iMeter 6

Advanced Power Quality Analyzer

User Manual

Version: V1.0A

September 24, 2019

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

Standards Compliance

CE

DANGER

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

CAUTION

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

DANGER

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

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

Limited warranty

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

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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 96mmx96mmx119.5mm, 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 with Modbus TCP/RTU support, 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, on-board Web Server or free PMC Setup software
- Easy installation with mounting slide bar, no tools required

Basic True RMS Measurements (1 second update)

- 3-Phase Voltage, Current and Power measurements
- Neutral Current (I4), Calculated Residual Current (Ir) and Frequency
- kWh/kvarh Import/Export/Net/Total, kVAh Total
- kvarh Q1 - Q4
- Voltage and Current Phase Angles
- Interval Energy measurements for kWh Import/Export, kvarh Import/Export and kVAh with programmable **EN Period**
- Device Operating Time (Running Hours)

High-speed RMS Measurements

- 3-phase Voltage, 3-Phase Current and Neutral Current (I4) @ 1 cycle
- 3-phase Power and Power Factor @ 1 cycle

Power Quality

- IEC 61000-4-30 Class S Compliance
- Waveform Recording at 256 samples per cycle
- Fundamental measurements for 3-Phase Voltage, Current, Power, PF and I4
- Voltage and Current Unbalance and Symmetrical Components
- Voltage and Frequency Deviation
- THD, TOHD, TEHD, K-Factor and TDD
- Individual Harmonics up to 63rd
- Dip/Swell/Interruption Detection and Transient Capture

Demands

- Demands and Predicted Demands for 3-Phase Voltage, Current, Power, PF, I4, Frequency, U and I Unbalance and THD
- Peak Demands with Timestamp for Current, Power, and PF 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 Setpoints with extensive list of monitoring parameters including Voltage, Current, Power, Demands and THD, etc.
- 8 High-Speed Setpoints for Voltage, Current, Power, PF, Frequency, Deviation, and DI.
- Configurable thresholds and time delays
- 6 Logical Modules supporting AND/OR/NAND/NOR operations
- SOE, WF Recording, Data Recorder, DO, and Email Alarm trigger

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 with minimum 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
- Tariff switching based on DI status

Log memory

- 1GB on-board memory
- Data Recorder Logs, Waveform Recorder Logs, Energy Log and Demand Logs

Data Recorder (DR) Log

- 12 Standard DR Logs and 4 High-Speed DR Logs
- Recording interval from 1s to 40 days for standard DR and 1 to 60 cycles for High-Speed DR.
- Up to 16 Programmable Parameters for each DR Log with programmable sources which include almost all Real-Time measurements, Harmonics, Unbalance and Demand measurements
- Configurable Depth and Recording Offset
- Support FIFO or Stop-When-Full Recording Mode

Waveform Recorder (WFR) Log

- 2 independent groups of Waveform Recorders with a combined total of 256 entries
- Simultaneous capture of 3-Phase Voltage and Current signals
- Programmable formats and pre-fault cycles from 256x20 to 16x320
- Support FIFO Recording Mode

Interval Energy Recorder (IER) Log

- Interval Energy recording of kWh/kvarh Import/Export and kVAh Total
- 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
- Sag/Swell/Interruption and Transient detection

Max/Min Log

- Logging of Max./Min. values for measurements such as Voltage, Current, Frequency, kW, kvar, kVA, 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 for alarming and control

Analog Input (Optional)

- 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 RS485 port
  - Baud rate from 1200 to 38,400bps
  - Modbus RTU, Ethernet Gateway
- Ethernet (P2)
  - 10/100BaseT Ethernet Port with RJ45 connection
  - Modbus RTU over TCP/IP, Modbus TCP, HTTP, SMTP, SNTP, FTP

Real-time clock

- Battery-backed Real-time Clock with 6ppm accuracy (<0.5s per day)

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 allows 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.

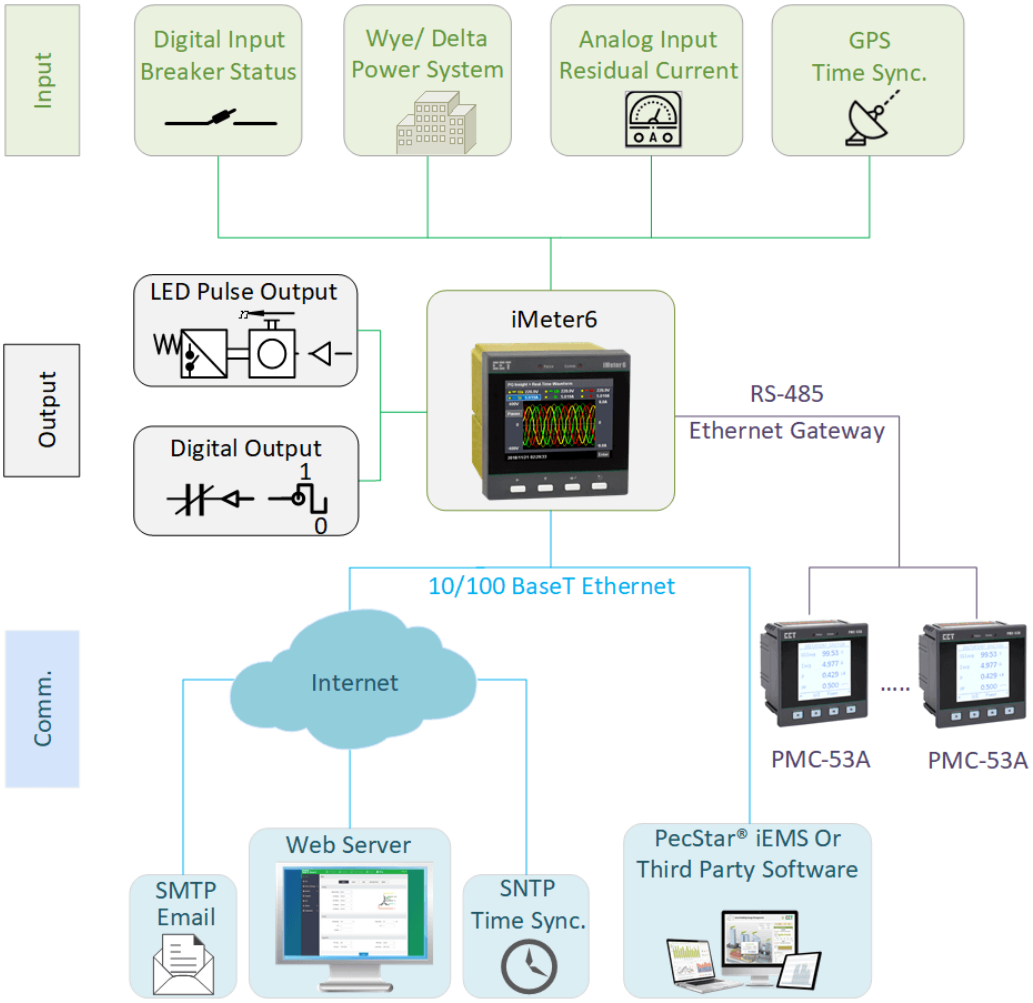


Figure 1-1 Typical Applications

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

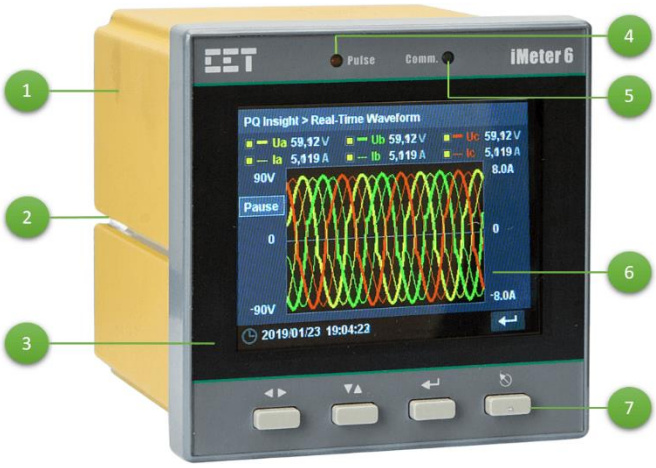
Chapter 2 Installation

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.

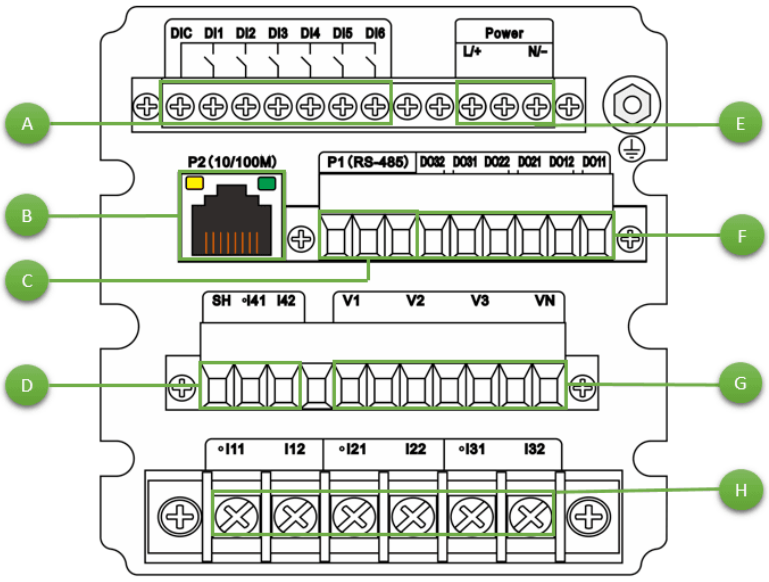
During the operation of the meter, hazardous voltages are present at the input terminals. Failure to observe precautions can result in serious or even fatal injury and equipment damage.

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

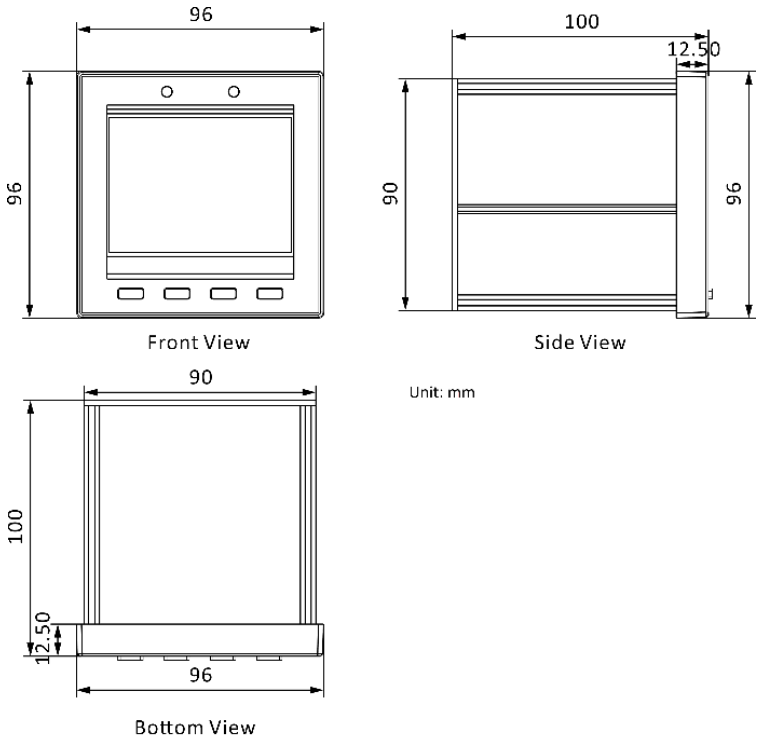
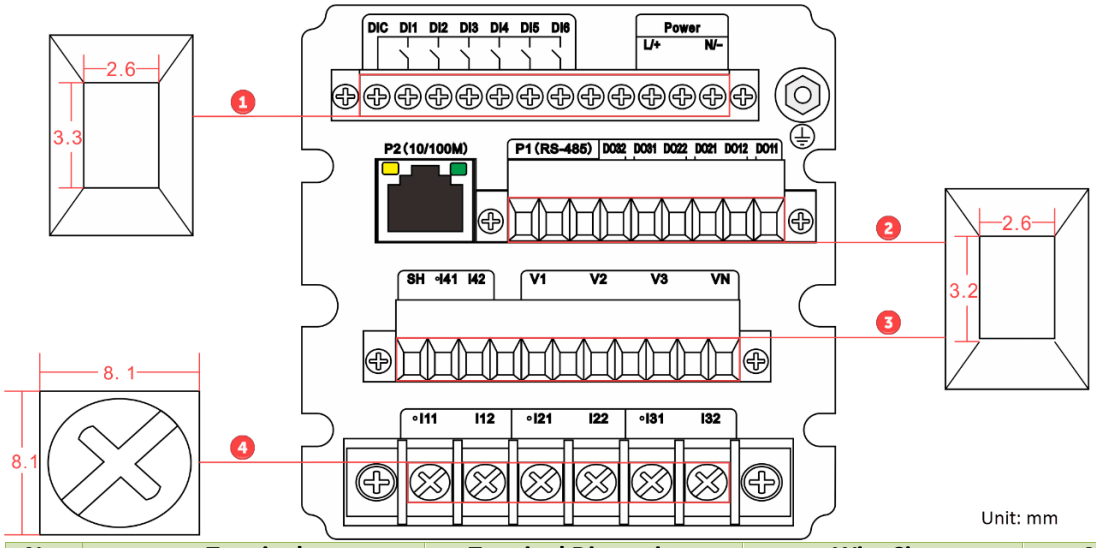


Figure 2-3 Unit Dimensions

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	RS485	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

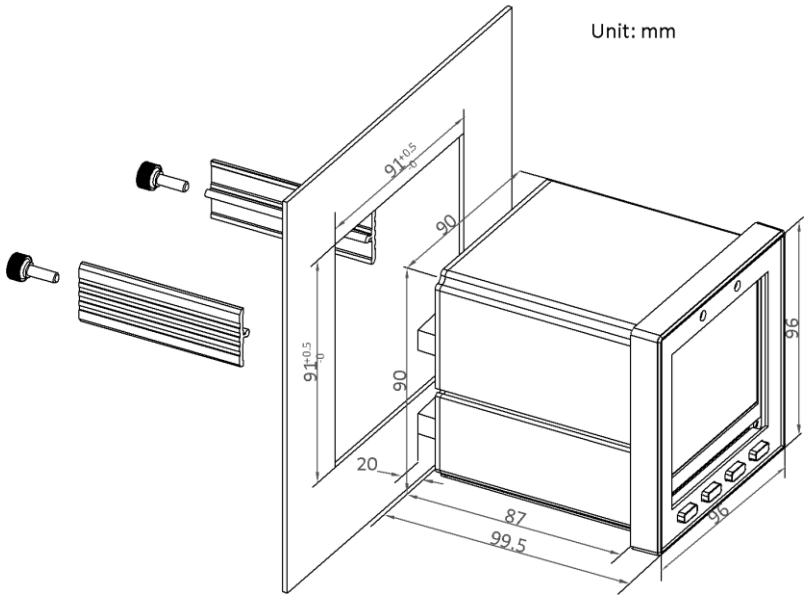


Figure 2-5 Panel Cutout

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 Connection with 3CTs or 4CTs
- 3-Phase 4-Wire Wye with 3PTs and 3CTs or 4CTs
- 3-Phase 3-Wire Grounded Wye Direct Connection
- 3-Phase 3-Wire Grounded Wye with 3PTs and 3CTs
- 3-Phase 3-Wire Direct Delta Connection with 3CTs or 2CTs
- 3-Phase 3-Wire Open Delta with 2PTs and 3CTs or 2CTs

Caution

Under no circumstances should the PT secondary be shorted.

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

2.5.2 3-Phase 4-Wire Wye Direct Connection 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**.

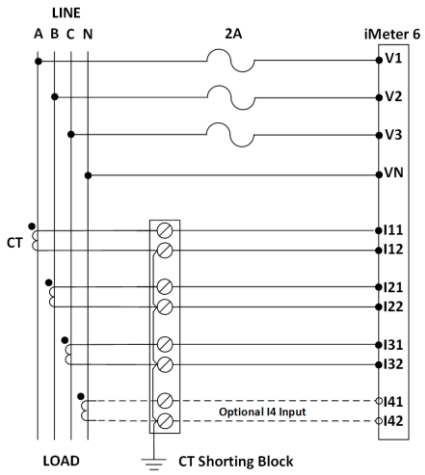


Figure 2-6 3P4W Wye Direct Connection with 3CTs or 4CTs (Optional I4 Input)

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**.

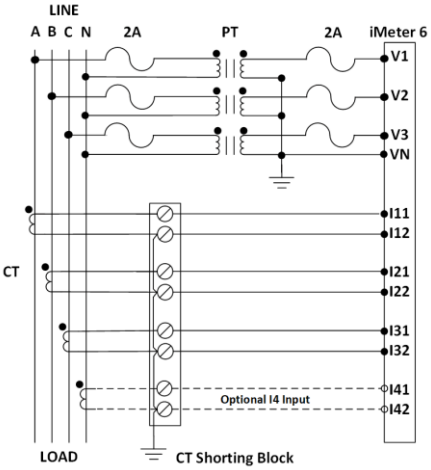


Figure 2-7 3P4W Wye with 3PTs and 3CTs or 4CTs (Optional I4 Input)

2.5.4 3-Phase 3-Wire Grounded Wye

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**.

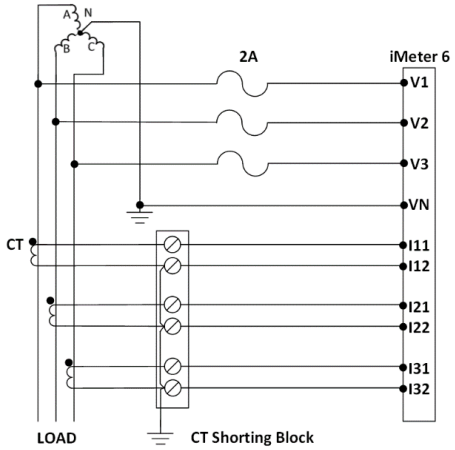


Figure 2-8 3P3W Grounded Wye with no PTs & 3CTs

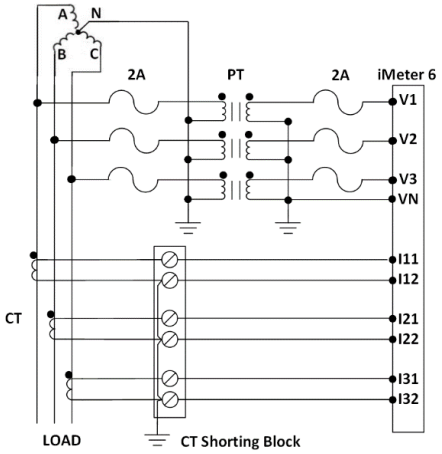


Figure 2-9 3P3W Grounded Wye with 3PTs & 3CTs

2.5.5 3-Phase 3-Wire Direct Delta Connection 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**.

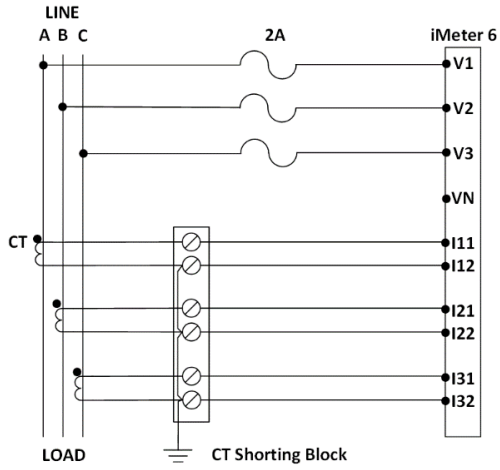


Figure 2-10 3P3W Direct Connections with 3 CTs

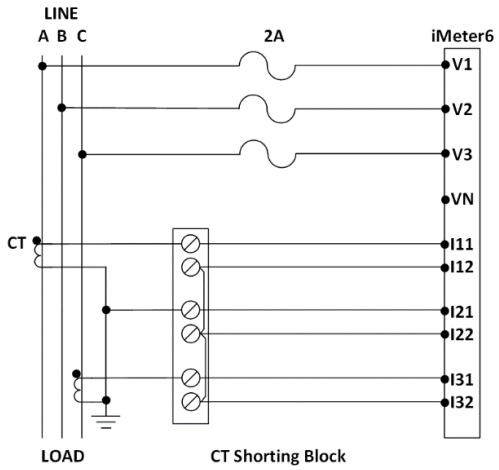


Figure 2-11 3P3W Direct Connection with 2CTs

2.5.6 3-Phase 3-Wire Open Delta 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**.

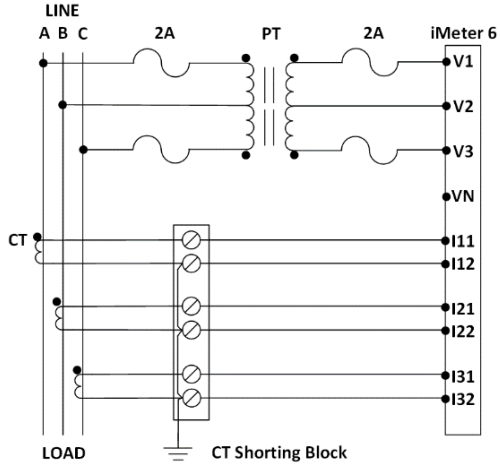


Figure 2-12 3P3W Open Delta with 2PTs & 3CTs

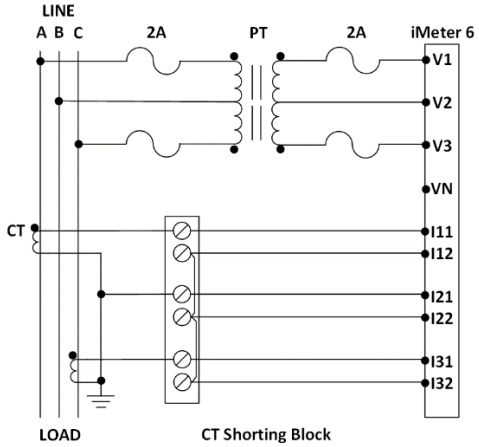


Figure 2-13 3P3W Open Delta with 2PTs & 2CTs

2.6 Communications Wiring

2.6.1 RS485 Port

The iMeter 6 provides one RS485 port and supports the Modbus RTU protocol. Up to 32 devices can be connected on a RS485 bus. The overall length of the RS485 cable connecting all devices should not exceed 1200m.

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

The following figure illustrates the RS485 communications connections on the iMeter 6:

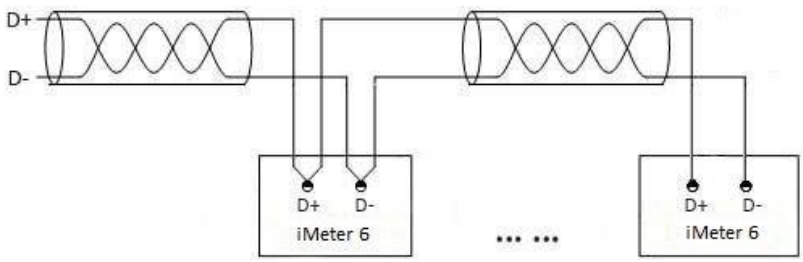


Figure 2-14 RS-485 Communications Connections

2.6.2 Ethernet Port (10/100BaseT)

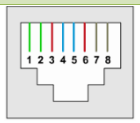
RJ45 Connector	Pin	Meaning
	1	Transmit Data+
	2	Transmit Data-
	3	Receive Data+
	4,5,7,8,	NC
	6	Receive Data-

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:

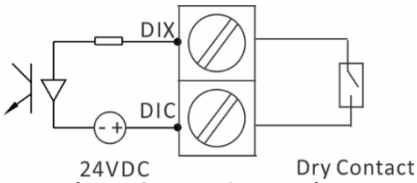


Figure 2-15 DI Connections

2.8 GPS 1PPS Input wiring

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

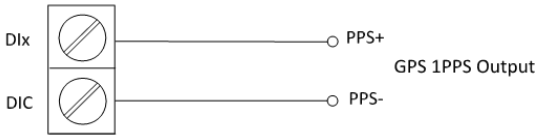


Figure 2-16 Time Sync. Connections

2.9 Digital Output Wiring

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

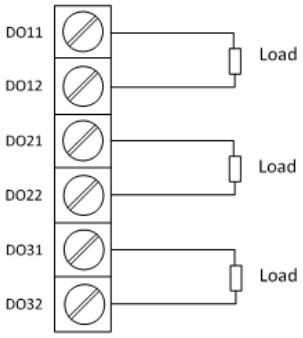


Figure 2-17 DO Connections

2.10 Energy Pulse Output Wiring

The following figure illustrates the Energy Pulse Output connections.

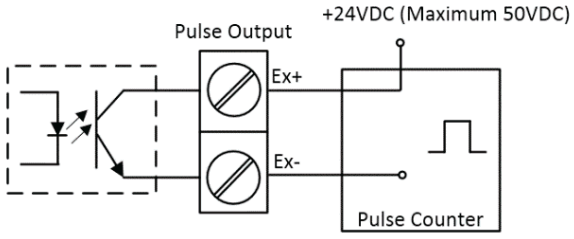


Figure 2-18 Energy Pulse Output Connections

2.11 Analog Input Wiring

The following figure illustrates the optional Analog Input connections.

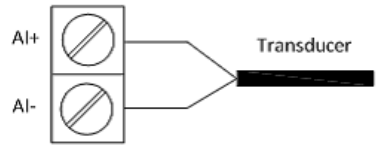


Figure 2-19 AI Connections

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.

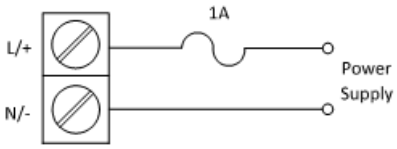


Figure 2-20 Power Supply Connections

2.13 Chassis Ground Wiring

Connect the G terminal to earth ground.

Figure 2-21 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 iMeter6, 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 iMeter6 also provides four buttons for data display and setup configuration.

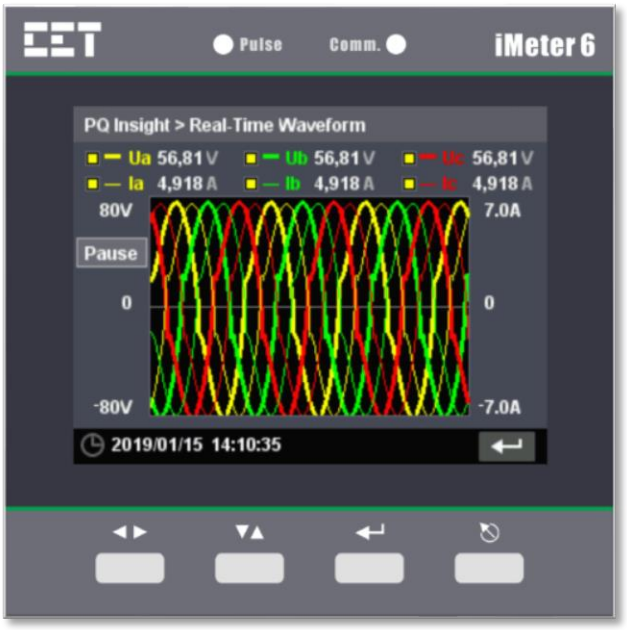


Figure 3-1 Front Panel

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 Buttons

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 5 items, **Metering**, **Power Quality**, **PQ Insight**, **Events**, 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 following figure provides an overview of the Front Panel User Interface.

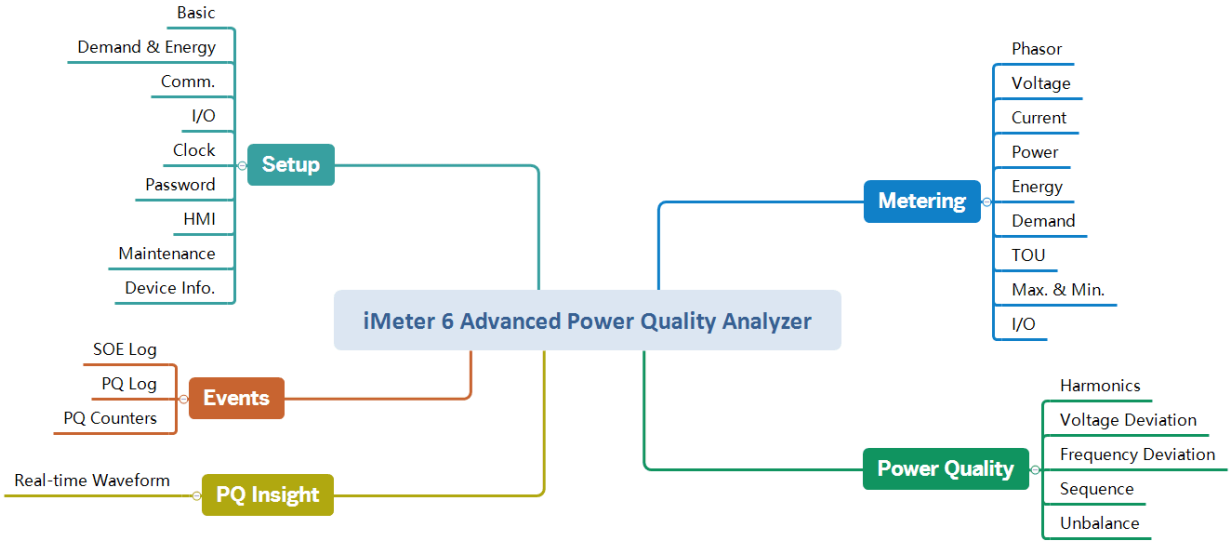


Figure 3-2 Overview for Front Panel Operation

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.

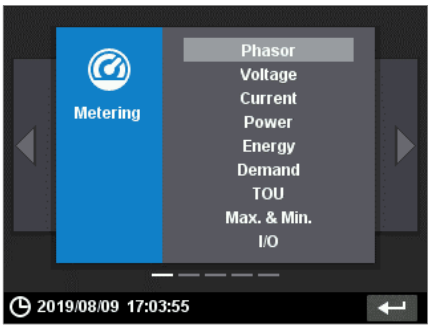


Figure 3-3 Metering Menu

3.1.3.1.1 Phasor

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

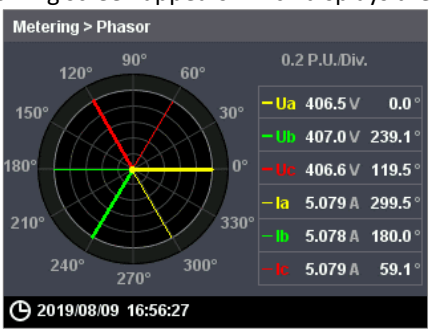


Figure 3-4 Phasor

3.1.3.1.2 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 and Frequency.

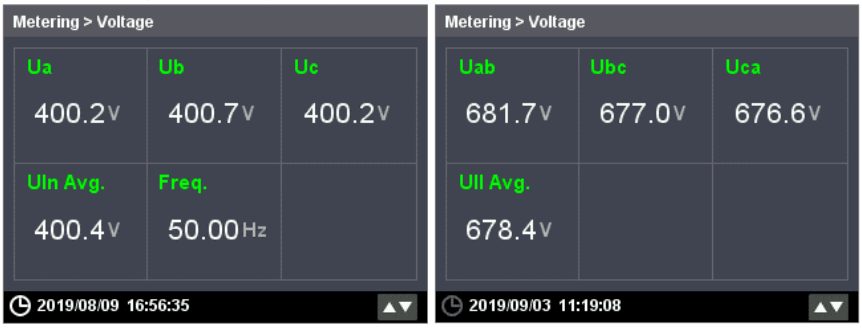


Figure 3-5 Voltage Measurements

3.1.3.1.3 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).

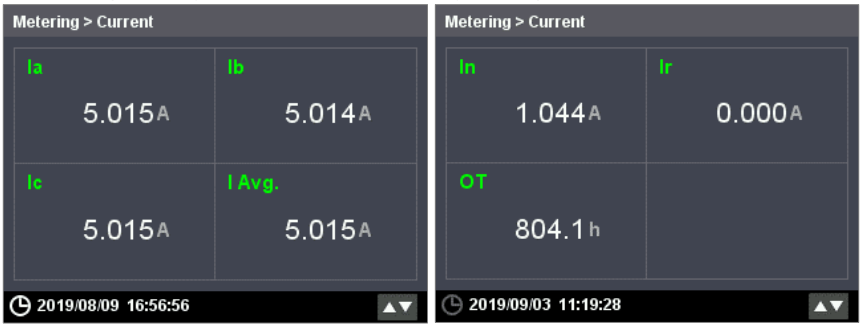


Figure 3-6 Current Measurements

3.1.3.1.4 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.

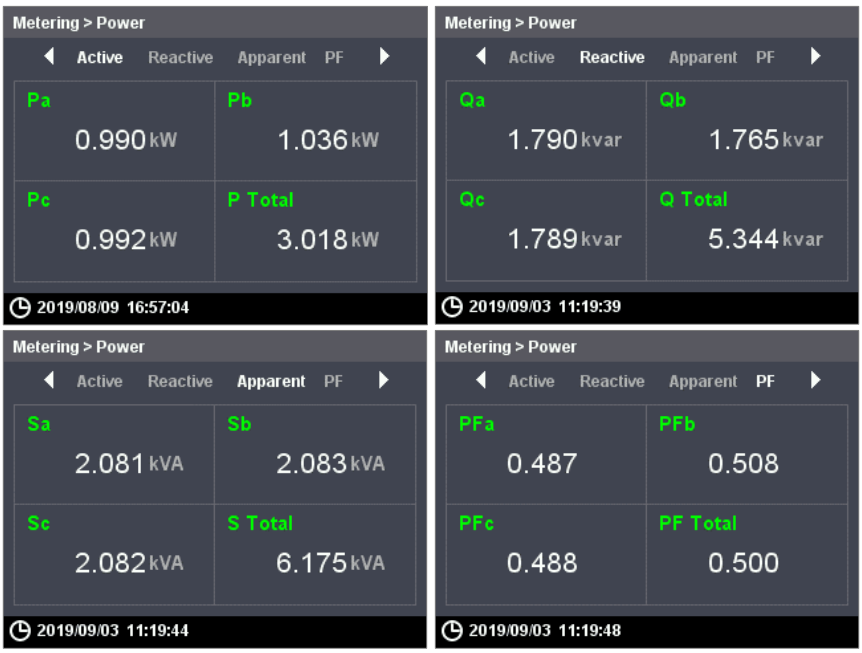


Figure 3-7 Power Measurements

3.1.3.1.5 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

3.1.3.1.6 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.** Use the <▼▲> button to scroll to the different parameters for 3Φ Current, P, Q, S and PF.

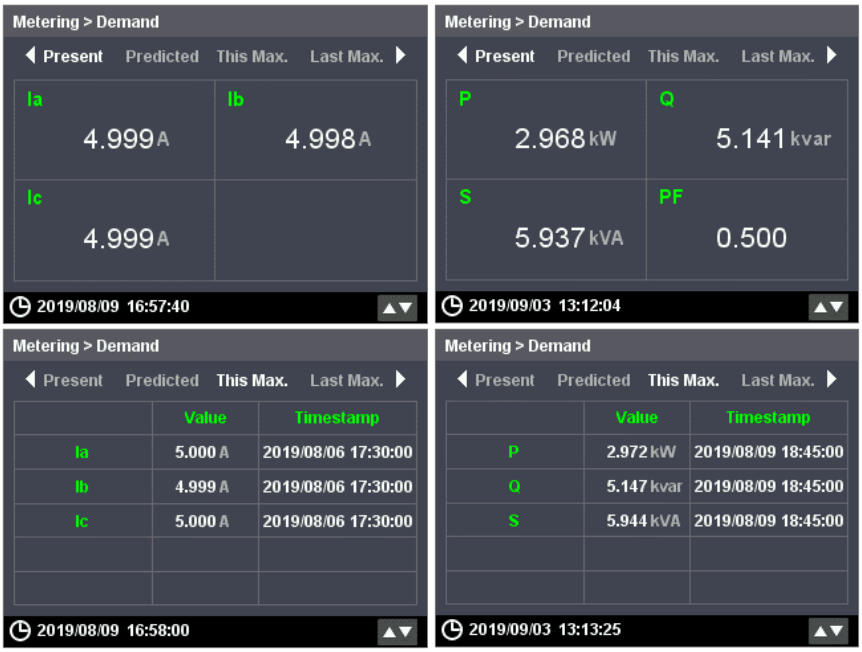


Figure 3-9 Demand Measurements

3.1.3.1.7 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 between the different Tariffs.

Figure 3-10 TOU Measurements

3.1.3.1.8 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 4-16 Max./Min. Log** illustrates the parameters monitored.

Figure 3-11 Max. & Min. Measurements

3.1.3.1.9 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).

