040	RW	kWh Import of T5	UINT32		kWh
4042	RW	kWh Export of T5	UINT32		
4044	RW	kvarh Import of T5	UINT32		kvarh
4046	RW	kvarh Export of T5	UINT32		
4048	RW	kVAh of T5	UINT32		kVAh
4050	RW	kWh Import of T6	UINT32		kWh
4052	RW	kWh Export of T6	UINT32		
4054	RW	kvarh Import of T6	UINT32		kvarh
4056	RW	kvarh Export of T6	UINT32		
4058	RW	kVAh of T6	UINT32		kVAh
4060	RW	kWh Import of T7	UINT32		kWh
4062	RW	kWh Export of T7	UINT32		
4064	RW	kvarh Import of T7	UINT32		kvarh
4066	RW	kvarh Export of T7	UINT32		
4068	RW	kVAh of T7	UINT32		kVAh
4070	RW	kWh Import of T8	UINT32		kWh
4072	RW	kWh Export of T8	UINT32		
4074	RW	kvarh Import of T8	UINT32		kvarh
4076	RW	kvarh Export of T8	UINT32		
4078	RW	kVAh of T8	UINT32		kVAh
4080~4099	RW	Reserved	--	--	--
4100	RO	kWh Import of T1 Fractional	Float	x1	W.s
4102	RO	kWh Export of T1 Fractional	Float		
4104	RO	kvarh Import of T1 Fractional	Float		var.s
4106	RO	kvarh Export of T1 Fractional	Float		
4108	RO	kVAh of T1 Fractional	Float		VA.s
4110	RO	kWh Import of T2 Fractional	Float		W.s
4112	RO	kWh Export of T2 Fractional	Float		
4114	RO	kvarh Import of T2 Fractional	Float		var.s
4116	RO	kvarh Export of T2 Fractional	Float		
4118	RO	kVAh of T2 Fractional	Float		VA.s

4120	RO	kWh Import of T3 Fractional	Float		W.s
4122	RO	kWh Export of T3 Fractional	Float		
4124	RO	kvarh Import of T3 Fractional	Float		var.s
4126	RO	kvarh Export of T3 Fractional	Float		
4128	RO	kVAh of T3 Fractional	Float		VA.s
4130	RO	kWh Import of T4 Fractional	Float		W.s
4132	RO	kWh Export of T4 Fractional	Float		
4134	RO	kvarh Import of T4 Fractional	Float		var.s
4136	RO	kvarh Export of T4 Fractional	Float		
4138	RO	kVAh of T4 Fractional	Float		VA.s
4140	RO	kWh Import of T5 Fractional	Float		W.s
4142	RO	kWh Export of T5 Fractional	Float		
4144	RO	kvarh Import of T5 Fractional	Float		var.s
4146	RO	kvarh Export of T5 Fractional	Float		
4148	RO	kVAh of T5 Fractional	Float		VA.s
4150	RO	kWh Import of T6 Fractional	Float		W.s
4152	RO	kWh Export of T6 Fractional	Float		
4154	RO	kvarh Import of T6 Fractional	Float		var.s
4156	RO	kvarh Export of T6 Fractional	Float		
4158	RO	kVAh of T6 Fractional	Float		VA.s
4160	RO	kWh Import of T7 Fractional	Float		W.s
4162	RO	kWh Export of T7 Fractional	Float		
4164	RO	kvarh Import of T7 Fractional	Float		var.s
4166	RO	kvarh Export of T7 Fractional	Float		
4168	RO	kVAh of T7 Fractional	Float		VA.s
4170	RO	kWh Import of T8 Fractional	Float		W.s
4172	RO	kWh Export of T8 Fractional	Float		
4174	RO	kvarh Import of T8 Fractional	Float		var.s
4176	RO	kvarh Export of T8 Fractional	Float		
4178	RO	kVAh of T8 Fractional	Float		VA.s

Table 5-7 TOU Energy Measurements

5.2.6 Interval Energy Measurements

Register	Property	Description	Format	Scale	Unit
4500	RO	kWh Import	INT32	x0.01	kWh
4502	RO	kWh Export	INT32		
4504	RO	kvarh Import	INT32		kvarh
4506	RO	kvarh Export	INT32		
4508	RO	kVAh	INT32		kVAh

Table 5-8 Interval Energy Measurements

5.3 Pulse Counter

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

Register	Property	Description	Format	Scale	Range
0350	RW	DI1 Pulse Counter	UINT32	x1	0 to 999,999,999
0352	RW	DI2 Pulse Counter	UINT32		
0354	RW	DI3 Pulse Counter	UINT32		
0356	RW	DI4 Pulse Counter	UINT32		
0358	RW	DI5 Pulse Counter	UINT32		
0360	RW	DI6 Pulse Counter	UINT32		

Table 5-9 Pulse Counter

5.4 Harmonic Measurements

5.4.1 Fundamental (Displacement) Measurements

Register	Property	Description	Format	Scale	Unit
0400	RO	dUa[1]	Float	x1	V
0402	RO	dUb[1]	Float		
0404	RO	dUc[1]	Float		
0406	RO	dUln average[1]	Float		
0408	RO	dUab[2]	Float		
0410	RO	dUbc[2]	Float		
0412	RO	dUca[2]	Float		
0414	RO	dUll average[2]	Float		

0416	RO	dIa	Float		A
0418	RO	dIb	Float		
0420	RO	dIc	Float		
0422	RO	dI average	Float		
0424	RO	dI4[3]	Float		
0426	RO	dkWa[1]	Float		W
0428	RO	dkWb[1]	Float		
0430	RO	dkWc[1]	Float		
0432	RO	dkW Total	Float		
0434	RO	dkvara[1]	Float		var
0436	RO	dkvarb[1]	Float		
0438	RO	dkvarc[1]	Float		
0440	RO	dkvar Total	Float		
0442	RO	dkVAa[1]	Float		VA
0444	RO	dkVAb[1]	Float		
0446	RO	dkVAc[1]	Float		
0448	RO	dkVA Total	Float		
0450	RO	dPFa[1]	Float		-
0452	RO	dPFb[1]	Float		
0454	RO	dPFc[1]	Float		
0456	RO	dPF Total	Float		

Table 5-10 Fundamental Measurements

Notes:

1) When the **Wiring Mode** is **3P3W (Delta)**, the fundamental components of per phase line-to-neutral Voltages, kWs, kvars, kVAs and PFs have no meaning, and their registers are reserved.

2) When the **Wiring Mode** is **3P4W** (**Wye)**, the fundamental components of line-to-line voltages have no meaning, and their registers are reserved.

3) **I4** is valid only if the device is equipped with I4 option. Otherwise, it is reserved.

5.4.2 THD/TOHD/TEHD Measurements

Register	Property	Description	Format	Scale	Unit
0458	RO	Ia K-Factor	UINT16	×100	-
0459	RO	Ib K-Factor	UINT16		
0460	RO	Ic K-Factor	UINT16		
0461	RO	Ua (3P4W)/Uab (3P3W) THD	UINT16	x100	%
0462	RO	Ub (3P4W)/Ubc (3P3W) THD	UINT16		
0463	RO	Uc (3P4W)/Uca (3P3W) THD	UINT16		
0464	RO	Ia THD	UINT16		
0465	RO	Ib THD	UINT16		
0466	RO	Ic THD	UINT16		
0467	RO	I4 THD[1]	UINT16		
0468	RO	Ua (3P4W)/Uab (3P3W) TOHD	UINT16		
0469	RO	Ub (3P4W)/Ubc (3P3W) TOHD	UINT16		
0470	RO	Uc (3P4W)/Uca (3P3W) TOHD	UINT16		
0471	RO	Ia TOHD	UINT16		
0472	RO	Ib TOHD	UINT16		
0473	RO	Ic TOHD	UINT16		
0474	RO	I4 TOHD[1]	UINT16		
0475	RO	Ua (3P4W)/Uab (3P3W) TEHD	UINT16		
0476	RO	Ub (3P4W)/Ubc (3P3W) TEHD	UINT16		
0477	RO	Uc (3P4W)/Uca (3P3W) TEHD	UINT16		
0478	RO	Ia TEHD	UINT16		
0479	RO	Ib TEHD	UINT16		
0480	RO	Ic TEHD	UINT16		
0481	RO	I4 TEHD[1]	UINT16		
0482	RO	Ua (3P4W)/Uab (3P3W) HD02	UINT16		
0483	RO	Ub (3P4W)/Ubc (3P3W) HD02	UINT16		
0484	RO	Uc (3P4W)/Uca (3P3W) HD02	UINT16		
0485	RO	Ia HD02	UINT16		
0486	RO	Ib HD02	UINT16		
0487	RO	Ic HD02	UINT16		
0488	RO	I4 HD02[1]	UINT16		
…		…			
0909	RO	Ua (3P4W)/Uab (3P3W) HD63	UINT16		
0910	RO	Ub (3P4W)/Ubc (3P3W) HD63	UINT16		
0911	RO	Uc (3P4W)/Uca (3P3W) HD63	UINT16		

0912	RO	Ia HD63	UINT16		
0913	RO	Ib HD63	UINT16		
0914	RO	Ic HD63	UINT16		
0915	RO	I4 HD63[1]	UINT16		
0916	RO	Ua (3P4W)/Uab (3P3W) Crest-Factor	UINT16	x100	-
0917	RO	Ub (3P4W)/Ubc (3P3W) Crest-Factor	UINT16		-
0918	RO	Uc (3P4W)/Uca (3P3W) Crest-Factor	UINT16		-
0919	RO	Ia Crest-Factor	UINT16		-
0920	RO	Ib Crest-Factor	UINT16		-
0921	RO	Ic Crest-Factor	UINT16		-

Table 5-11 THD/TOHD/TEHD Measurements

Notes:

1) **I4 THD/TOHD/TEHD** and **Individual Harmonic** Registers are valid only if the device is equipped with the I4 option. Otherwise, they are reserved.

5.4.3 TDD Measurements

Register	Property	Description	Format	Scale	Unit
4800	RO	Ia TDD	UINT16	×100	%
4801	RO	Ib TDD	UINT16		
4802	RO	Ic TDD	UINT16		
4803	RO	Ia TDD Odd	UINT16		
4804	RO	Ib TDD Odd	UINT16		
4805	RO	Ic TDD Odd	UINT16		
4806	RO	Ia TDD Even	UINT16		
4807	RO	Ib TDD Even	UINT16		
4808	RO	Ic TDD Even	UINT16		

Table 5-12 TDD Measurements

5.5 High-speed Measurements

Register	Property	Description	Format	Scale	Unit
0930	RO	Ua[1]	Float	x1	V
0932	RO	Ub[1]	Float		
0934	RO	Uc[1]	Float		
0936	RO	Uln average[1]	Float		
0938	RO	Uab	Float		
0940	RO	Ubc	Float		
0942	RO	Uca	Float		
0944	RO	Ull average	Float		
0946	RO	Ia	Float		A
0948	RO	Ib	Float		
0950	RO	Ic	Float		
0952	RO	I average	Float		
0954	RO	I4[2]	Float		
0956	RO	kWa[1]	Float		W
0958	RO	kWb[1]	Float		
0960	RO	kWc[1]	Float		
0962	RO	kW Total	Float		
0964	RO	kvara[1]	Float		var
0966	RO	kvarb[1]	Float		
0968	RO	kvarc[1]	Float		
0970	RO	kvar Total	Float		
0972	RO	kVAa[1]	Float		VA
0974	RO	kVAb[1]	Float		
0976	RO	kVAc[1]	Float		
0978	RO	kVA Total	Float		
0980	RO	PFa[1]	Float		-
0982	RO	PFb[1]	Float		
0984	RO	PFc[1]	Float		
0986	RO	PF Total	Float		
0988	RO	In (Calculated)	Float		A

Table 5-13 High-speed Measurements

Notes:

1) When the **Wiring Mode** is **3P3W (Delta)**, the per phase line-to-neutral Voltages, kWs, kvars, kVAs and PFs have no meaning, and their registers are reserved.

2) **I4** is valid only if the device is equipped with the I4 option. Otherwise, it is reserved.

3) The high-speed measurements update Voltage @ ½ cycle, 3-phase Current, Neutral Current (I4) and In @ 1 cycle.

5.6 Event Counter

Register	Property	Description	Format	Scale	Unit
4850	RO	Swell	UINT32	x1	-
4852	RO	Dip	UINT32		
4854	RO	Interruption	UINT32		
4856	RO	Transient	UINT32		
4858	RO	Total	UINT32		

Table 5-14 Event Counter

5.7 Demand Measurements

5.7.1 Present Demand

Register	Property	Description	Format	Scale	Unit
1000	RO	Ua	INT32	x100	V
1002	RO	Ub	INT32		
1004	RO	Uc	INT32		
1006	RO	Uln average	INT32		
1008	RO	Uab	INT32		
1010	RO	Ubc	INT32		
1012	RO	Uca	INT32		
1014	RO	Ull average	INT32		
1016	RO	Ia	INT32	x1000	A
1018	RO	Ib	INT32		
1020	RO	Ic	INT32		
1022	RO	I average	INT32		
1024	RO	I4[1]	INT32		
1026	RO	kWa	INT32	x1	W
1028	RO	kWb	INT32		
1030	RO	kWc	INT32		
1032	RO	kW Total	INT32		
1034	RO	kvara	INT32	x1	var
1036	RO	kvarb	INT32		
1038	RO	kvarc	INT32		
1040	RO	kvar Total	INT32		
1042	RO	kVAa	INT32	x1	VA
1044	RO	kVAb	INT32		
1046	RO	kVAc	INT32		
1048	RO	kVA Total	INT32		
1050	RO	PFa	INT32	x1000	-
1052	RO	PFb	INT32		
1054	RO	PFc	INT32		
1056	RO	PF Total	INT32		
1058	RO	Frequency	INT32	x100	Hz
1060	RO	U2 Unbalance	INT32	x10	%
1062	RO	I2 Unbalance	INT32		
1064	RO	Ua (3P4W)/Uab (3P3W) THD	INT32	x100	%
1066	RO	Ub (3P4W)/Ubc (3P3W) THD	INT32		
1068	RO	Uc (3P4W)/Uca (3P3W) THD	INT32		
1070	RO	Ia THD	INT32		
1072	RO	Ib THD	INT32		
1074	RO	Ic THD	INT32		
1076	RO	U0 Unbalance	INT32	x10	%
1078	RO	I0 Unbalance	INT32		
1080	RO	Ia Fundamental	INT32	x1000	A
1082	RO	Ib Fundamental	INT32		
1084	RO	Ic Fundamental	INT32		

Table 5-15 Present Demand

Notes:

1) **I4 Present Demand** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated) Present Demand** if the meter is equipped with the AI option.

5.7.2 Predicted Demand

Register	Property	Description	Format	Scale	Unit
1200	RO	Ua	INT32	x100	V
1202	RO	Ub	INT32		
1204	RO	Uc	INT32		
1206	RO	Uln average	INT32		
1208	RO	Uab	INT32		
1210	RO	Ubc	INT32		
1212	RO	Uca	INT32		
1214	RO	Ull average	INT32		
1216	RO	Ia	INT32	x1000	A
1218	RO	Ib	INT32		
1220	RO	Ic	INT32		
1222	RO	I average	INT32		
1224	RO	I4[1]	INT32		
1226	RO	kWa	INT32	x1	W
1228	RO	kWb	INT32		
1230	RO	kWc	INT32		
1232	RO	kW Total	INT32		
1234	RO	kvara	INT32	x1	var
1236	RO	kvarb	INT32		
1238	RO	kvarc	INT32		
1240	RO	kvar Total	INT32		
1242	RO	kVAa	INT32	x1	VA
1244	RO	kVAb	INT32		
1246	RO	kVAc	INT32		
1248	RO	kVA Total	INT32		
1250	RO	PFa	INT32	x1000	-
1252	RO	PFb	INT32		
1254	RO	PFc	INT32		
1256	RO	PF Total	INT32		
1258	RO	Frequency	INT32	x100	Hz
1260	RO	U2 Unbalance	INT32	x10	%
1262	RO	I2 Unbalance	INT32		
1264	RO	Ua (3P4W)/Uab (3P3W) THD	INT32	x100	%
1266	RO	Ub (3P4W)/Ubc (3P3W) THD	INT32		
1268	RO	Uc (3P4W)/Uca (3P3W) THD	INT32		
1270	RO	Ia THD	INT32		
1272	RO	Ib THD	INT32		
1274	RO	Ic THD	INT32		
1276	RO	U0 Unbalance	INT32	x10	%
1278	RO	I0 Unbalance	INT32		
1280	RO	Ia Fundamental	INT32	x1000	A
1282	RO	Ib Fundamental	INT32		
1284	RO	Ic Fundamental	INT32		

Table 5-16 Predicted Demand

Notes:

1) **I4 Predicted Demand** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated) Predicted Demand** if the meter is equipped with the AI option.

5.7.3 Max./Min. per Demand Period

Register	Property	Description	Format	Scale	Unit
1400	RO	Ua Max.	INT32	x100	V
1402	RO	Ub Max.	INT32		
1404	RO	Uc Max.	INT32		
1406	RO	Uln average Max.	INT32		
1408	RO	Uab Max.	INT32		
1410	RO	Ubc Max.	INT32		
1412	RO	Uca Max.	INT32		
1414	RO	Ull average Max.	INT32		
1416	RO	Ia Max.	INT32	x1000	A
1418	RO	Ib Max.	INT32		
1420	RO	Ic Max.	INT32		
1422	RO	I average Max.	INT32		
1424	RO	I4 Max.[1]	INT32		
1426	RO	kWa Max.	INT32	x1	W

1428	RO	kWb Max.	INT32		
1430	RO	kWc Max.	INT32		
1432	RO	kW Total Max.	INT32		
1434	RO	kvara Max.	INT32	x1	var
1436	RO	kvarb Max.	INT32		
1438	RO	kvarc Max.	INT32		
1440	RO	kvar Total Max.	INT32		
1442	RO	kVAa Max.	INT32	x1	VA
1444	RO	kVAb Max.	INT32		
1446	RO	kVAc Max.	INT32		
1448	RO	kVA Total Max.	INT32		
1450	RO	PFa Max.	INT32	x1000	-
1452	RO	PFb Max.	INT32		
1454	RO	PFc Max.	INT32		
1456	RO	PF Total Max.	INT32		
1458	RO	Frequency Max.	INT32	x100	Hz
1460	RO	U2 Unbalance Max.	INT32	x10	%
1462	RO	I2 Unbalance Max.	INT32		
1464	RO	Ua (3P4W)/Uab (3P3W) THD Max.	INT32	x100	%
1466	RO	Ub (3P4W)/Ubc (3P3W) THD Max.	INT32		
1468	RO	Uc (3P4W)/Uca (3P3W) THD Max.	INT32		
1470	RO	Ia THD Max.	INT32		
1472	RO	Ib THD Max.	INT32		
1474	RO	Ic THD Max.	INT32		
1476	RO	U0 Unbalance	INT32	x10	%
1478	RO	I0 Unbalance	INT32		
1480	RO	Ia Fundamental	INT32	x1000	A
1482	RO	Ib Fundamental	INT32		
1484	RO	Ic Fundamental	INT32		
1486~1598	--	Reserved	--	--	--
1600	RO	Ua Min.	INT32	x100	V
1602	RO	Ub Min.	INT32		
1604	RO	Uc Min.	INT32		
1606	RO	Uln average Min.	INT32		
1608	RO	Uab Min.	INT32		
1610	RO	Ubc Min.	INT32		
1612	RO	Uca Min.	INT32		
1614	RO	Ull average Min.	INT32		
1616	RO	Ia Min.	INT32	x1000	A
1618	RO	Ib Min.	INT32		
1620	RO	Ic Min.	INT32		
1622	RO	I average Min.	INT32		
1624	RO	I4 Min.[1]	INT32		
1626	RO	kWa Min.	INT32	x1	W
1628	RO	kWb Min.	INT32		
1630	RO	kWc Min.	INT32		
1632	RO	kW Total Min.	INT32		
1634	RO	kvara Min.	INT32	x1	var
1636	RO	kvarb Min.	INT32		
1638	RO	kvarc Min.	INT32		
1640	RO	kvar Total Min.	INT32		
1642	RO	kVAa Min.	INT32	x1	VA
1644	RO	kVAb Min.	INT32		
1646	RO	kVAc Min.	INT32		
1648	RO	kVA Total Min.	INT32		
1650	RO	PFa Min.	INT32	x1000	-
1652	RO	PFb Min.	INT32		
1654	RO	PFc Min.	INT32		
1656	RO	PF Total Min.	INT32		
1658	RO	Frequency Min.	INT32	x100	Hz
1660	RO	U2 Unbalance Min.	INT32	x10	%
1662	RO	I2 Unbalance Min.	INT32		
1664	RO	Ua (3P4W)/Uab (3P3W) THD Min.	INT32	x100	%
1666	RO	Ub (3P4W)/Ubc (3P3W) THD Min.	INT32		
1668	RO	Uc (3P4W)/Uca (3P3W) THD Min.	INT32		
1670	RO	Ia THD Min.	INT32		
1672	RO	Ib THD Min.	INT32		

1674	RO	Ic THD Min.	INT32		
1676	RO	U0 Unbalance	INT32	x10	%
1678	RO	I0 Unbalance	INT32		
1680	RO	Ia Fundamental	INT32	x1000	A
1682	RO	Ib Fundamental	INT32		
1684	RO	Ic Fundamental	INT32		

Table 5-17 Max./Min. Value per Demand Period

Notes:

1) **I4 Max./Min. Value per Demand Period** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated) Max./Min. Value per Demand Period** if the meter is equipped with the AI option.

