iMeter D7
DIN-Rail Advanced Power Quality Analyzer

User Manual
Version: V0.9A

May 28, 2020

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

Standards Compliance

CE

DANGER

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

CAUTION

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

DANGER

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

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

Limited warranty

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

Table of Contents

Chapter 1 Introduction

This manual explains how to use the iMeter D7 DIN-Rail Advanced Power Quality Analyzer. Throughout the manual, the term “meter” generally refers to all models.

This chapter provides an overview of the iMeter D7 and summarizes many of its key features.

1.1 Overview

The iMeter D7 is CET’s Advanced DIN-Rail Mount PQ Analyzer designed for the compliance monitoring market as it offers un-surpassed functionality by combining Class 0.2S accuracy and advanced PQ features in a compact 145*124*77 housing with a high resolution, color IPS Dot-Matrix LCD display. The iMeter D7 complies with such standards as IEC 62053-22 Class 0.2S, IEC 61000-4-30 Ed.3 Class A, IEC-61000-4-15, IEC 61000-4-7, EN50160 as well as IEC 61850 for Substation Automation. Further, it offers a large logging capacity with 4GB of on-board memory, extensive I/O, multiple Time Sync. methods, 2x100BaseT Ethernet and 1xRS-485 port. In addition, it optionally provides 2xAI for measuring external transducer signal or 1xIresidual Input & 1xRTD for Leakage Current and Temperature measurements. These features likely make the iMeter D7 one of the most advanced DIN-Rail PQ Analyzer for an intelligent Power Quality Monitoring System.

Following is a list of typical applications for the iMeter D7:

- PQ monitoring at LV Utility Substations
- Data Centers, Semiconductor Fabs and Heavy Industries
- 7x24 Automated Manufacturing Facilities
- Mains and critical feeder monitoring
- Renewable Energy Applications
- Dips, Swells, Interruptions, Transients, Flickers and Harmonics monitoring
- IEC 61850 support for Substation Automation and Smart Grid
- Retrofit applications with optional Class 1 Split-Core Current Probes

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

1.2 Features

Basic Features

- IEC 62053-22 Class 0.2S kWh metering with Multi-Tariff TOU
- True RMS 1024 samples/cycle sampling
- 4GB on-board memory
- Industrial-grade, high-resolution IPS Color Dot-Matrix Display @ 320x240
- Time Sync. Via SNTP, IEEE 1588 (PTP), IRIG-B or GPS 1PPS output
- 40 Programmable Setpoints
- Dual 1000BaseT Ethernet and one RS485 ports

Power Quality Features

- IEC 61000-4-30 Ed. 3 Class A Certified Compliant
- IEC61000-4-7, IEC 61000-4-15 and EN50160 Reporting
- 2kHz to 150kHz Conducted Emission Measurements
- Dips, Swells, Interruptions, Transients, Rapid Voltage Change, Inrush Current, Mains Signalling Voltage and Flicker monitoring.
- Real-time Waveform Capture (WFC), Waveform Recording (WFR) & Disturbance Waveform Recording (DWR)
- Disturbance Direction Indicator
- Statistical Reporting and ½ cycle RMS Recording
- Fault Capture up to 2,000V peak to peak (400VLN Input)
- Waveform recording in COMTRADE file format

Front Panel Display and Web Interface

- True RMS Real-time, Harmonics, Power and Energy measurements
- Phasor Diagram
- Demands and Multi-Tariff TOU
- Max. & Min. Logs
- Sequence & Unbalance
- Real-time WFC of 3Φ U & I @ 128 samples/cycle x 4 cycles
- Event Waveforms and ITIC/SEMI F47 Curves
- Harmonics & Interharmonics Histogram and Table
- Device Logs, SOE Logs, PQ Counters and I/O Status
- Device Configurations and Diagnostics

Power Quality Metering

PQ Parameters as per IEC 61000-4-30 Ed.3

- Power Frequency
- Magnitude of the Supply Voltage
- Flicker
- Supply Voltage Dips/Swells
- Voltage Interruptions
- Transient Voltages
- Supply Voltage Unbalance
- Voltage Harmonics and Interharmonics
- Mains Signalling Voltage on the Supply Voltage
- Rapid Voltage Changes
- Measurement of Underdeviation and Overdeviation parameters
- Magnitude of Current
- Current Harmonics and Interharmonics
- Current Unbalance
- 2kHz to 150kHz Conducted Emission measurements

Harmonic and Interharmonics measurements

- K-Factor for Current, Crest Factor for Current and Voltage
- U and I THD, TOHD, TEHD, TIHD, TOIHD, TEIHD and TH (RMS)
- U and I Individual Harmonics (%HD and RMS) from 2nd to 63rd
- U and I Individual Interharmonics (%IHD and RMS) from 1st to 63rd
- Total Harmonic P, Q, S and PF
- Harmonic P, Q, S and PF from 2nd to 63rd in RMS
- Fundamental U, I, P, Q, S, Phase Angle and Displacement PF
- Harmonic Phase Angle from 2nd to 63rd
- U and I DC Components
- Fundamental kWh, kvarh Import/Export/Net/Total
- Total Harmonic kWh, kvarh Import/Export/Net/Total
- Total Harmonic kWh, kvarh Import/Export from 2nd to 63rd

[#] %HD and %IHD can be configured as % of Fundamental, % of U/I nominal or % of RMS

Conducted Emissions in 2-150kHz range

- Real-Time amplitudes (150/180-Cycle) and the Max./Min./Average/CP95 values (in 1-minute interval) for a total of 106 frequency segments for the 2-90kHz and 9-150kHz range are available via the Web Interface
- Display of Daily Heat Map for the Max./Min./Avg. and CP95 values on the Web Interface

Sequence and Unbalances

- Zero, Positive and Negative Sequence Components
- U and I Unbalance based on Zero and Negative Sequence Components

Dips/Swells/Interruptions and Transients Recording

- Dips, Swells and Interruptions detection @ 10ms (½ cycle at 50Hz)
- Transients capture as short as 40us at 512 samples @ 50Hz for sub-cycle disturbances such as capacitor switching and resonance phenomena
- Trigger for DO, WF Recording, Disturbance Waveform Recording, RMS Recording and Alarm Email.
- Display of Event WFR and DWR on the Front Panel and Web Interface
- Display of ITIC or SEMI F47 plot on the Web Interface

Rapid Voltage Changes

- Detection of a quick transition in RMS voltage between two steady-states

Inrush Current Monitoring

- Monitoring of the ½ cycle RMS Current and capturing of the Current waveforms associated with events such as motor starting and transformer being energized

Disturbance Direction Indicator

- Determine if a Dip Event is located upstream or downstream
- Pinpoint if the cause of the event is external or internal

PQ Event Counters

- Dip, Swell, Interruption, Transient, Rapid Voltage Change, Inrush Current, Mains Signalling Voltages and Total PQ Event Counters

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

- Real-Time WFC @ 128 samples/cycle x 4 cycles via Front Panel and Web Interface
- WFR with max. 128 entries
- Simultaneous capture of 3-phase Voltage and Current inputs
- (Range of Cycles) x Samples/Cycles with programmable pre-fault and post-fault cycles between 2-6 cycles included (20-250) x1024, (20-500) x512, (20-1000) x256, (20-2000) x128
- Scheduled WFR with max. repetition of 10,000 times and programmable schedule from 1 to 960 hours
- COMTRADE file format, downloadable from the on-board Web Server or FTP Server

Disturbance Waveform Recorder

- 128 entries
- Simultaneous recording of all Voltage (U1 – U4) and Current (I1 – I4)
  - Initial Fault: 35 cycles @ 512 samples/cycle
  - Extended Fault: Up to 150 cycles @ 16 samples/cycle
  - Steady State: Up to 360s of 1-cycle absolute peak values recording
  - Post Fault: 15 cycles @ 512 samples/cycle

RMS Recorder (RMSR)

- 128 entries
- 8 parameters max., selectable U, I, P, Q, S, PF, Freq. Freq. Deviation.
- Recording Interval from 0.5 to 60 cycles
- Recording Depth @ 7200 samples per parameter
- Configurable pre-fault samples from 100 to 500
- 72 seconds of ½ cycle RMS recording @ 50Hz or 60 seconds @ 60Hz

Metering

Basic Measurements (1-second update)

- 3-phase U, I, Ir, P, Q, S, and PF as well as U4 and I4, Frequency and Ir
- kWh, kvarh Import/Export/Net/Total and kVAh Total

High-speed Measurements

- 3-phase U, I, P, Q, S, and PF as well as U4 and I4 @ ½ cycle
- Frequency @ 5 cycles

Demands

- Present and Predicted Demand for 3-phase U, I, P, Q, S, PF as well as U4, I4, Frequency
- Present Demand of 4-phase U & I THD/TOHD/TEHD, 4-phase Current K-factor, U2/U0 & I2/I0 Unbalance, Over & Under Deviation of Voltage and Frequency, 4-phase Fundamental Current
- Peak Demands for This Month and Last Month (or Before Last Reset and Since Last Reset)
- Max/Min values per Demand Interval
- Demand Synchronization with DI

Multi-Tariff TOU capability

- Two independent sets of TOU Schedules, each supporting
  - Up to 12 Seasons
  - 90 Holidays or Alternate Days and 3 Weekdays
  - 20 Daily Profiles, each with 12 Periods at 15min interval
  - 8 Tariffs, each providing the following information:
    - kWh/kvarh Import/Export and kVAh
    - P & Q Import/Export Peak Demands
    - Register rollover at 100,000,000,000.000 kXh
- Switching between two TOU schedules manually or according to pre-programmed time
- 12 Historical Logs for Energy and Max. Demand

Data and Event Recorders

Non-volatile Log Memory

- 4GB on-board log memory

Interval Energy Recorder (IER) and Accumulative Energy Recorder (AER)

- Both IER Log and AER Log support the recording of Total RMS kWh, kvarh Import/Export/Total/Net and kVAh, Total Fundamental and Total Harmonic kWh, kvarh Import/Export
- Recording interval from 1 minute to 65535 minutes
- Max. Recording Depth @ 65535 records
- Support FIFO and Stop-When-Full mode

Statistical Data Recording (SDR) Log

- 8 SDR Logs of max. 64 parameters each
- Recording of the Max, Min, Avg. and CP95 values for real-time measurements including U, I, P, Q, S, PF, Freq., Harmonics, Deviations and Unbalances
- Recording interval from 1 minute to 60 minutes
- 90 days @ 3-minute, 300 days @ 10-minute, 450-day @15-minute
- Downloadable via Free DiagSys software
- Support FIFO or Stop-When-Full mode

Max/Min Recorder (MMR) Log

- 4 Max/Min Recorders of 20 parameters each
- RMS/Fundamental/Harmonic/Interharmonic measurements, Demands, Deviation, Unbalances and Flicker
- Two transfer modes:
  - Manual: Max/Min Since Last Reset/Before Last Reset
  - Auto: Max/Min of This Month/Last Month

SOE Log

- 1024 FIFO events time-stamped to ±1ms resolution
- Setpoint events, I/O operations, Dips, Swells, Interruptions, Transient, Rapid Voltage Changes, Inrush Current, Mains Signalling Voltages, etc.
- Record the characteristic data of the Setpoints event as well as Waveform, ITIC and SEMI F47 Curve for PQ events

Device Log

- 1024 FIFO entries time-stamped to ±1ms resolution
- Power On/Off Records, Setup changes, Time Sync., Device Operations and Self-diagnostics

Setpoints

PQ Setpoints

- Transients, Dips, Swells, Interruptions
- Rapid Voltage Changes, Inrush Current
- Trigger DO, SOE Log, WFR or DWR or RMSR and Alarm Email

Control Setpoints

- 40 Control Setpoints can be configured as standard or high-speed setpoints
- Extensive monitoring sources including U, I, P, Q, S, Demand, Harmonics, Unbalances, Deviations, Flickers, Phase Reversal/Loss, Ir and AI, etc.
- Configurable thresholds and time delays
- Trigger DO, SOE Log, WFR or DWR or RMSR and Alarm Email

Digital Input Setpoints

- Provides control output actions in response to changes in Digital Input status
- Trigger DO, SOE Log, WFR or DWR or RMSR and Alarm Email

Inputs and Outputs

Digital Inputs

- Standard 4 channels, volts free dry contact, 24VDC Internal Excitation
- 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 and Tariff Switching based on DI Status

Digital Outputs

- Standard 2 channels Form A and 1 channel Form C Mechanical Relays for general purpose control or alarming
- Optional 3 SS Relays for Energy pulsing applications

Analog Inputs (Optional)

- Optional 2xAI, 0/4-20mA DC input with programmable zero and full scales that can be used to measure external transducer signal
- Optional 1xIresidual Input for Leakage Current & 1xRTD for Temperature measurements (Residual Current Transducer and PT100 Sensor are not included)

Communications

Ethernet Ports (P1, P2)

- Dual 10/100BaseT Ethernet Ports with RJ45 connector and built-in switch
- Protocols supported: Modbus TCP, HTTPS, SNTP, SMTP, FTP and IEC61850
- Built-in password protected Web Server with multiple user accounts with pre-defined roles for easy data viewing, setup configuration and firmware upgrade
- Simultaneous client connections for 8 x Modbus TCP and 4 x IEC61580

RS-485

- One Optically isolated RS-485 port with baud rate from 1.2 to 38.4 kbps
- Support Modbus RTU and Ethernet Gateway

4G (optional)

- One optional 4G connection with the following Frequency Bands supported:
    - GSM: EGSM 900MHz/DCS 1800MHz
    - CDMA 2000/EVDO: BC0
    - WCDMA: B1/B8
    - TD-SCDMA: TD-SCDNA 1.9G/TD-SCDMA 2G
    - LTE-FDD: LTE-FDD B1/B3/B8
    - LTE-TDD: TDD B38/B39/B40/B41

Time Synchronization

- Battery-backed real-time clock @ 6ppm (≤ 0.5s/day)
- Time Sync. via Modbus RTU protocol, SNTP, GPS 1PPS, IRIG-B or IEEE1588 (PTP)

System Integration

PecStar iEMS

- The iMeter D7 is supported by CET's PecStar iEMS.
- In addition, the iMeter D7 can be easily integrated into other 3rd party systems because of its support of multiple communications ports as well as different industry standard protocols such as Modbus and IEC 61850.

Diagsys

- Display of Real-Time Measurements, PQ Events, Waveforms and Statiscal Trend Charts.
- Export of IER, AER, SDR, MMR Logs as well as EN50160 Reports
- Generation and export of self-defined PQ Analysis Reports

3rd Party System Integration

- Easy integration into Substation Automation or Utility SCADA systems via Modbus RTU, Modbus TCP or IEC61850
- The on-board, password protected Web Server provides user-friendly access to its data and supports the configuration for most Setup parameters via a web browser without the use of proprietary software
- The on-board, password protected FTP Server allows logged data in CSV/Excel and waveform records in COMTRADE format to be downloaded without any special software. The downloaded files can be subsequently viewed using software that supports the industry standard COMTRADE file formats

1.3 iMeter D7' application in Power and Energy Management and Analyzer Systems

The iMeter D7 can be used to monitor 3P4W (WYE) or 3P3W (Delta) connected power system. Modbus communications allow real-time data, events, DI status, DR Logs, WFR Logs and other information to be transmitted to an Integrated Energy Management System such as PecStar® iEMS.

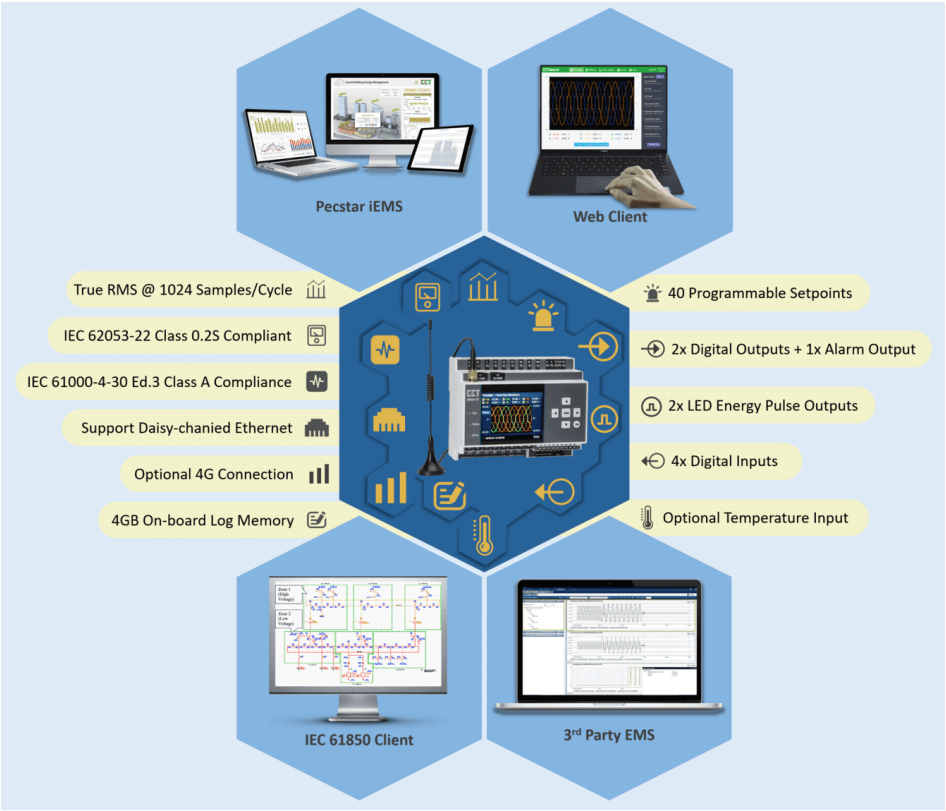


Figure 1-1 Typical Application

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 D7 should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

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

2.1 Appearance

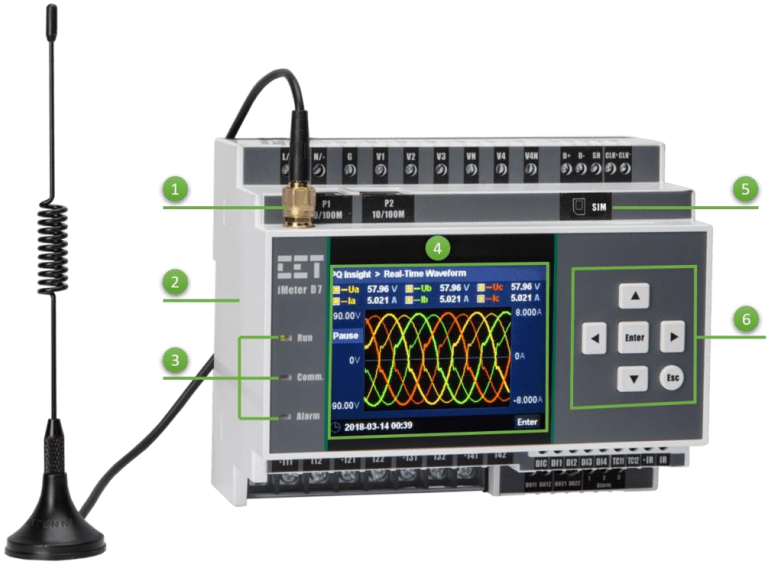


Figure 2-1 Appearance

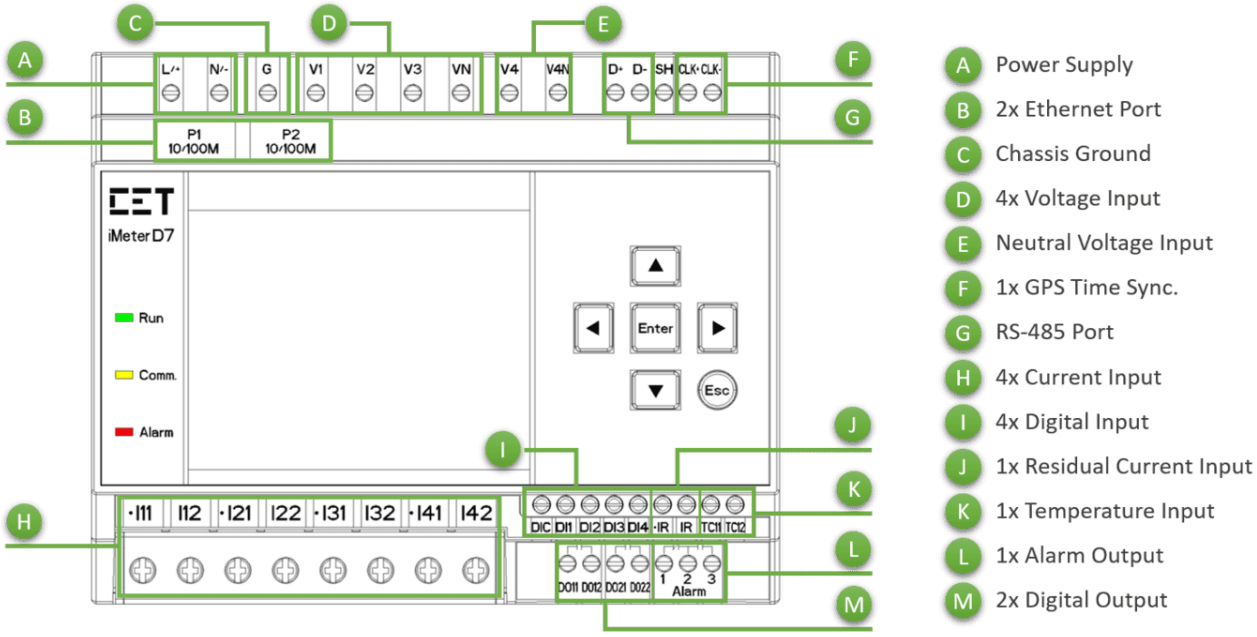


Figure 2-2 Terminals Diagram

2.2 Unit Dimensions

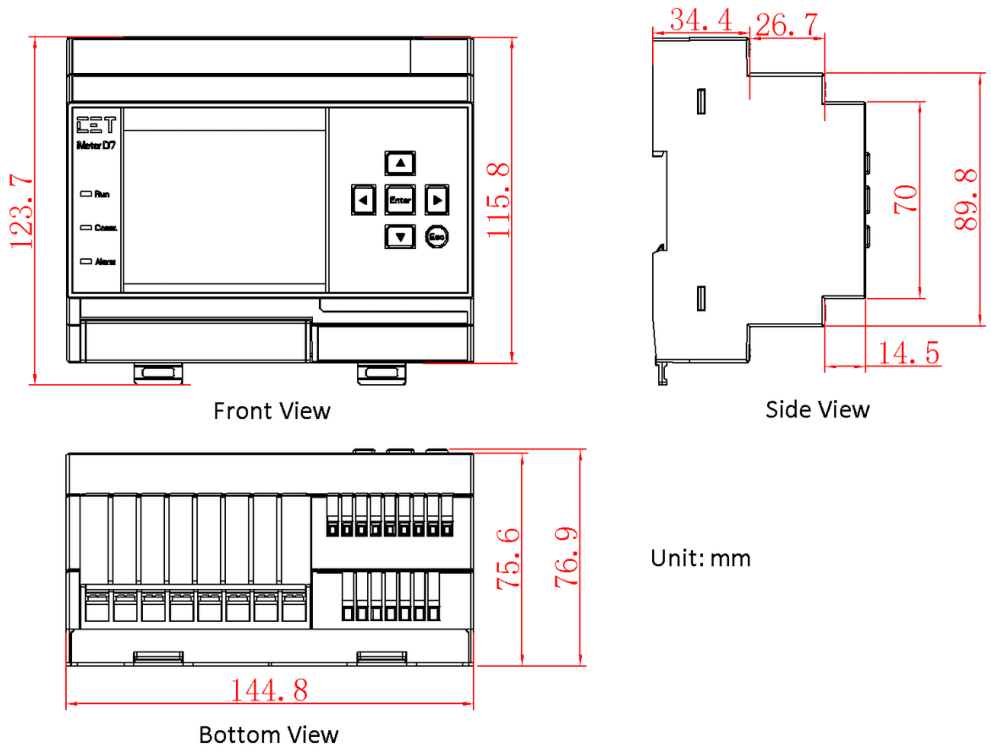
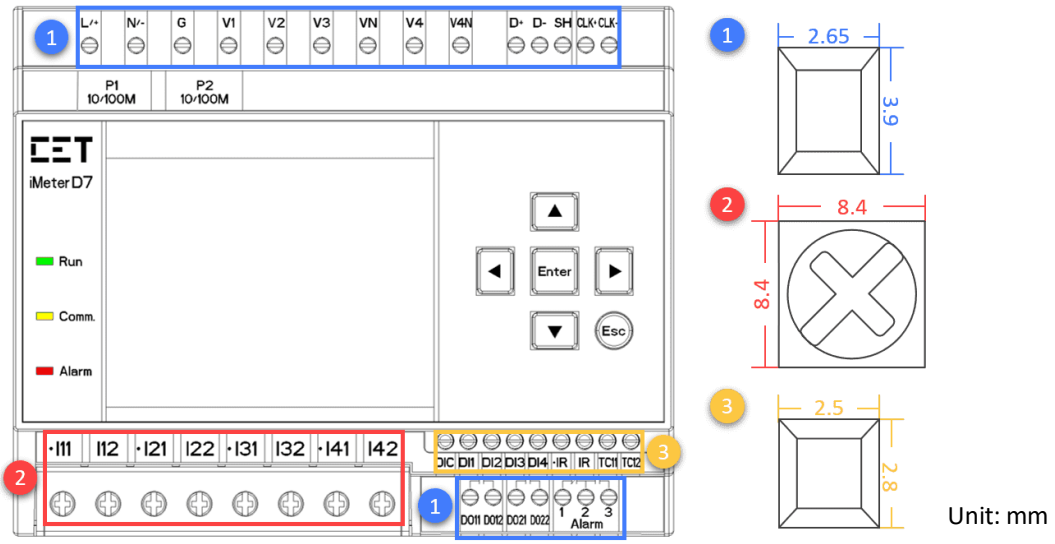


Figure 2-3 Dimensions

2.3 Terminal Dimensions



No.	Terminal	Terminal Dimensions	Wire Size	Max. Torque
1	Power Supply Chassis Ground Voltage Input RS-485 GPS Input DO/Alarm Output	2.65mm × 3.9mm	1.5 mm^2	5 kgf.cm/M3 (4.3 lb-in)
2	Current Input	8.4mm × 8.4mm	1 mm^2 -2.5 mm^2	18kgf.cm/M4 (15.6 lb-in)
3	DI IR TC	2.5mm × 2.8mm	1.5 mm^2	5 kgf.cm/M3 (4.3 lb-in)

Figure 2-4 Terminal Dimensions

2.4 SCCP Dimensions

- **PMC-SCCP-50A-500mV-B-A-B (unit: mm)**

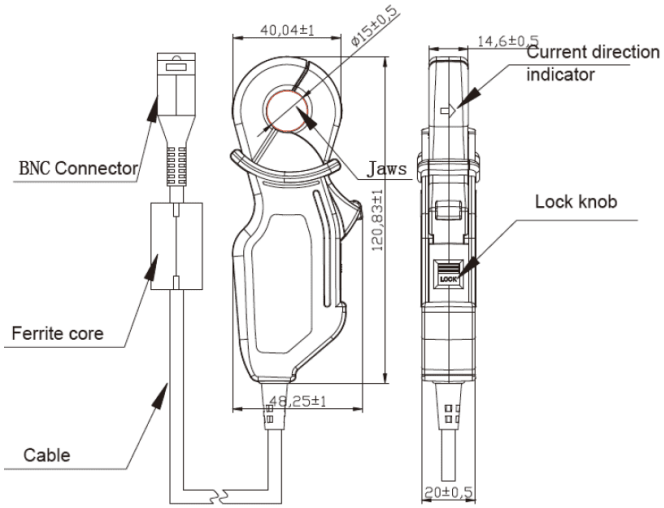


Figure 2-5 PMC-SCCP-50A-500mV-B-A-B Dimensions

- **PMC-SCCP-200A-200mV-B-B-B (unit: mm)**

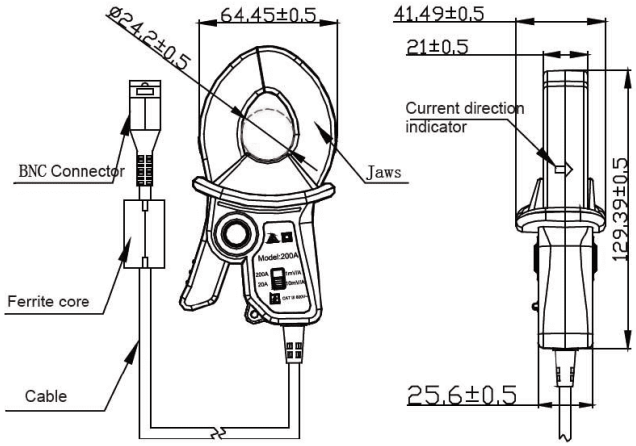


Figure 2-6 PMC-SCCP-200A-200mV-B-B-B Dimensions

- **PMC-SCCP-500A-500mV-B-B-B (unit: mm)**

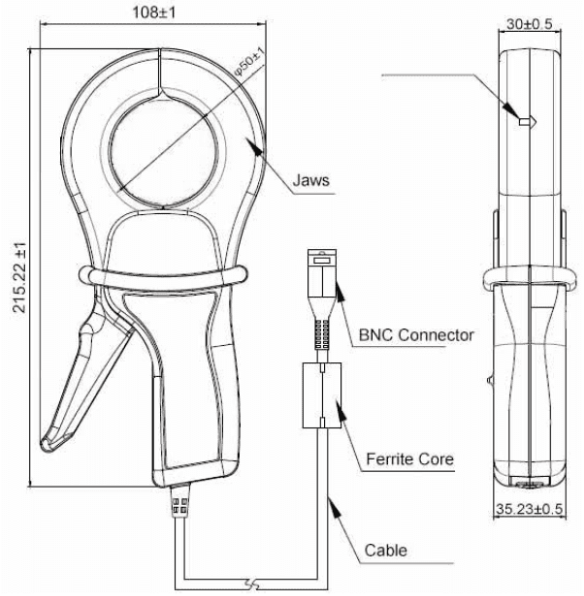


Figure 2-7 PMC-SCCP-500A-500mV-B-B-B Dimensions

- **PMC-SCCP-5kA-500mV-B-C-C-100**

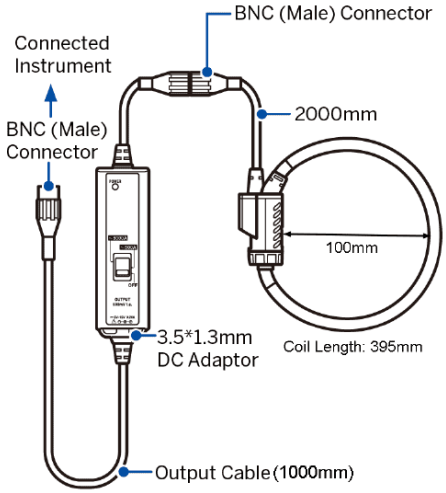


Figure 2-8 PMC-SCCP-5kA-500mV-B-C-C-100 Dimensions

- **PMC-SCCP-5kA-500mV-B-C-C-150**

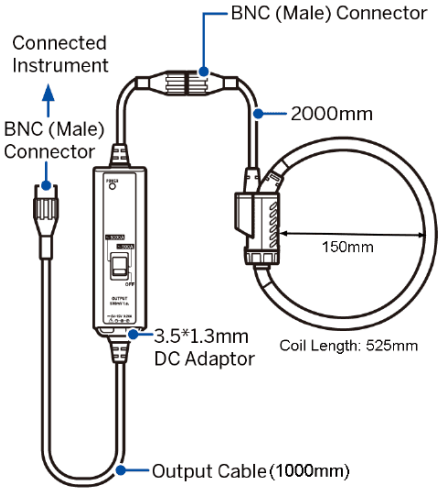


Figure 2-9 PMC-SCCP-5kA-500mV-B-C-C-150 Dimensions

- **PMC-SCCP-5kA-500mV-B-C-C-254**

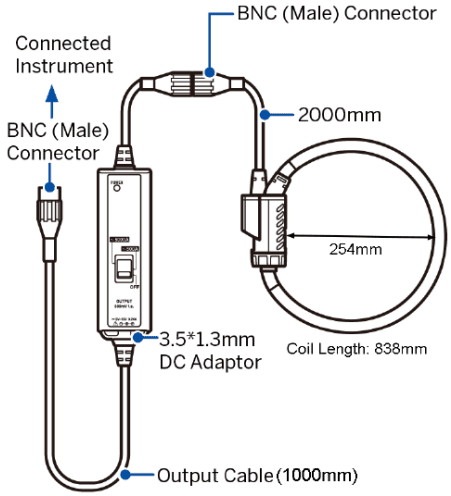


Figure 2-10 PMC-SCCP-5kA-500mV-B-C-C-254 Dimensions

- **PMC-SCCP-5kA-500mV-B-C-C-371**

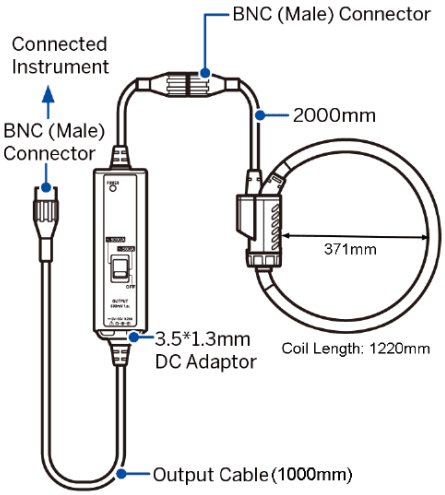


Figure 2-11 PMC-SCCP-5kA-500mV-B-C-C-371 Dimensions

2.5 4G Installation

Install the 4G antennas and position it at proper location. Insert the Micro SIM card into the slot with the direction shown in the follow figure.

Figure 2-12 SIM Card Installation

2.6 Mounting

The iMeter D7 should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise sources.

Installation steps:

- Pre-drill the mounting holes for the DIN rail and ensure it is already in place before installation.
- Move the installation clips at the back of the iMeter D7 downward to the “unlock” position.
- Align the top of the mounting channel at the back of the iMeter D7 at an angle against the top of the DIN rail as shown in figure below.
- Rotate the bottom of the iMeter D7 towards the back while applying a slight pressure to ensure that the device is completely and securely fixed on to the DIN rail.
- Push the installation clips upward to the “lock” position to secure the iMeter D7 on to the DIN rail.

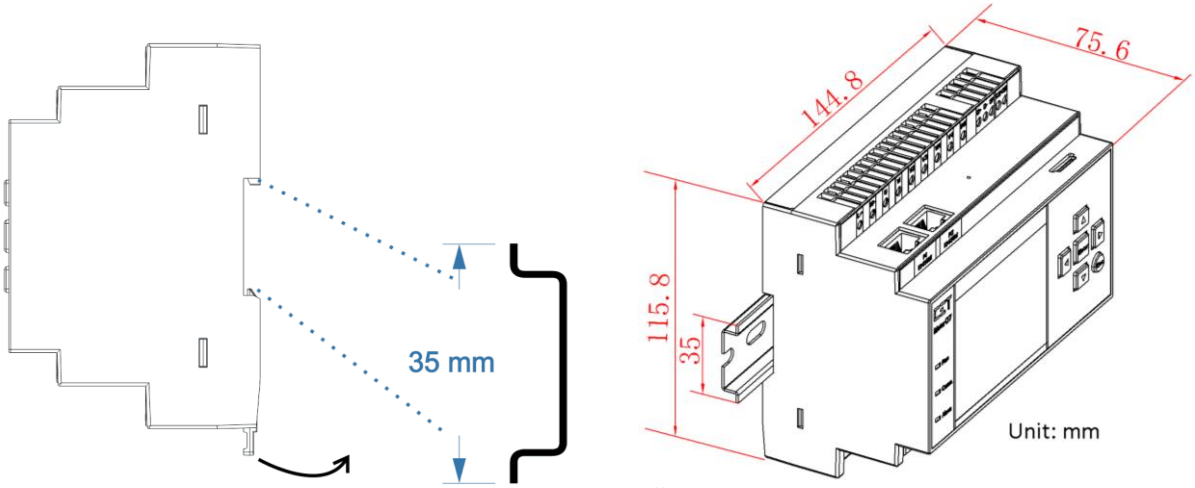


Figure 2-13 Installation

2.7 Wiring Connections

iMeter D7 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 4CTs
- 3-Phase 4-Wire Wye with 3PTs and 4CTs
- 3-Phase 3-wire Grounded Wye with no PTs & 3CTs
- 3-Phase 3-wire Grounded Wye with 3PTs and 3CTs
- 3-Phase 3-wire Direct Delta Direct Connection with 3CTs
- 3-Phase 3-wire Open Delta with 2PTs and 3CTs
- 3-Phase 3-wire Open Delta with 2PTs and 2CTs

Caution

Under no circumstances should the PT secondary be shorted.

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

2.7.1 3-Phase 4-Wire Wye Direct Connection with 4CTs

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

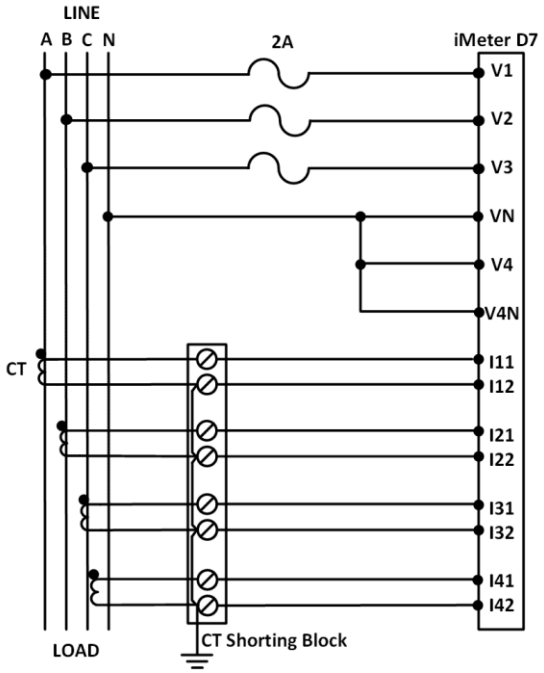


Figure 2-14 3-Phase 4-Wire Wye Direct Connection with 4CTs

2.7.2 3-Phase 4-Wire Wye with 3PTs & 4CTs

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

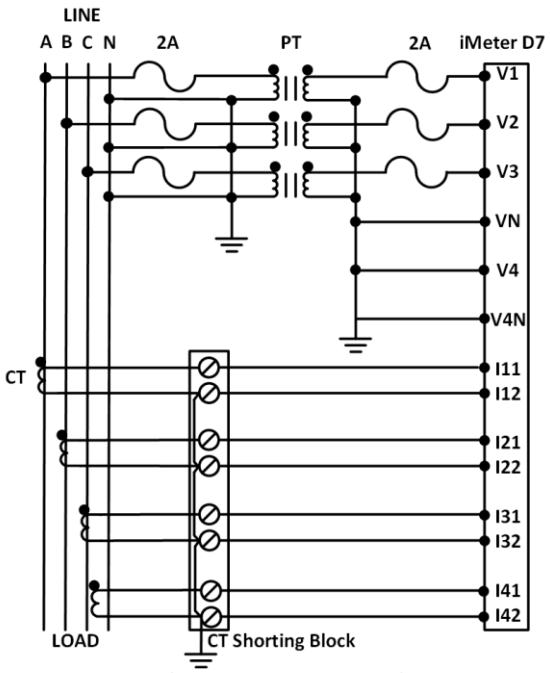


Figure 2-15 3-Phase 4-Wire Wye with 3PTs & 4CTs

2.7.3 3-Phase 3-Wire Grounded Wye with no PTs & 3CTs

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

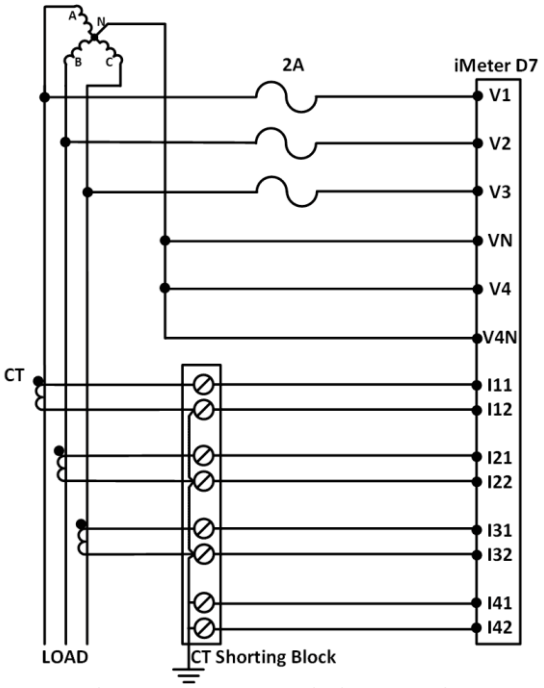


Figure 2-16 3-Phase 3-Wire Grounded Wye with no PTs & 3CTs

2.7.4 3-Phase 3-Wire Grounded Wye with 3PTs & 3CTs

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

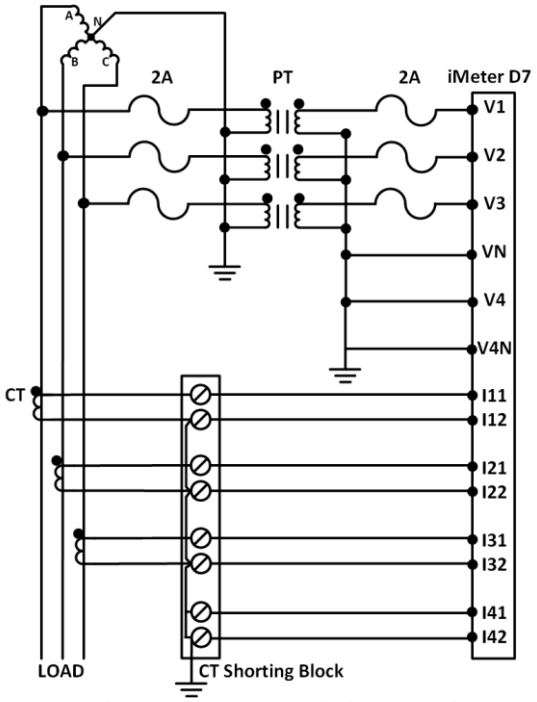


Figure 2-17 3-Phase 3-Wire Grounded Wye with 3PTs & 3CTs

2.7.5 3-Phase 3-Wire Direct Delta Connection with 3CTs

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

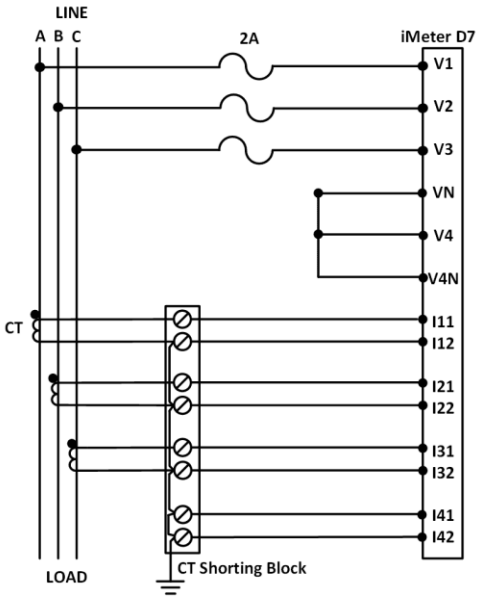


Figure 2-18 3-Phase 3-Wire Direct Delta Connection with 3CTs

2.7.6 3-Phase 3-Wire Open Delta with 2PTs & 3CTs

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

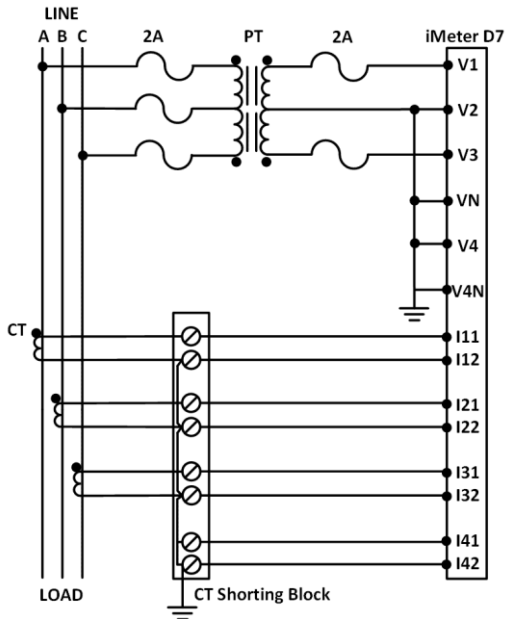


Figure 2-19 3-Phase 3-Wire Open Delta with 2PTs & 3CTs

2.7.7 3-Phase 3-Wire Open Delta with 2PTs and 2CTs

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

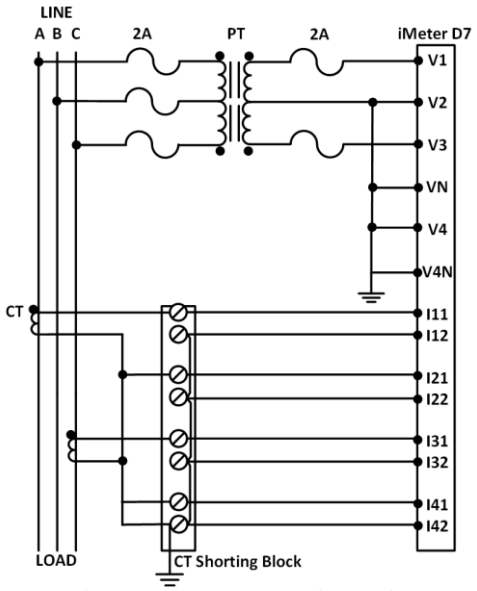


Figure 2-20 3-Phase 3-Wire Open Delta with 2PTs and 2CTs

2.8 Communications Wiring

2.8.1 Ethernet Port (10/100BaseT)

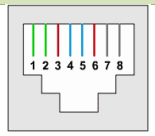
RJ45 Connector	Pin	Meaning
	1	Transmit Data+
	2	Transmit Data-
	3	Receive Data+
	4,5,7,8,	NC
	6	Receive Data-

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

The iMeter D7 supports two kinds of Ethernet connections, which are **Normal Model** and **Switch Mode**. The topologies are depicted as below.