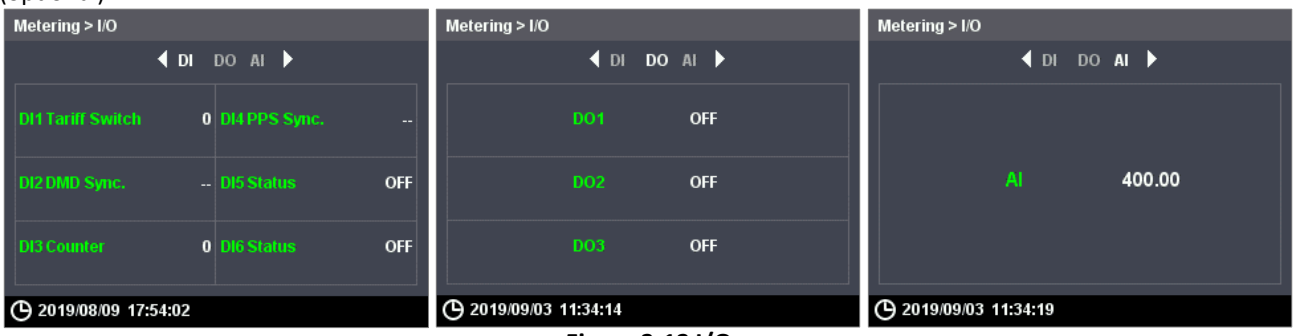


Figure 3-12 I/O

3.1.3.2 Power Quality

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

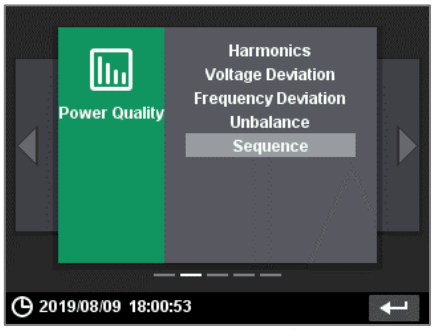


Figure 3-13 Power Quality Menu

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.

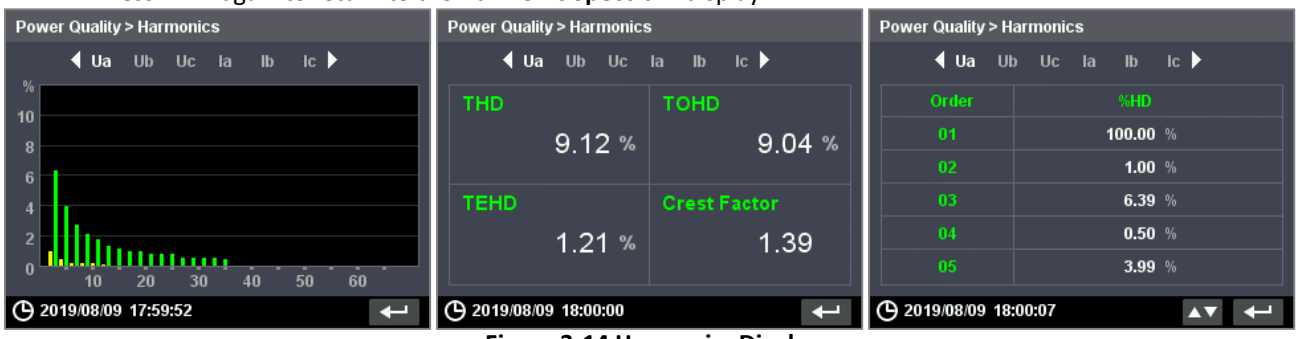


Figure 3-14 Harmonics Display

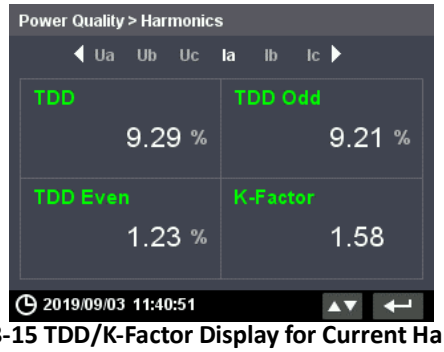


Figure 3-15 TDD/K-Factor Display for Current Harmonics

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.

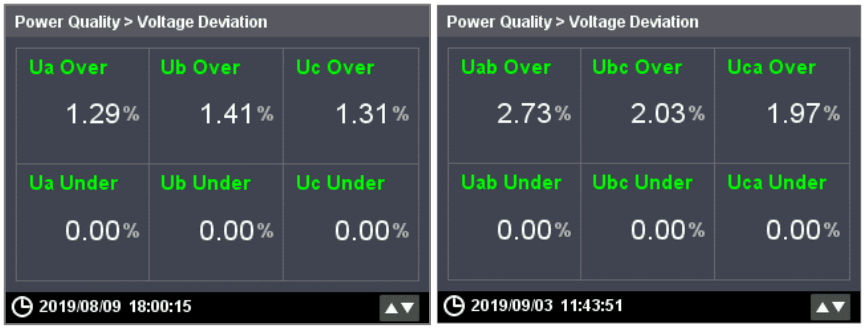


Figure 3-16 Voltage Deviation

3.1.3.2.3 Frequency Deviation

Figure 3-17 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 3-18 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 3-19 Sequence

3.1.3.3 PQ Insight

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

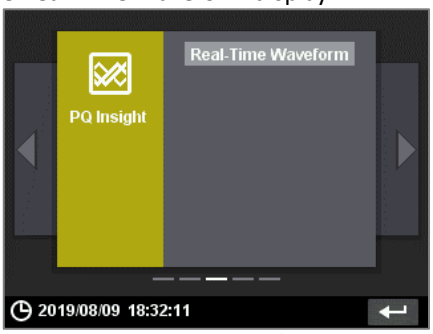


Figure 3-20 PQ Insight Menu

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.

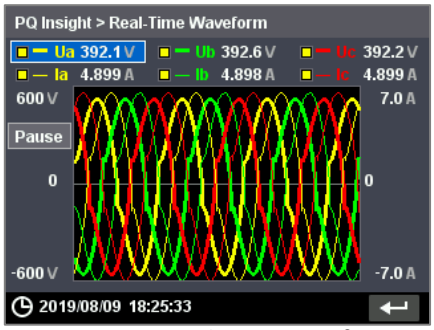


Figure 3-21 Real-time Waveform

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.

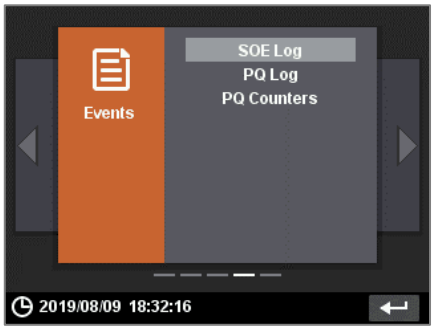


Figure 3-22 Events Menu

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.

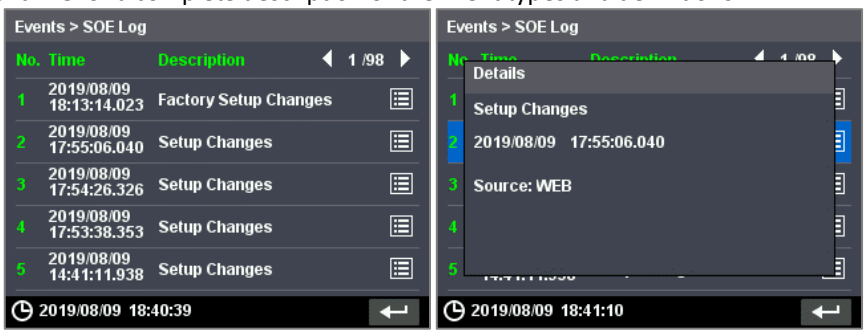


Figure 3-23 SOE Log

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.

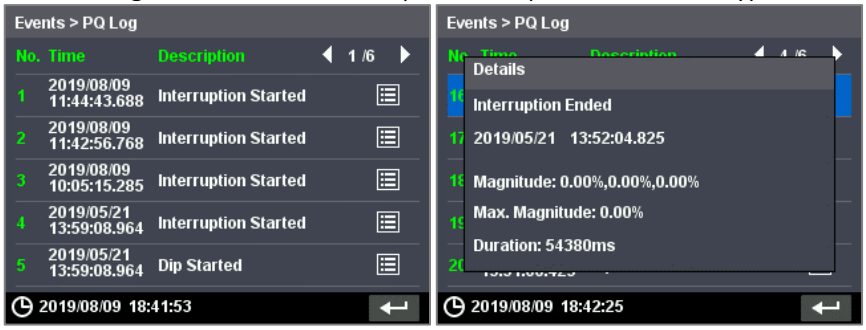


Figure 3-24 PQ Log

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 3-25 PQ Counters

3.1.3.5 Setup

The **Setup** menu consists of **Basic**, **Demand & Energy**, **Comm.**, **I/O**, **Clock**, **Password**, **HMI**, **Maintenance**, and **Device Info.** The following sections provide a quick overview for these screens.

Figure 3-26 Setup menu

3.1.3.5.1 Basic

Enter the **Basic** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **Wiring**, **Rated**, 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 **Table 3-5** for the setup range and the default values.

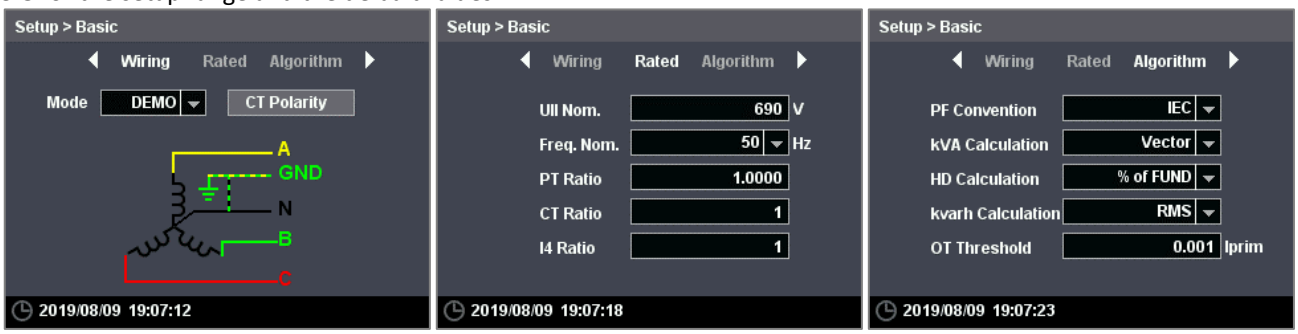


Figure 3-27 Basic Setup Screens

3.1.3.5.2 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** 3.2.3.5.3 for more information about the different parameters.

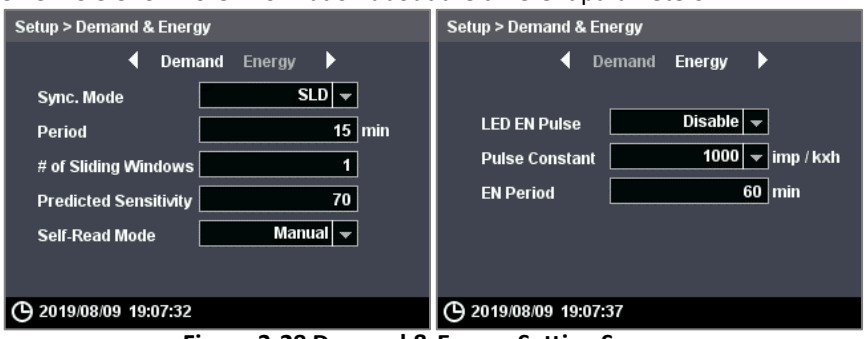


Figure 3-28 Demand & Energy Setting Screens

3.1.3.5.3 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 **Table 3-6** for more information about the different parameters.

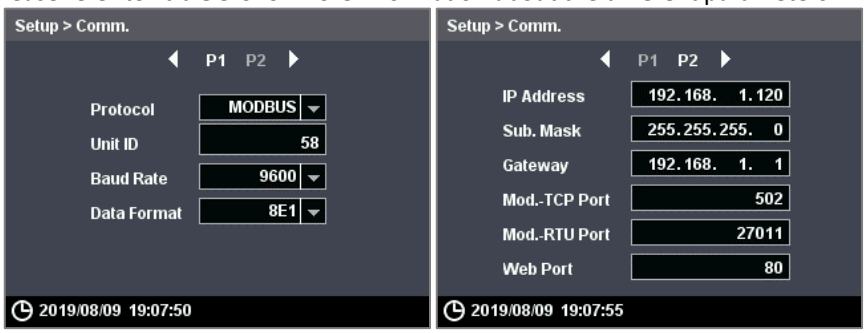


Figure 3-29 Comm. Setup Screens

3.1.3.5.4 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 5-35 Basic Setup Parameters -** register 6025 to 6058 for more information.

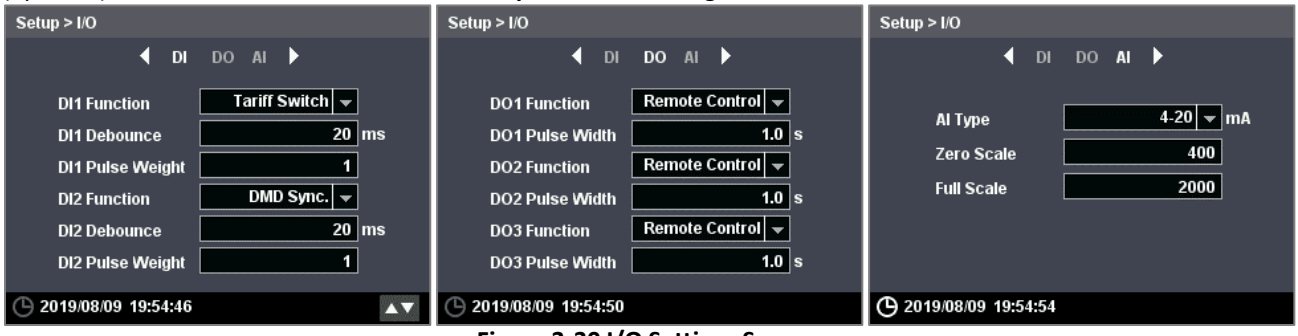


Figure 3-30 I/O Settings Screens

3.1.3.5.5 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 **Table 3-7 Time Sync. Setup** for more information.

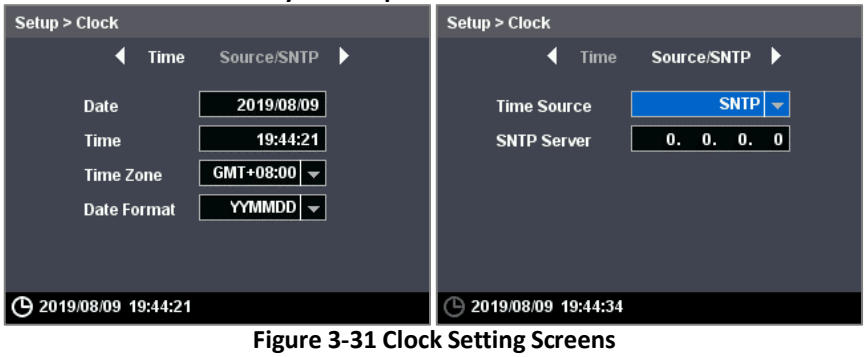


Figure 3-31 Clock Setting Screens

3.1.3.5.6 Password

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

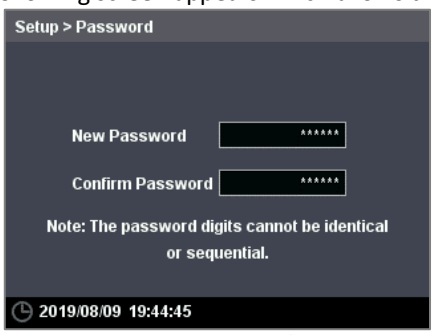


Figure 3-32 Password Setting

3.1.3.5.7 HMI

Enter **HMI** sub-menu and the following screen appear.

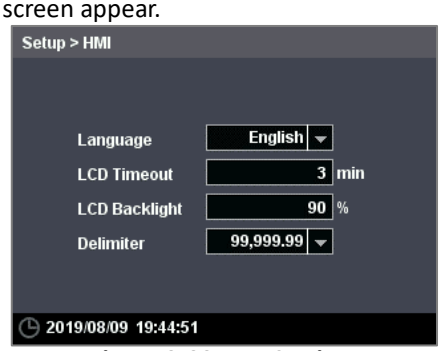


Figure 3-33 HMI Settings

3.1.3.5.8 Maintenance

Enter the **Maintenance** sub-menu and the following screens are available. Use the <◀ ▶> button to scroll between **DO** and **Clear**.

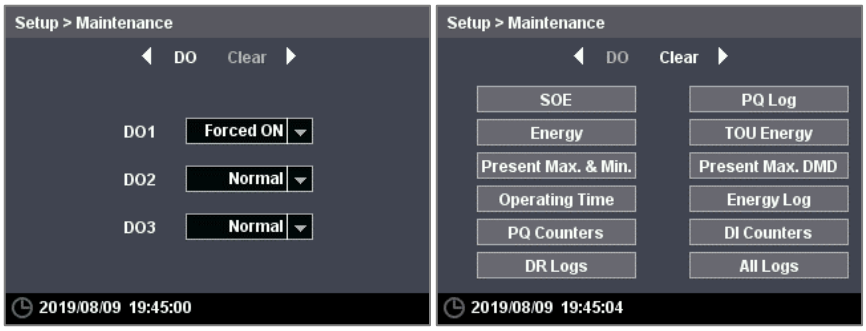


Figure 3-34 Maintenance Setting Screens

3.1.3.5.9 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.

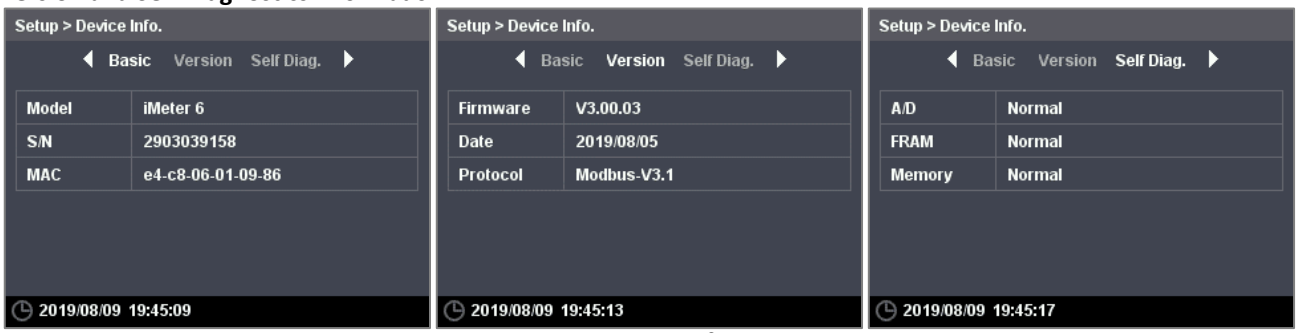


Figure 3-35 Device Info. Screens

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).

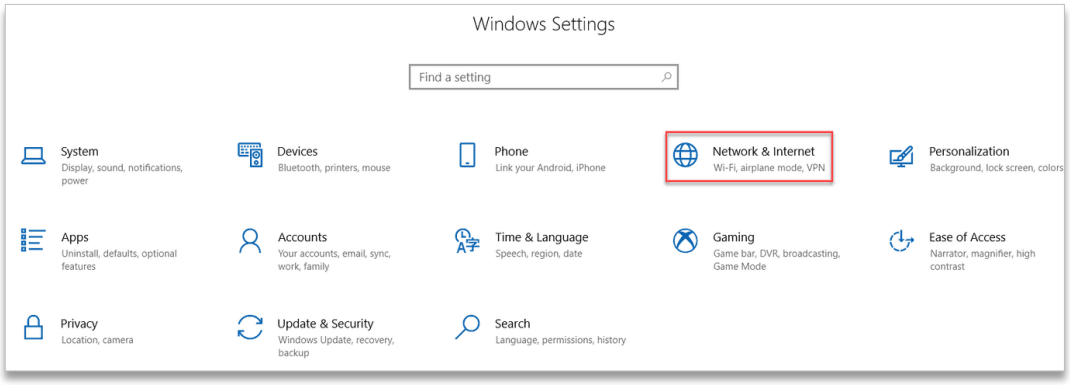


Figure 3-36 Settings-> Network & Internet

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

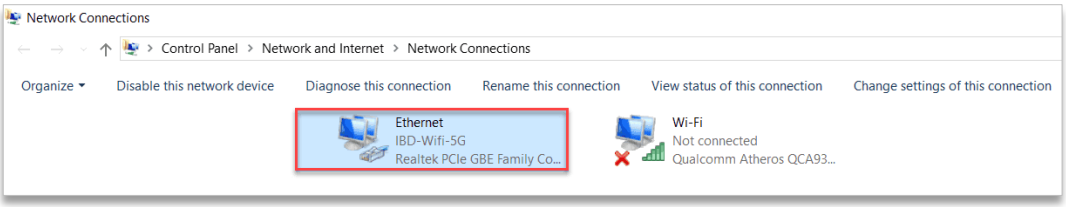


Figure 3-37 Network and Sharing Center

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

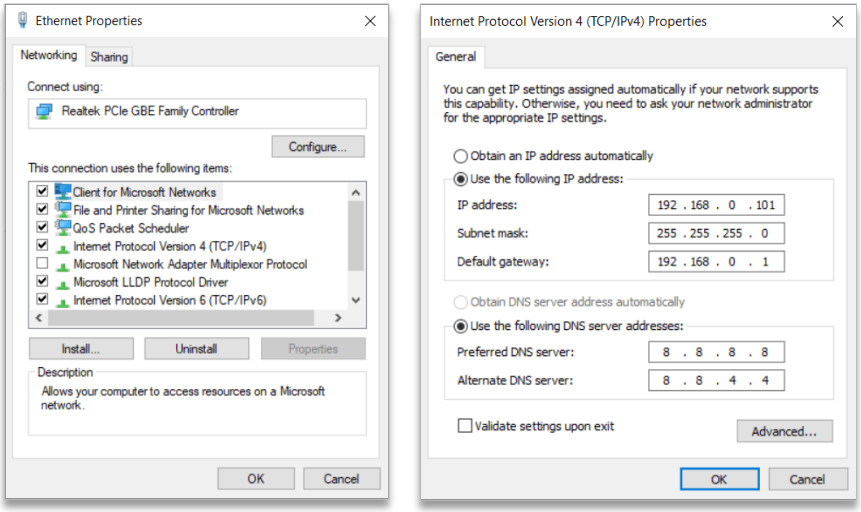


Figure 3-38 Setting PC's IP Address

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**. The default IP Address of the meter is 192.168.0.100.

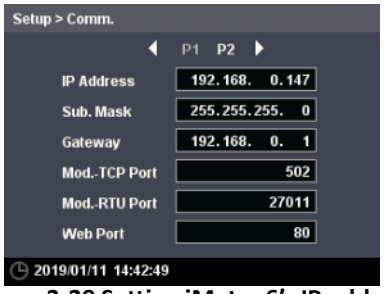


Figure 3-39 Setting iMeter 6's IP address

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 3-40 Web Logon

2) The iMeter 6's logon page appears.

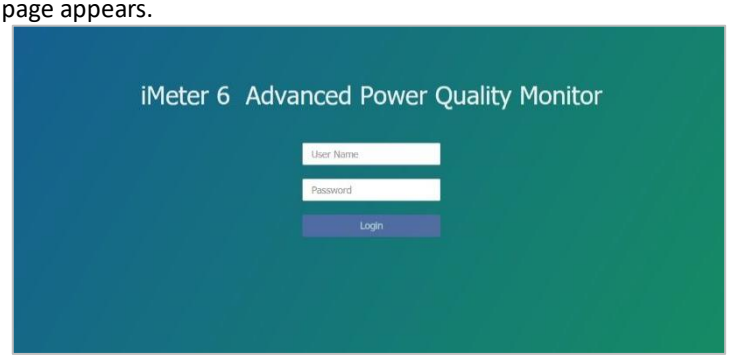


Figure 3-41 Web Interface

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.

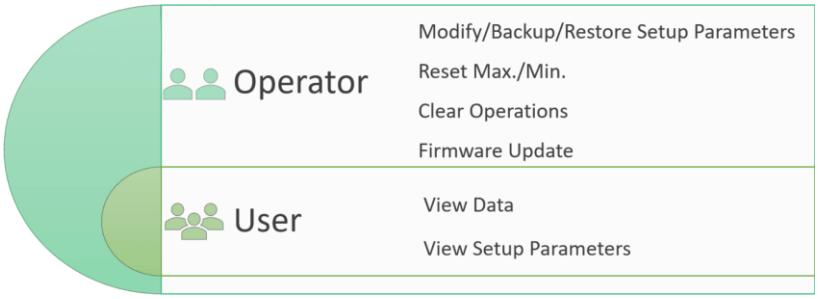


Figure 3-42 Authorities with their Permission Levels

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

4) The iMeter 6's Web Interface appears after login. There are five items at the **Title Bar** – **PQ Insight**, **Metering, Power Quality, Events** and **Setup.**

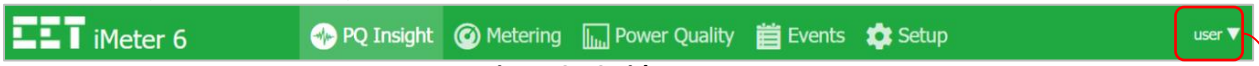


Figure 3-43 Title Bar

5) 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.

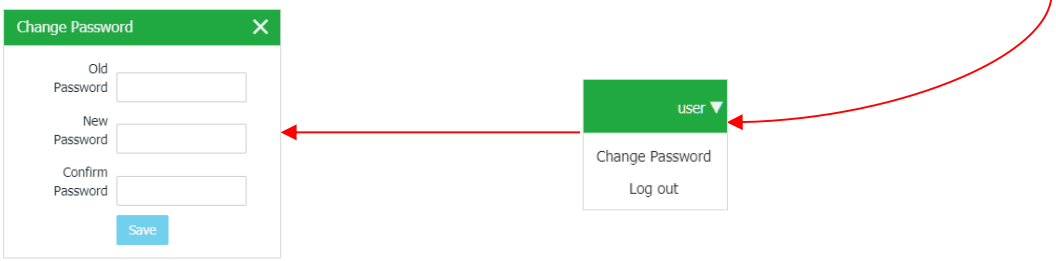


Figure 3-44 Modify the Web Interface Password

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:

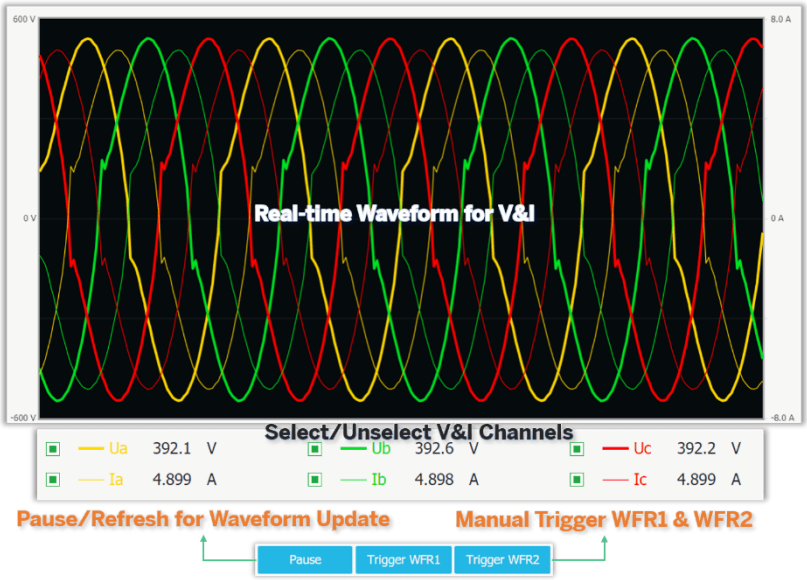


Figure 3-45 PQ Insight Interface

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.

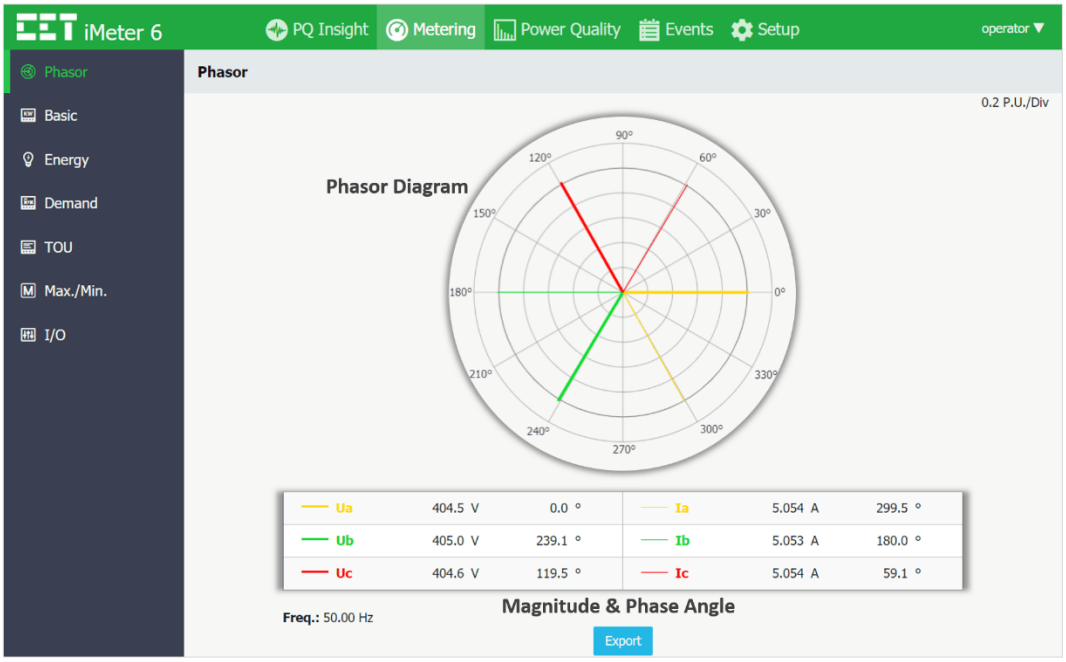


Figure 3-46 Phasor Diagram

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, I4, Ir and In. Click **Export** to save the data on this page to .csv file at the default Download folder.

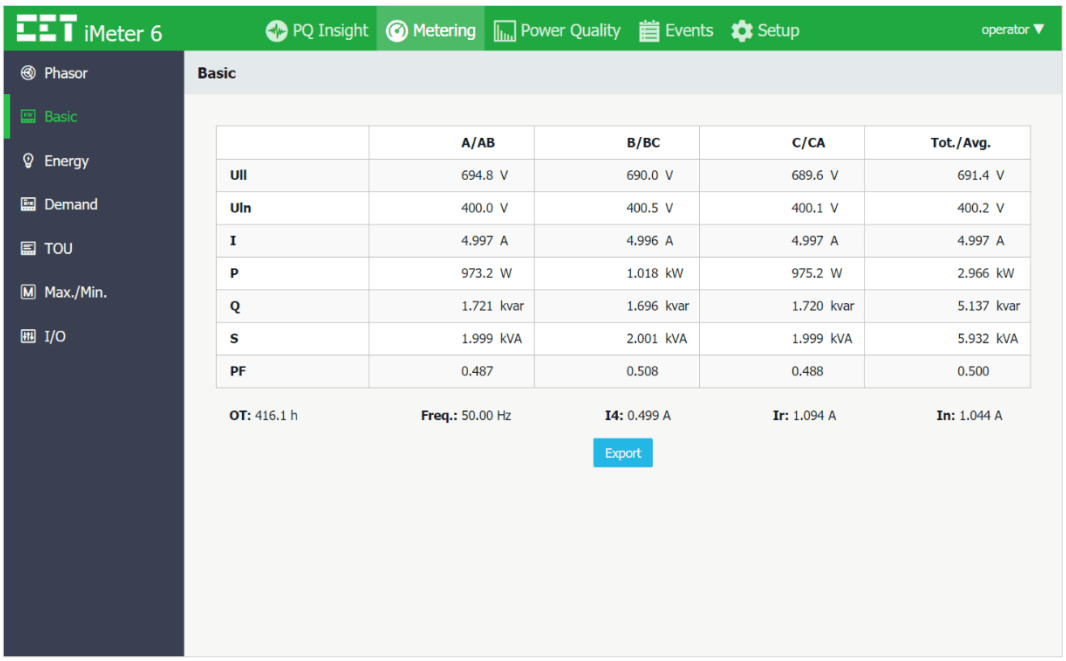


Figure 3-47 Basic Measurements

3.2.3.2.3 Energy

Click **Energy** on the left-hand pane and the following screen appears which shows the **Active** and **Reactive** Energy for **Import/Export/Net/Total** as well as the **Total Apparent** Energy 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.

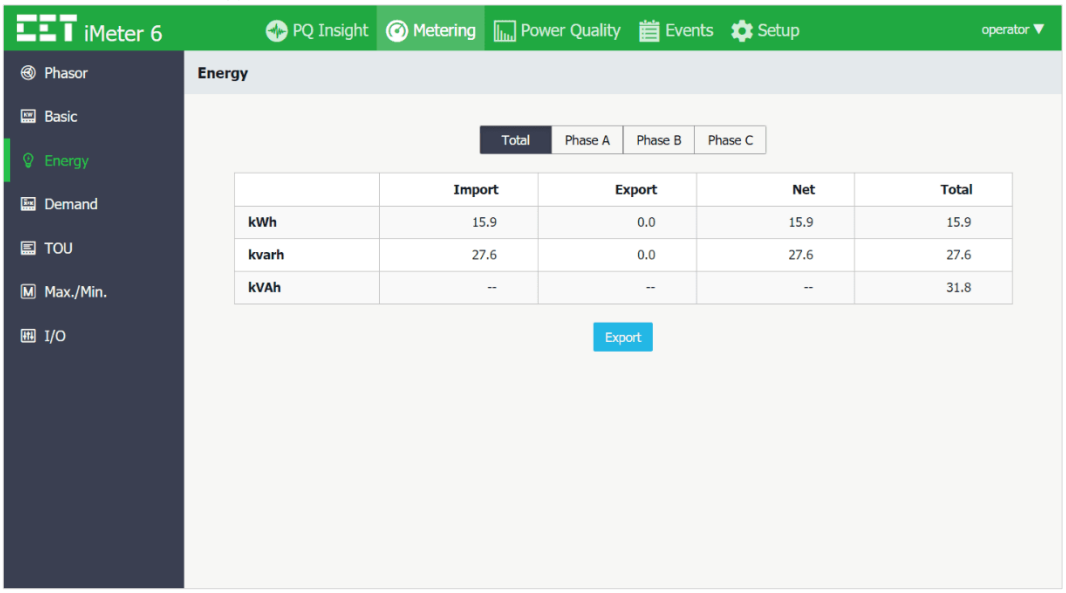


Figure 3-48 Energy Measurements

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.

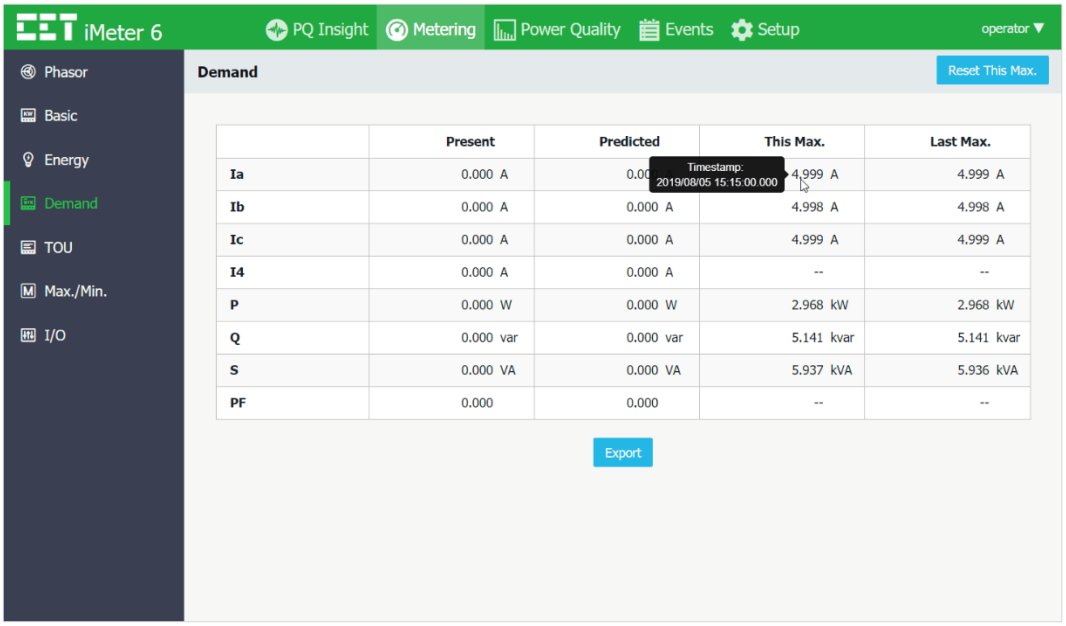


Figure 3-49 Demand Measurements

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.