5.7.4 Maximum Demand Log of This Month (Since Last Reset)

Register	Property	Description	Format	Scale	Unit
1800~1805	RO	kW Total	See **Table 5-20**	x1	W
1806~1811	RO	kvar Total			var
1812~1817	RO	kVA Total			VA
1818~1823	RO	Ia		x1000	A
1824~1829	RO	Ib			
1830~1835	RO	Ic			
1836~1841	RO	I average			
1842~1847	RO	Ull average		x100	V

Table 5-18 Maximum Demand Log of This Month (Since Last Reset)

5.7.5 Maximum Demand Log of Last Month (Before Last Reset)

Register	Property	Description	Format	Scale	Unit
1850~1855	RO	kW Total	See **Table 5-20**	x1	W
1856~1861	RO	kvar Total			var
1862~1867	RO	kVA Total			VA
1868~1873	RO	Ia		x1000	A
1874~1879	RO	Ib			
1880~1885	RO	Ic			
1886~1891	RO	I average			
1892~1897	RO	Ull average		x100	V

Table 5-19 Maximum Demand Log of Last Month (Before Last Reset)

5.7.6 Demand Data Structure

Offset	Property	Description	Format	Note
+0	RO	Maximum Demand	INT32	/
+2	RO	High-order Byte: Year	Timestamp	1-37 (Year-2000)
		Low-order Byte: Month		1 to 12
+3	RO	High-order Byte: Day		1 to 31
		Low-order Byte: Hour		0 to 23
+4	RO	High-order Byte: Minute		0 to 59
		Low-order Byte: Second		0 to 59
+5	RO	Millisecond		0 to 999

Table 5-20 Demand Data Structure

5.8 Log Register

5.8.1 Max./Min. Log

5.8.1.1 Max. Log of This Month (Since Last Reset)

Register	Property	Description	Format	Scale	Unit
2000~2005	RO	Ua	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2006~2011	RO	Ub			
2012~2017	RO	Uc			
2018~2023	RO	Uln average			
2024~2029	RO	Uab			
2030~2035	RO	Ubc			
2036~2041	RO	Uca			
2042~2047	RO	Ull average			
2048~2053	RO	Ia		x1000	A
2054~2059	RO	Ib			
2060~2065	RO	Ic			
2066~2071	RO	I average			
2072~2077	RO	I4[1]			

2078~2083	RO	kW Total		x1	W
2084~2089	RO	kvar Total			var
2090~2095	RO	kVA Total			VA
2096~2101	RO	PF Total		x1000	-
2102~2107	RO	Frequency		x100	Hz
2108~2113	RO	Ua (3P4W)/Uab (3P3W) THD		x100	%
2114~2119	RO	Ub (3P4W)/Ubc (3P3W) THD			
2120~2125	RO	Uc (3P4W)/Uca (3P3W) THD			
2126~2131	RO	Ia THD			
2132~2137	RO	Ib THD			
2138~2143	RO	Ic THD			
2144~2149	RO	Ia K-Factor		x100	-
2150~2155	RO	Ib K-Factor			
2156~2161	RO	Ic K-Factor			
2162~2167	RO	U2 Unbalance		x10	%
2168~2173	RO	I2 Unbalance			
2174~2179	RO	Ir		x1000	A
2180~2185	RO	U0 Unbalance		x10	-
2186~2191	RO	I0 Unbalance			

Table 5-21 Max. Log of This Month (Since Last Reset)

Notes:

1) **I4** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated)** if the meter is equipped with the AI option.

5.8.1.2 Min. Log of This Month (Since Last Reset)

Register	Property	Description	Format	Scale	Unit
2300~2305	RO	Ua	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2306~2311	RO	Ub			
2312~2317	RO	Uc			
2318~2323	RO	Uln average			
2324~2329	RO	Uab			
2330~2335	RO	Ubc			
2336~2341	RO	Uca			
2342~2347	RO	Ull average			
2348~2353	RO	Ia		x1000	A
2354~2359	RO	Ib			
2360~2365	RO	Ic			
2366~2371	RO	I average			
2372~2377	RO	I4[1]			
2378~2383	RO	kW Total		x1	W
2384~2389	RO	kvar Total			var
2390~2395	RO	kVA Total			VA
2396~2401	RO	PF Total		x1000	-
2402~2407	RO	Frequency		x100	Hz
2408~2413	RO	Ua (3P4W)/Uab (3P3W) THD		x100	%
2414~2419	RO	Ub (3P4W)/Ubc (3P3W) THD			
2420~2425	RO	Uc (3P4W)/Uca (3P3W) THD			
2426~2431	RO	Ia THD			
2432~2437	RO	Ib THD			
2438~2443	RO	Ic THD			
2444~2449	RO	Ia K-Factor		x100	-
2450~2455	RO	Ib K-Factor			
2456~2461	RO	Ic K-Factor			
2462~2467	RO	U2 Unbalance		x10	%
2468~2473	RO	I2 Unbalance			
2474~2479	RO	Ir		x1000	A
2480~2485	RO	U0 Unbalance		x10	%
2486~2491	RO	I0 Unbalance			

Table 5-22 Min. Log of This Month (Since Last Reset)

Notes:

1) **I4** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated)** if the meter is equipped with the AI option.

5.8.1.3 Max. Log of Last Month (Before Last Reset)

Register	Property	Description	Format	Scale	Unit
2600~2605	RO	Ua	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2606~2611	RO	Ub			
2612~2617	RO	Uc			
2618~2623	RO	Uln average			
2624~2629	RO	Uab			
2630~2635	RO	Ubc			
2636~2641	RO	Uca			
2642~2647	RO	Ull average			
2648~2653	RO	Ia		x1000	A
2654~2659	RO	Ib			
2660~2665	RO	Ic			
2666~2671	RO	I average			
2672~2677	RO	I4[1]			
2678~2683	RO	kW Total		x1	W
2684~2689	RO	kvar Total			var
2690~2695	RO	kVA Total			VA
2696~2701	RO	PF Total		x1000	-
2702~2707	RO	Frequency		x100	Hz
2708~2713	RO	Ua (3P4W)/Uab (3P3W) THD		x100	%
2714~2719	RO	Ub (3P4W)/Ubc (3P3W) THD			
2720~2725	RO	Uc (3P4W)/Uca (3P3W) THD			
2726~2731	RO	Ia THD			
2732~2737	RO	Ib THD			
2738~2743	RO	Ic THD			
2744~2749	RO	Ia K-Factor		x100	-
2750~2755	RO	Ib K-Factor			
2756~2761	RO	Ic K-Factor			
2762~2767	RO	U2 Unbalance		x10	%
2768~2773	RO	I2 Unbalance			
2774~2779	RO	Ir		x1000	A
2780~2785	RO	U0 Unbalance		x10	%
2786~2791	RO	I0 Unbalance			

Table 5-23 Max. Log of Last Month (Before Last Reset)

Notes:

1) **I4** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated)** if the meter is equipped with the AI option.

5.8.1.4 Min Log of Last Month (Before Last Reset)

Register	Property	Description	Format	Scale	Unit
2900~2905	RO	Ua	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2906~2911	RO	Ub			
2912~2917	RO	Uc			
2918~2923	RO	Uln average			
2924~2929	RO	Uab			
2930~2935	RO	Ubc			
2936~2941	RO	Uca			
2942~2947	RO	Ull average			
2948~2953	RO	Ia		x1000	A
2954~2959	RO	Ib			
2960~2965	RO	Ic			
2966~2971	RO	I average			
2972~2977	RO	I4[1]			
2978~2983	RO	kW Total		x1	W
2984~2989	RO	kvar Total			var
2990~2995	RO	kVA Total			VA
2996~3001	RO	PF Total		x1000	-
3002~3007	RO	Frequency		x100	Hz
3008~3013	RO	Ua (3P4W)/Uab (3P3W) THD		x100	%
3014~3019	RO	Ub (3P4W)/Ubc (3P3W) THD			
3020~3025	RO	Uc (3P4W)/Uca (3P3W) THD			
3026~3031	RO	Ia THD			
3032~3037	RO	Ib THD			
3038~3043	RO	Ic THD			

3044~3049	RO	Ia K-Factor		x100	-
3050~3055	RO	Ib K-Factor			
3056~3061	RO	Ic K-Factor			
3062~3067	RO	U2 Unbalance		x10	%
3068~3073	RO	I2 Unbalance			
3074~3079	RO	Ir		x1000	A
3080~3085	RO	U0 Unbalance		x10	%
3086~3091	RO	I0 Unbalance			

Table 5-24 Min. Log of Last Month (Before Last Reset)

Notes:

1) **I4** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated)** if the meter is equipped with the AI option.

5.8.1.5 Max./Min. Log Data Structure

Offset	Property	Description	Format	Note
+0	RO	Max./Min. Value	INT32	-
+2	RO	High-order Byte: Year	UINT16	1-37 (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

Table 5-25 Max./Min. Log Data Structure

5.8.2 SOE Log

The **SOE Pointer** points to the location within the **SOE Log** where the next event will be stored. The following formula is used to determine the register address of the most recent SOE event referenced by the **SOE Pointer** value: Register Address = 10000 + Modulo((**SOE Pointer**-1) / 512)*7

Register	Property	Description	Format
10000~10006	RO	Event 1	See **Table 5-27 SOE Log Data Structure**
10007~10013	RO	Event 2	
10014~10020	RO	Event 3	
10021~10027	RO	Event 4	
10028~10034	RO	Event 5	
…		…	
13577~13583	RO	Event 512	

Table 5-26 SOE Log

Notes:

1) SOE Log Data Structure

Offset	Properties	Description	Format	Note
+0	RO	High-order Byte: Event Classification	UINT16	**See Appendix C**
		Low-order Byte: Sub-Classification		**See Appendix C**
+1	RO	High-order Byte: Year	Timestamp	0-37 (Year-2000)
		Low-order Byte: Month		1 to 12
+2	RO	High-order Byte: Day		1 to 31
		Low-order Byte: Hour		0 to 23
+3	RO	High-order Byte: Minute		0 to 59
		Low-order Byte: Second		0 to 59
+4	RO	Millisecond		0 to 999
+5	RO	Event Value	INT32	**See Appendix C**
+6	RO			

Table 5-27 SOE Log Data Structure

5.8.3 PQ Log

Register	Property	Description	Format
20000~20014	RO	Event 1	See **Table 5-29 PQ Log Data Structure**
20015~20029	RO	Event 2	
20030~20044	RO	Event 3	
20045~20059	RO	Event 4	
20060~20074	RO	Event 5	
20075~20089	RO	Event 6	
20090~20104	RO	Event 7	

20105~20119	RO	Event 8	
20120~20134	RO	Event 9	
20135~20149	RO	Event 10	
20150~20164	RO	Event 11	
20165~20179	RO	Event 12	
…		…	
27665~27679	RO	Event 512	

Table 5-28 PQ Log

Offset	Properties	Description	Format	Note
+0	RO	High-order Byte: Event Classification	UINT16	See Table 5-30
		Low-order Byte: Sub-Classification		
+1	RO	High-order Byte: Year	Timestamp	1-37 (Year-2000)
		Low-order Byte: Month		1 to 12
+2	RO	High-order Byte: Day		1 to 31
		Low-order Byte: Hour		0 to 23
+3	RO	High-order Byte: Minute		0 to 59
		Low-order Byte: Second		0 to 59
+4	RO	Millisecond		0 to 999
+5~+6	RO	Event Value 1	INT32	See Table 5-30 - **Event Value**
+7~+8	RO	Event Value 2	INT32	
+9~+10	RO	Event Value 3	INT32	
+11~+12	RO	Event Value 4	INT32	
+13~+14	RO	Event Value 5	INT32	

Table 5-29 PQ Log Data Structure

PQ Log Classification	Sub-Classification	Description	Event Value, Unit, Scale, Option
7. Transient	1	Transient Triggered	**Event Value 1**: Maximum of Transient (%), x100 **Event Value 2**: Duration (μs) **Event Value 3:** Maximum Ua/Uab Transient (%), x100 **Event Value 4**: Maximum Ub/Ubc Transient (%), x100 **Event Value 5**: Maximum Uc/Uca Transient (%), x100
8. Dip/Swell	1	Swell Starts	**Event Value 1:** Trigger Phase B0 = Ua B1 = Ub B2 = Uc B3 = Uab B4 = Ubc B5 = Uca **Event Value 2 to 5:** Reserved
	2	Swell Ends	When the **Wiring Mode** is **3P4W(WYE)**: **Event Value 1**: Maximum %Residual Uln, x100 **Event Value 2**: Duration (ms) **Event Value 3**: %Residual $Ua_{max}/Uln_{nominal}$, x100 **Event Value 4**: %Residual $Ub_{max}/Uln_{nominal}$, x100 **Event Value 5**: %Residual $Uc_{max}/Uln_{nominal}$, x100 Where $Uln_{nominal} = (Ull_{nominal} \div \sqrt{3})$ When the **Wiring Mode** is **3P3W (Delta)**: **Event Value 1**: Maximum %Residual Ull, x100 **Event Value 2**: Duration (us) **Event Value 3**: %Residual $Uab_{max}/Ull_{nominal}$, x100 **Event Value 4**: %Residual $Ubc_{max}/Ull_{nominal}$, x100 **Event Value 5**: %Residual $Uca_{max}/Ull_{nominal}$, x100
	3	Dip Starts	See **PQ Log Classification** 8 => **Sub-Classification** 1
	4	Dip Ends	When the **Wiring Mode** is **3P4W(WYE)**: **Event Value 1**: Minimum %Residual Uln, x100 **Event Value 2**: Duration (ms) **Event Value 3**: %Residual $Ua_{min}/Uln_{nominal}$, x100 **Event Value 4**: %Residual $Ub_{min}/Uln_{nominal}$, x100 **Event Value 5**: %Residual $Uc_{min}/Uln_{nominal}$, x100 Where $Uln_{nominal} = (Ull_{nominal} \div \sqrt{3})$ When the **Wiring Mode** is **3P3W (Delta)**: **Event Value 1**: Maximum %Residual Ull, x100 **Event Value 2**: Duration (ms) **Event Value 3**: %Residual $Uab_{min}/Ull_{nominal}$, x100 **Event Value 4**: %Residual $Ubc_{min}/Ull_{nominal}$, x100 **Event Value 5**: %Residual $Uca_{min}/Ull_{nominal}$, x100
	5	Interruption Starts	**Event Value 1:** Trigger Phase B0 = Ua B1 = Ub B2 = Uc B3 = Uab B4 = Ubc B5 = Uca **Event Value 2 to 5:** Reserved

	6	Interruption Ends	When the **Wiring Mode** is **3P4W(WYE)**: **Event Value 1**: Minimum %Residual Uln, x100 **Event Value 2**: Duration (ms) **Event Value 3**: %Residual $Ua_{min}/Uln_{nominal}$, x100 **Event Value 4**: %Residual $Ub_{min}/Uln_{nominal}$, x100 **Event Value 5**: %Residual $Uc_{min}/Uln_{nominal}$, x100 Where $Uln_{nominal} = (Ull_{nominal} \div \sqrt{3})$ When the **Wiring Mode** is **3P3W (Delta)**: **Event Value 1**: Maximum %Residual Ull, x100 **Event Value 2**: Duration (ms) **Event Value 3**: %Residual $Uab_{min}/Ull_{nominal}$, x100 **Event Value 4**: %Residual $Ubc_{min}/Ull_{nominal}$, x100 **Event Value 5**: %Residual $Uca_{min}/Ull_{nominal}$, x100
	7	Disturbance Direction Indicator[0]	**Event Value 1**: Location 0=Upstream, 1=Downstream **Event Value 2**: Confidence 0=Low, 1=Middle, 2=High
	8	PQ Disturbance Started[0]	**Reserved**
	9	PQ Disturbance Ended[0]	When the **Wiring Mode** is **3P4W(WYE)**: **Event Value 1**: %Residual $Ua_{min}/Uln_{nominal}$, x100 **Event Value 2**: %Residual $Ub_{min}/Uln_{nominal}$, x100 **Event Value 3**: %Residual $Uc_{min}/Uln_{nominal}$, x100 Where $Uln_{nominal} = (Ull_{nominal} \div \sqrt{3})$ When the **Wiring Mode** is **3P3W (Delta)**: **Event Value 1**: %Residual $Uab_{min}/Ull_{nominal}$, x100 **Event Value 2**: %Residual $Ubc_{min}/Ull_{nominal}$, x100 **Event Value 3**: %Residual $Uca_{min}/Ull_{nominal}$, x100

Note:
The Disturbance Direction Indicator, PQ Disturbance Started/Ended events are supported in Firmware V3.10.00 or later.

Table 5-30 PQ Log Classification

5.8.4 Data Recorder Log

Register	Property	Description	Format
28000~28038	RO	High-Speed Data Recorder #1	See Table 5-32
28040~28078	RO	High-Speed Data Recorder #2	
28080~28118	RO	High-Speed Data Recorder #3	
28120~28158	RO	High-Speed Data Recorder#4	
28160~28198	RO	Standard Data Recorder #1	
28200~28238	RO	Standard Data Recorder #2	
…	RO	…	
29200~29238	RO	Standard Data Recorder #27	
29240~29278	RO	Standard Data Recorder #28	

Table 5-31 Data Recorder Buffer

Offset	Properties	Format	Description
+0	RW	UINT32	Data Recorder Log Index N
+2	RO	Timestamp	High-order: Year (-2000) Low-order: Month (1 to 12)
+3	RO		High-order: Day (1 to 31) Low-order: Hour (0 to 23)
+4	RO		High-order: Minute (0 to 59) Low-order: Second (0 to 59)
+5	RO		Millisecond (0 to 999)
+6	RO	INT32	Parameter 1
…	RO	INT32	…
+36	RO	INT32	Parameter 16
+38	--	--	Reserved

Table 5-32 Data Recorder Log Structure

5.8.5 EN50160 Log

The iMeter 6 can store up to 52 entries EN50160 Log (supported in Firmware V3.10.00 or later) for a year. Retrieve the newest 52 entries EN50160 logs through writing the entry number which you can get from **EN50160 Report Pointer** (Register 0194) into **EN50160 Log Index X** (Register 24200). For example, if the value for **EN50160 Report Pointer** is 100, then you can write 100 to 49 into **24200** register where 100 means the newest logs and 49 means the oldest logs.

Register	Property	Description	Format	Note
41000	RW	EN50160 Log Index X	UINT32	
41002	RO	Start Time	Bitmap	See Table 5-34
14005	RO	End Time	Bitmap	
41008	RO	Reserved	UINT32	

41010	RO	Freq. Evaluation Result	UINT32	0=Pass, 1=Failed
41012	RO	Freq N Valid	UINT32	Number of valid intervals
41014	RO	Freq N Invalid	UINT32	Number of invalid intervals
41016	RO	Freq Wide Limit Result	UINT32	0=Pass, 1=Failed
41018	RO	Freq N2	UINT32	Number of valid intervals in which the freq deviates from the nominal by more than user defined wide limit
41020	RO	Freq (1 - N2/N)	Float	--
41022	RO	Freq Narrow Limit Result	UINT32	0=Pass, 1=Failed
41024	RO	Freq N1	UINT32	Number of valid intervals in which the freq. deviates from the nominal by more than user defined narrow limit
41026	RO	Freq (1 - N1/N)	Float	--
41028	RO	Freq Max-op	Float	Hz, maximum mean Frequency (Freq mean-ep) over 1week
41030	RO	Freq Min-op	Float	Hz, minimum mean Frequency (Freq mean-ep) over 1week
41032	RO	U Magnitude Conclusion	UINT32	0=Pass, 1=Failed
41034	RO	U Mag N Valid	UINT32	Number of valid intervals
41036	RO	U Mag Invalid N	UINT32	Number of invalid intervals
41038	RO	U Mag Wide Conclusion	UINT32	0=Pass, 1=Failed
41040	RO	Ua Mag N2	UINT32	Number of valid intervals in which the voltage on 3-phase deviates from nominal by more than user defined wide limit
41042	RO	Ub Mag N2	UINT32	
41044	RO	Uc Mag N2	UINT32	
41046	RO	Ua Mag (1 - N2/N)	Float	--
41048	RO	Ub Mag (1 - N2/N)	Float	--
41050	RO	Uc Mag (1 - N2/N)	Float	--
41052	RO	U Mag Narrow Conclusion	UINT32	0=Pass, 1=Failed
41054	RO	Ua Mag N1	UINT32	Number of valid intervals in which the voltage on 3-phase deviates from nominal by more than user defined narrow limit
41056	RO	Ub Mag N1	UINT32	
41058	RO	Uc Mag N1	UINT32	
41060	RO	Ua Mag (1 - N1/N)	Float	--
41062	RO	Ub Mag (1 - N1/N)	Float	
41064	RO	Uc Mag (1 - N1/N)	Float	--
41066	RO	Ua mean Max.	Float	Max. of average voltage Ua/Ub/Uc over 1 week
41068	RO	Ub mean Max.	Float	
41070	RO	Uc mean Max.	Float	
41072	RO	Ua mean Min.	Float	Min. of average voltage Ua/Ub/Uc over 1 week
41074	RO	Ub mean Min.	Float	
41076	RO	Uc mean Min.	Float	
41078	RO	U Unbalance Conclusion	UINT32	0=Pass, 1=Failed
41080	RO	U Unbalance N valid	UINT32	Number of valid intervals
41082	RO	U Unbalance N invalid	UINT32	Number of invalid intervals
41084	RO	U Unbalance N1	UINT32	Number of valid intervals in which the voltage unbalance exceeds user defined unbalance limit value
41086	RO	U Unbalance (1 - N1/N)	Float	--
41088	RO	U Unbalance Max.	Float	Maximum/Minimum/CP95 voltage unbalance value over 1 week
41090	RO	U Unbalance Min.	Float	
41092	RO	U Unbalance CP95	Float	
41094	RO	Harmonic Conclusion	UINT32	0=Pass, 1=Failed
41096	RO	Harmonic N Valid	UINT32	Number of valid intervals
41098	RO	Harmonic N Invalid	UINT32	Number of invalid intervals
41100	RO	THD Conclusion	UINT32	0=Pass, 1=Failed
41102	RO	Ua THD N1	UINT32	Number of intervals in which the THD on 3-phase exceed user defined limits
41104	RO	Ub THD N1	UINT32	
41106	RO	Uc THD N1	UINT32	
41108	RO	Ua THD (1 - N1/N)	Float	--
41110	RO	Ub THD (1 - N1/N)	Float	--
41112	RO	Uc THD (1 - N1/N)	Float	--
41114~41140	--	Reserved	--	--
41142	RO	H02 Harm Conclusion	UINT32	0=Pass, 1=Failed
41144	RO	Ua H02 N1	UINT32	Number of intervals in which the 2nd Harmonics on 3-phase exceed user
41146	RO	Ub H02 N1	UINT32	