2.8.1.1 Normal Mode

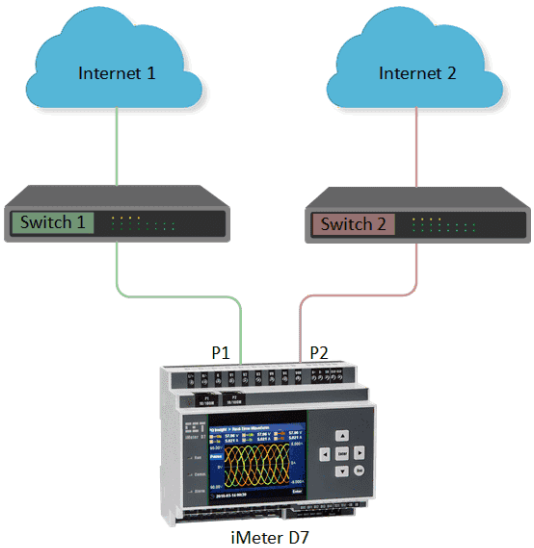


Figure 2-21 Normal Mode Connection

2.8.1.2 Switch Mode

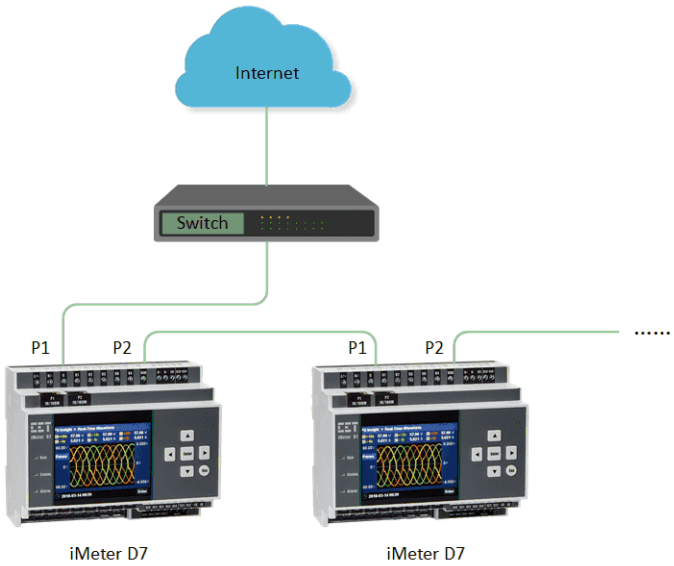


Figure 2-22 Switch Mode Connection

2.8.2 RS485 Port

The iMeter D7 provides up to two RS485 ports and supports the Modbus RTU protocol. Up to 32 devices can be connected on an RS485 bus. The overall length of the RS485 cable connecting all devices should not exceed 1200m.

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

The following figure illustrates the RS485 communication connections on the iMeter D7:

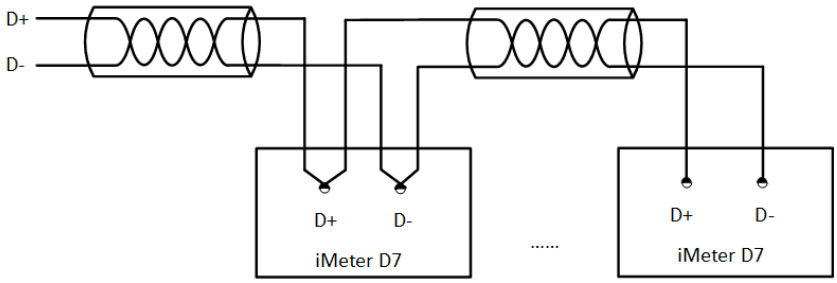


Figure 2-23 RS485 Communication Connections

2.9 Chassis Ground Wiring

Connect the G terminal to earth ground.

Figure 2-24 Chassis Ground Connection

2.10 Digital Input Wiring

The following figure illustrates the Digital Input connections on the iMeter D7:

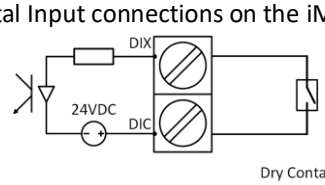


Figure 2-25 DI Connections

2.11 GPS 1PPS Input wiring

The iMeter D7 can be used for time synchronization with a GPS 1PPS output. The following figure illustrates the wiring connections:

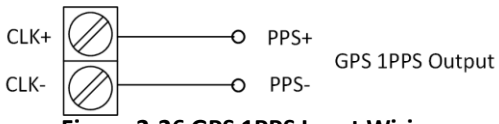


Figure 2-26 GPS 1PPS Input Wiring

2.12 Digital Output Wiring

The following figure illustrates the Digital Output connections on the iMeter D7:

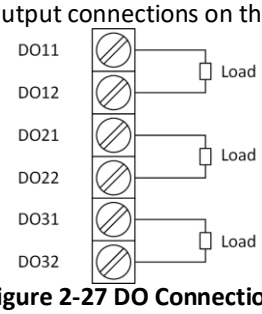


Figure 2-27 DO Connections

2.13 Residual Current (Ir) Wiring

The following figure illustrates the Residual Current connections on the iMeter D7

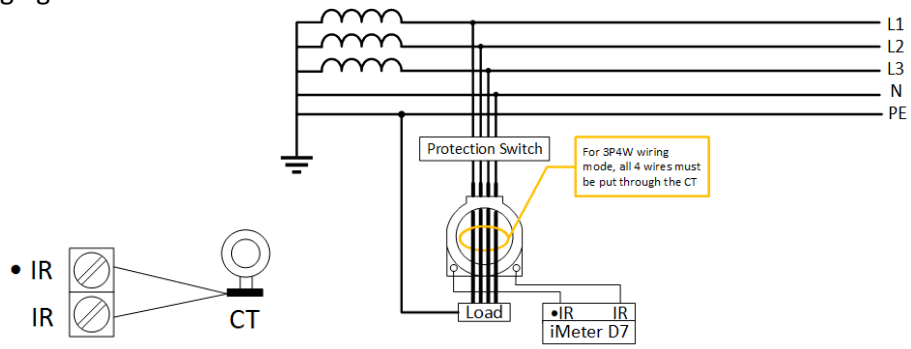


Figure 2-28 Residual Current Connections

Note:

1) The Residual Current terminals (either •IR and IR) should be left open and should not be connected to ground if unused. Otherwise, doing so would damage the device.

2.14 RTD Input Wiring

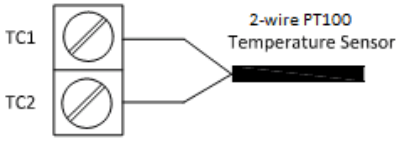


Figure 2-29 RTD Input Connections

2.15 Pulse Output Wiring

The following figure illustrates the Pulse Output connections on the iMeter D7 when the **EO Mode** register is programmed for Energy Pulsing:

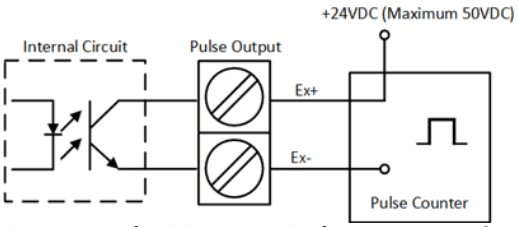


Figure 2-30 Pulse Output (Solid State Relay) Connections for Energy Pulsing

2.16 Analog Input Wiring

The following figure illustrates the Analog Input connections on the iMeter D7:

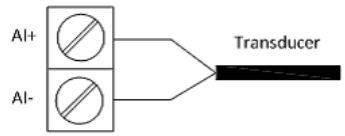


Figure 2-31 Analog Input Wiring

2.17 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.

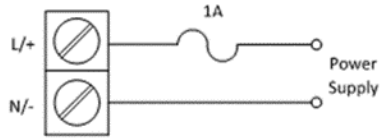


Figure 2-32 Power Supply Connections

Chapter 3 User Interface

3.1 Front Panel Interface

The following screenshot shows the Real-Time Waveform Capture display on the iMeter D7, which is equipped with an Industrial-grade, high-resolution IPS Color Dot-Matrix Display @ 320x240. There are three LED indicators which are used for **System status**, **Communication activities** and **Alarm status**. The iMeter D7 also provides six buttons, <▲>, <▼>, <◀>, <▶>, <**Enter**>, <**Esc**> for data display and setup configuration. The **Network Type** and **Signal Strength** will display at the bottom of the LCD screen for 4G models.

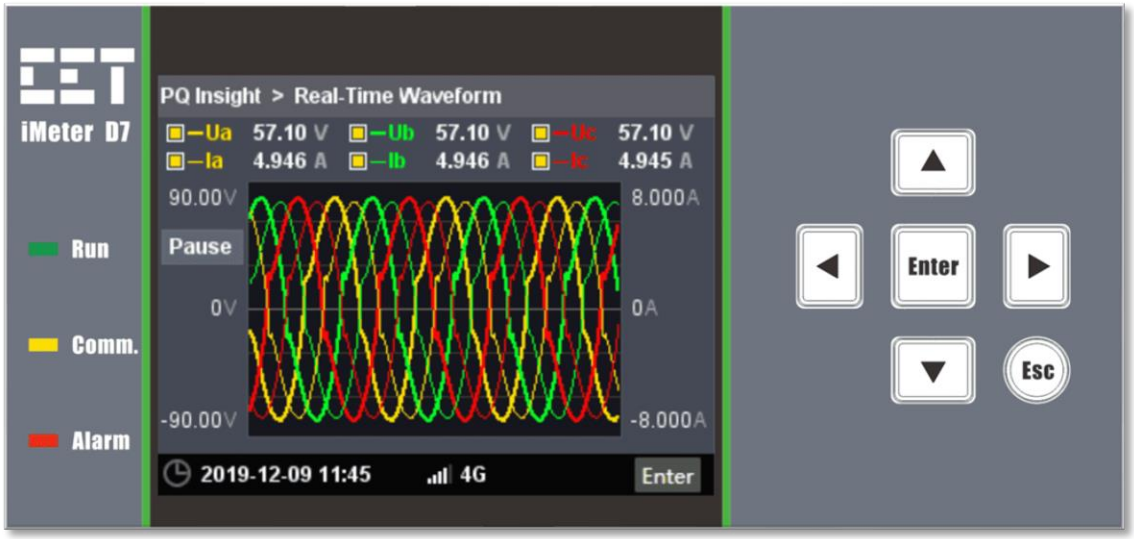


Figure 3-1 Front Panel Interface

3.1.1 Front Panel LED Indicators

The following table illustrates the meaning for the three LED indicators on the Front Panel.

LED Indicator	Color	Status	Description
Run	Green	Flashing	Device is running normally
		OFF	Device is running abnormally
Comm.	Yellow	Flashing	Communication in Process
		OFF	No Communication
Alarm	Red	ON	Hardware Error or Setpoint Triggered
		OFF	No Error Detected or No Triggered Setpoint

Table 3-1 Front Panel LED Indicators

3.1.2 Front Panel Buttons

The iMeter D7 provides <▲>, <▼>, <◀>, <▶>, <**Enter**>, <**Esc**>, six buttons for data display and setup. The following table describes the basic function for each button:

Button	Description
▲	Move cursor up; Increments the selected digit for numeric value.
▼	Move cursor down; Decrements the selected digit for numeric value.
◀	Move cursor left
▶	Move cursor right
Enter	Enter the next menu item; Confirm the setup change.
Esc	Back to the previous menu item; Cancel the setup change.

Table 3-2 Front Panel Button Description

3.1.3 Front Panel Data 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.

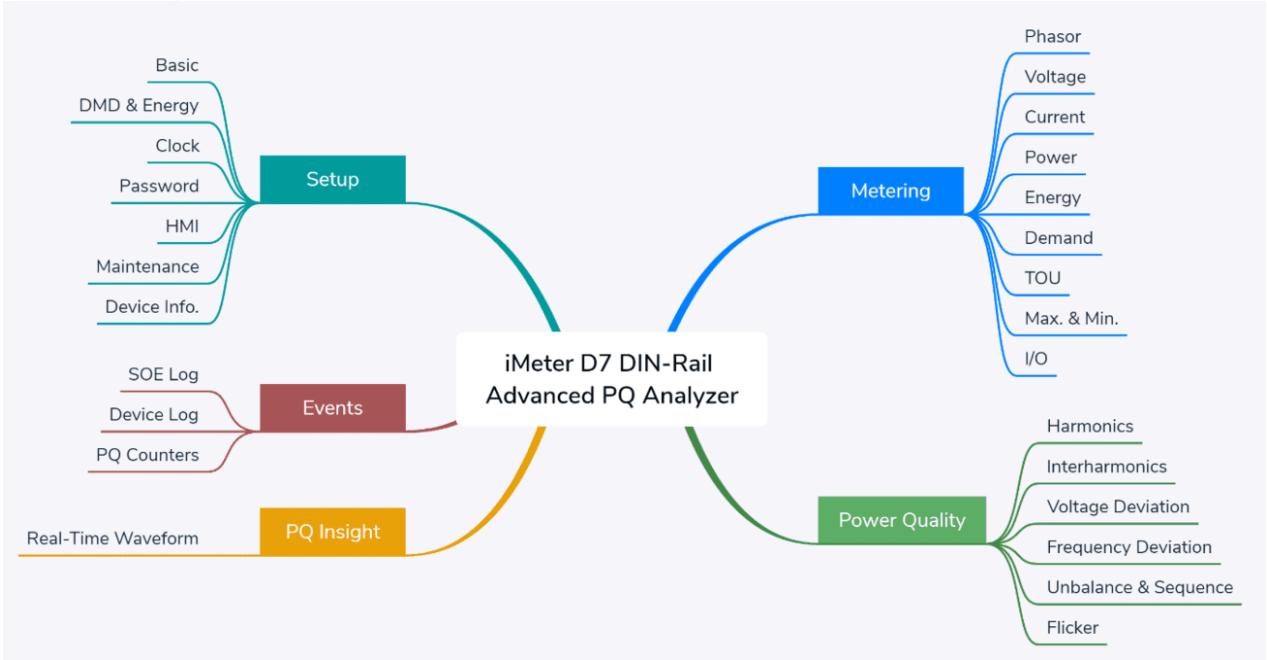


Figure 3-2 Overview for Front Panel Operations

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 for these sub-menus.

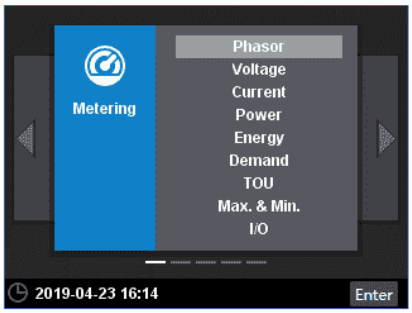


Figure 3-3 Metering Menu

3.1.3.1.1 Phasor

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

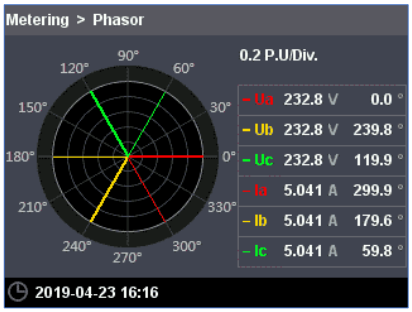


Figure 3-4 Phasor

3.1.3.1.2 Voltage

Enter the **Voltage** sub-menu and the following screens are available. Use the <▲> or <▼> to scroll to the different displays for 3Φ Uln, 3Φ Ull, Average, U4 and Frequency.

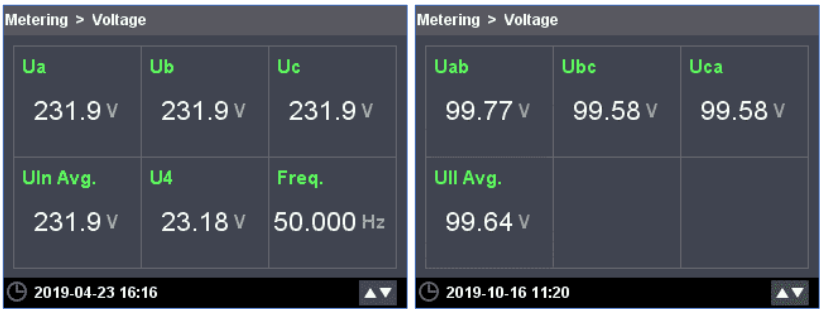


Figure 3-5 Voltage

3.1.3.1.3 Current

Enter the **Current** sub-menu and the following screen appears which displays the 3Φ Currents, Average, I4 and Ir (optional).

Figure 3-6 Current

3.1.3.1.4 Power

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

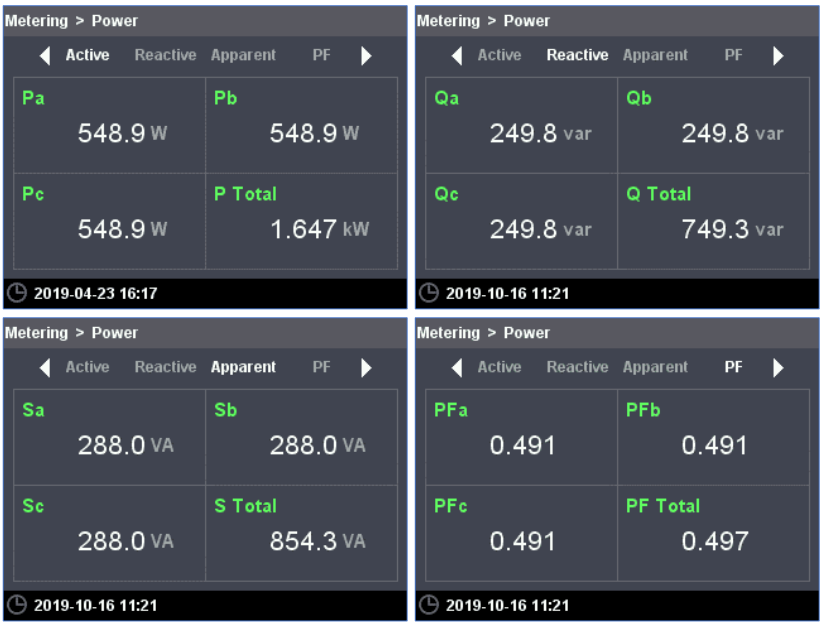


Figure 3-7 Power

3.1.3.1.5 Energy

Enter the **Energy** sub-menu and the following screens are available. Press <◀> or <▶> button to scroll among RMS, Fundamental and Total Harmonics Energy measurements.

Use <▲> or <▼> button to scroll to the different displays for kWh, kvarh Import/Export/Total/Net and kVA Total (RMS Energy only).

Figure 3-8 RMS Energy

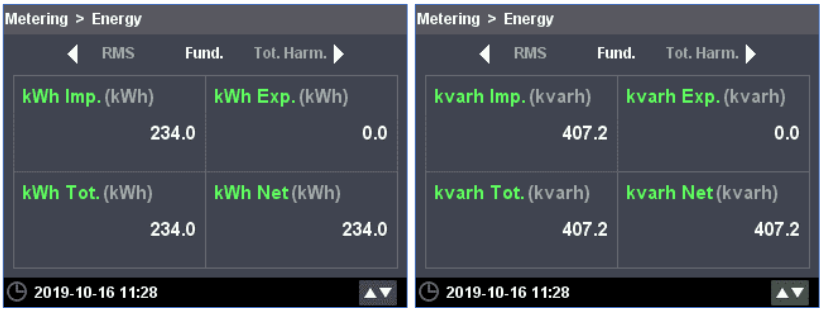


Figure 3-9 Fundamental Energy

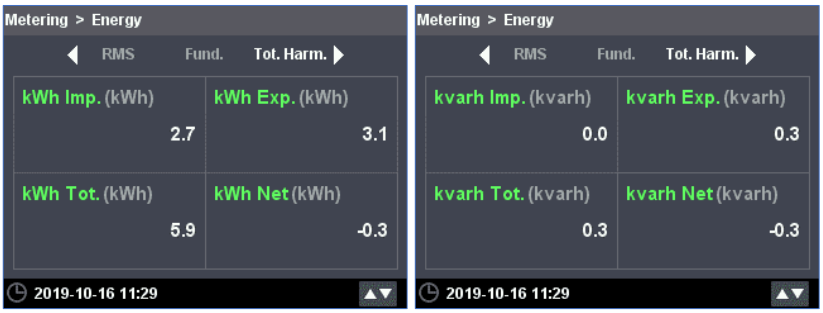


Figure 3-10 Total Harmonics Energy

3.1.3.1.6 Demand

Enter the **Demand** sub-menu and the following screens are available. Press the <◀> or <▶> button to scroll among Present Demand, Predicted Demand, This Max. and Last Max. Use the <▲> or <▼> button to scroll to the different parameters for 3Φ Currents, P, Q, and S.

Figure 3-11 Present Demand

Figure 3-12 Predicted Demand

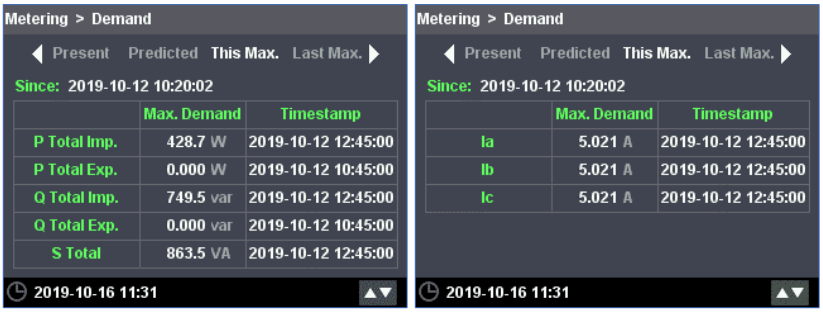


Figure 3-13 This Max. Demand

Figure 3-14 Last Max. Demand

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 corresonding kWh, kvarh Import/Export and kVAh. Use the <◀> or <▶> button to scroll among the T1 to T8.

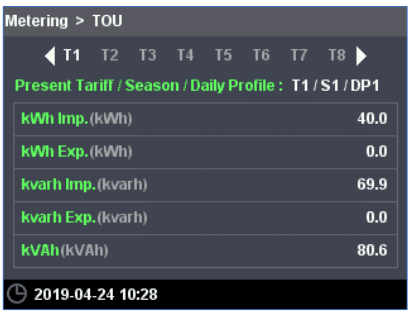


Figure 3-15 TOU

3.1.3.1.8 Max. & Min.

Enter the **Max. & Min.** sub-menu and the following screens are available. Press <**Enter**> button to toggle between Max. and Min. Recorders.

Use the <◀> or <▶> button to scroll among Recorder #01 to #04.

Figure 3-16 Max. & Min.

3.1.3.1.9 I/O

Enter the **I/O** sub-menu and the following screens are available. Use the <◀> or <▶> button to scroll among DI, DO, Optional AI or TC (not shown in the following screen captures).

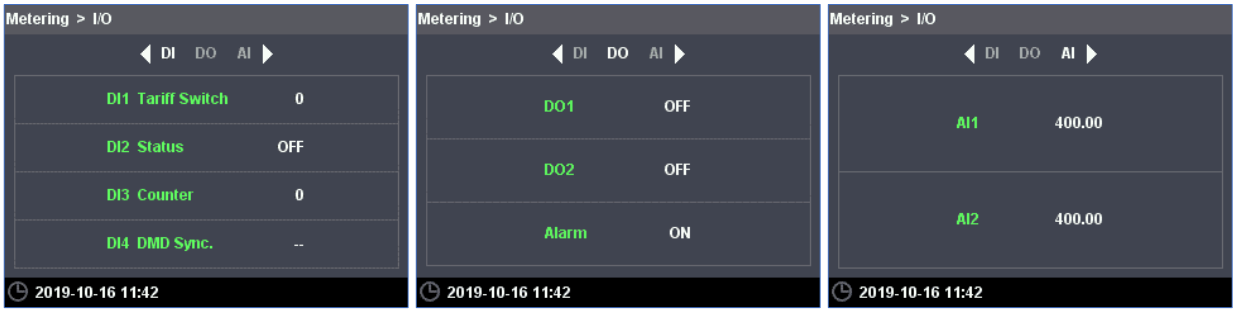


Figure 3-17 I/O

3.1.3.2 Power Quality

The **Power Quality** menu includes **Harmonics**, **Interharmonics**, **2kHz – 150kHz C.E.**, **Voltage Deviation**, **Frequency Deviation**, **Unbalance & Sequence** and **Flicker**. The following sections provide a quick overview of these screens.

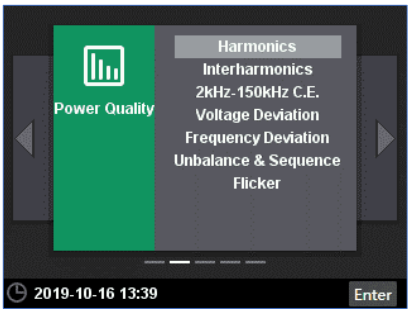


Figure 3-18 Power Quality

3.1.3.2.1 Harmonics

Enter the **Harmonics** sub-menu and the following screens are available. Use <◀> or <▶> to scroll among the Harmonic Spectrum for 4Φ Voltages and Currents.

- Press <**Enter**> to view the THD, TOHD, TEHD and Crest Factor measurements and use the <▲> or <▼> button to view the TDD, TDD Odd, TDD Even and K-Factor measurements for Currents.
- Press <**Enter**> again to view the Individual Harmonics and use the <▲> or <▼> button to view the %HD, RMS and Angle for Voltages and Currents for the respective individual harmonics.

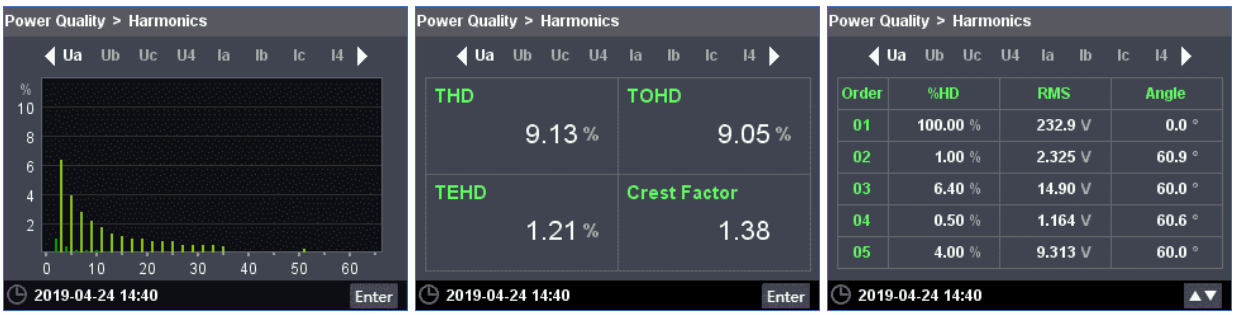


Figure 3-19 Harmonics

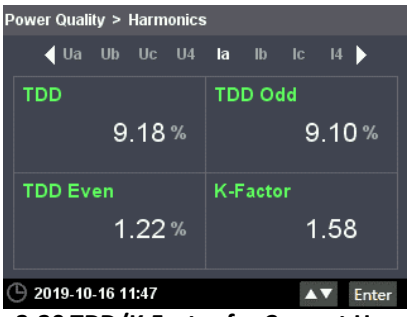


Figure 3-20 TDD/K-Factor for Current Harmonics

3.1.3.2.2 Interharmonics

Enter the **Interharmonics** sub-menu and the following screens are available. Use <◀> or <▶> to scroll among the Interharmonic Spectrum for 4Φ Voltages and Currents.

- Press <**Enter**> to view the TIHD, TOIHD and TEIHD measurements.
- Press <**Enter**> again to view the Individual Interharmonics and use the <▲> or <▼> button to view the %IHD and RMS measurements for Voltages and Currents for the respective individual interharmonics.

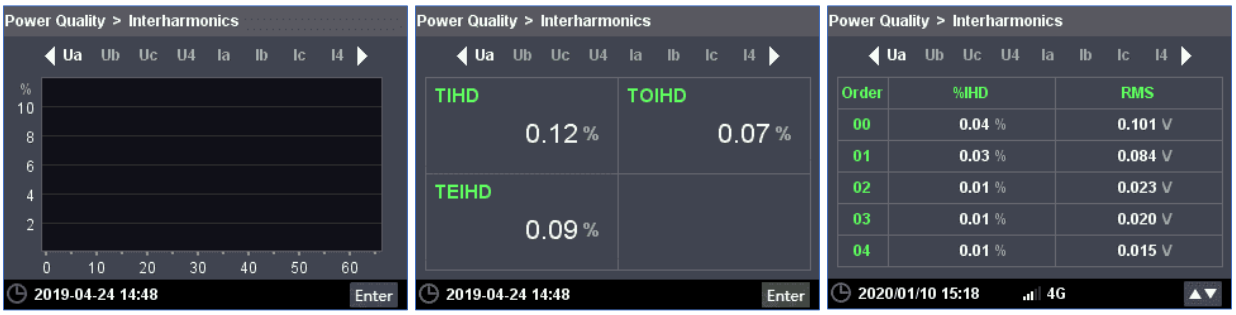


Figure 3-21 Interharmonics

3.1.3.2.3 2kHz – 150kHz C.E.

Enter the **2kHz – 150kHz C.E.** sub-menu and the following screens are available. Use <◀> or <▶> to scroll between 2kHz – 9kHz and 9kHz – 150kHz frequency bands. Press <▲> or <▼> to view the 3Φ U_{rms} C.E. for different segments.

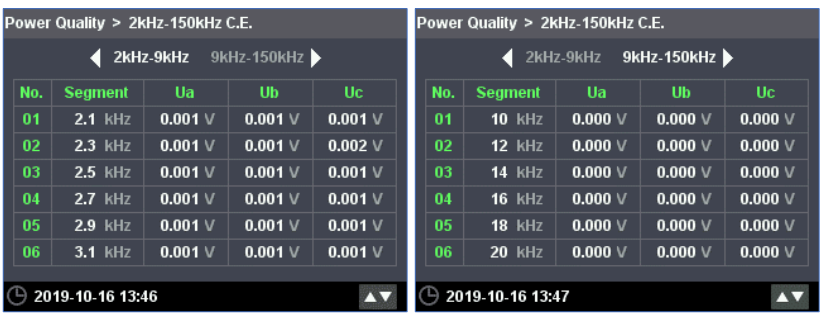


Figure 3-22 2kHz – 150kHz C.E.

3.1.3.2.4 Voltage Deviation

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

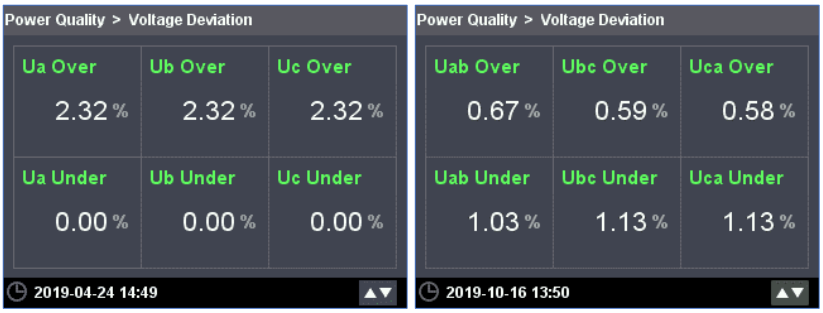


Figure 3-23 Voltage Deviation

3.1.3.2.5 Frequency Deviation

Figure 3-24 Frequency Deviation

3.1.3.2.6 Unbalance & Sequence

Enter the **Unbalance & Sequence** sub-menu and the following screens are available. Use the <▲> or <▼> button to scroll through the displays for Negative (U2/I2) & Zero (U0/I0) Sequence Unbalances and the Positive (U1/I1), Negative (U2/I2) & Zero (U0/I0) Sequence Components for Voltage and Current.

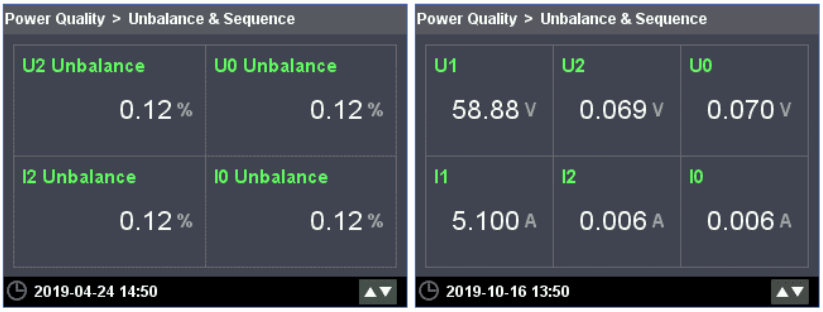


Figure 3-25 Unbalance & Sequence

3.1.3.2.7 Flicker

Enter the **Flicker** sub-menu to display the Pst/Plt measurements for 3Ø Voltages.

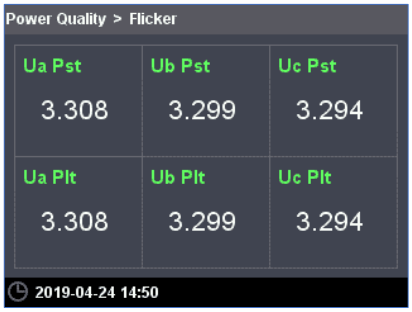


Figure 3-26 Flicker

3.1.3.3 PQ Insight

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

Figure 3-27 PQ Insight

3.1.3.3.1 Real-Time Waveform

This screen shows the Real-Time Waveform Capture for 3Φ Voltages and Currents at 128 samples/cycle for 4 cycles that is updated every second. Press <**Enter**> to enter the display and then use the <▲>, <▼>, <◀>, <▶> and <**Enter**> 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.

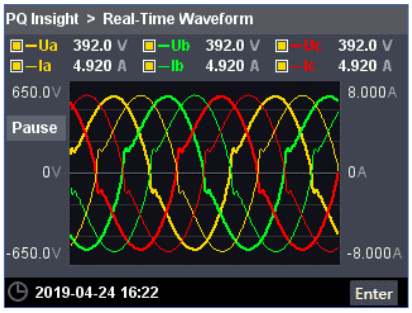


Figure 3-28 Real-Time Waveform

3.1.3.4 Events

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

Figure 3-29 Events

3.1.3.4.1 SOE Log

Enter the **SOE Log** sub-menu and the following screens are available. The SOE Log screen displays up to 1024 logs starting with the most recent event.

Use the <▲> or <▼> to move through the event pages.
Use the <◀> or <▶> to quickly skip the next 4 event pages.

Press <**Enter**> to enter a desired event page and then use the <▲> or <▼> to scroll though the event list.
Press <**Enter**> to select and view the event details.
Press <◀> or <▶> to scroll through other event pages.

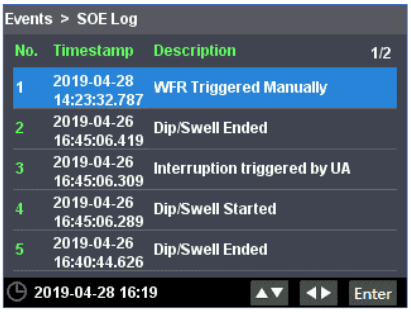


Figure 3-30 SOE Log

If the selected event is set to trigger WFR and/or DWR waveform, the Details dialog box may provide the options for displaying the WFR and/or DWR waveform. Press <◀> or <▶> to select the option and then press <**Enter**> to select and view the respective display.

Figure 3-31 Event Details

Here is an example for the waveform display:

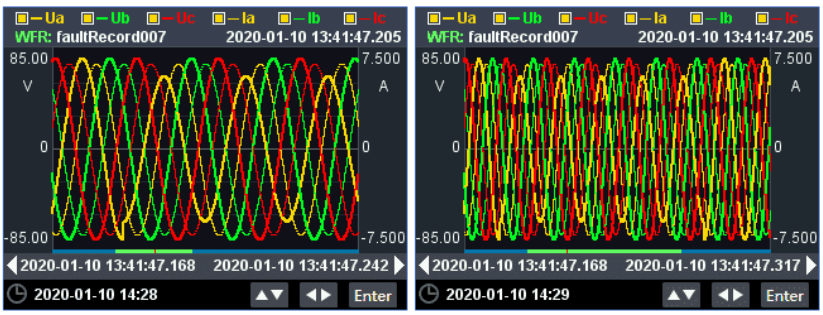


Figure 3-32 Waveform Display for Dip Triggered by Ua

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

3.1.3.4.2 Device Log

Enter **Device Log** sub-menu and the following screens are available. The Device Log displays up to 1024 events starting with the most recent event.

Use the <▲> or <▼> to move through the event pages.
Use the <◀> or <▶> to quickly skip the next 4 event pages.

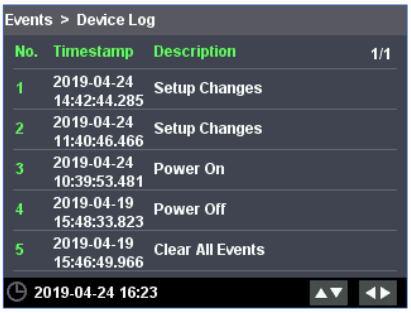


Figure 3-33 Device Log

3.1.3.4.3 PQ Counters

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

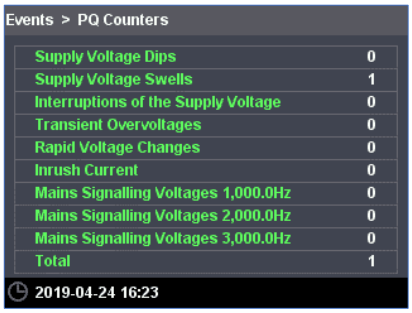


Figure 3-34 PQ Counters

3.1.3.5 Setup

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

Figure 3-35 Setup Menu

3.1.3.5.1 Basic

Enter **Basic** sub-menu and the following screens are available. Use the <◀>, <▶>, <▼>, <▲> scroll through the different parameters. Press <**Enter**> to select and modify the desired parameter. The Front Panel Password is required for any setup changes. Please refer to Table 3-5 for the range and the default values of these parameters.

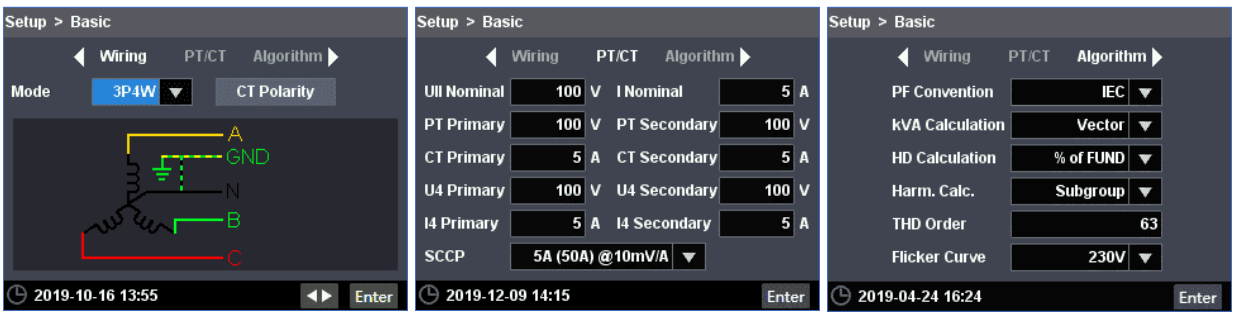


Figure 3-36 Basic Setup Screens

3.1.3.5.2 DMD & Energy

Enter the **DMD & Energy** sub-menu and the following screens are available. Use <◀> or <▶> button to scroll between **Demand** and **Energy**. Please refer to **Table 4-11 Demand Setup Parameters** and **Table 4-25 Energy Log Parameters** for more information about these parameters.

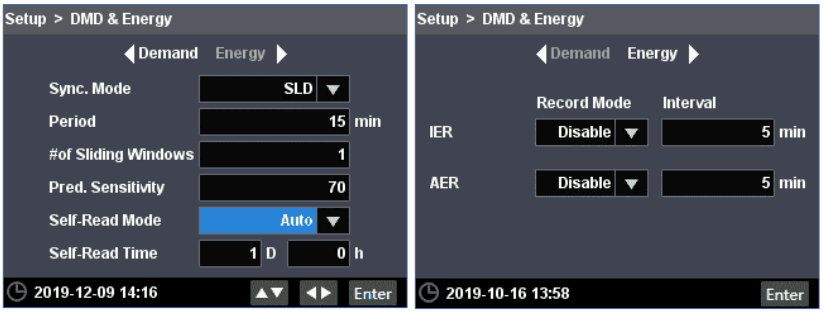


Figure 3-37 Demand & Energy Setup Screens

3.1.3.5.3 Comm.

Enter the **Comm.** sub-menu and the following screens are available. Use the <◀> or <▶> to scroll among P1, P2 and RS-485. Please refer to **Table 5-51** for more information about these parameters.

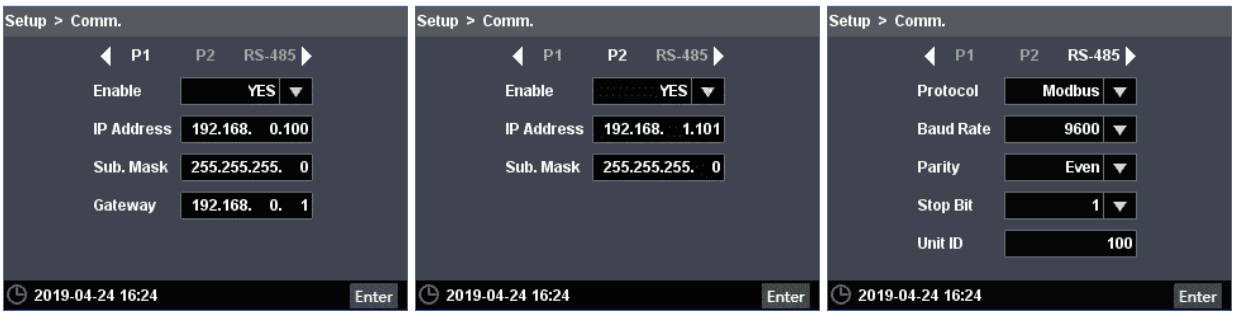


Figure 3-38 Comm. Setup Screens

3.1.3.5.4 Clock

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

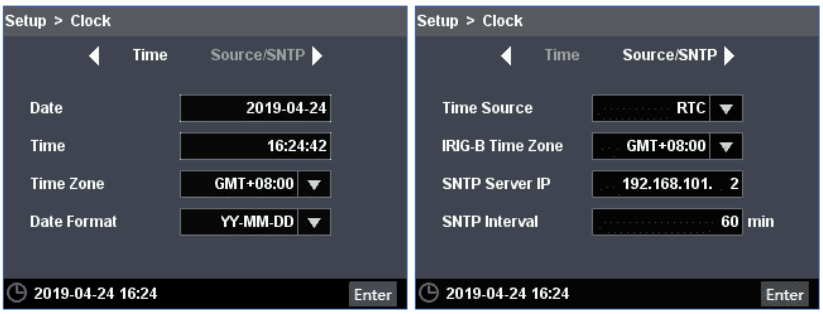


Figure 3-39 Clock Setup Screens

3.1.3.5.5 Password

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

Figure 3-40 Password Setting

3.1.3.5.6 HMI

Enter the **HMI** sub-menu and the following screens are available. Use the <◀> or <▶> to scroll between Basic, Pop-up Alarm and Auto-Scroll. Please refer to **Section 4.2** for more information.