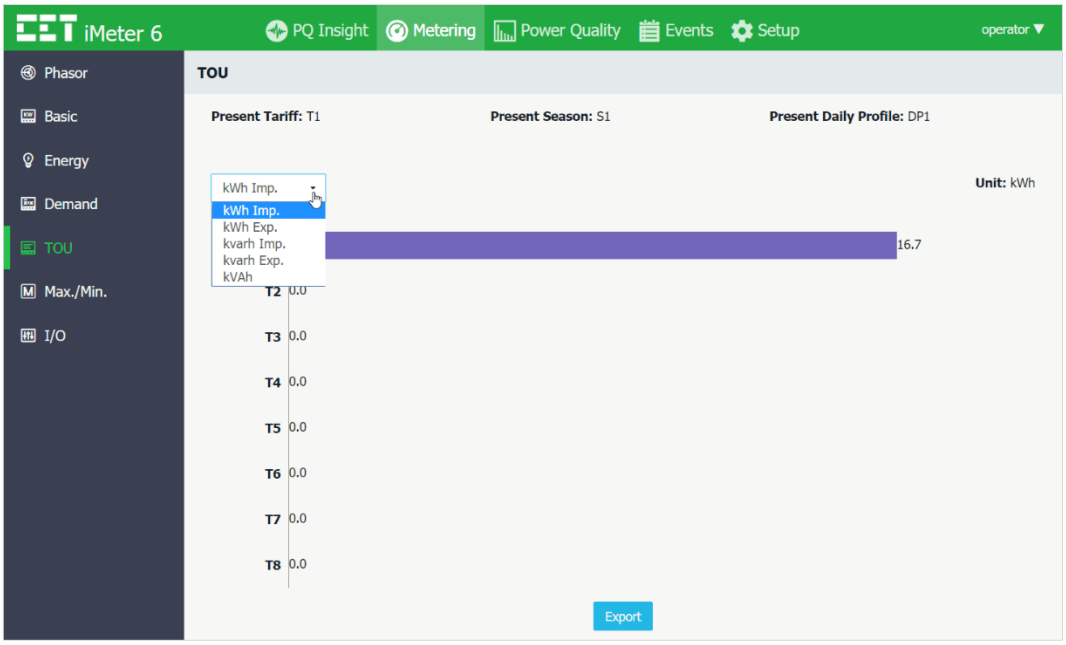


Figure 3-50 TOU Measurement

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.

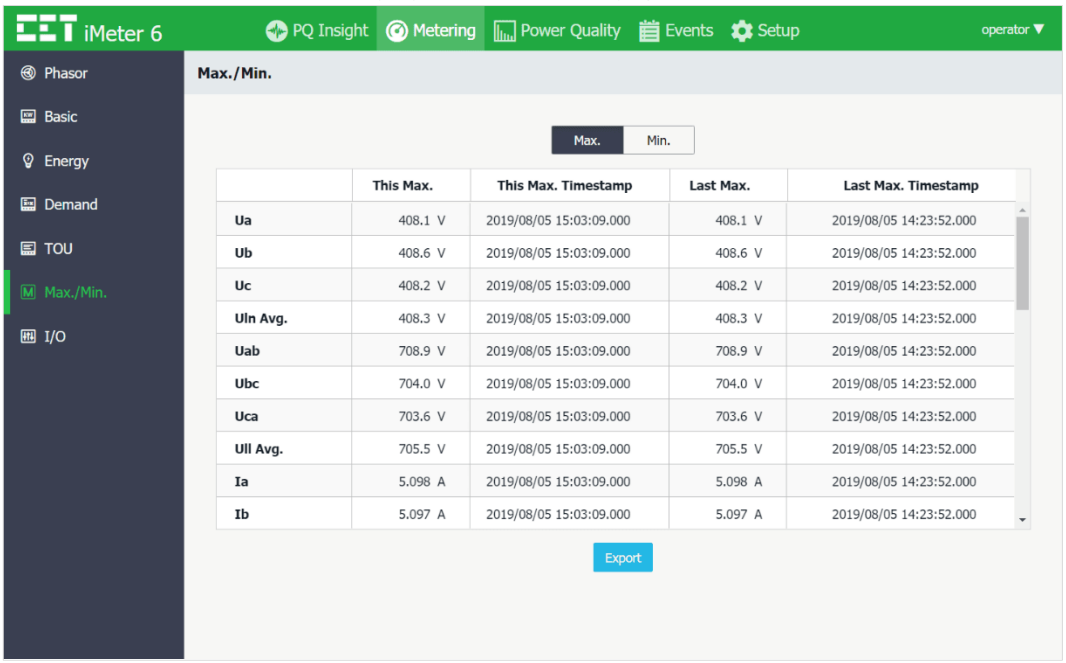


Figure 3-51 Max./Min. Measurements

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).

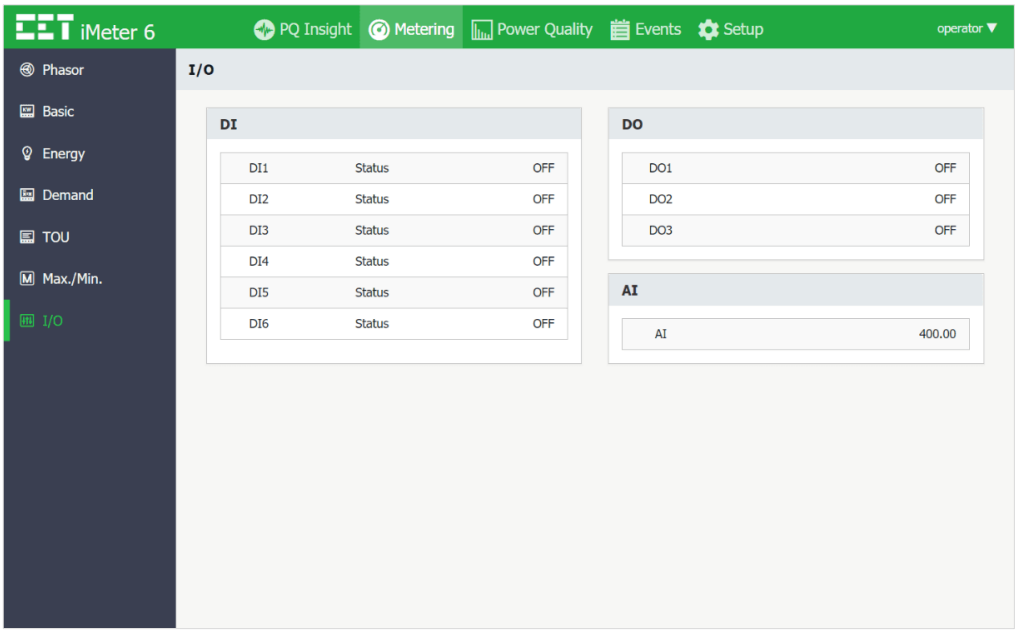


Figure 3-52 I/O Display

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.

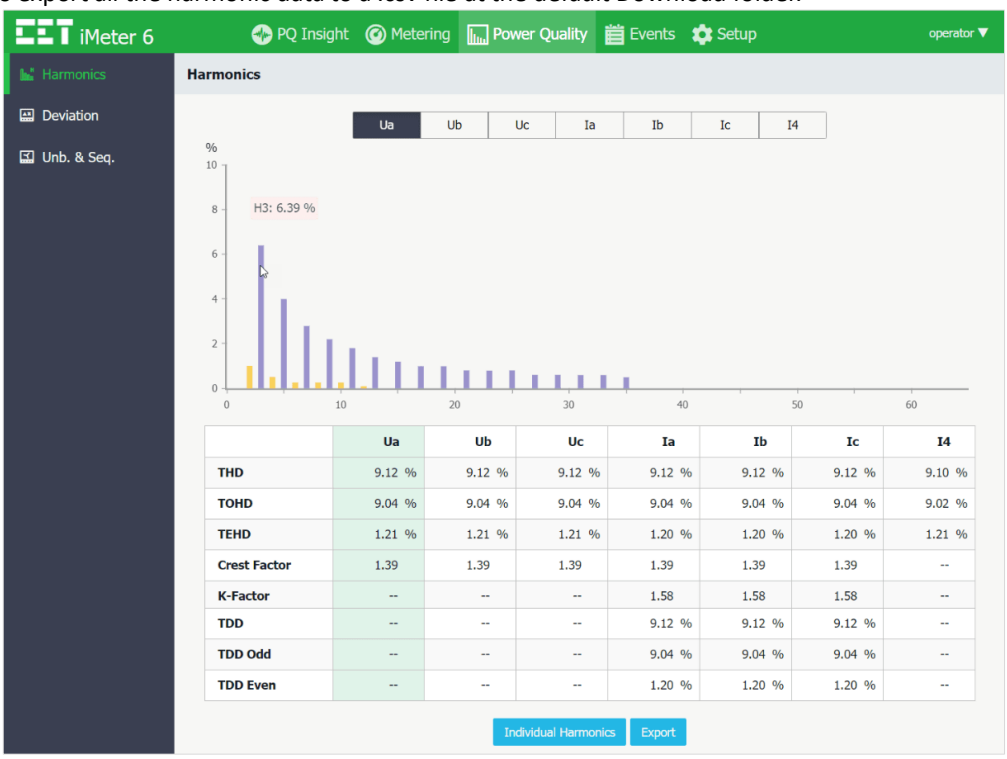


Figure 3-53 Harmonics Measurements

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

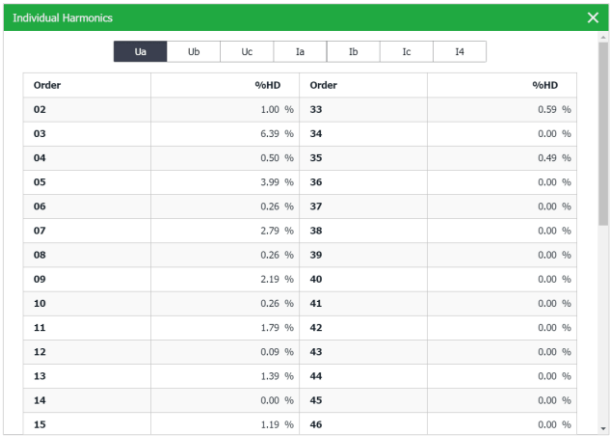


Figure 3-54 Individual Harmonic Measurements

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 **Frequency Deviation**.

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

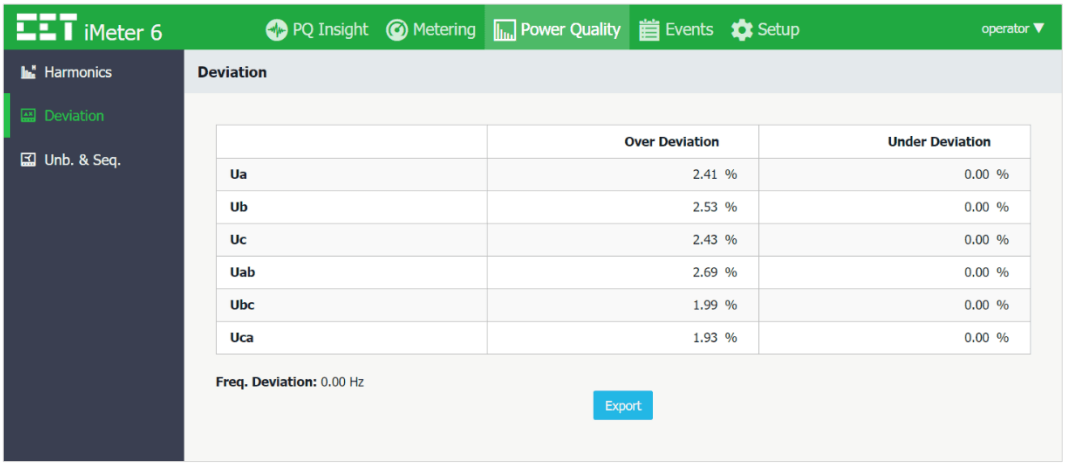


Figure 3-55 Deviation Interface

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 Positive/Negative/Zero 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.

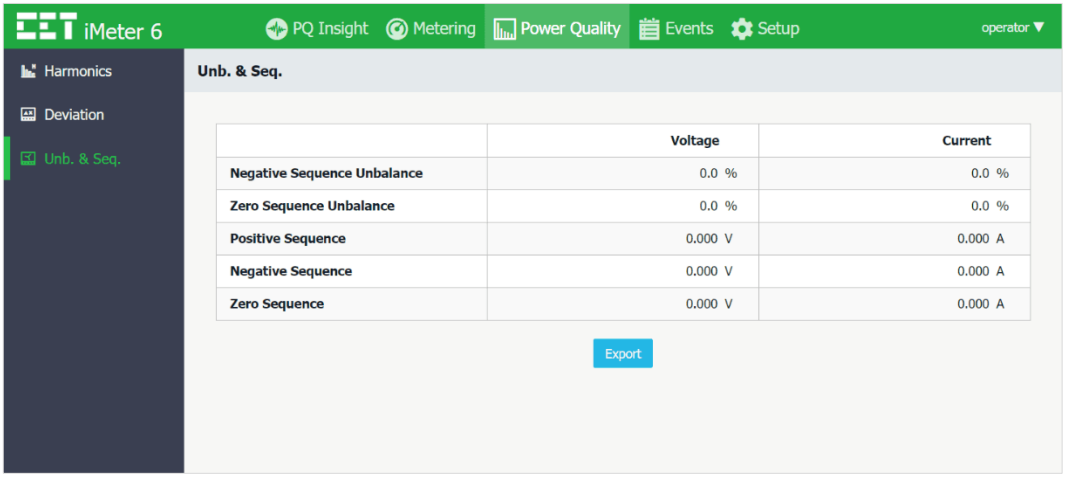


Figure 3-56 Unbalance & Sequence Interface

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 Counter**. 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 and Record.

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.

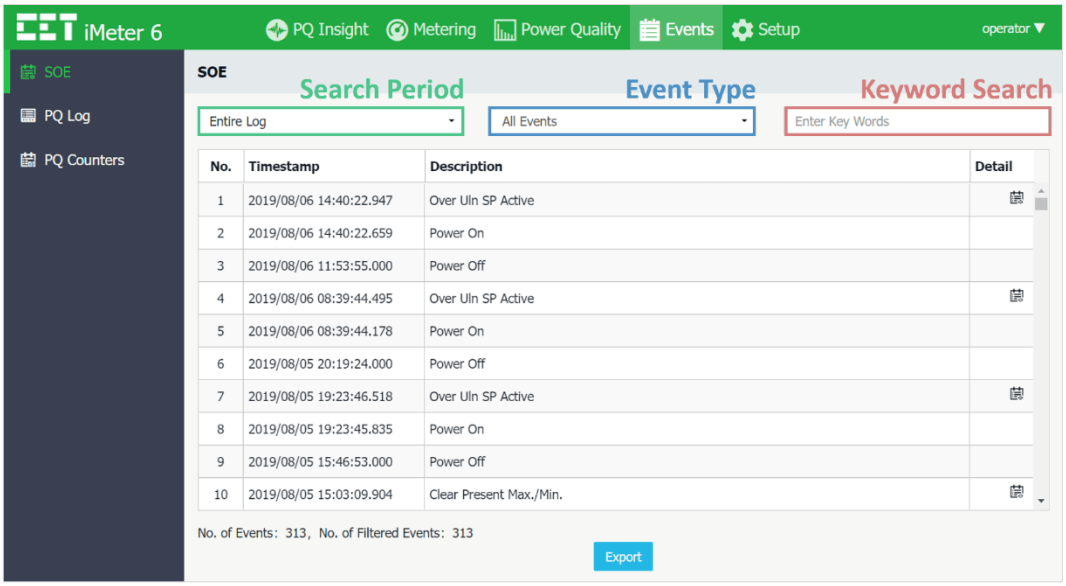


Figure 3-57 SOE Interface

Here are several examples for the SOE Details:

1) Over Uln Setpoint

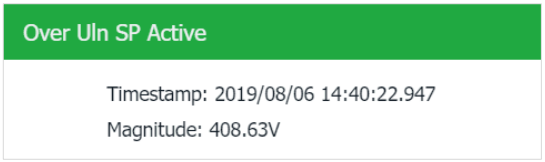


Figure 3-58 SOE Detail about Over Uln Setpoint

2) WFR #1 Triggered by Comm.

Figure 3-59 SOE Detail about WFR #1 Triggered by Comm.

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.

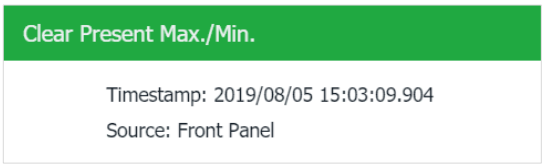


Figure 3-60 SOE Detail about Clear Present Max./Min.

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/Interruption/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, Interruption 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.

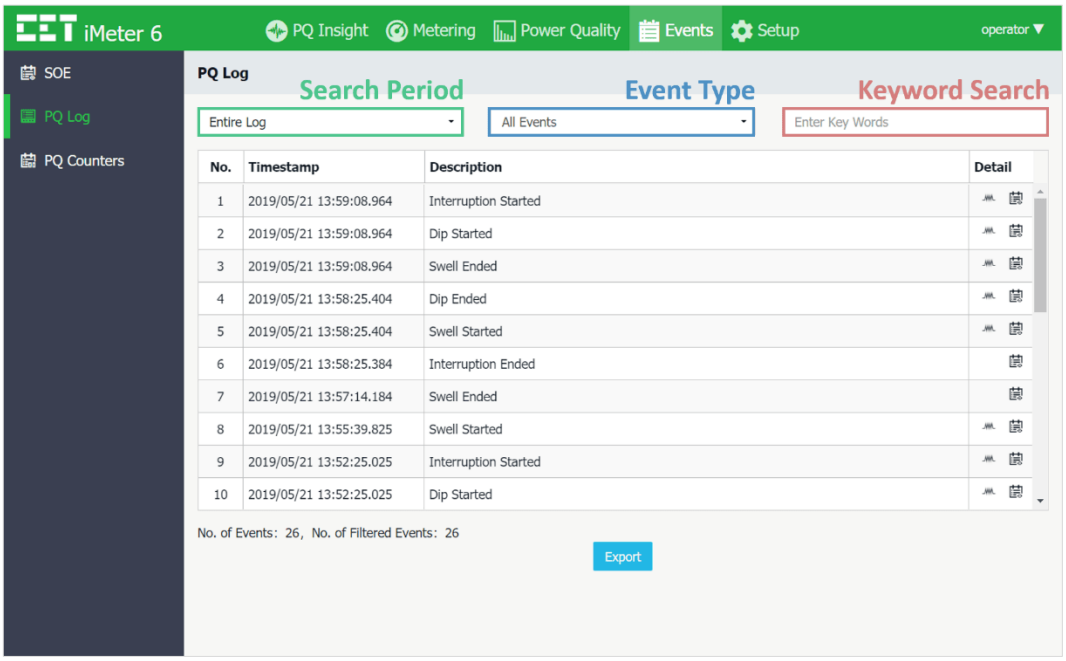


Figure 3-61 PQ Log Interface

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 **Dips, Swells, Interruptions, and Transients**.

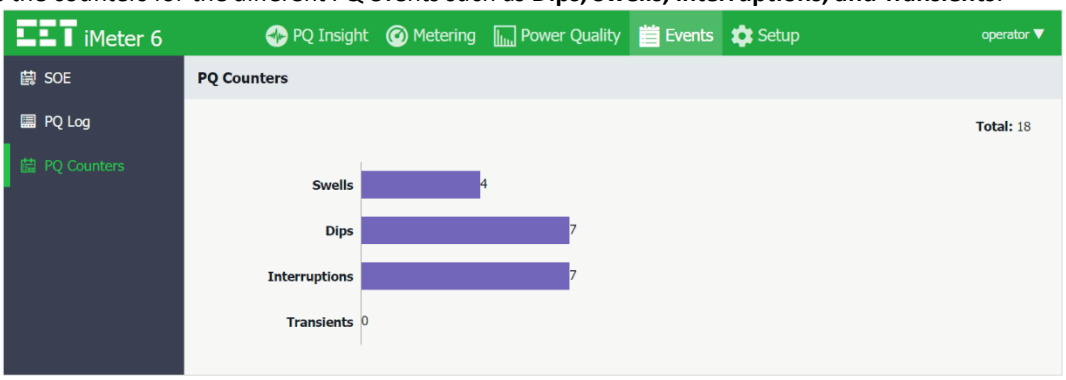


Figure 3-62 PQ Counters Interface

3.2.3.5 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, Others** and **Diagnostics.**

3.2.3.5.1 Basic

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

- **Basic**

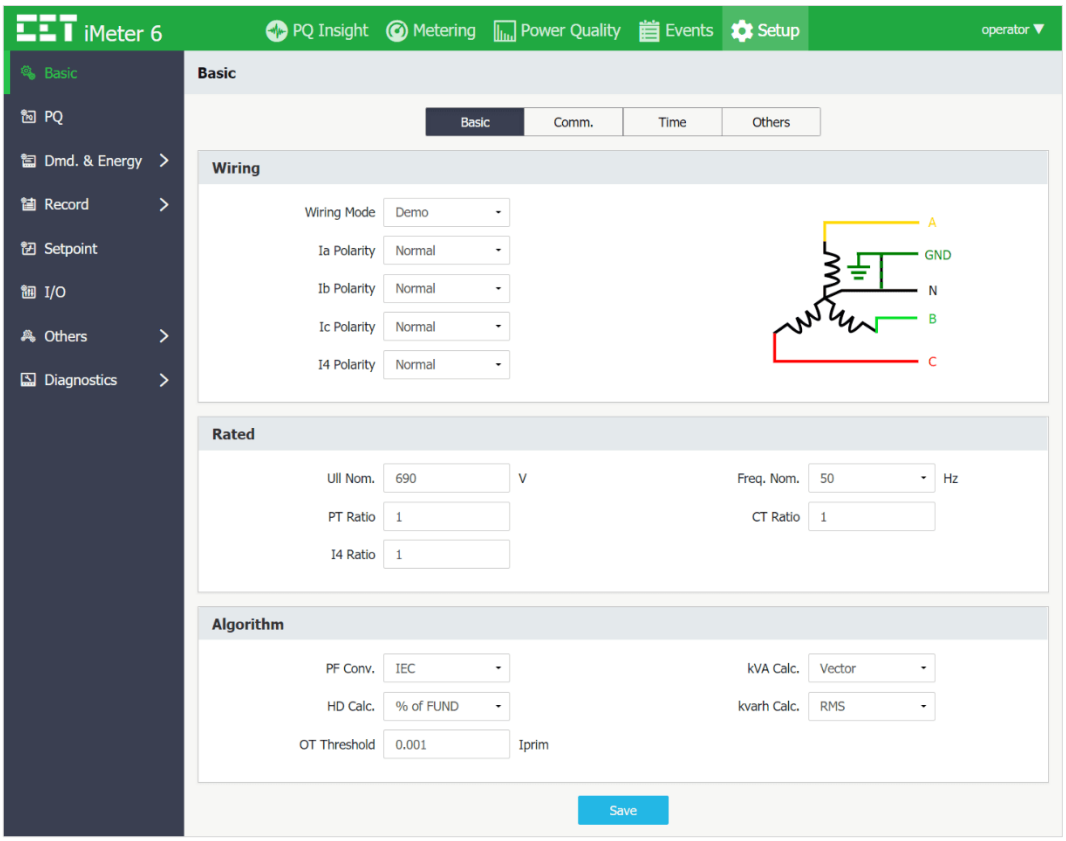


Figure 3-63 Basic Setup-> Basic tab

The following table illustrates the range for each basic setup parameter where * indicates the default value.

Parameter	Range, Default*	Parameter	Range, Default*
Wring Mode	3P4W*, DEMO, 3P3W, 1P3W, 1P2W	Ia Polarity	Normal*, Reverse
Ull Nominal	100 to 700V, 120* for 69/120V Input 415* for 240/415V, 690* for 400/690V	Ib Polarity	Normal*, Reverse
Freq. Nominal	50Hz*, 60Hz	Ic Polarity	Normal*, Reverse
PT Ratio[1]	1 to 10,000, 1*	I4 Polarity	Normal*, Reverse
CT Ratio[1]	1A: 1 to 3,000A, 1* 5A: 1 to 6,000A, 1*	PF Conv.	IEC*, IEEE, -IEEE
		kVA Calc.	Vector*, Standard
I4 Ratio	1 to 10,000A, 5*	Kvar Calc.	RMS*, FUND
HD Calc.	% of FUND*, % of RMS	OT Threshold	1 to 1000 × 0.001 Iprim, 1*

Table 3-5 Basic Setup Parameters

Note:

1. The PT and CT Ratios should comply with this principle: When the Input Current is 1A, PT Ratio × CT Ratio ≤ 5.0×10^6; and When the Input Current is 5A, the PT Ratio × CT Ratio ≤ 1.0×10^6.

- **Comm.**
  The iMeter 6 comes standard with one RS-485 port (P1) and one Ethernet port (P2) which support Modbus RTU and Modbus TCP, respectively. Click on the **Comm.** tab at the top of the right-hand pane and the following screen appears. Set the **Comm.** parameters as required. Please refer to **5.10.1** for more information.

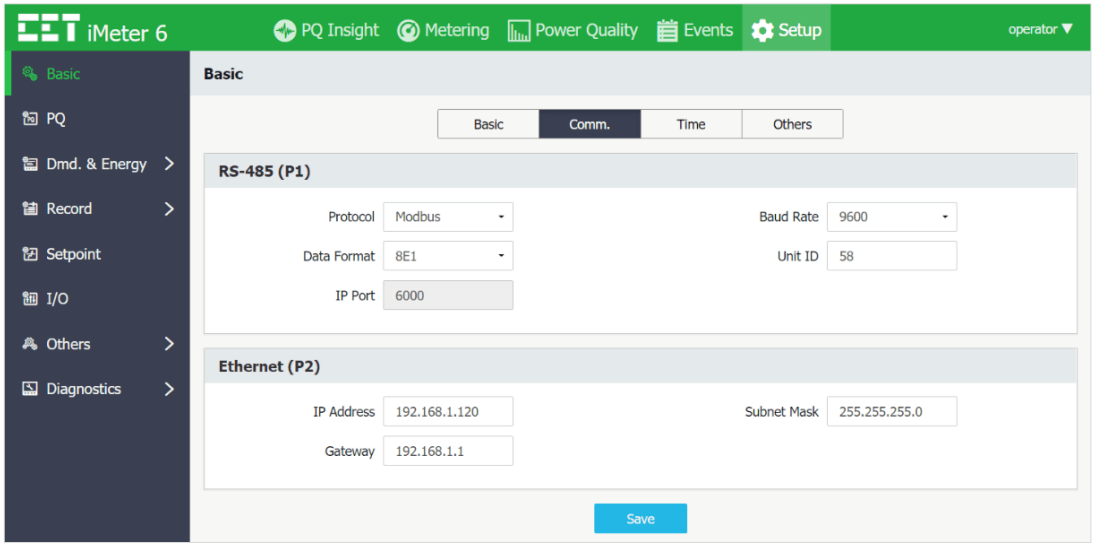


Figure 3-64 Comm. Setup Interface

The following table illustrates the range for each Comm. setup parameter where * indicates the default value.

RS-485 (P1)			
Protocol	Modbus*, EtherGate	Baud Rate	1200, 2400, 4800, 9600*, 19200, 38400
Data Format	8N2, 8O1, 8E1*, 8N1, 8O2, 8E2	Unit ID	1 to 247, 100*
IP Port	Modbus: 1 to 65535, 27011* EtherGate: 1 to 65535, 6000*		
Ethernet (P2)			
IP Address	192.168.0.100*	Subnet Mask	255.255.255.0*
Gateway	192.168.0.1*		

Table 3-6 Comm. Setup Parameters

- **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 **Sync. With PC** check box can be used to synchronize the iMeter 6's Clock with the PC Clock with just a simple click.

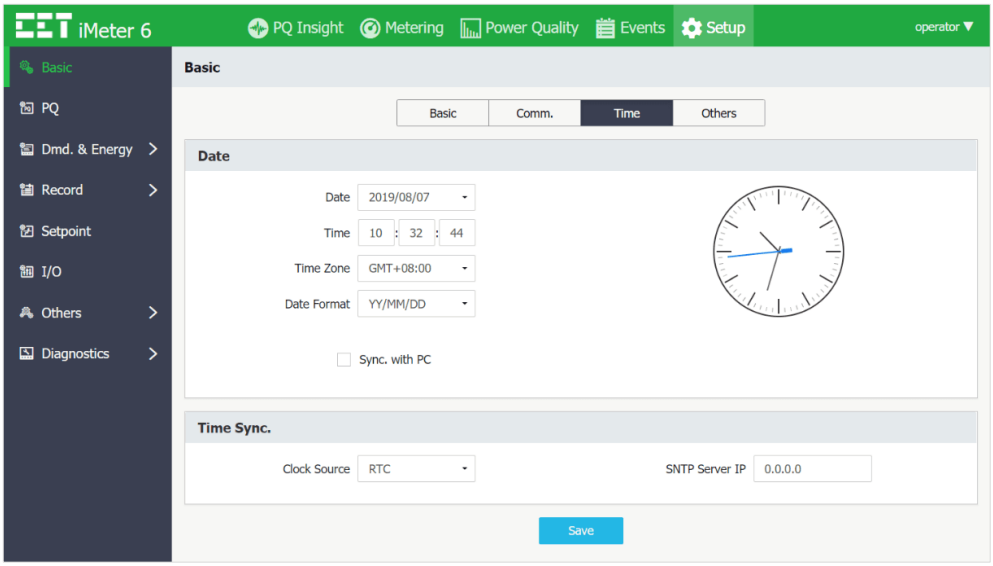


Figure 3-65 Time Setup Interface

The following table illustrates the range for each **Time Sync** parameter where * indicates the default value.

Time Sync			
Clock Source	RTC*, SNTP, GPS	SNTP Server IP	0.0.0.0*

Table 3-7 Time Sync. Setup Parameters

- **Others**

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

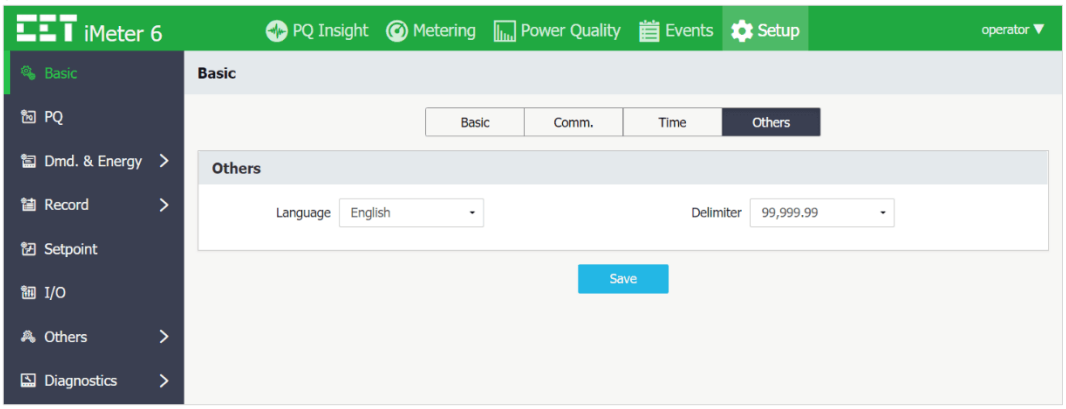


Figure 3-66 Basic-> Others Setup Interface

The following table illustrates the setup range for the **Language** and **Delimiter** parameters where * indicates the default value.

Parameter	Range	Parameter	Range
Language	English*, Simplified Chinese	Delimiter	Option 1: "," is used as the x1000 delimiter and "." as the decimal point (e.g. 999,999,999.123). Option 2: " " is used as the x1000 delimiter and "," as the decimal point (e.g. 999 999 999,123).

Table 3-8 Basic-> Others Setup Range

3.2.3.5.2 PQ Setup

Click **PQ Setup** on the left-hand pane and the following screen appears which allows the users to configure the Dip/Swell and Transient Detection setup parameters.

- **Dip/Swell**

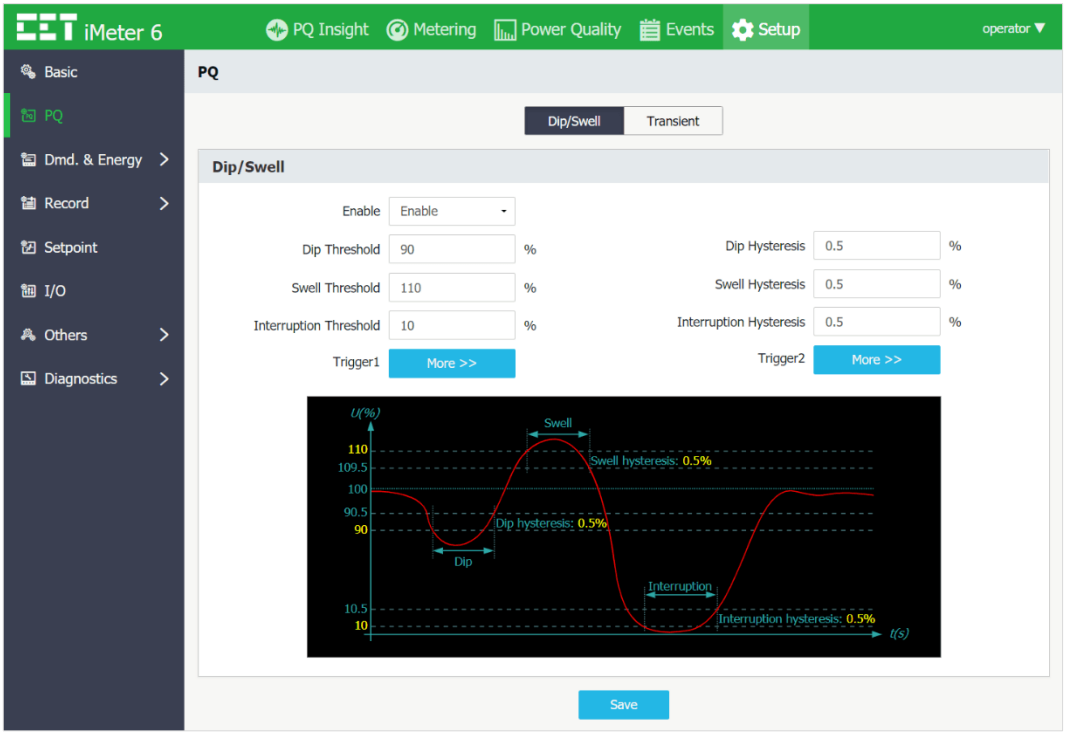


Figure 3-67 Dip/Swell Setup Interface

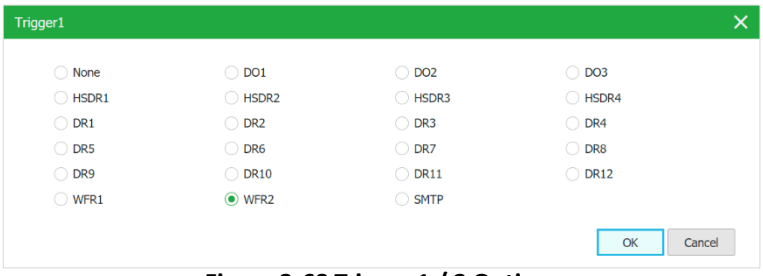


Figure 3-68 Trigger 1 / 2 Options

The following table illustrates the setup range for Dip/Swell parameters where * indicates the default value.