41148	RO	Uc H02 N1	UINT32	defined limits
41150	RO	Ua H02 (1 - N1/N)	Float	--
41152	RO	Ub H02 (1 - N1/N)	Float	--
41154	RO	Uc H02 (1 - N1/N)	Float	--
.....	RO	.....	UINT32	.....
41464	RO	H25 Conclusion	UINT32	0=Pass, 1=Failed
41466	RO	Ua H25 N1	UINT32	Number of intervals in which the 25th Harmonics on 3-phase exceed user defined limits
41468	RO	Ub H25 N1	UINT32	
41470	RO	Uc H25 N1	UINT32	
41472	RO	Ua H25 (1 - N1/N)	Float	--
41474	RO	Ub H25 (1 - N1/N)	Float	--
41476	RO	Uc H25 (1 - N1/N)	Float	--
41478	RO	Ua THD Max.	Float	Max. THD on 3-phase over 1 week
41480	RO	Ub THD Max.	Float	
41482	RO	Uc THD Max.	Float	
41484	RO	Ua THD Min.	Float	Min. THD on 3-phase over 1 week
41486	RO	Ub THD Min.	Float	
41488	RO	Uc THD Min.	Float	
41490	RO	Ua THD CP95	Float	CP95 average THD on 3-phase over 1 week
41492	RO	Ub THD CP95	Float	
41494	RO	Uc THD CP95	Float	
41496	RO	Ua THD Avg	Float	Average THD on 3-phase over 1 week
41498	RO	Ub THD Avg	Float	
41500	RO	Uc THD Avg	Float	
41502~41512	--	Reserved	--	--
41514	RO	Ua H02 Max.	Float	Maximum 2nd harmonics on 3-phase over 1 week
41516	RO	Ub H02 Max.	Float	
41518	RO	Uc H02 Max.	Float	
...	RO	.....	Float	.....
41652	RO	Ua H25 Max.	Float	Maximum 25th harmonics on 3-phase over 1 week
41654	RO	Ub H25 Max.	Float	
41656	RO	Uc H25 Max.	Float	
41658~41668	--	Reserved	--	--
41670	RO	Ua H02 Min.	Float	Minimum 2nd harmonics on 3-phase over 1 week
41672	RO	Ub H02 Min.	Float	
41674	RO	Uc H02 Min.	Float	
...	RO	.....	Float	.....
41808	RO	Ua H25 Min.	Float	Minimum 25th harmonics on 3-phase over 1 week
41810	RO	Ub H25 Min.	Float	
41812	RO	Uc H25 Min.	Float	
41814~41824	--	Reserved	--	--
41826	RO	Ua H02 CP95	Float	CP95 2nd harmonics on 3-phase over 1 week
41828	RO	Ub H02 CP95	Float	
41830	RO	Uc H02 CP95	Float	
...	RO	.....	Float	.....
41964	RO	Ua H25 CP95	Float	CP95 25th harmonics on 3-phase over 1 week
41966	RO	Ub H25 CP95	Float	
41968	RO	Uc H25 CP95	Float	
41970~41980	--	Reserved	--	--
41982	RO	Ua H02 Avg	Float	Average 2nd harmonics on 3-phase over 1 week
41984	RO	Uc H02 Avg	Float	
41986	RO	Uc H02 Avg	Float	
...	RO	.....	Float	.....
42120	RO	Ua H25 Avg	Float	Average 25th harmonics on 3-phase over 1 week
42122	RO	Uc H25 Avg	Float	
42124	RO	Uc H25 Avg	Float	
42126	RO	Swell N11	UINT32	See Note 1)
42128	RO	Swell N21	UINT32	
42130	RO	Swell N31	UINT32	
42132	RO	Swell N41	UINT32	
42134	RO	Swell N12	UINT32	
42136	RO	Swell N22	UINT32	
42138	RO	Swell N32	UINT32	
42140	RO	Swell N42	UINT32	
42142	RO	Swell N13	UINT32	
42144	RO	Swell N23	UINT32	
42146	RO	Swell N33	UINT32	

42148	RO	Swell N43	UINT32	
42150	RO	Swell N14	UINT32	
42152	RO	Swell N24	UINT32	
42154	RO	Swell N34	UINT32	
42156	RO	Swell N44	UINT32	
42158	RO	Swell N15	UINT32	
42160	RO	Swell N25	UINT32	
42162	RO	Swell N35	UINT32	
42164	RO	Swell N45	UINT32	
42166	RO	Dip N11	UINT32	
42168	RO	Dip N21	UINT32	
42170	RO	Dip N31	UINT32	
42172	RO	Dip N41	UINT32	
42174	RO	Dip N51	UINT32	
42176	RO	Dip N61	UINT32	
42178	RO	Dip N12	UINT32	
42180	RO	Dip N22	UINT32	
42182	RO	Dip N32	UINT32	
42184	RO	Dip N42	UINT32	
42186	RO	Dip N52	UINT32	
42188	RO	Dip N62	UINT32	
42190	RO	Dip N13	UINT32	
42192	RO	Dip N23	UINT32	
42194	RO	Dip N33	UINT32	
42196	RO	Dip N43	UINT32	
42198	RO	Dip N53	UINT32	
42200	RO	Dip N63	UINT32	
42202	RO	Dip N14	UINT32	
42204	RO	Dip N24	UINT32	
42206	RO	Dip N34	UINT32	
42208	RO	Dip N44	UINT32	
42210	RO	Dip N54	UINT32	
42212	RO	Dip N64	UINT32	
42214	RO	Dip N15	UINT32	
42216	RO	Dip N25	UINT32	
42218	RO	Dip N35	UINT32	
42220	RO	Dip N45	UINT32	
42222	RO	Dip N55	UINT32	
42224	RO	Dip N65	UINT32	
42226	RO	Interruptions N11	UINT32	
42228	RO	Interruption N21	UINT32	
42230	RO	Interruption N31	UINT32	
42232	RO	Ua Transient N1	UINT32	Transients occur on 3-Phase over 1 week
42234	RO	Ub Transient N1	UINT32	
42236	RO	Uc Transient N1	UINT32	

Table 5-33 EN50160 Log

Note:

1) The following table illustrates the structure for the Start/End time of the EN50160 Log.

Offset	Property	Description	Format	Unit
+0	RO	Year	Timestamp	1-37 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day		1 to 31
	RO	Hour		0 to 23
+2	RO	Minute		0 to 59
	RO	Second		0 to 59

Table 5-34 Time structure

2) Nxx have the following definitions:

Swell (t indicates Duration, while u indicates Residual Voltage)				
Counter	10ms≤ *t*≤500ms	500ms < t ≤5000ms	5000ms < t ≤60000ms	t>60000ms
110%<u<120%	N11	N21	N31	N41
120%≤u<140%	N12	N22	N32	N42
140%≤u<160%	N13	N23	N33	N43
160%≤u<200%	N14	N24	N34	N44
u≥200%	N15	N25	N35	N45

Table 5-35 Swell Counter Definition

Dip (t indicates Duration, while u indicates Residual Voltage)						
Counter	10ms<t≤200ms	200ms<t ≤500ms	500ms<t≤1000ms	1000ms<t≤5000ms	5000ms<t≤60000ms	t>60000ms
u<5%	N11	N21	N31	N41	N51	N61
5%≤u<40%	N12	N22	N32	N42	N52	N62
40%≤u<70%	N13	N23	N33	N43	N53	N63
70%≤u<80%	N14	N24	N34	N44	N54	N64
80%≤u<90%	N15	N25	N35	N45	N55	N65

Table 5-36 Dip Counter Definition

Interruption (t indicates Duration, while u indicates Residual Voltage)			
Counter	t<=1000s	1000<t<=180000ms	t>180000ms
	N11	N21	N31

Table 5-37 Interruption Counter Definition

5.9 MB Slave Measurements

Register	Property	Description	Format
31000~31253	RO	MB Slave #1's Data	See Table 5-39
31300~31553	RO	MB Slave #2's Data	
31600~31853	RO	MB Slave #3's Data	
31900~32153	RO	MB Slave #4's Data	
…	RO	…	
39700~39953	RO	MB Slave #30's Data	
40000~40253	RO	MB Slave #31's Data	

Table 5-38 MB Slave's Measurements

Offset	Properties	Description	Format	Unit/Scale
+0	RO	Ua	Float	V, x1
+2	RO	Ub	Float	V, x1
+4	RO	Uc	Float	V, x1
+6	RO	Uln average	Float	V, x1
+8	RO	Ung	Float	V, x1
+10	RO	Uab	Float	V, x1
+12	RO	Ubc	Float	V, x1
+14	RO	Uca	Float	V, x1
+16	RO	Ull average	Float	V, x1
+18	RO	Ia	Float	A, x1
+20	RO	Ib	Float	A, x1
+22	RO	Ic	Float	A, x1
+24	RO	I average	Float	A, x1
+26	RO	kWa	Float	W, x1
+28	RO	kWb	Float	W, x1
+30	RO	kWc	Float	W, x1
+32	RO	kW Total	Float	W, x1
+34	RO	kvara	Float	var, x1
+36	RO	kvarb	Float	var, x1
+38	RO	kvarc	Float	var, x1
+40	RO	kvar Total	Float	var, x1
+42	RO	kVAa	Float	VA, x1
+44	RO	kVAb	Float	VA, x1
+46	RO	kVAc	Float	VA, x1
+48	RO	kVA Total	Float	VA, x1
+50	RO	PFa	Float	--
+52	RO	PFb	Float	--
+54	RO	PFc	Float	--
+56	RO	PF Total	Float	--
+58	RO	Frequency	Float	Hz, x1
+60	RO	Ua (3P4W) / Uab (3P3W) Phase Angle	Float	°
+62	RO	Ub (3P4W) / Ubc (3P3W) Phase Angle	Float	°
+64	RO	Uc (3P4W) / Uca (3P3W) Phase Angle	Float	°
+66	RO	Ia Phase Angle	Float	°
+68	RO	Ib Phase Angle	Float	°
+70	RO	Ic Phase Angle	Float	°
+72	RO	In (Calculated)	Float	A, x1
+74	RO	I4	Float	A, x1
+76	RO	dPF	Float	--
+78	RO	Device Operating Time	UINT32	Hour, x0.1
+80	RO	U1 (Positive Sequence)	Float	V, x1

+82	RO	U2 (Negative Sequence)	Float	V, x1
+84	RO	U0 (Zero Sequence)	Float	V, x1
+86	RO	I1 (Positive Sequence)	Float	A, x1
+88	RO	I2 (Negative Sequence)	Float	A, x1
+90	RO	I0 (Zero Sequence)	Float	A, x1
+92	RO	kWh Import	INT32	kWh, x0.1
+94	RO	kWh Export	INT32	kWh, x0.1
+96	RO	kWh Net	INT32	kWh, x0.1
+98	RO	kWh Total	INT32	kWh, x0.1
+100	RO	kvarh Import	INT32	kvarh, x0.1
+102	RO	kvarh Export	INT32	kvarh, x0.1
+104	RO	kvarh Net	INT32	kvarh, x0.1
+106	RO	kvarh Total	INT32	kvarh, x0.1
+108	RO	kVAh	INT32	kVAh, x0.1
+110	RO	Ia Present Demand	Float	A, x1
+112	RO	Ib Present Demand	Float	A, x1
+114	RO	Ic Present Demand	Float	A, x1
+116	RO	I average Present Demand	Float	A, x1
+118	RO	Ua Present Demand	Float	V, x1
+120	RO	Ub Present Demand	Float	V, x1
+122	RO	Uc Present Demand	Float	V, x1
+124	RO	Uln average Present Demand	Float	V, x1
+126	RO	Uab Present Demand	Float	V, x1
+128	RO	Ubc Present Demand	Float	V, x1
+130	RO	Uca Present Demand	Float	V, x1
+132	RO	Ull average Present Demand	Float	V, x1
+134	RO	kW Total Present Demand	Float	W, x1
+136	RO	kvar Total Present Demand	Float	var, x1
+138	RO	kVA Total Present Demand	Float	VA, x1
+140	RO	Ia This Max. Demand	See Table 5-40	A, x1
+146	RO	Ib This Max. Demand		A, x1
+152	RO	Ic This Max. Demand		A, x1
+158	RO	I average This Max. Demand		A, x1
+164	RO	Ua This Max. Demand		V, x1
+170	RO	Ub This Max. Demand		V, x1
+176	RO	Uc This Max. Demand		V, x1
+182	RO	Uln average This Max. Demand		V, x1
+188	RO	Uab This Max. Demand		V, x1
+194	RO	Ubc This Max. Demand		V, x1
+200	RO	Uca This Max. Demand		V, x1
+206	RO	Ull average This Max. Demand		V, x1
+212	RO	kW This Max. Demand		W, x1
+218	RO	kvar This Max. Demand		var, x1
+224	RO	kVA This Max. Demand		VA, x1
+230	RO	U Unbalance	Float	--
+232	RO	I Unbalance	Float	--
+234	RO	Ia TDD	Float	--
+236	RO	Ib TDD	Float	--
+238	RO	Ic TDD	Float	--
+240	RO	Ia THD	Float	--
+242	RO	Ib THD	Float	--
+244	RO	Ic THD	Float	--
+246	RO	Ua THD	Float	--
+248	RO	Ub THD	Float	--
+250	RO	Uc THD	Float	--
+252	RO	DI Status	UINT16	--
+253	RO	DO Status	UINT16	--
+254	RO	MB Master Connection Status[2]	UINT16	--

Table 5-39 MB Slave's Data Structure

Note:

1. The following table illustrates the details for Max. Demand Data Format.

Offset	Property	Description	Format	Note
+0	RO	High-order Byte: Year	Timestamp	1-37 (Year-2000)
		Low-order Byte: Month		1 to 12
+1	RO	High-order Byte: Day		1 to 31
		Low-order Byte: Hour		0 to 23

+2	RO	High-order Byte: Minute		0 to 59
		Low-order Byte: Second		0 to 59
+3	RO	Millisecond		0 to 999
+4~+5	RO	Max. Demand	Float	/

Table 5-40 MB Slave's Max. Demand Data Format

2. The bit value of "0" means the connection is normal while "1" means abnormal for **MB Master Connection Status** register.

5.10 Device Setup

5.10.1 Basic Setup

Register	Property	Description	Format	Range/Default*
5999~6002	RW	Reserved	UINT16	-
6003	RW	Wiring Mode	UINT16	0=3P4W*, 1=DEMO, 2=3P3W, 3=1P2W L-N, 4=1P2W L-L, 5=1P3W L-L-N
6004	RW	Secondary Ull Nominal ($Ull_{nominal}$)	UINT16	100V to 700V (Ull), See Note 1
6005	RW	Nominal Frequency ($f_{nominal}$)	UINT16	0=50Hz*, 1=60Hz
6006	RW	Port 1 Protocol	UINT16	0=Modbus*, 1=Gateway, 2=MB Master
6007	RW	Port 1 Unit ID	UINT16	1 to 247, 100*
6008	RW	Port 1 Baudrate	UINT16	0=1200, 1=2400, 2=4800, 3=9600* 4=19200, 5=38400
6009	RW	Port 1 Data Format	UINT16	0=8N2, 1=8O1, 2=8E1*, 3=8N1, 4=8O2, 5=8E2
6010~6012	--	Reserved	--	--
6013	RW	IP Address[2]	UINT32	192.168.0.100*
6015	RW	Subnet Mask[2]	UINT32	255.255.255.0*
6017	RW	Ethernet Gateway[2]	UINT32	192.168.0.1*
6019	RW	PF Convention[3]	UINT16	0=IEC*, 1=IEEE, 2=-IEEE
6020	RW	kVA Calculation[4]	UINT16	0=Vector*, 1=Scalar
6021	RW	Demand Sync. Method	UINT16	0= SLD*, 1=SYNC DI
6022	RW	Demand Period	UINT16	1 to 60 (minutes), 15*
6023	RW	Number of Sliding Windows	UINT16	1 to 15, 1*
6024	RW	Predicted Response[5]	UINT16	70 to 99, 70*
6025	RW	DI1 Function	UINT16	0=Status Input*, 1=Pulse Counter 2=SYNC DI[6], 3=PPS[7], 4=Tariff Switch[8]
6026	RW	DI2 Function	UINT16	
6027	RW	DI3 Function	UINT16	
6028	RW	DI4 Function	UINT16	0=Status Input*, 1=Pulse Counter 2=SYNC DI[6], 3=PPS[7]
6029	RW	DI5 Function	UINT16	
6030	RW	DI6 Function	UINT16	
6031	RW	DI1 Debounce	UINT16	1 to 1000 (ms), 20*
6032	RW	DI2 Debounce	UINT16	
6033	RW	DI3 Debounce	UINT16	
6034	RW	DI4 Debounce	UINT16	
6035	RW	DI5 Debounce	UINT16	
6036	RW	DI6 Debounce	UINT16	
6037	RW	DI1 Pulse Weight	UINT32	1 to 1,000,000, 1*
6039	RW	DI2 Pulse Weight	UINT32	
6041	RW	DI3 Pulse Weight	UINT32	
6043	RW	DI4 Pulse Weight	UINT32	
6045	RW	DI5 Pulse Weight	UINT32	
6047	RW	DI6 Pulse Weight	UINT32	
6049	RW	DO1 Function	UINT16	0= Remote Control/Setpoint* 1=kWh Import, 2=kWh Export 3=kvarh Import, 4=kvarh Export 5=kWh Total, 6=kvarh Total
6050	RW	DO2 Function	UINT16	
6051	RW	DO3 Function	UINT16	
6052	RW	DO1 Pulse Width	UINT16	0 to 999 (x0.1s) 0=Latch Mode*
6053	RW	DO2 Pulse Width	UINT16	
6054	RW	DO3 Pulse Width	UINT16	
6055	RW	AI Type[9]	UINT16	0=4-20mA*, 1=0-20mA
6056	RW	AI Zero scale[9]	INT32	-999,999 to +999,999, 400*
6058	RW	AI Full scale[9]	INT32	-999,999 to +999,999, 2000*
6060~6064	RW	Reserved	UINT16	-
6065	RW	I4 Polarity	UINT16	0=Normal*, 1=Reverse
6066	RW	Ia Polarity	UINT16	
6067	RW	Ib Polarity	UINT16	
6068	RW	Ic Polarity	UINT16	
6069	RW	Harmonic Calculation[10]	UINT16	0=Fundamental*, 1=RMS
6070	RW	LED Energy Pulse	UINT16	0=Disabled*

				1=kWh Import, 2=kWh Export, 3=kvarh Import, 4=kvarh Export, 5=kWh Total, 6=kvarh Total
6071	RW	Pulse Constant[11]	UINT16	0 to 4, 0*
6072	RW	Self-Read Time[12]	UINT16	See Note 12, 0xFFFF*
6073	RW	Dip/Swell Enable	UINT16	0=Disabled, 1=Enabled*
6074	RW	Swell Limit	UINT16	101 to 200, (x0.01$Ull_{nominal}$), 110*
6075	RW	Dip Limit	UINT16	1 to 99, (x0.01$Ull_{nominal}$), 90*
6076	RW	Dip/Swell Trigger 1	UINT16	See Note 13, 21*
6077	RW	Dip/Swell Trigger 2	UINT16	See Note 13, 0*
6078	--	Reserved	--	--
6079	RW	Time Zone[14]	UINT16	0 to 32, 26*
6080	RW	SNTP Broadcast[15]	UINT16	0=Disabled*, 1=Enabled
6081	RW	SNTP IP Address	UINT32	0.0.0.0*
6083	RW	SMTP IP Port	UINT16	0 to 65535, 25*
6084	RW	Reserved	UINT32	
6086~6121	RW	Sender Email[16]	UINT16	Sender@domain.com*
6122~6141	RW	Logon Password[17]	UINT16	iMeter 6*
6142~6177	RW	Receiver Email[18]	UINT16	Receiver@domain.com*
6178	RW	Transient Enable	UINT16	0=Disabled, 1=Enabled*
6179	RW	Transient Limit	UINT16	5 to 500 (x0.01 $Ull_{nominal}$), 35*
6180	RW	Transient Trigger 1	UINT16	See Note 13, 20*
6181	RW	Transient Trigger 2	UINT16	See Note 13, 0*
6182	RW	Language	UINT16	0=English*, 1=Simplified Chinese 2=Traditional Chinese
6183	RW	LCD Timeout[19]	UINT16	0 to 60 (mins), 3*
6184	RW	Interruption Limit	UINT16	0 to 50 (x0.01Un), 5*
6185	RW	Arm before Execute	UINT16	0=Disabled*, 1=Enabled
6186	RW	kvarh Calculation Method	UINT16	0=RMS*, 1=FUND
6187	RW	EN Period[20]	UINT16	5 to 60 (mins), 60*
6188	RW	PT Primary[15]	UINT32	1 to 1,000,000 (V), 100*
6190	RW	PT Secondary[15]	UINT32	1 to 1500 (V), 100*
6192	RW	CT Primary[15]	UINT32	1 to 30000 (A), 5*
6194	RW	CT Secondary[15]	UINT32	1 to 50(A), 5*
6196	RW	I4 Primary[15]	UINT32	1 to 30000 (A), 5*
6198	RW	I4 Secondary[15]	UINT32	1 to 50 (A), 5*
6200	RW	Current On Threshold	UINT16	1 to 1000 (x0.001Iprim), 1*
6201	RW	Swell Hysteresis	UINT16	1 to 1000 (x0.001 $Ull_{nominal}$), 20*
6202	RW	Dip Hysteresis	UINT16	
6203	RW	Interruption Hysteresis	UINT16	
6204	RW	Date Format	UINT16	0=YYMMDD*, 1=MMDDYY, 2=DDMMYY
6205	RW	LCD Contrast (%)	UINT16	50 to 100, 90*
6206	RW	Phase A Color	UINT16	See Note 21, 1*
6207	RW	Phase B Color	UINT16	See Note 21, 4*
6208	RW	Phase C Color	UINT16	See Note 21, 8*
6209	RW	Phase N Color	UINT16	See Note 21, 13*
6210	RW	Ground Wire Color	UINT16	0=Green, 1=Yellow-green*
6211	RW	Clock Source	UINT16	0=RTC*, 1=SNTP, 2=GPS, 3=IRIG-B
6212	RW	Gateway Port	UINT16	1 to 65535, 6000*
6213	RW	Modbus RTU Port[22]	UINT16	1 to 65535, 27011*
6214	RW	Modbus TCP Port[22]	UINT16	1 to 65535, 502*
6215	RW	Web Port[23]	UINT16	1 to 65535, 80*
6216	RW	Delimiter	UINT16	See Note 24
6217	RW	Voltage Symbol[15]	UINT16	0=U*, 1=V
6218	RW	Phase Symbol[15]	UINT16	0=ABC*, 1=123
6219	RW	IEC61850 Enable[15, 22]	UINT16	0=No*, 1=Yes
6220	RW	IEC61850 Port[15, 22]	UINT16	1 to 65535, 102*
6221	RW	FTP Enable[15]	UINT16	0=No, 1=Yes*
6222	RW	FTP Port[15]	UINT16	1 to 65535, 21*
6223	RW	SSL Enable[15]	UINT16	0=No*, 1=Yes
6224	RW	IRIG-B Time Zone[15, 25]	UINT16	0 to 32, 26*
6225	RW	SNMP Enable[15]	UINT16	0=No*, 1=Yes
6226	RW	SNMP Port[15]	UINT16	1 to 65535, 161*
6227~6242	RW	SNMP Read-Only Password[15]	UINT16	See Note 26, public*
6243~6258	RW	SNMP Read-Write Password[15]	UINT16	See Note 26, private*
6259	RW	Primary DNS[15]	UINT16	0x08080808 (8.8.8.8)*
6261	RW	Alternative DNS[15]	UINT16	0x72727272 (114.114.114.114)*