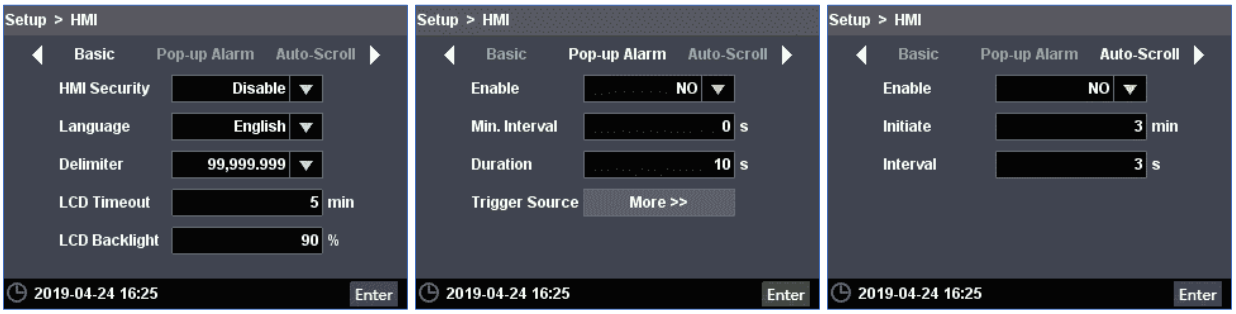


Figure 3-41 HMI Settings

3.1.3.5.7 I/O

Enter the **I/O** sub-menu and the following screens are available. Use the <◀> or <▶> to scroll between DI, DO and optional AI. Please refer to **Section 4.1** for more information.

Figure 3-42 I/O Setup Screens

3.1.3.5.8 Maintenance

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

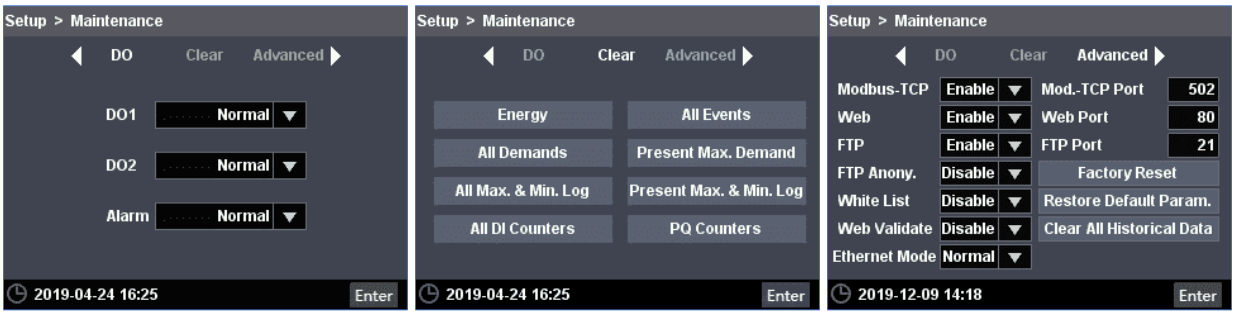


Figure 3-43 Maintenance Setting Screens

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 Diag.** information.

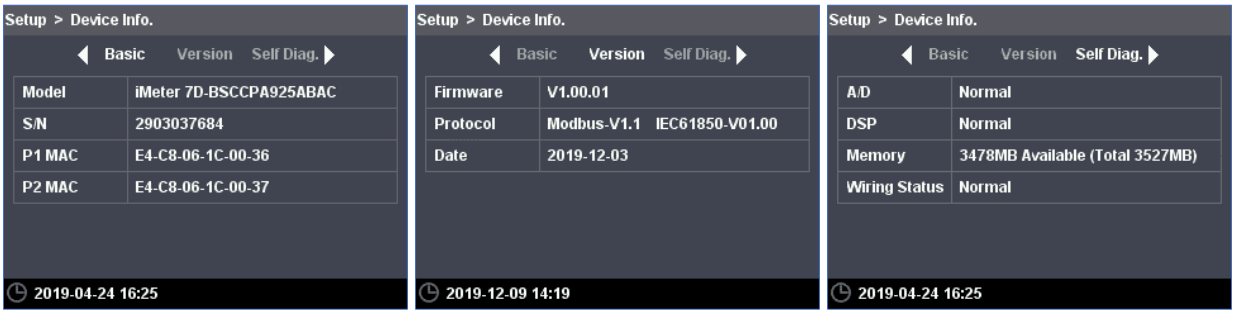


Figure 3-44 Device Info. Screens

3.2 On-board Web Interface

The iMeter D7's Web Interface is compatible with various web browsers.

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

Table 3-3 Web Browser Supported

The default IP Addresses of the iMeter D7's P1/P2 Ethernet Port are 192.168.0.100 and 192.168.1.100, respectively. Please make sure to configure the IP Address, Subnet Mask and Default Gateway of P1/P2 (depending on which port is connected) such that it's on the same subnet as the PC that is being used to connect with the iMeter D7.

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).

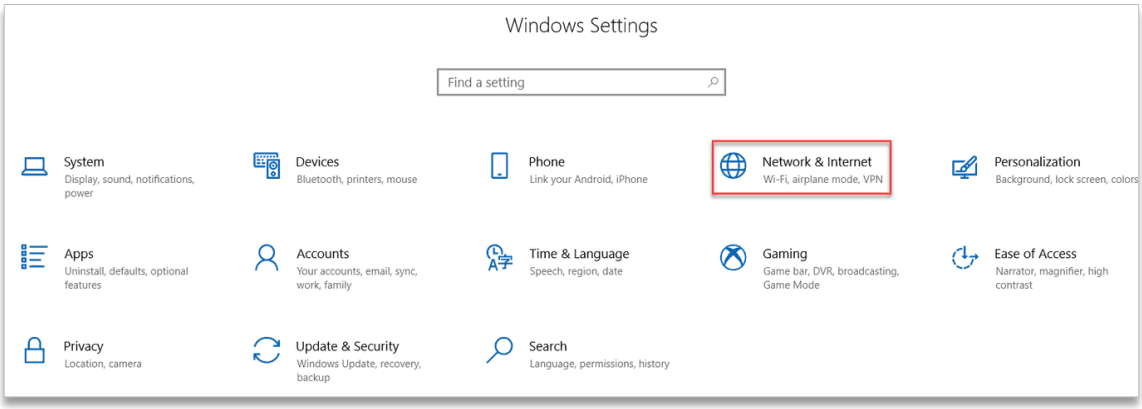


Figure 3-45 Settings-> Network & Internet

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

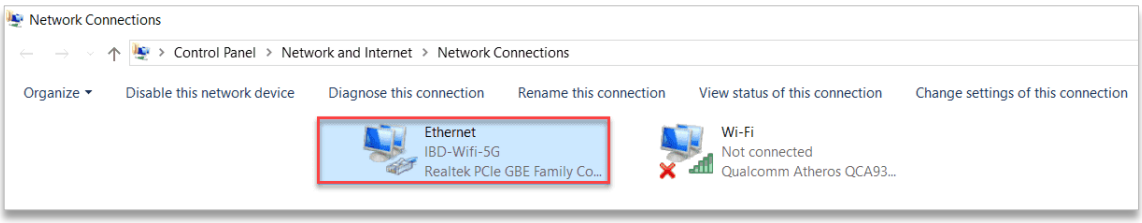


Figure 3-46 Network and Sharing Center

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

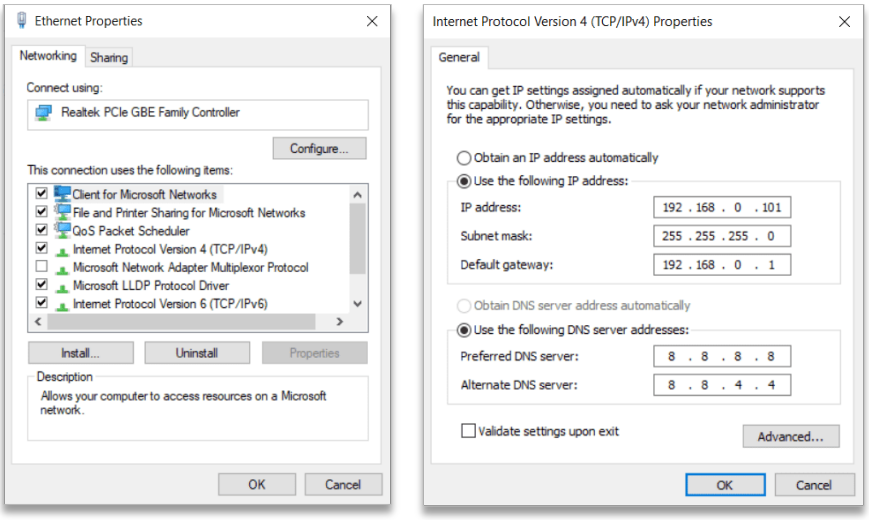


Figure 3-47 Setting PC's IP Address

3.2.2 Configure iMeter D7's IP Address

Please refer to **Section 3.1.3.5.3** to configure the **IP Address**, **Sub. Mask** and **Gateway**.

3.2.3 Accessing Web Interface

1) When the Client Validate is enabled, which is disabled by default, it's required to import the HTTPS certificate for Web validation in Google Chrome as per the following steps (If Client Validate is disabled, please skip step 1). The HTTPS certificate is retrievable from this site: https://doc.cet-global.com/device/https/pmc-client.pfx.

   a. Click the **Menu** icon ⋮ on Chrome and then select **Settings**.

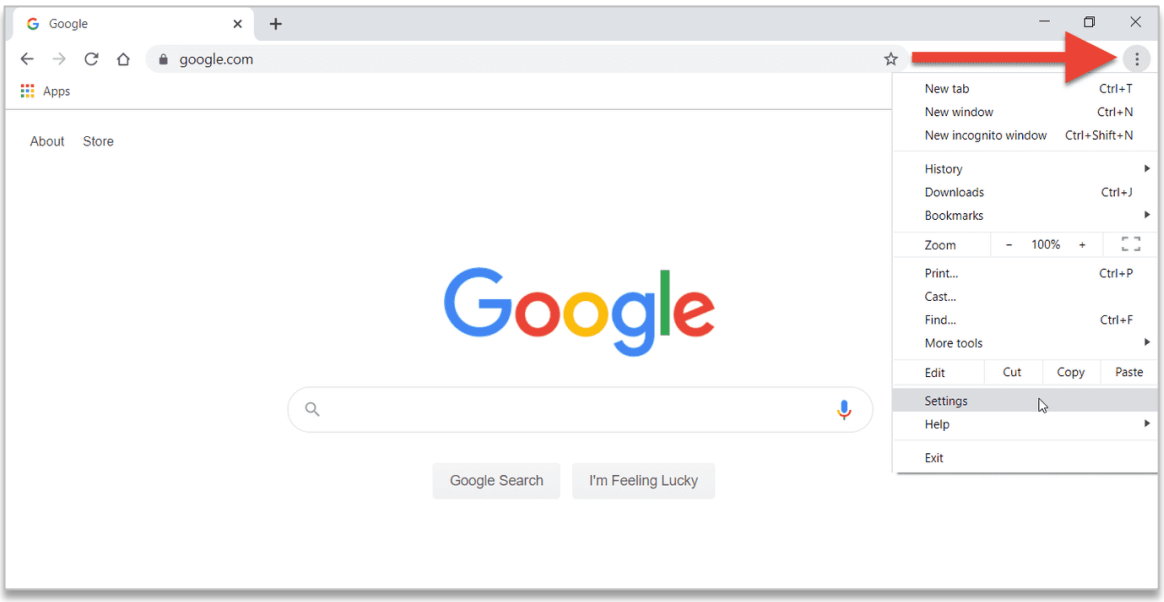


Figure 3-48 Chrome Settings

   b. Expand the **Advanced** menu on left-hand side and go to **Privacy and Security**.

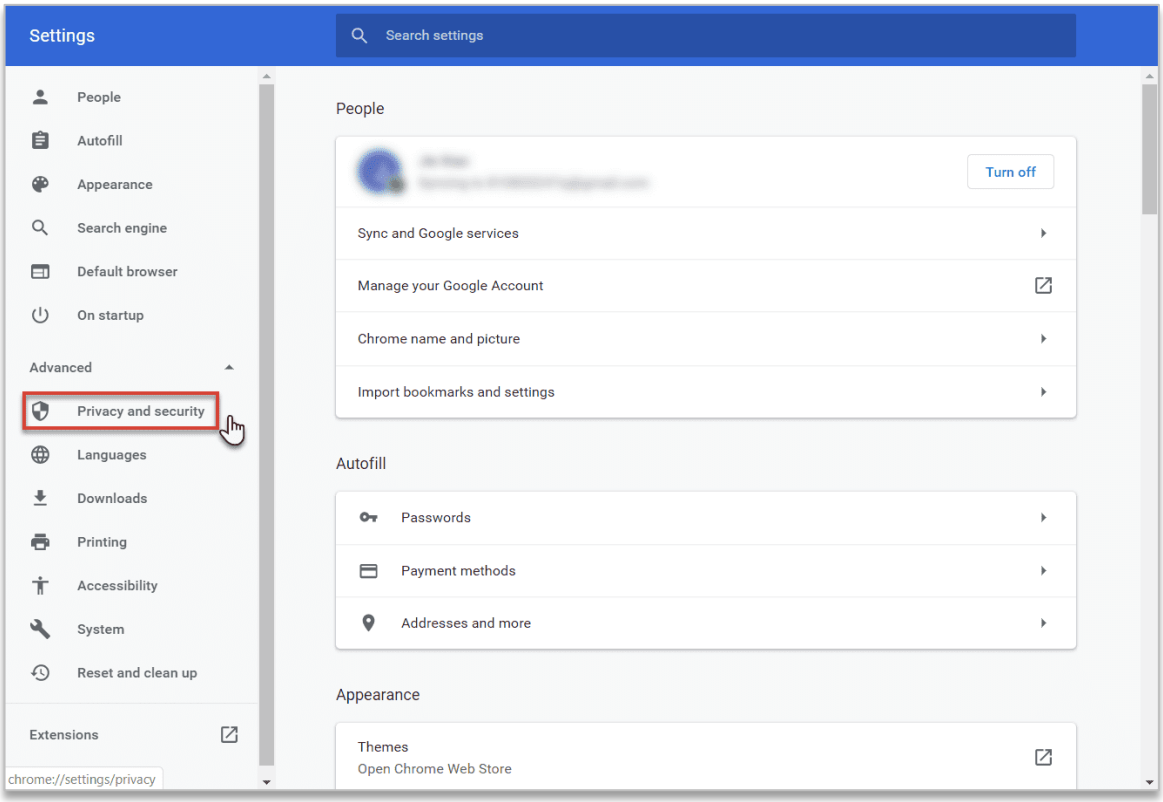


Figure 3-49 Privacy and security

c. Choose **Manage certificates** and then click on **Import** on the **Certificates** dialog box.

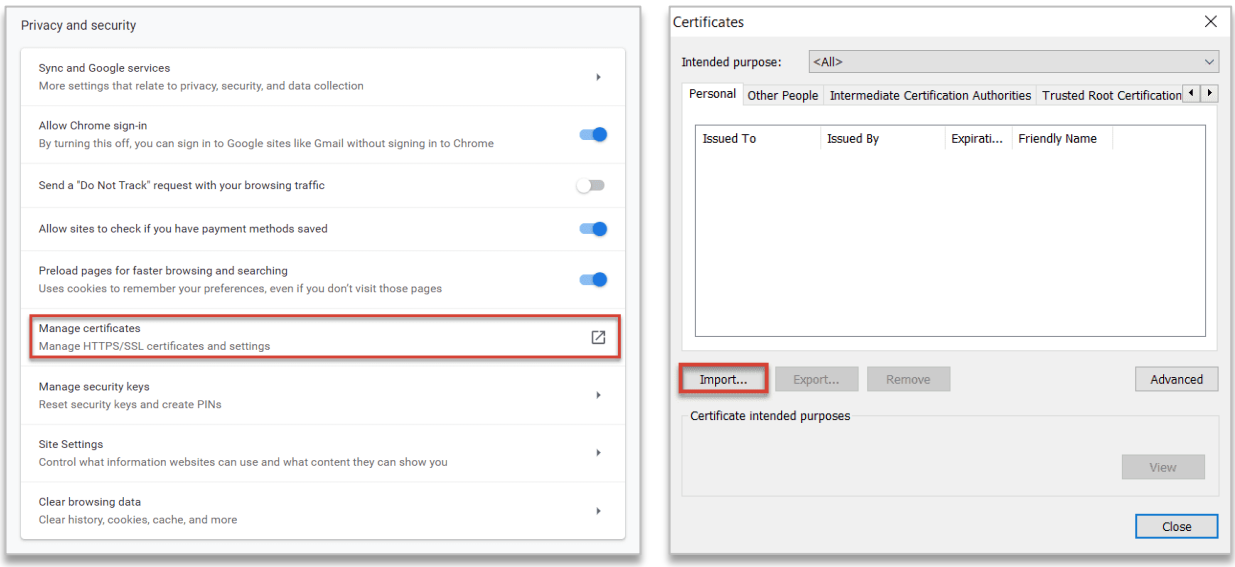


Figure 3-50 Manage certificates -> Import certificate

d. Follow the discrete steps wizard for importing the certificate. Choose the .pfx certificate and enter the password for the **private key** which is "**123456**". It's recommended to place the certificate in **Trusted Publishers** store in the next step.

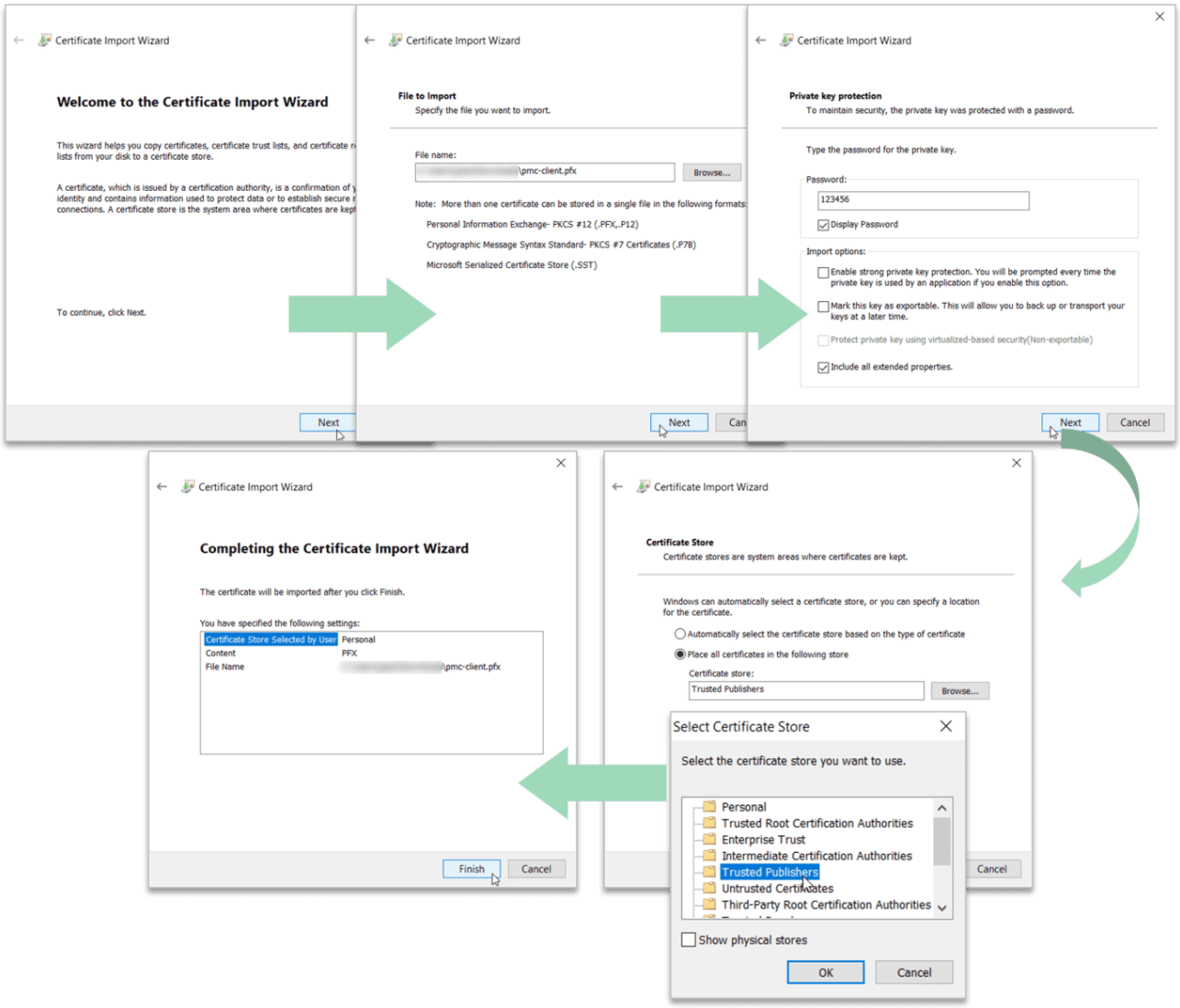


Figure 3-51 Import .pfx certificate

2) Restart Chrome and enter the complete IP Address such as https://192.168.0.100 in the Address area of **Google Chrome**, and then press **<Enter>**.

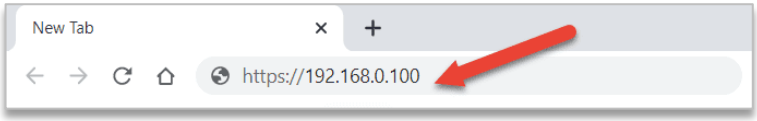


Figure 3-52 Web Logon

3) Select the pmc-client certificate as shown in the following figure and press OK.

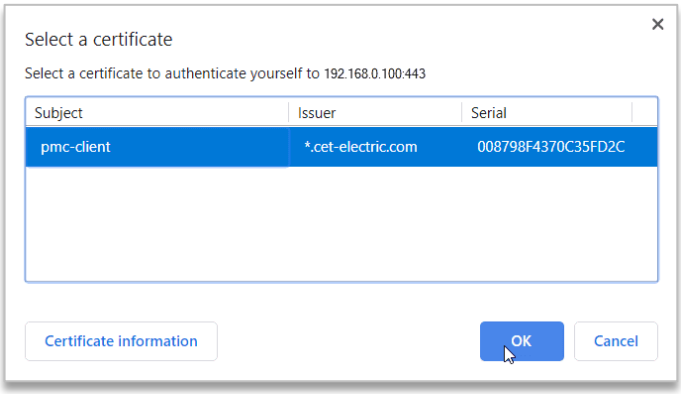


Figure 3-53 Select a certificate

4) The following Privacy Error may appear since the certificate is untrusted for Chrome. Click on **Advanced** then **Proceed to localhost (unsafe)**.

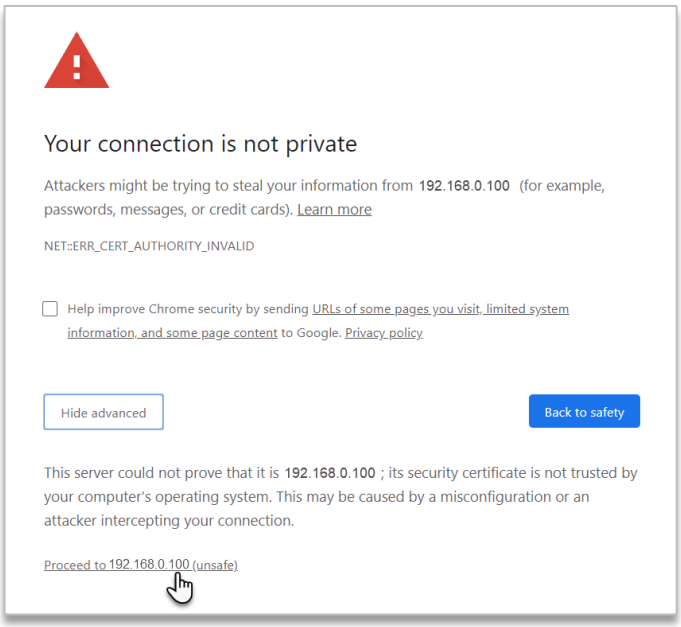


Figure 3-54 Privacy Error

5) The iMeter D7's logon page appears.

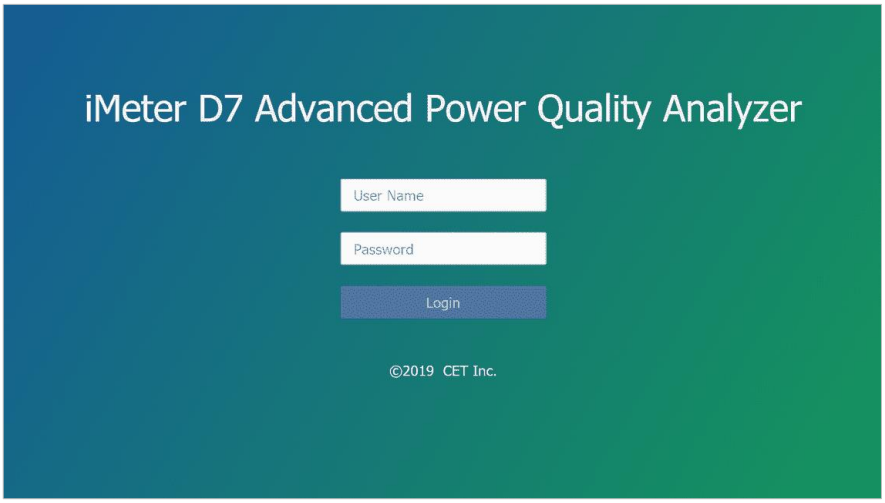


Figure 3-55 Web Interface

6) 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.

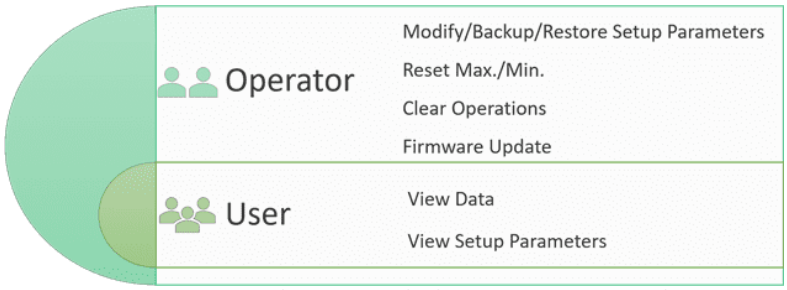


Figure 3-56 Authorities with their Permission Levels

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

Account	Username	Password
Operator	operator	abcd1234-
User	user	abcd1234-

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

Please be noted that if the password is entered incorrectly for 6 times, the login access will be denied in 5 minutes (for the same account).

7) The iMeter D7's Web Interface appears after login. There are five items at the **Title Bar** – **PQ Insight**, **Metering**, **Power Quality**, **Events** and **Setup**.

Figure 3-57 Title bar

8) The Web Interface's login password can be changed by clicking on the inverse triangle at the upper right-hand corner of the page and then selecting **Change Password** as shown below. The new password must consist of a combination of numbers, letters (case-sensitive) and ASCII special characters. Please keep it between 8 and 16 characters.

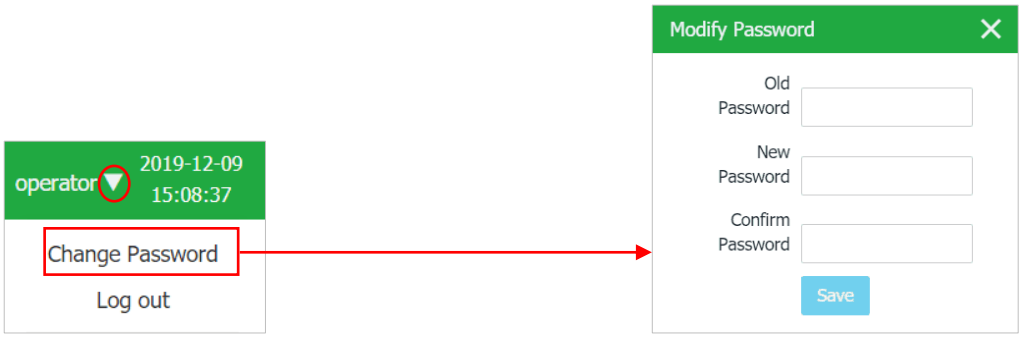
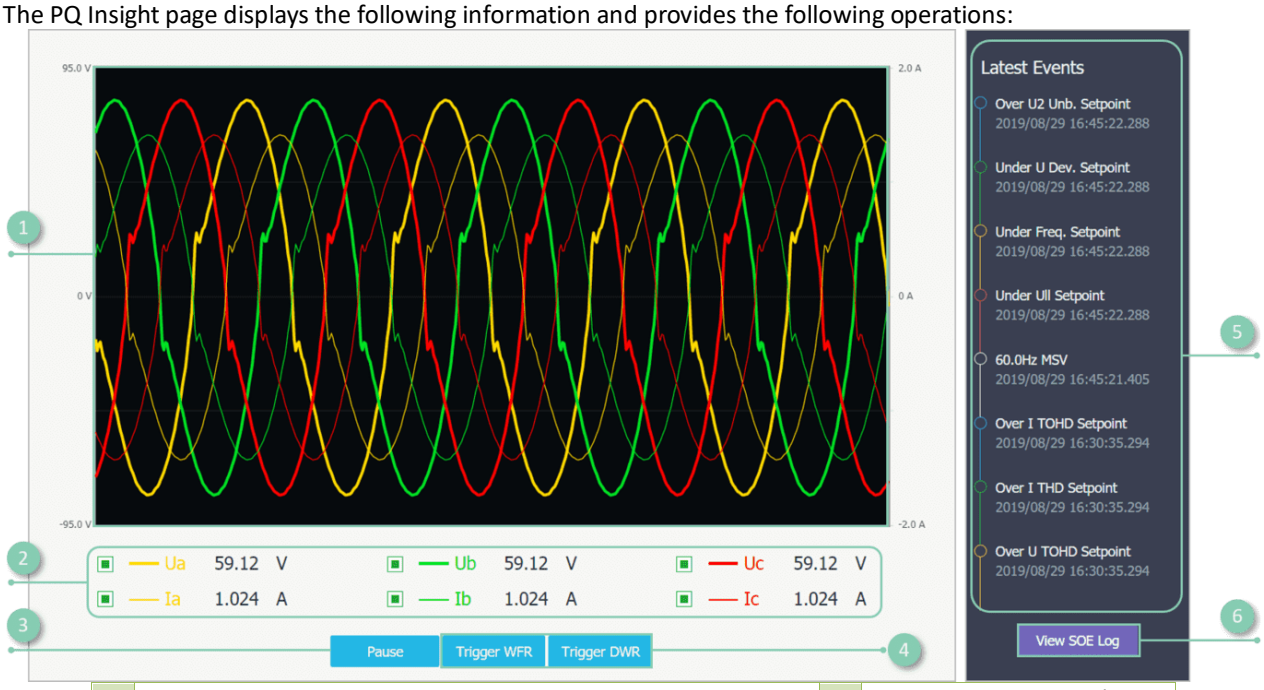


Figure 3-58 Modify the Web Interface Password

3.2.3.1 PQ Insight

The PQ Insight page displays the following information and provides the following operations:



1	Voltage & Current Waveform	4	Manual Trigger WFR/DWR
2	Select/De-select Voltage/Current Channels	5	Latest 8 SOE Events
3	Toggles between <Pause> & <Refresh> for waveform update	6	Enter SOE Log sub-menu

Figure 3-59 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 Phase and Magnitude information for Ua/Ub/Uc (3P4W) or Uab/Ubc/Uca (3P3W) and Ia/Ib/Ic, as well as Frequency. Click **Export** to save the Phasor data to a .csv file at the default Download folder for the Web Browser.

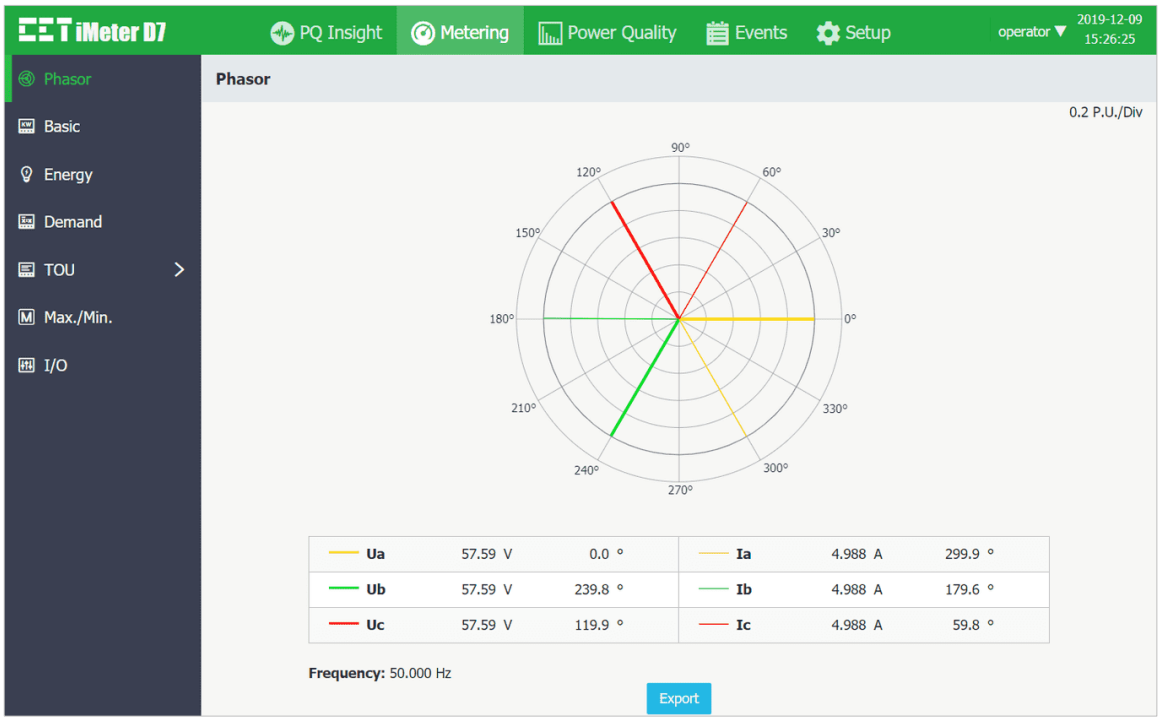


Figure 3-60 Phasor Diagram

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 3Φ Voltages, Currents, Powers, Power Factors as well as U4, I4, Ir (optional) and Frequency. Click **Export** to save the data on this page to .csv file at the default Download folder.

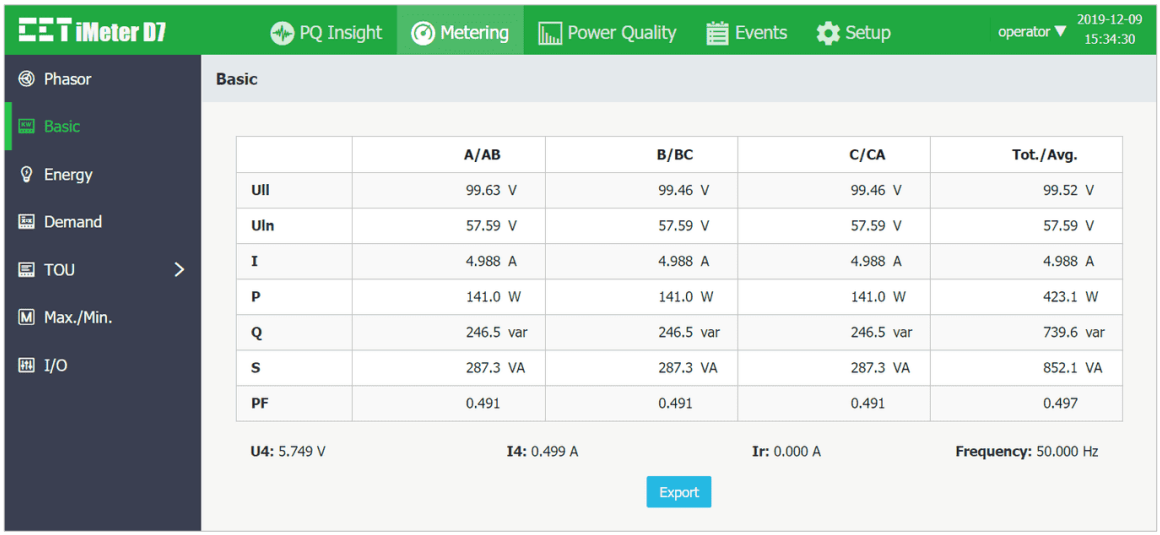


Figure 3-61 Basic Information

3.2.3.2.3 Energy

Click **Energy** on the left-hand pane and the following screen appears which shows the **RMS**, **Fundamental**, and **Harmonics** kWh/kvarh for **Import/Export/Net/Total** as well as the **Total Apparent** Energy for the total of 3 Phases.

Select **Active** or **Reactive** from the drop-down list to switch between Active/Reactive Energy display.

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

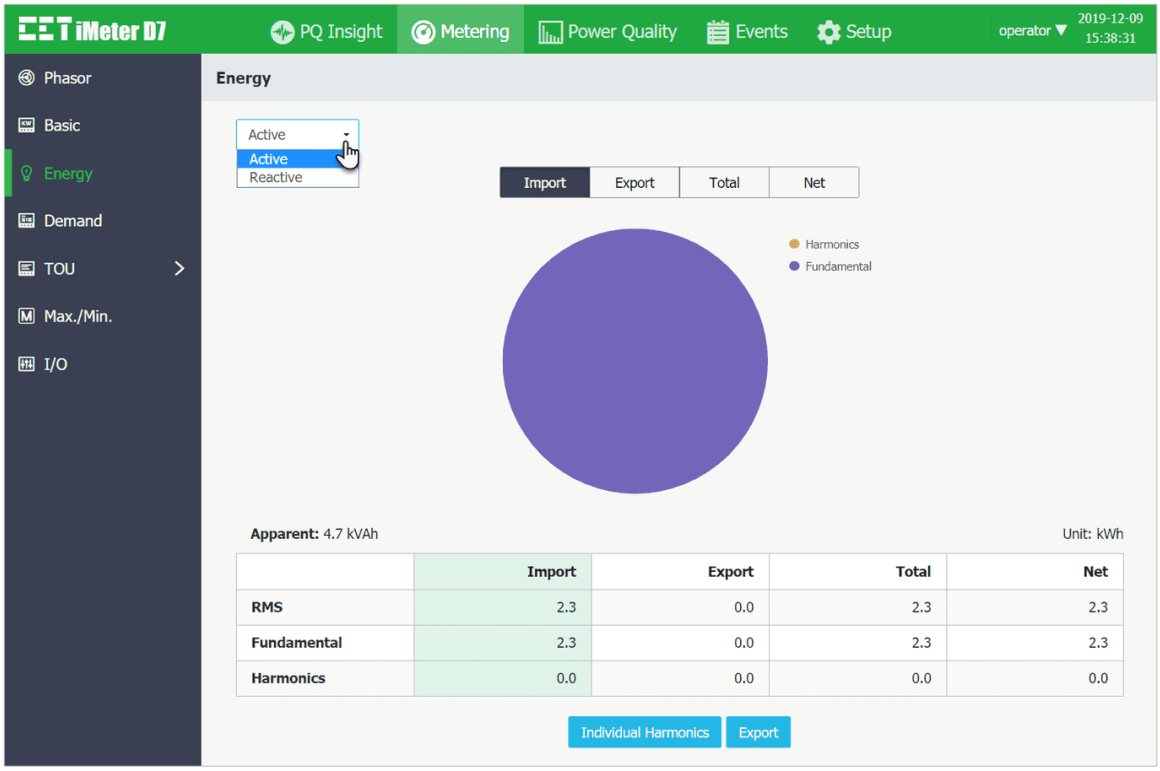


Figure 3-62 Energy Interface

Click on **Individual Harmonics** and the following pages are available which display the Harmonic Energy in Spectrum or table format for kWh, kvarh Import/Export by selecting Spectrum or Table from the top left drop-down list.

- **Spectrum** Move the mouse pointer over a particular histogram to show its harmonic order and value. Click on the kWh Imp., kWh Exp., kvarh Imp., kvarh Exp. tab at the top to view the respective Harmonic Energy spectrum.

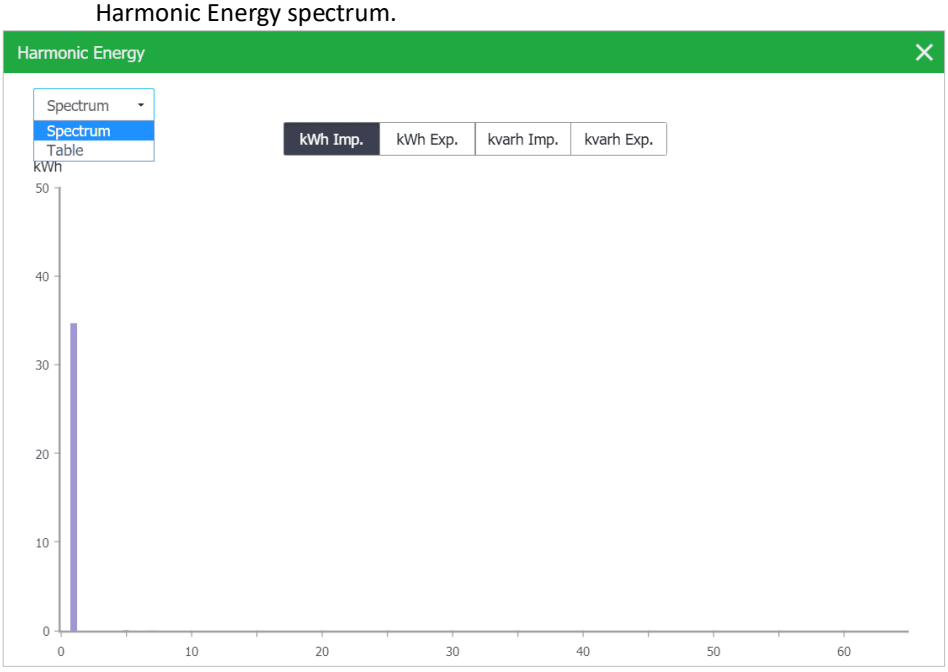
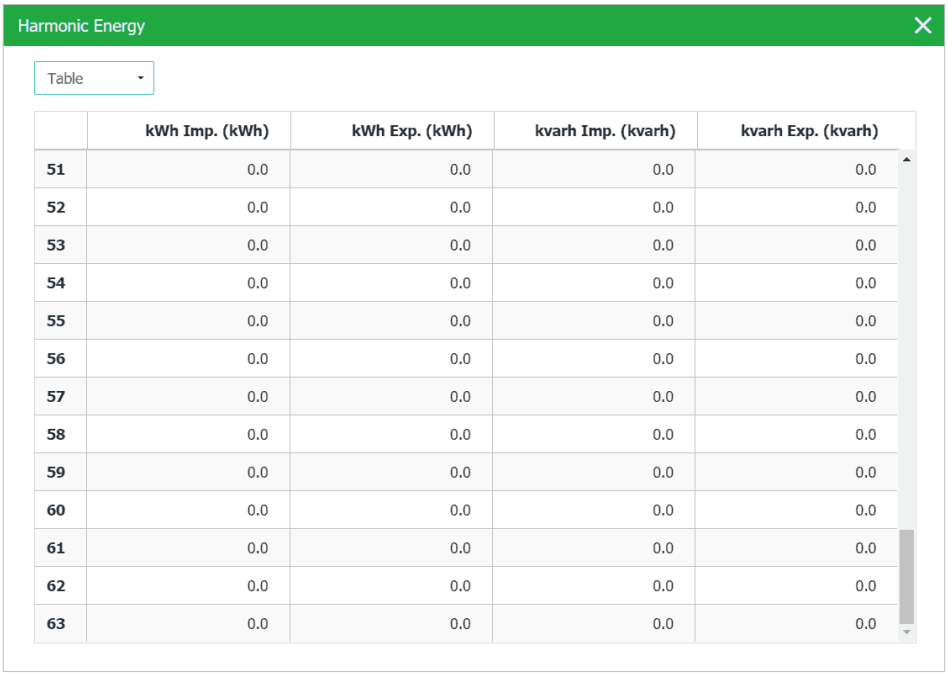


Figure 3-63 Individual Harmonics in Spectrum

- **Table**



	kWh Imp. (kWh)	kWh Exp. (kWh)	kvarh Imp. (kvarh)	kvarh Exp. (kvarh)
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0
61	0.0	0.0	0.0	0.0
62	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0

Figure 3-64 Individual Harmonics in Table

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 .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.