Parameter	Description	Options/Value, Default*
Enable	Dip/Swell Detection Enable	Enable* / Disable
Dip Threshold	Specify the Dip threshold as a percentage of Ull nominal	1% to 99% (xUllnominal), 90%*
Dip Hysteresis	Specify the Dip return threshold as a percentage of Ull nominal	0.1% to 100% (×Ullnominal), 0.5%*
Swell Threshold	Specify the Swell threshold as a percentage of Ull nominal	101% to 200% (×Ullnominal), 110%*
Swell Hysteresis	Specify the Swell return threshold as a percentage of Ull nominal	0.1% to 100% (×Ullnominal), 0.5%*
Interruption Threshold	Specify the Interruption threshold as a percentage of Ull nominal	0% to 50% (xUllnominal), 10%*
Interruption Hysteresis	Specify the Interruption return threshold as a percentage of Ull nominal	0.1% to 100% (×Ullnominal), 0.5%*
Trigger 1	Specify the action taken when the Dip/Swell/Interruption becomes active	DOx/DRx/HS DRx/WFRx/SMTP, WFR2*
Trigger 2	Specify the action taken when the Dip/Swell/Interruption becomes active	DOx/DRx/HS DRx/WFRx/SMTP, N/A*

Table 3-9 Dip/Swell Setup Parameters

- **Transient**

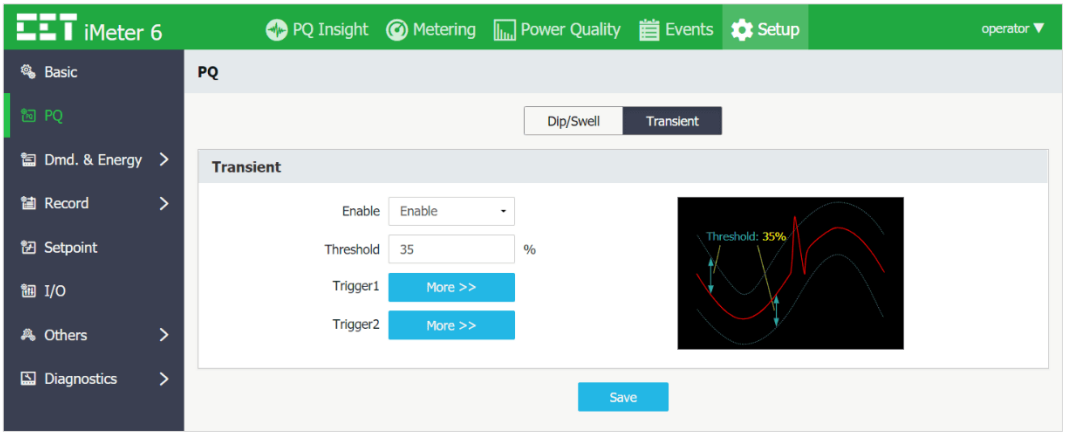


Figure 3-69 Transient Setup Interface

Please refer to **Figure 3-68 Trigger 1 / 2 Options** for the available options to avoid redundancy.

The following table illustrates the setup range of Transient parameters where * indicates the default value.

Setup Parameter	Definition	Options
Enable	Transient Enable	Enable*/Disable
Threshold	Specify the Transient threshold as a percentage of Ull nominal	5% to 500% Ullnominal, 35%*
Trigger1	Specify the action taken when the Dip/Swell/Interruption becomes active	DOx / DRx / HS DRx / WFRx / SMTP, WFR1*
Trigger2	Specify the action taken when the Dip/Swell/Interruption becomes active	DOx / DRx / HS DRx / WFRx / SMTP, N/A*

Table 3-10 Transient Setup Parameters

3.2.3.5.3 Dmd. & Energy

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

3.2.3.5.3.1 Demand

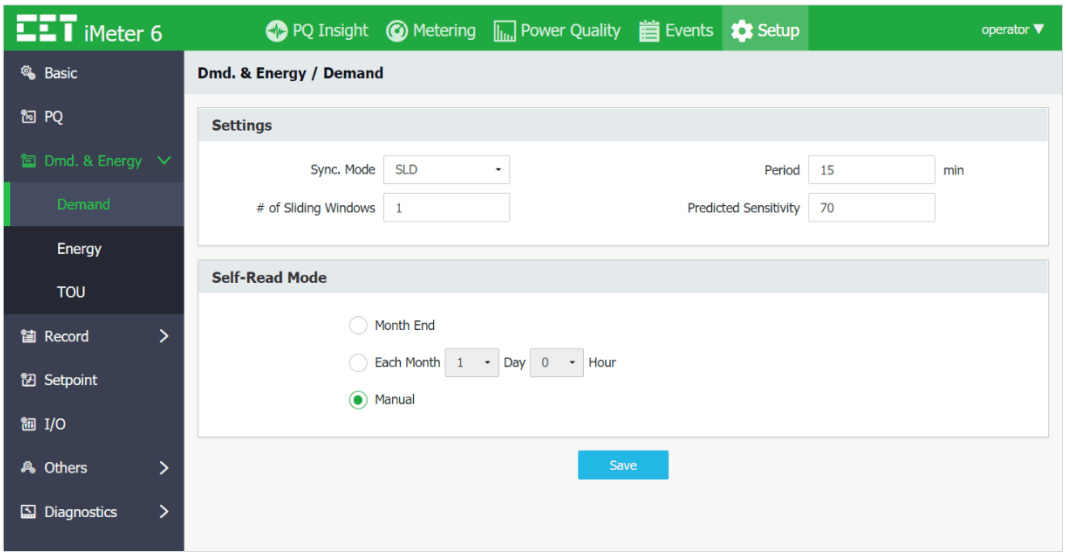


Figure 3-70 Demand Setup Interface

The following table illustrates the setup range for Demand parameters where * indicates the default value.

Setup Parameter	Definition	Options
Sync. Mode	**SLD** - Internally synchronized to the meter's real-time clock **DI Sync** - Externally synchronized to a DI that has been programmed as a Demand Sync Input by setting the **DI Mode** setup parameter as **DMD Sync**.	0=SLD* 1=DI Sync
Period	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 minutes Default=15
# of Sliding Windows	The number of Sliding Windows.	1* to 15
Predicted Sensitivity	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
Self-Read Time	The **Self-Read Time** allows the user to specify the time and day of the month for the Peak Demand Self-Read operation. The **Self-Read Time** supports three options: • Month End: The Self-Read will take place at 24:00 of the last day of each month. • The user can specify the day of the month and the hour of the day for the Self-Read operation. • Manual: The **Self-Read** operation will be disabled and replaced with **Manual** operation. A manual reset will cause the Max. Demand of **This Month** to be transferred to the Max. Demand of **Last Month** and then reset. The terms **This Month** and **Last Month** will become **Since Last Reset** and **Before Last Reset**.	Default=Manual

Table 3-11 Demand Setup Parameters

3.2.3.5.3.2 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).

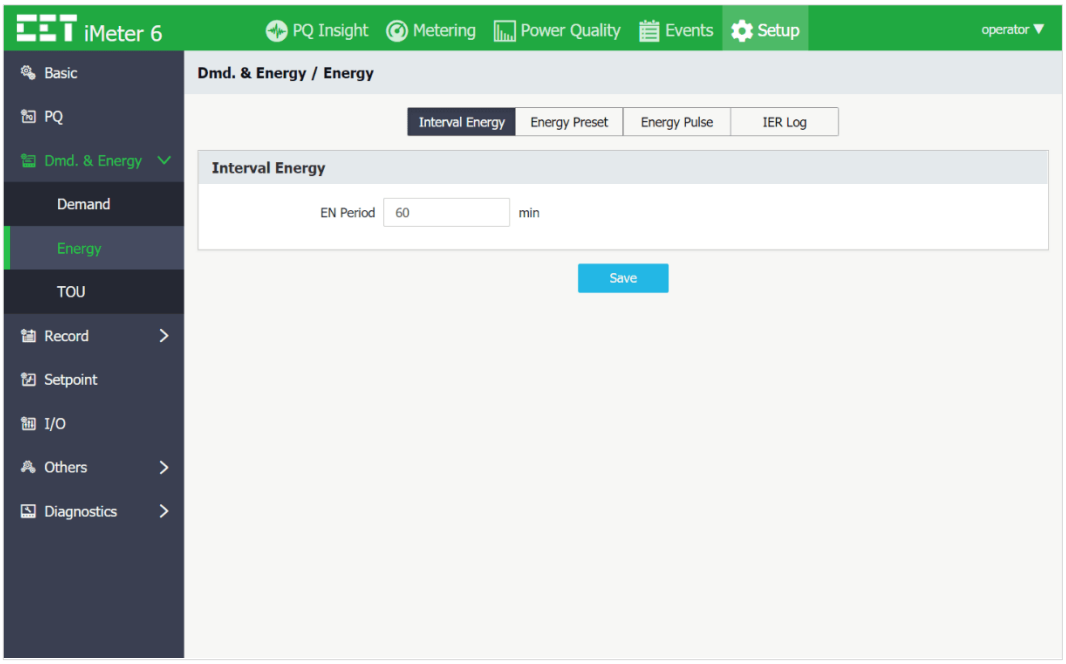


Figure 3-71 Interval Energy Setup Interface

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

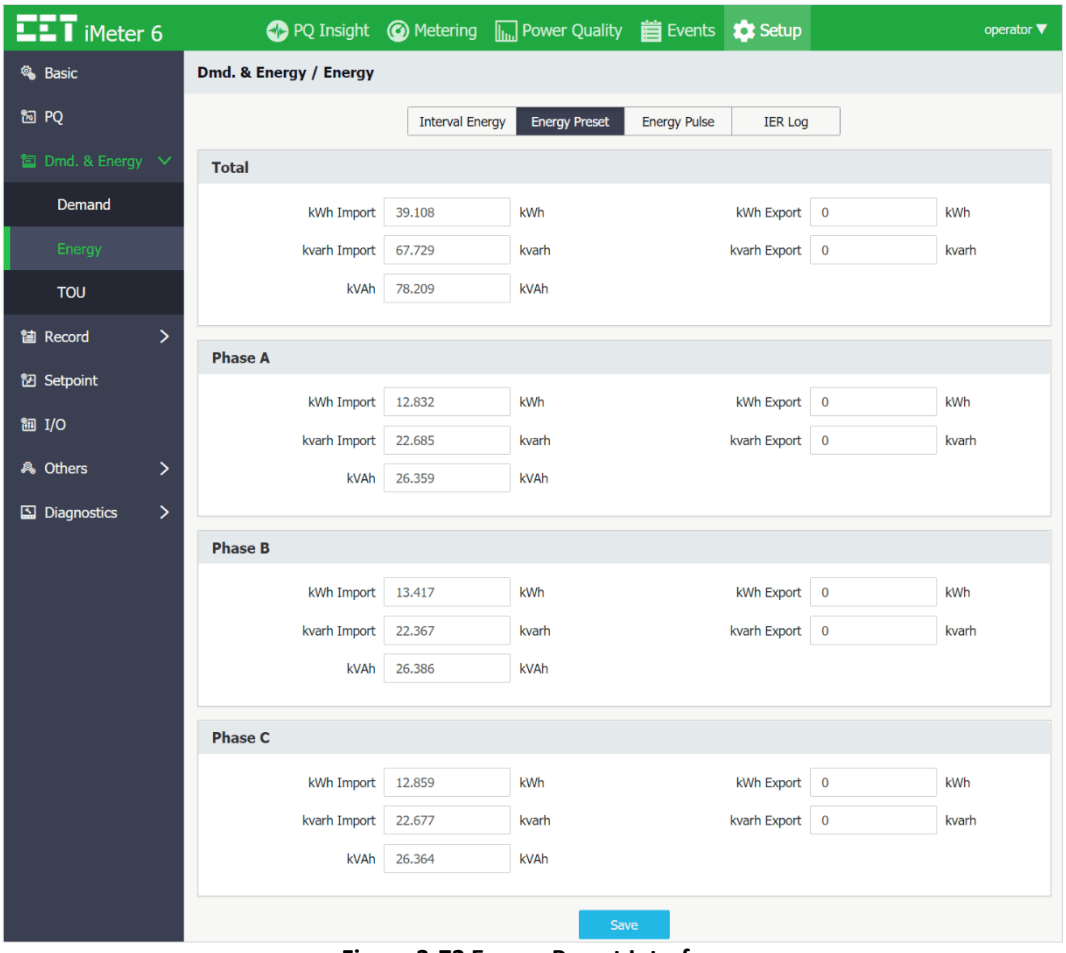


Figure 3-72 Energy Preset Interface

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

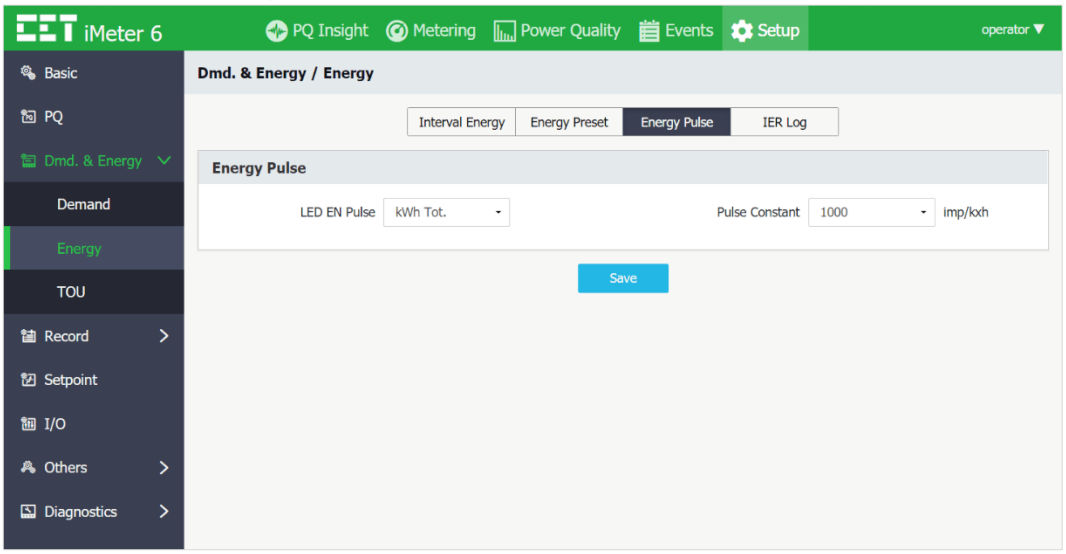


Figure 3-73 Energy Pulse Setup Interface

The following table illustrates the range of Energy Pulse setup parameters where * indicates the default value.

Setup Parameter	Definition	Options
LED EN Pulse	Front Panel LED Energy Pulse Enable	Disable*, kWh Imp. / kWh Exp. / kWh Tot. /kvarh Imp. / kvarh Exp. / kvarh Tot.
Pulse Constant	Specify the Energy Pulse Constant in number of impulses per kxh	1000*/3200/5000/6400/12800

Table 3-12 Energy Pulse Setup Range

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

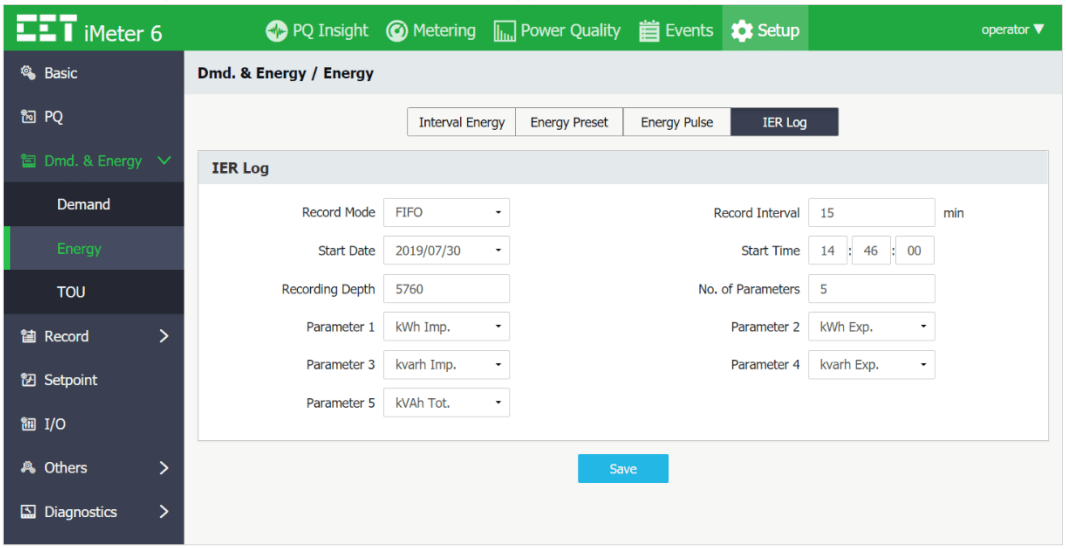


Figure 3-74 IER Log Setup Interface

The following table illustrates the IER setup parameters where * indicates the default value.

Setup Parameter	Description	Options
Record Mode	Recording Mode	Disable/FIFO*/Stop When Full
Record Interval	Recording Interval in minutes	1 to 65535 min, 15 min*
Start Date	Start Date	-
Start Time	Start Time	-
Recording Depth	Recording Depth	1-65535, 5760*
Parameter 1	--	kWh Import*, kWh Export, kvarh Import, kvarh Export, kVAh Total
Parameter 2	--	kWh Export*, kWh Import, kvarh Import, kvarh Export, kVAh Total
Parameter 3	--	kvarh Import*, kWh Import, kWh Export, kvarh Export, kVAh Total
Parameter 4	--	kvarh Export*, kWh Import, kWh Export, kvarh Import, kVAh Total
Parameter 5	--	kVAh Total*, kWh Import, kWh Export, kvarh Import, kvarh Export

Table 3-13 IER Log Setup Parameters

3.2.3.5.3.3 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 4.6.8** for more information.

- **Basic**

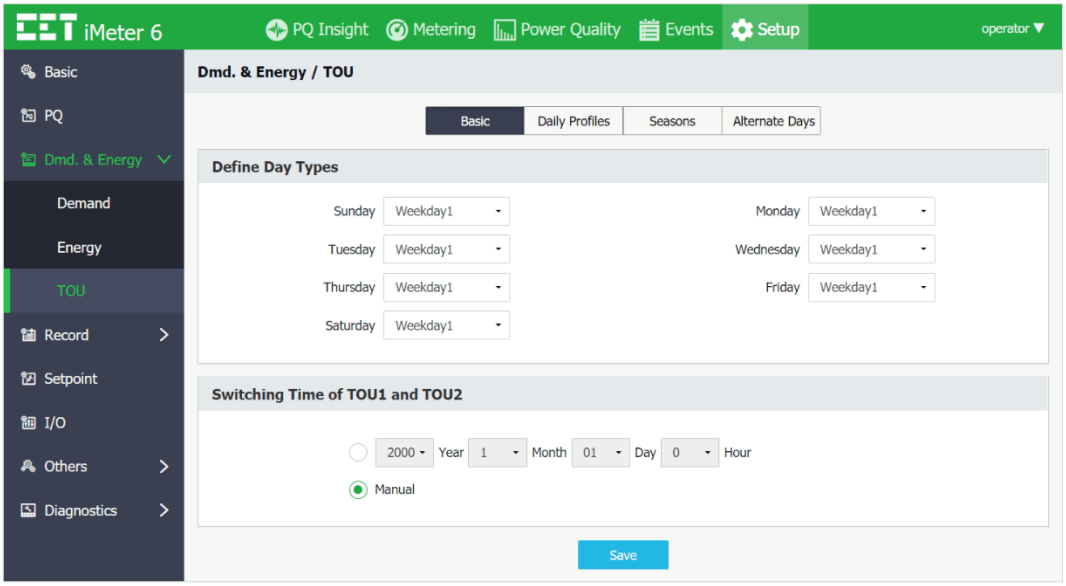


Figure 3-75 TOU – Basic Settings

- **Daily Profiles**

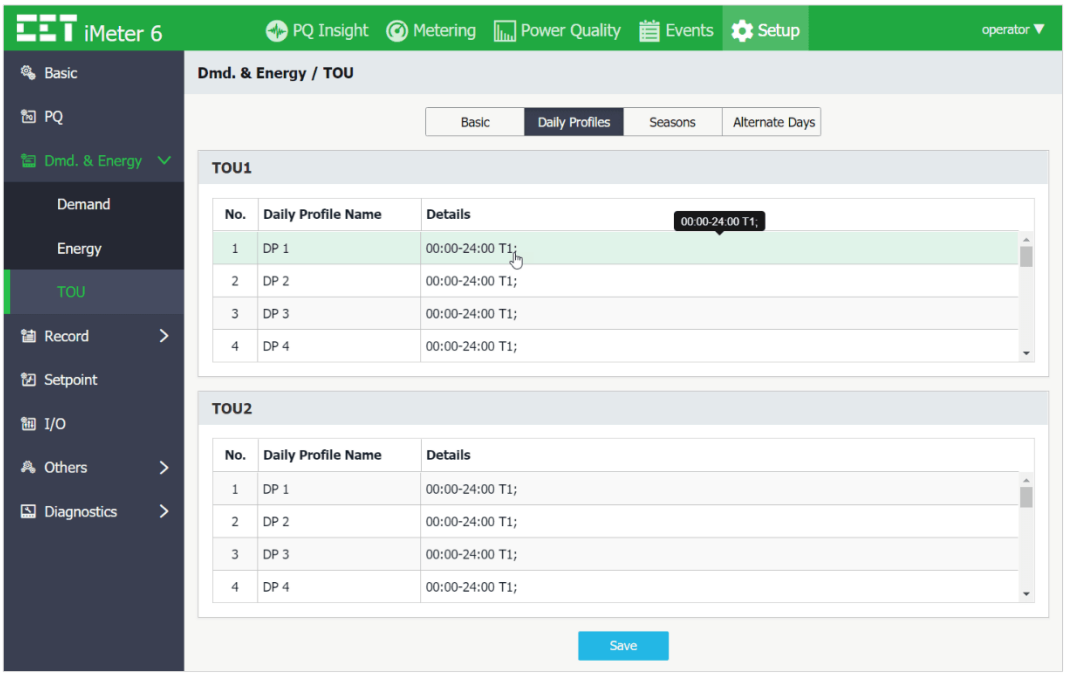


Figure 3-76 TOU – Daily Profile

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 3-77 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.

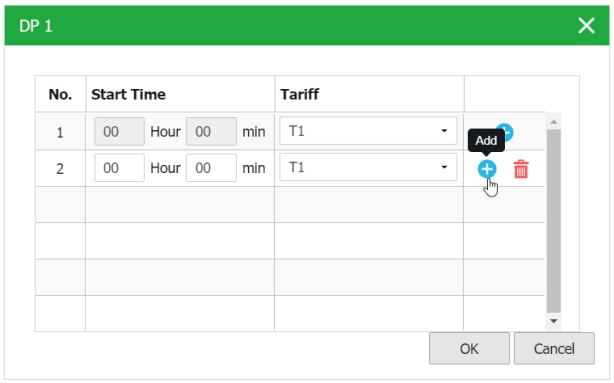


Figure 3-77 TOU – DP1 Setting Dialog

- **Seasons**

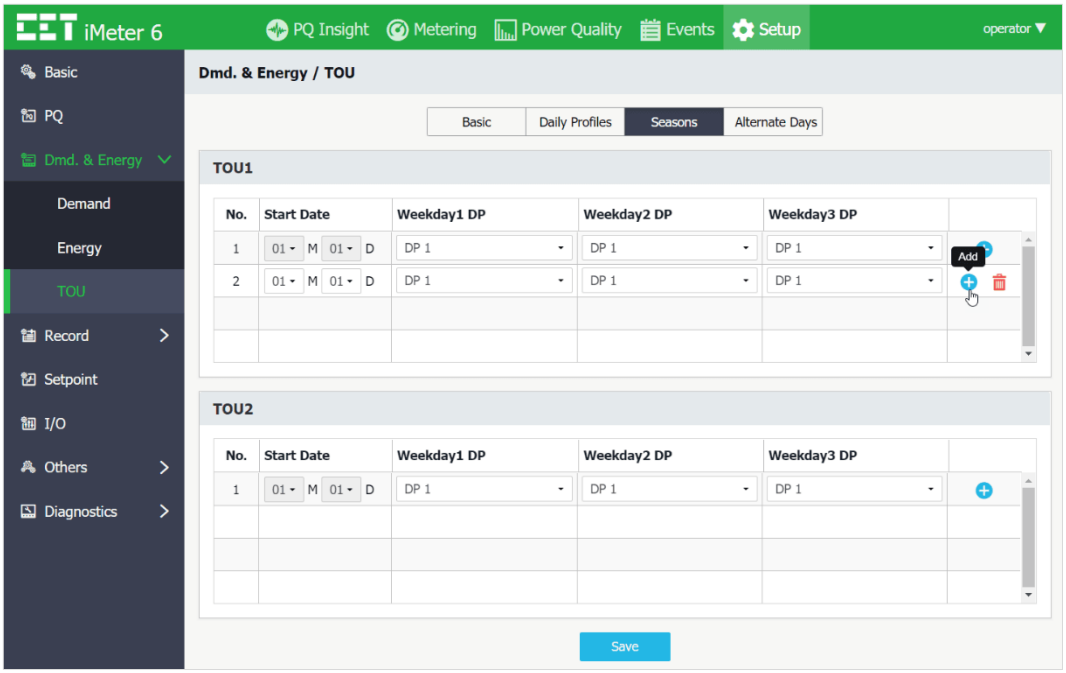


Figure 3-78 TOU – Seasons

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.

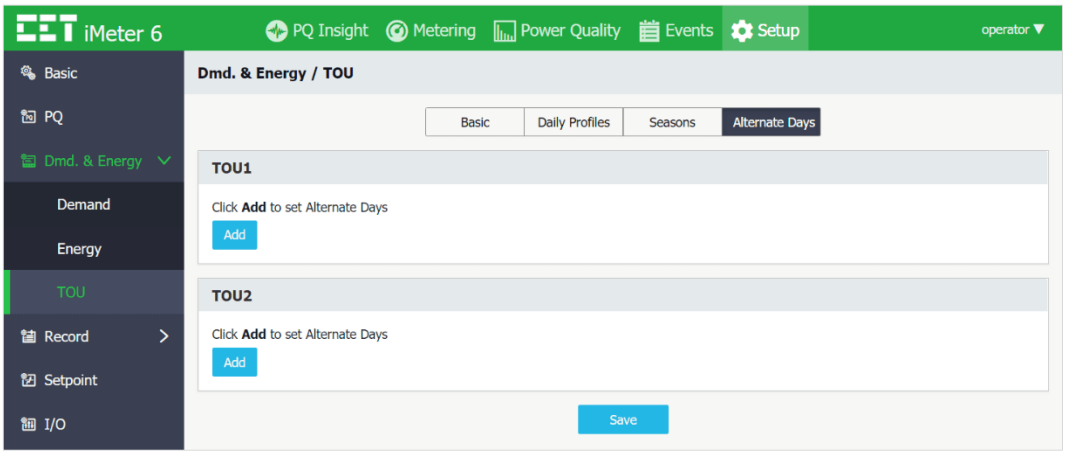


Figure 3-79 TOU – Alternate Days Setup Interface

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

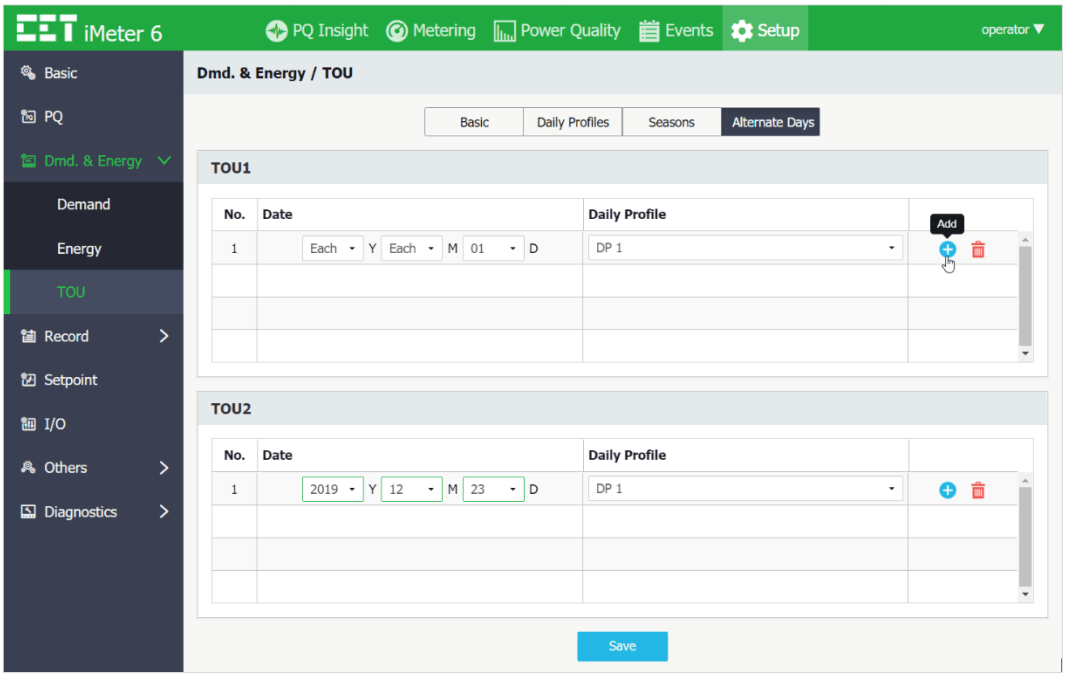


Figure 3-80 TOU – Alternate Days Setup Interface

3.2.3.5.4 Record

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

3.2.3.5.4.1 Waveform

The iMeter 6 provides 2 independent groups of Waveform Recorders (**WFR**) with 128 entries each. Click on **WFR1** or **WFR2** to access their configurations. Please refer to **Section 4.6.4** for more details.

The following table illustrates the setup range for WFR 1/ 2 parameters, where * indicates the default value.

Setup Parameters	Value/Option	Default	
		WFR 1	WFR 2
Format	256x20, 128x40, 64x80, 32x160, 16x320	256x20	256x20
Pre-fault Cycles	0 to 20 Cycles	4	6

Table 3-14 WFR 1/2 Parameters Setup Range

- **WFR1 (Waveform Recorder 1)**

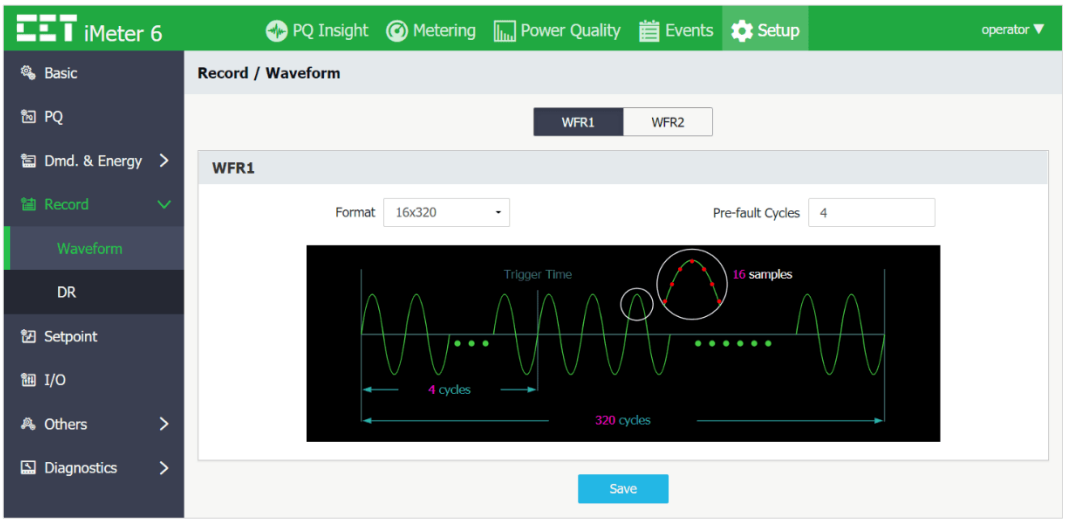


Figure 3-81 Record – WFR1 Setup Interface

- **WFR2 (Waveform Recorder 2)**

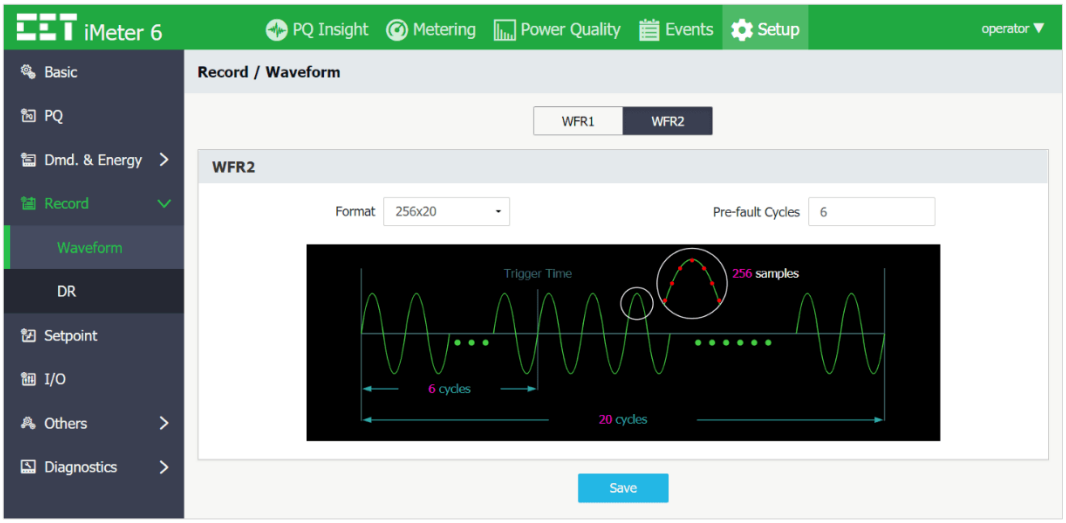


Figure 3-82 Record – WFR2 Setup Interface

3.2.3.5.4.2 DR (Data Recorder)

The iMeter 6 provides 4 High-Speed Data Recorders (**HS DR**) as well as 12 Standard Data Recorders (**DR**) capable of recording up to 16 parameters each. Please refer to **Section 4.6.7** for more information.

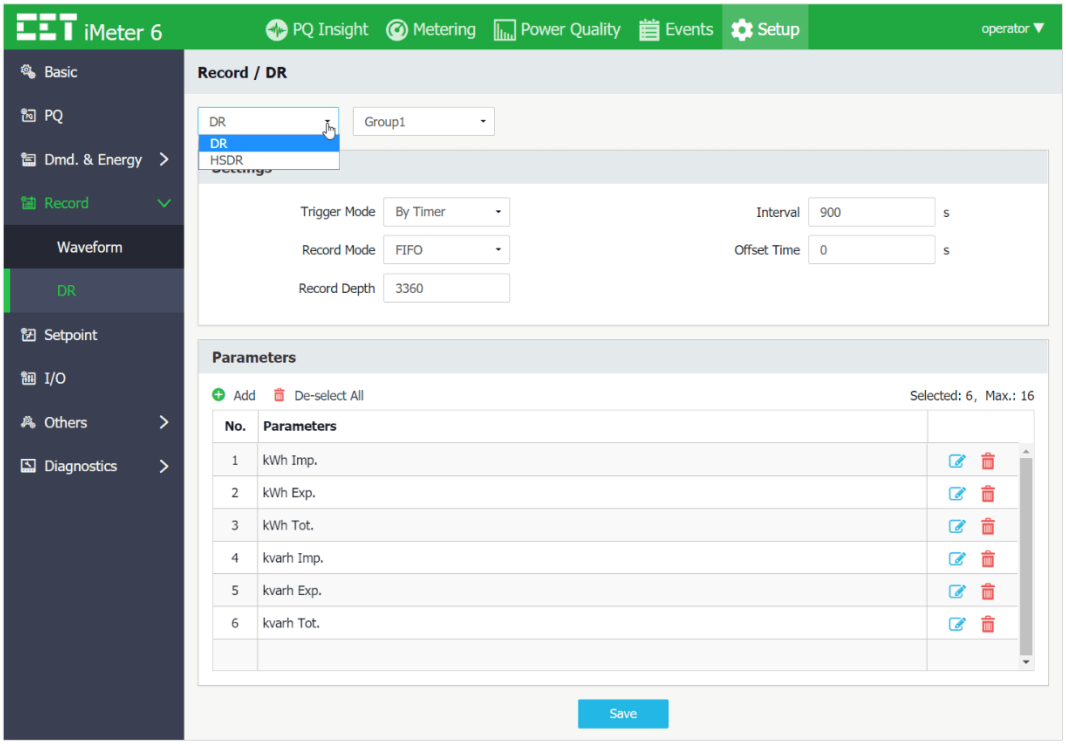


Figure 3-83 Record – DR Setup Interface

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.