6263	RW	Web Enable[15]	UINT16	0=No, 1=Yes*
6264	RW	Ethernet Enable[15]	UINT16	0=No, 1=Yes*
6265~6304	RW	SMTP Server Address[15]	UINT16	See Note 29, 0.0.0.0*
6305	RW	Enable White List[15]	UINT16	0=No*, 1=Yes
6306	RW	IP Address 1[15]	UINT32	0*
6308	RW	IP Address 2[15]	UINT32	0*
……	RW	……	UINT32	0*
6336	RW	IP Address 16[15]	UINT32	0*
6338	RW	Web Client Validate[15]	UINT16	0=Disabled*, 1=Enabled
6339	RW	Dip/Swell Reference Voltage[15]	UINT16	0=Udin*, 1=Usr
6340	RW	Interruption Mode[15, 27]	UINT16	0=Single Phase, 1=Three Phase*
6341	RW	D/S Filter[15, 28]	UINT16	0=Disabled*, 1=Enable
6342	RW	D/S Max. Duration[15, 28]	UINT16	1~600 (s), 60*
6343	RW	Swell Max. Magnitude[15, 28]	UINT16	101~500 (%), 500*
6344	RW	Web Login Timeout[15]	UINT16	0~1440 (mins), 5*
6345~6364	RW	IEC 61850 IED Name[15, 22]	CHAR	20 Characters, Null (When the default is null for the register, the IED Name will be iMeter 6 in the icd file)

Table 5-41 Basic Setup Parameters

Notes:

1. The default Ullnominal = 120V for 69V/120V Input;
   = 415V for 240V/415V Input;
   = 690V for 400V/690V Input.
2. The last Octet of the **IP Address, Subnet Mask** and **Gateway** can neither be "0000 0000" nor "1111 1111".
   If the IP Address is "192.168.0.100", write "0xC0A80064" to this register. The default values for the **IP Address, Subnet Mask** and **Gateway Address** are 192.168.0.100, 255.255.255.0 and 192.168.0.1, respectively.
3. PF Convention (-IEEE is the same as IEEE but with the opposite sign):

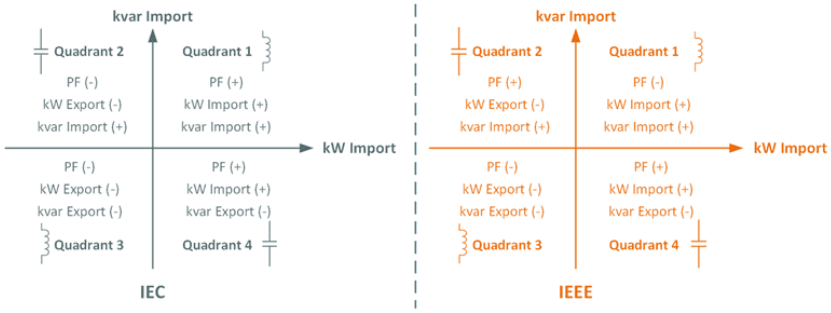


Figure 5-1 PF Convention

4. There are two methods to calculate kVA:
   Mode V (Vector method)**:** $kVA^2_{total}=\sqrt{kW^2_{total}+kvar^2_{total}}$
   Mode S (Scalar method)**:** $kVA_{total}=kVA_a+kVA_b+kVA_c$
5. The **Predicated Response** setup parameter allows the user to adjust the sensitivity of the predicted demand output. A value between 70 and 99 is recommended for a reasonably fast response. Specify a higher value for higher sensitivity.
6. Only one DI should be programmed as a Demand Sync Input and the last one that is set to Demand Sync Input is valid. For example, DI2, DI3 and DI5 are all set to Demand Sync Input, but only DI5 control the Demand Sync.
7. Only DI6 can be used as an external time synchronization (PPS) input.
8. The 3 Digital Inputs (DI1, DI2 and DI3) represent 3 binary digits where Tariff 1=000, Tariff 2=001, Tariff 3= 010, …Tariff 7=110 and Tariff 8=111 where DI1 represents the least significant digit and DI3 represents the most significant digit. As soon as DI1, DI2 and/or DI3 are configured as **Tariff Switches**, the current **TOU Tariff** will be determined by the status of the DIs, and the TOU Schedule will be ignored. The **DI1 Function** setup register must first be programmed as a **Tariff Switch** before configuring DI2 and DI3 with the same function. In other words, if DI1 is configured as a **Digital Input** or **Energy Pulse Counter**, and DI2 is configured as a **Tariff Switch**, the TOU will continue to function based on the TOU Schedule. The number of Tariffs supported depends on how many DIs are programmed as a Tariff Switch as indicated in the following table.

Tariff	DI Function		
	DI1 = Tariff Switch	DI2 & DI1 = Tariff Switch	DI3, DI2 & DI1 = Tariff Switch
T1	DI1 (0=T1)	DI2 + DI1 (00=T1)	DI3 + DI2 + DI1 (000=T1)
T2	DI1 (1=T2)	DI2 + DI1 (01=T2)	DI3 + DI2 + DI1 (001=T2)
T3	Not Available	DI2 + DI1 (10=T3)	DI3 + DI2 + DI1 (010=T3)
T4	Not Available	DI2 + DI1 (11=T4)	DI3 + DI2 + DI1 (011=T4)
T5	Not Available	Not Available	DI3 + DI2 + DI1 (100=T5)
T6	Not Available	Not Available	DI3 + DI2 + DI1 (101=T6)
T7	Not Available	Not Available	DI3 + DI2 + DI1 (110=T7)
T8	Not Available	Not Available	DI3 + DI2 + DI1 (111=T8)

Table 5-42 DIs and the Number of Tariffs Setup

9. The **AI Type**, **AI Full Scale**, **AI Zero Scale** registers are valid only when the meter is equipped with corresponding AI module.

10. There are two methods to calculate THD:

THDf:

$$THDf = \frac{\sqrt{\sum_{n=2}^{\infty} I_n^2}}{I_1} \times 100\%$$

where I_1 represents the RMS value of the fundamental component, and I_n represents the RMS value for the n^{th} harmonic with n for harmonic order.

THDr:

$$THDr = \frac{\sqrt{\sum_{n=2}^{\infty} I_n^2}}{\sqrt{\sum_{n=1}^{\infty} I_n^2}} \times 100\%$$

where I_n represents the RMS value for the n^{th} harmonic with n for harmonic order.

11. Recommended Pulse Constant settings for the different Line Voltage & Current Inputs

Voltage Input	Current Input	X Value	Energy Pulse Constant (X Value)
69V/120V	1A	4	0=1000 imp/kWh 1=3200 imp/kWh 2=5000 imp/kWh 3=6400 imp/kWh 4=12800 imp/kWh
	5A	4	
240V/415V	1A	4	
	5A	1	
400V/690V	1A	2	
	5A	0	

Table 5-43 Pulse Constant

12. The **Self-Read Time** applies to both the Maximum Demand Log as well as the Max./Min. Log and supports the following three 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 x 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.
    - A 0xFFFF value means the automatic self-read operation is disabled and the log will be transferred manually.
13. The following table illustrates the details for the value of Trigger 1/ Trigger 2 registers. Only DOx Mode is set to **Remote Control** would setting **Setpoint Trigger** to **DOx** be valid. HSDR & DR (4-19) couldn't be set as a trigger for Transient event.

Key	Action	Key	Action
0	None	**20, 21**	WFR, DWR
1-3	DO1 to DO3	**22**	Alarm Email
4-7	HS DR1 to HS DR4	**23**	iTrigger WFR
8-19	Standard DR1 to Standard DR12	**24**	iTrigger DWR

Table 5-44 Trigger 1/ Trigger 2 register

14. SNTP doesn't support Daylight Saving Time (DST). The following table lists the supported Time Zones:

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

Table 5-45 Time Zones

15. This new parameter is supported in Firmware V3.10.00 or later.
16. This string register specifies the sender email address that appears in the "From" field of the email. This string may be up to 36 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, the default sender email address is sender@domain.com, set the registers as" 0073 0065 006E 0064 0065 0072 0040 0064 006F 006D 0061 0069 006E 002E 0063 006F 006D 0000".
17. This string register specifies the Logon Password to login the "Source Email" account. This string may be up to 20 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, the default password is "iMeter 6", set the registers as "0069 004D 0065 0074 0065 0072 0036".

18. This string register specifies the receiver email address that appears in the "To" field of the email. This string may be up to 36 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, the default receiver email address is receiver@domain.com, so set the registers as" 0072 0065 0063 0065 0069 0076 0065 0072 0040 0064 006F 006D 0061 0069 006E 002E 0063 006F 006D 0000".
19. The LCD Timeout can be set from 0 to 60 minutes. A zero (0) value indicates that the LCD Timeout is disabled for 3 hours.
20. The Interval Energy will be reset once the **EN Period** is changed.
21. The following table lists the Color options for different wires.

No.	Color (R, G, B)	No.	Color (R, G, B)	No.	Color (R, G, B)	No.	Color (R, G, B)
0	Brown (153,51,0)	4	Yellow (255,255,0)	8	Blue (0,0,255)	12	White (255,255,255)
1	Red (255,0,0)	5	Turquoise (0,162,132)	9	Violet (112,48,160)	13	Black (0,0,0)
2	Pink (255,173,177)	6	Green (0,255,36)	10	Grey (159,159,159)		
3	Orange (255,102,0)	7	Light-blue (79,204,246)	11	Neutral Grey (193,193,193)		

Table 5-46 Wire Color Options

22. Modification to the Modbus TCP Port, Modbus RTU Port and IEC 61850 parameters requires a device reboot to take effect.
23. Port 80 and 443 is used for HTTP, HTTPS connection with the web server, respectively. When set other values to the port number, HTTPS is the only supported connection. Modification to the Web Port requires a device reboot to take effect.
24. The **Delimiter** setup register supports two options, 0 and 1:

    0: "," is used as the x1000 delimiter and "." as the decimal point (e.g. 123,456,789.0).
    1: " " is used as the x1000 delimiter and "," as the decimal point (e.g. 123 456 789,0).

25. It's required to set the IRIG-B Time Zone register when the Clock Source register is set to IRIG-B.
26. This string may be up to 16 characters long. Please add the value zero "0000" at the end of the string as the string terminator. The Password could be "A" to "Z", "a" to "z" , "0" to "9", "-" or "_" or a combination of them. For example, the default SNMP Read-Only Password is "public", set the registers as "0070 0075 0062 006C 0069 0063 0000".
27. The Interruption Mode register determines if an Interruption event should start when the Urms of all 3 phases (register value = 1) or when the Urms of any 1 phase (register value = 0) fall below the Interruption Threshold.
28. The Dip/Swell Filter determines if a Dip/Swell event should be recorded when the Dip/Swell duration exceeds the preset value of Dip/Swell Max. Duration register or if a Swell event should be recorded if the Urms exceeds the preset value of Swell Max. Magnitude register. The Dip/Swell Max. Duration and Swell Max. Magnitude registers are disregarded if the Dip/Swell Filter is disabled.
29. 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. The SMTP Server Address could be "A" to "Z", "a" to "z" , "0" to "9", "-", "_" or "." Or a combination of them.

5.10.2 Setpoint Setup

5.10.2.1 Setpoint Setup Registers

- **Standard Setpoint**

Register	Property	Description	Format
6600~6609	RW	Setpoint #1	See Section **5.10.2.2**
6610~6619	RW	Setpoint #2	
6620~6629	RW	Setpoint #3	
6630~6639	RW	Setpoint #4	
6640~6649	RW	Setpoint #5	
6650~6659	RW	Setpoint #6	
6660~6669	RW	Setpoint #7	
6670~6679	RW	Setpoint #8	
6680~6689	RW	Setpoint #9	
6690~6699	RW	Setpoint #10	
6700~6709	RW	Setpoint #11	
6710~6719	RW	Setpoint #12	
6720~6729	RW	Setpoint #13	
6730~6739	RW	Setpoint #14	
6740~6749	RW	Setpoint #15	
6750~6759	RW	Setpoint #16	

Table 5-47 Standard Setpoint

- **High-Speed Setpoint**

Register	Property	Description	Format
6760~6769	RW	Setpoint #1	See Section **5.10.2.2**
6770~6779	RW	Setpoint #2	
6780~6789	RW	Setpoint #3	
6790~6799	RW	Setpoint #4	
6800~6809	RW	Setpoint #5	
6810~6819	RW	Setpoint #6	
6820~6829	RW	Setpoint #7	
6830~6839	RW	Setpoint #8	

Table 5-48 High-Speed Setpoint

5.10.2.2 Setpoint Setup Data Structure

Offset	Property	Description		Format	Range	Default
+0	RW	Standard Setpoint	Type	UINT16	0=Disabled 1=Over Setpoint 2=Under Setpoint	0
+1	RW		Parameter[1]	UINT16	1 to 39	1
+2	RW		Active Limit	INT32	-	999999
+4	RW		Inactive Limit	INT32	-	0
+6	RW		Active Delay	UINT16	0 to 9999 s	10
+7	RW		Inactive Delay	UINT16	0 to 9999 s	10
+8	RW		Trigger 1[2]	UINT16	0 to 24	0
+9	RW		Trigger 2[2]	UINT16	0 to 24	0
+0	RW	High-speed Setpoint	Type	UINT16	0=Disabled 1=Over Setpoint 2=Under Setpoint	0
+1	RW		Parameter[1]	UINT16	1 to 14	1
+2	RW		Active Limit	INT32	-	999999
+4	RW		Inactive Limit	INT32	-	0
+6	RW		Active Delay	UINT16	0 to 9999 cycles	10
+7	RW		Inactive Delay	UINT16	0 to 9999 cycles	10
+8	RW		Trigger 1[2]	UINT16	0 to 24	0
+9	RW		Trigger 2[2]	UINT16	0 to 24	0

Table 5-49 Setpoint Setup Register Structure

Notes:

1. "**Parameter**" specifies the parameter to be monitored. The table below provides a list of Setpoint Parameters. Standard Setpoint can monitor all parameters while the HS Setpoint only can monitor 1 to 14.

Key	Parameter	Scale/Unit
1	Uln	x100, V
2	Ull	x100, V
3	I	x1000, A
4	I4[3] (Measured) / In (Calculated)	x1000, A
5	Freq Deviation	x100, Hz
6	kW Total	kW
7	kvar Total	kvar
8	PF	x1000
9 ~ 14	DI1 to DI6	1) For Over Setpoint, the Active Limit is DI Close (**DI=1**), and Inactive Limit is DI Open (**DI=0**); 2) For Under Setpoint, the Active Limit is DI Open (**DI=0**), and Inactive Limit is DI Close (**DI=1**).
15	AI	/
16	kW Total Present DMD	kW
17	kvar Total Present DMD	kvar
18	PF Present DMD	x1000
19	Total kW Predicted DMD	kW
20	Total kvar Predicted DMD	kvar
21	PF Predicted DMD	x1000
22	U THD	x100, %
23	U TOHD	x100, %
24	U TEHD	x100, %
25	I THD	x100, %
26	I TOHD	x100, %
27	I TEHD	x100, %
28	U2 Unbalance	x10, %
29	I2 Unbalance	x10, %
30	U Over Deviation	x100, %
31	U Phase Reversal	Active/Inactive Limit settings are invalid when Voltage Phase Reversal is set as the Setpoint Parameter.
32	Ir Calculated	x1000, A
33	U2	x100, V
34	U0	x100, V
35	I Phase Reversal	Active/Inactive Limit settings are invalid when Voltage Phase Reversal is set as the Setpoint Parameter.
36	Ia DMD	x1000, A
37	Ib DMD	x1000, A
38	Ic DMD	x1000, A
39	I Avg. DMD	x1000, A

Table 5-50 Setpoint Parameters

2. **Trigger 1/2** specifies what action the Setpoint will take when it becomes active. Table below provides a list of Setpoint Triggers.

Key	Action	Key	Action
0	None	**20, 21**	WFR, DWR
1-3	DO1 to DO3	**22**	Alarm Email
4-7	HS DR1 to HS DR4	**23**	iTrigger WFR
8-19	Standard DR1 to Standard DR12	**24**	iTrigger DWR

Only when **DOx Mode** is set to **Remote Control** would setting **Setpoint Trigger** to **DOx** be valid.

Table 5-51 Setpoint Triggers

3. The **I4** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated)** if the meter is equipped with the AI option.

5.10.3 Logical Module Setup

5.10.3.1 Logical Module Setup Registers

Register	Property	Description	Format
6840~6849	RW	Logical Module #1	See **Section 5.10.3.2**
6850~6859	RW	Logical Module #2	
6860~6869	RW	Logical Module #3	
6870~6879	RW	Logical Module #4	
6880~6889	RW	Logical Module #5	
6890~6899	RW	Logical Module #6	

Table 5-52 Logical Modules

5.10.3.2 Logical Module Setup Data Structure

Register	Property	Description	Format	Range	Default
+0	RW	Enable Logical Module	UINT16	0=Disabled, 1=Enabled	0
+1	RW	Mode 1	UINT16	0=AND, 1=OR 2=NAND, 3=NOR	0
+2	RW	Mode 2	UINT16		0
+3	RW	Mode 3	UINT16		0
+4	RW	Source 1	UINT16	See Note 1	1
+5	RW	Source 2	UINT16		2
+6	RW	Source 3	UINT16		3
+7	RW	Source 4	UINT16		4
+8	RW	Trigger 1	UINT16	See Note 2	0
+9	RW	Trigger 2	UINT16		0

Table 5-53 Logical Module Data Structure

Notes:

1. The Logical Modules can have up to 4 Source inputs. Table below provides a list of Logical Module Sources.

Key	Source	Key	Source
0	None	**13**	Standard Setpoint #13
1	Standard Setpoint #1	**14**	Standard Setpoint #14
2	Standard Setpoint #2	**15**	Standard Setpoint #15
3	Standard Setpoint #3	**16**	Standard Setpoint #16
4	Standard Setpoint #4	**17**	High-Speed Setpoint #1
5	Standard Setpoint #5	**18**	High-Speed Setpoint #2
6	Standard Setpoint #6	**19**	High-Speed Setpoint #3
7	Standard Setpoint #7	**20**	High-Speed Setpoint #4
8	Standard Setpoint #8	**21**	High-Speed Setpoint #5
9	Standard Setpoint #9	**22**	High-Speed Setpoint #6
10	Standard Setpoint #10	**23**	High-Speed Setpoint #7
11	Standard Setpoint #11	**24**	High-Speed Setpoint #8
12	Standard Setpoint #12		

Table 5-54 Logical Module Sources

2. **Trigger 1/2** specifies what action the Logical Module will take when it becomes active. Table 5-55 below provides a list of Logical Module Triggers.

Key	Action	Key	Action
0	None	**20, 21**	WFR, DWR
1-3	DO1 to DO3	**22**	Alarm Email
4-7	HS DR1 to HS DR4	**23**	iTrigger WFR
8-19	Standard DR1 to Standard DR12	**24**	iTrigger DWR

Only when **DOx Mode** is set to **Remote Control** would setting **Setpoint Trigger** to **DOx** be valid.

Table 5-55 Logical Module Triggers

5.10.4 Data Recorder Setup

5.10.4.1 Data Recorder Setup Registers

- **High-Speed Data Recorder**

Register	Property	Description	Format
7000~7022	RW	HS Data Recorder #1	See **Section 5.10.4.2**
7023~7045	RW	HS Data Recorder #2	
7046~7068	RW	HS Data Recorder #3	
7069~7091	RW	HS Data Recorder #4	

Table 5-56 High-Speed Data Recorder

- **Standard Data Recorder**

Register	Property	Description	Format
7092~7114	RW	Data Recorder #1	See **Section 5.10.4.3**
7115~7137	RW	Data Recorder #2	
…	RW	…	
7345~7367	RW	Data Recorder #12	
7368~7383	--	Reserved	
18100~18123	RW	Data Recorder #13	
18124~18147	RW	Data Recorder #14	
…	RW	…	
18436~18459	RW	Data Recorder #27	
18460~18483	RW	Data Recorder #28	

Table 5-57 Standard Data Recorder

5.10.4.2 High-Speed Data Recorder Setup Data Structure

Offset	Property	Description	Format	Range
+0	RW	Trigged Mode[1]	UINT16	0=Disabled, 1=Triggered by Timer 2=Triggered by Setpoint
+1	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out
+2	RW	Recording Depth[2]	UINT16	0 to 65535
+3	RW	Recording Interval	UINT32	1 to 60 (cycles)
+5	RW	Recording Offset[3]	UINT16	0~43200 s
+6	RW	Number of Parameters[4]	UINT16	0 to 16
+7	RW	Parameter 1	UINT16	Please refer to Appendices A and B for a complete list of the Data Recorder Parameters and the default configuration for each DR, respectively.
+8	RW	Parameter 2	UINT16	
+9	RW	Parameter 3	UINT16	
+10	RW	Parameter 4	UINT16	
+11	RW	Parameter 5	UINT16	
+12	RW	Parameter 6	UINT16	
+13	RW	Parameter 7	UINT16	
+14	RW	Parameter 8	UINT16	
+15	RW	Parameter 9	UINT16	
+16	RW	Parameter 10	UINT16	
+17	RW	Parameter 11	UINT16	
+18	RW	Parameter 12	UINT16	
+19	RW	Parameter 13	UINT16	
+20	RW	Parameter 14	UINT16	
+21	RW	Parameter 15	UINT16	
+22	RW	Parameter 16	UINT16	

Table 5-58 HS DR Setup Data Structure

Notes:

1. The High-speed Data Recorder can be triggered by Setpoints (**Triggered by Setpoint**) or on a time basis using the meter clock (**Triggered by Timer**).
   For **Triggered by Setpoint**, when the Setpoint goes active, the Data Recorder starts to record, and when the Setpoint becomes inactive, the Data Recorder stops.
2. If **Recording Depth** is set to "**0**", the Data Recorder will be disabled.
3. **Recording Offset** should be set to zero for **High-Speed Data Recorder**.
4. **Appendix A** provides a list of available parameters for data recording. Parameters 0 to 28 are available for high-speed data recording. If **Number of parameters** is set to **0**, the Data Recorder is disabled.
5. Modifying **Recording Mode**, **Recording Depth**, **Recording Interval**, **Recording Offset**, **Number of Parameters** and **Parameters 1 to 16** will clear the DRx Log and reset the DRx Pointer to "0".