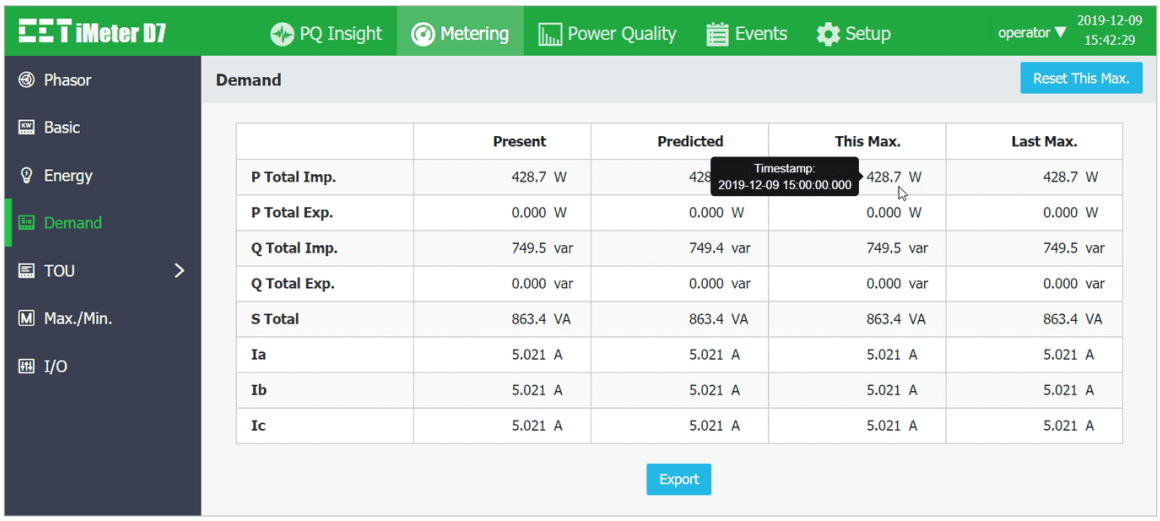


Figure 3-65 Demand Interface

3.2.3.2.5 TOU

Click **TOU** on the left-hand pane to view the **Real Time**, **Freeze Record** and **Historical Record** TOU information.

3.2.3.2.5.1 Real Time

This page displays the present TOU information, including Energy and Max. Demand for all 8 Tariffs. The **Present Schedule**, **Present Tariff**, **Present Season** and **Present Daily Profile** are displayed at the top of the page. Click **Switch Schedule** (only accessible for **Operator**) to manually switch between Schedule for TOU1 and TOU2.

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

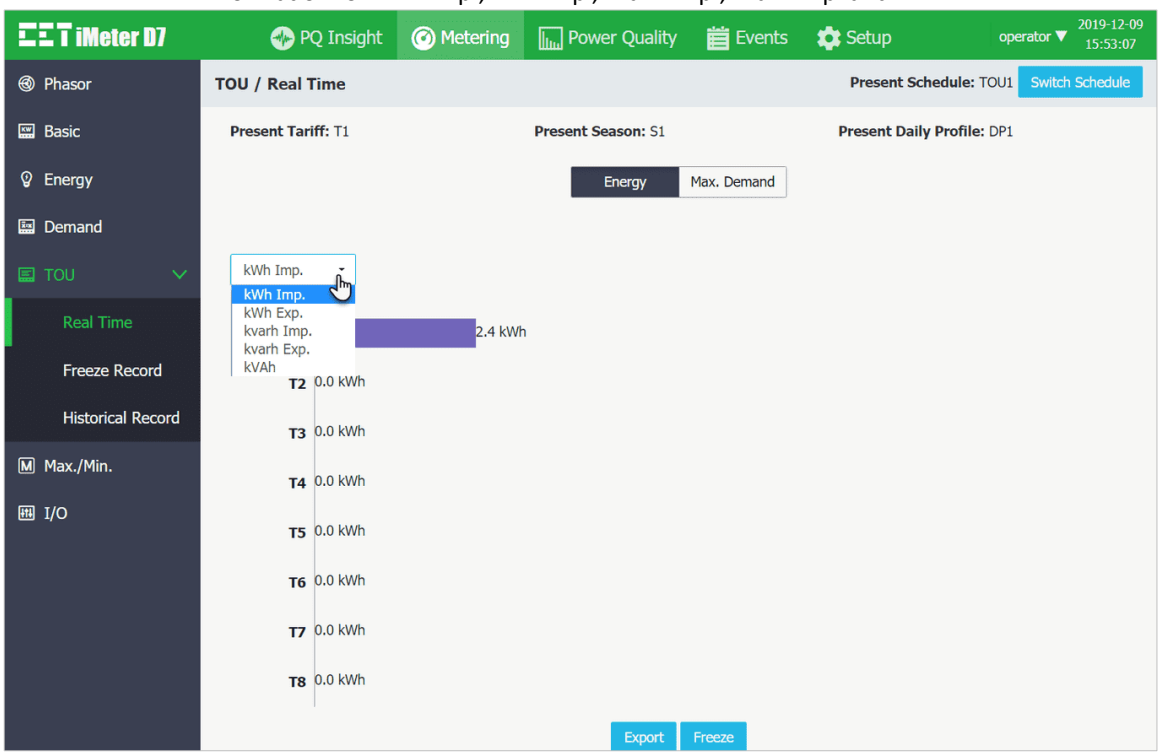


Figure 3-66 Real Time TOU Energy

- **Max. Demand** Select from the drop-down list underneath Present Tariff to display the respective Tariff information for P Imp., P Exp., Q Imp. and Q Exp.

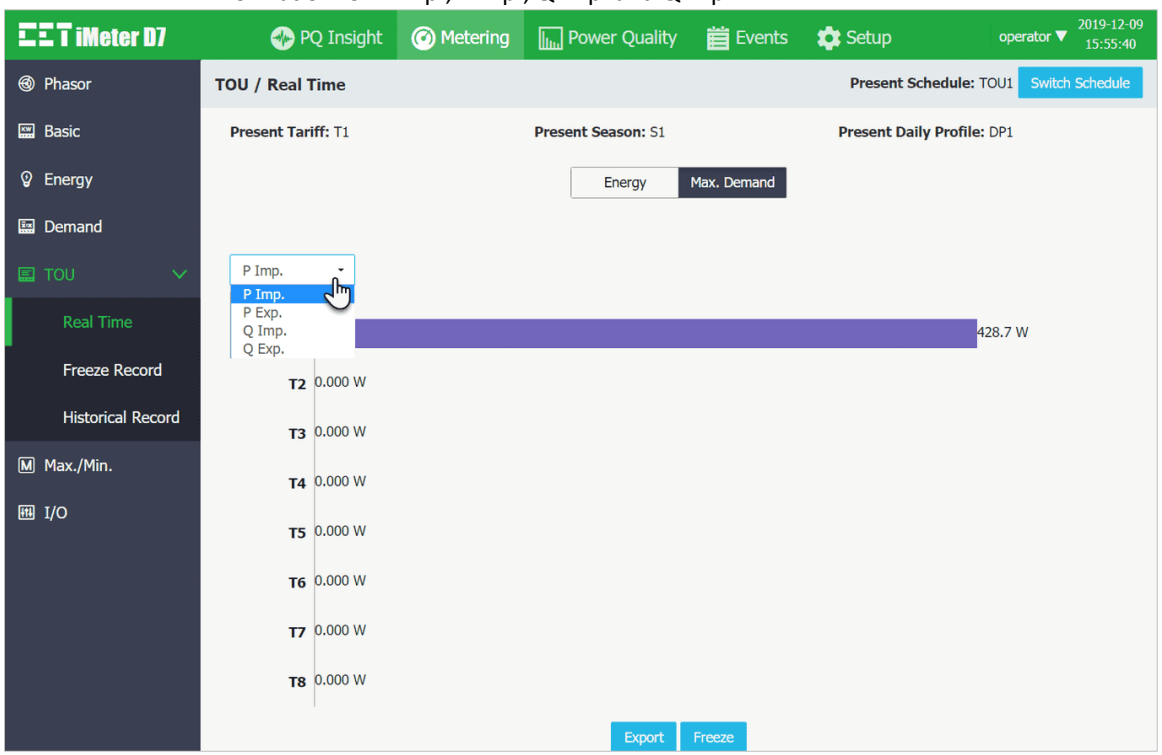


Figure 3-67 Real Time TOU Max. Demand

Click **Export** to save the Real Time TOU data to a .csv file at the default Download folder. Click **Freeze** (only accessible for **Operator**) to take a momentary snapshot of the TOU Energy and Max. Demand.

3.2.3.2.5.2 Freeze Record

The iMeter D7 provides a **Freeze Record** with timestamp for the Energy and Max. Demand generated momentarily after the manual **Freeze** operation from the **TOU > Real Time** interface.

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

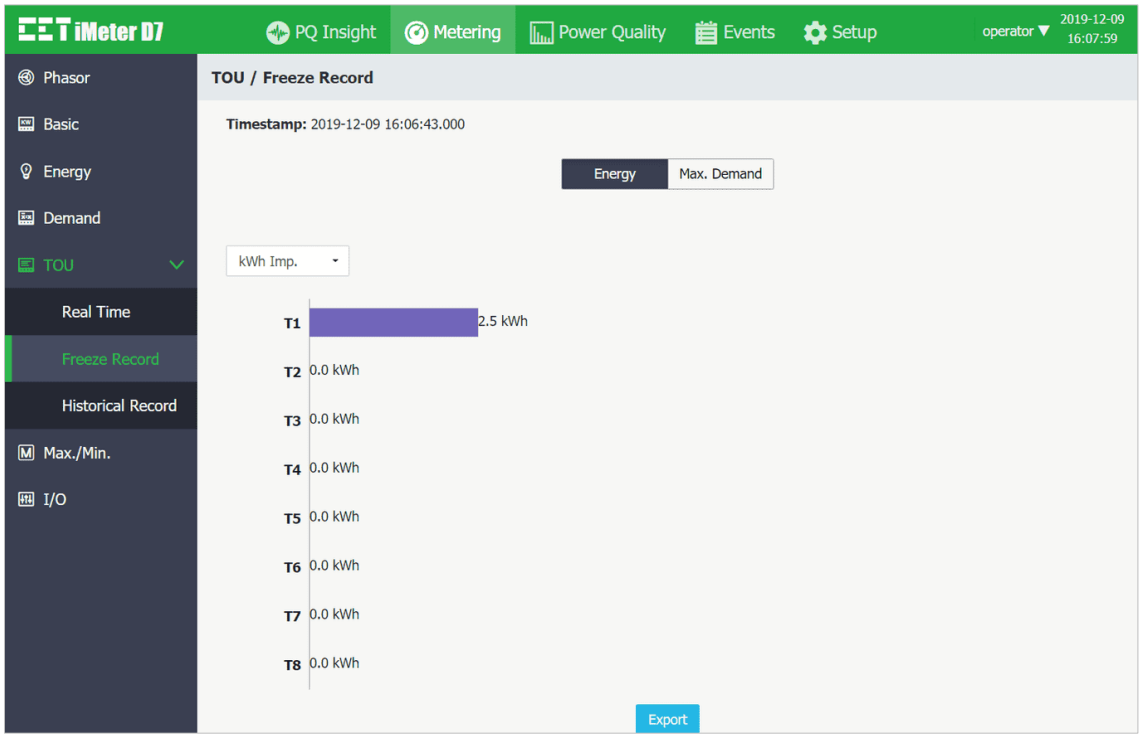


Figure 3-68 TOU Freeze Record

3.2.3.2.5.3 Historical Record

The iMeter D7 can store up to 12 Historical Records with timestamp based on the First-In-First-Out principle. The **Historical Record** includes PF Total, TOU Energy and Max. Demand for the 8 Tariffs. When the **TOU Record Self-Read Time** is set to **Auto**, the Historical Record is generated monthly at the pre-defined Self-Read Time. It can also be manually generated by clicking on the **Trigger TOU Recording** (only accessible for **Operator**) button at the top right.

Click **Export** to save the currently displayed Historical Record data to a .csv file at the default Download folder.

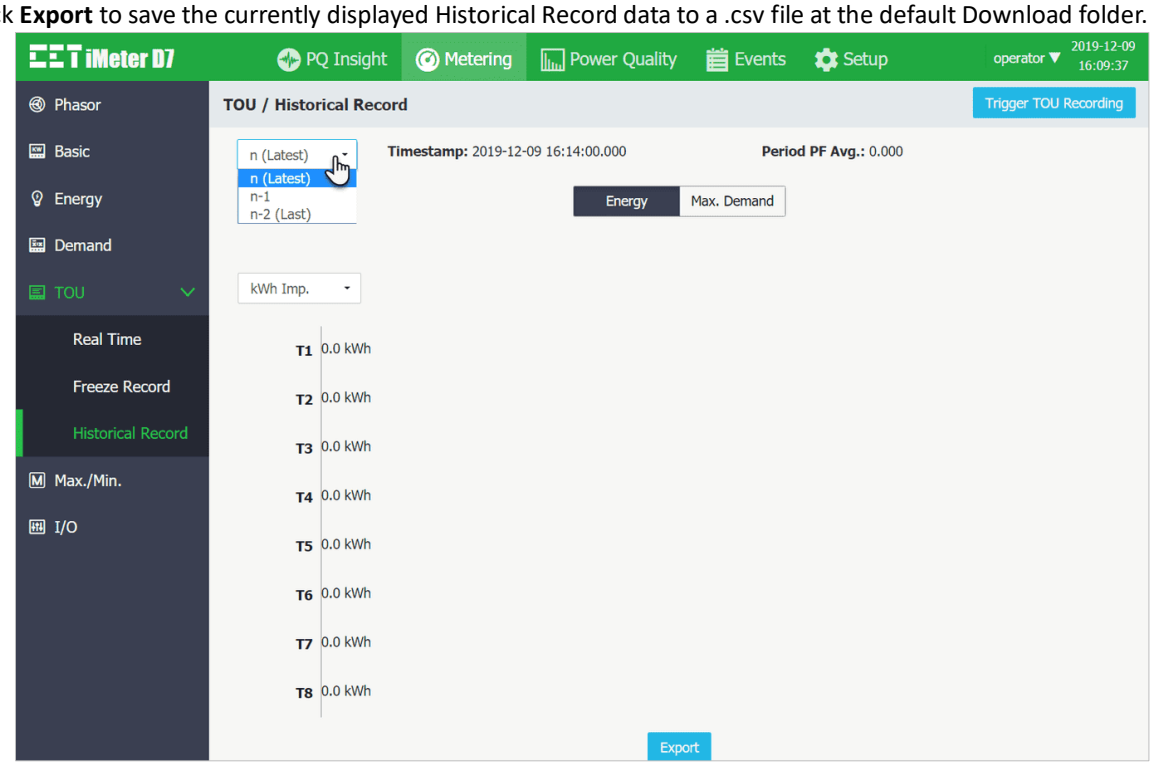


Figure 3-69 Historical TOU Record

3.2.3.2.6 Max./Min.

Click **Max./Min.** on the left-hand pane and the following screen appears which displays the 4 Max./Min. Recorders.

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

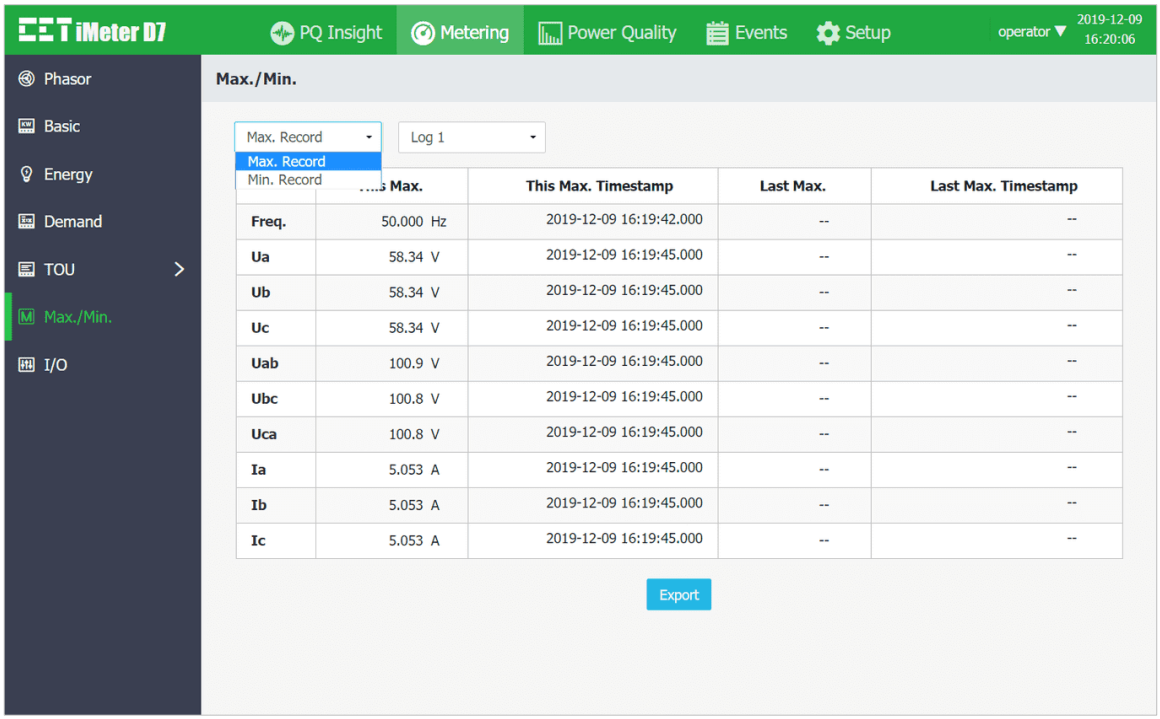


Figure 3-70 Max./Min. Interface

3.2.3.2.7 I/O

Click **I/O** on the left-hand pane and the following screen appears which displays the I/O functions and status.

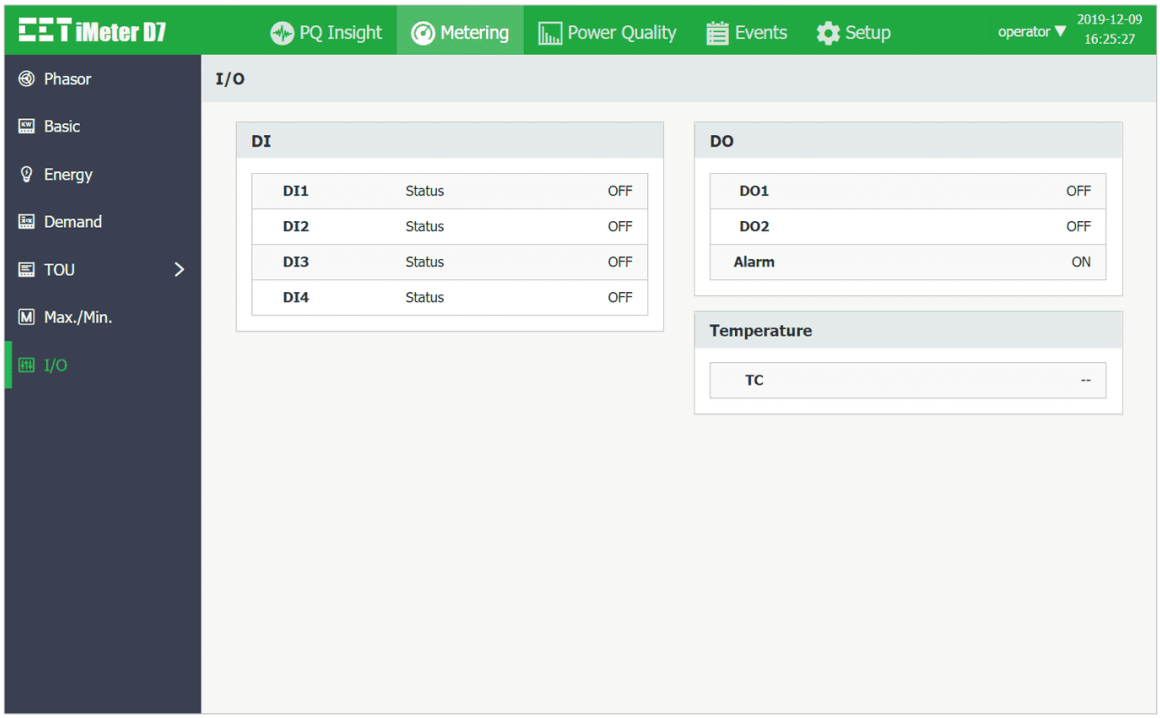


Figure 3-71 I/O Interface

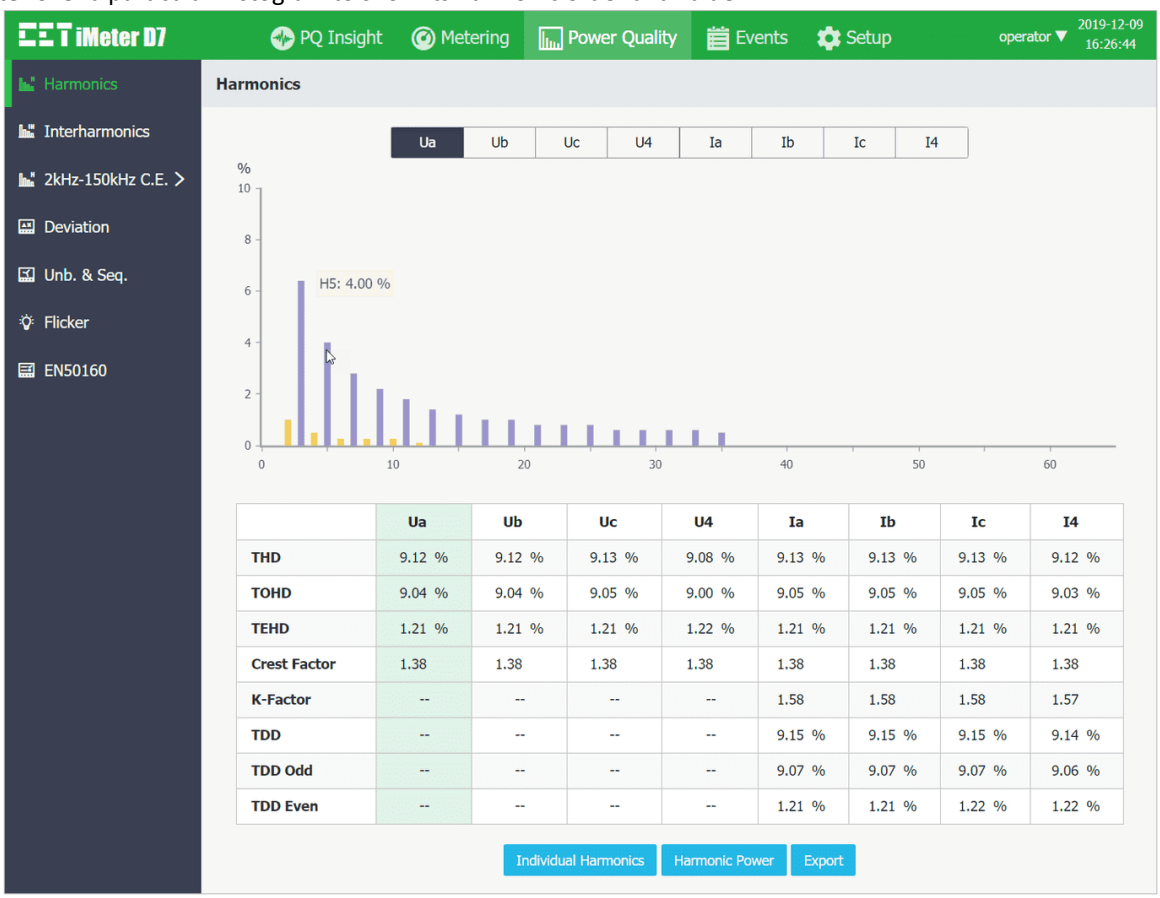
3.2.3.3 Power Quality

Click **Power Quality** at the **Title Bar** and its sub-menu appears on the left-hand pane which includes **Harmonics**, **Interharmonics**, **2 – 150kHz C.E.**, **Deviation**, and **Unb. & Seq.**, **Flicker** and **EN50160**. 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 Spectrum for up to 63rd harmonics and the following parameters: **THD, TOHD, TEHD, Crest Factor, K-Factor, TDD, TDD Odd** and **TDD Even**.

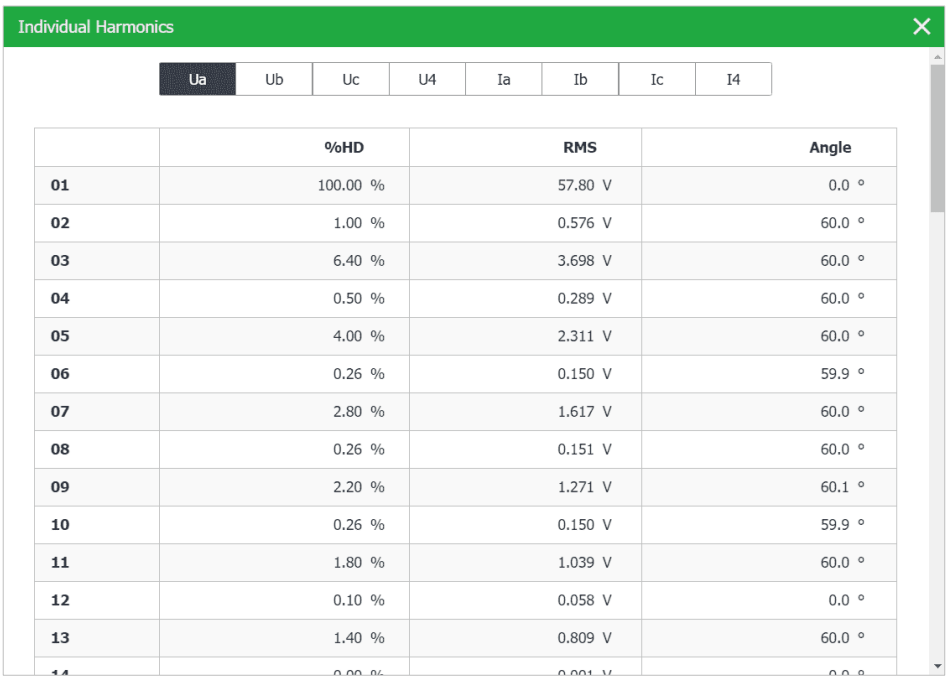
Click **Ua**, **Ub**, **Uc**, **U4**, **Ia**, **Ib**, **Ic** or **I4** at the top of the page to view the respective Harmonics data. Move the mouse pointer over a particular histogram to show its harmonic order and value.



	Ua	Ub	Uc	U4	Ia	Ib	Ic	I4
THD	9.12 %	9.12 %	9.13 %	9.08 %	9.13 %	9.13 %	9.13 %	9.12 %
TOHD	9.04 %	9.04 %	9.05 %	9.00 %	9.05 %	9.05 %	9.05 %	9.03 %
TEHD	1.21 %	1.21 %	1.21 %	1.22 %	1.21 %	1.21 %	1.21 %	1.21 %
Crest Factor	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
K-Factor	--	--	--	--	1.58	1.58	1.58	1.57
TDD	--	--	--	--	9.15 %	9.15 %	9.15 %	9.14 %
TDD Odd	--	--	--	--	9.07 %	9.07 %	9.07 %	9.06 %
TDD Even	--	--	--	--	1.21 %	1.21 %	1.22 %	1.22 %

Figure 3-72 Harmonics

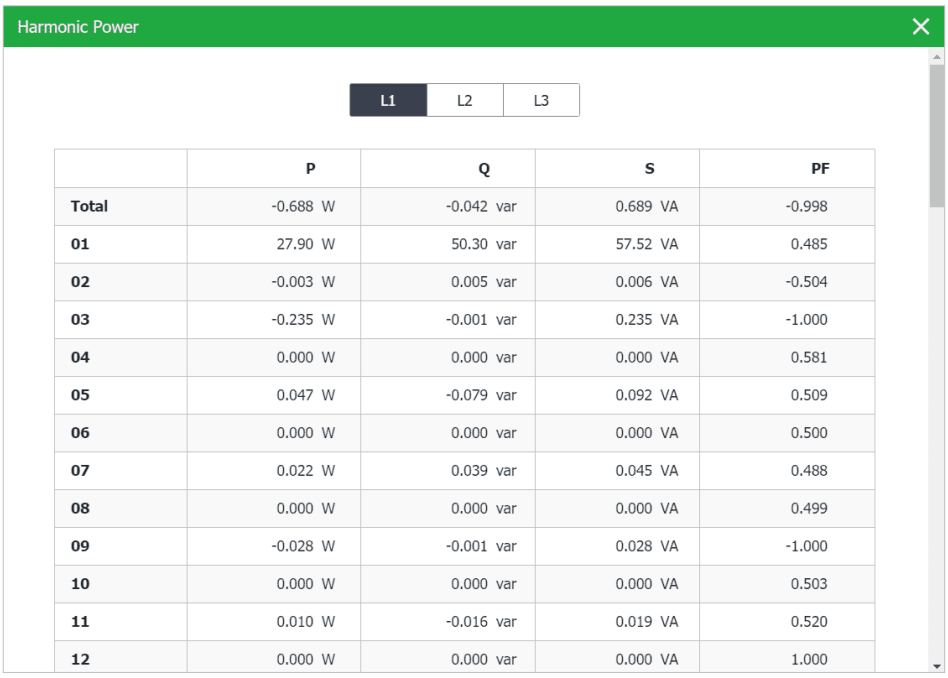
- Click **Individual Harmonics** at the bottom of the page to view the **%HD**, **RMS** and **Angle** for 4Φ Voltages and Currents in a Table format.



	%HD	RMS	Angle
01	100.00 %	57.80 V	0.0 °
02	1.00 %	0.576 V	60.0 °
03	6.40 %	3.698 V	60.0 °
04	0.50 %	0.289 V	60.0 °
05	4.00 %	2.311 V	60.0 °
06	0.26 %	0.150 V	59.9 °
07	2.80 %	1.617 V	60.0 °
08	0.26 %	0.151 V	60.0 °
09	2.20 %	1.271 V	60.1 °
10	0.26 %	0.150 V	59.9 °
11	1.80 %	1.039 V	60.0 °
12	0.10 %	0.058 V	0.0 °
13	1.40 %	0.809 V	60.0 °

Figure 3-73 Individual Harmonics

- Click **Harmonic Power** on the bottom of the page to display the individual harmonic measurement for 3Ø P, Q, S, and PF in Table format.



	P	Q	S	PF
Total	-0.688 W	-0.042 var	0.689 VA	-0.998
01	27.90 W	50.30 var	57.52 VA	0.485
02	-0.003 W	0.005 var	0.006 VA	-0.504
03	-0.235 W	-0.001 var	0.235 VA	-1.000
04	0.000 W	0.000 var	0.000 VA	0.581
05	0.047 W	-0.079 var	0.092 VA	0.509
06	0.000 W	0.000 var	0.000 VA	0.500
07	0.022 W	0.039 var	0.045 VA	0.488
08	0.000 W	0.000 var	0.000 VA	0.499
09	-0.028 W	-0.001 var	0.028 VA	-1.000
10	0.000 W	0.000 var	0.000 VA	0.503
11	0.010 W	-0.016 var	0.019 VA	0.520
12	0.000 W	0.000 var	0.000 VA	1.000

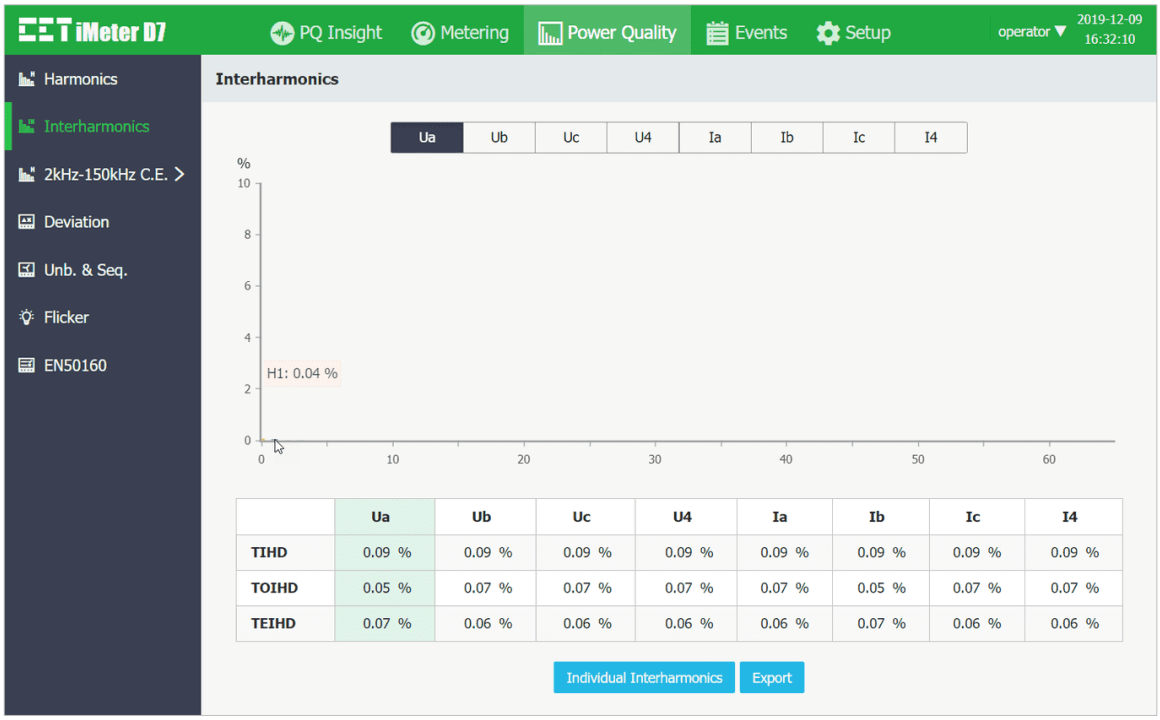
Figure 3-74 Harmonic Power

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

3.2.3.3.2 Interharmonics

Click **Interharmonics** on the left-hand pane and the following screen appears which displays the Spectrum for up to 63rd Interharmonics and **TIHD**, **TOIHD** and **TEIHD** for 4Φ Voltages and Currents.

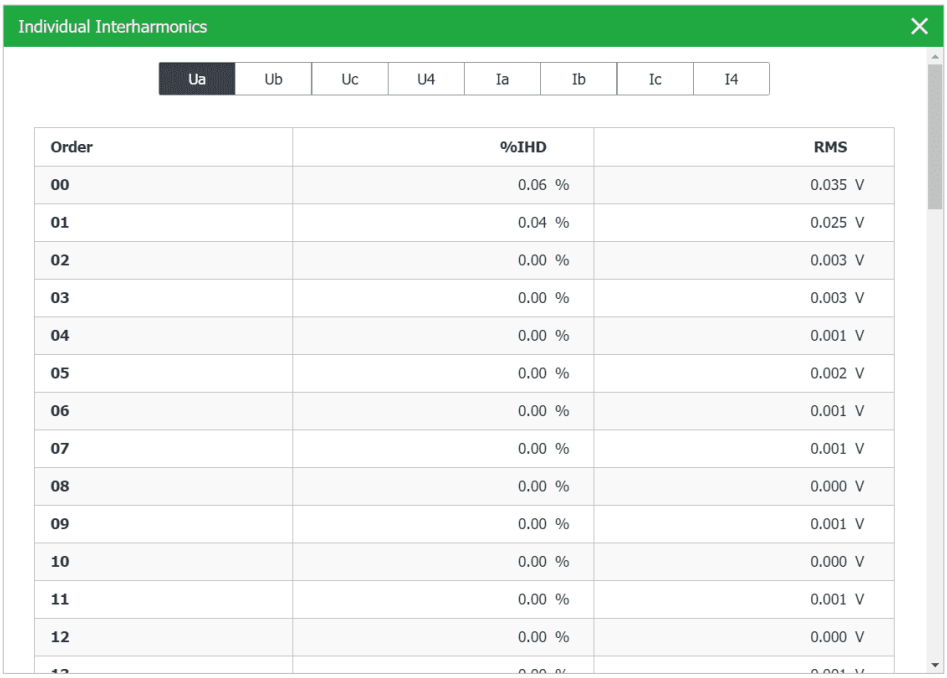
Move the mouse pointer over a particular histogram to shows its interharmonic order and value.



	Ua	Ub	Uc	U4	Ia	Ib	Ic	I4
TIHD	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %
TOIHD	0.05 %	0.07 %	0.07 %	0.07 %	0.07 %	0.05 %	0.07 %	0.07 %
TEIHD	0.07 %	0.06 %	0.06 %	0.06 %	0.06 %	0.07 %	0.06 %	0.06 %

Figure 3-75 Interharmonics

Click **Individual Interharmonics** at the bottom of the page to view the %IHD and RMS for 4Φ Voltages and Currents in a Table format.



Order	%IHD	RMS
00	0.06 %	0.035 V
01	0.04 %	0.025 V
02	0.00 %	0.003 V
03	0.00 %	0.003 V
04	0.00 %	0.001 V
05	0.00 %	0.002 V
06	0.00 %	0.001 V
07	0.00 %	0.001 V
08	0.00 %	0.000 V
09	0.00 %	0.001 V
10	0.00 %	0.000 V
11	0.00 %	0.001 V
12	0.00 %	0.000 V

Figure 3-76 Individual Interharmonics

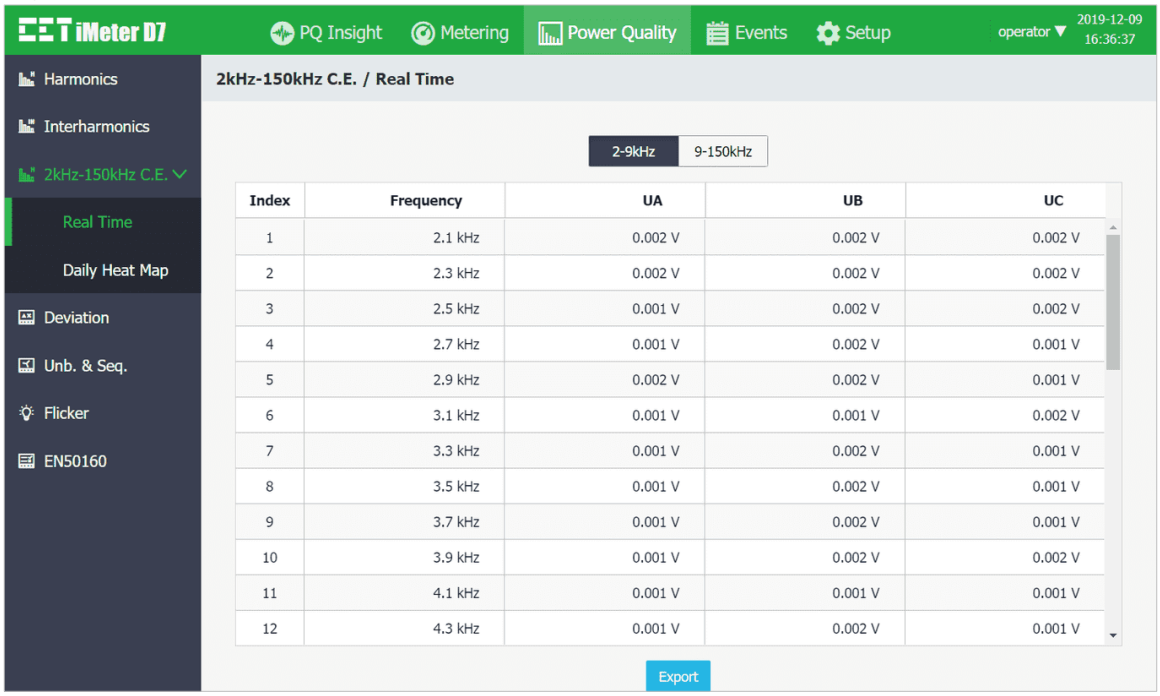
Click **Export** to export all the Interharmonic data to a .csv file at the default Download folder.

3.2.3.3.3 2 – 150kHz C.E.

Click **2 – 150kHz C.E.** on the left-hand pane to view the **Real Time** and **Daily Heat Map** for 3Φ U_{rms} Conducted Emissions. For more information, please refer to **Section 4.4.13** .

3.2.3.3.3.1 Real Time

Display the U_{rms} C.E. with a resolution @ 3s in the frequency band of 2 – 9kHz and 9kHz – 150kHz.
Click **Export** to save the real time data to a .csv file at the default Download folder.

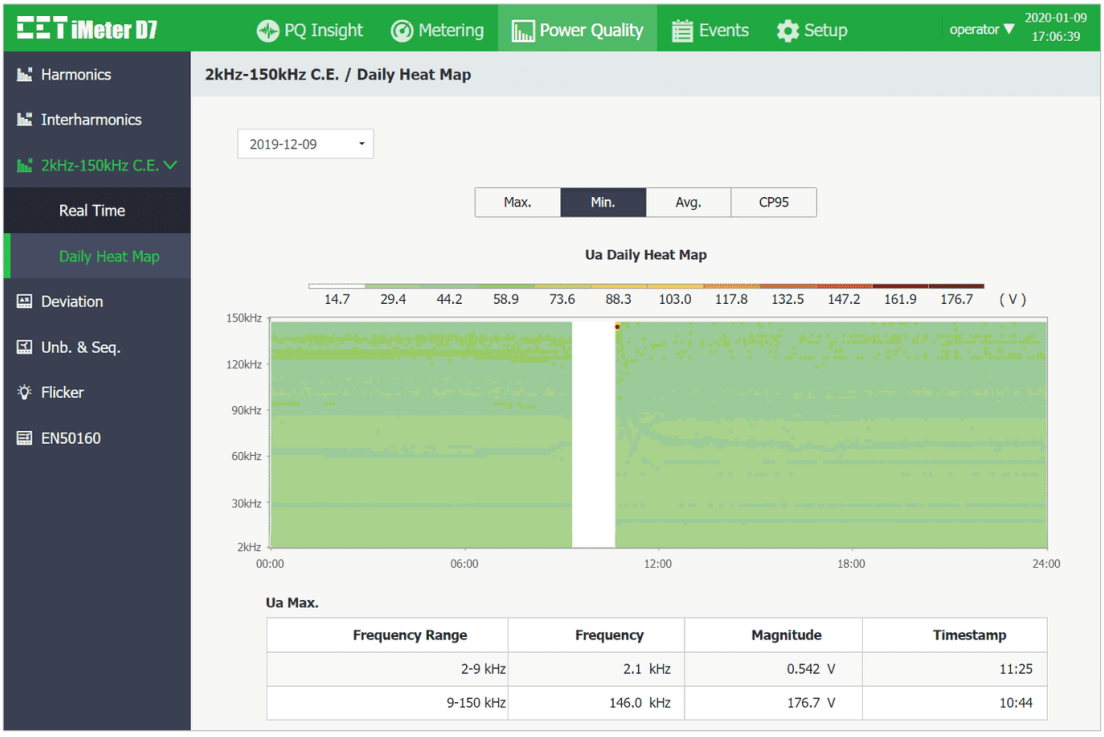


Index	Frequency	UA	UB	UC
1	2.1 kHz	0.002 V	0.002 V	0.002 V
2	2.3 kHz	0.002 V	0.002 V	0.002 V
3	2.5 kHz	0.001 V	0.002 V	0.002 V
4	2.7 kHz	0.001 V	0.002 V	0.001 V
5	2.9 kHz	0.002 V	0.002 V	0.001 V
6	3.1 kHz	0.001 V	0.001 V	0.002 V
7	3.3 kHz	0.001 V	0.002 V	0.001 V
8	3.5 kHz	0.001 V	0.002 V	0.001 V
9	3.7 kHz	0.001 V	0.002 V	0.001 V
10	3.9 kHz	0.001 V	0.002 V	0.002 V
11	4.1 kHz	0.001 V	0.001 V	0.001 V
12	4.3 kHz	0.001 V	0.002 V	0.001 V

Figure 3-77 2 – 150 kHz Real Time Conducted Emissions

3.2.3.3.3.2 Daily Heat Map

Display the Daily Heat Map and the 3-Φ Peak values for the Max./Min./Average/CP95 of U_{rms} with timestamp in a specific day.
Click **Export** to save the currently displayed Peak value and 24-hour C.E. with an interval of 1-minute to a.csv file at the default Download folder.