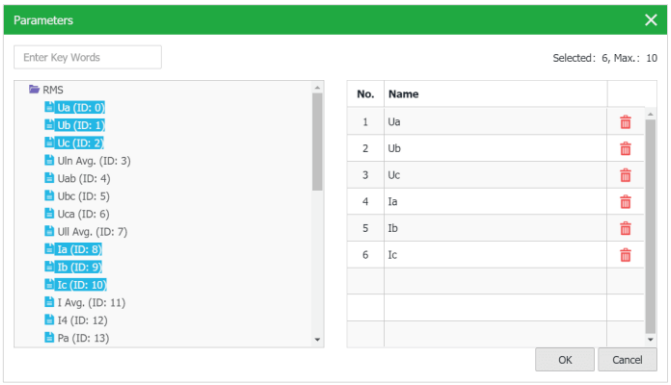


Figure 3-84 Parameters Editing Dialog Box

3.2.3.5.5 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**

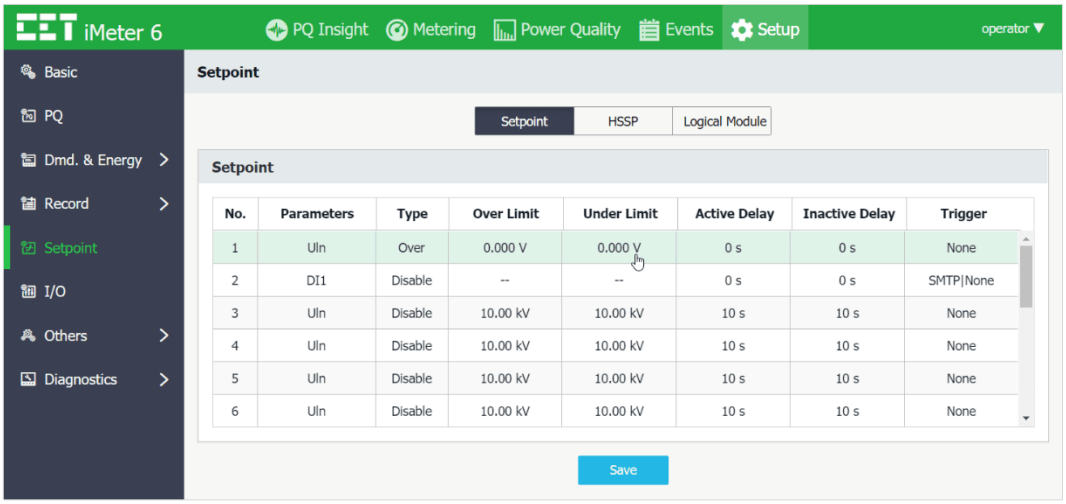


Figure 3-85 Setpoint – Standard Setpoint Settings

Click on a particular Setpoint and the **Setpoint Settings** dialog box appears. Up to 35 parameters are available for the Standard Setpoint monitoring, including Voltage, Current, Power, DI Status, etc. (Please refer to **Table 4-11 Setpoint Parameters** for more information).

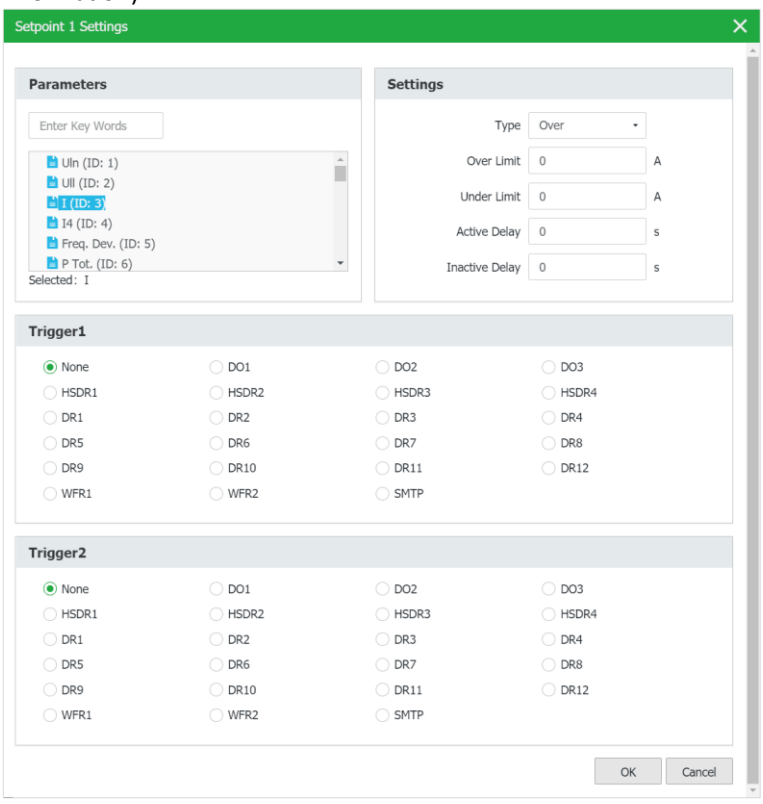


Figure 3-86 Setpoint Settings Dialog

- **HS Setpoint**

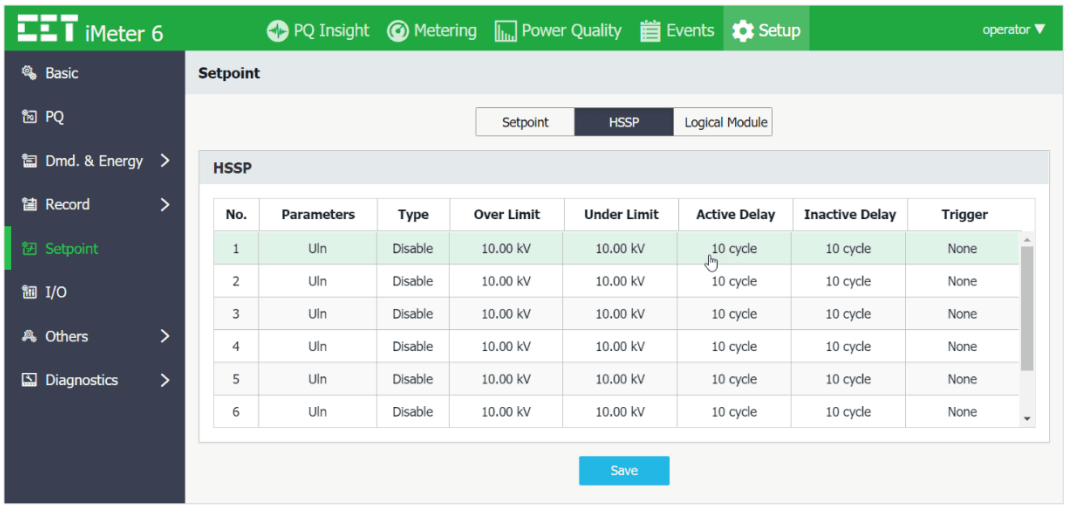


Figure 3-87 Setpoint – HSSP Settings

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.

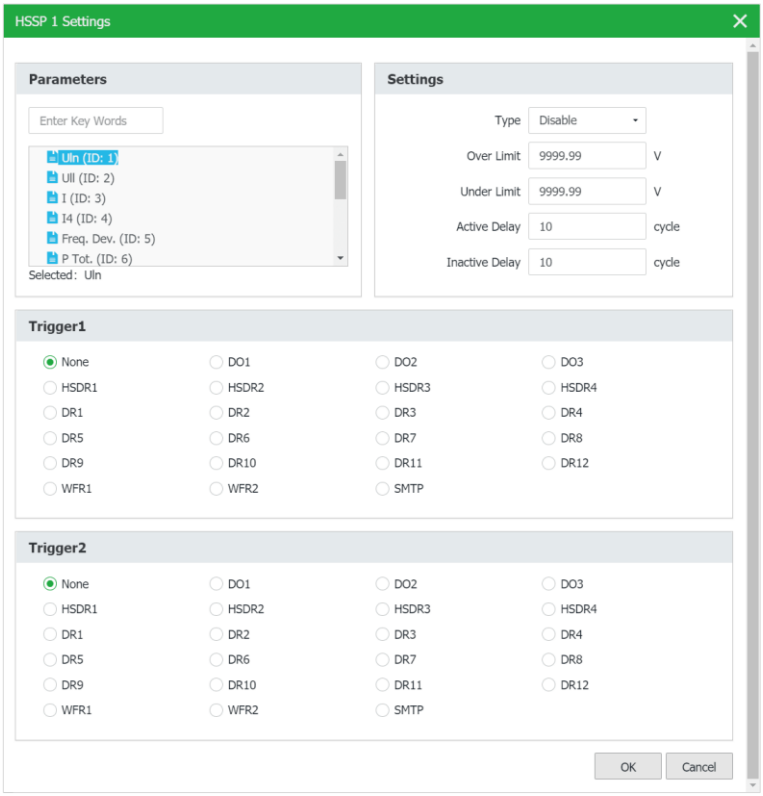


Figure 3-88 HS Setpoint Settings Dialog

- **Logical Module**

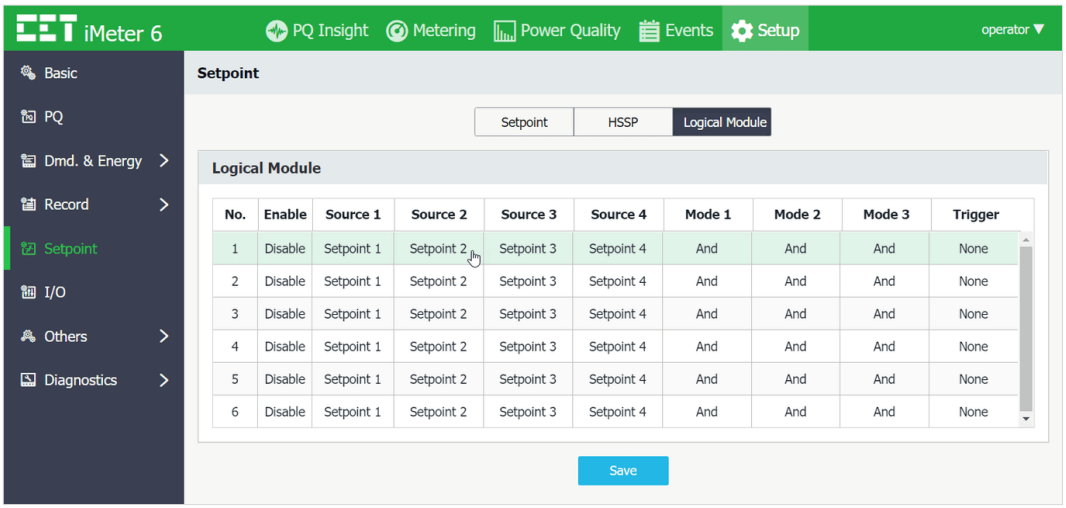


Figure 3-89 Setpoint – Logical Module Settings

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.

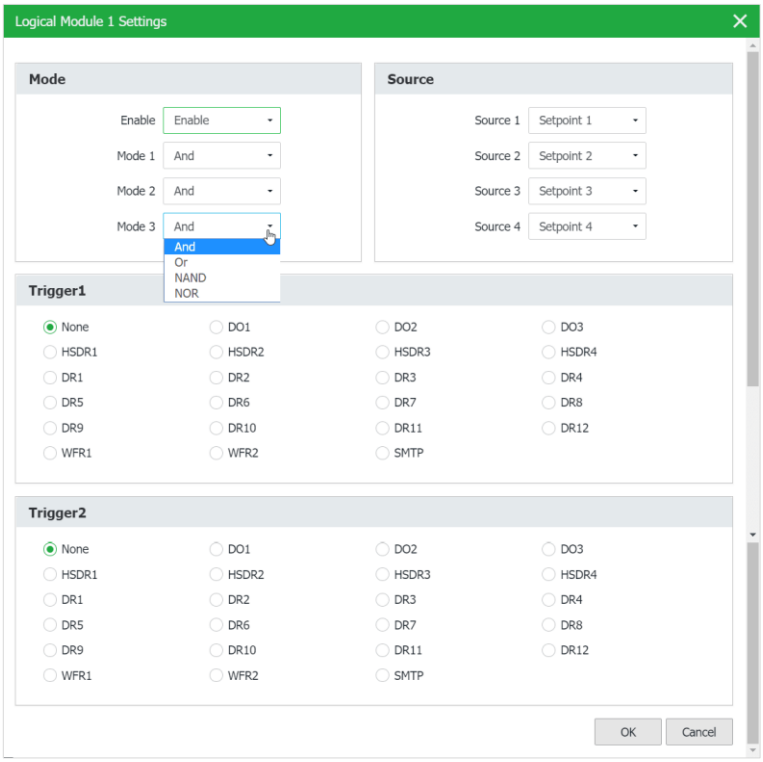


Figure 3-90 Logical Module Setup Interface

3.2.3.5.6 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**

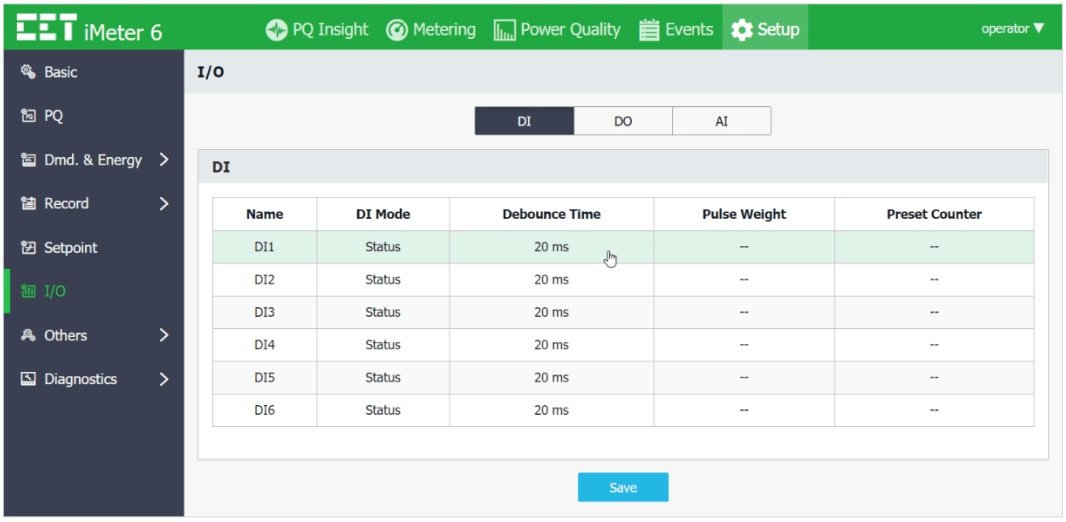


Figure 3-91 DI Setup Interface

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

- **DI Mode = Status**

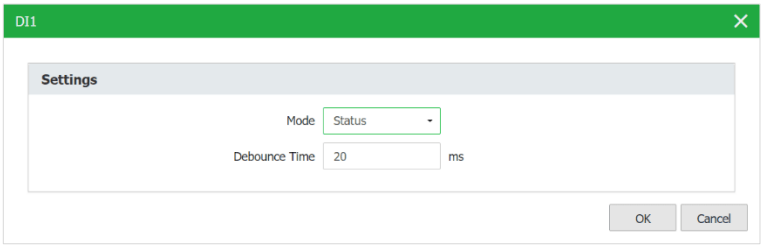


Figure 3-92 DI Status Setup Interface

- **DI Mode = Counter**

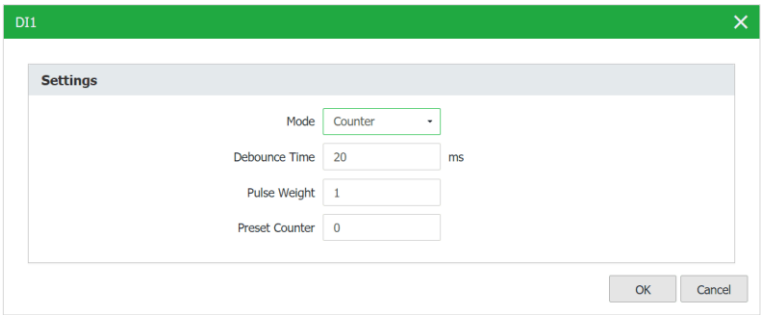


Figure 3-93 DI Counter Setup Interface

- **DI Mode = DMD Sync.**

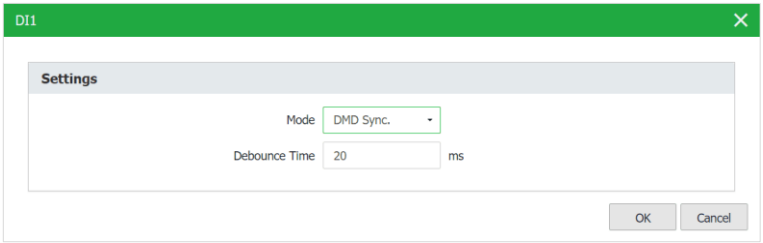


Figure 3-94 DI DMD Sync. Setup Interface

- **DI Mode = PPS Sync.**

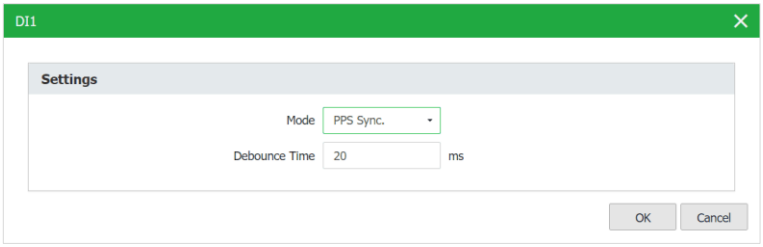


Figure 3-95 DI PPs Sync. Setup Interface

- **DI Mode = Tariff Switch**

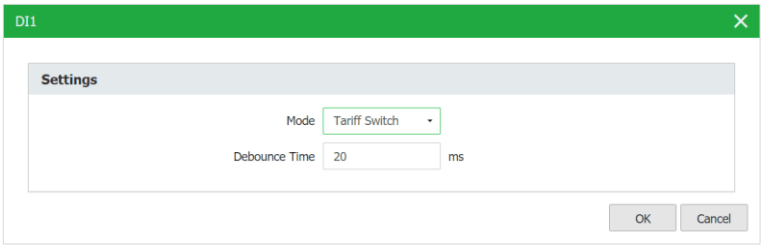


Figure 3-96 DI Tariff Switch Setup Interface

- **DO**

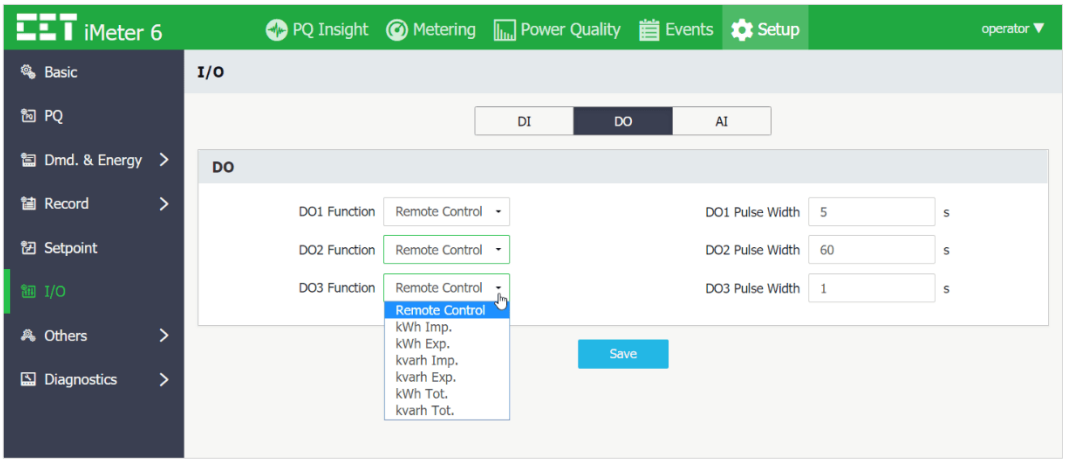


Figure 3-97 DO Setup Interface

- **AI (Optional)**

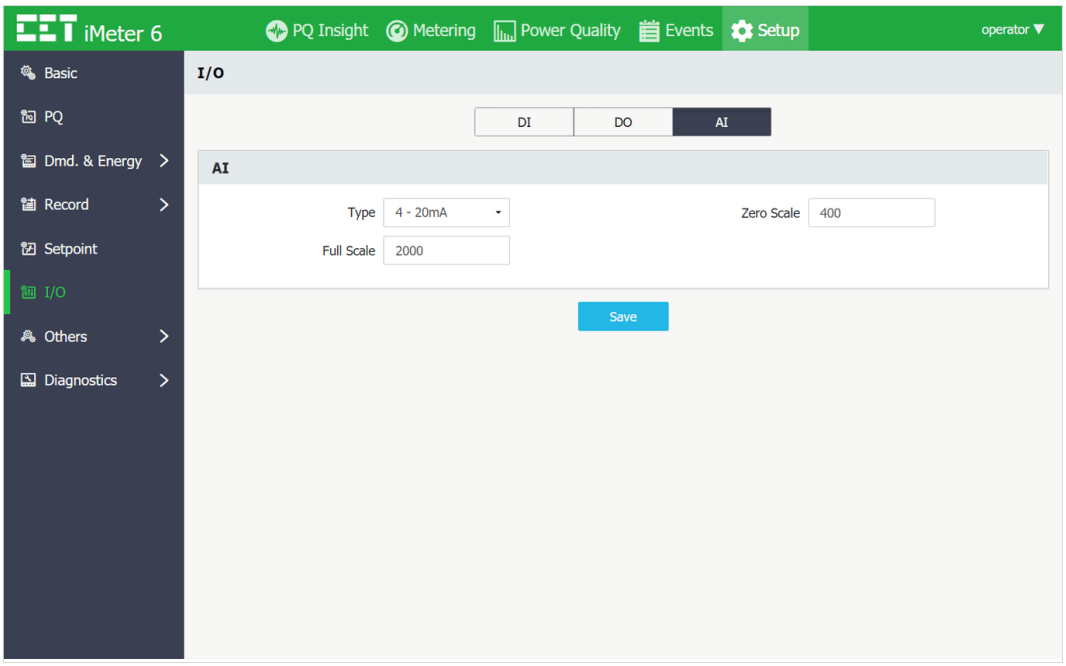


Figure 3-98 Optional AI Setup Interface

3.2.3.5.7 Others

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

3.2.3.5.7.1 Alarm Email

- **Settings**
  Please refer to **Section 4.8** for more details about the configurations.

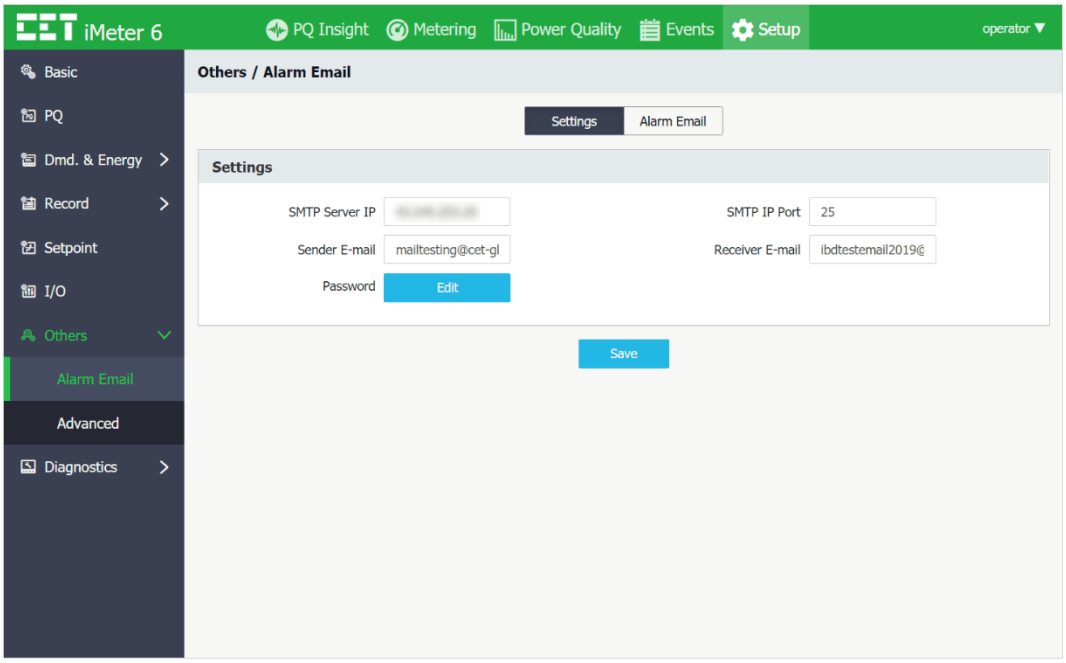


Figure 3-99 Alarm Email Settings Interface

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

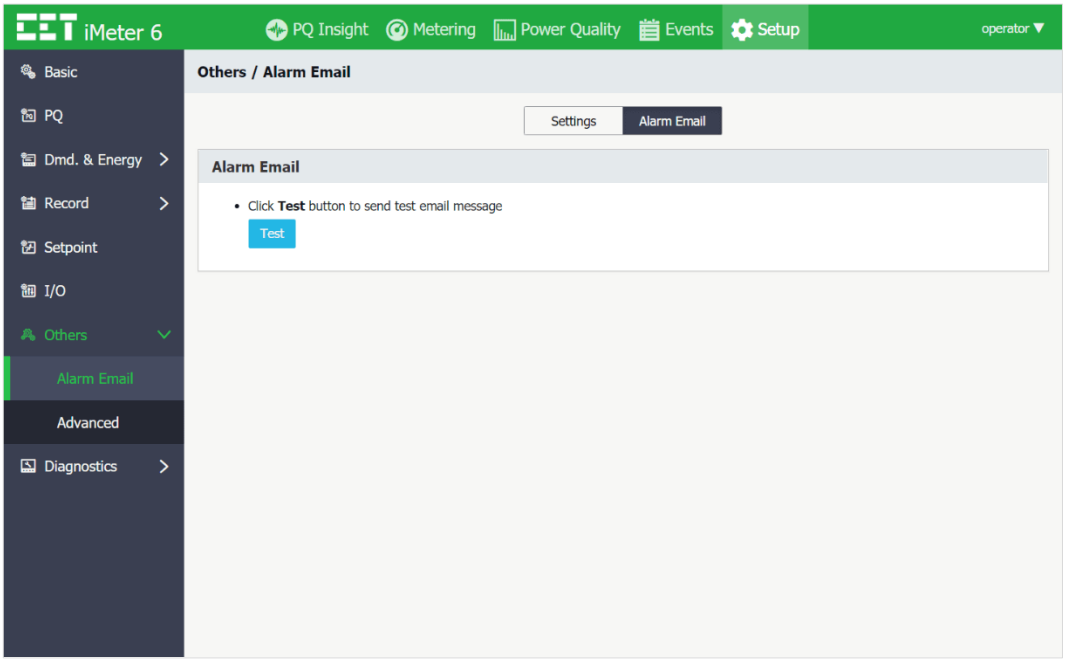


Figure 3-100 Test Alarm Email

3.2.3.5.7.2 Advanced

Click **Advanced** on the left-hand pane and the following screen appears which allows the IP Port Numbers for the different protocols to be configured. Please consult the qualified personnel before making changes to these parameters.

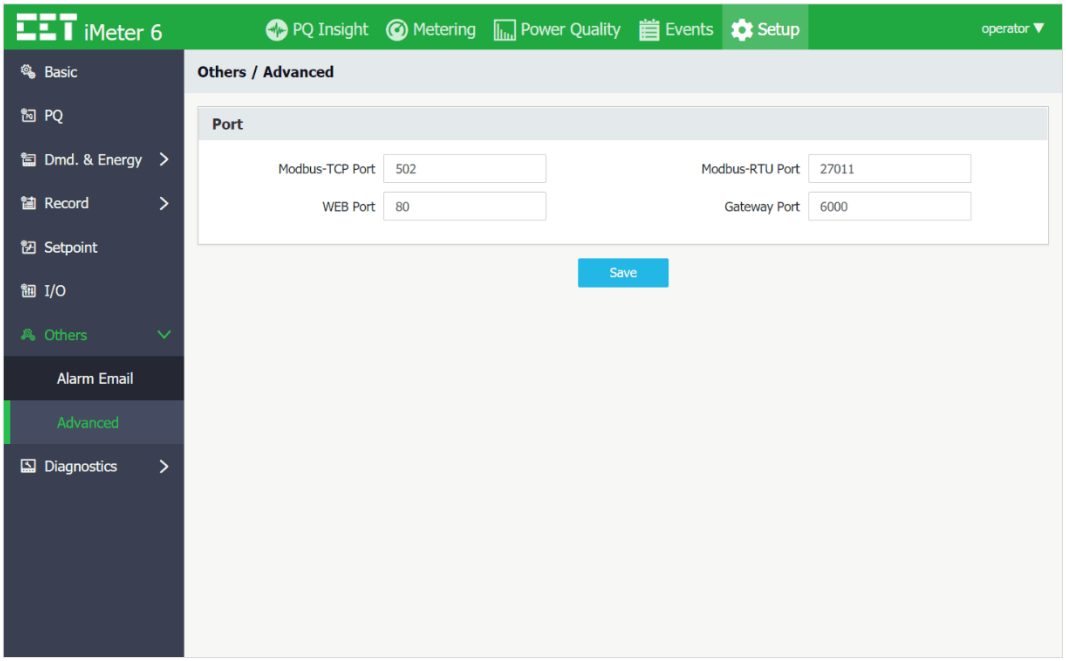


Figure 3-101 Others – Advanced Settings

3.2.3.5.8 Diagnostics

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

3.2.3.5.8.1 Device Info.

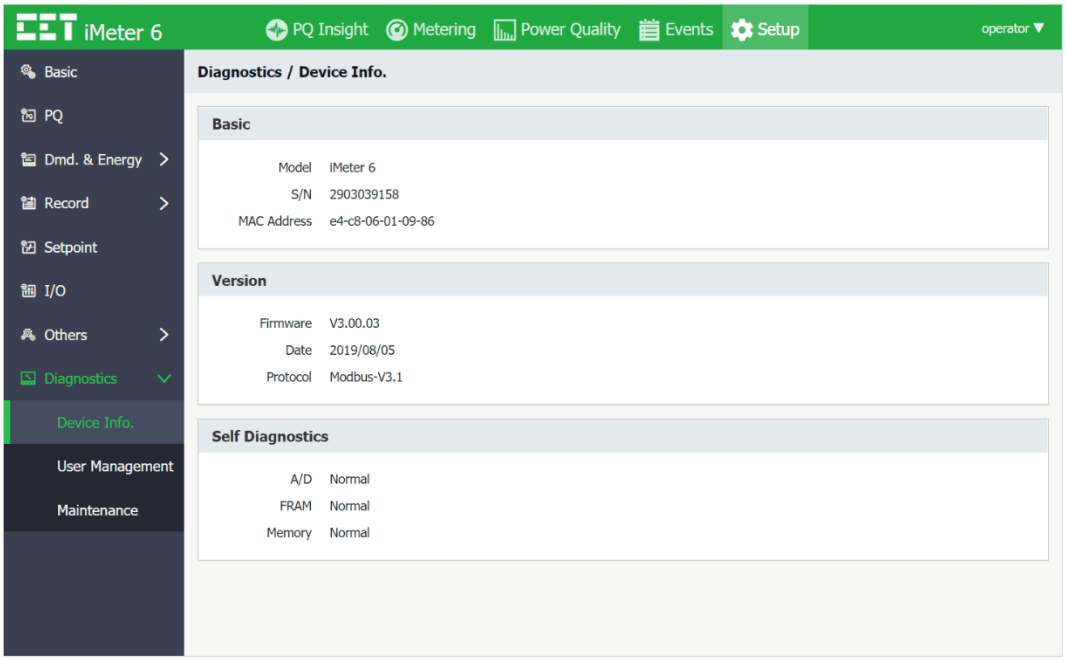


Figure 3-102 Diagnostics – Device Info. Interface

3.2.3.5.8.2 User Management

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

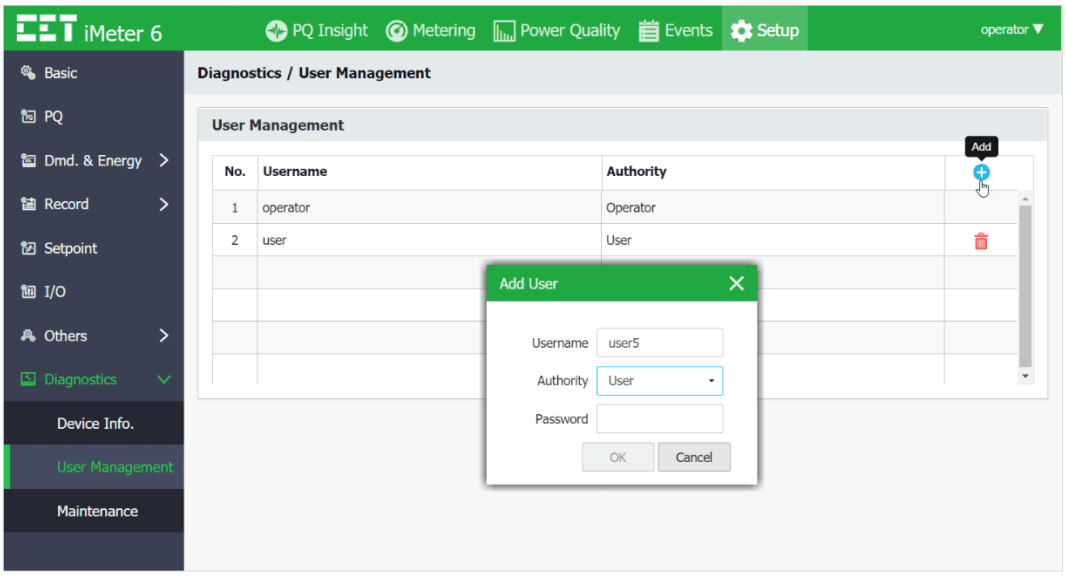


Figure 3-103 Diagnostics – User Management

3.2.3.5.8.3 Maintenance

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

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

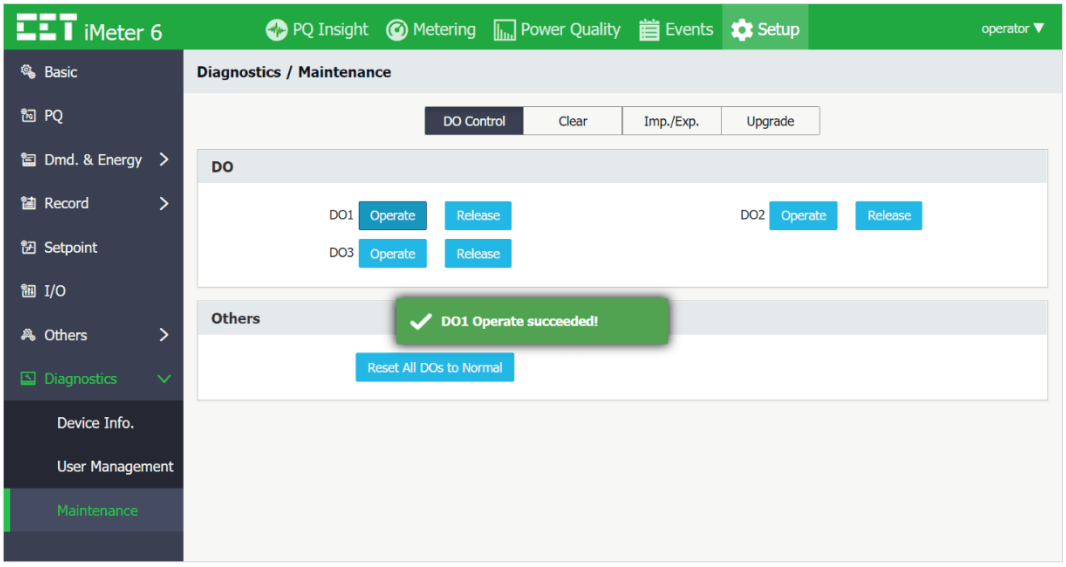


Figure 3-104 Maintenance – DO Control Interface

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.