5.10.4.3 Standard Data Recorder Setup Data Structure

Offset	Property	Description	Format	Range
+0	RW	Trigged Mode[1]	UINT16	0=Disabled, 1=Triggered by Timer 2=Triggered by Setpoint
+1	RW	Recording Mode	UINT16	0=Stop-When-Full 1=First-In-First-Out
+2	RW	Recording Depth[2]	UINT16	0 to 65535 for DR #1 to #26, 0 to 120000 for DR #27 & DR #28
+3	RW	Recording Interval	UINT32	1 to 3456000 (seconds)
+5	RW	Recording Offset[3]	UINT16	0 to 43200 (seconds)
+6	RW	Number of Parameters[4]	UINT16	0 to 16
+7	RW	Parameter 1	UINT16	Please refer to Appendices A and B for a complete list of the Data Recorder Parameters and the default configuration for each DR, respectively.
+8	RW	Parameter 2	UINT16	
+9	RW	Parameter 3	UINT16	
+10	RW	Parameter 4	UINT16	
+11	RW	Parameter 5	UINT16	
+12	RW	Parameter 6	UINT16	
+13	RW	Parameter 7	UINT16	
+14	RW	Parameter 8	UINT16	
+15	RW	Parameter 9	UINT16	
+16	RW	Parameter 10	UINT16	
+17	RW	Parameter 11	UINT16	
+18	RW	Parameter 12	UINT16	
+19	RW	Parameter 13	UINT16	
+20	RW	Parameter 14	UINT16	
+21	RW	Parameter 15	UINT16	
+22	RW	Parameter 16	UINT16	

Table 5-59 Standard DR Setup Data Structure

Notes:

1. The Standard Data Recorder #1 to #12 can be triggered by Setpoint (**Triggered by Setpoint**) or on a time basis using the meter clock (**Triggered by Timer**), but the Standard Data Recorder #13 to #28 can only be triggered by **Timer**.
   For **Triggered by Setpoint**, when the Setpoint goes active, the Data Recorder starts to record, and when the Setpoint becomes inactive, the Data Recorder stops.
2. If the **Recording Depth** is set to **0**, the Data Recorder will be disabled. The maximum Recording Depth for DR #27 to DR #28 is 120000.
3. **Recording Offset** can be used to delay the recording by a fixed time from the **Recording Interval**. For example, if **Recording Interval** is set to 3600 (hourly) and **Recording Offset** is set to 300 (5 minutes), the recording will take place at 5 minutes after the hour every hour, i.e. 00:05, 01:05, 02:05…etc. The programmed value of **Recording Offset** should be less than that of **Recording Interval**.
4. **Appendix A** provides a list of available parameters for data recording. All parameters are available for standard data recording. If **Number of parameters** is set to **0**, the Data Recorder is disabled.
5. Modifying **Recording Mode**, **Recording Depth**, **Recording Interval**, **Recording Offset**, **Number of Parameters** and **Parameters 1 to 16** will clear the DRx Log and reset the **DRx Pointer** to "0".

5.10.5 Interval Energy Recorder Setup Registers

Register	Property	Description		Format	Range/Default*	
7700	RW	Recording Mode[1]		UINT16	0=Disabled, 1=Stop-When-Full 2= First-In-First-Out*	
7701	RW	Recording Depth		UINT16	0 to 65535, 65535*	
7702	RW	Recording Interval		UINT16	1 to 65535 mins, 15*	
7703	RW	Start Time[2]	High-order Byte: Year	Timestamp	1-37 (Year-2000), 1*	
			Low-order Byte: Month		1 to 12, 1*	
7704	RW		High-order Byte: Day		1 to 31, 1*	
			Low-order Byte: Hour		0 to 23, 0*	
7705	RW		High-order Byte: Min		0 to 59, 0*	
			Low-order Byte: Second		0 to 59, 0*	
7706	RW	Number of Parameters		UINT16	0 to 5, 5*	
7707	RW	Parameter 1		UINT16	0=kWh Import 1=kWh Export 2=kvarh Import 3=kvarh Export 4=kVAh	0*
7708	RW	Parameter 2		UINT16		1*
7709	RW	Parameter 3		UINT16		2*
7710	RW	Parameter 4		UINT16		3*
7711	RW	Parameter 5		UINT16		4*

Table 5-60 Interval Energy Recorder Setup Registers

Notes:

1. If **Recording Depth** is set to **0**, the Energy Log is disabled.
2. When the current time meets or exceeds the **Start Time**, the **Interval Energy Recorder** starts to record.
3. Modifying **Recording Mode**, **Recording Depth**, **Recording Interval**, **Start Time**, **Number of Parameters** and **Parameters 1 to 5** will clear the Energy Log and reset the **Energy Log Pointer** to "0".

5.10.6 WFR/DWR Setup

The iMeter 6 provides one Waveform Recorder and one Disturbance WFR (DWR), with a fixed **Recording Depth** of 128. WFR and DWR can simultaneously capture 3-phase Voltage and Current signals at a maximum resolution of 256 samples per cycles.

Register	Property	Description	Format	Range/Default*
7600	RW	WFR Time Format	UINT16	0=Local*, 1=UTC
7601	RW	WFR Format[1]	UINT16	0~4, 4*
7602	RW	Reserved	UINT16	-
7603	RW	WFR Pre-fault Cycles	UINT16	0 to 20, 4*
7604	RW	DWR Time Format[4]	UINT16	0=Local*, 1=UTC
7605	RW	Reserved	--	--
7606	RW	Reserved	UINT16	-
7607	RW	DWR Pre-fault Cycles[4]	UINT16	5~10, 5*
7608	--	Reserved	--	--
7609	--	Reserved	--	--
7611	RW	Scheduled WFR Enable[4]	UINT16	0=Disabled*, 1=Enable
7612	RW	Scheduled WFR Start Time[4]	Timestamp	See Note 2, 2001/01/01/00:00:00*
7613	RW			
7614	RW			
7615	RW	Scheduled WFR Interval[4]	UINT16	1 to 960 (hours), 24*
7616	RW	Scheduled WFR Repetition[4]	UINT16	0 to 10000, 1* (0 indicates recording continuously)
7617 ~ 7622	--	Reserved	--	--
7623	RW	Enable iTrigger WFR/DWR[4]	UINT16	0=No*, 1=Yes
7624	RW	iTrigger ID[4]	UINT16	1~0x3FFF, 1*

Table 5-61 Waveform Recorder Setup Parameters

Notes:

1. The valid WFR formats (# of samples/cycle x # of cycles) include 0~4, which are 16x320, 32x160, 64x80, 128x40 and 256x20, respectively.
2. The following table illustrates the **Scheduled WFR Start Time** structure.

Offset	Description
+0	High - Year (-2000) / Low - Month
+1	High - Day / Low - Hour
+2	High - Minute / Low - Second

Table 5-62 Scheduled WFR Start Time Structure

3. Modifying the Setup Parameters of WFR/DWR will clear the WFR/DWR Log and reset WFR/DWR Pointer will be reset to "0".
4. The DWR, Scheduled WFR and iTrigger features are supported in Firmware V3.10.00 or later.

5.10.7 EN50160 Setup

The default values in **Table 5-64 EN50160 Parameters Setup** may be different for LV, MV and HV levels such that it's required to set **Register 7800 Voltage Level** first. Please note that the EN 50160 feature is supported in Firmware V3.10.00 or later.

5.10.7.1 Basic

Register	Property	Description	Format	Range, Default*
7800	RW	Voltage Level	UINT16	0=LV*, 1=MV, 2=HV
7801	RW	Start Week	UINT16	0=Sunday* 1~6=Monday to Saturday

Table 5-63 EN50160 Basic Setup

5.10.7.2 EN50160 Parameters

Register	Property	Description	Format	Default* (%)
7810	RW	Freq Wide Tolerance	Float	1.0
7812	RW	Freq Positive Deviation Wide Limit	Float	1.04
7814	RW	Freq Negative Deviation Wide Limit	Float	0.94
7816	RW	Freq Narrow Tolerance	Float	0.995
7818	RW	Freq Positive Deviation Narrow Limit	Float	1.01
7820	RW	Freq Negative Deviation Narrow Limit	Float	0.99
7822	RW	Voltage Wide Tolerance	Float	1.0
7824	RW	Voltage Positive Deviation Wide Limit	Float	LV: 1.1, MV/LV: 1.15
7826	RW	Voltage Negative Deviation Wide Limit	Float	0.85
7828	RW	Voltage Narrow Tolerance	Float	LV: 0.95, MV/HV: 0.99

7830	RW	Voltage Positive Deviation Narrow Limit	Float	1.1
7832	RW	Voltage Negative Deviation Narrow Limit	Float	0.9
7834	RW	Flicker Tolerance	Float	0.95
7836	RW	Flicker Limit	Float	1
7838	RW	Harmonic Voltage Tolerance	Float	0.95
7840	RW	THD Limit	Float	0.08
7842	RW	Reserved	Float	
7844	RW	Reserved	Float	
7846	RW	H02 Voltage Limit	Float	LV/MV: 0.02, HV: 0.019
7848	RW	H03 Voltage Limit	Float	LV/MV: 0.05, HV: 0.03
7850	RW	H04 Voltage Limit	Float	0.01
7852	RW	H05 Voltage Limit	Float	LV/MV: 0.06, HV: 0.05
7854	RW	H06 Voltage Limit	Float	0.005
7856	RW	H07 Voltage Limit	Float	LV/MV: 0.05, HV: 0.04
7858	RW	H08 Voltage Limit	Float	0.005
7860	RW	H09 Voltage Limit	Float	LV/MV:0.015, HV: 0.013
7862	RW	H10 Voltage Limit	Float	0.005
7864	RW	H11 Voltage Limit	Float	LV/MV:0.035, HV: 0.03
7866	RW	H12 Voltage Limit	Float	0.005
7868	RW	H13 Voltage Limit	Float	LV/MV:0.03, HV: 0.025
7870	RW	H14 Voltage Limit	Float	0.005
7872	RW	H15 Voltage Limit	Float	0.005
7874	RW	H16 Voltage Limit	Float	0.005
7876	RW	H17 Voltage Limit	Float	0.02
7878	RW	H18 Voltage Limit	Float	0.005
7880	RW	H19 Voltage Limit	Float	0.015
7882	RW	H20 Voltage Limit	Float	0.005
7884	RW	H21 Voltage Limit	Float	0.005
7886	RW	H22 Voltage Limit	Float	0.005
7888	RW	H23 Voltage Limit	Float	0.015
7890	RW	H24 Voltage Limit	Float	0.005
7892	RW	H25 Voltage Limit	Float	0.015

Table 5-64 EN50160 Parameters Setup

5.10.8 TOU Setup

5.10.8.1 Basic

Register	Property	Description	Format	Range/Option
16000	RO	Current Tariff	UINT16	0=T1, 1=T2, 2=T3, 3=T4 4=T5, 5=T6, 6=T7, 7=T8
16001	RO	Current Season	UINT16	0 to 11 (Season #1 to #12)
16002	RO	Current Period	UINT16	0 to 11 (Period #1 to #12)
16003	RO	Current Daily Profile No.	UINT16	0 to 19(Daily Profile #1 to #20)
16004	RO	Current Day Type	UINT16	0=Weekday1, 1=Weekday2 2=Weekday3, 3= Alternate Day
16005	RO	Current TOU No.	UINT16	0=TOU #1, 1=TOU #2
16006	RW	TOU Switch Time[1]	UINT32	See Note 2
16008	WO	Reserved	UINT16	-
16009	RW	Sunday Setup	UINT16	0=Weekday1* 1=Weekday2 2=Weekday3
16010	RW	Monday Setup	UINT16	
16011	RW	Tuesday Setup	UINT16	
16012	RW	Wednesday Setup	UINT16	
16013	RW	Thursday Setup	UINT16	
16014	RW	Friday Setup	UINT16	
16015	RW	Saturday Setup	UINT16	

Table 5-65 TOU Basic Setup

Notes:

1. If DI1 is not programmed as a **Tariff Switch**, the TOU will function based on the TOU Schedule. If at least one DI (DI1) is programmed as a **Tariff Switch**, the TOU Schedule will no longer be used and the Tariff switching will be based on the status of the DIs.
2. The following table illustrates the data structure for the TOU Switch Time. For example, 0x1003140C indicates a switch time of 12:00pm on March 20th, 2016. Writing 0xFFFFFFFF to this register disables the switching between TOU Schedule.

Byte 3	Byte 2	Byte 1	Byte 0
Year-2000 (1-37)	Month (1-12)	Day (1-31)	Hour (00-23)

Table 5-66 TOU Switch Time Format

5.10.8.2 Season

The iMeter 6 has two sets of Season setup parameters, one for each TOU. The Base Addresses for the two sets are 16100 and 17100, respectively, where the Register Address = Base Address + Offset. For example, the register address for TOU #1's Season #2's Start Date is 17100+4 = 17104.

Offset	Property	Description	Format	Range/Note
0	RW	Season #1: Start Date	UINT16	0x0101
1	RW	Season #1: Weekday#1 Daily Profile	UINT16	0 to 19
2	RW	Season #1: Weekday#2 Daily Profile	UINT16	
3	RW	Season #1: Weekday#3 Daily Profile	UINT16	
4	RW	Season #2: Start Date	UINT16	High-order Byte: Month Low-order Byte: Day
5	RW	Season #2: Weekday#1 Daily Profile	UINT16	0 to 19
6	RW	Season #2: Weekday#2 Daily Profile	UINT16	
7	RW	Season #2: Weekday#3 Daily Profile	UINT16	
8	RW	Season #3: Start Date	UINT16	See Season #2: Start Date
9	RW	Season #3: Weekday#1 Daily Profile	UINT16	0 to 19
10	RW	Season #3: Weekday#2 Daily Profile	UINT16	
11	RW	Season #3: Weekday#3 Daily Profile	UINT16	
12	RW	Season #4: Start Date	UINT16	See Season #2: Start Date
13	RW	Season #4: Weekday#1 Daily Profile	UINT16	0 to 19
14	RW	Season #4: Weekday#2 Daily Profile	UINT16	
15	RW	Season #4: Weekday#3 Daily Profile	UINT16	
16	RW	Season #5: Start Date	UINT16	See Season #2: Start Date
17	RW	Season #5: Weekday#1 Daily Profile	UINT16	0 to 19
18	RW	Season #5: Weekday#2 Daily Profile	UINT16	
19	RW	Season #5: Weekday#3 Daily Profile	UINT16	
20	RW	Season #6: Start Date	UINT16	See Season #2: Start Date
21	RW	Season #6: Weekday#1 Daily Profile	UINT16	0 to 19
22	RW	Season #6: Weekday#2 Daily Profile	UINT16	
23	RW	Season #6: Weekday#3 Daily Profile	UINT16	
24	RW	Season #7: Start Date	UINT16	See Season #2: Start Date
25	RW	Season #7: Weekday#1 Daily Profile	UINT16	0 to 19
26	RW	Season #7: Weekday#2 Daily Profile	UINT16	
27	RW	Season #7: Weekday#3 Daily Profile	UINT16	
28	RW	Season #8: Start Date	UINT16	See Season #2: Start Date
29	RW	Season #8: Weekday#1 Daily Profile	UINT16	0 to 19
30	RW	Season #8: Weekday#2 Daily Profile	UINT16	
31	RW	Season #8: Weekday#3 Daily Profile	UINT16	
32	RW	Season #9: Start Date	UINT16	See Season #2: Start Date
33	RW	Season #9: Weekday#1 Daily Profile	UINT16	0 to 19
34	RW	Season #9: Weekday#2 Daily Profile	UINT16	
35	RW	Season #9: Weekday#3 Daily Profile	UINT16	
36	RW	Season #10: Start Date	UINT16	See Season #2: Start Date
37	RW	Season #10: Weekday#1 Daily Profile	UINT16	0 to 19
38	RW	Season #10: Weekday#2 Daily Profile	UINT16	
39	RW	Season #10: Weekday#3 Daily Profile	UINT16	
40	RW	Season #11: Start Date	UINT16	See Season #2: Start Date
41	RW	Season #11: Weekday#1 Daily Profile	UINT16	0 to 19
42	RW	Season #11: Weekday#2 Daily Profile	UINT16	
43	RW	Season #11: Weekday#3 Daily Profile	UINT16	
44	RW	Season #12: Start Date	UINT16	See Season #2: Start Date
45	RW	Season #12: Weekday#1 Daily Profile	UINT16	0 to 19
46	RW	Season #12: Weekday#2 Daily Profile	UINT16	
47	RW	Season #12: Weekday#3 Daily Profile	UINT16	

Table 5-67 Season Setup

Notes:

1) **Start Date** for Season #1 is Jan. 1st and cannot be modified.
2) Setting a Season's **Start Date** as 0xFFFF terminates the TOU's Season settings. All subsequent Seasons' setup parameters will be ignored since the previous Season's duration is from its **Start Date** to the end of the year.
3) The **Start Date** of a particular Season must be later than the previous Season's.

5.10.8.3 Daily Profile

The iMeter 6 has two sets of Daily Profile setup parameters, one for each TOU.

Register	Property	Description	Format
16200~16223	RW	Daily Profile #1	See Table 5-70
16224~16247	RW	Daily Profile #2	
16248~16271	RW	Daily Profile #3	
16272~16295	RW	Daily Profile #4	
16296~16319	RW	Daily Profile #5	
16320~16343	RW	Daily Profile #6	
16344~16367	RW	Daily Profile #7	
16368~16391	RW	Daily Profile #8	
16392~16415	RW	Daily Profile #9	
16416~16439	RW	Daily Profile #10	
16440~16463	RW	Daily Profile #11	
16464~16487	RW	Daily Profile #12	
16488~16511	RW	Daily Profile #13	
16512~16535	RW	Daily Profile #14	
16536~16559	RW	Daily Profile #15	
16560~16583	RW	Daily Profile #16	
16584~16607	RW	Daily Profile #17	
16608~16631	RW	Daily Profile #18	
16632~16655	RW	Daily Profile #19	
16656~16679	RW	Daily Profile #20	

Table 5-68 TOU #1's Daily Profile Setup

Register	Property	Description	Format
17200~17223	RW	Daily Profile #1	See Table 5-70
17224~17247	RW	Daily Profile #2	
17248~17271	RW	Daily Profile #3	
17272~17295	RW	Daily Profile #4	
17296~17319	RW	Daily Profile #5	
17320~17343	RW	Daily Profile #6	
17344~17367	RW	Daily Profile #7	
17368~17391	RW	Daily Profile #8	
17392~17415	RW	Daily Profile #9	
17416~17439	RW	Daily Profile #10	
17440~17463	RW	Daily Profile #11	
17464~17487	RW	Daily Profile #12	
17488~17511	RW	Daily Profile #13	
17512~17535	RW	Daily Profile #14	
17536~17559	RW	Daily Profile #15	
17560~17583	RW	Daily Profile #16	
17584~17607	RW	Daily Profile #17	
17608~17631	RW	Daily Profile #18	
17632~17655	RW	Daily Profile #19	
17656~17679	RW	Daily Profile #20	

Table 5-69 TOU #2's Daily Profile Setup

Offset	Property	Description		Format	Note
+0	RW	Period #1 Start Time		UINT16	0x0000
+1	RW	Period #1 Tariff		UINT16	0=T1, …, 7=T8
+2	RW	Period #2 Start Time	High-order Byte: Hour	UINT16	0 ≤ Hour < 24
			Low-order Byte: Min		Min = 0, 15, 30, 45
+3	RW	Period #2 Tariff		UINT16	0=T1, …, 7=T8
+4	RW	Period #3 Start Time		UINT16	See Period #2 Start Time
+5	RW	Period #3 Tariff		UINT16	0=T1, …, 7=T8
+6	RW	Period #4 Start Time		UINT16	See Period #2 Start Time
+7	RW	Period #4 Tariff		UINT16	0=T1, …, 7=T8
+8	RW	Period #5 Start Time		UINT16	See Period #2 Start Time
+9	RW	Period #5 Tariff		UINT16	0=T1, …, 7=T8
+10	RW	Period #6 Start Time		UINT16	See Period #2 Start Time
+11	RW	Period #6 Tariff		UINT16	0=T1, …, 7=T8
+12	RW	Period #7 Start Time		UINT16	See Period #2 Start Time
+13	RW	Period #7 Tariff		UINT16	0=T1, …, 7=T8
+14	RW	Period #8 Start Time		UINT16	See Period #2 Start Time
+15	RW	Period #8 Tariff		UINT16	0=T1, …, 7=T8

+16	RW	Period #9 Start Time	UINT16	See Period #2 Start Time
+17	RW	Period #9 Tariff	UINT16	0=T1, …, 7=T8
+18	RW	Period #10 Start Time	UINT16	See Period #2 Start Time
+19	RW	Period #10 Tariff	UINT16	0=T1, …, 7=T8
+20	RW	Period #11 Start Time	UINT16	See Period #2 Start Time
+21	RW	Period #11 Tariff	UINT16	0=T1, …, 7=T8
+22	RW	Period #12 Start Time	UINT16	See Period #2 Start Time
+23	RW	Period #12 Tariff	UINT16	0=T1, …, 7=T8

Table 5-70 Daily Profile Data Structure

Notes:

1) **Daily Profile #1's Period #1 Start Time** is always 00:00 and cannot be modified.
2) Setting a Period's **Start Time** as 0xFFFF terminates the Daily Profile's settings. All later Daily Profile' setup parameters will be ignored**,** and the previous Period's duration is from its **Start Time** to the end of the day.
3) The minimum interval of a period is 15 minutes.
4) The **Start Time** of a particular Period must be later than the previous Period's.