Ua Max.

Frequency Range	Frequency	Magnitude	Timestamp
2-9 kHz	2.1 kHz	0.542 V	11:25
9-150 kHz	146.0 kHz	176.7 V	10:44

Figure 3-78 Daily Heat Map – Peak value for Min. Ua

3.2.3.3.4 Deviation

Click **Deviation** on the left-hand pane to display the Over/Under Deviation for 3Φ Uln and Ull as well as the Frequency Deviation.

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

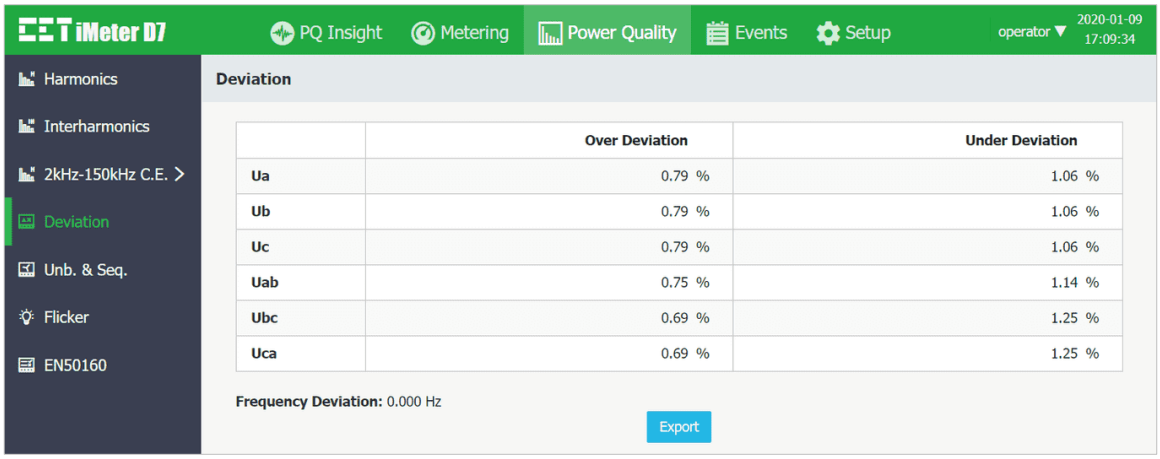


Figure 3-79 Deviation

3.2.3.3.5 Unb. & Seq.

Click **Unb. & Seq.** to display the Negative/Zero Sequence Unbalance as well as the Positive, Negative and Zero Sequence measurements for Voltage and Current.

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

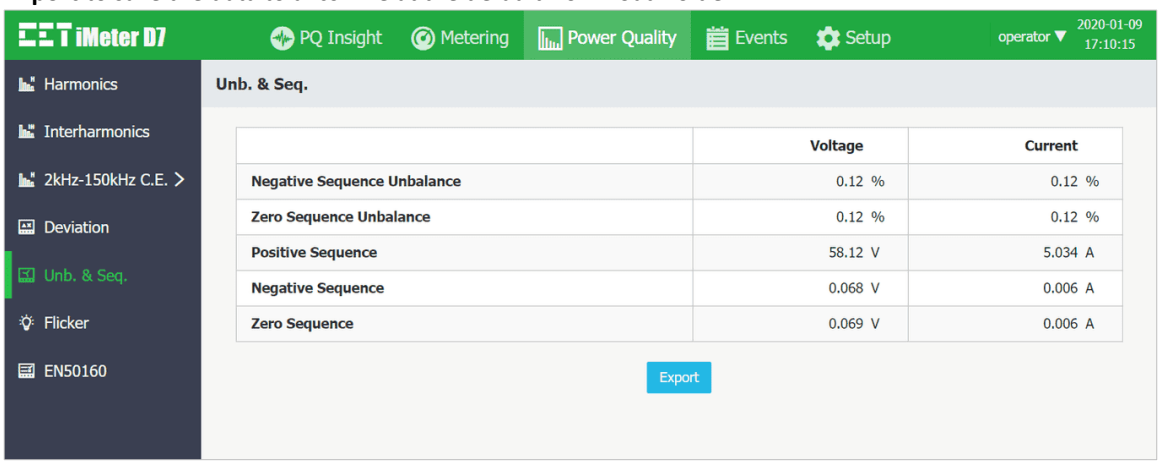


Figure 3-80 Unbalances & Sequences Interface

3.2.3.3.6 Flicker

Click **Flicker** on the left-hand pane to display the **Pst/Plt** measurements for 3Φ Voltages.

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

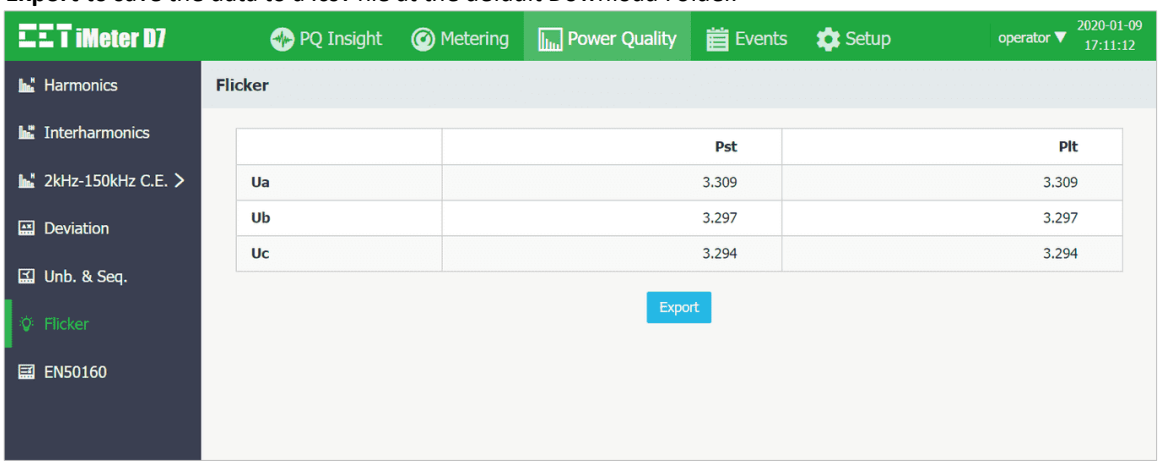


Figure 3-81 Flicker

3.2.3.3.7 EN50160

Click **EN50160** on the left-hand pane and the following screen appears. Click on the drop-down list on the top left to select the period for the desired EN50160 Summary Report. As shown in Figure 3-82, ✓ denotes the positive evaluation while ✗ denotes the negative evaluation for the parameter. Click on a particular parameter to view the report details. Click **Export** to download the en50160Report.xls file for the currently selected period.

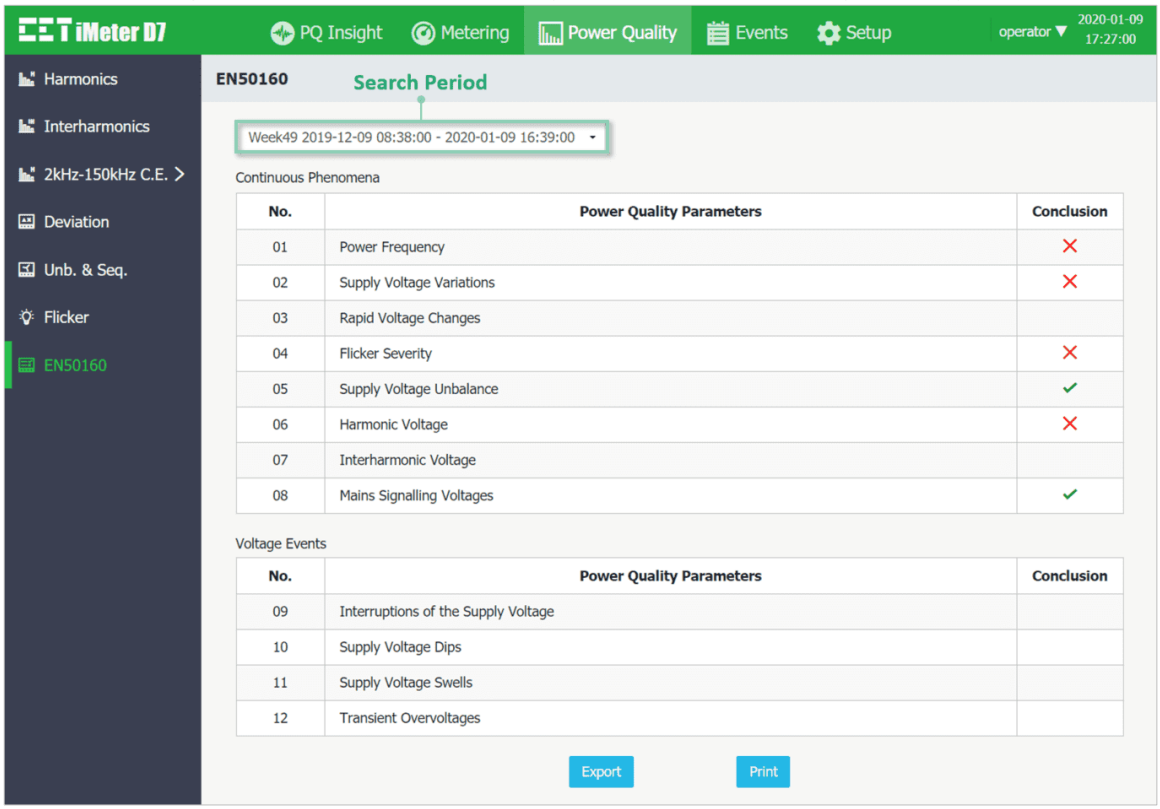


Figure 3-82 EN50160 Summary

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

- **Power Frequency**

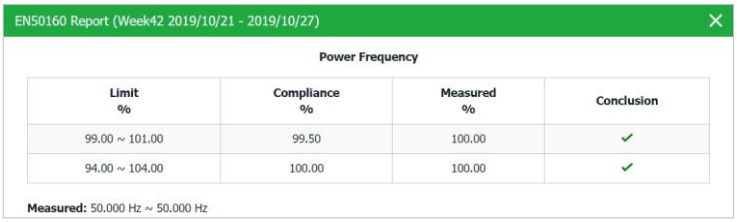


Figure 3-83 Power Frequency

- **Supply Voltage Variations**

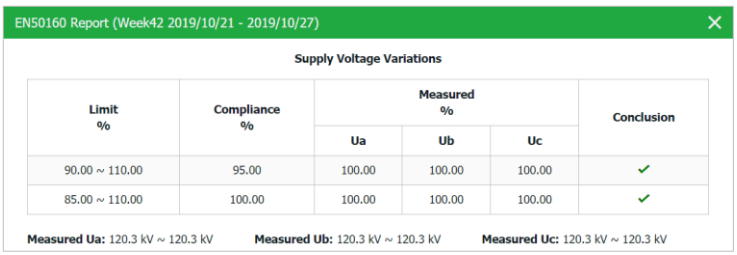


Figure 3-84 Supply Voltage Variations

- **Rapid Voltage Changes**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Rapid Voltage Changes

Ua Count	Ub Count	Uc Count
0	0	0

Figure 3-85 Rapid Voltage Changes

- **Flicker Severity**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Flicker Severity

Limit	Compliance %	Measured %			Conclusion
		Ua	Ub	Uc	
Plt ≤ 1.000	95.00	0.00	0.00	0.00	✗

Measured Ua Plt: 3.308 ~ 3.310 **Measured Ub Plt:** 3.298 ~ 3.300 **Measured Uc Plt:** 3.293 ~ 3.296

Figure 3-86 Flicker Severity

- **Supply Voltage Unbalance**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Supply Voltage Unbalance

Limit %	Compliance %	Measured %	Conclusion
2.00	95.00	100.00	✓

Measured U2 Unbalance: 0.12 % ~ 0.12 %

Figure 3-87 Supply Voltage Unbalance

- **Harmonic Voltage**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Harmonic Voltage

Order h	Limit %	CP95 %			Compliance %	Measured %			Conclusion
		Ua	Ub	Uc		Ua	Ub	Uc	
THD	8.00	9.13	9.13	9.13	95.00	0.00	0.00	0.00	✗
Odd Harmonics (Not Multiples of 3)									
H05	6.00	4.00	4.00	4.00	95.00	100.00	100.00	100.00	✓
H07	5.00	2.80	2.80	2.80	95.00	100.00	100.00	100.00	✓
H11	3.50	1.80	1.80	1.80	95.00	100.00	100.00	100.00	✓
H13	3.00	1.40	1.40	1.40	95.00	100.00	100.00	100.00	✓
H17	2.00	1.00	1.00	1.00	95.00	100.00	100.00	100.00	✓
H19	1.50	1.00	1.00	1.00	95.00	100.00	100.00	100.00	✓
H23	1.50	0.80	0.80	0.80	95.00	100.00	100.00	100.00	✓
H25	1.50	0.80	0.80	0.80	95.00	100.00	100.00	100.00	✓
Odd Harmonics (Multiples of 3)									
H03	5.00	6.40	6.40	6.40	95.00	0.00	0.00	0.00	✗
H09	1.50	2.20	2.20	2.20	95.00	0.00	0.00	0.00	✗
H15	0.50	1.20	1.20	1.20	95.00	0.00	0.00	0.00	✗
H21	0.50	0.80	0.80	0.80	95.00	0.00	0.00	0.00	✗
Even Harmonic									
H02	2.00	1.00	1.00	1.00	95.00	100.00	100.00	100.00	✓
H04	1.00	0.50	0.50	0.50	95.00	100.00	100.00	100.00	✓
H06	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H08	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H10	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H12	0.50	0.10	0.10	0.10	95.00	100.00	100.00	100.00	✓
H14	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H16	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H18	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H20	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H22	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H24	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓

Figure 3-88 Harmonic Voltages

- **Interharmonic Voltage**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Interharmonic Voltage

Order h	Avg. %			CP95 %			Max. %		
	Ua	Ub	Uc	Ua	Ub	Uc	Ua	Ub	Uc
TIHD	0.07	0.07	0.07	0.09	0.09	0.09	0.09	0.09	0.09
IH01	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
IH02	0.01	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02
IH03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
IH04	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
IH05	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
IH06	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
IH07	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
IH08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
IH09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
IH10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 3-89 Interharmonic Voltage

- **Mains Signalling Voltages**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Mains Signalling Voltages

Signalling Frequency Hz	Limit %	Compliance %	Measured %			Conclusion
			Ua	Ub	Uc	
1,000.0	5.00	99.00	100.00	100.00	100.00	✓
2,000.0	5.00	99.00	100.00	100.00	100.00	✓
3,000.0	5.00	99.00	100.00	100.00	100.00	✓

Figure 3-90 Mains Signalling Voltages

- **Interruptions of the Supply Voltage**

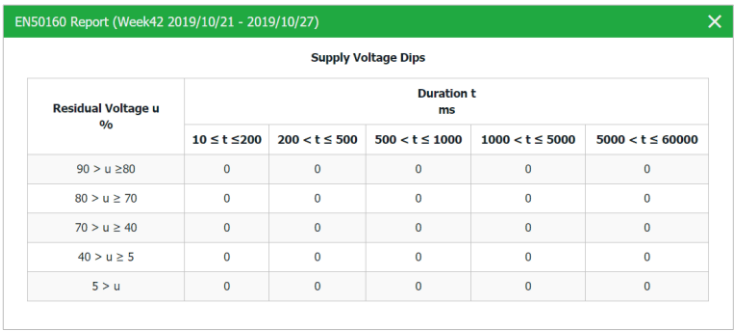
EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Interruptions of the Supply Voltage

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

Figure 3-91 Interruptions of the Supply Voltage

- **Supply Voltage Dips**

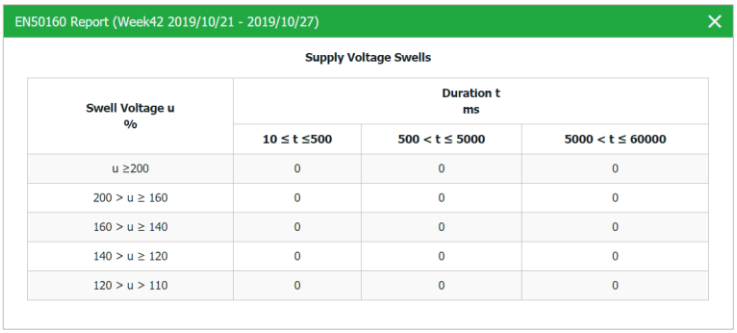

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Supply Voltage Dips

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

Figure 3-92 Supply Voltage Dips

- **Supply Voltage Swells**

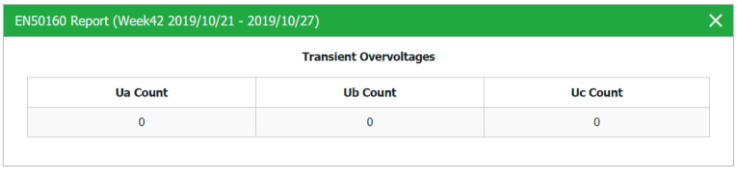

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Supply Voltage Swells

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

Figure 3-93 Supply Voltage Swells

- **Transient Overvoltages**

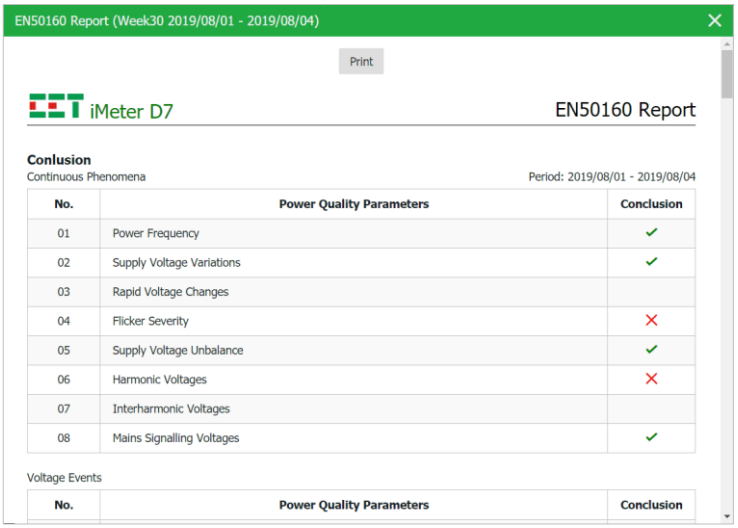

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Transient Overvoltages

Ua Count	Ub Count	Uc Count
0	0	0

Figure 3-94 Transient Overvoltages

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


EN50160 Report (Week30 2019/08/01 - 2019/08/04)

Print

iMeter D7 EN50160 Report

Conlusion

Continuous Phenomena Period: 2019/08/01 - 2019/08/04

No.	Power Quality Parameters	Conclusion
01	Power Frequency	✓
02	Supply Voltage Variations	✓
03	Rapid Voltage Changes	
04	Flicker Severity	✗
05	Supply Voltage Unbalance	✓
06	Harmonic Voltages	✗
07	Interharmonic Voltages	
08	Mains Signalling Voltages	✓

Voltage Events

No.	Power Quality Parameters	Conclusion

Figure 3-95 Preview for Printing EN50160 Report

3.2.3.4 Events

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

3.2.3.4.1 SOE Log

Click **SOE Log** on the left-hand pane to display the SOE events on the right-hand pane starting with the most recent event.

The interface supports the following filtering mechanism.

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 Dip/Swell, Transient, RVC, MSV, Inrush Current, Setpoint, I/O, Manual Trigger WFR.

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

Click on a specific event to display the event details.

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

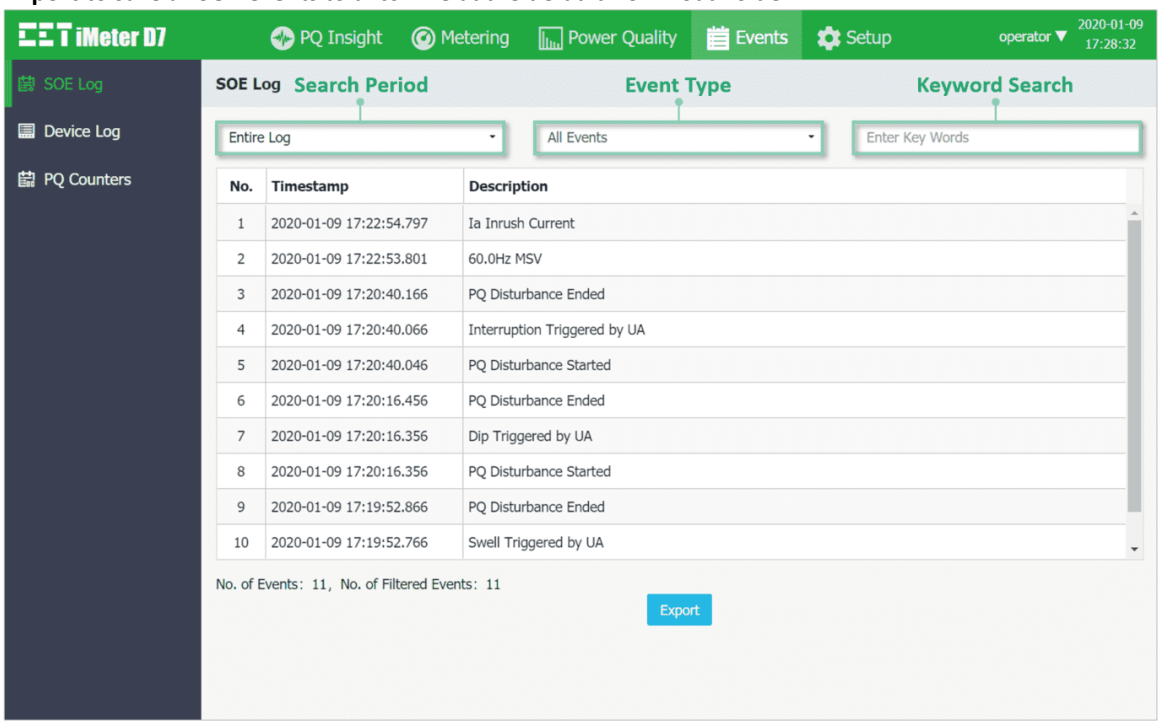


Figure 3-96 SOE Log Interface

Here are several examples for SOE Log details:

1) DO1 Closed:

Figure 3-97 DO1 Operated by Setpoint

2) DO1 Open:

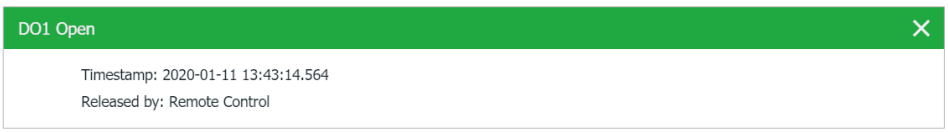


Figure 3-98 DO1 Released by Remote Control

3) PQ Disturbance Started (Interruption triggered by UA)

Figure 3-99 PQ Disturbance Started (Interruption triggered by UA)

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.

The 3Φ voltages and currents will display at where the mouse moves over on the waveform.

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

4) When a PQ Setpoint is configured to trigger WFR (Waveform Recorder) or DWR (Disturbance Waveform Recorder), the Recorded Swell events will have the option of showing the ITIC plot while the Dip/Interruptions events will have the option of showing both the ITIC and SEMI F47 plots, along with the WFR/DWR waveform.

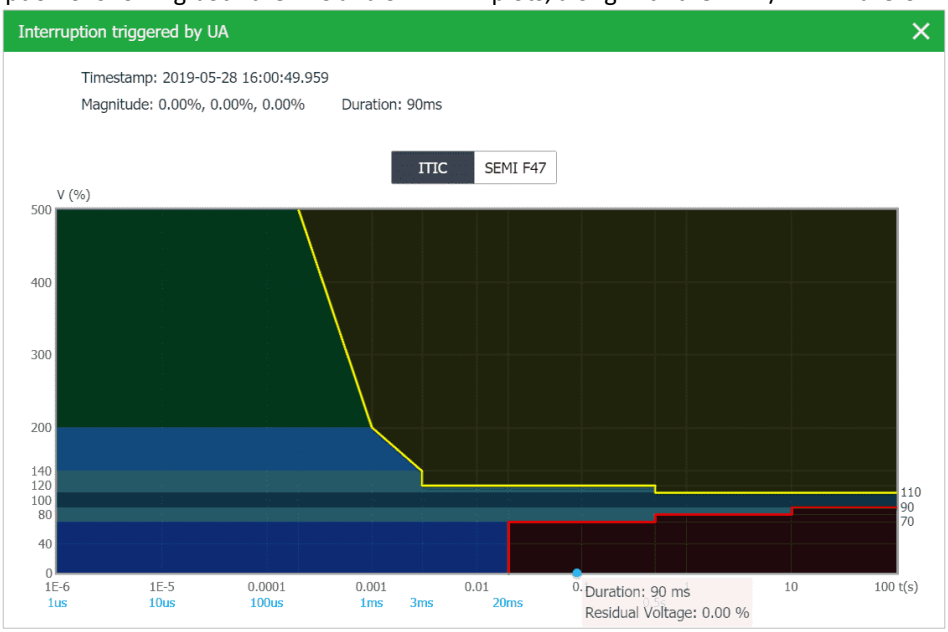


Figure 3-100 Interruption on ITIC Interface

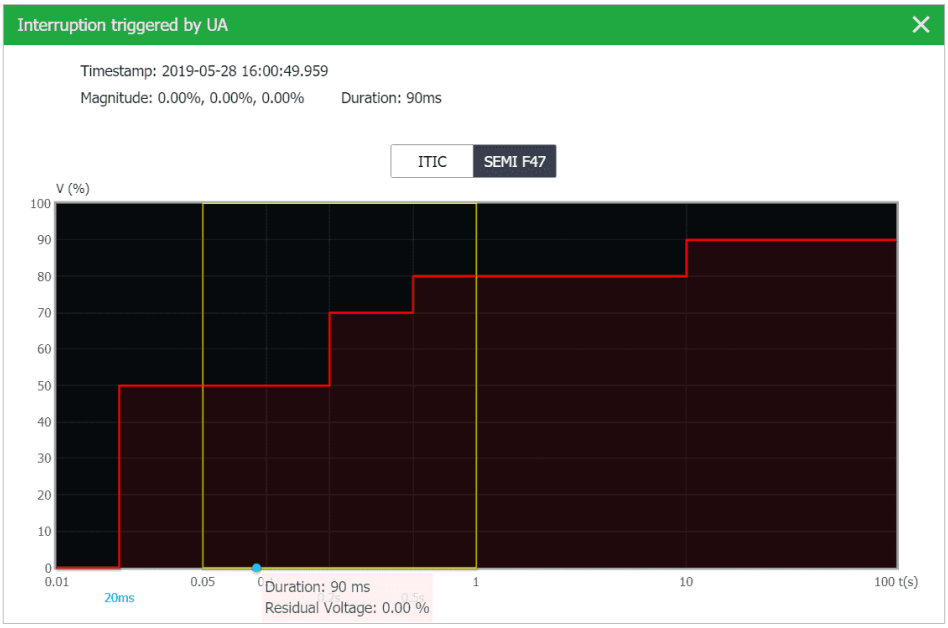


Figure 3-101 Interruption on SEMI F47 Interface

3.2.3.4.2 Device Log

Click **Device Log** on the left-hand pane to display the Device Log on the right-hand pane starting with the most recent events.

Also, the interface supports the following filtering mechanism**.**

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

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

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

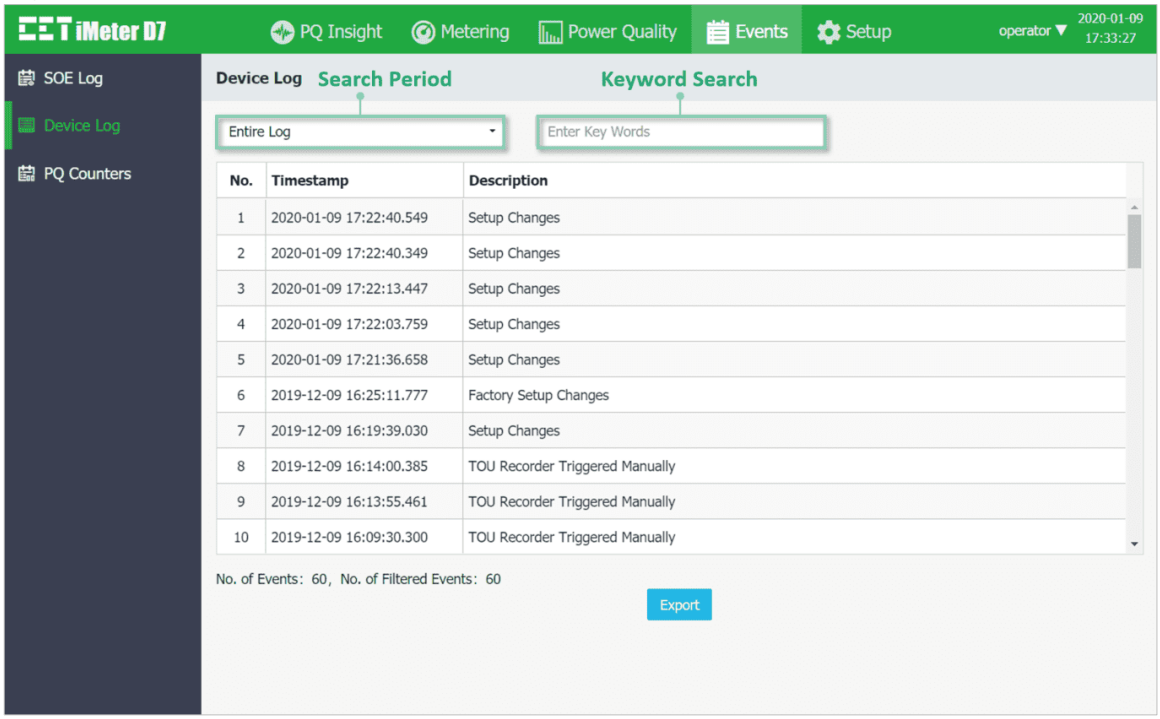


Figure 3-102 Device Log

3.2.3.4.3 PQ Counters

Click **PQ Counters** on the left-hand pane to display the different PQ Counters such as **Dips**, **Swells**, **Interruptions**, **Transients**, **RVC**, **Inrush Current**, and **MSV** on the right-hand pane.

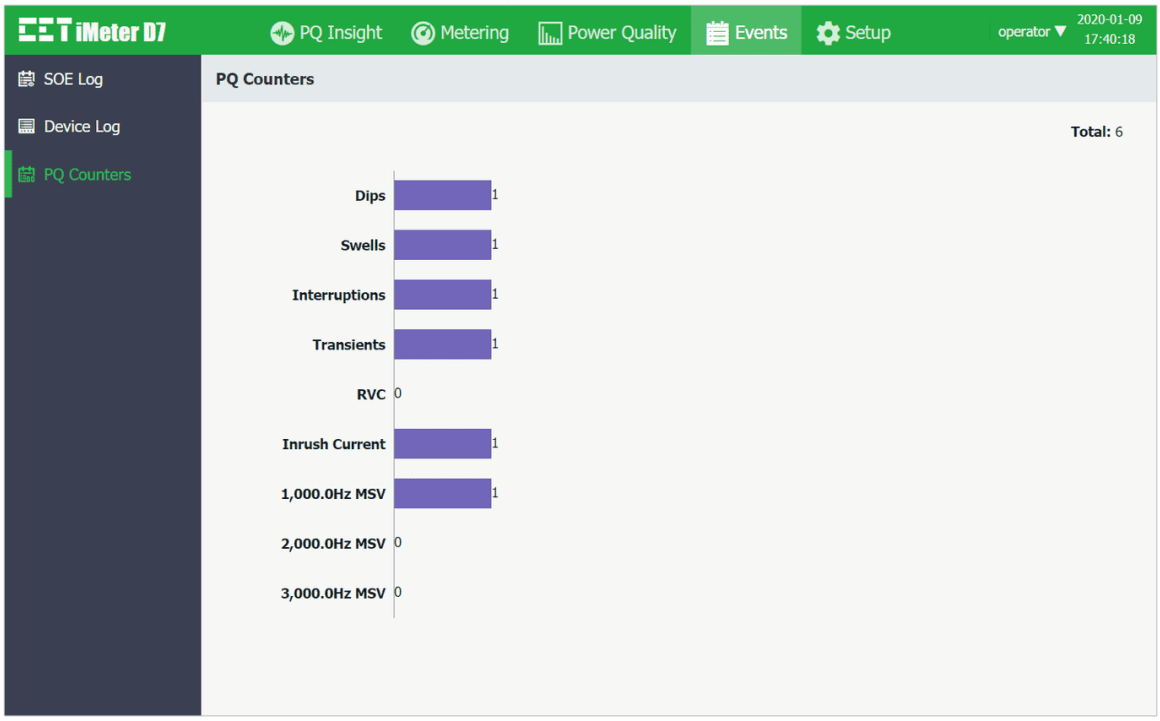


Figure 3-103 PQ Counters

3.2.3.5 Setup

Click **Setup** at the **Title Bar** and the web server displays the Setup Wizard to guide users to setup the meter quickly.

3.2.3.5.1 Quick Setup

- **Start**. The user may select **Manual** to setup the meter step-by-step and then click **Next** or choose **Import Template** to restore a previously saved configuration.

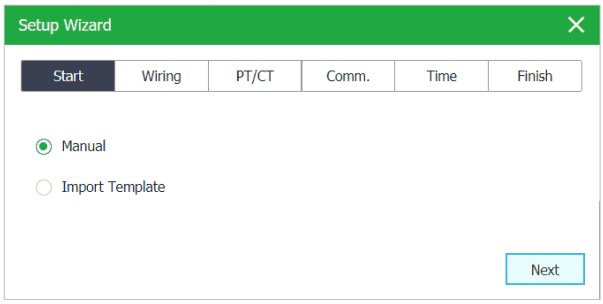


Figure 3-104 Start

- **Wiring**. Please refer to **Section 2.7** to set the wiring mode.

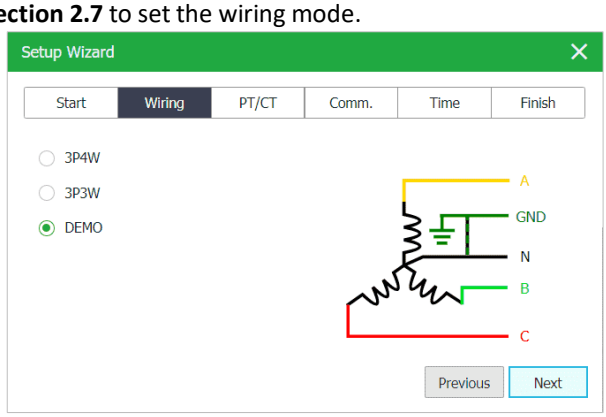


Figure 3-105 Wiring

- **PT/CT**. Please refer to Table 3-5 Basic Parameters for more information.

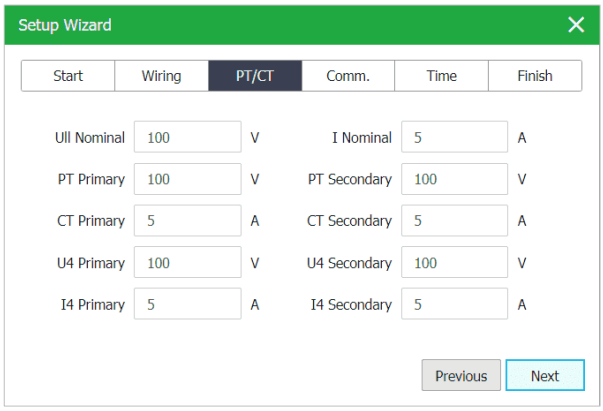


Figure 3-106 PT/CT

- **Comm.** Please refer to **Table 5-51** for more information.

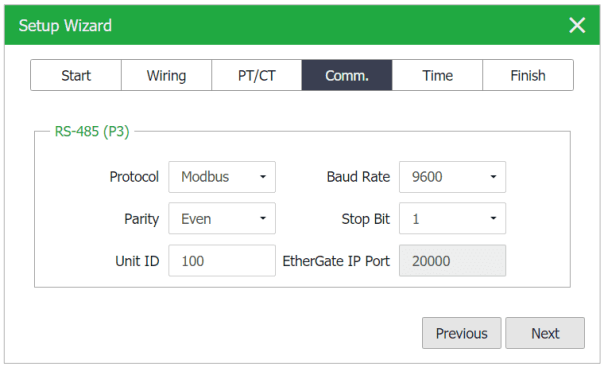


Figure 3-107 Comm.

- **Time**. This step provides two methods to set time: manual configuration or synchronization with PC.

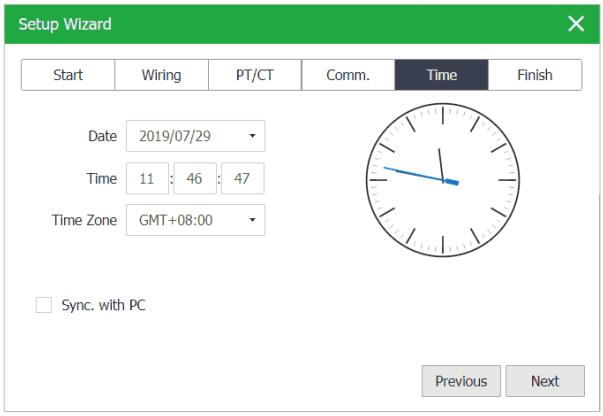


Figure 3-108 Time

- **Finish**. Click **Previous** to return to the previous pages or **Finish** to apply the changes and exit the wizard.

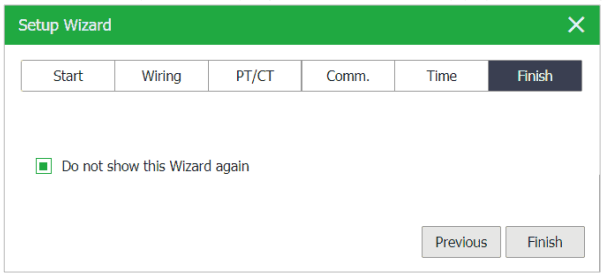


Figure 3-109 Finish

The following sections describe the **Setup** sub-menus which include **Basic**, **PQ**, **Dmd. & Energy**, **Record**, **Setpoint**, **I/O**, **HMI**, **Others** and **Diagnostics**.

3.2.3.5.2 Basic

Click **Basic** on the left-hand pane and the following screen appears which has the following options: **Basic**, **IP**, **Comm.**, **VPN**, **Time**, **Cloud** and **Others**.

3.2.3.5.2.1 Basic > Basic Settings

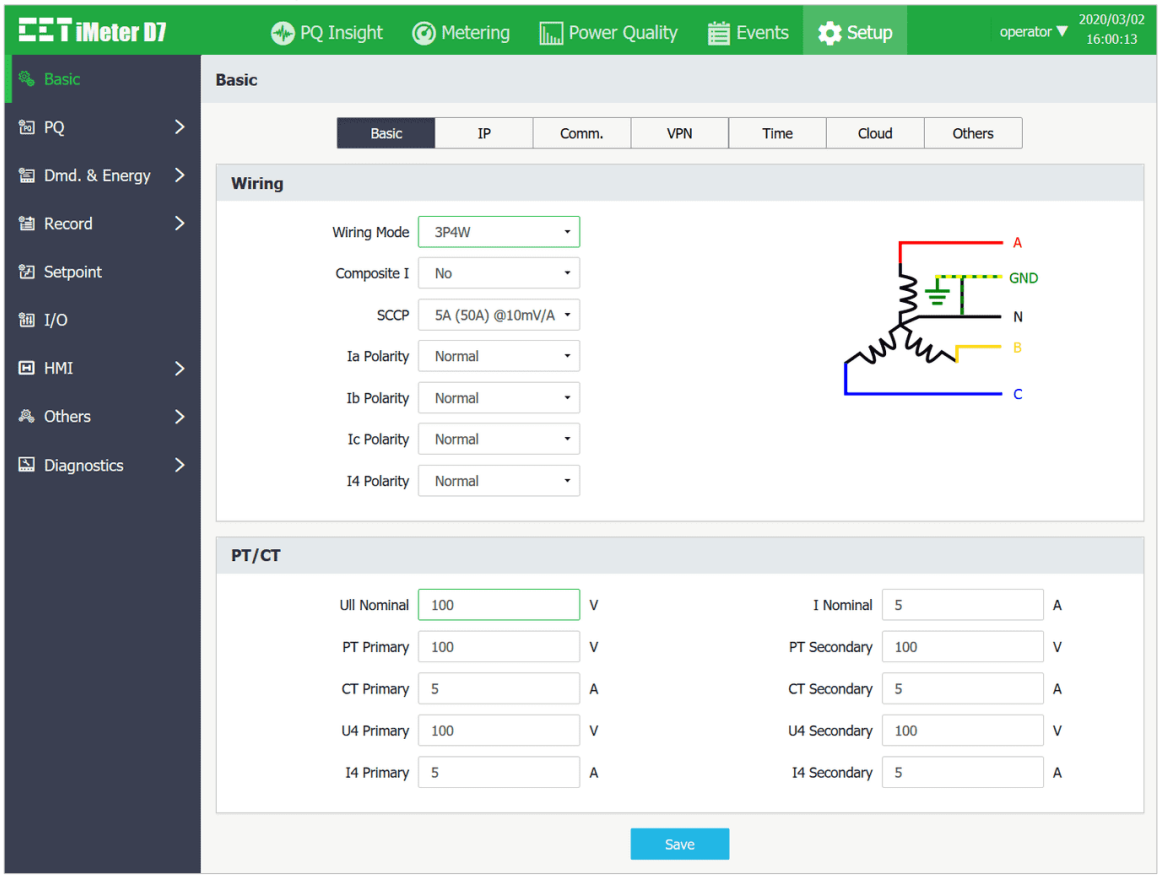


Figure 3-110 Basic Settings Interface

The following table illustrates the ranges and default values for the basic parameters.

Parameter	Range/Default*	Parameter	Range/Default*
Wiring		PT/CT	
Wiring Mode	3P4W*, 3P3W, DEMO	Ull Nominal	1 to 1500V, 100V*
Composite I	No*/Ia/Ib/Ic	I Nominal	1 to 1000A, 5A*
SCCP	5A (50A) @10mV/A*, 20A @ 10mV/A, 200A @ 1mV/A, 500A @ 1mV/A, 500A (550A) @ 1mV/A, 5kA @ 0.1 mV/A	PT Primary	1 to 1000000V, 100V*
		PT Secondary	1 to 1500V, 100V*
		CT Primary	1 to 30000A, 5A*
		CT Secondary	1 to 50A, 5A*
Ia/Ib/Ic/I4 Polarity	Ia Normal*/Reverse, Ib Normal*/Reverse, Ic Normal*/Reverse, I4 Normal*/Reverse	U4 Primary	1 to 1000000V, 100V*
		U4 Secondary	1 to 1500V, 100V*
		I4 Primary	1 to 30000A, 5A*
		I4 Secondary	1 to 50A, 5A*

Table 3-5 Basic Parameters

Click on the wiring graphic on the right-hand side to set the **Channels Color** as shown below:

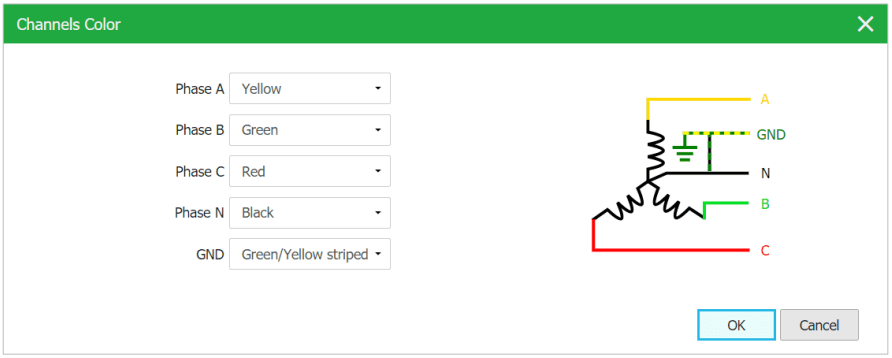


Figure 3-111 Channels Color Settings

3.2.3.5.2.2 Basic > IP

The iMeter D7 comes standard with two Ethernet ports (P1/P2).