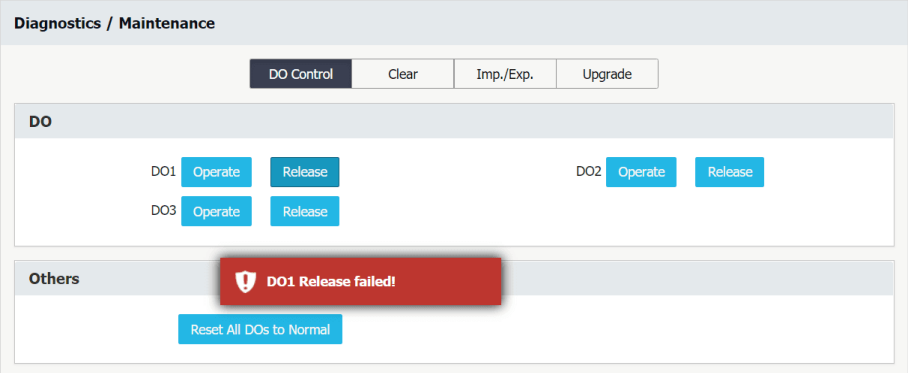


Figure 3-105 Maintenance – DO Release Command Failed

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 the various **Clear** operations by groups or individually:

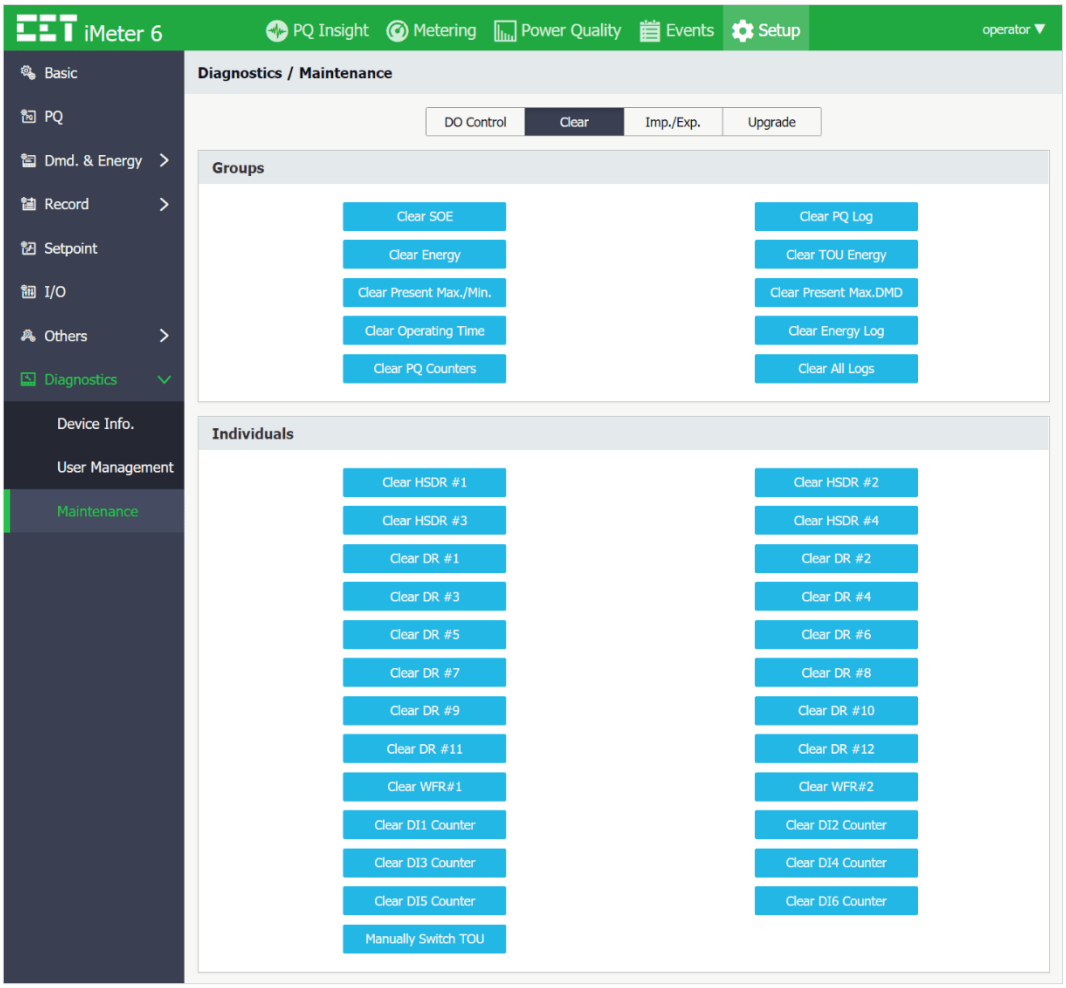


Figure 3-106 Maintenance – Clear Operations

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

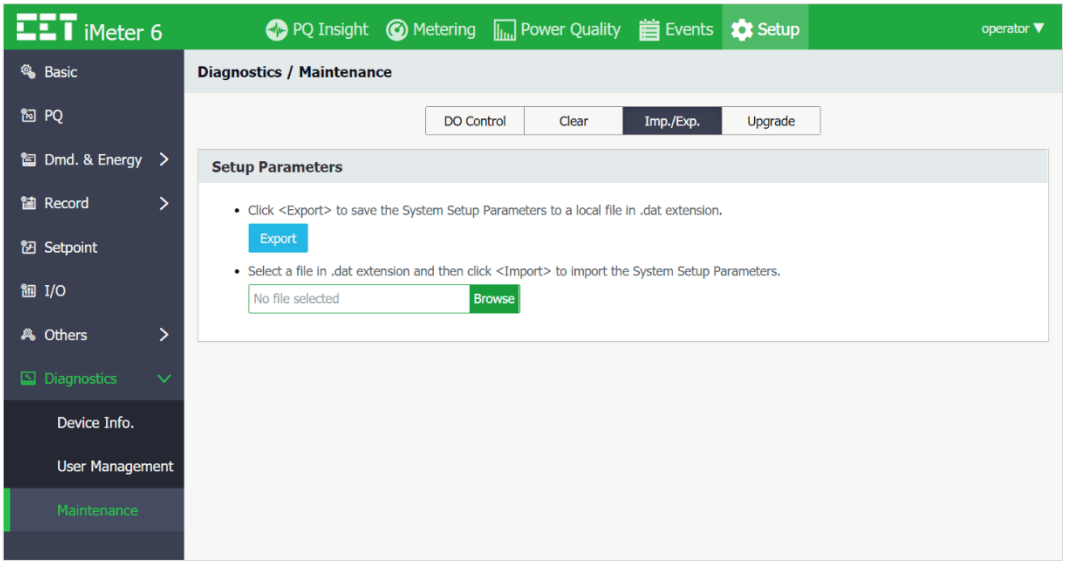


Figure 3-107 Maintenance – Imp./Exp.

- **Upgrade**
  Only a user with Operator authority can perform a firmware upgrade for the iMeter 6.

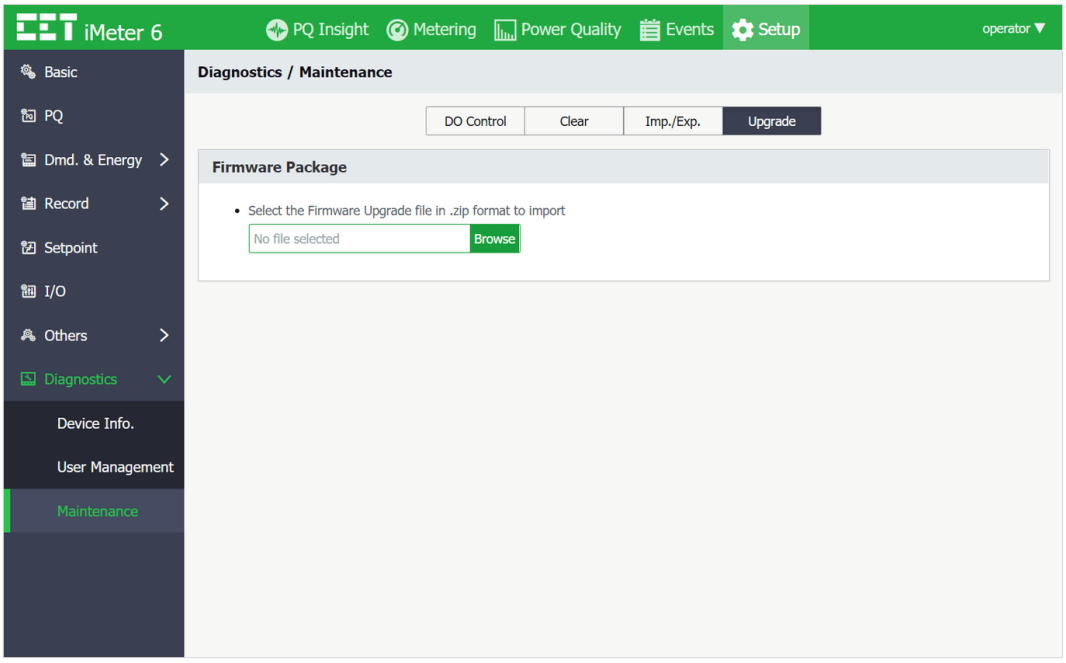


Figure 3-108 Maintenance – Upgrade

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 4.7** 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) (Default=20ms)
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 3.1.3.5.8 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 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 or 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 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 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 Setpoint 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 pulses 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 measurements 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)	-
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 3.2.3.5.3.2 – 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 1 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
Demand 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
Demand 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 Default=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 Peak 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 manual operation. A manual reset will cause the Peak Demand of **This**	Default=0xFFFF

	Month to be transferred to the Peak 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	Uan / Ubn / Ucn / 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	Uan / Ubn / Ucn 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			
dUan	dUbn	dUcn	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:

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

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

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, DR, DO and Alarm Email. The programming of the Dip/Swell and Interruption setpoint parameters is supported via the Web Interface or communications.

Parameter	Description	Options/Value, Default*
Enable	Dip/Swell/Interruption Detection Enable	Enable* / Disable
Dip Threshold	Specify the Dip threshold of voltage	1% to 99% (xUllnominal), 90%*
Dip Hysteresis	Specify the Dip return threshold of voltage	0.1% to 100% (×Ullnominal), 0.5%*
Swell Threshold	Specify the Swell threshold of voltage	101% to 200% (×Ullnominal), 110%*
Swell Hysteresis	Specify the Swell return threshold of voltage	0.1% to 100% (×Ullnominal), 0.5%*
Interruption Threshold	Specify the Interruption threshold of voltage	0% to 50% (xUllnominal), 10%*
Interruption Hysteresis	Specify the Interruption return threshold of voltage	0.1% to 100% (×Ullnominal), 0.5%*
Trigger 1	Specify the action taken when the Dip/Swell/Interruption setpoint actives	DOx/DRx/HS DRx/WFRx/SMTP, WFR2*
Trigger 2	Specify the action taken when the Dip/Swell/Interruption setpoint actives	DOx/DRx/HS DRx/WFRx/SMTP, N/A*

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 80μs. 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	Definition	Options/Value, Default*
Enable	Transient Enable	Enable*/Disable
Threshold	Specify the Transient threshold as a percentage of nominal voltage	5% to 500% Ullnominal, 35%*
Trigger1	Specify the action taken when the Dip/Swell/Interruption setpoint actives	DOx / DRx / HS DRx / WFRx / SMTP, WFR1*
Trigger2	Specify the action taken when the Dip/Swell/Interruption setpoint actives	DOx / DRx / HS DRx / WFRx / SMTP, N/A*

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.

4.4 Setpoints

The iMeter 6 comes standard with 24 user programmable setpoints which provide extensive control by allowing a user to initiate an action in response to a specific condition. The Setpoint #1 to #16 are standard Setpoints and the Setpoint #17 to #24 are High-Speed Setpoints. Typical setpoint applications include alarming, fault detection and power quality monitoring.

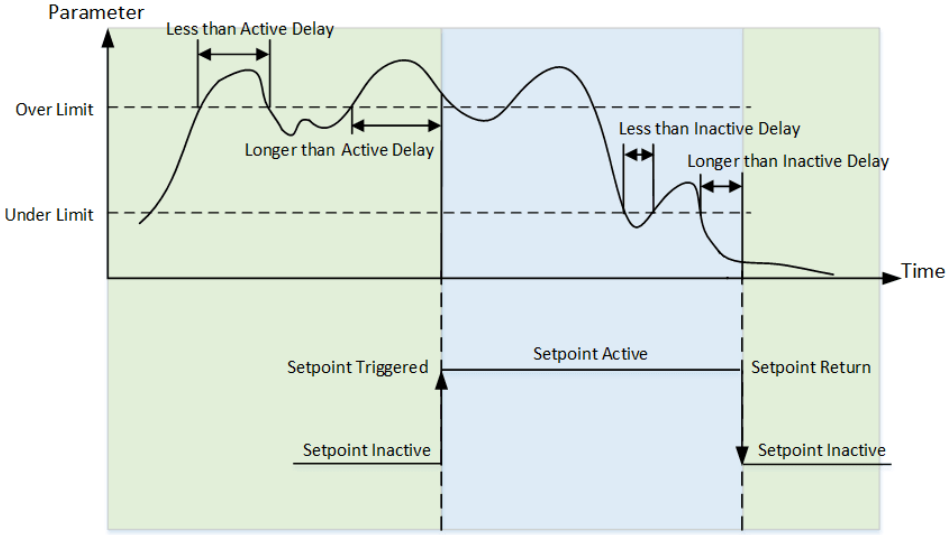


Figure 4-1 Over Setpoint

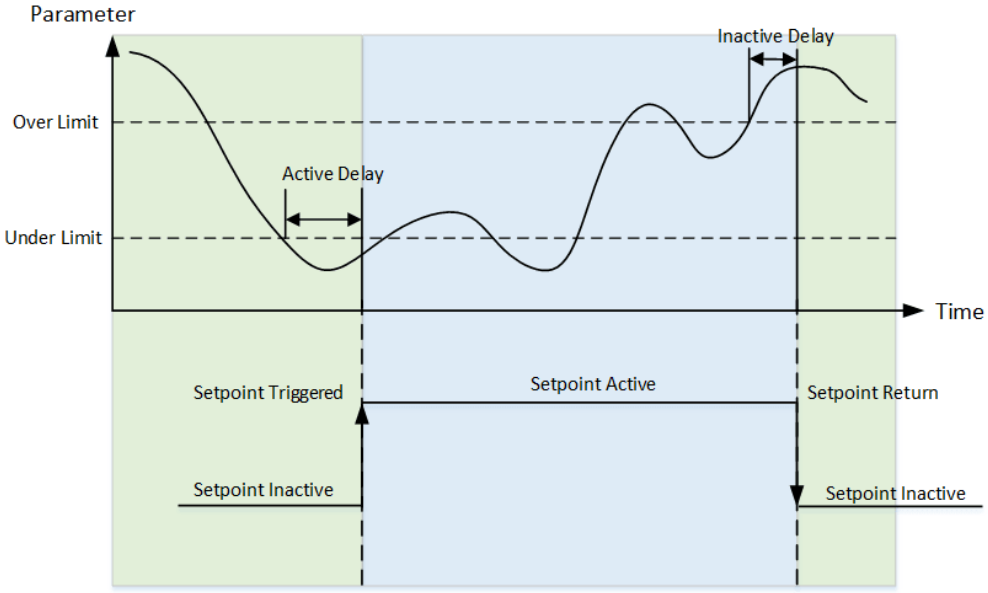


Figure 4-2 Under Setpoint

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

Parameter	Definition	Options/*Default
Setpoint Type	Disabled, Over or Under Setpoint.	0=Disabled* 1=Over Setpoint 2=Under Setpoint
Setpoint Parameter	Specify the parameter to be monitored.	See **Table 4-11**, 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).	Default=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).	Default=999,999
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 4-12** below for a list of Setpoint Triggers.	See **Table 4-12**

Table 4-10 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[1]	x1000, A
5	Freq Deviation	x100, Hz
6	kW Total	kW
7	kvar Total	kvar
8	PF	x1000
9	DI1	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**).
10	DI2	
11	DI3	
12	DI4	
13	DI5	
14	DI6	
15	AI	/
16	kW Total Present Demand	kW
17	kvar Total Present Demand	kvar
18	PF Present Demand	x1000
19	Total kW Predicted Demand	kW
20	Total kvar Predicted Demand	kvar
21	PF Predicted Demand	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 OverDeviation	x100, %
31	Voltage Phase Reversal	Over/Under Limit settings are invalid when Voltage Phase Reversal is set as the Setpoint Parameter. Please See Note 2) to check the Phase Reversal logic diagram.
32	Ir Calculated	x1000, A
33	U2 (Negative Sequence Voltage)	x100, V
34	U0 (Zero Sequence Voltage)	x100, V
35	Current Phase Reversal	Over/Under Limit settings are invalid when Current Phase Reversal is set as the Setpoint Parameter. Please See Note 2) to check the Phase Reversal logic diagram.

Table 4-11 Setpoint Parameters

Notes:

1) **I4** is valid only if the device is equipped with the I4 Input option, and **In (Calculated Neutral Current)** will automatically be used to if the meter is equipped with the AI option (instead of I4).

Key	Action	Key	Action
0	None	**12**	DR #5
1	DO1	**13**	DR #6
2	DO2	**14**	DR #7
3	DO3	**15**	DR #8
4	HS DR1	**16**	DR #9
5	HS DR2	**17**	DR #10
6	HS DR3	**18**	DR #11
7	HS DR4	**19**	DR #12
8	DR #1	**20**	WFR #1
8	DR #2	**21**	WFR #2
10	DR #3	**22**	Alarm Email
11	DR #4		

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

Table 4-12 Setpoint Triggers

2) The Phase Reversal is based on the Voltage/Current Angles detection. Following is the logic diagram.

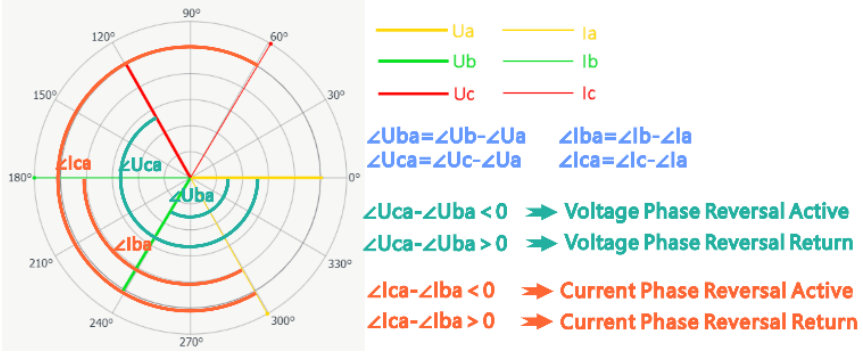


Figure 4-3 Phase Reversal Logic Diagram

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=Disabled*, 1=Enabled
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 4-14**
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 4-15**

Table 4-13 Logical Module Parameters

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

Table 4-14 Logical Module Sources

The iMeter 6 provides the following Logical Module Triggers:

Key	Action	Key	Action
0	None	**8-19**	DR1 to DR12
1-3	DO1 to DO3	**20, 21**	WR1, WR2
4-7	HSDR1 to HSDR4	**22**	Alarm Email

Table 4-15 Logical Module Triggers

4.6 Logging

4.6.1 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 4-16 Max./Min. Log**
. 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			
Uan	Ubn	Ucn	Uln avg
Uab	Ubc	Uca	Ull avg
Ia	Ib	Ic	I avg.
kW Total	kvar Total	kVA Total	PF Total
Uan/Uab THD	Ubn/Ubc THD	Ucn/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 4-16 Max./Min. Log

The same **Self-Read Time** for the **Peak 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.

4.6.2 Peak Demand Log

The iMeter 6 stores the **Peak Demand** of **This Month (Since Last Reset)** and **Last Month (Before Last Reset)** with timestamp for Ia, Ib, Ic, kW Total, kvar Total and kVA Total. All Peak 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 Peak Demand of This Month can be reset manually via the Front Panel, Web Interface or communications. The iMeter 6 provides the following Peak Demand parameters:

Peak Demand Logs of This Month (Since Last Reset) and Last Month (Before Last Reset)	
kW Total	Ia
kVA Total	Ib
kvar Total	Ic

Table 4-17 Peak Demand Measurements

4.6.3 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 users wish 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 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)	5760
Recording Interval	0 to 65535 (min)	15
Start Time	20YY/MM/DD, HH:MM:SS	--
Number of Parameters	0 to 5	5
Parameter 1 to 5	kWh Import/Export, kvarh Import/Export and kVAh	--

Table 4-18 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.

4.6.4 Waveform Recorder (WFR) Log

The iMeter 6 provides 2 independent groups of Waveform Recorders (**WFR**) with 128 entries each. Each WFR can simultaneously capture 3-phase Voltage and Current signals at a maximum resolution of 256 samples per cycles. The WFR can be triggered by Setpoints, Dip/Swell and Transient Detection or manually through Front Panel 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	
		WFR 1	WFR 2
Recording Depth	128 (Fixed)	128	128
Format	256x20, 128x40, 64x80, 32x160, 16x320	256x20	256x20
Pre-fault Cycles	0 to 20 Cycles	4	6

Table 4-19 WFR Setup Parameters

The recording depth for WFR 1 and WFR 2 is fixed at 128 each. The valid formats (# of samples/cycle x # of cycles) of WFR include 16x320, 32x160, 64x80, 128x40 and 256x20. When the WFR format is 256 samples/cycles, the "**Pre-fault Cycle**" can only 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 or free PMC Setup Software for display.

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

4.6.5 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.

4.6.6 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.

4.6.7 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 12 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 only supported 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)	
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 for Standard Data Recorder 0 to 28 for High-Speed Data Recorder Please see refer to **Appendix A** for more information.	

Table 4-20 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.

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.

4.6.8 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 4-21 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 4-22 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.

4.7 Time Synchronization

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. Since the iMeter 6 provides timestamps for all recorded data, particularly the Power Quality events, it's very important to keep the clock well synchronized for the data and events recording.

There are several methods to synchronize the iMeter 6's clock:

1) The Web Interface can be used to set the clock of an individual iMeter 6 manually or through the **Sync. with PC** function using the computer's clock as the time source

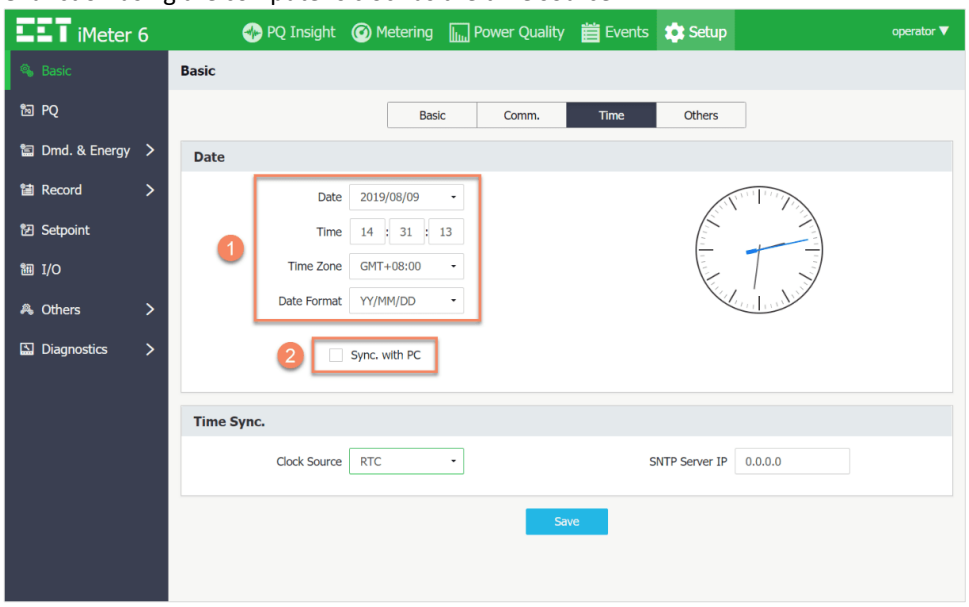


Figure 4-5 Time Synchronization via Web Interface

2) The **SNTP** service can be used to periodically synchronize the iMeter 6's clock through its Ethernet port providing that there is a local **SNTP Server** on the LAN or if the LAN is connected to the Internet where an external **SNTP Server** may be accessed. The **SNTP** configuration is supported via the Web Interface or communications. The iMeter 6 provides the following **SNTP** related setup parameters:

Setup Parameters	Options/*Default
Time Zone	GMT-12:00 / GMT-11:00 / GMT-10:00 / GMT-9:00 / GMT-8:00 / GMT-7:00 / GMT-6:00 / GMT-5:00 / GMT-4:00 / GMT-3:30 / GMT-3:00 / GMT-2:00 / GMT-1:00 / GMT-0:00 / GMT+1:00 / GMT+2:00 / GMT+3:00 / GMT+3:30 / GMT+4:00 / GMT+4:30/ GMT+5:00 / GMT+5:30 / GMT+5:45 / GMT+6:00 / GMT+6:30 / GMT+7:00 / GMT+8:00*/ GMT+9:00 / GMT+9:30 / GMT+10:00 / GMT+11:00 / GMT+12:00 / GMT+13:00
SNTP Server IP	Set the IP address of your Time Server

Table 4-23 SNTP Setup Parameters

3) Further, a GPS that has a 1 PPS output can be used to synchronize the millisecond clock through iMeter 6's **DI6 Input**. The programming of the Digital Input is supported via the Front Panel, Web Interface, or communications. The iMeter 6 provides the following DI setup parameters (please refer **Section 5.10.1** for a complete description of the DI Setup registers):

Setup Parameters	Options/*Default
DI Function	0=Digital Input*, 1=Pulse Counter, 2=SYNC DI, 3=PPS, 4=Tariff Switch
DI Debounce	0 and 1000 (ms), Default = 20 (ms)
DI Pulse Weight	1 and 1,000,000, Default = 1

Table 4-24 DI Setup Parameters

Please also refer to **Figure 2-16** Time Sync. Connections for the time synchronization wiring diagram.

4) **PMC Setup** can be used to manually set the time of an individual meter through the “Set Time” function in the **Manual Operate** dialog box using the computer’s clock as the clock source.

5) **PecStar® iEMS** can be configured to provide regular time synchronization by broadcasting time-sync packets over the connected medium, whether it be RS485 or Ethernet. The default time of synchronization interval is 60 minutes.

4.8 Alarm Email

The iMeter 6 supports the SMTP protocol which can be configured to send alarm email messages, triggered by Setpoint, Dip/Swell or Transient Detection.

The email shows the following information in text format:

1) iMeter 6’s serial number
2) Event description
3) Event time stamp

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

Parameters	Option
Port	0 to 65535 (Default=25)
Server IP	IP Address of the SMTP Server
Sender Email	Sender’s Email Address. This string is up to 36 characters long.
Password	Logon password for sender email address. This string is up to 19 characters long.
Receiver Email	Receiver’s Email address. This string is up to 35 characters long.
Test Email	Send a “test email” to the destination email address.

Table 4-25 Email Setup Parameters

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

1. 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). Click **Save** to store the configuration in the iMeter 6. The message “**Saved Succeeded**” will appear if the configuration is accepted by the meter.

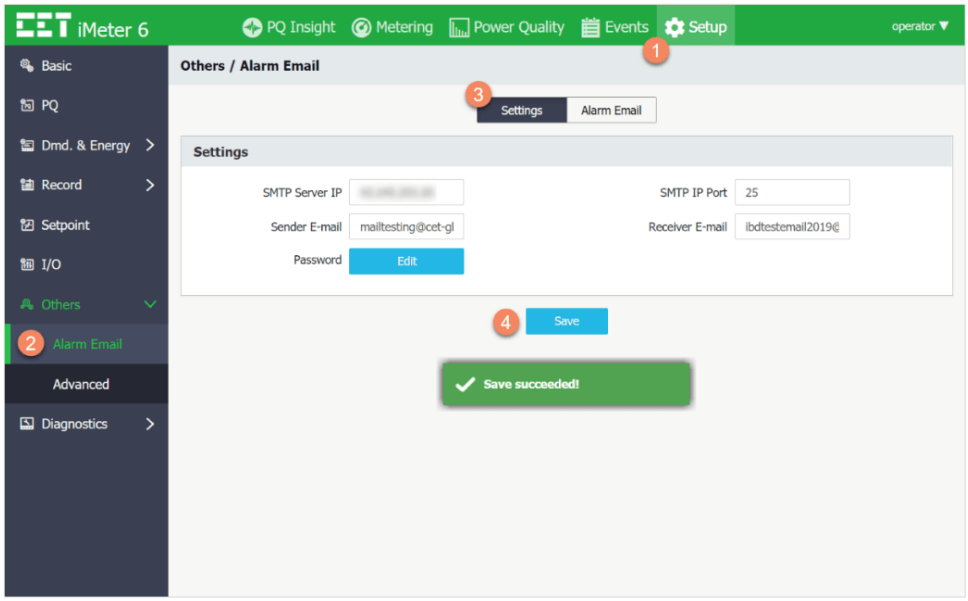


Figure 4-6 Alarm Email Settings via Web Server

2. Click **Alarm Email** tab to send 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 that it is connected to the Internet.

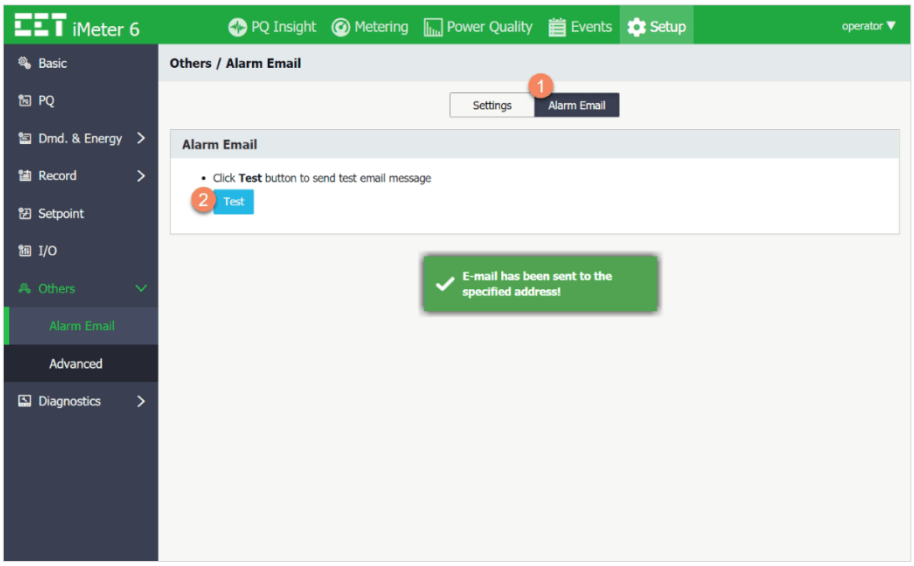


Figure 4-7 Send Test Email

Figure 4-8 An Example of Test Email

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

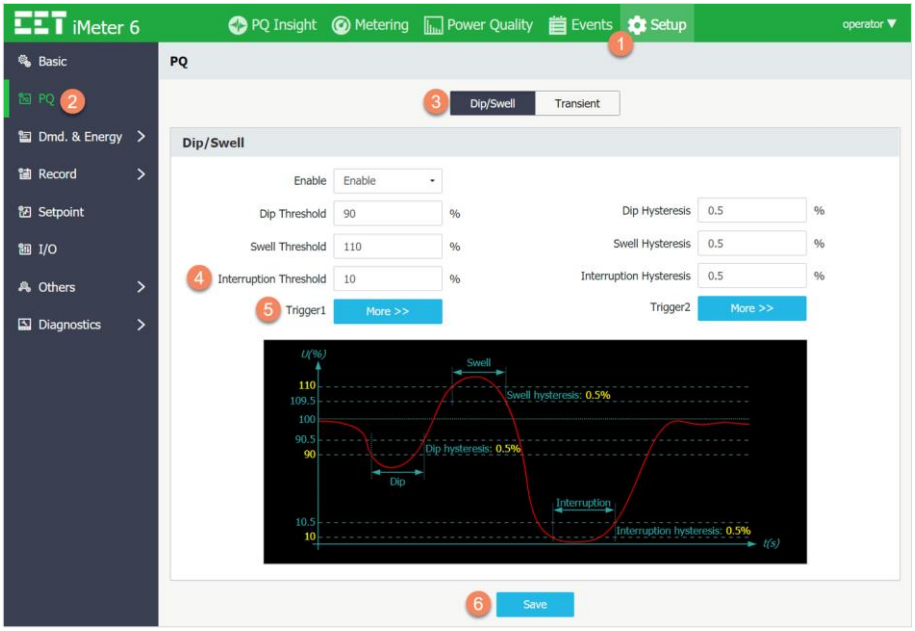


Figure 4-9 Dip, Swell and Interruption Thresholds & Hysteresis

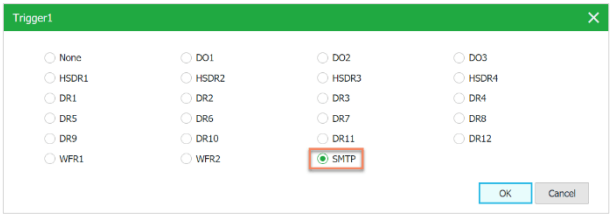


Figure 4-10 Trigger 1 Settings

4. 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.

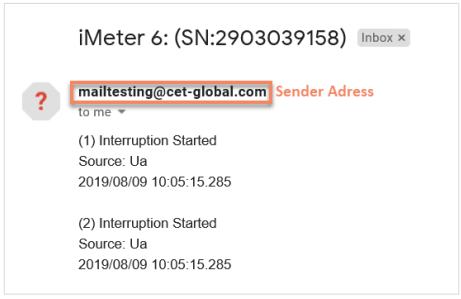


Figure 4-11 Alarm Email

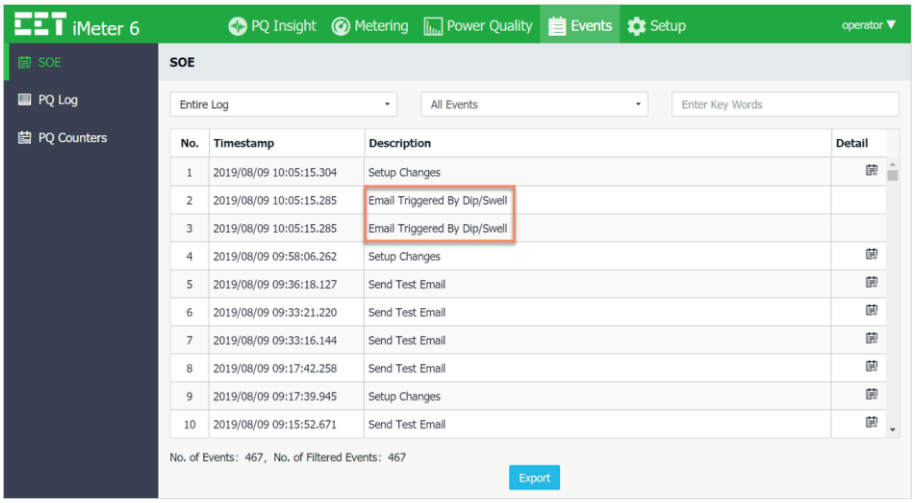


Figure 4-12 Email Triggered Event in SOE

4.9 Ethernet Gateway

The iMeter 6's Ethernet port together with its RS485 port can be used as an Ethernet Gateway (EtherGate) to allow communications between a Modbus Master on an Ethernet network and a number of RS485-enabled devices connected to the iMeter 6's RS485 port using the **Modbus RTU over TCP/IP** protocol as shown in **Figure 4-13 Topological Graph**.

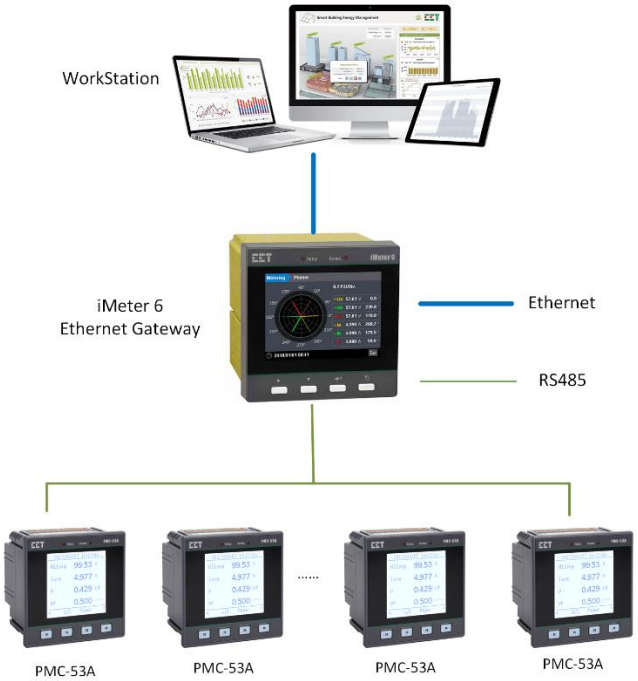


Figure 4-13 Topological Graph

Please follow the below steps to setup the iMeter 6's RS485 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.