5.10.8.4 Alternate Days

Each Alternate Day is assigned a Daily Profile and has a higher priority than Season. If a particular date is set as an Alternate Day, its assigned Daily Profile will override the "normal" Daily Profile for this day according the TOU settings.

The iMeter 6 has two sets of Alternate Days setup parameters, one for each TOU. The Base Addresses for the two sets are 16700 and 17700, respectively, where the Register Address = Base Address + Offset. For example, the register address for TOU #2's Alternative Day #2's Date is 17700+3 = 17703.

Offset	Property	Description	Format	Note
0	RW	Alternate Day #1 Date[1)]	UINT32	Table 5-72 Date Format
2	RW	Alternate Day #1 Daily Profile	UINT16	0 to 19
3	RW	Alternate Day #2 Date[1)]	UINT32	Table 5-72 Date Format
5	RW	Alternate Day #2 Daily Profile	UINT16	0 to 19
6	RW	Alternate Day #3 Date[1)]	UINT32	Table 5-72 Date Format
8	RW	Alternate Day #3 Daily Profile	UINT16	0 to 19
9	RW	Alternate Day #4 Date[1)]	UINT32	Table 5-72 Date Format
11	RW	Alternate Day #4 Daily Profile	UINT16	0 to 19
12	RW	Alternate Day #5 Date[1)]	UINT32	Table 5-72 Date Format
14	RW	Alternate Day #5 Daily Profile	UINT16	0 to 19
15	RW	Alternate Day #6 Date[1)]	UINT32	Table 5-72 Date Format
17	RW	Alternate Day #6 Daily Profile	UINT16	0 to 19
18	RW	Alternate Day #7 Date[1)]	UINT32	Table 5-72 Date Format
19	RW	Alternate Day #7 Daily Profile	UINT16	0 to 19
21	RW	Alternate Day #8 Date[1)]	UINT32	Table 5-72 Date Format
22	RW	Alternate Day #8 Daily Profile	UINT16	0 to 19
24	RW	Alternate Day #9 Date[1)]	UINT32	Table 5-72 Date Format
25	RW	Alternate Day #9 Daily Profile	UINT16	0 to 19
27	RW	Alternate Day #10 Date[1)]	UINT32	Table 5-72 Date Format
29	RW	Alternate Day #10 Daily Profile	UINT16	0 to 19
…		…		Table 5-72 Date Format
…		…		0 to 19
240	RW	Alternate Day #81 Date[1)]	UINT32	Table 5-72 Date Format
162	RW	Alternate Day #81 Daily Profile	UINT16	0 to 19
243	RW	Alternate Day #82 Date[1)]	UINT32	Table 5-72 Date Format
245	RW	Alternate Day #82 Daily Profile	UINT16	0 to 19
246	RW	Alternate Day #83 Date[1)]	UINT32	Table 5-72 Date Format
248	RW	Alternate Day #83 Daily Profile	UINT16	0 to 19
249	RW	Alternate Day #84 Date[1)]	UINT32	Table 5-72 Date Format
251	RW	Alternate Day #84 Daily Profile	UINT16	0 to 19
252	RW	Alternate Day #85 Date[1)]	UINT32	Table 5-72 Date Format
254	RW	Alternate Day #85 Daily Profile	UINT16	0 to 19
255	RW	Alternate Day #86 Date	UINT32	Table 5-72 Date Format
256	RW	Alternate Day #86 Daily Profile	UINT16	0 to 19
258	RW	Alternate Day #87 Date[1)]	UINT32	Table 5-72 Date Format
260	RW	Alternate Day #87 Daily Profile	UINT16	0 to 19
261	RW	Alternate Day #88 Date[1)]	UINT32	Table 5-72 Date Format
263	RW	Alternate Day #88 Daily Profile	UINT16	0 to 19
264	RW	Alternate Day #89 Date[1)]	UINT32	Table 5-72 Date Format

266	RW	Alternate Day #89 Daily Profile	UINT16	0 to 19
267	RW	Alternate Day #90 Date[1)]	UINT32	Table 5-72 Date Format
269	RW	Alternate Day #90 Daily Profile	UINT16	0 to 19

Table 5-71 Alternate Days Setup

Notes:

1) The following table illustrates the data structure of the Date register:

When the Year and/or Month are set as **0xFF**, it means the Alternate Day is repetitive by year and/or month, i.e. the same day of every year or every month is an Alternate Day.

Byte 3	Byte 2	Byte 1	Byte 0
Reserved	Year-2000 (1-37)	Month (1-12)	Day (1-31)

Table 5-72 Date Format

5.10.9 Auto-Scroll Setup

Register	Property	Description	Format	Range/Option, Default*
18000	RW	Auto-Scroll Enable	UINT16	0=No*, 1=Yes
18001	RW	Initiate Time	UINT16	1 to 60 (mins), 3*
18002	RW	Interval	UINT16	1 to 60 (s), 3*
18003	RW	Screen 1	UINT16	See Note 1, 1
18004	RW	Screen 2	UINT16	See Note 1, 2
18005	RW	Screen 3	UINT16	See Note 1, 3
18006	RW	Screen 4	UINT16	See Note 1, 4
18007	RW	Screen 5	UINT16	See Note 1, 5
18008	RW	Screen 6	UINT16	See Note 1, 6
18009	RW	Screen 7	UINT16	See Note 1,8
18010	RW	Screen 8	UINT16	See Note 1, 10
18011	RW	Screen 9	UINT16	See Note 1, 13
18012	RW	Screen 10	UINT16	See Note 1, 15

Table 5-73 Auto-Scroll Screen Setup

Note:

1. The following table illustrates the available screen options for Auto-Scroll Screen Setup.

ID	Parameter	ID	Parameter	ID	Parameter
0	Null	7	TOU	14	Sequence
1	Phasor	8	Max. & Min.	15	Real-time Waveform
2	Voltage	9	I/O	16	PQ Log
3	Current	10	Harmonics	17	SOE Log
4	Power	11	Voltage Deviation	18	PQ Counters
5	Energy	12	Frequency Deviation		
6	Demand	13	Unbalance		

Table 5-74 Available Options for Auto-Scroll Setup

5.10.10 MB Master Setup

Register	Property	Description	Format
30000~30014	RW	Slave #1 Configuration	See Table 5-76
30030~30044	RW	Slave #2 Configuration	
30060~30074	RW	Slave #3 Configuration	
30090~30104	RW	Slave #4 Configuration	
30120~30134	RW	Slave #5 Configuration	
...	RW	...	
30870~30884	RW	Slave #30 Configuration	
30900~30914	RW	Slave #31 Configuration	

Table 5-75 MB Slave Setup

Offset	Properties	Description	Format	Options/Range, Default*
+0	RW	Enable the Slave	UINT16	0=No*, 1=Yes
+1	RW	Device Type	UINT16	See Note 1, 0*
+2	RW	Unit ID	UINT16	1 to 247, see Note 2
+3	RW	Data Type	UINT32	See Note 3, 0x0006FFFF*
+5~+14	RW	Device Name	ASCII	Null*

Table 5-76 MB Slave Setup Data Structure

Notes:

1. The value of **Device Type** register, 0 to 6 stands for "PMC-53A", "PMC-53M-E", "PMC-53M-A", "PMC-340-B", "PMC-340-A", "PMC-D726M", and "PMC-53A-E", respectively.
2. The default Unit ID for the slave consists of 100 + Slave ID (from 1 to 31). For example, the default Unit ID for Slave #21 is 121.
3. The Data Type displayed for the slave on the Front Panel and Web Interface of iMeter 6 can be configured via the following bit values.

Bit	Page	Data Type
Bit0	Page 1	U1/U2/U3/Uln Avg./Ung
Bit1	Page 2	U12/U23/U31/Ull Avg./Freq.
Bit2	Page 3	I1/I2/I3/I Avg./In/I4
Bit3	Page 4	U1/U12 Angle, U2/U23 Angle, U3/U31 Angle, I1 Angle, I2 Angle, I3 Angle
Bit4	Page 5	P/Q/S/PF Total+ Disp. PF Total
Bit5	Page 6	P1/P2/P3/P Total
Bit6	Page 7	Q1/Q2/Q3/Q Total
Bit7	Page 8	S1/S2/S3/S Total
Bit8	Page 9	PF1/PF2/PF3/PF Total
Bit9	Page 10	kWh Imp./Exp./Tot./Net
Bit10	Page 11	kvarh Imp./Exp./Tot./Net
Bit11	Page 12	kVAh Tot.
Bit12	Page 13	I1/I2/I3/I Avg. Present DMD
Bit13	Page 14	P/Q/S Total Present DMD
Bit14	Page 15	I1/I2/I3/I Avg. This Max. DMD
Bit15	Page 16	P/Q/S Total This Max. DMD
Bit16	Page 17	U1/U12 THD, U2/U23 THD, U3/U31 THD
Bit17	Page 18	I1/I2/I3 THD
Bit18	Page 19	I1/I2/I3 TDD
Bit19	Page 20	U1/U2/U0 & I1/I2/I0 (For Sequence)
Bit20	Page 21	U Unb., I Unb. (For Unbalance)
Bit21	Page 22	Operating Time
Bit22	Page 23	DIx (x=1, 2, 3, ...,6)
Bit23	Page 24	DOx (x=1, 2, 3, 4)
Bit24	Page 25	U1/U2/U3/Uln Avg. Present DMD (If supported)
Bit25	Page 26	U12/U23/U31/Ull Avg. Present DMD (If supported)
Bit26	Page 27	U1/U2/U3/Uln Avg. This Max. DMD (If supported)
Bit27	Page 28	U12/U23/U31/Ull Avg. This Max. DMD (If supported)

Table 5-77 Data Type Setup Format

5.10.11 DO Control

The DO Control registers are implemented as both "Write-Only" Modbus Coil Registers (0XXXXX) and Modbus Holding Registers (4XXXXX), which can be controlled with the Force Single Coil command (Function Code 0x05) or the Preset Multiple Hold Registers (Function Code 0x10). The iMeter 6 does not support the Read Coils command (Function Code 0x01) because DO Control registers are "Write-Only". The DO Status register 0098 should be read instead to determine the current DO status.

The iMeter 6 adopts the ARM before EXECUTE operation for the remote control of its Digital Outputs if this function is enabled through the **Arm Before Execute Enable** Setup register (6185), which is disabled by default. Before executing an OPEN or CLOSE command on a Digital Output, it must be "Armed" first. This is achieved by writing the value 0xFF00 to the appropriate register to "Arm" a particular DO operation. The DO will be "Disarmed" automatically if an "Execute" command is not received within 15 seconds after it has been "Armed". If an "Execute" command is received without first having received an "Arm" command, the meter ignores the "Execute" command and returns the 0x04 exception code.

Register	Property	Description	Format	Note
9100	WO	Arm DO1 Close	UINT16	Writing "0xFF00" to the register to perform the described action.
9101	WO	Execute DO1 Close	UINT16	
9102	WO	Arm DO1 Open	UINT16	
9103	WO	Execute DO1 Open	UINT16	
9104	WO	Arm DO2 Close	UINT16	
9105	WO	Execute DO2 Close	UINT16	
9106	WO	Arm DO2 Open	UINT16	
9107	WO	Execute DO2 Open	UINT16	
9108	WO	Arm DO3 Close	UINT16	
9109	WO	Execute DO3 Close	UINT16	
9110	WO	Arm DO3 Open	UINT16	
9111	WO	Execute DO3 Open	UINT16	

Table 5-78 DO Control

5.10.12 Clear/Reset Control

Register	Property	Description	Format	Note
6400	WO	Manual WFR Log Trigger[1]	UINT16	Writing "0xFF00" to the register to execute the described action.
6401	WO	Manual DWR Log Trigger[1]	UINT16	
6402	WO	Clear High-Speed DR #1	UINT16	
6403	WO	Clear High-Speed DR #2	UINT16	

6404	WO	Clear High-Speed DR #3	UINT16	
6405	WO	Clear High-Speed DR #4	UINT16	
6406	WO	Clear Standard DR #1	UINT16	
…	WO	…	UINT16	
6416	WO	Clear Standard DR #11	UINT16	
6417	WO	Clear Standard DR #12	UINT16	
6418	WO	Clear WFR Log[2]	UINT16	
6419	WO	Clear DWR Log[2]	UINT16	
6420	WO	Clear IER Log	UINT16	
6421	WO	Clear PQ Log	UINT16	
6422	WO	Clear SOE Log	UINT16	
6423	WO	Clear All Energy[3]	UINT16	
6424	WO	Clear Max./Min. Log of This Month	UINT16	
6425	WO	Clear Max. Demand Log of This Month	UINT16	
6426	WO	Clear DI1 Counter	UINT16	
6427	WO	Clear DI2 Counter	UINT16	
…	WO	…	UINT16	
6430	WO	Clear DI5 Counter	UINT16	
6431	WO	Clear DI6 Counter	UINT16	
6432	WO	Clear Device Operating Time	UINT16	
6433	WO	Manual Switch TOU Schedule	UINT16	
6434	WO	Clear TOU Energy	UINT16	
6435	WO	Send Testing Email	UINT16	
6436	WO	Clear Event Counter	UINT16	
6437	WO	Clear All Data[4]	UINT16	Writing “0xFF00” to the register to execute the described action.
6438	WO	Clear Standard DR #13	UINT16	
…	WO	…	UINT16	
6453	WO	Clear Standard DR #28	UINT16	
6454	WO	Clear EN50160 Log[1]	UINT16	
6455	WO	Manual iTrigger WFR[1]	UINT16	
6456	WO	Manual iTrigger DWR[1]	UINT16	

Table 5-79 Clear/Reset Registers

Notes:

1. This operation is supported in Firmware V3.10.00 or later.
2. Clearing the WFR Log or DWR Log only resets the WFR/DWR Log Pointer but does not delete the COMTRADE files immediately until they are overwritten by new waveform logs.
3. Writing “0XFF00” to the register clears all 3-Phase, Total Energy Measurement, TOU Energy and Interval Energy Measurements.
4. Writing “0XFF00” to the register clears all logs, including Data Recorder, Waveform Recorder, Disturbance Recorder, Energy Log, PQ Log, SOE Log, Max./Min. Log of This Month (Since Last Reset), Maximum Demand of This Month (Since Last Reset), DI Counters, Energy Registers, Device Operating Time, TOU energy Event Counter and EN50160 Log. Please note that the **Clear All Data** operation will require a meter reboot to take effect.

5.11 Time

There are two sets of Time registers supported by the iMeter 6 – Year / Month / Day / Hour / Minute / Second (Registers # 60000 to 60002) and UNIX Time (Register # 60004). When sending time to the iMeter 6 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 UNIX 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. In addition, attempting to write a Time value less than Jan 1, 2001 00:00:00 will be rejected.

Register		Property	Description	Format	Note
60000	9000	RW	High-order Byte: Year	UINT16	1-37 (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 ~ 60005	9004 ~ 9005	RW	UNIX Time	UINT32	0x386D4380 to 0x7FE8177F The corresponding time is 2000.01.01 00:00:00 to 2037.12.31 23:59:59 (GMT 0:00 Time Zone)

Table 5-80 Time Registers

5.12 Meter Information

Register		Property	Description	Format	Note
60200 ~ 60219	9800 ~ 9819	RO	Meter Model[1]	UINT16	See Note 1)
60220	9820	RO	Firmware Version	UINT16	e.g. 10000 means 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	UINT16	e.g. 140110 means January 10, 2014
60223	9823	RO	Firmware Update Date: Month	UINT16	
60224	9824	RO	Firmware Update Date: Day	UINT16	
60225	9825	RO	Serial Number	UINT32	
60227	9827	RO	Reserved	UINT16	
60228	9828	RO	Reserved	UINT16	
60229	9829	RO	Feature Code	UINT16	B3B2B1B0: 0: RS-485+Ethernet+6xDI+3xDO Others: Reserved
					B5B4: • 00: 5A I4 • 01: 1A I4 • 10: Analog Input • 11: Reserved
					Other bits are reserved.
60230	9830	RO	Current Input	UINT16	0=5A, 1=1A
60231	9831	RO	Voltage Input	UINT16	0=120 (V), 1=415 (V), 2=690 (V) 3=Reserved

Table 5-81 Meter Information

Notes:

1) The Meter Model appears in registers 9800 to 9819 and contains the ASCII encoding of the string “iMeter 6” as shown in the following table.

Register		Value(Hex)	ANSCII
60200	9800	0x69	i
60201	9801	0x4D	M
60202	9802	0x65	e
60203	9803	0x74	t
60204	9804	0x65	e
60205	9805	0x72	r
60206	9806	0x20	<Blank Space>
60207	9807	0x36	6
60208-60219	9808-9819	0x20	<Null>

Table 5-82 ASCII Encoding of “iMeter 6”

Appendix A – Data Recorder Parameters (Format: INT32)

Key	Parameters	Scale/Unit	Key	Parameters	Scale/Unit
0	Ua	x100, V	**1**	Ub	x100, V
2	Uc	x100, V	**3**	Uln Avg.	x100, V
4	Uab	x100, V	**5**	Ubc	x100, V
6	Uca	x100, V	**7**	Ull Avg.	x100, V
8	Ia	x1000, A	**9**	Ib	x1000, A
10	Ic	x1000, A	**11**	I Avg.	x1000, A
12	I4^	x1000, A	**13**	kWa	W
14	kWb	W	**15**	kWc	W
16	kW Total	W	**17**	kvara	var
18	kvarb	var	**19**	kvarc	var
20	kvar Total	var	**21**	kVAa	VA
22	kVAb	VA	**23**	kVAc	VA
24	kVA Total	VA	**25**	PFa	x1000
26	PFb	x1000	**27**	PFc	x1000
28	PF Total	x1000	**29**	Frequency	x100, Hz
30	Counter #1 (DI1)	-	**31**	Counter #2 (DI2)	-
32	Counter #3 (DI3)	-	**33**	Counter #4 (DI4)	-
34	Counter #5 (DI5)	-	**35**	Counter #6 (DI6)	-
36	U2 Unbalance	x10, %	**37**	I2 Unbalance	x10, %
38	Ia K-Factor	x10	**39**	Ib K-Factor	x10
40	Ic K-Factor	x10	**41**	Ua THD	x100, %
42	Ub THD	x100, %	**43**	Uc THD	x100, %
44	Ua TOHD	x100, %	**45**	Ub TOHD	x100, %
46	Uc TOHD	x100, %	**47**	Ua TEHD	x100, %
48	Ub TEHD	x100, %	**49**	Uc TEHD	x100, %
50	Ia THD	x100, %	**51**	Ib THD	x100, %
52	Ic THD	x100, %	**53**	Ia TOHD	x100, %
54	Ib TOHD	x100, %	**55**	Ic TOHD	x100, %
56	Ia TEHD	x100, %	**57**	Ib TEHD	x100, %
58	Ic TEHD	x100, %	**59**	Ua 2nd Harmonic	x100, %
60	Ub 2nd Harmonic	x100, %	**61**	Uc 2nd Harmonic	x100, %
62	Ua 3rd Harmonic	x100, %	**63**	Ub 3rd Harmonic	x100, %
64	Uc 3rd Harmonic	x100, %	**65**	Ua 4th Harmonic	x100, %
66	Ub 4th Harmonic	x100, %	**67**	Uc 4th Harmonic	x100, %
68	Ua 5th Harmonic	x100, %	**69**	Ub 5th Harmonic	x100, %
70	Uc 5th Harmonic	x100, %	**71**	Ua 6th Harmonic	x100, %
72	Ub 6th Harmonic	x100, %	**73**	Uc 6th Harmonic	x100, %
74	Ua 7th Harmonic	x100, %	**75**	Ub 7th Harmonic	x100, %
76	Uc 7th Harmonic	x100, %	**77**	Ua 8th Harmonic	x100, %
78	Ub 8th Harmonic	x100, %	**79**	Uc 8th Harmonic	x100, %
80	Ua 9th Harmonic	x100, %	**81**	Ub 9th Harmonic	x100, %
81	Uc 9th Harmonic	x100, %	**83**	Ua 10th Harmonic	x100, %
84	Ub 10th Harmonic	x100, %	**85**	Uc 10th Harmonic	x100, %
86	Ua 11th Harmonic	x100, %	**87**	Ub 11th Harmonic	x100, %
88	Uc 11th Harmonic	x100, %	**89**	Ua 12th Harmonic	x100, %
90	Ub 12th Harmonic	x100, %	**91**	Uc 12th Harmonic	x100, %
92	Ua 13th Harmonic	x100, %	**93**	Ub 13th Harmonic	x100, %
94	Uc 13th Harmonic	x100, %	**95**	Ua 14th Harmonic	x100, %
96	Ub 14th Harmonic	x100, %	**97**	Uc 14th Harmonic	x100, %
98	Ua 15th Harmonic	x100, %	**99**	Ub 15th Harmonic	x100, %
100	Uc 15th Harmonic	x100, %	**101**	Ua 16th Harmonic	x100, %
102	Ub 16th Harmonic	x100, %	**103**	Uc 16th Harmonic	x100, %
104	Ua 17th Harmonic	x100, %	**105**	Ub 17th Harmonic	x100, %
106	Uc 17th Harmonic	x100, %	**107**	Ua 18th Harmonic	x100, %
108	Ub 18th Harmonic	x100, %	**109**	Uc 18th Harmonic	x100, %
110	Ua 19th Harmonic	x100, %	**111**	Ub 19th Harmonic	x100, %
112	Uc 19th Harmonic	x100, %	**113**	Ua 20th Harmonic	x100, %
114	Ub 20th Harmonic	x100, %	**115**	Uc 20th Harmonic	x100, %
116	Ua 21st Harmonic	x100, %	**117**	Ub 21st Harmonic	x100, %
118	Uc 21st Harmonic	x100, %	**119**	Ua 22nd Harmonic	x100, %
120	Ub 22nd Harmonic	x100, %	**121**	Uc 22nd Harmonic	x100, %
122	Ua 23rd Harmonic	x100, %	**123**	Ub 23rd Harmonic	x100, %
124	Uc 23rd Harmonic	x100, %	**125**	Ua 24th Harmonic	x100, %
126	Ub 24th Harmonic	x100, %	**127**	Uc 24th Harmonic	x100, %
128	Ua 25th Harmonic	x100, %	**129**	Ub 25th Harmonic	x100, %
130	Uc 25th Harmonic	x100, %	**131**	Ia 2nd Harmonic	x100, %
132	Ib 2nd Harmonic	x100, %	**133**	Ic 2nd Harmonic	x100, %
134	Ia 3rd Harmonic	x100, %	**135**	Ib 3rd Harmonic	x100, %
136	Ic 3rd Harmonic	x100, %	**137**	Ia 4th Harmonic	x100, %
138	Ib 4th Harmonic	x100, %	**139**	Ic 4th Harmonic	x100, %
140	Ia 5th Harmonic	x100, %	**141**	Ib 5th Harmonic	x100, %
142	Ic 5th Harmonic	x100, %	**143**	Ia 6th Harmonic	x100, %
144	Ib 6th Harmonic	x100, %	**145**	Ic 6th Harmonic	x100, %
146	Ia 7th Harmonic	x100, %	**147**	Ib 7th Harmonic	x100, %
148	Ic 7th Harmonic	x100, %	**149**	Ia 8th Harmonic	x100, %
150	Ib 8th Harmonic	x100, %	**151**	Ic 8th Harmonic	x100, %
152	Ia 9th Harmonic	x100, %	**153**	Ib 9th Harmonic	x100, %
154	Ic 9th Harmonic	x100, %	**155**	Ia 10th Harmonic	x100, %
156	Ib 10th Harmonic	x100, %	**157**	Ic 10th Harmonic	x100, %