- **Ethernet (P1/P2)**
  The IP address settings for P1/P2 should be in different network segments. Please refer to **Section 2.8.1** for the connection under different **Ethernet Mode**.

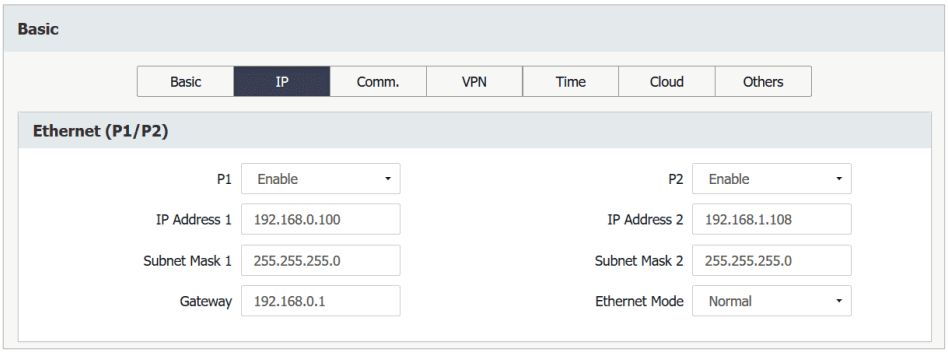


Figure 3-112 Ethernet Settings Interface

- **Static Routing (Restart Required)**
  Please refer to **Section 4.15** for more information.

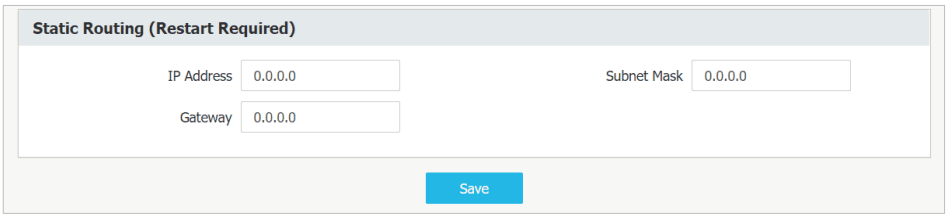


Figure 3-113 Static Routing Settings

3.2.3.5.2.3 Basic > Comm.

- **DNS**

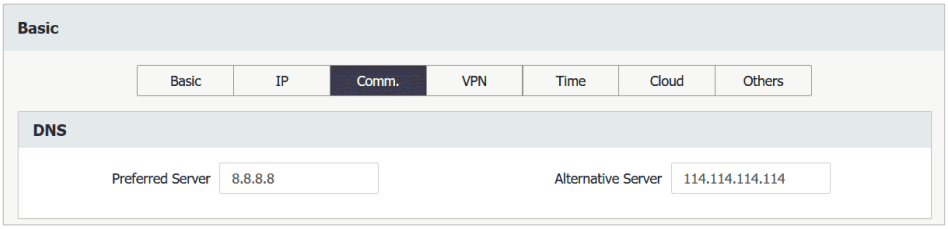


Figure 3-114 DNS Settings

- **RS-485 (P3)**

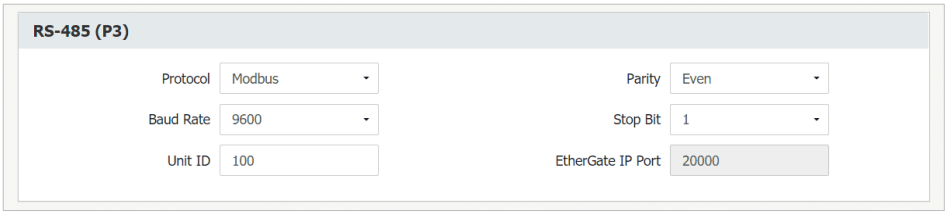


Figure 3-115 RS-485 Settings

- **4G Parameters (Restart Required)** Please refer to **Section 4.12** for more information.

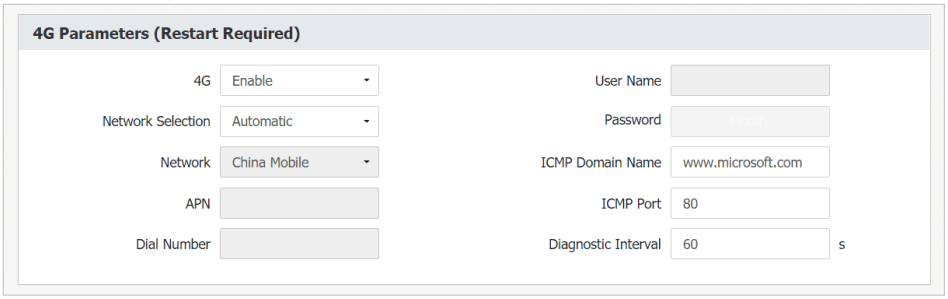


Figure 3-116 4G Parameters

- **White List**

  The **White List** is used for controlling access of specific clients in the LAN. The clients out of the White List are forbidden to log into the on-board Web server and FTP server. The iMeter D7 supports up to 10 devices access the meter with White List enabled.

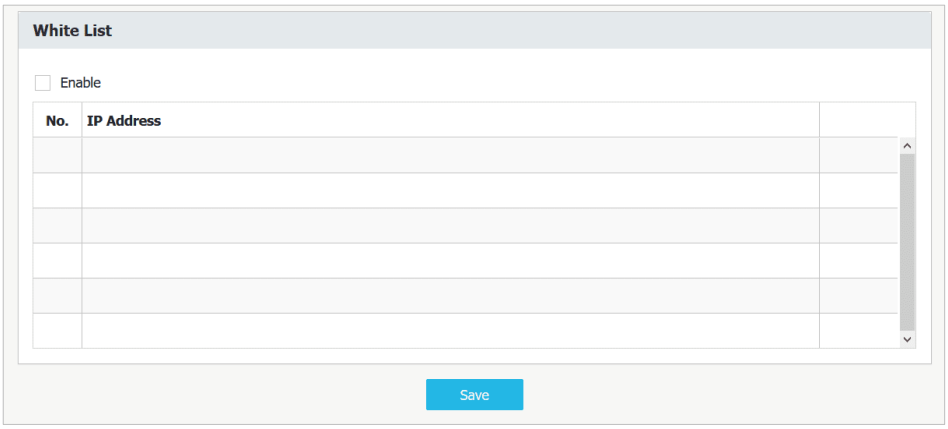


Figure 3-117 White List Settings

3.2.3.5.2.4 Basic > VPN

For more information, please refer to **Section 4.12**.

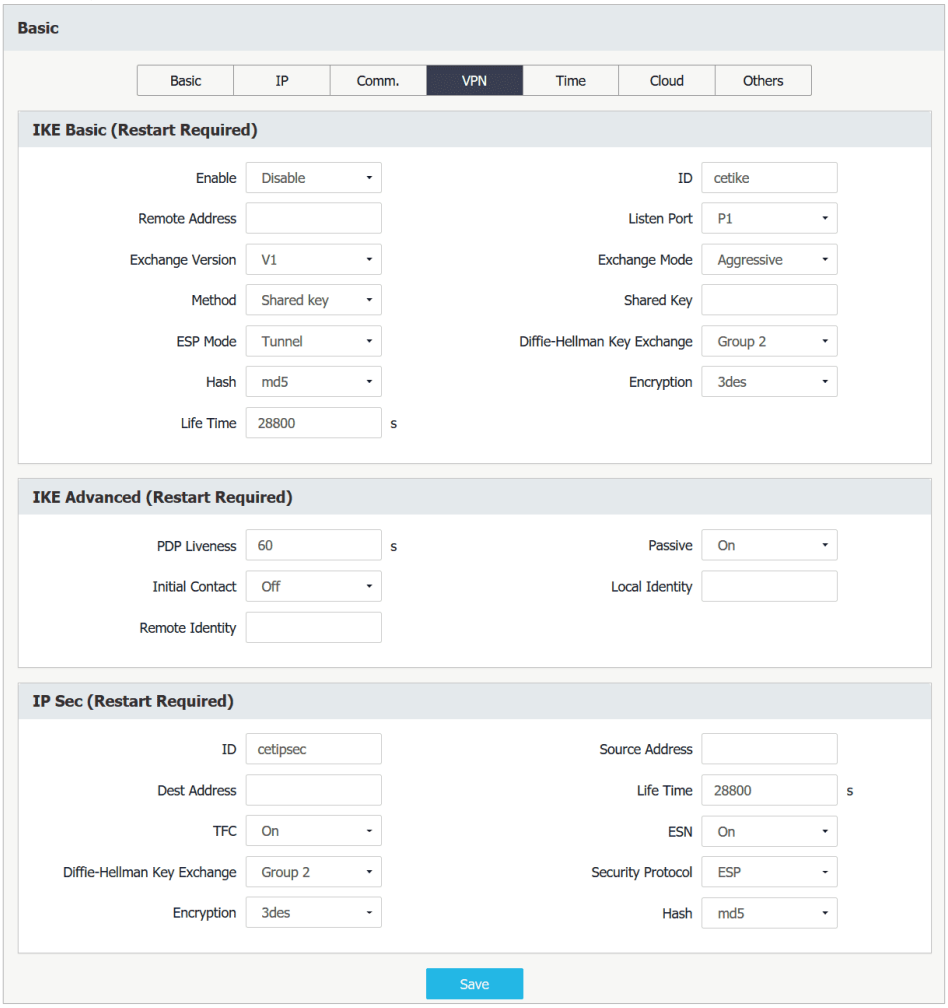


Figure 3-118 VPN Settings Interface

3.2.3.5.2.5 Basic >Time

This web page shows two areas: **Date** and **Time Sync**. Under unsynchronized status, the date and time can be updated manually or synchronized with a local PC by checking on box **Sync. with PC**.

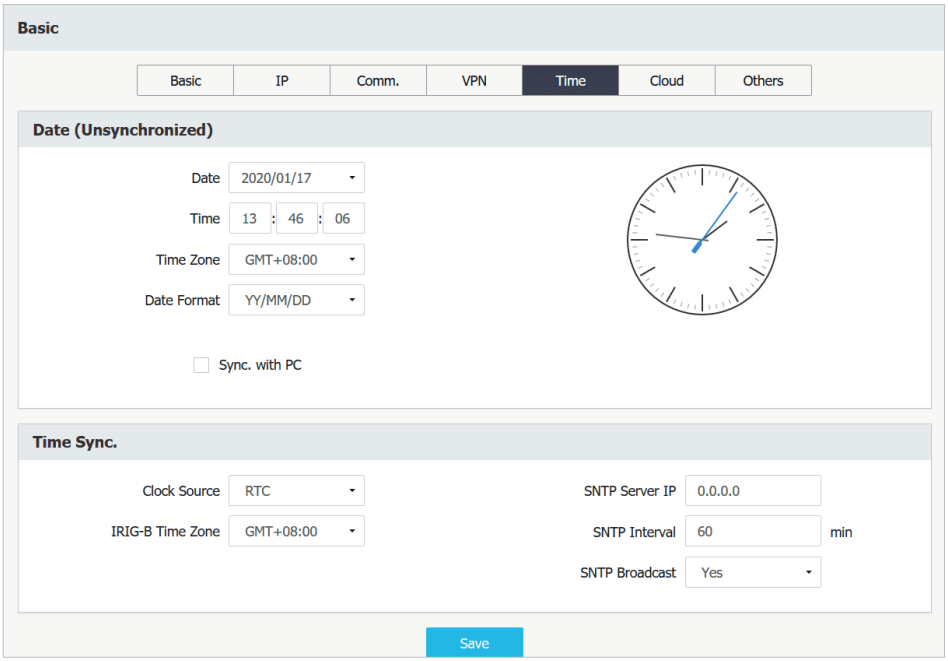


Figure 3-119 Time Settings Interface

3.2.3.5.2.6 Basic > Cloud

Please refer to **Section 4.14** for more information.

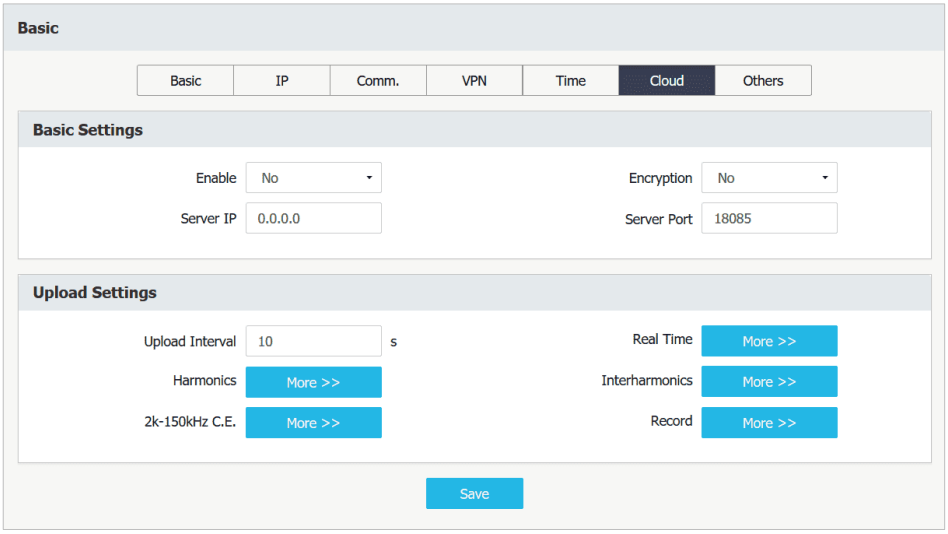


Figure 3-120 Cloud Settings Interface

3.2.3.5.2.7 Basic > Others

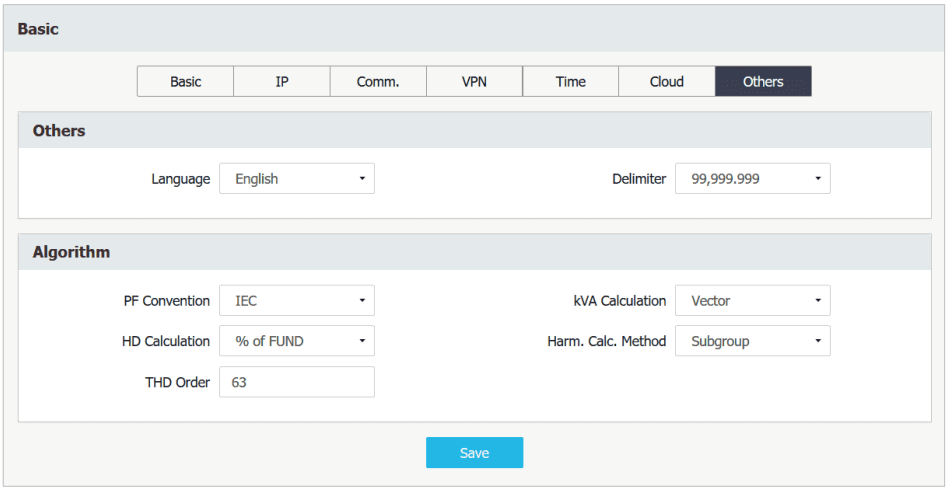


Figure 3-121 Others Settings Interface

3.2.3.5.3 PQ

Click **PQ** on the left-hand pane to expand its **Settings/EN50160** configurations.

3.2.3.5.3.1 PQ / Settings

Click on **Settings** under **PQ** and the following screen appears which allows the users to configure the **PQ Disturbance**, **Transient**, **RVC**, **MSV**, **Inrush Current** and **Flicker** parameters.

- **PQ Disturbance**

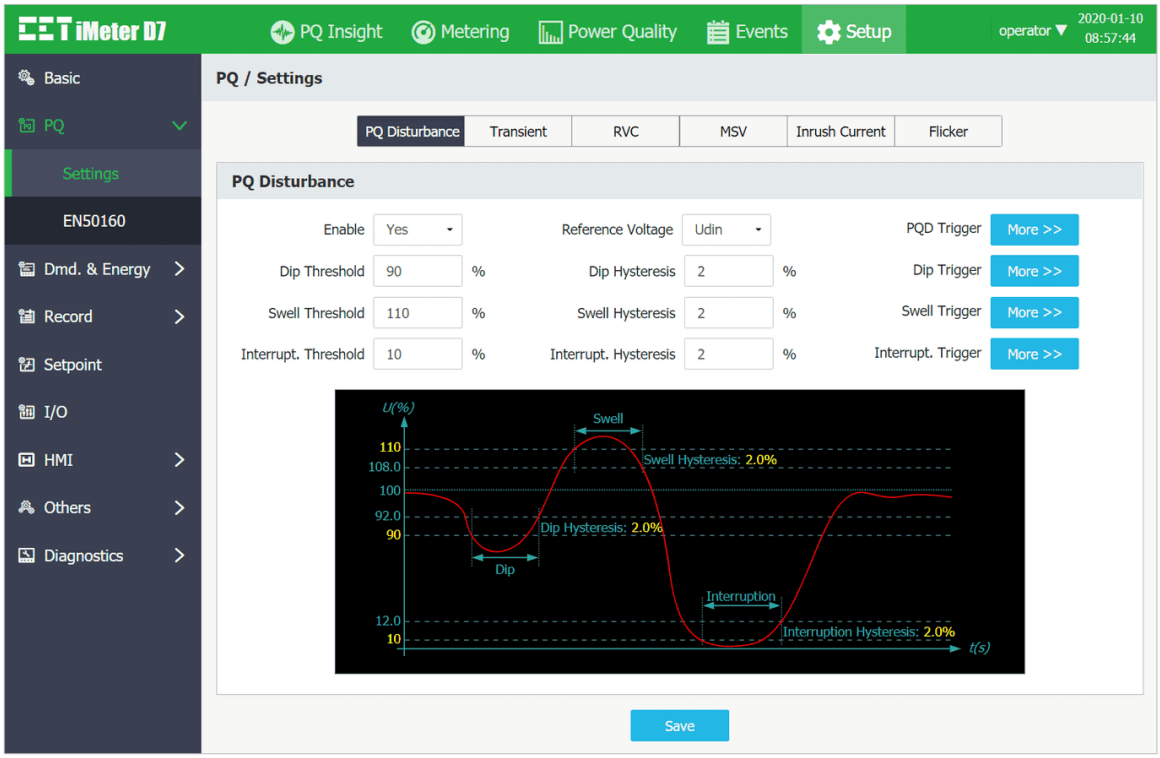


Figure 3-122 PQ Disturbance Settings Interface

- **Transient**

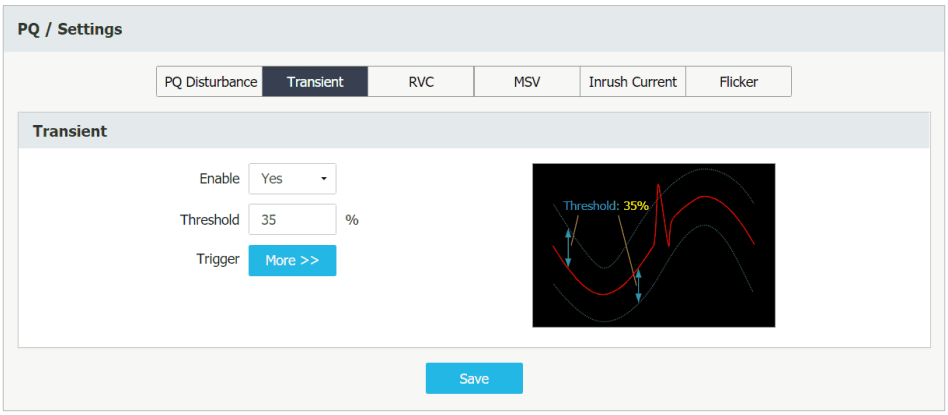


Figure 3-123 Transient Settings Interface

- **RVC**

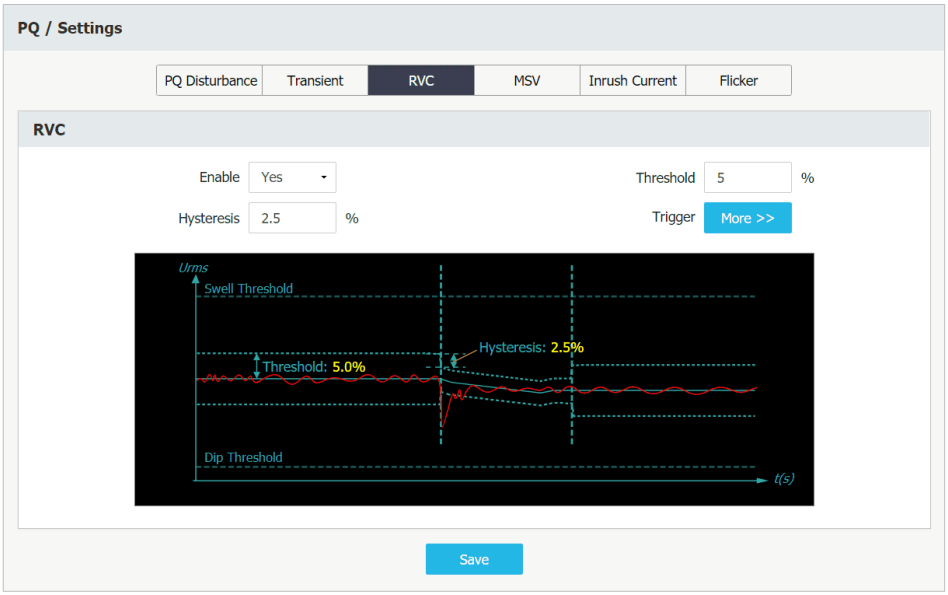


Figure 3-124 RVC Settings Interface

- **MSV**

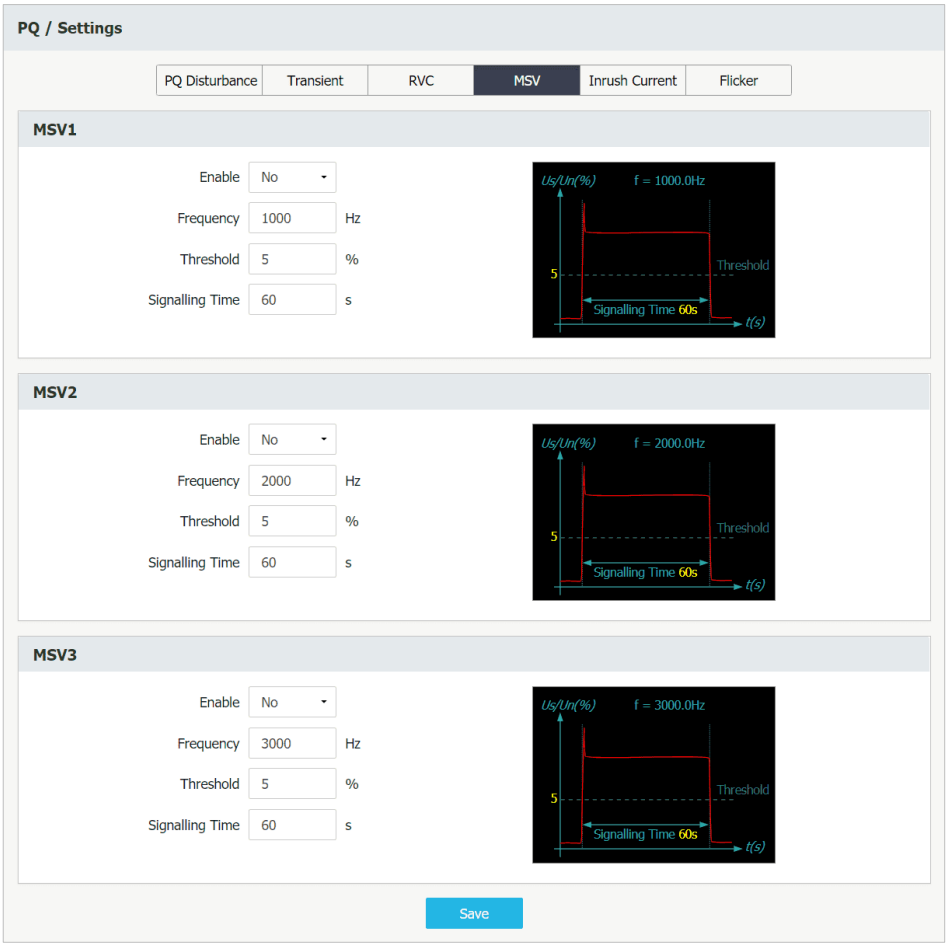


Figure 3-125 MSV Settings Interface

- **Inrush Current**

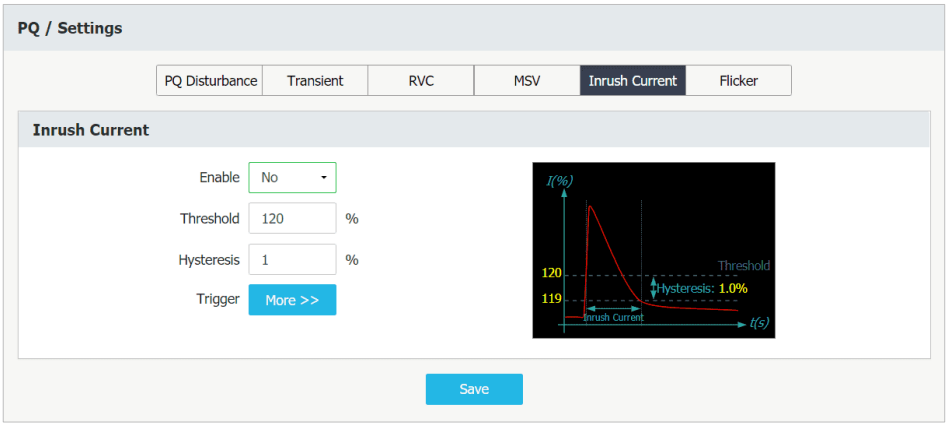


Figure 3-126 Inrush Current Settings Interface

- **Flicker**

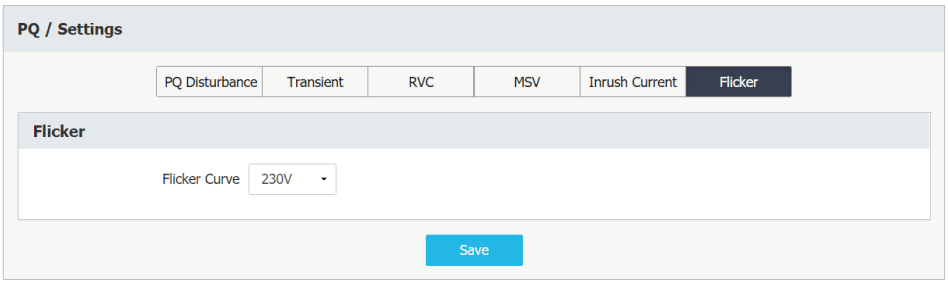


Figure 3-127 Flicker Settings Interface

3.2.3.5.3.2 PQ / EN50160

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

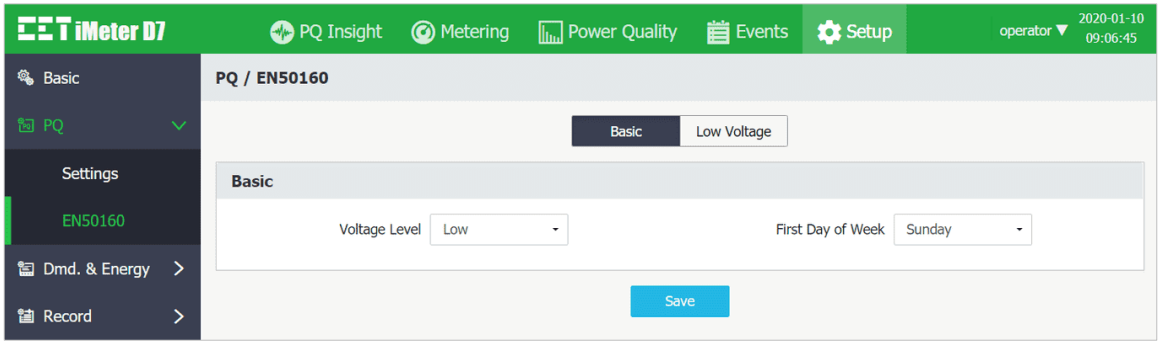


Figure 3-128 EN50160 Basic Setup Interface

Figure 3-129 below illustrates the default limits of the EN50160 parameters according to the Voltage Level settings above, which is low in this instance. For more information, please refer to **Section 4.4.15**

- **Power Frequency**

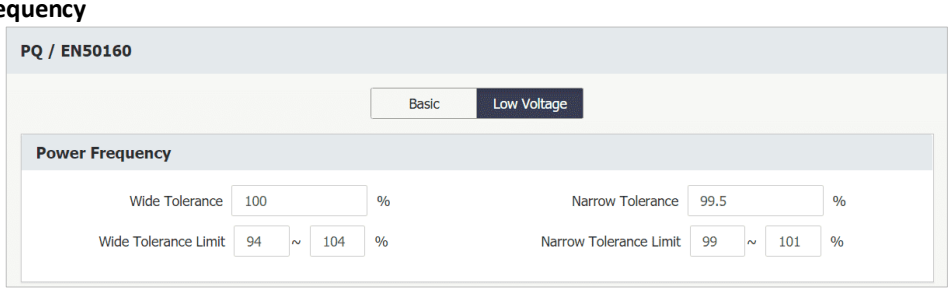


Figure 3-129 Power Frequency

- **Supply Voltage Variations**

Figure 3-130 Supply Voltage Variations

- **Flicker Severity**

Figure 3-131 Flicker Severity

- **Supply Voltage Unbalance**

Figure 3-132 Supply Voltage Unbalance

- **Voltage Harmonic Limits**

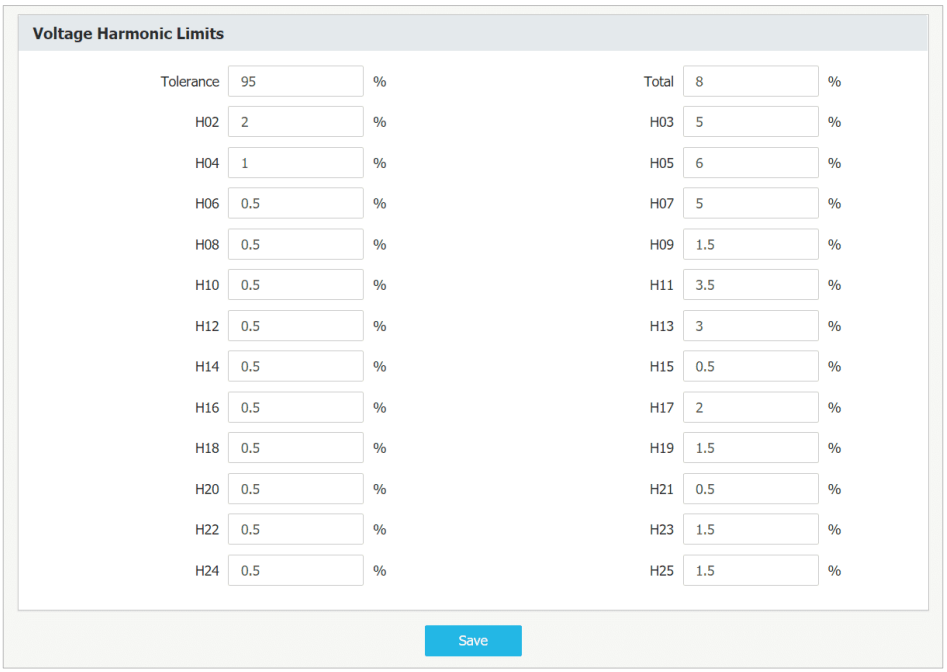


Figure 3-133 Voltage Harmonic Limits

3.2.3.5.4 Dmd. & Energy

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

3.2.3.5.4.1 Demand

For more information, please refer to **Section 4.3.4**

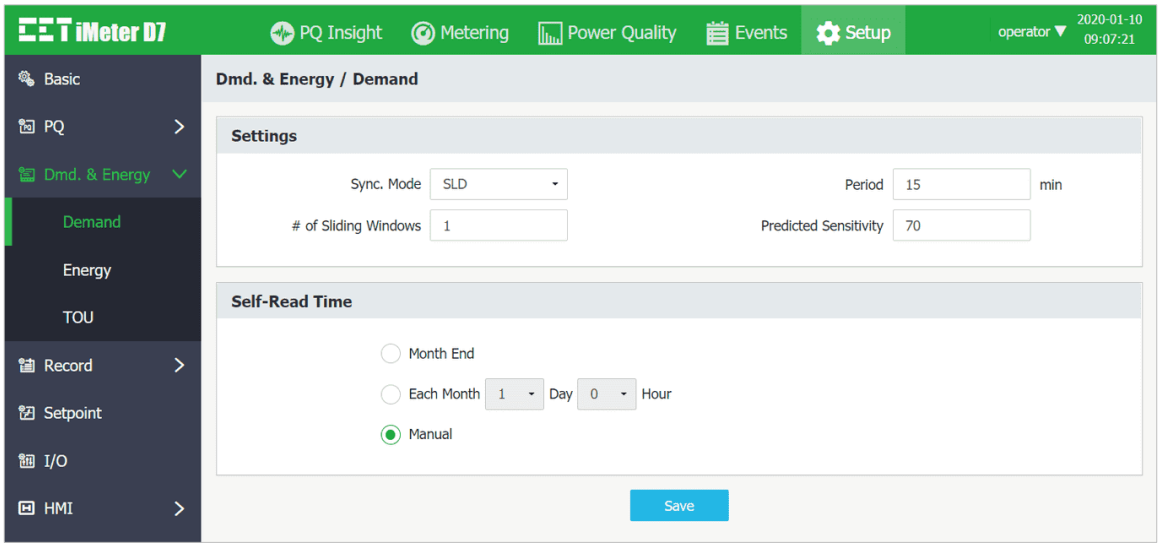


Figure 3-134 Demand Setup Interface

3.2.3.5.4.2 Energy

Click **Energy** tab on the top pane to access the **Energy Preset, Energy Pulse (Optional)** and **Energy Log** configurations.

- **Energy Preset** Supports the presetting of kWh Import/Export, kvarh Import/Export and kVAh Total. The valid range for the pre-defined energy should between 0 to 99,999,999,999.999.

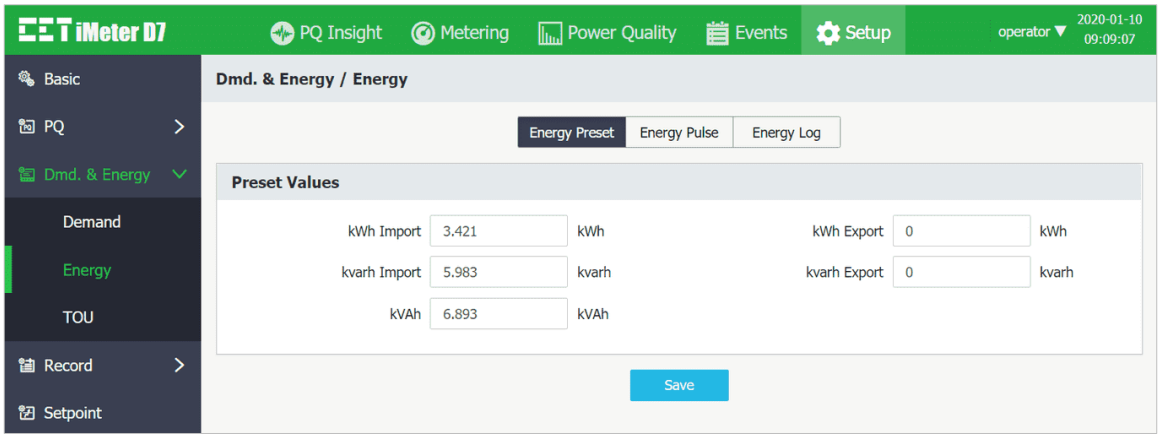


Figure 3-135 Energy Preset

- **Energy Pulse** Supports the configuration of the Pulse Constant, E1 to E3 (Energy Pulse Output) setup parameter. For more information, please refer to **Section 4.1.3** .

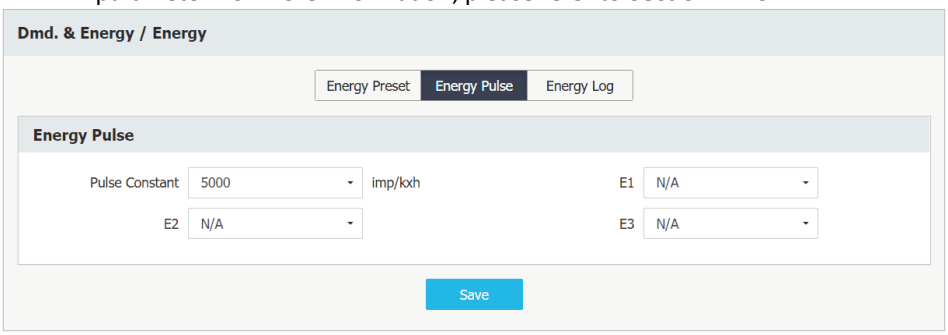


Figure 3-136 Energy Pulse

- **Energy Log** Please refer to **Section 4.6.1** for a detailed description of the parameters below.

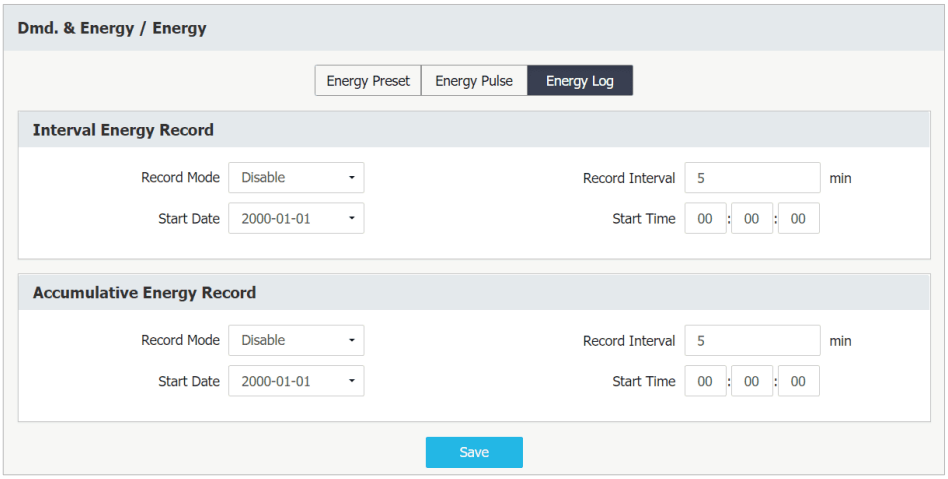


Figure 3-137 Energy Log Setup Interface

3.2.3.5.4.3 TOU

Click on **TOU** to access the **Labels**, **Basic**, **Daily Profiles**, **Seasons** and **Alternate Days** configurations.

- **Labels**

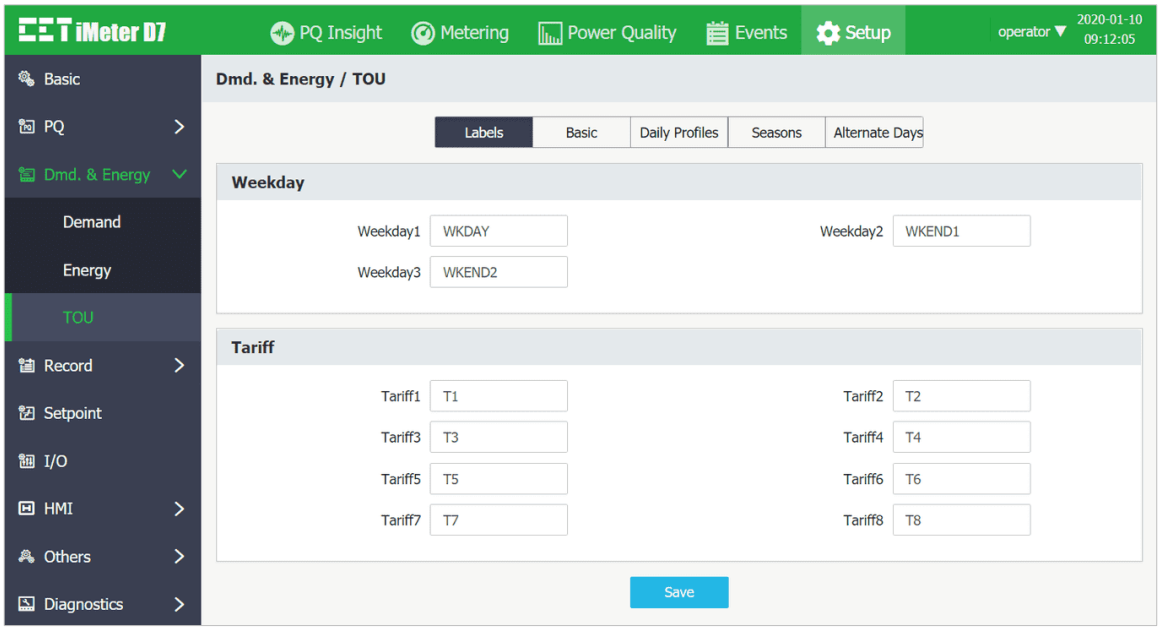


Figure 3-138 Labels Setup Interface

- **Basic**

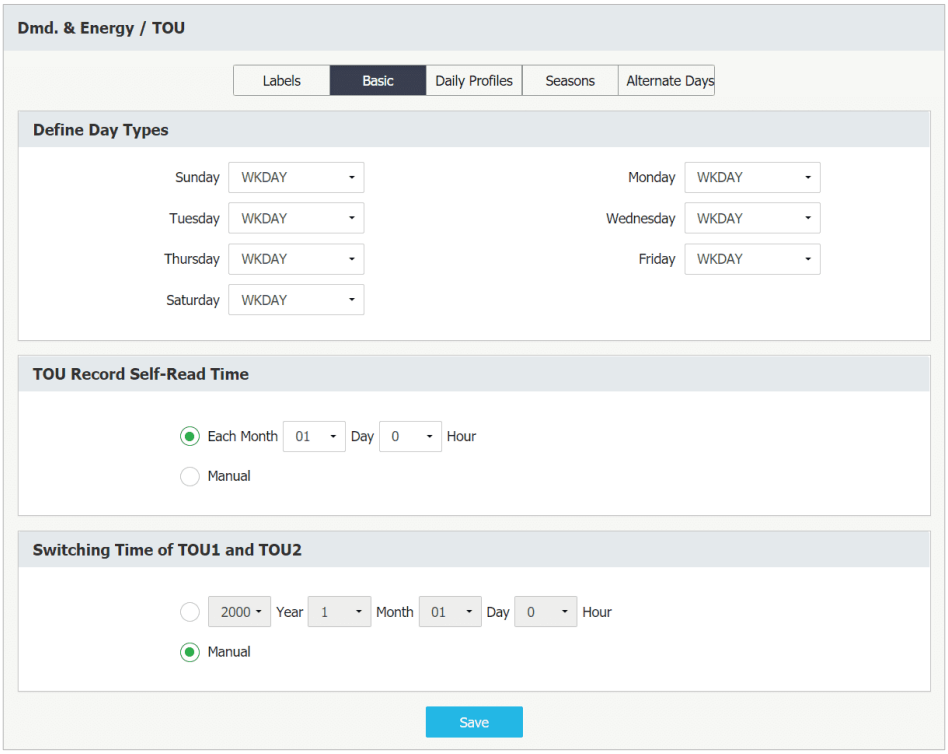


Figure 3-139 Basic Settings Interface

- **Daily Profiles**

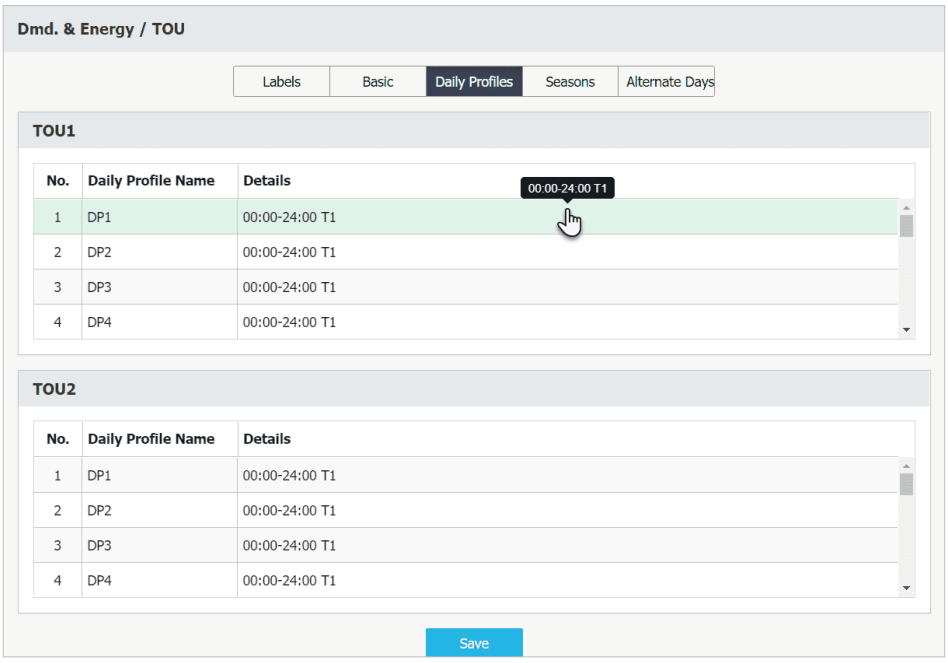


Figure 3-140 Daily Profiles Setup Interface

Click on a particular Daily Profile and the following dialog box appears which allows the **Daily Profile Name**, **Start Time** and **Tariff** for **each Period** to be defined until the entire day has been filled. As Figure 3-141 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**.