Chapter 5 Modbus Map

This chapter provides a complete description of the Modbus register map (**Protocol Version 3.0**) 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	Uan[1]	Float	x1	V
0002	RO	Ubn[1]	Float		
0004	RO	Ucn[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
0062~0069		Reserved			
0070	RO	U2 (Negative Sequence Voltage) Unbalance	UINT16	×10	%
0071	RO	I2 (Negative Sequence Current) Unbalance	UINT16		
0072	RO	Uan Over Deviation	INT16	x100	%
0073	RO	Ubn Over Deviation	INT16		
0074	RO	Ucn Over Deviation	INT16		
0075	RO	Frequency Deviation	INT16	x100	Hz
0076	RO	Uan (Wye)/Uab (3P3W) Angle	UINT16	x100	°
0077	RO	Ubn (Wye)/Ubc (3P3W) Angle	UINT16		
0078	RO	Ucn (Wye)/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	UINT16	x100	
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 #1 Pointer[5]	UINT32		
0095	RO	WFR Log #2 Pointer[5]	UINT32		
0097	RO	IER Log Pointer[5]	UINT32		
0099	RO	DR #1 Pointer (HS)[5]	UINT32		
0101	RO	DR #2 Pointer (HS)[5]	UINT32		
0103	RO	DR #3 Pointer (HS)[5]	UINT32		
0105	RO	DR #4 Pointer (HS)[5]	UINT32		
0107	RO	DR #5 Pointer (Standard)[5]	UINT32		
...		...			
0129	RO	DR #16 Pointer (Standard)[5]	UINT32		
0131~0133	RO	Reserved	UINT32	x1	
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		

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 Active (Closed) and "0" meaning Inactive (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 Active (Closed) and "0" meaning Inactive (Open).

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	Setpoint #1 (Standard)	B16	Setpoint #17 (High-Speed)
B1	Setpoint #2 (Standard)	B17	Setpoint #18 (High-Speed)
B2	Setpoint #3 (Standard)	B18	Setpoint #19 (High-Speed)
B3	Setpoint #4 (Standard)	B19	Setpoint #20 (High-Speed)
B4	Setpoint #5 (Standard)	B20	Setpoint #21 (High-Speed)
B5	Setpoint #6 (Standard)	B21	Setpoint #22 (High-Speed)
B6	Setpoint #7 (Standard)	B22	Setpoint #23 (High-Speed)
B7	Setpoint #8 (Standard)	B23	Setpoint #24 (High-Speed)
B8	Setpoint #9 (Standard)	B24	Logical Module #1
B9	Setpoint #10 (Standard)	B25	Logical Module #2
B10	Setpoint #11 (Standard)	B26	Logical Module #3
B11	Setpoint #12 (Standard)	B27	Logical Module #4
B12	Setpoint #13 (Standard)	B28	Logical Module #5
B13	Setpoint #14 (Standard)	B29	Logical Module #6
B14	Setpoint #15 (Standard)	B30	Reserved
B15	Setpoint #16 (Standard)	B31	Reserved

Table 5-2 Alarm Status Register (0087)

5) The range of the SOE/PQ/WFR/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/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**, **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.

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.

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	RO	kWh Import Fractional	Float	x1	W ·s
0228	RO	kWh Export Fractional	Float		
0230	RO	kWh Net Fractional	Float		
0232	RO	kWh Total Fractional	Float		
0234	RO	kvarh Import Fractional	Float	x1	var ·s
0236	RO	kvarh Export Fractional	Float		
0238	RO	kvarh Net Fractional	Float		
0240	RO	kvarh Total Fractional	Float		
0242	RO	kVAh Fractional	Float	x1	VA ·s
0244	RO	kvarh Q1 Fractional	Float	x1	var ·s
0246	RO	kvarh Q2 Fractional	Float		
0248	RO	kvarh Q3 Fractional	Float		
0250	RO	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	RW	kWh Net	INT32		
4606	RW	kWh Total	UINT32		
4608	RW	kvarh Import	UINT32	x1	kvarh
4610	RW	kvarh Export	UINT32		
4612	RW	kvarh Net	INT32		
4614	RW	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	RW	kWh Net Fractional	Float		

4632	RW	kWh Total Fractional	Float		
4634	RW	kvarh Import Fractional	Float	x1	var·s
4636	RW	kvarh Export Fractional	Float		
4638	RW	kvarh Net Fractional	Float		
4640	RW	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	RW	kWh Net	INT32		
4658	RW	kWh Total	UINT32		
4660	RW	kvarh Import	UINT32	x1	kvarh
4662	RW	kvarh Export	UINT32		
4664	RW	kvarh Net	INT32		
4666	RW	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	RW	kWh Net Fractional	Float		
4684	RW	kWh Total Fractional	Float		
4686	RW	kvarh Import Fractional	Float	x1	var·s
4688	RW	kvarh Export Fractional	Float		
4690	RW	kvarh Net Fractional	Float		
4692	RW	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	RW	kWh Net	INT32		
4710	RW	kWh Total	UINT32		
4712	RW	kvarh Import	UINT32	x1	kvarh
4714	RW	kvarh Export	UINT32		
4716	RW	kvarh Net	INT32		
4718	RW	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	RW	kWh Net Fractional	Float		
4736	RW	kWh Total Fractional	Float		
4738	RW	kvarh Import Fractional	Float	x1	var·s
4740	RW	kvarh Export Fractional	Float		
4742	RW	kvarh Net Fractional	Float		
4744	RW	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	UINT32		
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	Unit
0350	RW	DI1 Pulse Counter	UINT32	x1000	-
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	dUan[1]	Float	x1	V
0402	RO	dUbn[1]	Float		
0404	RO	dUcn[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

The Harmonics data (Individual Harmonics, THD, TOHD and TEHD) returned is 100 times the actual value. For example, if the register contains a value of 1031, the actual harmonic value is 10.31. The K Factor data returned is 10 times the actual value.

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	Uan (3P4W)/Uab (3P3W) THD	UINT16	x100	%
0462	RO	Ubn (3P4W)/Ubc (3P3W) THD	UINT16		
0463	RO	Ucn (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	Uan (3P4W)/Uab (3P3W) TOHD	UINT16		
0469	RO	Ubn (3P4W)/Ubc (3P3W) TOHD	UINT16		
0470	RO	Ucn (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	Uan (3P4W)/Uab (3P3W) TEHD	UINT16		
0476	RO	Ubn (3P4W)/Ubc (3P3W) TEHD	UINT16		
0477	RO	Ucn (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	Uan (3P4W)/Uab (3P3W) 2nd Harmonic	UINT16		
0483	RO	Ubn (3P4W)/Ubc (3P3W) 2nd Harmonic	UINT16		
0484	RO	Ucn (3P4W)/Uca (3P3W) 2nd Harmonic	UINT16		
0485	RO	Ia 2nd Harmonic	UINT16		
0486	RO	Ib 2nd Harmonic	UINT16		
0487	RO	Ic 2nd Harmonic	UINT16		
0488	RO	I4 2nd Harmonic[1]	UINT16		
…		…			
0909	RO	Uan (3P4W)/Uab (3P3W) 63rd Harmonic	UINT16		
0910	RO	Ubn (3P4W)/Ubc (3P3W) 63rd Harmonic	UINT16		
0911	RO	Ucn (3P4W)/Uca (3P3W) 63rd Harmonic	UINT16		
0912	RO	Ia 63rd Harmonic	UINT16		
0913	RO	Ib 63rd Harmonic	UINT16		
0914	RO	Ic 63rd Harmonic	UINT16		
0915	RO	I4 63rd Harmonic[1]	UINT16		

0916	RO	Uan (3P4W)/Uab (3P3W) Crest-Factor	UINT16		
0917	RO	Ubn (3P4W)/Ubc (3P3W) Crest-Factor	UINT16		
0918	RO	Ucn (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	Uan[1]	Float	x1	V
0932	RO	Ubn[1]	Float		
0934	RO	Ucn[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, 3-phase Current, Neutral Current (I4) and In @ 1 cycle.

5.6 Event Counter

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

Table 5-14 Event Counter

5.7 Demand Measurements

5.7.1 Present Demand

Register	Property	Description	Format	Scale	Unit
1000	RO	Uan	INT32	x100	V
1002	RO	Ubn	INT32		
1004	RO	Ucn	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	Uan (3P4W)/Uab (3P3W) THD	INT32	x100	%
1066	RO	Ubn (3P4W)/Ubc (3P3W) THD	INT32		
1068	RO	Ucn (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	x100	%
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	Uan	INT32	x100	V
1202	RO	Ubn	INT32		
1204	RO	Ucn	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	Uan (3P4W)/Uab (3P3W) THD	INT32	x100	%
1266	RO	Ubn (3P4W)/Ubc (3P3W) THD	INT32		
1268	RO	Ucn (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	x100	%
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	Uan Max.	INT32	x100	V
1402	RO	Ubn Max.	INT32		
1404	RO	Ucn 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	Uan (3P4W)/Uab (3P3W) THD Max.	INT32	x100	%
1466	RO	Ubn (3P4W)/Ubc (3P3W) THD Max.	INT32		
1468	RO	Ucn (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	x100	%
1482	RO	Ib Fundamental	INT32		
1484	RO	Ic Fundamental	INT32		
1486~1598		Reserved			
1600	RO	Uan Min.	INT32	x100	V
1602	RO	Ubn Min.	INT32		
1604	RO	Ucn 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	Uan (3P4W)/Uab (3P3W) THD Min.	INT32	x100	%
1666	RO	Ubn (3P4W)/Ubc (3P3W) THD Min.	INT32		
1668	RO	Ucn (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	x100	%
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 Demands** Period is valid only if the device is equipped with the I4 option, and it will be automatically changed to **In (Calculated) Demand** if the meter is equipped with the AI option.

5.7.4 Peak 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			

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

5.7.5 Peak 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			

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

5.7.6 Demand Data Structure

Offset	Property	Description	Format	Note
+0	RO	Peak Demand	INT32	/
+2	RO	High-order Byte: Year	UINT16	0-99 (Year-2000)
		Low-order Byte: Month		1 to 12
+3	RO	High-order Byte: Day	UINT16	1 to 31
		Low-order Byte: Hour		0 to 23
+4	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59
+5	RO	Millisecond	UINT16	0 to 999

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	Uan	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2006~2011	RO	Ubn			
2012~2017	RO	Ucn			
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	Uan (3P4W)/Uab (3P3W) THD		x100	%
2114~2119	RO	Ubn (3P4W)/Ubc (3P3W) THD			
2120~2125	RO	Ucn (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	Uan	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2306~2311	RO	Ubn			
2312~2317	RO	Ucn			
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	Uan (3P4W)/Uab (3P3W) THD		x100	%
2414~2419	RO	Ubn (3P4W)/Ubc (3P3W) THD			
2420~2425	RO	Ucn (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	Uan	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2606~2611	RO	Ubn			
2612~2617	RO	Ucn			
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	Uan (3P4W)/Uab (3P3W) THD		x100	%
2714~2719	RO	Ubn (3P4W)/Ubc (3P3W) THD			
2720~2725	RO	Ucn (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		x10	-
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	Uan	See **Table 5-25 Max./Min. Log Data Structure**	x100	V
2906~2911	RO	Ubn			
2912~2917	RO	Ucn			
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	FREQ		x100	Hz
3008~3013	RO	Uan (3P4W)/Uab (3P3W) THD		x100	%
3014~3019	RO	Ubn (3P4W)/Ubc (3P3W) THD			
3020~3025	RO	Ucn (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		x10	-
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	0-99 (Year-2000)
		Low-order Byte: Month		1 to 12
+3	RO	High-order Byte: Day	UINT16	1 to 31
		Low-order Byte: Hour		0 to 23
+4	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59
+5	RO	Millisecond	UINT16	0 to 999

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	UINT16	0-99 (Year-2000)
		Low-order Byte: Month		1 to 12
+2	RO	High-order Byte: Day	UINT16	1 to 31
		Low-order Byte: Hour		0 to 23
+3	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59
+4	RO	Millisecond	UNIT16	0 to 999
+5	RO	Event Value	INT32	-
+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 Low-order Byte: Sub-Classification	UINT16	See **Table 5-30 PQ Log Classification**
+1	RO	High-order Byte: Year Low-order Byte: Month	UINT16	0-99 (Year-2000) 1 to 12
+2	RO	High-order Byte: Day Low-order Byte: Hour	UINT16	1 to 31 0 to 23
+3	RO	High-order Byte: Minute Low-order Byte: Second	UINT16	0 to 59 0 to 59
+4	RO	Millisecond	UNIT16	0 to 999
+5 +6	RO RO	Event Value 1	INT32	See **Table 5-30 PQ Log Classification — Event Value**
+7 +8	RO RO	Event Value 2	INT32	
+9 +10	RO RO	Event Value 3	INT32	
+11 +12	RO RO	Event Value 4	INT32	
+13 +14	RO 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 Uan/Uab Transient (%), x100 **Event Value 4**: Maximum Ubn/Ubc Transient (%), x100 **Event Value 5**: Maximum Ucn/Uca Transient (%), x100
8. Dip/Swell	1	Swell Starts	**Event Value 1:** Trigger Phase B0 = Uan B1 = Ubn B2 = Ucn 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 $Uan_{max}/Uln_{nominal}$, x100 **Event Value 4**: %Residual $Ubn_{max}/Uln_{nominal}$, x100 **Event Value 5**: %Residual $Ucn_{max}/Uln_{nominal}$, 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 $Uan_{min}/Uln_{nominal}$, x100 **Event Value 4**: %Residual $Ubn_{min}/Uln_{nominal}$, x100 **Event Value 5**: %Residual $Ucn_{min}/Uln_{nominal}$, 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	See **PQ Log Classification** 8 => **Sub-Classification** 1
	6	Interruption Ends	See **PQ Log Classification** 8 => **Sub-Classification** 4

Table 5-30 PQ Log Classification

5.9 Log Data Format

5.9.1 Read General Reference Packet Structure (Function Code 0x14)

Modbus function code 0x14 is used to access to the Energy Log, PQ Log, Data Recorder Log and Waveform Recorder Log. The table below list the file format.

Read Reference Request Packet (Master Station to iMeter 6)	
Slave Address	1 Byte
Function Code (0x14)	1 Byte
Byte Count	1 Byte
Sub-Req X, Reference Type (0x06)	1 Byte
Sub-Req X, File Number	2 Bytes
Sub-Req X, Start Address	2 Bytes
Sub-Req X, Register Count	2 Bytes
Sub-Req X+1…	
Error Check (CRC)	2 Bytes

Read Reference Response Packet (iMeter 6 to Master Station)	
Salve Address	1 Byte
Function Code (0x14)	1 Byte
Byte Count	1 Byte (NxN_0+2)
Sub-Res X, Byte Count	1 Byte (NxN_0+1)
Sub-Res X, Reference Type (0x06)	1 Byte
Sub-Res X, Register Data	NxN_0 Bytes
Sub-Res X+1…	
Error Check (CRC)	2 Bytes

Table 5-31 Read Reference/ Response Request Packet

1) Start Address = [**Log #X Pointer** / **Log #X Depth**].
2) The Maximum length for the Register Count should be less than 256 bytes.
3) In the Request Packet, the **File Number** parameter is used to reference which log to read:
   a) For Interval Energy Recorder Log, **File Number** = 17
   b) For High Speed Data Recorder Logs 1 to 4, **File Number** = 1 to 4
   c) For Standard Data Recorder Logs 1 to 12, **File Number** = 5 to 16
   d) For Waveform Recorder #1 Log, **Data File Number (.Dat)** = 18 to 145, **Configuration File Number (.Cfg)** = 146 to 273
   e) For Waveform Recorder #2 Log, **Data File Number (.Dat)** = 274 to 401, **Configuration File Number (.Cfg)** = 402 to 529.
4) In the Response Packet, **N** represents the number of logs returned, and $\mathbf{N_0}$ is the length of a single log:
   a) For Interval Energy Recorder Log, $\mathbf{N_0}$ = 28 where n is the number of parameters for the Energy Log
   b) For Data Recorder, $\mathbf{N_0}$ = 72 where n is the number of parameters for a particular Data Recorder
   c) For Waveform Recorder Log, $\mathbf{N_0}$ = 2

5.9.2 Interval Energy Recorder Log Data Structure

Offset	Property	Description	Format	Note
+0	RO	Parameter 1	INT32	-
+2	RO	Parameter 2	INT32	-
…	RO	…	INT32	-
+2N	RO	Parameter N (N=0 to 5)	INT32	-
+2N+1	RO	High-order Byte: Year	UINT16	0-99 (Year-2000)
	RO	Low-order Byte: Month		1 to 12
+2N+2	RO	High-order Byte: Day	UINT16	1 to 31
	RO	Low-order Byte: Hour		0 to 23
+2N+3	RO	High-order Byte: Minute	UINT16	0 to 59
	RO	Low-order Byte: Second		0 to 59
+2N+4	RO	Millisecond	UINT16	0 to 999

Table 5-32 Interval Energy Recorder Log Data Structure

Note:

1) Please refer to **Section 5.9.1** for how to retrieve the energy log.

5.9.3 Data Recorder Log Data Structure

Offset	Property	Description	Format	Note
+0	RO	Parameter 1	INT32	/
+2	RO	Parameter 2	INT32	/
…	RO	…	INT32	
+2N	RO	Parameter N (N=1 to 16)	INT32	/
+2N+1	RO	High-order Byte: Year	UINT16	0-99 (Year-2000)
		Low-order Byte: Month		1 to 12
+2N+2	RO	High-order Byte: Day	UINT16	1 to 31
		Low-order Byte: Hour		0 to 23
+2N+3	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59
+2N+4	RO	Millisecond	UINT16	0 to 999

Table 5-33 DR-LOG Data Structure

Notes:

1) Please refer to **Section 5.9.1** for how to retrieve the DR log.

5.9.4 Waveform Recorder Log Data Structure

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

Primary Voltage Value = Voltage Data × PT Ratio ÷ 10

Primary Current Value = Current Data × CT Ratio ÷ 1000

Offset	Property	Description	Format	Note
+0	RO	Trigger Mode	UINT16	0=Disabled* 1=Manual 2=Setpoint 3=Dip/Swell 4=Transient
+1	RO	High-order Byte: Year	UINT16	0-99 (Year-2000)
		Low-order Byte: Month		1 to 12
+2	RO	High-order Byte: Day	UINT16	1 to 31
		Low-order Byte: Hour		0 to 23
+3	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59
+4	RO	Millisecond	UINT16	0 to 999
+5 to N+4	RO	Uan/Uab sample value (1 to N#)	UINT16	x10, V
+N+5 to 2N+4	RO	Ubn/Ubc sample value (1 to N#)	UINT16	x10, V
+2N+5 to 3N+4	RO	Ucn/Uca sample value (1 to N#)	UINT16	x10, V
+3N+5 to 4N+4	RO	Ia sample value (1 to N#)	UINT16	x1000, A
+4N+5 to 5N+4	RO	Ib sample value (1 to N#)	UINT16	x1000, A
+5N+5 to 6N+4	RO	Ic sample value (1 to N#)	UINT16	x1000, A

#N=# of Samples

Table 5-34 WFR Data Structure

Notes:

1) Please refer to **5.9.1** for how to retrieve the WFR log.

5.10 Device Setup

5.10.1 Basic Setup

Register	Property	Description	Format	Range	Default
5999	RW	PT Ratio-Fraction[1)]	UINT16	0 to 9999	0
6000	RW	PT Ratio-Integer[1)]	UINT16	1 to 10000	1
6001	RW	CT Ratio[1)]	UINT16	1 to 6,000 (5A input) 1 to 30,000 (1A input)	1
6002	RW	I4 Ratio	UINT16	1 to 10,000	1
6003	RW	Wiring Mode	UINT16	0=3P4W, 1=DEMO 2=3P3W, 3=1P2W L-N 4=1P2W L-L, 5=1P3W L-L-N	0
6004	RW	Secondary Ull Nominal ($Ull_{nominal}$)	UINT16	100V to 700V (Ull)	See Note 2)

6005	RW	Nominal Frequency ($f_{nominal}$)	UINT16	0=50Hz, 1=60Hz	0
6006	RW	Port 1 Protocol	UINT16	0=Modbus, 1=Gateway	0
6007	RW	Port 1 Unit ID	UINT16	1 to 247	100
6008	RW	Port 1 Baud rate	UINT16	0=1200, 1=2400 2=4800, 3=9600 4=19200, 5=38400	3
6009	RW	Port 1 Configuration	UINT16	0=8N2, 1=8O1, 2=8E1 3=8N1, 4=8O2, 5=8E2	2
6010~6012	RW	Reserved	UINT16		
6013	RW	IP Address	UINT32	See Note 3)	
6015	RW	Subnet Mask	UINT32		
6017	RW	Gateway Address	UINT32		
6019	RW	Power Factor Convention[4)]	UINT16	0=IEC, 1=IEEE, 2=-IEEE	0
6020	RW	kVA Calculation[5)]	UINT16	0=Vector, 1=Scalar	0
6021	RW	Demand Sync.	UINT16	0= SLD, 1=SYNC DI	0
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[6)]	UINT16	70 to 99	70
6025	RW	DI1 Function	UINT16	0=Digital Input 1=Pulse Counter 2=SYNC DI[7)], 3=PPS[8)] 4=Tariff Switch[9)]	0
6026	RW	DI2 Function	UINT16		
6027	RW	DI3 Function	UINT16		
6028	RW	DI4 Function	UINT16	0=Digital Input 1=Pulse Counter 2=SYNC DI[7)], 3=PPS[8)]	0
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	0
6050	RW	DO2 Function	UINT16		
6051	RW	DO3 Function	UINT16		
6052	RW	DO1 Pulse Width	UINT16	0 to 999 (x0.1s) 0=Latch Mode	0
6053	RW	DO2 Pulse Width	UINT16		
6054	RW	DO3 Pulse Width	UINT16		
6055	RW	AI Type[10)]	UINT16	0=4-20mA, 1=0-20mA	0
6056	RW	AI Zero scale[10)]	INT32	-999,999 to +999,999	400
6058	RW	AI Full scale[10)]	INT32	-999,999 to +999,999	2000
6060~6064	RW	Reserved	UINT16	-	-
6065	RW	I4 Polarity	UINT16	0=Normal 1=Reverse	0
6066	RW	Ia Polarity	UINT16		
6067	RW	Ib Polarity	UINT16		
6068	RW	Ic Polarity	UINT16		
6069	RW	Harmonic Calculation[11)]	UINT16	0=Fundamental, 1=RMS	0
6070	RW	Enable Energy Pulse	UINT16	0=Disabled, 1=Enabled	0
6071	RW	Pulse Constant[12)]	UINT16	0 to 4	0
6072	RW	Self-Read Time[13)]	UINT16	See Note 13)	0xFFFF
6073	RW	Dip/Swell Enable	UINT16	0=Disabled, 1=Enabled	1
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	0=None 1 to 3=DO1 ~ DO3 4 to 7=HS DR 1 ~ 4 8 to 19=Standard DR 1 ~ 12 20 to 21=WR 1 ~ WR 2 22= Alarm Email	20
6077	RW	Dip/Swell Trigger 2	UINT16		0
6078	RW	Reserved	UINT16	-	-
6079	RW	Time Zone[14)]	UINT16	0 to 32	26
6080	RW	Reserved	UINT16	-	-
6081	RW	SNTP IP Address	UINT32	If IP address is 192.168.8.94, write "0xC0A8085E" to this register	0.0.0.0
6083	RW	SMTP IP Port	UINT16	0 to 65535	25
6084	RW	SNTP Server IP	UINT32	If address is 191.168.0.94, write "0xC0A805E" to this register	192.168.0.94
6086~6121	RW	Sender Email[15)]	UINT16	See Note 15)	
6122~6141	RW	Logon Password[16)]	UINT16	See Note 16)	
6142~6177	RW	Receiver Email[17)]	UINT16	See Note 17)	
6178	RW	Transient Enable	UINT16	0=Disabled, 1=Enabled	1
6179	RW	Transient Limit	UINT16	5 to 500 (x0.01 $Ull_{nominal}$)	35
6180	RW	Transient Trigger 1	UINT16	0=None 1 to 3=DO1 ~ DO3 4 to 7=HS DR 1 ~ 4 8 to 19=Standard DR 1 ~ 12 20 to 21=WR 1 ~ WR 2 22= Alarm Email	20
6181	RW	Transient Trigger 2	UINT16		0
6182	RW	Email Language	UINT16	0=English, 1=Chinese	0
6183	RW	Backlight Time-out[18)]	UINT16	0 to 60 (mins)	3
6184	RW	Interruption Limit	UINT16	0 to 50 (x0.01Un)	10
6185	RW	Arm before Execute	UINT16	0=Disabled 1=Enabled	0
6186	RW	kvarh Type	UINT16	0=RMS kvarh 1=Fundamental kvarh	0
6187	RW	EN Period[19)]	UINT16	5 to 60min	60
6188~6199	RW	Reserved	UINT16	-	-
6200	RW	Current On Threshold	UINT16	1 to 1000 (x0.001Iprim)	1
6201	RW	Swell Hysteresis	UINT16	1 to 1000 (x0.001 $Ull_{nominal}$)	5
6202	RW	Dip Hysteresis	UINT16		
6203	RW	Interruption Hysteresis	UINT16		
6204	RW	Date Format	UINT16	0=YYMMDD 1=MMDDYY 2=DDMMYY	0
6205	RW	LCD Contrast (%)	UINT16	50 to 100	90
6206	RW	Phase A Color	UINT16	0=Brown, 1=Red 2=Pink, 3=Orange 4=Yellow 5=Yellow-green 6=Green 7=Light-blue 8=Dark-blue 9=Purple, 10=Gray 11=Natural Gray 12=White, 13=Black	4
6207	RW	Phase B Color	UINT16		6
6208	RW	Phase C Color	UINT16		1
6209	RW	Phase N Color	UINT16		13
6210	RW	Ground Wire Color	UINT16	0=Green, 1=Yellow-green	1
6211	RW	Clock Source	UINT16	0=RTC, 1=SNTP, 2=GPS	0
6212	RW	Gateway Port	UINT16	1 to 65535 Using the same port in different applications will cause conflict	6000
6213	RW	Modbus RTU Port	UINT16		27011
6214	RW	Modbus TCP Port	UINT16		502
6215	RW	Web Port[20)]	UINT16		80
6216	RW	Delimiter[21)]	UINT16	See Note 21)	0

Table 5-35 Basic Setup Parameters

Notes:

1) PT Ratio= PT Ratio-Integer Part + (PT Ratio-Decimal Part/10000)
For 1A configuration, PT Ratio × CT Ratio must be less than 5,000,000
For 5A configuration, PT Ratio × CT Ratio must be less than 1,000,000

2) The default Ullnominal = 120V for 69V/120V Input;
= 415V for 240V/415V Input;
= 690V for 400V/690V Input.

3) The last Octet of the **IP Address, Subnet Mask** and **Gateway** can neither be "0000 0000" nor "1111 1111".
If the IP Address is "192.168.8.97", write "0xC0A80861" 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.

4) PF Convention (-IEEE is the same as IEEE but with the opposite sign):

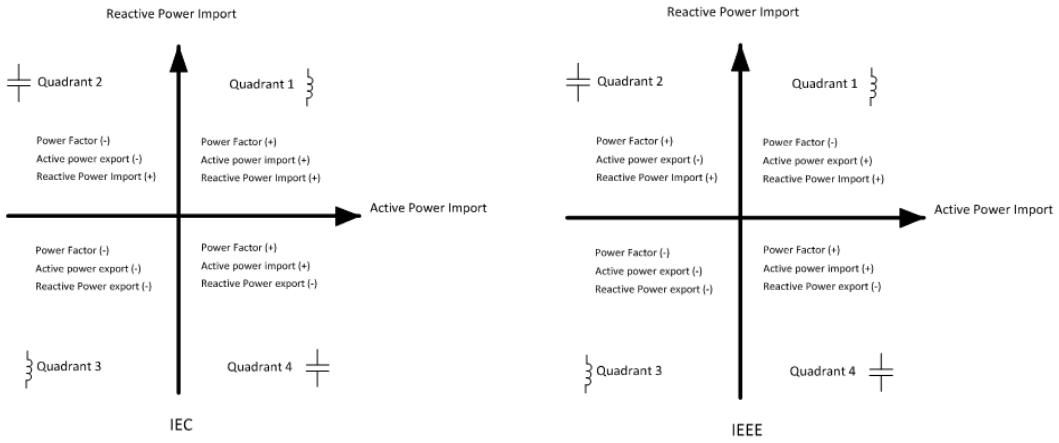


Figure 5-1 PF Convention

5) There are two methods to calculate kVA:

Vector: $kVA_{total}=\sqrt{kW_{total}^2+kVar_{total}^2}$

Scalar: $kVA_{total}=kVA_a+kVA_b+kVA_c$

6) 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.

7) 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.

8) Only DI6 can be used as an external time synchronization (PPS) input.

9) 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 5-36 DIs and the Number of Tariffs Setup

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

11) 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.

12) 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 5-37 Pulse Constant

13) The **Self-Read Time** applies to both the Peak 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.

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 5-38 Time Zones

15) This string register specifies the sender email address that appears in the "From" field of the email. This string may be up to 35 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".

16) This string register specifies the Logon Password to login the "Source Email" account. This string may be up to 19 characters long. Please add the value zero "0000" at the end of the string as the string terminator. For example, the default password is "iMeter6", set the registers as "0069 004D 0065 0074 0065 0072 0036"

17) This string register specifies the receiver email address that appears in the "To" field of the email. This string may be up to 35 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".

18) The Backlight Time-out can be set from 0 to 60 minutes. A zero (0) value indicates that the backlight time-out is disabled.

19) The Interval Energy will be reset once the **EN Period** is changed.

20) 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.

21) 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).

5.10.2 Setpoint Setup

5.10.2.1 Setpoint Setup Registers

Register	Property	Description	Format
6600~6609	RW	Setpoint #1 (Standard)	See Section **5.10.2.2**
6610~6619	RW	Setpoint #2 (Standard)	
6620~6629	RW	Setpoint #3 (Standard)	
6630~6639	RW	Setpoint #4 (Standard)	
6640~6649	RW	Setpoint #5 (Standard)	
6650~6659	RW	Setpoint #6 (Standard)	
6660~6669	RW	Setpoint #7 (Standard)	
6670~6679	RW	Setpoint #8 (Standard)	
6680~6689	RW	Setpoint #9 (Standard)	

6690~6699	RW	Setpoint #10 (Standard)	
6700~6709	RW	Setpoint #11 (Standard)	
6710~6719	RW	Setpoint #12 (Standard)	
6720~6729	RW	Setpoint #13 (Standard)	
6730~6739	RW	Setpoint #14 (Standard)	
6740~6749	RW	Setpoint #15 (Standard)	
6750~6759	RW	Setpoint #16 (Standard)	
6760~6769	RW	Setpoint #17 (High-Speed)	
6770~6779	RW	Setpoint #18 (High-Speed)	
6780~6789	RW	Setpoint #19 (High-Speed)	
6790~6799	RW	Setpoint #20 (High-Speed)	
6800~6809	RW	Setpoint #21 (High-Speed)	
6810~6819	RW	Setpoint #22 (High-Speed)	
6820~6829	RW	Setpoint #23 (High-Speed)	
6830~6839	RW	Setpoint #24 (High-Speed)	

Table 5-39 Setpoints Setup

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 35	1
+2	RW		Active Limit	INT32	-	999999
+4	RW		Inactive Limit	INT32	-	999999
+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 22	0
+9	RW		Trigger 2[2)]	UINT16	0 to 22	0
+0	RW	High-speed Setpoint	Type	UINT16	0=Disabled 1=Over Setpoint 2=Under Setpoint	0
+1	RW		Parameter1)	UINT16	1 to 14	1
+2	RW		Active Limit	INT32	-	999999
+4	RW		Inactive Limit	INT32	-	999999
+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 22	0
+9	RW		Trigger 2[2)]	UINT16	0 to 22	0

Table 5-40 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)]	x1000, A
5	Freq Deviation	x100, Hz
6	kW Total	kW
7	kvar Total	kvar
8	PF	x1000
9	DI1	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**).
10	DI2	
11	DI3	
12	DI4	
13	DI5	
14	DI6	
15	AI	/
16	kW Total Present Demand	kW
17	kvar Total Present Demand	kvar
18	PF Present Demand	x1000
19	Total kW Predicted Demand	kW
20	Total kvar Predicted Demand	kvar
21	PF Predicted Demand	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 OverDeviation	x100, %
31	Voltage Phase Reversal	Active/Inactive Limit settings are invalid when Voltage Phase Reversal is set as the Setpoint Parameter. Please See Note 4) to check the Phase Reversal logic diagram.
32	Ir Calculated	x1000, A
33	U2 (Negative Sequence Voltage)	x100, V
34	U0 (Zero Sequence Voltage)	x100, V
35	Current Phase Reversal	Active/Inactive Limit settings are invalid when Current Phase Reversal is set as the Setpoint Parameter. Please See Note 4) to check the Phase Reversal logic diagram.

Table 5-41 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	**12**	HS DR #5
1	DO1	**13**	HS DR #6
2	DO2	**14**	HS DR #7
3	DO3	**15**	HS DR #8
4	DR #1	**16**	HS DR #9
5	DR #2	**17**	HS DR #10
6	DR #3	**18**	HS DR #11
7	DR #4	**19**	HS DR #12
8	HS DR #1	**20**	WFR #1
8	HS DR #2	**21**	WFR #2
10	HS DR #3	**22**	Alarm Email
11	HS DR #4		

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

Table 5-42 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.

4) The Phase Reversal is based on the Voltage/Current Angles detection. Following is the logic diagram.

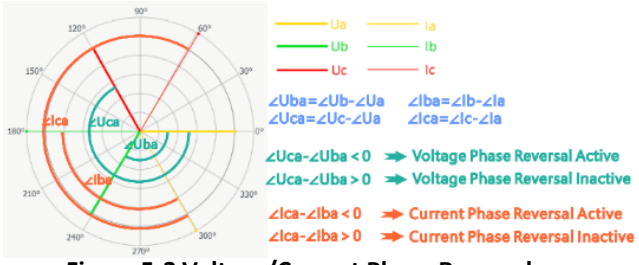


Figure 5-2 Voltage/Current Phase Reversal

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** Logical Module Setup Data Structure
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 5-43 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[1]	UINT16	0 to 24	1
+5	RW	Source 2[1]	UINT16	0 to 24	2
+6	RW	Source 3[1]	UINT16	0 to 24	3
+7	RW	Source 4[1]	UINT16	0 to 24	4
+8	RW	Trigger 1[2]	UINT16	0 to 22	0
+9	RW	Trigger 2[2]	UINT16	0 to 22	0

Table 5-44 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**	Setpoint #13 (Standard)
1	Setpoint #1 (Standard)	**14**	Setpoint #14 (Standard)
2	Setpoint #2 (Standard)	**15**	Setpoint #15 (Standard)
3	Setpoint #3 (Standard)	**16**	Setpoint #16 (Standard)
4	Setpoint #4 (Standard)	**17**	Setpoint #17 (High-Speed)
5	Setpoint #5 (Standard)	**18**	Setpoint #18 (High-Speed)
6	Setpoint #6 (Standard)	**19**	Setpoint #19 (High-Speed)
7	Setpoint #7 (Standard)	**20**	Setpoint #20 (High-Speed)
8	Setpoint #8 (Standard)	**21**	Setpoint #21 (High-Speed)
9	Setpoint #9 (Standard)	**22**	Setpoint #22 (High-Speed)
10	Setpoint #10 (Standard)	**23**	Setpoint #23 (High-Speed)
11	Setpoint #11 (Standard)	**24**	Setpoint #24 (High-Speed)
12	Setpoint #12 (Standard)		

Table 5-45 Logical Module Sources

2) **Trigger 1/2** specifies what action the Logical Module will take when it becomes active. Table 5-42 below provides a list of Logical Module Triggers.

Key	Action	Key	Action
0	None	**12**	HS DR #5
1	DO1	**13**	HS DR #6
2	DO2	**14**	HS DR #7
3	DO3	**15**	HS DR #8
4	DR #1	**16**	HS DR #9
5	DR #2	**17**	HS DR #10
6	DR #3	**18**	HS DR #11
7	DR #4	**19**	HS DR #12
8	HS DR #1	**20**	WFR #1
8	HS DR #2	**21**	WFR #2
10	HS DR #3	**22**	Alarm Email
11	HS DR #4		

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

Table 5-46 Logical Module Triggers

5.10.4 Data Recorder Setup

5.10.4.1 Data Recorder Setup Registers

Register	Property	Description	Format
7000~7022	RW	Data Recorder #1 (High-Speed)	See **Section 5.10.4.2** High-speed Data Recorder Setup Data Structure
7023~7045	RW	Data Recorder #2 (High-Speed)	
7046~7068	RW	Data Recorder #3 (High-Speed)	
7069~7091	RW	Data Recorder #4 (High-Speed)	
7092~7114	RW	Data Recorder #5 (Standard)	See **Section 5.10.4.3** Standard Data Recorder Setup Data Structure
7115~7137	RW	Data Recorder #6 (Standard)	
7138~7160	RW	Data Recorder #7 (Standard)	
7161~7183	RW	Data Recorder #8 (Standard)	
7184~7206	RW	Data Recorder #9 (Standard)	
7207~7229	RW	Data Recorder #10 (Standard)	
7230~7252	RW	Data Recorder #11 (Standard)	
7253~7275	RW	Data Recorder #12 (Standard)	
7276~7298	RW	Data Recorder #13 (Standard)	
7299~7321	RW	Data Recorder #14 (Standard)	
7322~7344	RW	Data Recorder #15 (Standard)	
7345~7367	RW	Data Recorder #16 (Standard)	

Table 5-47 Data Recorder Setup Registers

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 5-48 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
+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 5-49 Standard DR Setup Data Structure

Notes:

1) The Standard Data Recorder can be triggered by Setpoint (**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 the **Recording Depth** is set to **0**, the Data Recorder will be disabled.