158	Ia 11th Harmonic	x100, %	**159**	Ib 11th Harmonic	x100, %
160	Ic 11th Harmonic	x100, %	**161**	Ia 12th Harmonic	x100, %
162	Ib 12th Harmonic	x100, %	**163**	Ic 12th Harmonic	x100, %
164	Ia 13th Harmonic	x100, %	**165**	Ib 13th Harmonic	x100, %
166	Ic 13th Harmonic	x100, %	**167**	Ia 14th Harmonic	x100, %
168	Ib 14th Harmonic	x100, %	**169**	Ic 14th Harmonic	x100, %
170	Ia 15th Harmonic	x100, %	**171**	Ib 15th Harmonic	x100, %
172	Ic 15th Harmonic	x100, %	**173**	Ia 16th Harmonic	x100, %
174	Ib 16th Harmonic	x100, %	**175**	Ic 16th Harmonic	x100, %
176	Ia 17th Harmonic	x100, %	**177**	Ib 17th Harmonic	x100, %
178	Ic 17th Harmonic	x100, %	**179**	Ia 18th Harmonic	x100, %
180	Ib 18th Harmonic	x100, %	**181**	Ic 18th Harmonic	x100, %
182	Ia 19th Harmonic	x100, %	**183**	Ib 19th Harmonic	x100, %
184	Ic 19th Harmonic	x100, %	**185**	Ia 20th Harmonic	x100, %
186	Ib 20th Harmonic	x100, %	**187**	Ic 20th Harmonic	x100, %
188	Ia 21st Harmonic	x100, %	**189**	Ib 21st Harmonic	x100, %
190	Ic 21st Harmonic	x100, %	**191**	Ia 22nd Harmonic	x100, %
192	Ib 22nd Harmonic	x100, %	**193**	Ic 22nd Harmonic	x100, %
194	Ia 23rd Harmonic	x100, %	**195**	Ib 23rd Harmonic	x100, %
196	Ic 23rd Harmonic	x100, %	**197**	Ia 24th Harmonic	x100, %
198	Ib 24th Harmonic	x100, %	**199**	Ic 24th Harmonic	x100, %
200	Ia 25th Harmonic	x100, %	**201**	Ib 25th Harmonic	x100, %
202	Ic 25th Harmonic	x100, %	**203**	Ua DMD	x100, V
204	Ub DMD	x100, V	**205**	Uc DMD	x100, V
206	Uln Avg. DMD	x100, V	**207**	Uab DMD	x100, V
208	Ubc DMD	x100, V	**209**	Uca DMD	x100, V
210	Ull Avg. DMD	x100, V	**211**	Ia DMD	x1000, A
212	Ib DMD	x1000, A	**213**	Ic DMD	x1000, A
214	I Avg. DMD	x1000, A	**215**	I4 DMD	x1000, A
216	kWa DMD	W	**217**	kWb DMD	W
218	kWc DMD	W	**219**	kW Total DMD	W
220	kvara DMD	var	**221**	kvarb DMD	var
222	kvarc DMD	var	**223**	kvar Total DMD	var
224	kVAa DMD	VA	**225**	kVAb DMD	VA
226	kVAc DMD	VA	**227**	kVA Total DMD	VA
228	PFa DMD	x1000	**229**	PFb DMD	x1000
230	PFc DMD	x1000	**231**	PF Total DMD	x1000
232	Freq. DMD	x100, Hz	**233**	U2 Unbalance DMD	x10, %
234	I2 Unbalance DMD	x10, %	**235**	Ua THD DMD	x100, %
236	Ub THD DMD	x100, %	**237**	Uc THD DMD	x100, %
238	Ia THD DMD	x100, %	**239**	Ib THD DMD	x100, %
240	Ic THD DMD	x100, %	**241**	Ua Max. per DMD Period	x100, V
242	Ub Max. per DMD Period	x100, V	**243**	Uc Max. per DMD Period	x100, V
244	Uln Avg. Max. Per DMD Period	x100, V	**245**	Uab Max. per DMD Period	x100, V
246	Ubc Max. per DMD Period	x100, V	**247**	Uca Max. per DMD Period	x100, V
248	Ull Avg. Max. per DMD Period	x100, V	**249**	Ia Max. per DMD Period	x1000, A
250	Ib Max. per DMD Period	x1000, A	**251**	Ic Max. per DMD Period	x1000, A
252	I Avg. Max. Per DMD Period	x1000, A	**253**	I4 Max. per DMD Period	x1000, A
254	kWa Max. per DMD Period	W	**255**	kWb Max. per DMD Period	W
256	kWc Max. per DMD Period	W	**257**	kW Total Max. per DMD Period	W
258	kvara Max. per DMD Period	var	**259**	kvarb Max. per DMD Period	var
260	kvarc Max. per DMD Period	var	**261**	kvar Total Max. per DMD Period	var
262	kVAa Max. per DMD Period	VA	**263**	kVAb Max. per DMD Period	VA
264	kVAc Max. per DMD Period	VA	**265**	kVA Total Max. per DMD Period	VA
266	PFa Max. per DMD Period	x1000	**267**	PFb Max. per DMD Period	x1000
268	PFc Max. per DMD Period	x1000	**269**	PF Total Max. per DMD Period	x1000
270	Freq. Max. per DMD Period	x100, Hz	**271**	U2 Unbalance Max. Per DMD Period	x10, %
272	I2 Unbalance Max. Per DMD Period	x10, %	**273**	Ua THD Max. per DMD Period	x100, %
274	Ub THD Max. per DMD Period	x100, %	**275**	Uc THD Max. per DMD Period	x100, %
276	Ia THD Max. per DMD Period	x100, %	**277**	Ib THD Max. per DMD Period	x100, %
278	Ic THD Max. per DMD Period	x100, %	**279**	Ua Min. per DMD Period	x100, V
280	Ub Min. per DMD Period	x100, V	**281**	Uc Min. per DMD Period	x100, V
282	Uln Avg. Min. Per DMD Period	x100, V	**283**	Uab Min. per DMD Period	x100, V
284	Ubc Min. per DMD Period	x100, V	**285**	Uca Min. per DMD Period	x100, V
286	Ull Avg. Min. Per DMD Period	x100, V	**287**	Ia Min. per DMD Period	x1000, A
288	Ib Min. per DMD Period	x1000, A	**289**	Ic Min. per DMD Period	x1000, A
290	I Avg. Min. per DMD Period	x1000, A	**291**	I4 Min. per DMD Period	x1000, A
292	kWa Min. per DMD Period	W	**293**	kWb Min. per DMD Period	W
294	kWc Min. per DMD Period	W	**295**	kW Total Min. per DMD Period	W
296	kvara Min. per DMD Period	var	**297**	kvarb Min. per DMD Period	var
298	kvarc Min. per DMD Period	var	**299**	kvar Total Min. per DMD Period	var
300	kVAa Min. per DMD Period	VA	**301**	kVAb Min. per DMD Period	VA
302	kVAc Min. per DMD Period	VA	**303**	kVA Total Min. per DMD Period	VA
304	PFa Min. per DMD Period	x1000	**305**	PFb Min. per DMD Period	x1000
306	PFc Min. per DMD Period	x1000	**307**	PF Total Min. per DMD Period	x1000
308	Freq. Min. Per DMD Period	x100, Hz	**309**	U Unbalance Min. per DMD Period	x10, %
310	I Unbalance per DMD Period	x10, %	**311**	Ua THD Min. per DMD Period	x100, %
312	Ub THD Min. per DMD Period	x100, %	**313**	Uc THD Min. per DMD Period	x100, %
314	Ia THD Min. per DMD Period	x100, %	**315**	Ib THD Min. per DMD Period	x100, %
316	Ic THD Min. per DMD Period	x100, %	**317**	dUa/dUab	x100, V
318	dUb/dUbc	x100, V	**319**	dUc/dUca	x100, V
320	dIa	x1000, A	**321**	dIb	x1000, A

322	dIc	x1000, A	**323**	kWh Import	kWh
324	kWh Export	kWh	**325**	kWh Total	kWh
326	kvarh Import	kvarh	**327**	kvarh Export	kvarh
328	kvarh Total	kvarh	**329**	I Residual	x1000, A
330	U0 Unbalance	x10, %	**331**	I0 Unbalance	x10, %
332	U0 Unbalance DMD	x10, %	**333**	I0 Unbalance DMD	x10, %
334	U0 Unbalance Max. Per DMD Period	x10, %	**335**	I0 Unbalance Max. Per DMD Period	x10, %
336	U0 Unbalance Min. Per DMD Period	x10, %	**337**	I0 Unbalance Min. Per DMD Period	x10, %
338	Ua/Uab Crest Factor	100	**339**	Ub/Ubc Crest Factor	100
340	Uc/Uca Crest Factor	100	**341**	Ia Crest Factor	100
342	Ib Crest Factor	100	**343**	Ic Crest Factor	100
344	Ia TDD	x100, %	**345**	Ib TDD	x100, %
346	Ic TDD	x100, %	**347**	Ia TODD	x100, %
348	Ib TODD	x100, %	**349**	Ic TODD	x100, %
350	Ia TEDD	x100, %	**351**	Ib TEDD	x100, %
352	Ic TEDD	x100, %	**353**	kWha Import	kWh
354	kWha Export	kWh	**355**	kWha Total	kWh
356	kvarha Import	kvarh	**357**	kvarha Export	kvarh
358	kvarha Total	kvarh	**359**	kWhb Import	kWh
360	kWhb Export	kWh	**361**	kWhb Total	kWh
362	kvarhb Import	kvarh	**363**	kvarhb Export	kvarh
364	kvarhb Total	kvarh	**365**	kWhc Import	kWh
366	kWhc Export	kWh	**367**	kWhc Total	kWh
368	kvarhc Import	kvarh	**369**	kvarhc Export	kvarh
370	kvarhc Total	kvarh			

^ **I4** is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated)** if the meter is equipped with the AI option.

DR Source Parameters for MB Slaves

Slave #	Starting Key	Key Range
Slave #01	10000	10000-10999
Slave #02	11000	11000-11999
Slave #03	12000	12000-12999
Slave #04	13000	13000-13999
Slave #05-Slave #30	…	…
Slave #31	40000	40000-40999

Key Offset	Parameters	Scale/Unit
0	U1	x100, V
1	U2	x100, V
2	U3	x100, V
3	Uln Avg.	x100, V
4	U12	x100, V
5	U23	x100, V
6	U31	x100, V
7	Ull Avg.	x100, V
8	I1	x1000, A
9	I2	x1000, A
10	I3	x1000, A
11	I Avg.	x1000, A
12	P1	W
13	P2	W
14	P3	W
15	P Total	W
16	Q1	var
17	Q2	var
18	Q3	var
19	Q Total	var
20	S1	VA
21	S2	VA
22	S3	VA
23	S Total	VA
24	PF1	x1000
25	PF2	x1000
26	PF3	x1000
27	PF Total	x1000
28	Freq.	x100, Hz
29	U1/U12 Angle	x10, °
30	U2/U23 Angle	x10, °
31	U3/U31 Angle	x10, °
32	I1 Angle	x10, °
33	I2 Angle	x10, °

34	I3 Angle	x10, °
35	In	x1000, A
36	I4	x1000, A
37	Disp. PF Total	x1000
38	Ung	x100, V
39	Operating Time	x10, h
40	U1	x100, V
41	U2	x100, V
42	U0	x100, V
43	I1	x1000, A
44	I2	x1000, A
45	I0	x1000, A
46	kWh Imp.	kWh
47	kWh Exp.	kWh
48	kWh Net	kWh
49	kWh Tot.	kWh
50	kvarh Imp.	kvarh
51	kvarh Exp.	kvarh
52	kvarh Net	kvarh
53	kvarh Tot.	kvarh
54	kVAh Tot.	kVAh
55	I1 Present DMD	x1000, A
56	I2 Present DMD	x1000, A
57	I3 Present DMD	x1000, A
58	I Avg. Present DMD	x1000, A
59	U1 Present DMD	x100, V
60	U2 Present DMD	x100, V
61	U3 Present DMD	x100, V
62	Uln Avg. Present DMD	x100, V
63	U12 Present DMD	x100, V
64	U23 Present DMD	x100, V
65	U31 Present DMD	x100, V
66	Ull Avg. Present DMD	x100, V
67	P Total Present DMD	W
68	Q Total Present DMD	var
69	S Total Present DMD	VA
70	I1 This Max. DMD	x1000, A
71	I2 This Max. DMD	x1000, A
72	I3 This Max. DMD	x1000, A
73	I Avg. This Max. DMD	x1000, A
74	U1 This Max. DMD	x100, V
75	U2 This Max. DMD	x100, V
76	U3 This Max. DMD	x100, V
77	Uln Avg. This Max. DMD	x100, V
78	U12 This Max. DMD	x100, V
79	U23 This Max. DMD	x100, V
80	U31 This Max. DMD	x100, V
81	Ull Avg. This Max. DMD	x100, V
82	P Total This Max. DMD	W
83	Q Total This Max. DMD	var
84	S Total This Max. DMD	VA
85	U Unb.	x10, %
86	I Unb.	x10, %
87	I1 TDD	x100, %
88	I2 TDD	x100, %
89	I3 TDD	x100, %
90	I1 THD	x100, %
91	I2 THD	x100, %
92	I3 THD	x100, %
93	U1/U12 THD	x100, %
94	U2/U23 THD	x100, %
95	U3/U31 THD	x100, %

Appendix B – Data Recorder Default Settings

Parameter	HS DR 1	HS DR 2	HS DR 3	HS DR 4
Trigger Mode	Disabled	Disabled	Disabled	Disabled
Recording Mode	Stop-When-Full	Stop-When-Full	Stop-When-Full	Stop-When-Full
Recording Depth	0	0	0	0
Recording Interval	2	2	2	2
Recording Offset	0	0	0	0
No. of Parameters	0	0	0	0
Parameter 1~16	Null	Null	Null	Null

Parameter	DR 1	DR 2	DR 3	DR 4
Trigger Mode	Triggered by Timer	Triggered by Timer	Triggered by Timer	Triggered by Timer
Recording Mode	First-In-First-Out	First-In-First-Out	First-In-First-Out	First-In-First-Out
Recording Depth	3360	1440	1440	1440
Recording Interval	900	900	900	900
Recording Offset	0	0	0	0
No. of Parameters	6	15	16	6
Parameter 1 (Key)	323	4	0	41
Parameter 2 (Key)	324	5	1	42
Parameter 3 (Key)	325	6	2	43
Parameter 4 (Key)	326	7	3	50
Parameter 5 (Key)	327	8	13	51
Parameter 6 (Key)	328	9	14	52
Parameter 7 (Key)	Null	10	15	Null
Parameter 8 (Key)	Null	11	17	Null
Parameter 9 (Key)	Null	16	18	Null
Parameter 10 (Key)	Null	20	19	Null
Parameter 11 (Key)	Null	24	21	Null
Parameter 12 (Key)	Null	28	22	Null
Parameter 13 (Key)	Null	29	23	Null
Parameter 14 (Key)	Null	36	25	Null
Parameter 15 (Key)	Null	37	26	Null
Parameter 16 (Key)	Null	Null	27	Null

Parameter	DR 5	DR 6	DR 7	DR 8
Trigger Mode	Triggered by Timer	Triggered by Timer	Triggered by Timer	Triggered by Timer
Recording Mode	First-In-First-Out	First-In-First-Out	First-In-First-Out	First-In-First-Out
Recording Depth	1440	1440	1440	1440
Recording Interval	900	900	900	900
Recording Offset	0	0	0	0
No. of Parameters	15	16	6	15
Parameter 1 (Key)	207	203	235	245
Parameter 2 (Key)	208	204	236	246
Parameter 3 (Key)	209	205	237	247
Parameter 4 (Key)	210	206	238	248
Parameter 5 (Key)	211	216	239	249
Parameter 6 (Key)	212	217	240	250
Parameter 7 (Key)	213	218	Null	251
Parameter 8 (Key)	214	220	Null	252
Parameter 9 (Key)	219	221	Null	257
Parameter 10 (Key)	223	222	Null	261
Parameter 11 (Key)	227	224	Null	265
Parameter 12 (Key)	231	225	Null	269
Parameter 13 (Key)	232	226	Null	270
Parameter 14 (Key)	233	228	Null	271
Parameter 15 (Key)	234	229	Null	272
Parameter 16 (Key)	Null	230	Null	Null

Parameter	DR 9	DR 10	DR 11	DR 12
Trigger Mode	Triggered by Timer	Triggered by Timer	Triggered by Timer	Triggered by Timer
Recording Mode	First-In-First-Out	First-In-First-Out	First-In-First-Out	First-In-First-Out
Recording Depth	1440	1440	1440	1440
Recording Interval	900	900	900	900
Recording Offset	0	0	0	0
No. of Parameters	16	12	15	16
Parameter 1 (Key)	241	273	283	279
Parameter 2 (Key)	242	274	284	280
Parameter 3 (Key)	243	275	285	281
Parameter 4 (Key)	244	276	286	282
Parameter 5 (Key)	254	277	287	292
Parameter 6 (Key)	255	278	288	293
Parameter 7 (Key)	256	311	289	294
Parameter 8 (Key)	258	312	290	296
Parameter 9 (Key)	259	313	295	297
Parameter 10 (Key)	260	314	299	298
Parameter 11 (Key)	262	315	303	300
Parameter 12 (Key)	263	316	307	301
Parameter 13 (Key)	264	Null	308	302
Parameter 14 (Key)	266	Null	309	304
Parameter 15 (Key)	267	Null	310	305
Parameter 16 (Key)	268	Null	Null	306

Parameter	DR13 (Slave #1 Para.)	DR14 (Slave #2 Para.)	DR15 (Slave #3 Para.)	…
Trigger Mode	Disabled	Disabled	Disabled	Disabled
Recording Mode	First-In-First-Out	First-In-First-Out	First-In-First-Out	First-In-First-Out
Recording Depth	8640	8640	8640	8640
Recording Interval	900	900	900	900
Recording Offset	0	0	0	0
No. of Parameters	16	16	16	16
Parameter 1 (Key)	10004	11004	12004	…
Parameter 2 (Key)	10005	11005	12005	…
Parameter 3 (Key)	10006	11006	12006	…
Parameter 4 (Key)	10008	11008	12008	…
Parameter 5 (Key)	10009	11009	12009	…
Parameter 6 (Key)	10010	11010	12010	…
Parameter 7 (Key)	10035	11035	12035	…
Parameter 8 (Key)	10027	11027	12027	…
Parameter 9 (Key)	10046	11046	12046	…
Parameter 10 (Key)	10069	11069	12069	…
Parameter 11 (Key)	10093	11093	12093	…
Parameter 12 (Key)	10094	11094	12094	…
Parameter 13 (Key)	10095	11095	12095	…
Parameter 14 (Key)	10090	11090	12090	…
Parameter 15 (Key)	10091	11091	12091	…
Parameter 16 (Key)	10092	11092	12092	…

Parameter	DR27	DR28		
Trigger Mode	Disabled	Disabled		
Recording Mode	First-In-First-Out	First-In-First-Out		
Recording Depth	120000	120000		
Recording Interval	900	900		
Recording Offset	0	0		
No. of Parameters	16	6		
Parameter 1 (Key)	4	0		
Parameter 2 (Key)	5	1		
Parameter 3 (Key)	6	2		
Parameter 4 (Key)	8	3		
Parameter 5 (Key)	9	7		
Parameter 6 (Key)	10	11		
Parameter 7 (Key)	12	Null		
Parameter 8 (Key)	28	Null		
Parameter 9 (Key)	323	Null		
Parameter 10 (Key)	227	Null		
Parameter 11 (Key)	41	Null		
Parameter 12 (Key)	42	Null		
Parameter 13 (Key)	43	Null		
Parameter 14 (Key)	50	Null		
Parameter 15 (Key)	51	Null		
Parameter 16 (Key)	52	Null		