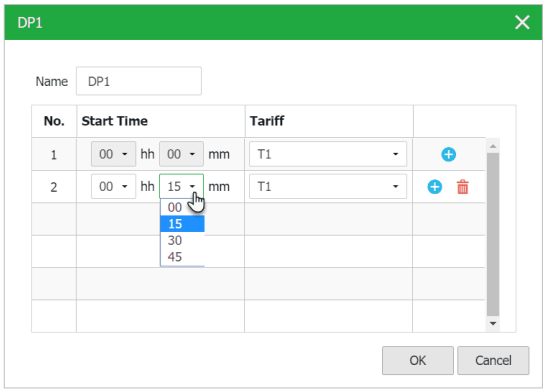


Figure 3-141 TOU- DP1 Setting Dialog Box

- **Seasons**

  Click on Seasons and the following page appears which allows the **Start Date**, **WKDAY Daily Profile**, **WKEND1 Daily Profile**, **WKEND2 Daily Profile** for **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 on **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 on **12/31**.

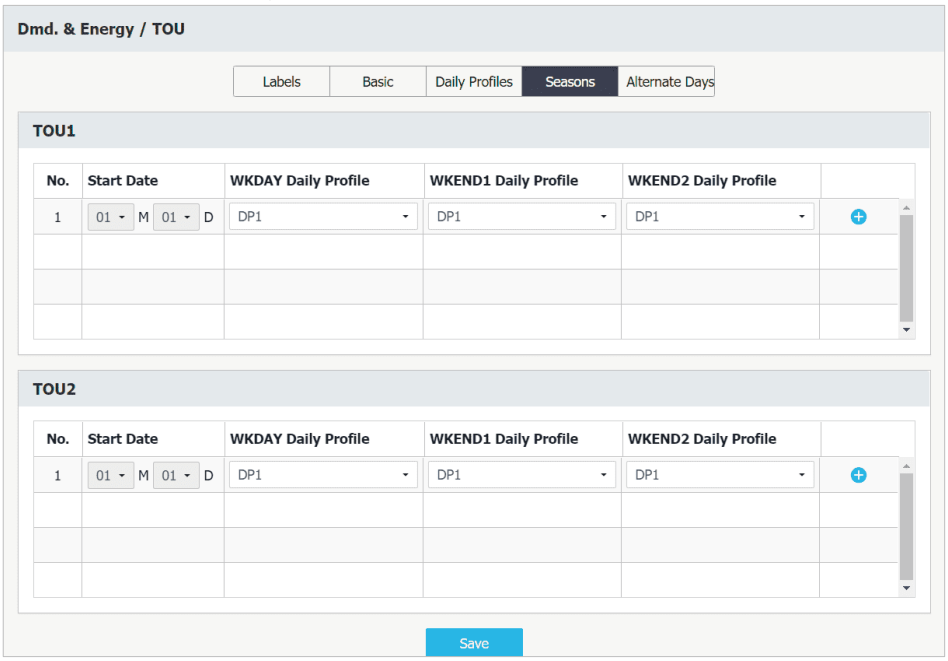


Figure 3-142 Season Setup Interface

- **Alternate Days**

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

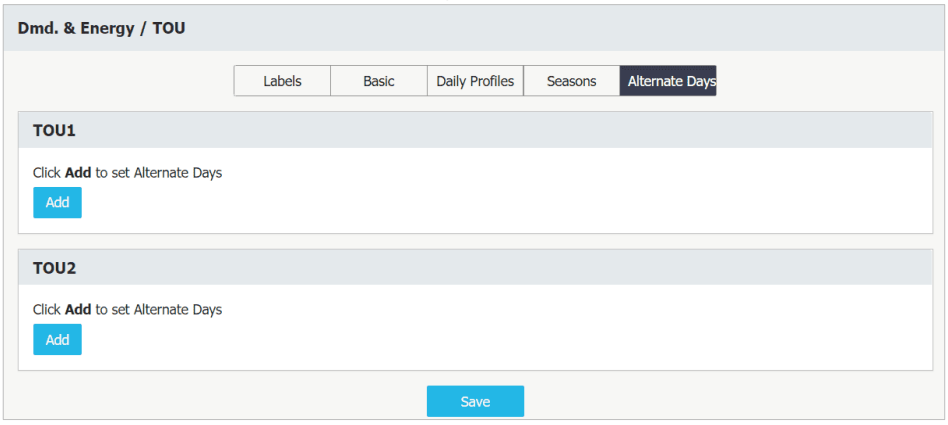


Figure 3-143 Alternate Days Setup Interface

Click ⊕ to add a new Alternate Day or 🗑 to clear the current Alternate Day's settings.

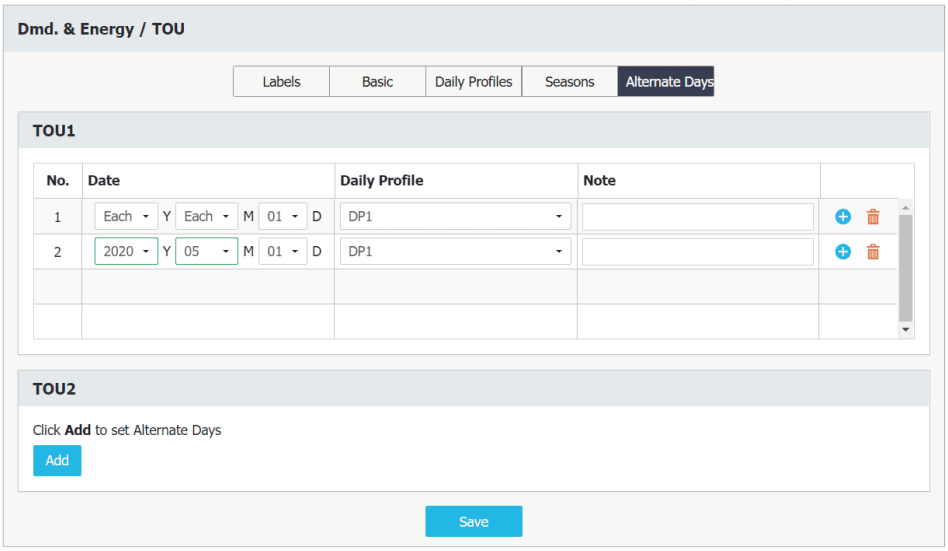


Figure 3-144 Alternate Days Setup Interface

3.2.3.5.5 Record

Click **Record** on the left-hand pane to expand its sub-menu which includes **Waveform**, **SDR** and **Max./Min.**

3.2.3.5.5.1 Waveform

Click **Waveform** on the left-hand pane and the following page appears which has four tabs: **WFR**, **DWR**, **RMSR** and **Sche. WFR**.

- **WFR** For more information, please refer to **Section 4.6.2**

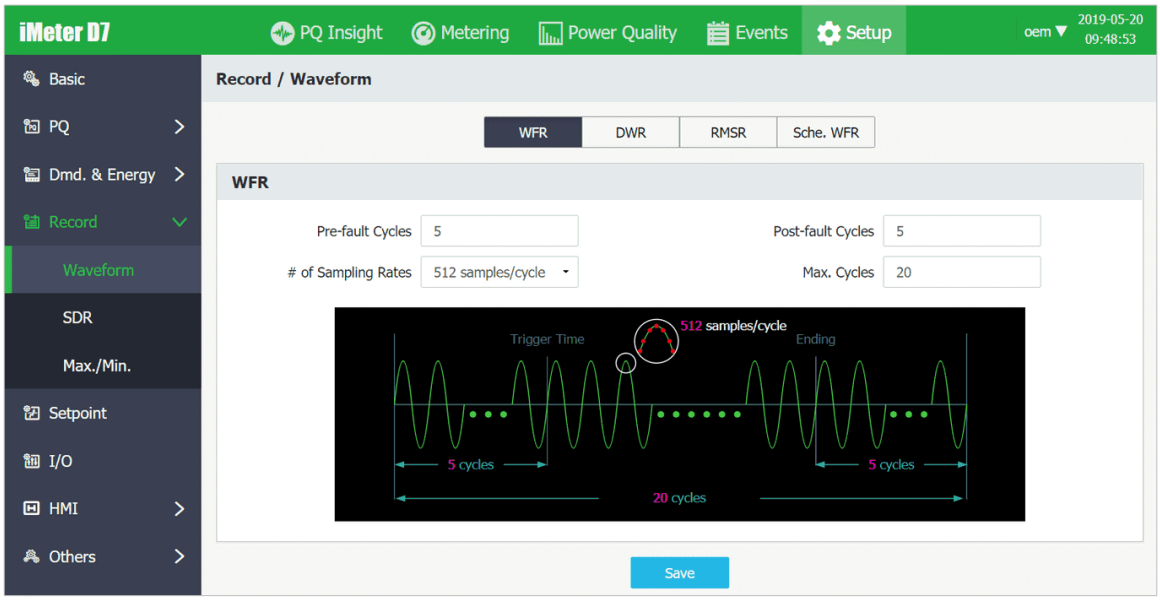


Figure 3-145 WFR Settings Interface

- **DWR** Click DWR near the top of the page and the following page appears which provides the Pre-fault Cycles settings. The range of Pre-fault Cycles is 5 to 10 with 5 being the default. For more information, please refer to **Section 4.6.3**

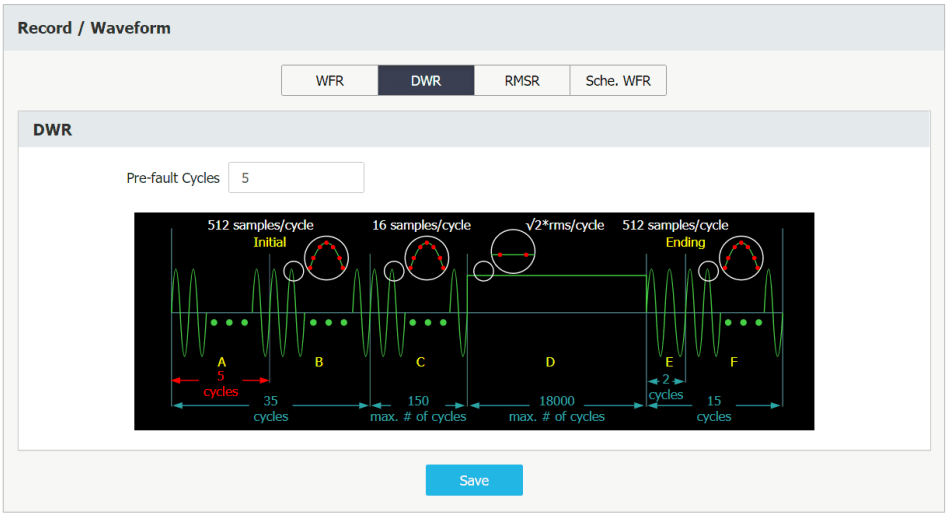


Figure 3-146 DWR Settings Interface

- **RMSR** Click ""Add" to add a batch of parameters by selecting one or more desired parameters from the **RMSR Source Parameters Dialog Box** (See Figure 3-148) or "De-select All" to remove all existing parameters. Click on the right-hand column to edit an existing parameter or to remove a particular parameter. For more information, please refer to **Section 4.6.4**

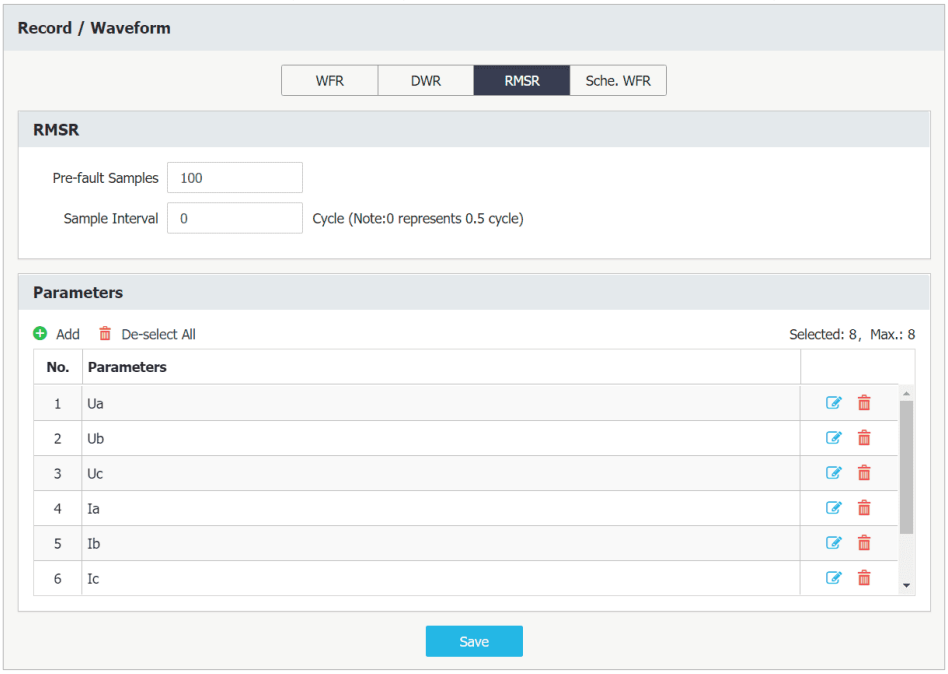


Figure 3-147 RMSR Setup Interface

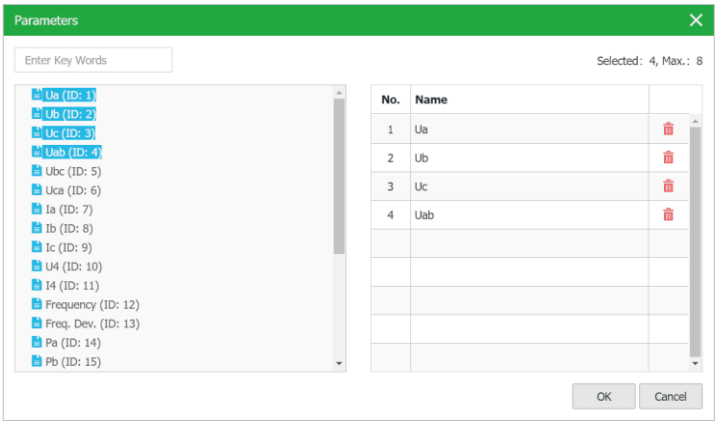


Figure 3-148 RMSR Source Parameters Dialog Box

- **Sche. WFR (Scheduled WFR)**

For more information, please refer to **Section 4.6.2**

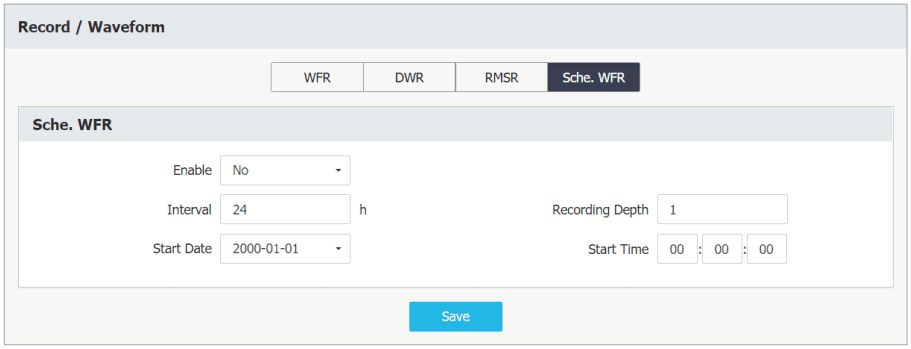


Figure 3-149 Sched. WFR Setup Interface

3.2.3.5.5.2 SDR

The iMeter D7 comes standard with 8 Statistical Data Records of 64 parameters each. Please refer to **Section 4.6.7** for more information.

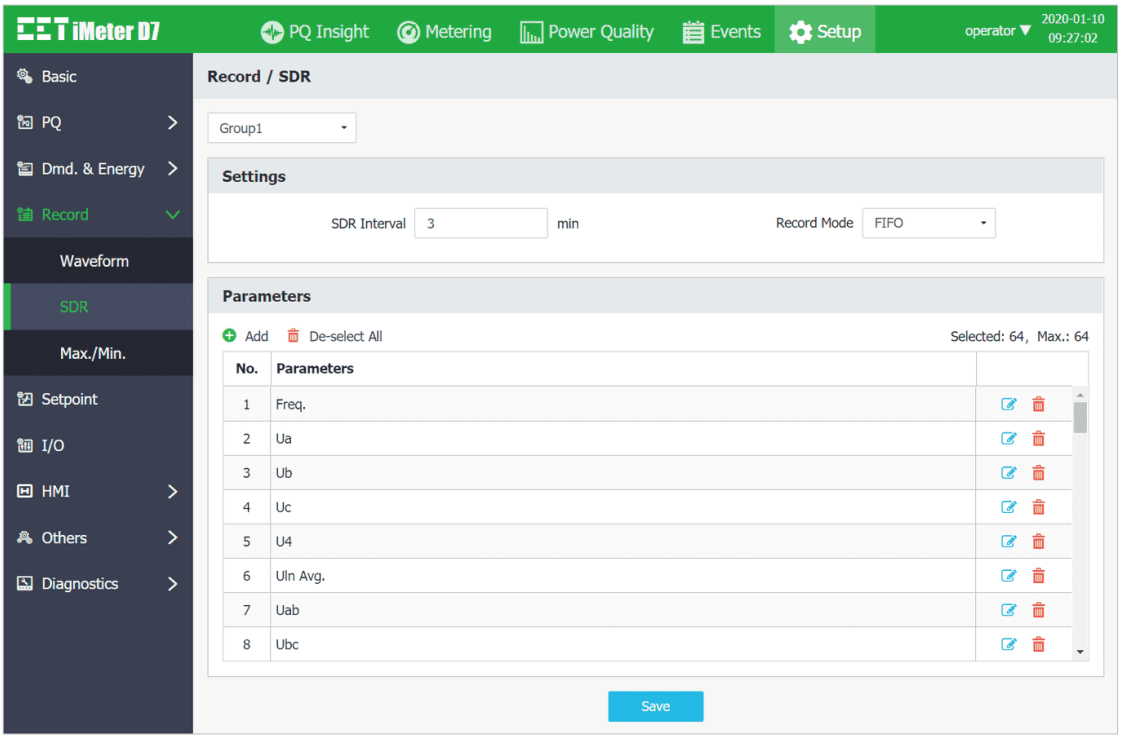


Figure 3-150 SDR Setup Interface

Click "Add" to add a batch of parameters or "De-select All" to remove all existing parameters.

Click on the right-hand column to edit an existing parameter or / to remove a particular parameter.

Please refer to Appendix A to check the available parameters for SDR.

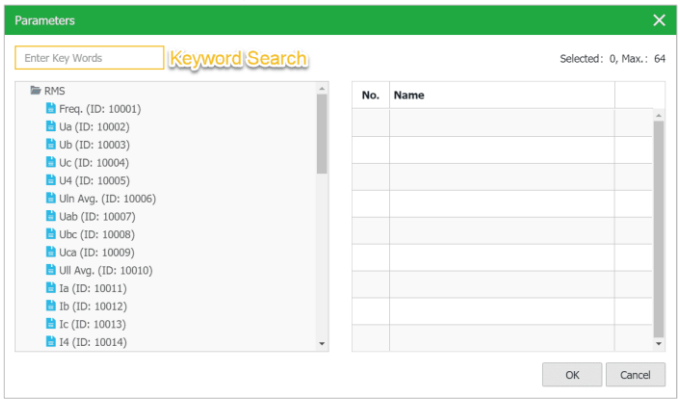


Figure 3-151 SDR Source Parameters Dialog Box

3.2.3.5.5.3 Max./Min.

The iMeter D7 supports 4 Max./Min. Recorders of 20 parameters each. Please refer to **Section 4.6.8** for the explanation of the Self-Read Time.

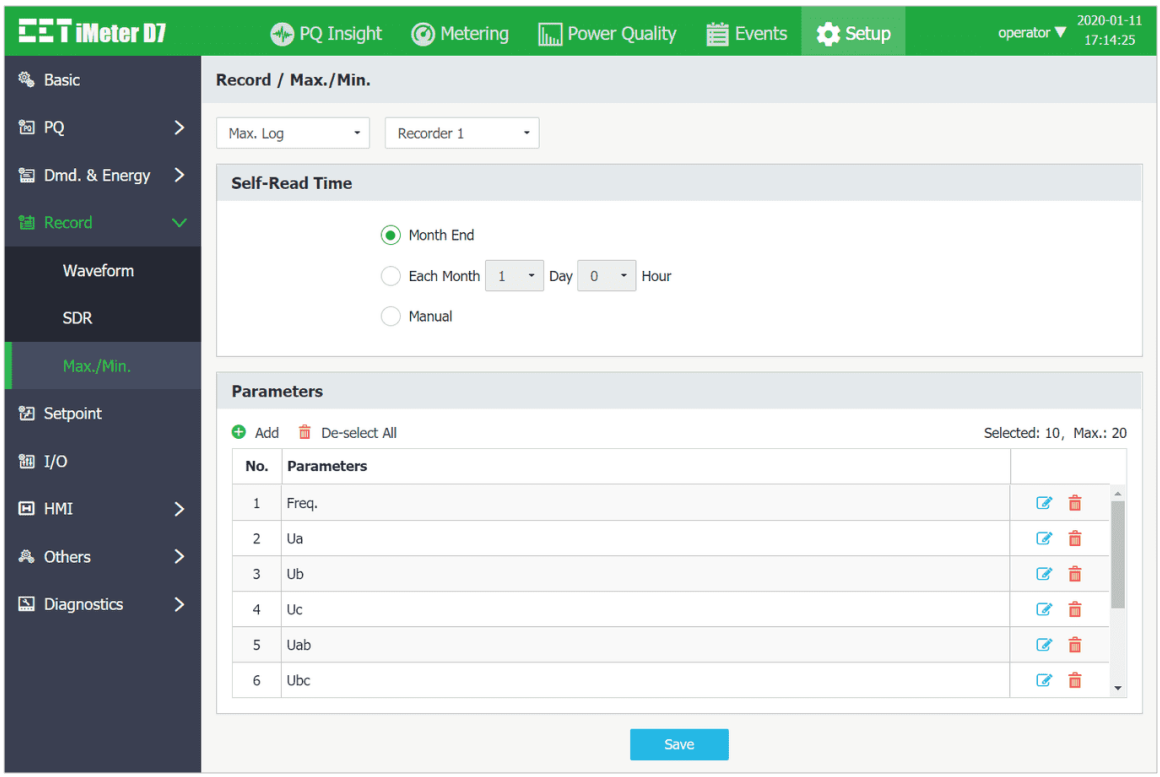


Figure 3-152 Max./Min. Recorder Setup Interface

Click "Add" to add a batch of parameters or " De-select All" to remove all existing parameters.

Click on the right-hand column to edit an existing parameter or to remove a particular parameter.

Please refer to Appendix A to check the available parameters for Max./Min. Recorders.

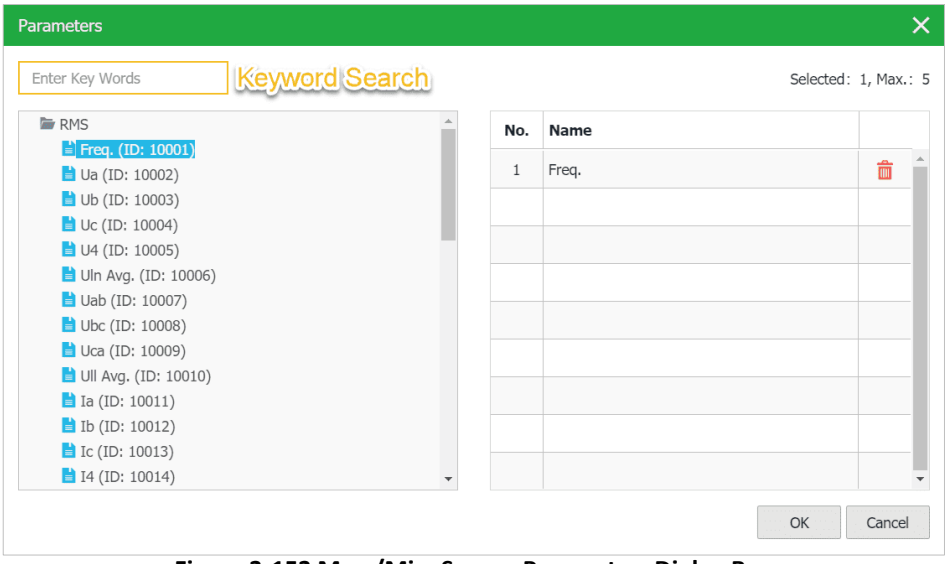


Figure 3-153 Max./Min. Source Parameters Dialog Box

3.2.3.5.6 Setpoint

Click **Setpoint** on the left-hand pane to configure the Setpoint feature. The iMeter D7 provides 40 programmable setpoints which can be Standard or High-Speed. For more information, please refer to **Section 4.5**.

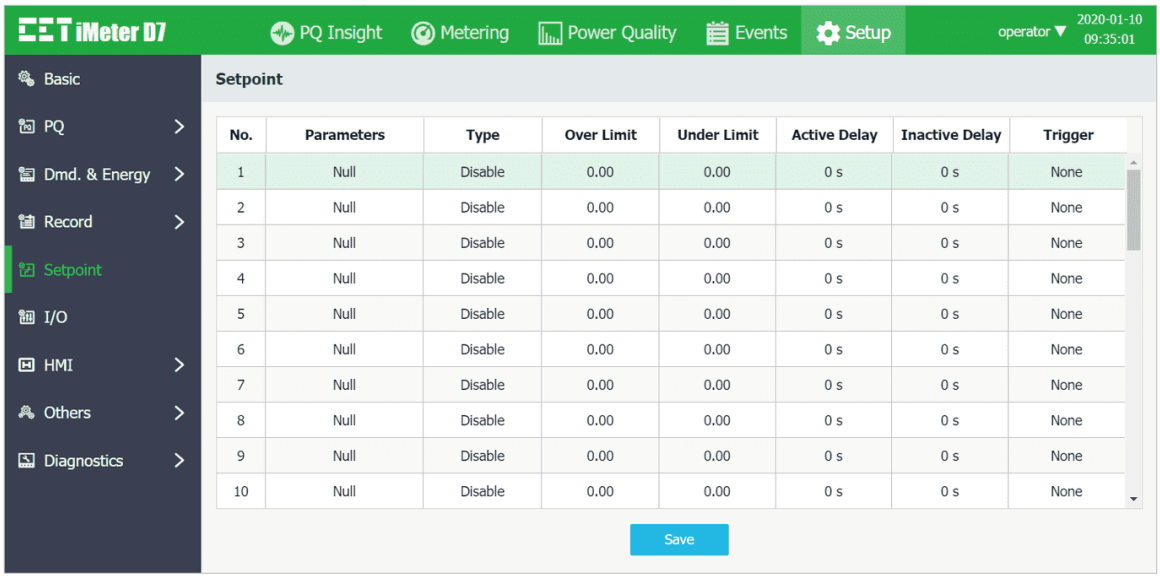


Figure 3-154 Setpoint Setup Interface

Click on a particular Setpoint and the **Setpoint Settings** dialog box appears.

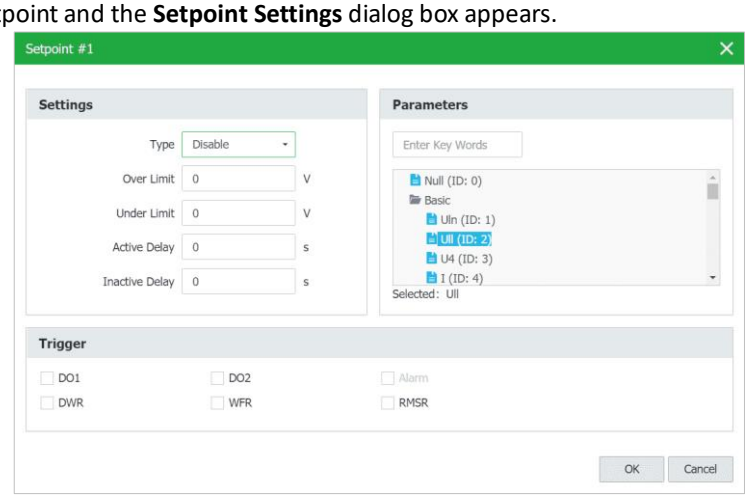


Figure 3-155 Setpoint Settings Dialog Box

3.2.3.5.7 I/O

Click **I/O** on the left-hand pane to configure I/O parameters. Please refer to **Section 4.1** for more information.

- **DI**

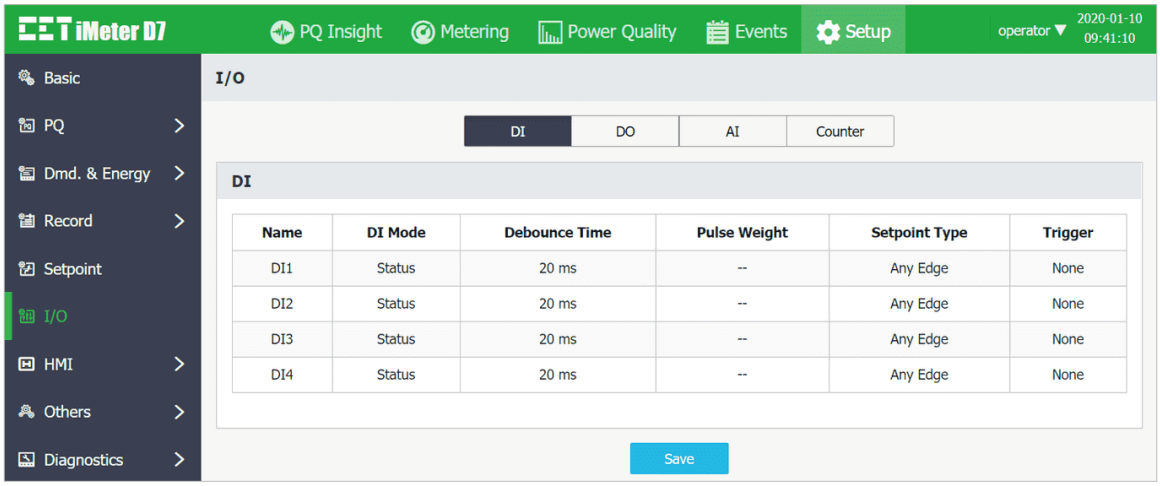


Figure 3-156 DI Setup Interface

Click on a specific DI and the **DI Settings** dialog box appears. Please refer to **Section 4.1.1** for more information.

- **DI Mode = Status**

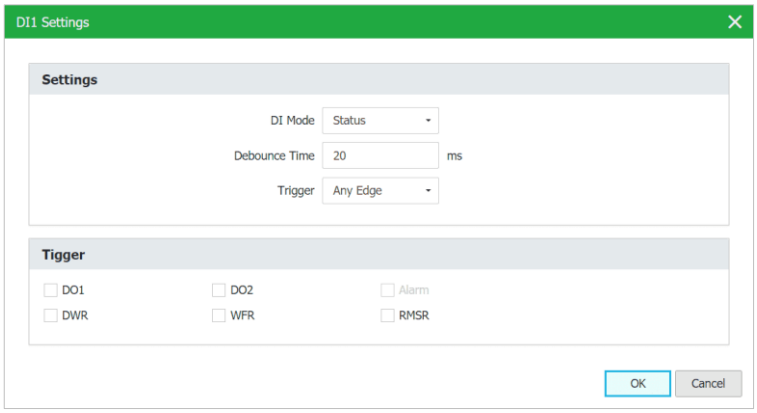


Figure 3-157 DI Status Setup Interface

- **DI Mode = Counter**

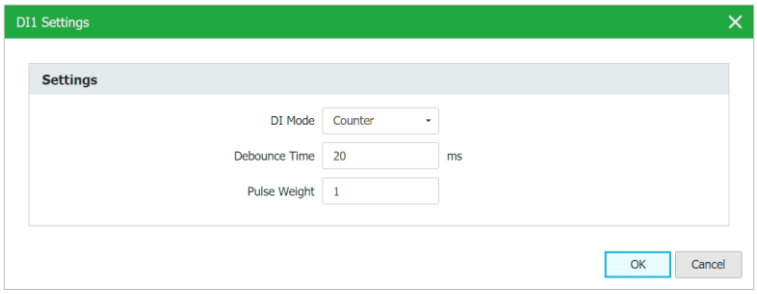


Figure 3-158 DI Counter Setup Interface

- **DI Mode = DMD Sync.**

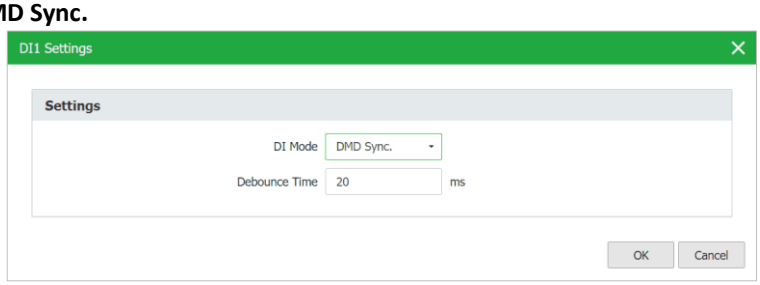


Figure 3-159 DI DMD Sync. Setup Interface

- **DI Mode = Tariff Switch**

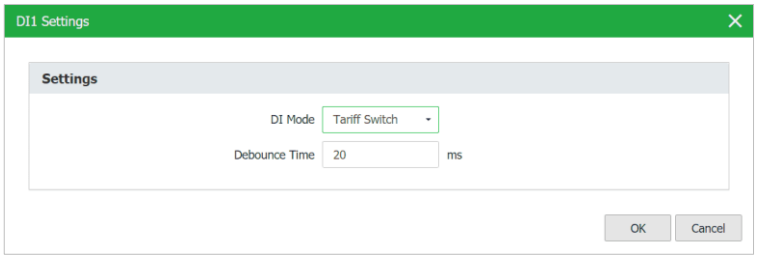


Figure 3-160 DI Tariff Switch Setup Interface

- **DO/Alarm Setup**

Click the **DO** tab at the top of the page and the following screen appears.

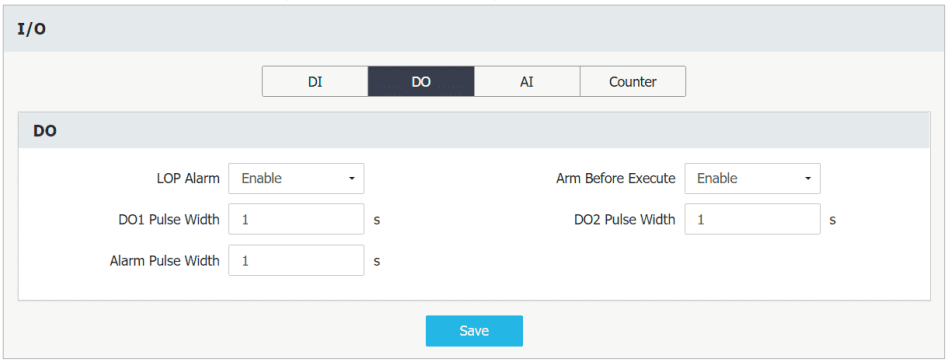


Figure 3-161 DO Setup Interface

- **AI (Optional)**

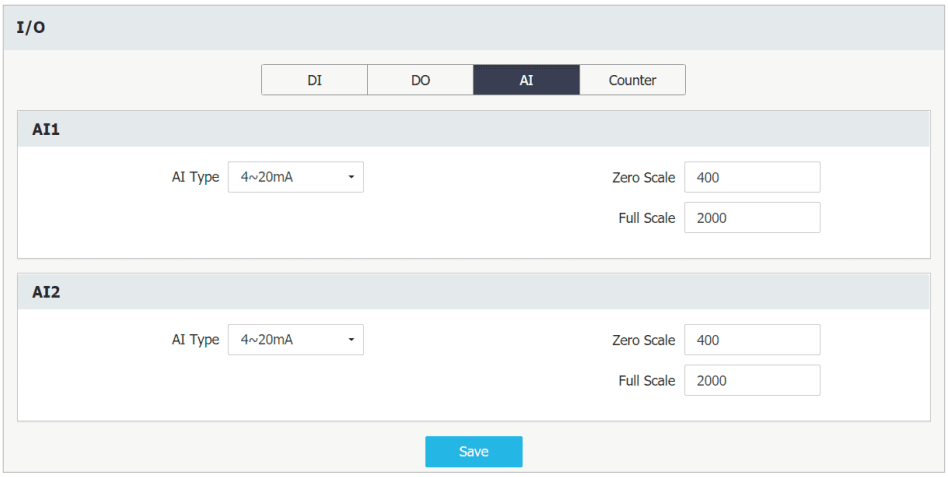


Figure 3-162 Optional AI Settings Interface

- **RTD (Optional)**

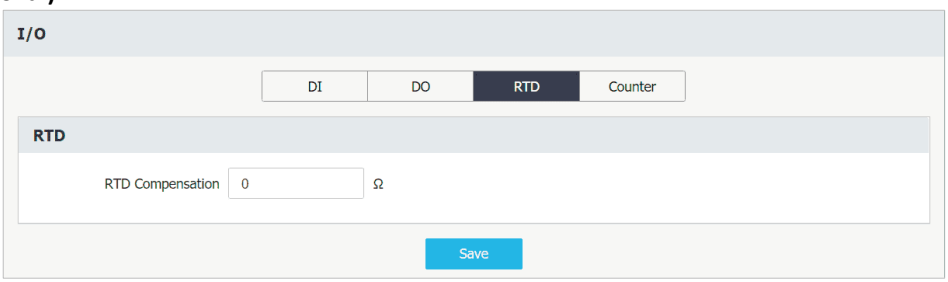


Figure 3-163 Optional RTD Settings Interface

- **Counter**

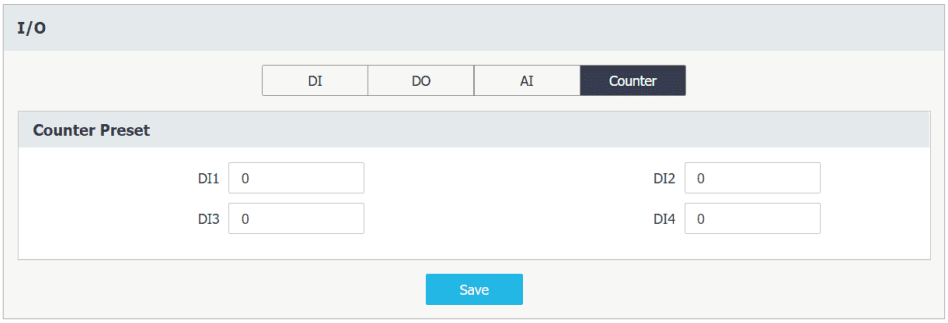


Figure 3-164 DI Counter Preset Settings

3.2.3.5.8 HMI

Click **HMI** to configure the parameters for **Pop-up Alarm** and **Auto-Scroll**.

3.2.3.5.8.1 Pop-up Alarm

Please refer to **Section 4.2.2** for more information.

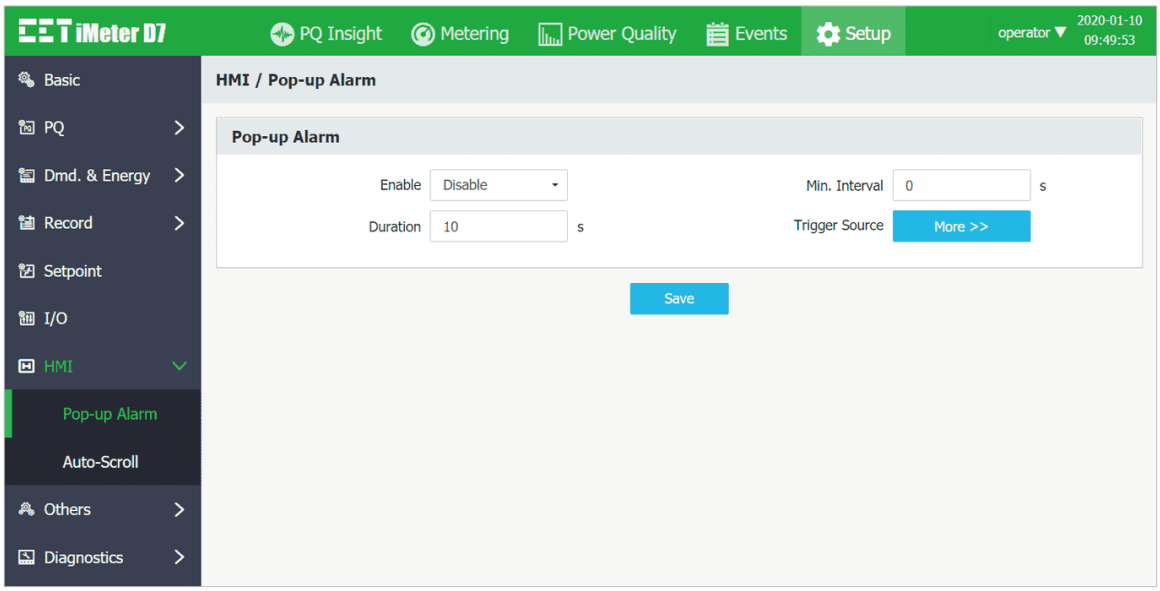


Figure 3-165 Pop-up Alarm Settings

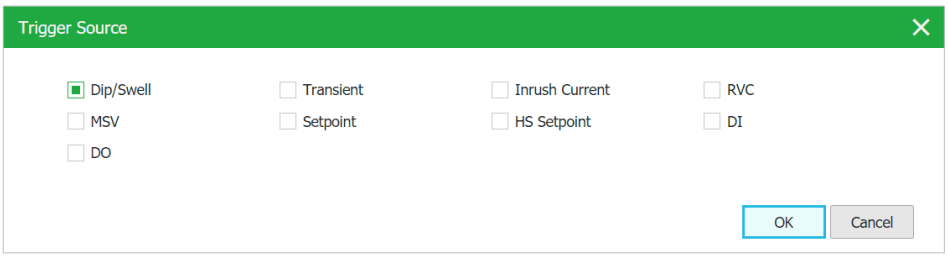


Figure 3-166 Pop-up Alarm Trigger Source Dialog Box

3.2.3.5.8.2 Auto-Scroll

Please refer to **Section 4.2.1** for more information

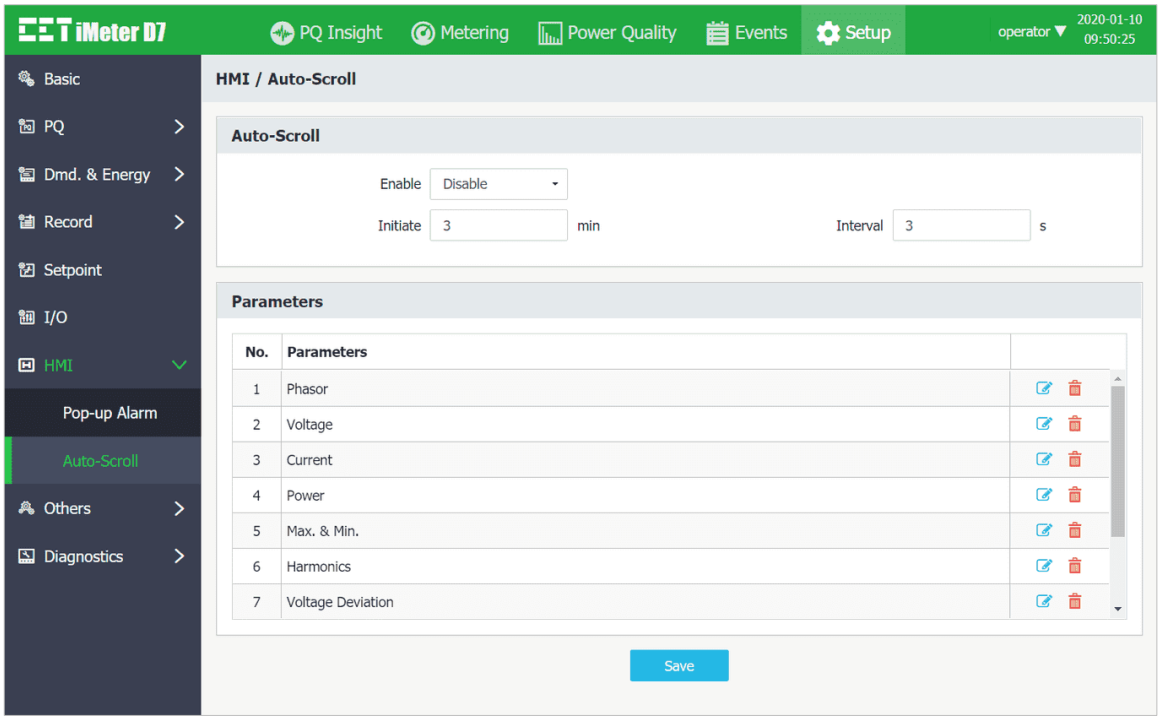


Figure 3-167 Auto-Scroll Setup Interface

Click on and the Source Parameters dialog box appears.