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	2
7701	RW	Recording Depth		UINT16	0 to 65535	5760
7702	RW	Recording Interval		UINT16	1 to 65535 mins	15
7703	RW	Start Time[2)]	High-order Byte: Year	UINT16	0-99 (Year-2000)	10
			Low-order Byte: Month		1 to 12	10
7704	RW		High-order Byte: Day	UINT16	1 to 31	14
			Low-order Byte: Hour		0 to 23	14
7705	RW		High-order Byte: Minute	UINT16	0 to 59	46
			Low-order Byte: Second		0 to 59	00
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 5-50 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 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 Waveform Recorder (WFR) Setup

The iMeter 6 provides 2 Waveform Recorders, each with a fixed **Recording Depth** of 128. Each WFR 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 Log 1**	Reserved	UINT16	-	-
7601	RW		Format[1)]	UINT16	0~4	0
7602	RW		Reserved	UINT16	-	-
7603	RW		Pre-fault Cycles	UINT16	0 to 20	4
7604	RW	**WFR Log 2**	Reserved	UINT16	-	-
7605	RW		Format[1)]	UINT16	0~4	0
7606	RW		Reserved	UINT16	-	-
7607	RW		Pre-fault Cycles	UINT16	0 to 20	6

Table 5-51 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) Modifying the Setup Parameters of WFRx will clear the WFRx Log and reset WFRx Pointer will be reset to "0".

5.10.7 TOU Setup

5.10.7.1 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 5-52 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 (0-37)	Month (1-12)	Day (1-31)	Hour (00-23)

Table 5-53 TOU Switch Time Format

5.10.7.2 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 5-54 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.

5.10.7.3 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 5-57 Daily Profile Data Structure**
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 5-55 TOU #1's Daily Profile Setup

Register	Property	Description	Format
17200~17223	RW	Daily Profile #1	See **Table 5-57 Daily Profile Data Structure**
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 5-56 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 5-57 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.

5.10.7.4 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 5-59 Date Format
2	RW	Alternate Day #1 Daily Profile	UINT16	0 to 19
3	RW	Alternate Day #2 Date[1)]	UINT32	Table 5-59 Date Format
5	RW	Alternate Day #2 Daily Profile	UINT16	0 to 19
6	RW	Alternate Day #3 Date[1)]	UINT32	Table 5-59 Date Format
8	RW	Alternate Day #3 Daily Profile	UINT16	0 to 19
9	RW	Alternate Day #4 Date[1)]	UINT32	Table 5-59 Date Format
11	RW	Alternate Day #4 Daily Profile	UINT16	0 to 19
12	RW	Alternate Day #5 Date[1)]	UINT32	Table 5-59 Date Format
14	RW	Alternate Day #5 Daily Profile	UINT16	0 to 19
15	RW	Alternate Day #6 Date[1)]	UINT32	Table 5-59 Date Format
17	RW	Alternate Day #6 Daily Profile	UINT16	0 to 19
18	RW	Alternate Day #7 Date[1)]	UINT32	Table 5-59 Date Format
19	RW	Alternate Day #7 Daily Profile	UINT16	0 to 19
21	RW	Alternate Day #8 Date[1)]	UINT32	Table 5-59 Date Format
22	RW	Alternate Day #8 Daily Profile	UINT16	0 to 19
24	RW	Alternate Day #9 Date[1)]	UINT32	Table 5-59 Date Format
25	RW	Alternate Day #9 Daily Profile	UINT16	0 to 19
27	RW	Alternate Day #10 Date[1)]	UINT32	Table 5-59 Date Format
29	RW	Alternate Day #10 Daily Profile	UINT16	0 to 19
…		…		Table 5-59 Date Format
…		…		0 to 19
240	RW	Alternate Day #81 Date[1)]	UINT32	Table 5-59 Date Format
162	RW	Alternate Day #81 Daily Profile	UINT16	0 to 19
243	RW	Alternate Day #82 Date[1)]	UINT32	Table 5-59 Date Format
245	RW	Alternate Day #82 Daily Profile	UINT16	0 to 19
246	RW	Alternate Day #83 Date[1)]	UINT32	Table 5-59 Date Format
248	RW	Alternate Day #83 Daily Profile	UINT16	0 to 19
249	RW	Alternate Day #84 Date[1)]	UINT32	Table 5-59 Date Format
251	RW	Alternate Day #84 Daily Profile	UINT16	0 to 19
252	RW	Alternate Day #85 Date[1)]	UINT32	Table 5-59 Date Format
254	RW	Alternate Day #85 Daily Profile	UINT16	0 to 19
255	RW	Alternate Day #86 Date	UINT32	Table 5-59 Date Format
256	RW	Alternate Day #86 Daily Profile	UINT16	0 to 19
258	RW	Alternate Day #87 Date[1)]	UINT32	Table 5-59 Date Format
260	RW	Alternate Day #87 Daily Profile	UINT16	0 to 19
261	RW	Alternate Day #88 Date[1)]	UINT32	Table 5-59 Date Format
263	RW	Alternate Day #88 Daily Profile	UINT16	0 to 19
264	RW	Alternate Day #89 Date[1)]	UINT32	Table 5-59 Date Format
266	RW	Alternate Day #89 Daily Profile	UINT16	0 to 19
267	RW	Alternate Day #90 Date[1)]	UINT32	Table 5-59 Date Format
269	RW	Alternate Day #90 Daily Profile	UINT16	0 to 19

Table 5-58 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 (0-37)	Month (1-12)	Day (1-31)

Table 5-59 Date Format

5.10.8 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 5-60 DO Control

5.10.9 Clear/Reset Control

Register	Property	Description	Format	Note
6400	WO	Manual WFR Log #1 Trigger	UINT16	Writing "0xFF00" to the register to execute the described action.
6401	WO	Manual WFR Log #2 Trigger	UINT16	
6402	WO	Clear DR #1 (High-Speed)	UINT16	
6403	WO	Clear DR #2 (High-Speed)	UINT16	
6404	WO	Clear DR #3 (High-Speed)	UINT16	
6405	WO	Clear DR #4 (High-Speed)	UINT16	
6406	WO	Clear DR #5 (Standard)	UINT16	
…	WO	…	UINT16	
6416	WO	Clear DR #15 (Standard)	UINT16	
6417	WO	Clear DR #16 (Standard)	UINT16	
6418	WO	Clear WFR Log #1	UINT16	
6419	WO	Clear WFR 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[1)]	UINT16	
6424	WO	Clear Max./Min. Log of This Month	UINT16	
6425	WO	Clear Peak Demand Log of This Month	UINT16	
6426	WO	Clear Counter #1 (DI1)	UINT16	
6427	WO	Clear Counter #2 (DI2)	UINT16	
…	WO	…	UINT16	
6430	WO	Clear Counter #5 (DI5)	UINT16	
6431	WO	Clear Counter #6 (DI6)	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[2)]	UINT16	Writing "0xFF00" to the register clears all of the above

Table 5-61 Clear/Reset Registers

Notes:

1) Writing "0XFF00" to the register clears all 3-Phase, Total Energy Measurement, TOU Energy and Interval Energy Measurements.

2) Writing "0XFF00" to the register clears all logs, including Data Recorder, Waveform Recorder, Energy Log, PQ Log, SOE Log, Max./Min. Log of This Month (Since Last Reset), Peak Demand of This Month (Since Last Reset), DI Counters, Energy Registers, Device Operating Time and TOU energy.

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, 2000 00:00:00 will be rejected.

Register		Property	Description	Format	Note
60000	9000	RW	High-order Byte: Year	UINT16	0-37 (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 0x 7FE8177F The corresponding time is 2000.01.01 00:00:00 to 2037.12.31 23:59:59 (GMT 0:00 Time Zone)

Table 5-62 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-2000	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	e.g. 1601030100 means the 100th iMeter 6 that was manufactured on January 3rd, 2016
60227	9827	RO	Reserved	UINT16	
60228	9828	RO	Reserved	UINT16	
60229	9829	RO	Feature Code	UINT16	B3B2B1B0: 0: RS485+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=5 (A), 1=1 (A)
60231	9831	RO	Voltage Input	UINT16	0=120 (V), 1=415 (V), 2=690 (V) 3=Reserved

Table 5-63 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	
60207	9807	0x36	6
60208-60219	9808-9819	0x20	<Null>

Table 5-64 ASCII Encoding of "iMeter 6"

Appendix A – Data Recorder Parameter

Key	Parameters	Scale/Unit	Key	Parameters	Scale/Unit
0	Uan	x100, V	1	Ubn	x100, V
2	Ucn	x100, V	3	Uln average	x100, V
4	Uab	x100, V	5	Ubc	x100, V
6	Uca	x100, V	7	Ull average	x100, V
8	Ia	x1000, A	9	Ib	x1000, A
10	Ic	x1000, A	11	I average	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	Uan THD	x100, %
42	Ubn THD	x100, %	43	Ucn THD	x100, %
44	Uan TOHD	x100, %	45	Ubn TOHD	x100, %
46	Ucn TOHD	x100, %	47	Uan TEHD	x100, %
48	Ubn TEHD	x100, %	49	Ucn 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	Uan 2nd Harmonic	x100, %
60	Ubn 2nd Harmonic	x100, %	61	Ucn 2nd Harmonic	x100, %
62	Uan 3rd Harmonic	x100, %	63	Ubn 3rd Harmonic	x100, %
64	Ucn 3rd Harmonic	x100, %	65	Uan 4th Harmonic	x100, %
66	Ubn 4th Harmonic	x100, %	67	Ucn 4th Harmonic	x100, %
68	Uan 5th Harmonic	x100, %	69	Ubn 5th Harmonic	x100, %
70	Ucn 5th Harmonic	x100, %	71	Uan 6th Harmonic	x100, %
72	Ubn 6th Harmonic	x100, %	73	Ucn 6th Harmonic	x100, %
74	Uan 7th Harmonic	x100, %	75	Ubn 7th Harmonic	x100, %
76	Ucn 7th Harmonic	x100, %	77	Uan 8th Harmonic	x100, %
78	Ubn 8th Harmonic	x100, %	79	Ucn 8th Harmonic	x100, %
80	Uan 9th Harmonic	x100, %	81	Ubn 9th Harmonic	x100, %
81	Ucn 9th Harmonic	x100, %	83	Uan 10th Harmonic	x100, %
84	Ubn 10th Harmonic	x100, %	85	Ucn 10th Harmonic	x100, %
86	Uan 11th Harmonic	x100, %	87	Ubn 11th Harmonic	x100, %
88	Ucn 11th Harmonic	x100, %	89	Uan 12th Harmonic	x100, %
90	Ubn 12th Harmonic	x100, %	91	Ucn 12th Harmonic	x100, %
92	Uan 13th Harmonic	x100, %	93	Ubn 13th Harmonic	x100, %
94	Ucn 13th Harmonic	x100, %	95	Uan 14th Harmonic	x100, %
96	Ubn 14th Harmonic	x100, %	97	Ucn 14th Harmonic	x100, %
98	Uan 15th Harmonic	x100, %	99	Ubn 15th Harmonic	x100, %
100	Ucn 15th Harmonic	x100, %	101	Uan 16th Harmonic	x100, %
102	Ubn 16th Harmonic	x100, %	103	Ucn 16th Harmonic	x100, %
104	Uan 17th Harmonic	x100, %	105	Ubn 17th Harmonic	x100, %
106	Ucn 17th Harmonic	x100, %	107	Uan 18th Harmonic	x100, %
108	Ubn 18th Harmonic	x100, %	109	Ucn 18th Harmonic	x100, %
110	Uan 19th Harmonic	x100, %	111	Ubn 19th Harmonic	x100, %
112	Ucn 19th Harmonic	x100, %	113	Uan 20th Harmonic	x100, %
114	Ubn 20th Harmonic	x100, %	115	Ucn 20th Harmonic	x100, %
116	Uan 21st Harmonic	x100, %	117	Ubn 21st Harmonic	x100, %
118	Ucn 21st Harmonic	x100, %	119	Uan 22nd Harmonic	x100, %
120	Ubn 22nd Harmonic	x100, %	121	Ucn 22nd Harmonic	x100, %
122	Uan 23rd Harmonic	x100, %	123	Ubn 23rd Harmonic	x100, %
124	Ucn 23rd Harmonic	x100, %	125	Uan 24th Harmonic	x100, %
126	Ubn 24th Harmonic	x100, %	127	Ucn 24th Harmonic	x100, %
128	Uan 25th Harmonic	x100, %	129	Ubn 25th Harmonic	x100, %
130	Ucn 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**	Uan Demand	x100, V
204	Ubn Demand	x100, V	**205**	Ucn Demand	x100, V
206	Uln avg. Demand	x100, V	**207**	Uab Demand	x100, V
208	Ubc Demand	x100, V	**209**	Uca Demand	x100, V
210	Ull avg. Demand	x100, V	**211**	Ia Demand	x1000, A
212	Ib Demand	x1000, A	**213**	Ic Demand	x1000, A
214	I avg. Demand	x1000, A	**215**	I4 Demand	x1000, A
216	kWa Demand	W	**217**	kWb Demand	W
218	kWc Demand	W	**219**	kW Total Demand	W
220	kvara Demand	var	**221**	kvarb Demand	var
222	kvarc Demand	var	**223**	kvar Total Demand	var
224	kVAa Demand	VA	**225**	kVAb Demand	VA
226	kVAc Demand	VA	**227**	kVA Total Demand	VA
228	PFa Demand	x1000	**229**	PFb Demand	x1000
230	PFc Demand	x1000	**231**	PF Total Demand	x1000
232	Freq. Demand	x100, Hz	**233**	U2 Unbalance Demand	x10, %
234	I2 Unbalance Demand	x10, %	**235**	Uan THD Demand	x100, %
236	Ubn THD Demand	x100, %	**237**	Ucn THD Demand	x100, %
238	Ia THD Demand	x100, %	**239**	Ib THD Demand	x100, %
240	Ic THD Demand	x100, %	**241**	Uan max per Demand Period	x100, V
242	Ubn max per Demand Period	x100, V	**243**	Ucn max per Demand Period	x100, V
244	Uln avg. max Per Demand Period	x100, V	**245**	Uab max per Demand Period	x100, V
246	Ubc max per Demand Period	x100, V	**247**	Uca max per Demand Period	x100, V
248	Ull avg. max per Demand Period	x100, V	**249**	Ia max per Demand Period	x1000, A
250	Ib max per Demand Period	x1000, A	**251**	Ic max per Demand Period	x1000, A
252	I avg. max Per Demand Period	x1000, A	**253**	I4 max per Demand Period	x1000, A
254	kWa max per Demand Period	W	**255**	kWb max per Demand Period	W
256	kWc max per Demand Period	W	**257**	kW Total max per Demand Period	W
258	kvara max per Demand Period	var	**259**	kvarb max per Demand Period	var
260	kvarc max per Demand Period	var	**261**	kvar Total max per Demand Period	var
262	kVAa max per Demand Period	VA	**263**	kVAb max per Demand Period	VA
264	kVAc max per Demand Period	VA	**265**	kVA Total max per Demand Period	VA
266	PFa max per Demand Period	x1000	**267**	PFb max per Demand Period	x1000
268	PFc max per Demand Period	x1000	**269**	PF Total max per Demand Period	x1000
270	Freq. max per Demand Period	x100, Hz	**271**	U Unbalance max Per Demand Period	x10, %
272	I Unbalance max Per Demand Period	x10, %	**273**	Uan THD max per Demand Period	x100, %
274	Ubn THD max per Demand Period	x100, %	**275**	Ucn THD max per Demand Period	x100, %
276	Ia THD max per Demand Period	x100, %	**277**	Ib THD max per Demand Period	x100, %
278	Ic THD max per Demand Period	x100, %	**279**	Uan min per Demand Period	x100, V
280	Ubn min per Demand Period	x100, V	**281**	Ucn min per Demand Period	x100, V
282	Uln avg. min Per Demand Period	x100, V	**283**	Uab min per Demand Period	x100, V
284	Ubc min per Demand Period	x100, V	**285**	Uca min per Demand Period	x100, V
286	Ull avg. min Per Demand Period	x100, V	**287**	Ia min per Demand Period	x1000, A
288	Ib min per Demand Period	x1000, A	**289**	Ic min per Demand Period	x1000, A
290	I avg. min per Demand Period	x1000, A	**291**	I4 min per Demand Period	x1000, A
292	kWa min per Demand Period	W	**293**	kWb min per Demand Period	W
294	kWc min per Demand Period	W	**295**	kW Total min per Demand Period	W
296	kvara min per Demand Period	var	**297**	kvarb min per Demand Period	var
298	kvarc min per Demand Period	var	**299**	kvar Total min per Demand Period	var
300	kVAa min per Demand Period	VA	**301**	kVAb min per Demand Period	VA
302	kVAc min per Demand Period	VA	**303**	kVA Total min per Demand Period	VA
304	PFa min per Demand Period	x1000	**305**	PFb min per Demand Period	x1000
306	PFc min per Demand Period	x1000	**307**	PF Total min per Demand Period	x1000
308	Freq. min Per Demand Period	x100, Hz	**309**	U Unbalance min per Demand Period	x10, %
310	I Unbalance per Demand Period	x10, %	**311**	Uan THD min per Demand Period	x100, %
312	Ubn THD min per Demand Period	x100, %	**313**	Ucn THD min per Demand Period	x100, %
314	Ia THD min per Demand Period	x100, %	**315**	Ib THD min per Demand Period	x100, %
316	Ic THD min per Demand Period	x100, %	**317**	dUan/dUab	x100, V
318	dUbn/dUbc	x100, V	**319**	dUcn/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 Demand	x10, %	**333**	I0 Unbalance Demand	x10, %
334	U0 Unbalance max Per Demand Period	x10, %	**335**	I0 Unbalance max Per Demand Period	x10, %
336	U0 Unbalance min Per Demand Period	x10, %	**337**	I0 Unbalance min Per Demand Period	x10, %
338	Uan/Uab Crest Factor	100	**339**	Ubn/Ubc Crest Factor	100
340	Ucn/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.

Appendix B – Data Recorder Default Settings

Parameter	DR 1 (HS)	DR 2 (HS)	DR 3 (HS)	DR 4 (HS)
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
Number of Parameters	0	0	0	0
Parameter 1~16	Null	Null	Null	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	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	kWh Import	Uab	Uan	Uan THD
Parameter 2	kWh Export	Ubc	Ubn	Ubn THD
Parameter 3	kWh Total	Uca	Ucn	Ucn THD
Parameter 4	kvarh Import	Ull avg	Uln avg	Ia THD
Parameter 5	kvarh Export	Ia	kWa	Ib THD
Parameter 6	kvarh Total	Ib	kWb	Ic THD
Parameter 7	Null	Ic	kWc	Null
Parameter 8	Null	I avg	kvara	Null
Parameter 9	Null	kW Total	kvarb	Null
Parameter 10	Null	kvar Total	kvarc	Null
Parameter 11	Null	kVA Total	kVAa	Null
Parameter 12	Null	PF Total	kVAb	Null
Parameter 13	Null	Freq	kVAc	Null
Parameter 14	Null	U2 Unbalance	PFa	Null
Parameter 15	Null	I2 Unbalance	PFb	Null
Parameter 16	Null	Null	PFc	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	15	16	6	15
Parameter 1	Uab Demand	Uan Demand	Uan THD Demand	Uab max per Demand Period
Parameter 2	Ubc Demand	Ubn Demand	Ubn THD Demand	Ubc max per Demand Period
Parameter 3	Uca Demand	Ucn Demand	Ucn THD Demand	Uca max per Demand Period
Parameter 4	Ull avg Demand	Uln avg Demand	Ia THD Demand	Ull avg max per Demand Period
Parameter 5	Ia Demand	kWa Demand	Ib THD Demand	Ia max per Demand Period
Parameter 6	Ib Demand	kWb Demand	Ic THD Demand	Ib max per Demand Period
Parameter 7	Ic Demand	kWc Demand	Null	Ic max per Demand Period
Parameter 8	I avg Demand	kvara Demand	Null	I avg max per Demand Period
Parameter 9	kW Total Demand	kvarb Demand	Null	kW Total max per Demand Period
Parameter 10	kvar Total Demand	kvarc Demand	Null	kvar Total max per Demand Period
Parameter 11	kVA Total Demand	kVAa Demand	Null	kVA Total max per Demand Period
Parameter 12	PF Total Demand	kVAb Demand	Null	PF Total max per Demand Period
Parameter 13	Freq Demand	kVAc Demand	Null	Freq max per Demand Period
Parameter 14	U2 Unbalance Demand	PFa Demand	Null	U2 Unbalance max per Demand Period
Parameter 15	I2 Unbalance Demand	PFb Demand	Null	I2 Unbalance max per Demand Period
Parameter 16	Null	PFc Demand	Null	Null
Parameter	**DR 13**	**DR 14**	**DR 15**	**DR 16**
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	900	900	900	900

Interval				
Recording Offset	0	0	0	0
No. of Parameters	16	12	15	16
Parameter 1	Uan max per Demand Period	Uan THD max per Demand Period	Uab min per Demand Period	Uan min per Demand Period
Parameter 2	Ubn max per Demand Period	Ubn THD max per Demand Period	Ubc min per Demand Period	Ubn min per Demand Period
Parameter 3	Ucn max per Demand Period	Ucn THD max per Demand Period	Uca min per Demand Period	Ucn min per Demand Period
Parameter 4	Uln avg max per Demand Period	Ia THD max per Demand Period	Ull avg min per Demand Period	Uln avg min per Demand Period
Parameter 5	kWa max per Demand Period	Ib THD max per Demand Period	Ia min per Demand Period	kWa min per Demand Period
Parameter 6	kWb max per Demand Period	Ic THD max per Demand Period	Ib min per Demand Period	kWb min per Demand Period
Parameter 7	kWc max per Demand Period	Uan THD min per Demand Period	Ic min per Demand Period	kWc min per Demand Period
Parameter 8	kvara max per Demand Period	Ubn THD min per Demand Period	I avg min per Demand Period	kvara min per Demand Period
Parameter 9	kvarb max per Demand Period	Ucn THD min per Demand Period	kW Total min per Demand Period	kvarb min per Demand Period
Parameter 10	kvarc max per Demand Period	Ia THD min per Demand Period	kvar Total min per Demand Period	kvarc min per Demand Period
Parameter 11	kVAa max per Demand Period	Ib THD min per Demand Period	kVA Total min per Demand Period	kVAa min per Demand Period
Parameter 12	kVAb max per Demand Period	Ic THD min per Demand Period	PF Total min per Demand Period	kVAb min per Demand Period
Parameter 13	kVAc max per Demand Period	Null	Freq min per Demand Period	kVAc min per Demand Period
Parameter 14	PFa max per Demand Period	Null	U2 Unbalance min per Demand Period	PFa min per Demand Period
Parameter 15	PFb max per Demand Period	Null	I2 Unbalance min per Demand Period	PFb min per Demand Period
Parameter 16	PFc max per Demand Period	Null	Null	PFc min per Demand Period

Appendix C – SOE Event Classification

Event Classification	Sub-Classification	Event Value Scale/Option	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 (x100)	Over Uln Setpoint Active
	2	Trigger Value (x100)	Over Ull Setpoint Active
	3	Trigger Value (x1000)	Over Current Setpoint Active
	4	Trigger Value (x1000)	Over I4 Setpoint Active
	5	Trigger Value (x100)	Over Freq. Deviation Setpoint Active
	6	Trigger Value	Over kW Total Setpoint Active
	7	Trigger Value	Over kvar Total Setpoint Active
	8	Trigger Value (x1000)	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 Demand Setpoint Active
	17	Trigger Value	Over kvar Total Demand Setpoint Active
	18	Trigger Value (x1000)	Over PF Total Demand Setpoint Active
	19	Trigger Value	Over kW Total Predicted Setpoint Active
	20	Trigger Value	Over kvar Total Predicted Setpoint Active
	21	Trigger Value (x1000)	Over PF Total Predicted Setpoint Active
	22	Trigger Value (x100)	Over Voltage THD Setpoint Active
	23	Trigger Value (x100)	Over Voltage TOHD Setpoint Active
	24	Trigger Value (x100)	Over Voltage TEHD Setpoint Active
	25	Trigger Value (x100)	Over Current THD Setpoint Active
	26	Trigger Value (x100)	Over Current TOHD Setpoint Active
	27	Trigger Value (x100)	Over Current TEHD Setpoint Active
	28	Trigger Value (x10)	Over U2 Unbalance Setpoint Active
	29	Trigger Value (x10)	Over I2 Unbalance Setpoint Active
	30	Trigger Value (x100)	Over Voltage OverDeviation Setpoint Active
	31	1	Over Voltage Phase Reversal Setpoint Active
	32	Trigger Value (x1000)	Over Ir Setpoint Active
	33	Trigger Value (x100)	Over U2 (Negative Sequence Voltage) Setpoint Active
	34	Trigger Value (x100)	Over U0 (Zero Sequence Voltage) Setpoint Active
	35	1	Over Current Phase Reversal Setpoint Active
	36~45	-	Reserved
	46	Return Value (x100)	Over Uln Setpoint Return
	47	Return Value (x100)	Over Ull Setpoint Return
	48	Return Value (x1000)	Over Current Setpoint Return
	49	Return Value (x1000)	Over I4 Setpoint Return
	50	Return Value (x100)	Over Freq. Deviation Setpoint Return
	51	Return Value	Over kW Total Setpoint Return
	52	Return Value	Over kvar Total Setpoint Return
	53	Return Value (x1000)	Over PF Total Setpoint Return
	54	0	DI1 Close Setpoint Return
	55	0	DI2 Close Setpoint Return
	56	0	DI3 Close Setpoint Return
	57	0	DI4 Close Setpoint Return
	58	0	DI5 Close Setpoint Return
	59	0	DI6 Close Setpoint Return
	60	Return Value	Over AI Setpoint Return
	61	Return Value	Over kW Total Demand Setpoint Return
	62	Return Value	Over kvar Total Demand Setpoint Return
	63	Return Value (x1000)	Over PF Total Demand Setpoint Return

	64	Return Value	Over kW Total Predicted Setpoint Return
	65	Return Value	Over kvar Total Predicted Setpoint Return
	66	Return Value (x1000)	Over PF Total Predicted Setpoint Return
	67	Return Value (x100)	Over Voltage THD Setpoint Return
	68	Return Value (x100)	Over Voltage TOHD Setpoint Return
	69	Return Value (x100)	Over Voltage TEHD Setpoint Return
	70	Return Value (x100)	Over Current THD Setpoint Return
	71	Return Value (x100)	Over Current TOHD Setpoint Return
	72	Return Value (x100)	Over Current TEHD Setpoint Return
	73	Return Value (x10)	Over Voltage Unbalance Setpoint Return
	74	Return Value (x10)	Over Current Unbalance Setpoint Return
	75	Return Value (x100)	Over Voltage OverDeviation Setpoint Return
	76	0	Over Voltage Phase Reversal Setpoint Return
	77	Return Value (x1000)	Over Ir Setpoint Return
	78	Return Value (x100)	Over U2 (Negative Sequence Voltage) Setpoint Return
	79	Return Value (x100)	Over U0 (Zero Sequence Voltage) Setpoint Return
	80	0	Over Current Phase Reversal Setpoint Return
	81~90	-	Reserved
	91	Trigger Value (x100)	Under Uln Setpoint Active
	92	Trigger Value (x100)	Under Ull Setpoint Active
	93	Trigger Value (x1000)	Under Current Setpoint Active
	94	Trigger Value (x1000)	Under I4 Setpoint Active
	95	Trigger Value (x100)	Under Freq. Deviation Setpoint Active
	96	Trigger Value	Under kW Total Setpoint Active
	97	Trigger Value	Under kvar Total Setpoint Active
	98	Trigger Value (x1000)	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 Demand Setpoint Active
	107	Trigger Value	Under kvar Total Demand Setpoint Active
	108	Trigger Value (x1000)	Under PF Total Demand Setpoint Active
	109	Trigger Value	Under kW Total Predicted Setpoint Active
	110	Trigger Value	Under kvar Total Predicted Setpoint Active
	111	Trigger Value (x1000)	Under PF Total Predicted Setpoint Active
	112	Trigger Value (x100)	Under Voltage THD Setpoint Active
	113	Trigger Value (x100)	Under Voltage TOHD Setpoint Active
	114	Trigger Value (x100)	Under Voltage TEHD Setpoint Active
	115	Trigger Value (x100)	Under Current THD Setpoint Active
	116	Trigger Value (x100)	Under Current TOHD Setpoint Active
	117	Trigger Value (x100)	Under Current TEHD Setpoint Active
	118	Trigger Value (x10)	Under U2 Unbalance Setpoint Active
	119	Trigger Value (x10)	Under I2 Unbalance Setpoint Active
	120	Trigger Value (x100)	Under Voltage OverDeviation Setpoint Active
	121	-	Reserved
	122	Trigger Value (x1000)	Under Ir Setpoint Active
	123	Trigger Value (x100)	Under U2 (Negative Sequence Voltage) Setpoint Active
	124	Trigger Value (x100)	Under U0 (Zero Sequence Voltage) Setpoint Active
	125~135	-	Reserved
	136	Return Value (x100)	Under Uln Setpoint Return
	137	Return Value (x100)	Under Ull Setpoint Return
	138	Return Value (x1000)	Under Current Setpoint Return
	139	Return Value (x1000)	Under I4 Setpoint Return
	140	Return Value (x100)	Under Freq. Deviation Setpoint Return
	141	Return Value	Under kW Total Setpoint Return
	142	Return Value	Under kvar Total Setpoint Return
	143	Return Value (x1000)	Under PF Total Setpoint Return
	144	1	DI1 Open Setpoint Return
	145	1	DI2 Open Setpoint Return
	146	1	DI3 Open Setpoint Return
	147	1	DI4 Open Setpoint Return
	148	1	DI5 Open Setpoint Return
	149	1	DI6 Open Setpoint Return
	150	Return Value	Under AI Setpoint Return
	151	Return Value	Under kW Total Demand Setpoint Return
	152	Return Value	Under kvar Total Demand Setpoint Return
	153	Return Value (x1000)	Under PF Total Demand Setpoint Return
	154	Return Value	Under kW Total Predicted Setpoint Return
	155	Return Value	Under kvar Total Predicted Setpoint Return
	156	Return Value (x1000)	Under PF Total Predicted Setpoint Return
	157	Return Value (x100)	Under Voltage THD Setpoint Return
	158	Return Value (x100)	Under Voltage TOHD Setpoint Return
	159	Return Value (x100)	Under Voltage TEHD Setpoint Return
	160	Return Value (x100)	Under Current THD Setpoint Return
	161	Return Value (x100)	Under Current TOHD Setpoint Return
	162	Return Value (x100)	Under Current TEHD Setpoint Return
	163	Return Value (x10)	Under U2 Unbalance Setpoint Return
	164	Return Value (x10)	Under I2 Unbalance Setpoint Return

	165	Return Value (x100)	Under Voltage OverDeviation Setpoint Return
	166	-	Reserved
	167	Return Value (x1000)	Under Ir Setpoint Return
	168	Return Value (x100)	Under U2 (Negative Sequence Voltage) Setpoint Return
	169	Return Value (x100)	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
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=1 to 3	Set Clock
	4	X=1 to 3	Setup Changes
	5	X=1 to 3	Clear DI Counter
	6	X=1 to 3	Clear SOE
	7	X=1 to 3	Clear PQ Log
	8	X=1 to 3	Clear Energy[1]
	9	X=1 to 3	Clear Data Recorder Log
	10	X=1 to 3	Clear Waveform Recorder Log
	11	X=1 to 3	Clear IER Log
	12	X=1 to 3	Clear Max./Min. Log of This Month (Since Last Reset)
	13	X=1 to 3	Clear Peak Demand of This Month (Since Last Reset)
	14	X=1 to 3	Clear Operation Time
	15	X=1 to 3	Clear PQ Counter
	16	X=1 to 3	Clear TOU Energy
	17	X=1 to 3	Preset Energy value
	18	X=1 to 3	Send Testing Email
	19	X=1 to 3	Factory Setup Changes
	20	X=1 to 3	Setup DI Pulse Counter
	21	X=1 to 3	Reset Normal Parameter to Default
	22	X=1 to 3	Reset Factory Parameter to Default
	23	X=1 to 3	Restore Factory Defaults
	24	X=1 to 3	Preset TOU Energy
	25	X=1 to 3	Clear All Data[2]
6=Other	1	0	WF1 Recorder Triggered via Communication
	2	0	WF2 Recorder Triggered via Communication
	3	Setpoint # X (X = 1 to 30)	WF1 Recorder Triggered by Setpoint # X
	4	Setpoint # X (X = 1 to 30)	WF2 Recorder Triggered by Setpoint # X
	5	0	WF1 Recorder Triggered by Dip/Swell
	6	0	WF2 Recorder Triggered by Dip/Swell
	7	0	WF1 Recorder Triggered by Transient
	8	0	WF2 Recorder Triggered by Transient
	9	Setpoint # X (X = 1 to 30)	Data Recorder Triggered by Setpoint # X
	10	Setpoint # X (X = 1 to 30)	High Speed Data Recorder Triggered by Setpoint # X
	11	0	Data Recorder Triggered by Dip/Swell
	12	0	High Speed Data Recorder Triggered by Dip/Swell
	13	0	Data Recorder Triggered by Transient
	14	0	High Speed Data Recorder 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

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), Peak Demand of This Month (Since Last Reset), DI Counters, Energy Registers, Device Operating Time and TOU energy.
3. The value of the Operation events 3~25 illustrates where the operations take place: 1= Communications, 2=

On-board Web Server, 3=Front Panel.

4. 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.
5. 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**

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	1-10,000
Overload	1.2xUn continuous, 2xUn for 10s
Burden	<0.5VA @ 240V
Frequency	45-65 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 (I1-I3)	1-6,000 (5A) or 1-30,000 (1A)
I4 Ratio	1-10,000
Overload	2xIn continuous, 20xIn for 1s
Burden	<0.25VA @ 5A
Power Supply (L+, N-)	
Standard	95-277V L-N/415V L-L AC, 45-65Hz, 95-300V DC, OVC III
Burden	6W/10VA
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
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	< 3000m
Pollution Degree	2
Measurement Category	CAT III
Mechanical Characteristics	
Enclosure	Aluminum Alloy
Panel Cutout	92x92 mm
Unit Dimensions	96x96x119.5 mm
Shipping Dimensions	TBD
IP Rating	52
Shipping Weight	TBD

Accuracy

Parameters	Accuracy	Resolution
Voltage	±0.1%	0.01V
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	0.1kvarh
PF	±0.2%	0.001
Frequency	±0.01 Hz	0.01Hz
Harmonics	IEC 61000-4-7 Class A	0.1%
K-Factor	IEC 61000-4-7 Class A	0.01
Phase Angles	±1°	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
Conducted Disturbances	EN 61000-4-6: 2014
Magnetic Fields	EN 61000-4-8: 2010
Voltage Dips and Interruptions	EN 61000-4-11:2004
Oscillatory waves	EN 61000-4-12: 2017
Radio Disturbances	CISPR 22:2006, Level B
Emission Tests	
Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment	EN 55011: 2009 + A1: 2010 (CISPR 11)
Limits and methods of measurement of radio disturbance characteristics of information technology equipment	EN 55022: 2010+AC: 2011 (CISPR 22)
Limits for harmonic current emissions for equipment with rated current ≤16 A	EN 61000-3-2: 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
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 20190422

Product Code	Description
iMeter 6 Advanced Power Quality Monitor	
Basic Function	
256 samples per cycle, Class 0.2S Compliant, 3-Phase Metering, Demands, Peak Demands, Max/Min, SOE Log, Individual Harmonics to 63rd, 1GB Log Memory, 16 Data Recorders, High-Speed Data Recording, WF Recording, Sag/Swell/Interruption and Transient 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	45Hz-65Hz
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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