Appendix C – SOE Event Classification

Event Classification	Sub-Classification	Event Value	Description
1=DI Changes	1	1 / 0	DI1 Close/DI1 Open
	2	1 / 0	DI2 Close/DI2 Open
	3	1 / 0	DI3 Close/DI3 Open
	4	1 / 0	DI4 Close/DI4 Open
	5	1 / 0	DI5 Close/DI5 Open
	6	1 / 0	DI6 Close/DI6 Open
2=DO Changes	1	1 / 0	DO1 Operated/Released by Remote Control
	2	1 / 0	DO2 Operated/Released by Remote Control
	3	1 / 0	DO3 Operated/Released by Remote Control
	4	1 / 0	DO1 Operated/Released by Setpoint
	5	1 / 0	DO2 Operated/Released by Setpoint
	6	1 / 0	DO3 Operated/Released by Setpoint
	7	1 / 0	DO1 Operated/Released by Dip/swell
	8	1 / 0	DO2 Operated/Released by Dip/swell
	9	1 / 0	DO3 Operated/Released by Dip/swell
	10	1 / 0	DO1 Operated/Released by Transient
	11	1 / 0	DO2 Operated/Released by Transient
	12	1 / 0	DO3 Operated/Released by Transient
	13	0	DO1 Released by Pulse Time Out
	14	0	DO2 Released by Pulse Time Out
	15	0	DO3 Released by Pulse Time Out
	16	1 / 0	DO1 Operated/Released by Front Panel
	17	1 / 0	DO2 Operated/Released by Front Panel
	18	1 / 0	DO3 Operated/Released by Front Panel
3=Setpoint	1	Trigger Value	Over Uln Setpoint Active
	2	Trigger Value	Over Ull Setpoint Active
	3	Trigger Value	Over Current Setpoint Active
	4	Trigger Value	Over I4 Setpoint Active
	5	Trigger Value	Over Freq. Deviation Setpoint Active
	6	Trigger Value	Over kW Total Setpoint Active
	7	Trigger Value	Over kvar Total Setpoint Active
	8	Trigger Value	Over PF Total Setpoint Active
	9	1	DI1 Close Setpoint Active
	10	1	DI2 Close Setpoint Active
	11	1	DI3 Close Setpoint Active
	12	1	DI4 Close Setpoint Active
	13	1	DI5 Close Setpoint Active
	14	1	DI6 Close Setpoint Active
	15	Trigger Value	Over AI Setpoint Active
	16	Trigger Value	Over kW Total DMD Setpoint Active
	17	Trigger Value	Over kvar Total DMD Setpoint Active
	18	Trigger Value	Over PF Total DMD Setpoint Active
	19	Trigger Value	Over kW Total Predicted Setpoint Active
	20	Trigger Value	Over kvar Total Predicted Setpoint Active
	21	Trigger Value	Over PF Total Predicted Setpoint Active
	22	Trigger Value	Over Voltage THD Setpoint Active
	23	Trigger Value	Over Voltage TOHD Setpoint Active
	24	Trigger Value	Over Voltage TEHD Setpoint Active
	25	Trigger Value	Over Current THD Setpoint Active
	26	Trigger Value	Over Current TOHD Setpoint Active
	27	Trigger Value	Over Current TEHD Setpoint Active
	28	Trigger Value	Over U2 Unbalance Setpoint Active
	29	Trigger Value	Over I2 Unbalance Setpoint Active
	30	Trigger Value	Over Voltage OverDeviation Setpoint Active
	31	1	Over Voltage Phase Reversal Setpoint Active
	32	Trigger Value	Over Ir Setpoint Active
	33	Trigger Value	Over U2 (Negative Sequence Voltage) Setpoint Active
	34	Trigger Value	Over U0 (Zero Sequence Voltage) Setpoint Active
	35	1	Over Current Phase Reversal Setpoint Active
	36	Trigger Value	Over Ia DMD Setpoint Active
	37	Trigger Value	Over Ib DMD Setpoint Active
	38	Trigger Value	Over Ic DMD Setpoint Active
	39	Trigger Value	Over I average DMD Setpoint Active
	40~45	-	Reserved
	46	Return Value	Over Uln Setpoint Return
	47	Return Value	Over Ull Setpoint Return
	48	Return Value	Over Current Setpoint Return
	49	Return Value	Over I4 Setpoint Return
	50	Return Value	Over Freq. Deviation Setpoint Return
	51	Return Value	Over kW Total Setpoint Return
	52	Return Value	Over kvar Total Setpoint Return
	53	Return Value	Over PF Total Setpoint Return
	54	1	DI1 Close Setpoint Return
	55	1	DI2 Close Setpoint Return
	56	1	DI3 Close Setpoint Return
	57	1	DI4 Close Setpoint Return
	58	1	DI5 Close Setpoint Return
	59	1	DI6 Close Setpoint Return

	60	Return Value	Over AI Setpoint Return
	61	Return Value	Over kW Total DMD Setpoint Return
	62	Return Value	Over kvar Total DMD Setpoint Return
	63	Return Value	Over PF Total DMD Setpoint Return
	64	Return Value	Over kW Total Predicted Setpoint Return
	65	Return Value	Over kvar Total Predicted Setpoint Return
	66	Return Value	Over PF Total Predicted Setpoint Return
	67	Return Value	Over Voltage THD Setpoint Return
	68	Return Value	Over Voltage TOHD Setpoint Return
	69	Return Value	Over Voltage TEHD Setpoint Return
	70	Return Value	Over Current THD Setpoint Return
	71	Return Value	Over Current TOHD Setpoint Return
	72	Return Value	Over Current TEHD Setpoint Return
	73	Return Value	Over Voltage Unbalance Setpoint Return
	74	Return Value	Over Current Unbalance Setpoint Return
	75	Return Value	Over Voltage OverDeviation Setpoint Return
	76	0	Over Voltage Phase Reversal Setpoint Return
	77	Return Value	Over Ir Setpoint Return
	78	Return Value	Over U2 (Negative Sequence Voltage) Setpoint Return
	79	Return Value	Over U0 (Zero Sequence Voltage) Setpoint Return
	80	0	Over Current Phase Reversal Setpoint Return
	81	Return Value	Over Ia DMD Setpoint Return
	82	Return Value	Over Ib DMD Setpoint Return
	83	Return Value	Over Ic DMD Setpoint Return
	84	Return Value	Over I average DMD Setpoint Return
	85~90	-	Reserved
	91	Trigger Value	Under Uln Setpoint Active
	92	Trigger Value	Under Ull Setpoint Active
	93	Trigger Value	Under Current Setpoint Active
	94	Trigger Value	Under I4 Setpoint Active
	95	Trigger Value	Under Freq. Deviation Setpoint Active
	96	Trigger Value	Under kW Total Setpoint Active
	97	Trigger Value	Under kvar Total Setpoint Active
	98	Trigger Value	Under PF Total Setpoint Active
	99	0	DI1 Open Setpoint Active
	100	0	DI2 Open Setpoint Active
	101	0	DI3 Open Setpoint Active
	102	0	DI4 Open Setpoint Active
	103	0	DI5 Open Setpoint Active
	104	0	DI6 Open Setpoint Active
	105	Trigger Value	Under AI Setpoint Active
	106	Trigger Value	Under kW Total DMD Setpoint Active
	107	Trigger Value	Under kvar Total DMD Setpoint Active
	108	Trigger Value	Under PF Total DMD Setpoint Active
	109	Trigger Value	Under kW Total Predicted Setpoint Active
	110	Trigger Value	Under kvar Total Predicted Setpoint Active
	111	Trigger Value	Under PF Total Predicted Setpoint Active
	112	Trigger Value	Under Voltage THD Setpoint Active
	113	Trigger Value	Under Voltage TOHD Setpoint Active
	114	Trigger Value	Under Voltage TEHD Setpoint Active
	115	Trigger Value	Under Current THD Setpoint Active
	116	Trigger Value	Under Current TOHD Setpoint Active
	117	Trigger Value	Under Current TEHD Setpoint Active
	118	Trigger Value	Under U2 Unbalance Setpoint Active
	119	Trigger Value	Under I2 Unbalance Setpoint Active
	120	Trigger Value	Under Voltage OverDeviation Setpoint Active
	121	-	Reserved
	122	Trigger Value	Under Ir Setpoint Active
	123	Trigger Value	Under U2 (Negative Sequence Voltage) Setpoint Active
	124	Trigger Value	Under U0 (Zero Sequence Voltage) Setpoint Active
	125	Trigger Value	Under Ia DMD Setpoint Active
	126	Trigger Value	Under Ib DMD Setpoint Active
	127	Trigger Value	Under Ic DMD Setpoint Active
	128	Trigger Value	Under I average DMD Setpoint Active
	125~135	-	Reserved
	136	Return Value	Under Uln Setpoint Return
	137	Return Value	Under Ull Setpoint Return
	138	Return Value	Under Current Setpoint Return
	139	Return Value	Under I4 Setpoint Return
	140	Return Value	Under Freq. Deviation Setpoint Return
	141	Return Value	Under kW Total Setpoint Return
	142	Return Value	Under kvar Total Setpoint Return
	143	Return Value	Under PF Total Setpoint Return
	144	0	DI1 Open Setpoint Return
	145	0	DI2 Open Setpoint Return
	146	0	DI3 Open Setpoint Return
	147	0	DI4 Open Setpoint Return
	148	0	DI5 Open Setpoint Return
	149	0	DI6 Open Setpoint Return
	150	Return Value	Under AI Setpoint Return
	151	Return Value	Under kW Total DMD Setpoint Return
	152	Return Value	Under kvar Total DMD Setpoint Return

	153	Return Value	Under PF Total DMD Setpoint Return
	154	Return Value	Under kW Total Predicted Setpoint Return
	155	Return Value	Under kvar Total Predicted Setpoint Return
	156	Return Value	Under PF Total Predicted Setpoint Return
	157	Return Value	Under Voltage THD Setpoint Return
	158	Return Value	Under Voltage TOHD Setpoint Return
	159	Return Value	Under Voltage TEHD Setpoint Return
	160	Return Value	Under Current THD Setpoint Return
	161	Return Value	Under Current TOHD Setpoint Return
	162	Return Value	Under Current TEHD Setpoint Return
	163	Return Value	Under U2 Unbalance Setpoint Return
	164	Return Value	Under I2 Unbalance Setpoint Return
	165	Return Value	Under Voltage OverDeviation Setpoint Return
	166	-	Reserved
	167	Return Value	Under Ir Setpoint Return
	168	Return Value	Under U2 (Negative Sequence Voltage) Setpoint Return
	169	Return Value	Under U0 (Zero Sequence Voltage) Setpoint Return
	170	0	Over Logical Module #1 Setpoint Active
	171	0	Over Logical Module #2 Setpoint Active
	172	0	Over Logical Module #3 Setpoint Active
	173	0	Over Logical Module #4 Setpoint Active
	174	0	Over Logical Module #5 Setpoint Active
	175	0	Over Logical Module #6 Setpoint Active
	176	0	Over Logical Module #1 Setpoint Return
	177	0	Over Logical Module #2 Setpoint Return
	178	0	Over Logical Module #3 Setpoint Return
	179	0	Over Logical Module #4 Setpoint Return
	180	0	Over Logical Module #5 Setpoint Return
	181	0	Over Logical Module #6 Setpoint Return
	182	Return Value	Under Ia DMD Setpoint Return
	183	Return Value	Under Ib DMD Setpoint Return
	184	Return Value	Under Ic DMD Setpoint Return
	185	Return Value	Under I average DMD Setpoint Return
4=Self-Diagnostic	1	0	Reserved
	2	0	Power Supply of CPU Fault
	3	0	A/D Fault
	4	0	FRAM Fault
	5	0	System Parameter Fault
	6	0	Secret Parameter Fault
	7	0	Setpoint Parameter Fault
	8	0	Data Recorder Parameter Fault
	9	0	Waveform Recorder Parameter Fault
	10	0	Energy Log Parameter Fault
	11	0	TOU Parameter Fault
5=Operations	1	0	Power On
	2	0	Power Off
	3	X=0 to 2	Set Clock
	4	X=0 to 2	Setup Changes
	5	X=0 to 2	Clear DI Counter
	6	X=0 to 2	Clear SOE
	7	X=0 to 2	Clear PQ Log
	8	X=0 to 2	Clear Energy[1]
	9	X=0 to 2	Clear Data Recorder Log
	10	X=0 to 2	Clear Waveform Recorder Log
	11	X=0 to 2	Clear Disturbance Waveform Recorder Log
	12	X=0 to 2	Clear IER Log
	13	X=0 to 2	Clear Max./Min. Log of This Month (Since Last Reset)
	14	X=0 to 2	Clear Maximum DMD of This Month (Since Last Reset)
	15	X=0 to 2	Clear Operation Time
	16	X=0 to 2	Clear PQ Counter
	17	X=0 to 2	Clear TOU Energy
	18	X=0 to 2	Preset Energy value
	19	X=0 to 2	Send Testing Email
	20	X=0 to 2	Factory Setup Changes
	21	X=0 to 2	Setup DI Pulse Counter
	22	X=0 to 2	Reset Normal Parameter to Default
	23	X=0 to 2	Reset Factory Parameter to Default
	24	X=0 to 2	Restore Factory Defaults
	25	X=0 to 2	Preset TOU Energy
	26	X=0 to 2	Clear All Data[2]
	27	X=0 to 2	Clear EN 50160 Reports[3]
6=Other	1	0	WFR Triggered via Communication
	2	0	DWR Triggered via Communication[3]
	3	Setpoint # X (X = 1 to 30)	WFR Triggered by Setpoint # X
	4	Setpoint # X (X = 1 to 30)	DWR Triggered by Setpoint # X[3]
	5	0	WFR Triggered by Dip/Swell
	6	0	DWR Triggered by Dip/Swell[3]
	7	0	WFR Triggered by Transient
	8	0	DWR Triggered by Transient[3]
	9	Setpoint # X (X = 1 to 30)	DR Triggered by Setpoint # X
	10	Setpoint # X (X = 1 to 30)	HS DR Triggered by Setpoint # X
	11	0	DR Triggered by Dip/Swell

	12	0	HS DR Triggered by Dip/Swell
	13	0	DR Triggered by Transient
	14	0	HS DR Triggered by Transient
	15	Setpoint # X (X = 1 to 30)	Alarm Email Triggered by Setpoint # X
	16	0	Alarm Email Triggered by Dip/Swell
	17	0	Alarm Email Triggered by Transient
	18	1~4	TOU Schedule Switch
	19	0	Scheduled WFR Started[3]
	20	0	iTrigger WFR Triggered by Comm.
	21	0	iTrigger DWR Triggered by Comm. [3]
	22	Setpoint # X (X = 1 to 30)	iTrigger WFR Triggered by Setpoint
	23	Setpoint # X (X = 1 to 30)	iTrigger DWR Triggered by Setpoint[3]
	24	0	iTrigger WFR Triggered by Dip/Swell[3]
	25	0	iTrigger DWR Triggered by Dip/Swell[3]
	26	0	iTrigger WFR Triggered by Transient[3]
	27	0	iTrigger DWR Triggered by Transient[3]
	28	Source MAC Address	WFR Triggered by iTrigger[3]
	29	Source MAC Address	DWR Triggered by iTrigger[3]
	30	Bit0~Bit2: DI Status	Start Switching TOU by DI Status
	31	Bit0~Bit2: DI Status	Stop Switching TOU by DI Status
	32	Bit0~Bit2: DI Status	Tariff Switched by DI Status

Notes:

1. **Clear Energy** means to clear all 3-Phase, Total Energy Measurement, TOU Energy and Interval Energy Measurements.
2. **Clear All Data** means to clears all logs, including Data Recorder, Waveform Recorder, Energy Log, PQ Log, SOE Log, Max./Min. Log of This Month (Since Last Reset), Maximum DMD of This Month (Since Last Reset), DI Counters, Energy Registers, Device Operating Time and TOU energy.
3. This event is supported in Firmware V3.10.00 or later.
4. The value of the Operation events 3~25 illustrates where the operations take place: 0= Communications, 1= On-board Web Server, 2=Front Panel.
5. The value of the Other events 3~4, 9~10 and 15 illustrates the Setpoint module which triggers the recorder/alarm: 1 to 16 represent the standard setpoint 1 to 16, 17 to 24 represent the high-speed setpoint 1 to 8 and 25 to 30 represent the Logical Module 1 to 6.
6. The event values of **Switch TOU Schedule** are illustrated in the table below:

Record Value	Description
1	Schedule Switch from TOU 1 to TOU 2 manually
2	Schedule Switch from TOU 2 to TOU 1 manually
3	Schedule Switch from TOU 1 to TOU 2 based on the pre-defined **Switching Time**
4	Schedule Switch from TOU 2 to TOU 1 based on the pre-defined **Switching Time**

7. The Event value in SOE Log only displays the left 8 digits of the Source MAC Address due to the limit of format.

Appendix D – Technical Specifications

Voltage Inputs (V1, V2, V3, VN)	
Standard (Un)	240VLN/415VLL
Optional (Un)	69VLN/120VLL, 400VLN/690VLL
Range	10% to 120% Un
PT Ratio	
Primary	1 to 1,000,000
Secondary	1 to 1,500
Overload	1.2xUn continuous, 2xUn for 10s
Burden	<0.5VA @ 240V
Frequency	42-69 Hz
Current Inputs (·I11, I12, ·I21, I22, ·I31, I32, ·I41, I42)	
Standard (In / Imax)	5A / 10A
Optional (In / Imax)	1A / 2A
Range	0.1% to 200% In
CT Ratio	
Primary	1 to 30,000
Secondary	1 to 50
Overload	2xIn continuous, 4xIn for 60s, 10xIn for 10s, 20xIn for 1s
Burden	<0.25VA @ 5A
Power Supply (L+, N-)	
Standard	95-277V L-N/415V L-L AC, 45-65Hz, 90-300V DC
Burden	<10VA/6W @ 240V
Digital Inputs (DI1, DI2, DI3, DI4, DI5, DI6, DIC)	
Type	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Hysteresis	1-1,000ms programmable
Digital Outputs (DO11, DO12, DO21, DO22, DO31, DO32)	
Type	Form A Mechanical Relay
Loading	5A @ 250VAC/30VDC
LED Pulse Outputs (kWh, kvarh)	
Type	Optical
Pulse Constant	1000/3200/5000/6400/12800 imp/kxh
Optional Analog Input (AI+, AI-)	
Type	0-20 / 4-20 mA
Overload	24 mA maximum
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
Altitude	< 3000 m
Pollution Degree	2
Measurement Category	CAT III
Mechanical Characteristics	
Enclosure	Aluminum Alloy
Panel Cutout	92x92 mm
Unit Dimensions	96x96x119.5 mm
Shipping Dimensions	300x220x160 mm
IP Rating	54
Shipping Weight	1.18 kg

Appendix E – Accuracy Specifications

Parameters	Accuracy	Resolution
Voltage	±0.1%	0.001V
Current	±0.1%	0.001A
I4 Measured	±0.1%	0.001A
kW, kvar, kVA	±0.2%	0.001k
kWh, kVAh	IEC 62053-22 Class 0.2S ANSI C12.20 Class 0.2	0.1kXh
kvarh	IEC 62053-24 Class 0.5S IEC 62053-23 Class 2	0.1kvarh
PF	±0.2%	0.001
Frequency	±0.01 Hz	0.01Hz
Harmonics	IEC 61000-4-7 Class A	0.01%
K-Factor	IEC 61000-4-7 Class A	0.01
Phase Angles	±1°	0.1°
Voltage Deviation	±0.5%	0.01%
Frequency Deviation	±0.01Hz	0.01Hz
U Unbalance	±0.2%	0.1%
I Unbalance	±1.0%	0.1%
AI	±0.5%	-

Appendix E – Standards Compliance

Safety Requirements	
CE LVD Directive 2014 / 35 / EU	EN61010-1: 2010 EN61010-2-030: 2010
Electrical Safety in Low Voltage Distribution Systems up to 1000Vac and 1500 Vdc	IEC 61557-12: 2018 (PMD)
Insulation AC Voltage: 2kV @ 1 minute Insulation Resistance: >100MΩ Impulse Voltage: 6kV, 1.2/50µs	IEC 62052-11: 2003 IEC 62053-22: 2003
Electromagnetic Compatibility CE EMC Directive 2014 / 30 / EU (EN 61326: 2013)	
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: 2014+A1: 2017
Conducted Disturbances	EN 61000-4-6: 2014
Magnetic Fields	EN 61000-4-8: 2010
Voltage Dips and Interruptions	EN 61000-4-11: 2004+A1: 2017
Ring Wave	EN 61000-4-12: 2017
Voltage Dips, Short Interruptions and Voltage Variations on DC Input Power Port	EN 61000-4-29: 2000
Damped Oscillatory Wave	EN 61000-4-18: 2011 Class 4
Emission Tests	
Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment	EN 55011: 2016
Electromagnetic Compatibility of Multimedia Equipment – Emission Requirements	EN 55032: 2015
Limits for Harmonic Current Emissions for Equipment with Rated Current ≤16 A	EN 61000-3-2: 2014
Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems for Equipment with Rated Current ≤16 A	EN 61000-3-3: 2013
Emission Standard for Residential, Commercial and Light-Industrial Environments	EN 61000-6-4: 2007+A1: 2011
Power Quality	
Testing and Measurement Techniques – Power Quality Measurement Methods	IEC 61000-4-30 Ed. 3 Class S Compliance
Power Quality Measurement in Power Supply Systems - Part 2: Functional Tests and Uncertainty Requirements	IEC 62586-2 Ed. 2
Mechanical Tests	
Spring Hammer Test	IEC 62052-11: 2003
Vibration Test	IEC 62052-11: 2003
Shock Test	IEC 62052-11: 2003

Appendix F – Ordering Guide

CET Electric Technology

Version 20210712

Product Code	Description
iMeter 6 Advanced Power Quality Monitor	
Basic Function	
256 samples per cycle, Class 0.2S Compliant, 3-Phase Metering, Demands, Max. Demands, Max./Min., SOE Log, Individual Harmonics to 63rd, 1GB Log Memory, 32 Data Recorders, High-Speed Data Recording, WF Recording, Dips/Swells/Interruptions and Transients Detections	
Display Screen	
B	Color Dot-Matrix IPS Display (320x240 Resolution)
Input Current (I1, I2, I3, I4#)	
5	5A
1	1A
Input Voltage (V1, V2, V3)	
1	69V/120V
3	240V/415V
9*	400V/690V
Power Supply	
2	95-277VAC L-N/415VAC L-L, 45-65Hz 90-300VDC
System Frequency	
5	42Hz-69Hz
DI/DO	
A	6DI + 3DO
AI	
X	No
A*	1xAnalog Input (0-20mA or 4-20mA DC)#
Communications	
D	1x10/100BaseT Ethernet port + 1xRS-485 port
Display Language	
E	English

iMeter 6	-	B	5	3	2	5	A	X	D	E	iMeter 6-B5325AXDE (Standard Model)

* Additional charges apply

The I4 Input is replaced by the AI Option A

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