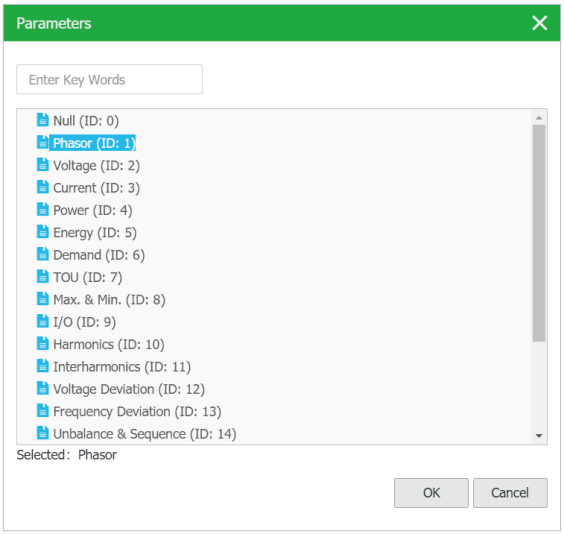


Figure 3-168 Source Parameters for Auto-Scroll Setup

3.2.3.5.9 Others

Click **Others** and the following screens appear which allows the users to configure the parameters for **Alarm Emails** and **Advanced** Settings.

3.2.3.5.9.1 Alarm Email

Click **Settings** tab on the top pane to configure the SMTP Email settings. For detailed configuration guidance, please refer to **Section 4.9**.

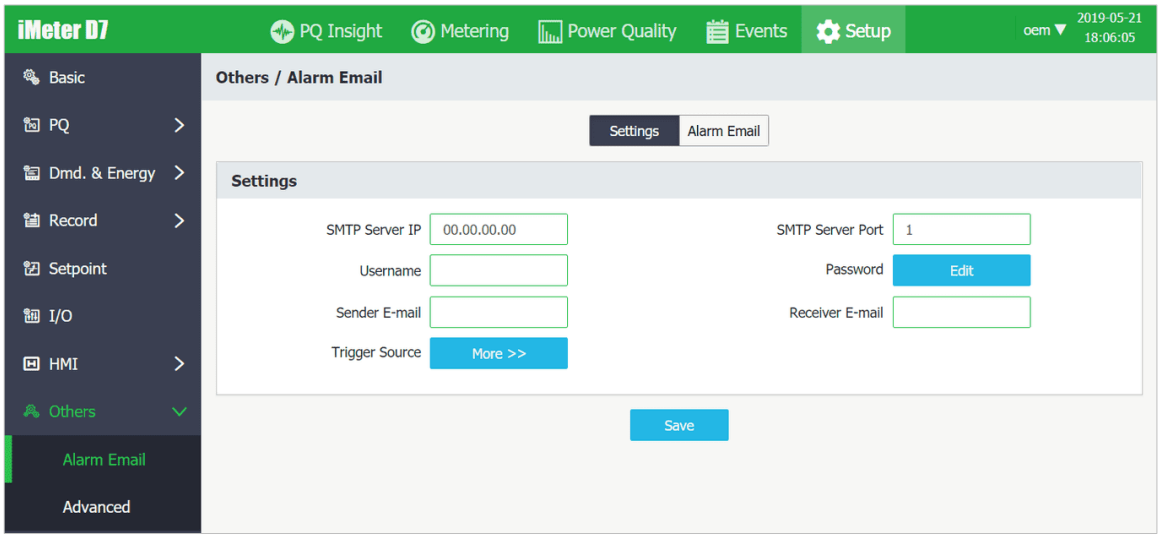


Figure 3-169 Alarm Email Settings Interface

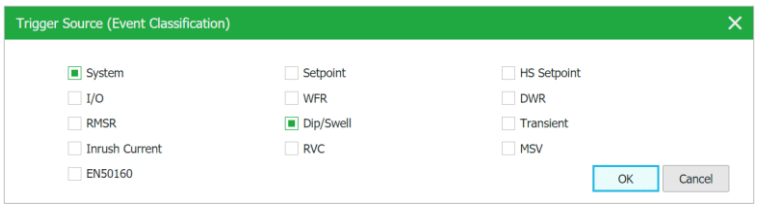


Figure 3-170 Alarm Email Trigger Source

Click on **Alarm Email** tab on the top pane once the SMTP Email settings are confirmed. Click **Test** button to send a test email to the receiver email.

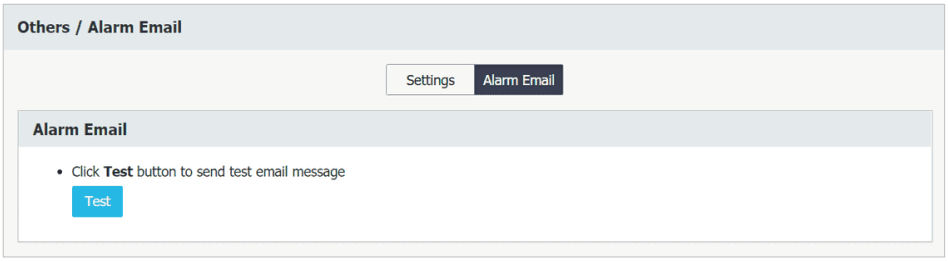


Figure 3-171 Test Email

3.2.3.5.9.2 Advanced

Click on **Advanced** to proceed the advanced configuration for iMeter D7. Please consult with the qualified personnel to continue the settings these advanced parameters.

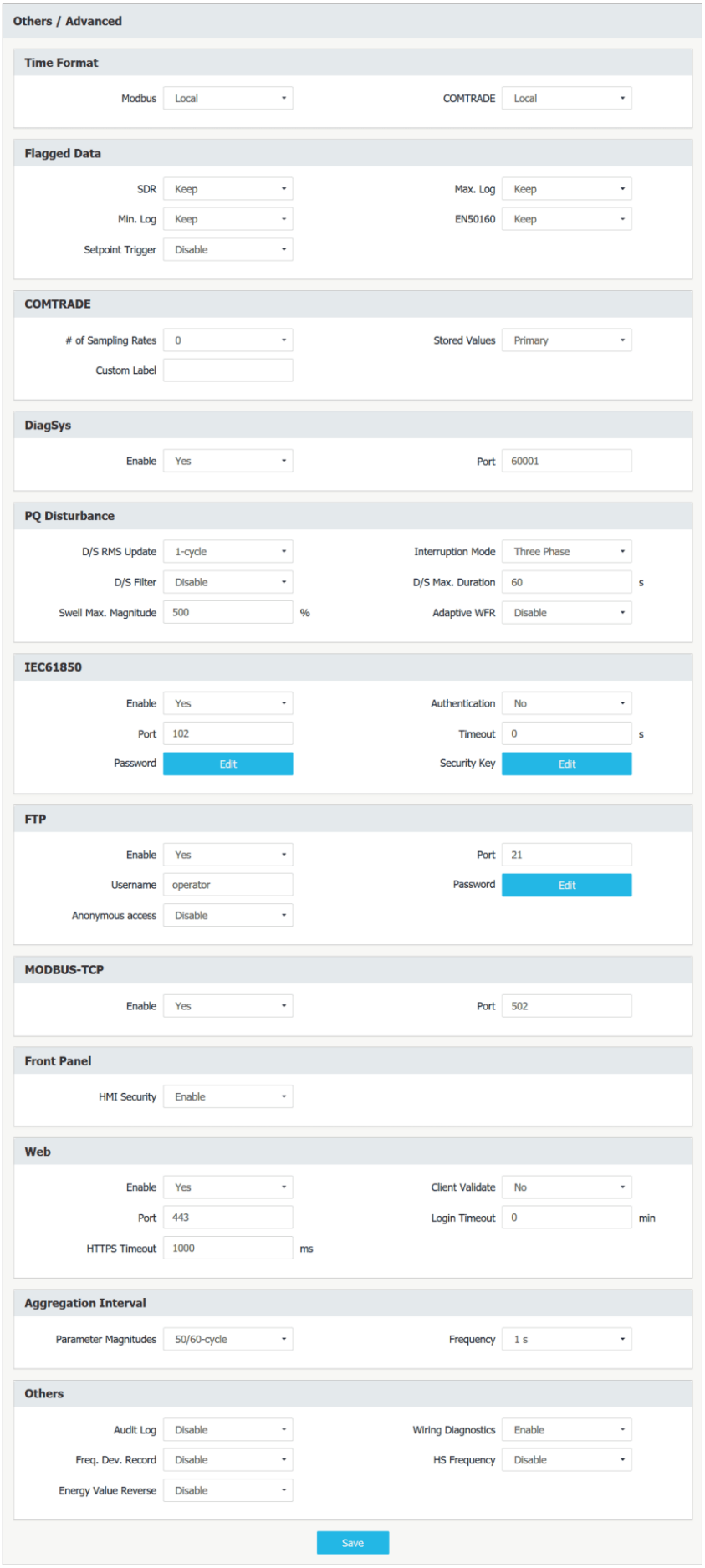


Figure 3-172 Advanced Settings Interface

3.2.3.5.10 Diagnostics

Click on **Diagnostics** on the left-hand side to expand its sub-menu which includes **Device & Site Info.**, **User Management** and **Maintenance**.

3.2.3.5.10.1 Device & Site Info.

- **Device**

  Click **Device** on the top pane and the following screen appears.

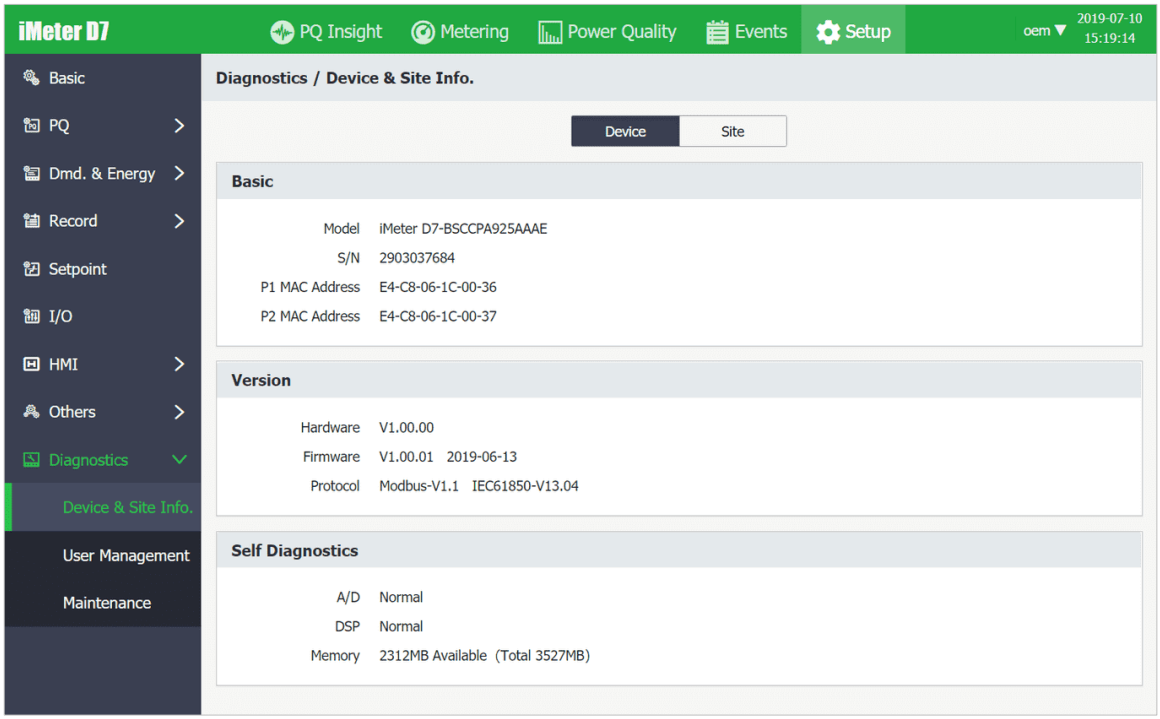


Figure 3-173 Device Info.

- **Site Info.**

  Click **Site Info.** on the top pane and the following screen appears.

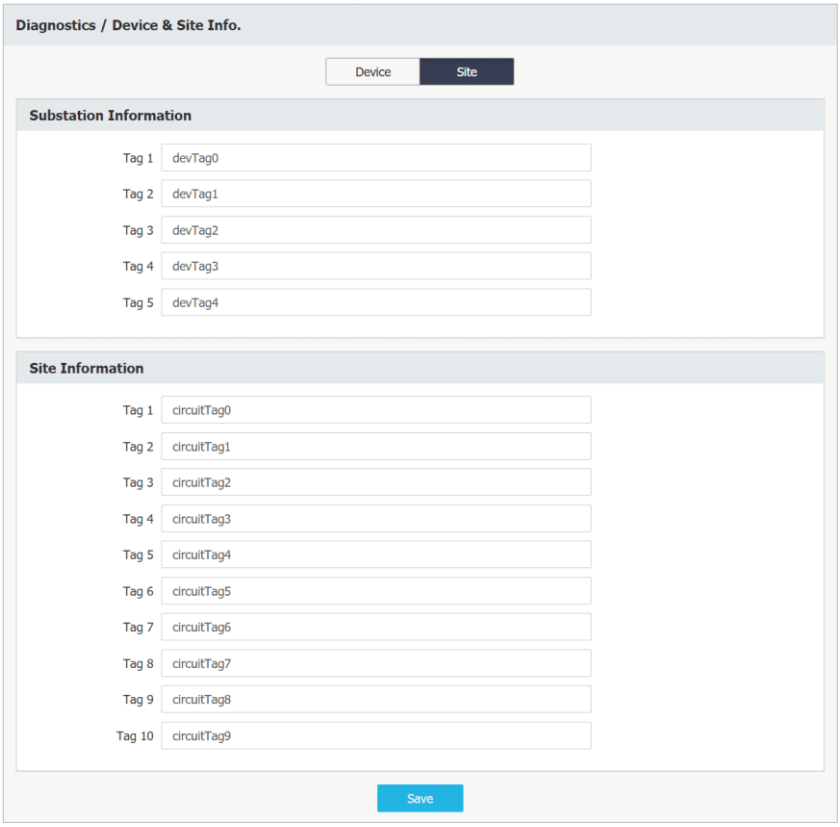


Figure 3-174 Site Info.

3.2.3.5.10.2 User Management

Click **User Management** to create or delete user accounts.

Click ⊕ / 🗑 to add or remove the operator account.

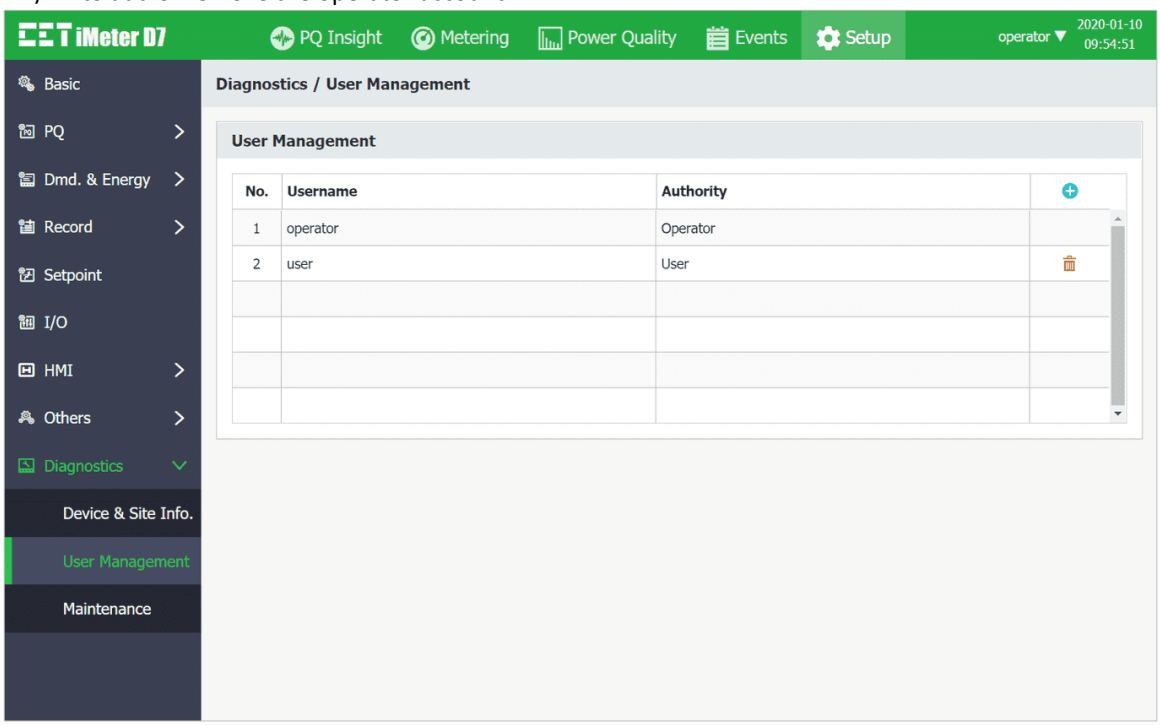


Figure 3-175 User Management

3.2.3.5.10.3 Maintenance

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

- **DO Control** Click the **DO Control** tab at the top of the page and the following screen appears which allows the users to perform manual DO Control and to disable the DO Control from the Front Panel.

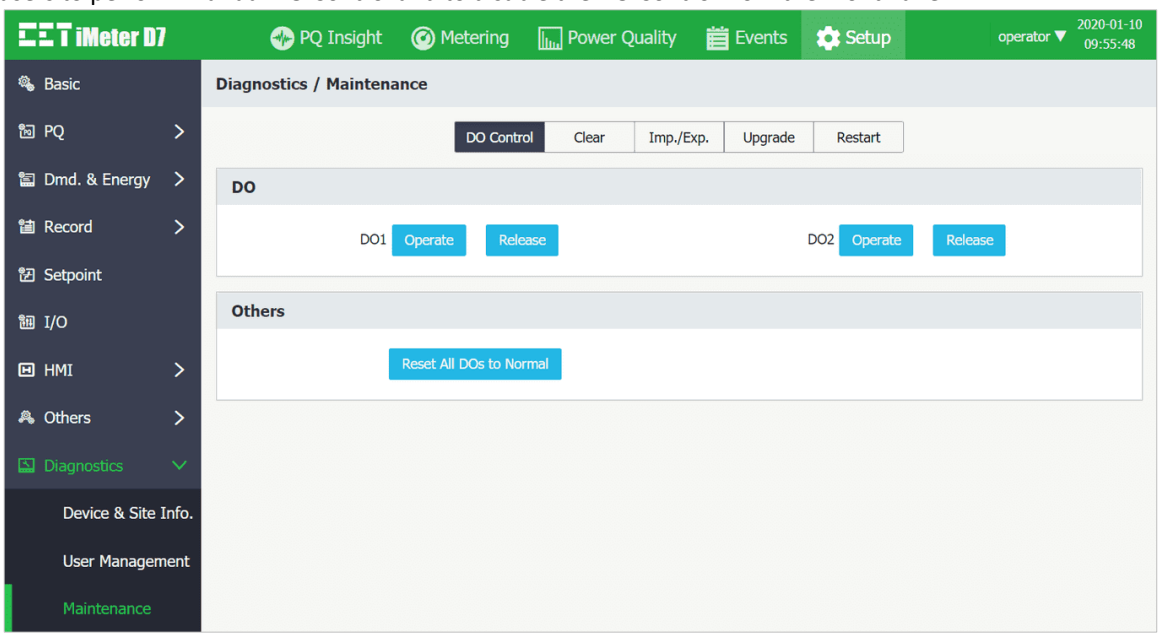


Figure 3-176 Maintenance

- **Clear** Click the **Clear** tab at the top of the page and the following screen appears which allows the users to perform the various **Clear** operations by group or individually.

Figure 3-177 Clear Operations

- **Imp./Exp.** Click the **Imp./Exp.** tab at the top of the page and the following screen appears which allows the users to export or import the System Setup Parameters.

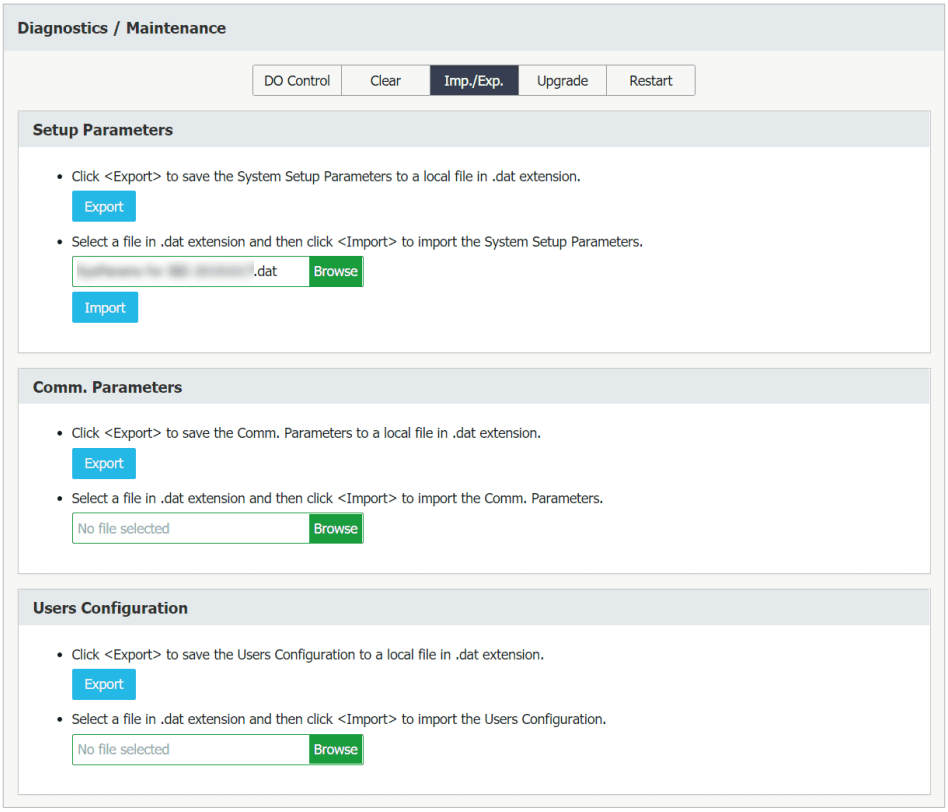


Figure 3-178 Import/Export Interface

- **Upgrade** Click the **Upgrade** tab at the top pane of the page and it displays the following screen where the users can upgrade the meter's IEC SCL or its firmware.

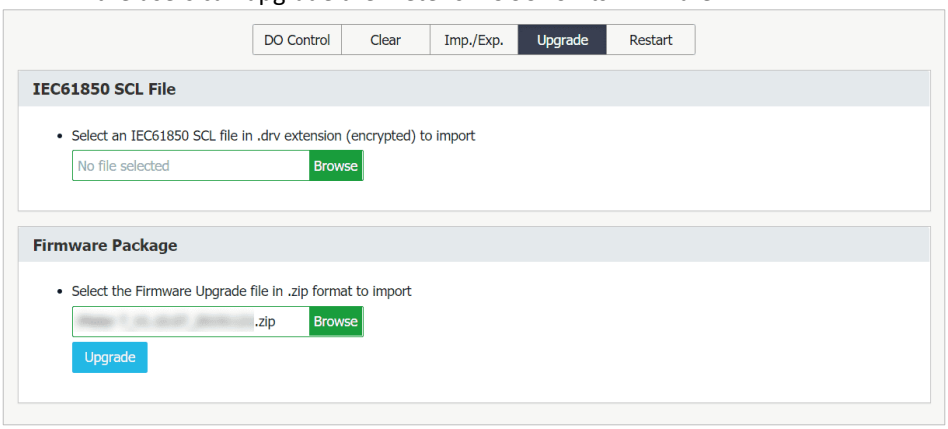


Figure 3-179 Upgrade Interface

- **Restart** Click the **Restart** tab at the top pane and the following page appears, which provides a quick access to restart the meter by a simple click.

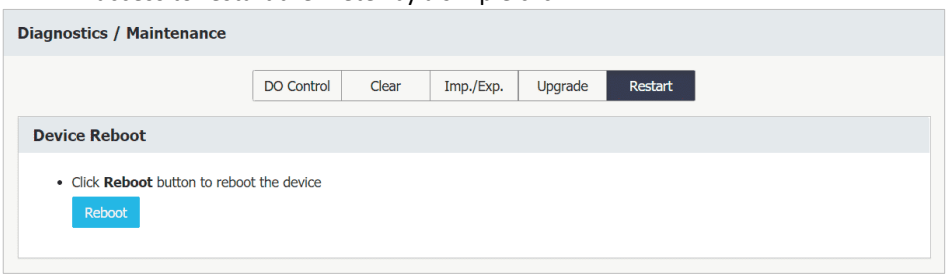


Figure 3-180 Restart Interface

Chapter 4 Applications

4.1 Inputs and Outputs

4.1.1 Digital Inputs

The iMeter D7 comes standard with four self-excited Digital Inputs that are internally wetted at 24 VDC with a sampling frequency of 1000Hz and programmable debounce. The iMeter D7 provides the following programmable functions for its Digital Inputs:

1) **Status Input** — Status 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, Web Interface 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. Only one DI can be programmed as **DMD Sync**. For example, to set DI4 as Demand Sync Input, DI1 to DI3 must not be programmed as a **DMD Sync** input.

4) **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:

Parameter	Definition	Options/*Default
DIx Function	Each **DI** can be configured as a Status Input, Pulse Counter or SYNC DI. Only DI1 to DI3 can be configured as **Tariff Switch**.	0=Status Input* 1=Pulse Counter 2=DMD Sync 3=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 9999 (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
DIx Setpoint Type[1]	Specifies the transition edge, whether it's positive, negative or any, for a DI Setpoint to become active. The DI Setpoint Type is only used when a DI is configured as a Status Input.	Any Edge*, Positive, Negative
DIx Trigger[2]	Specifies what output action a DI Setpoint will take when it becomes active. DI Setpoint is only valid when a DI is configured as a Status Input.	DO1/DO2/WFR /DWR/RMSR

Table 4-1 DI Setup Parameters

Note:
1. The DIx Setpoint Type only affects which edge would trigger the Waveform Recorder if configured.
2. The WFR/DWR Waveforms linked to the DI Changes are not visible via Front Panel or Web Interface, but downloadable via FTP Server.

4.1.2 Digital Outputs

The iMeter D7 comes standard with three Form A Electromechanical Digital Outputs, and one of the Digital Outputs can be used for Power Failure Alarm Output by Enabling **LOP Alarm**.

The Digital Outputs on the iMeter D7 can be used in the following applications:

1) **Front Panel Control** — Manually operated from the Front Panel. Please refer to the DO Control parameters in **Section 3.1.3.5.8** for a detailed description.

2) **Remote Control** — Remotely operated via on-board web server or the PecStar® iEMS Integrated Energy Management System.

3) **Control Setpoint** — Control setpoints can be programmed to trigger DO/WFR/DWR/RMSR or Alarm Email upon becoming active. See **Section 4.5** for a detailed description.

4) **PQ Disturbance Setpoint** Dips/Swells setpoint can be programmed to trigger DO/ WFR/DWR/RMSR or Alarm Email upon becoming active. See **Section 4.4.4** for a detailed description.

5) **Transient Setpoint:** Transient setpoint can be programmed to trigger DO/WFR/DWR/RMSR or Alarm Email upon becoming active. See **Section 0**for a detailed description.

6) **RVC Setpoint** RVC setpoint can be programmed to trigger DO/WFR/DWR/RMSR or Alarm Email upon becoming active. See **Section 4.4.10** for a detailed description.

7) **Inrush Setpoint** Inrush Setpoint can be programmed to trigger DO/WFR/DWR/RMSR or Alarm Email upon becoming active. See **Section 4.4.14** for a detailed description.

DOs on the iMeter D7 has the following setup parameters:

Parameter	Definition	Options, Default*
LOP Alarm	Specifies if the Power Failure Alarm function is enabled. If the Output isn't programmed as Power Failure Alarm, it can be used as normal DO.	0=Disabled, 1=Enabled*
Arm Before Execute	Enable or disable the Arm Before Execute feature for Alarm/DO	0=Disabled, 1=Enabled*
Alarm/DOx Pulse Width	Specifies the duration for which the Alarm/DO will be active when a Remote Operate or Setpoint Trigger command is received to operate it.	0 to 6000 (x 0.1s), 0 (Latched Mode)*

Table 4-2 DO Setup Parameters

Since there are multiple ways to trigger the Digital Outputs on the iMeter D7, 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, Dip/Swell Setpoint, Transient Setpoint, RVC Setpoint and Inrush 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 (Optional)

The iMeter D7 comes optionally with three Pulse Outputs for Energy pulsing. Energy Pulse Outputs are typically used for accuracy testing. The Energy Pulse can be enabled from the Front Panel (please refer to **Section 3.1.3.5.7**), Web Interface (please refer to **Section 3.2.3.5.7**) or communications.

The following table illustrates the ranges and default values for the Energy Pulse parameters.

Parameters	Options/Default*	Parameters	Options/Default*
Pulse Constant[2]	100, 1000, 3200, 5000*, 6400, 12800	E1 / E2 / E3	See **Table 4-4**, N/A*

Table 4-3 Energy Pulse Parameters

Notes:

1. The following table illustrates the available options for the Energy Pulse parameters.

ID	Parameter	ID	Parameter	ID	Parameter
1	kWh Total	7	kWh Total TH	13	kvarh Total Fund.
2	kWh Imp.	8	kWh Imp. TH	14	kvarh Imp. Fund.
3	kWh Exp.	9	kWh Exp. TH	15	kvarh Exp. Fund.
4	kWh Total Fund.	10	kvarh Total	16	kvarh Total TH
5	kWh Imp. Fund.	11	kvarh Imp.	17	kvarh Imp. TH
6	kWh Exp. Fund.	12	kvarh Exp.	18	kvarh Exp. TH

Table 4-4 Available options for Energy Pulse

2. The **Pulse Constant** can be configured as 100/1000/3200/5000/6400/12800 impulses per kWh or kvarh Pulse. It's important to understand that energy pulsing is always based on the secondary ratings as it would be impossible to generate the required number or pulses based on the primary ratings. The following table illustrates the recommended settings for the **Energy Pulse Constant** based on $Z = V_{nominal} \times I_{nominal} \times 2$, where $V_{nominal}$ and $I_{nominal}$ are the secondary voltage and current nominal ratings, respectively. In general, one would use a higher **Pulse Constant** for a smaller **Z** value in an accuracy testing situation to reduce the test time.

Z	Energy Pulse Constant	Default
≤1000	100/1000/3200/5000/6400/12800	5000
≤2000	100/1000/3200/5000/6400	5000
≤2600	100/1000/3200/5000	5000
≤4000	100/1000/3200	5000
≤13000	100/1000	5000
>130000	100	5000

Table 4-5 Recommended Settings for Energy Pulse Constant

4.1.4 Analog Input (Optional)

The iMeter D7 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 D7. 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.

4.1.5 RTD Input (Optional)

The iMeter D7 optionally provides one RTD Input for temperature measurement. The PT100 sensors are optional and not included. The 2-wire outputs of the PT100 sensor are connected to the RTD Input of the iMeter D7 if so equipped. The iMeter D7 can provide accurate temperature monitoring with the optional RTD inputs for measuring the temperature of the Neutral Conductor, Transformer or other equipment. There is an RTD Compensation register for each channel which can be used to compensate the measurement accuracy, and the compensation can be set according to formula:

RTD Compensation = 0.29xL where L ≤ 8 is the PT100 sensor's cable length in m

4.1.6 IR Input (Optional)

The iMeter D7 comes optionally with one IR input for Residual Current measurement via external Residual Current transformer. The IR measurement can be set as the Setpoint Source to trigger an alarm when a threshold value is exceeded. This 3-Phase and Neutral conductors should be wired through the Residual Current CT without the PE (Protective Earth) wire as illustrated below.

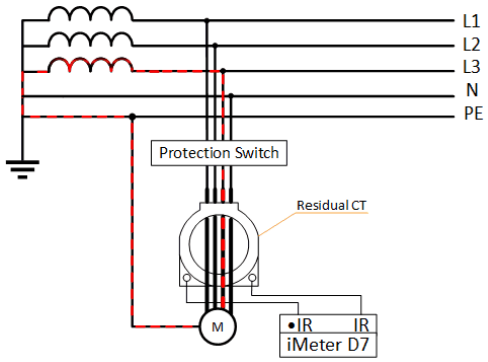


Figure 4-1 Example for Residual Current Measurement

4.2 HMI

4.2.1 Auto-Scroll

The iMeter D7 can enter the **Auto-Scroll** display mode where up to 10 parameters selected in Table 4-7 are automatically scrolled through at a pre-programmed interval.

The following table illustrates the Auto-Scroll setup parameters range and default value.

Parameter	Range/Default*	Parameter	Range/Default*
Enable	0=Disable*, 1=Enable	Initiate	1 to 60 (mins), 3*
Interval	1 to 60 (s), 3*	Screen 1 to 10	See Table 4-7

Table 4-6 Auto-Scroll Setup Parameters

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

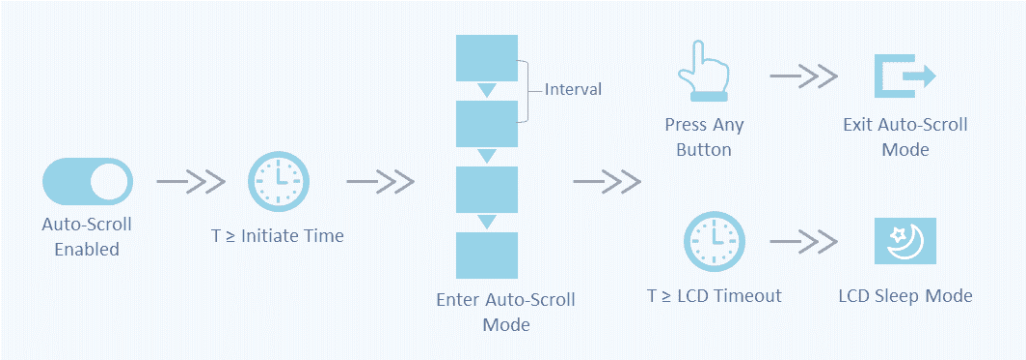


Figure 4-2 Auto-Scroll Logical Diagram

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

ID	Parameter	ID	Parameter	ID	Parameter
0	Null	7	TOU	14	Unbalance & Sequence
1	Phasor	8	Max. & Min.	15	Flicker
2	Voltage	9	I/O	16	Reserved
3	Current	10	Harmonics	17	Waveform
4	Power	11	Interharmonics	18	SOE Log
5	Energy	12	Voltage Deviation	19	Device Log
6	Demand	13	Frequency Deviation	20	PQ Counters

Table 4-7 Auto-Scroll Screen Options

4.2.2 Pop-up Alarm

The iMeter D7 supports Pop-up Alarm where the latest Alarm Event in the selected Trigger Source illustrated in **Table 4-9** will automatically pop up when the LCD is illuminated.

The following table illustrates the Pop-up Alarm setup parameters range and default value.

Parameter	Range/Default*	Parameter	Range/Default*
Enable	0=Disable*, 1=Enable	Min. Interval	0* to 3600 (s)
Duration	0* to 3600 (s)	Trigger Source	See Table 4-9, Dip/Swell*

Table 4-8 Pop-up Alarm Setup Parameters

The following figure illustrates the logical diagram for Pop-up Alarm.

Figure 4-3 Pop-up Alarm Logical Diagram

The following table illustrates the Trigger Source for Pop-up Alarm.

ID	Parameter	ID	Parameter	ID	Parameter
0	Dip/Swell	3	RVC	7	HS Setpoint
1	Transient	4	MSV	8	DI
2	Inrush Current	5	Standard Setpoint	9	DO

Table 4-9 Available Trigger Source Options

When both the **Auto-Scroll** and **Pop-up Alarm** are enabled, the Pop-up Alarm can display over Auto-Scroll screens and the Auto-Scroll Initiate Time along with the LCD Timeout will be reset after the Pop-up Alarm ended.

4.3 Power, Energy and Demand

4.3.1 Basic Measurements

The iMeter D7 provides the following basic measurements (@ 1-second update rate) which are available through the Front Panel, Web Interface or communications.

- 3-phase U, I, P, Q, S, and PF and well as U4, I4, Frequency and Ir.
- kWh, kvarh Import/Export/Net/Total and kVAh Total

4.3.2 High-Speed Measurements

The iMeter D7 provides the following high-speed measurements which are available through communications.

- 3-phase U, I, P, Q, S, and PF as well as U4, I4 @ ½ cycle
- Frequency @ 5 cycle

4.3.3 Energy Measurements

The iMeter D7 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 ±100,000,000,000.000. When the maximum value is reached, the energy registers will automatically roll over to zero. The energy can be reset manually through the Front Panel, on-board web or via communications. Besides, the energy can be preset to user-defined value through the web server or via communications.

The iMeter D7 provides the following energy measurements:

kWh	kvarh	kVAh
Imp. (Total RMS)	Imp. (Total RMS)	kVAh Total
Exp. (Total RMS)	Exp. (Total RMS)	
Net (Total RMS)	Net (Total RMS)	
Total (Total RMS)	Total (Total RMS)	
Imp. / Exp. / Net / Total Fundamental	Imp. / Exp. / Net / Total Fundamental	
Imp./Exp./Net/Total TH	Imp./Exp./Net/Total TH	
Imp./Exp. H02 to H63	Imp./Exp. H02 to H63	

Table 4-10 Energy Measurements

4.3.4 Demands

Demand is defined as the average power consumption over a fixed interval (usually 15 minutes).

iMeter D7 provides the predicted demand for pre-alarming and helps users to reduce demand consumption by predicting the demand at the end of the present period based on the current real-time power consumption.

The iMeter D7 provides the following present Demand and Predicted Demand parameters:

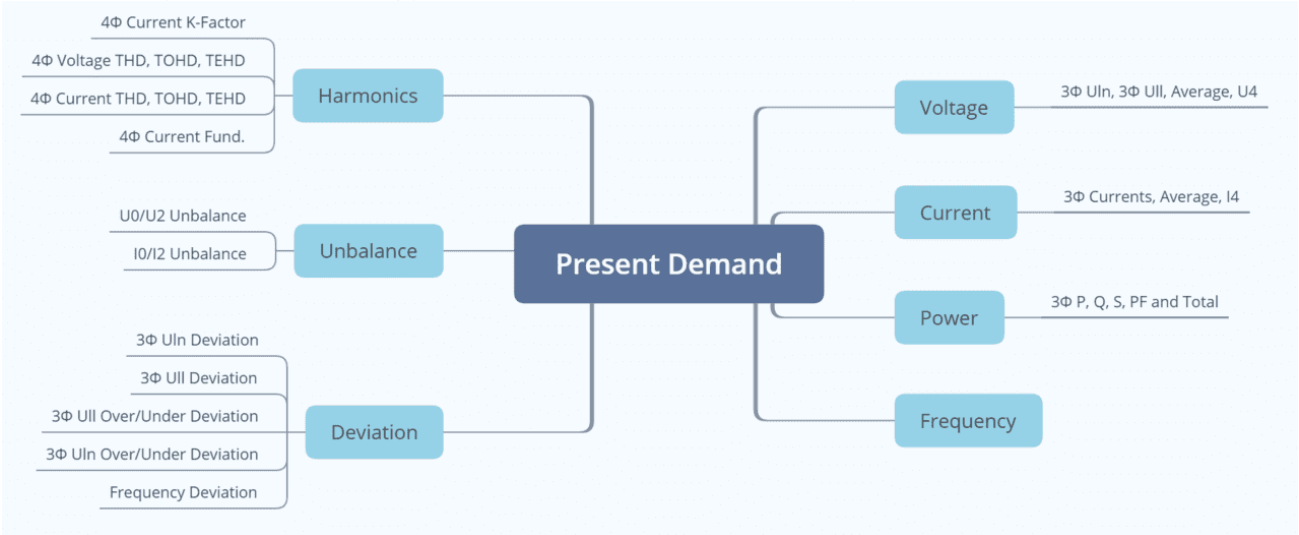


Figure 4-4 Present Demand Parameters

Figure 4-5 Predicted Demand

The iMeter D7 provides the following setup parameters.

Setup Parameter	Definition	Options/Default*
Sync. Mode	**SLD** – Internally synchronized to the meter's real-time clock **Sync. DI** – Externally synchronized to a DI that has been programmed as a Demand Sync Input by setting the DI Function as "DMD Sync".	0 = SLD* 1 = Sync. DI
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, 15*
# of Sliding Windows	The 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 Max. 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 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=0xFFFF
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 4-11 Demand Setup Parameters

4.4 Power Quality Parameters

4.4.1 Power Frequency and Freq. Deviation

The iMeter D7 is capable of measuring **Frequency** accurate to ±0.003Hz. The measurement range is ±10% of $f_{nominal}$, which is 40Hz to 60Hz for 50Hz system and 48 Hz to 72Hz for 60Hz system.

The measurement method of **Frequency** is in accordance with **Section 5.1 of IEC 61000-4-30 Ed. 3 Standard** for Class A performance. The iMeter D7 also computes **Freq. Deviation** as per below:

$$\textbf{\textit{Freq. Deviation}} = ((f - f_{nominal})/f_{nominal}) \times 100\%$$

where $f_{nominal}$ is the Nominal Frequency

The **Freq. Deviation** measurement can be accessed through Front Panel (refer to **Section 3.1.3.2.5**) or On-board Web Server (refer to **Section 3.2.3.3.4**).

4.4.2 Magnitude of the Supply Voltage

The measurement method of the **Magnitude of the Supply Voltage** parameters is in accordance with **Section 5.2 of IEC 61000-4-30 Ed. 3 Standard** for Class A performance. The measurement method is not intended for the detection and measurement of disturbances such as **Dips**, **Swells**, **Interruptions** and **Transients**. The RMS value includes voltage related measurements such as **Harmonics**, **Interharmonics**, **Mains Signalling**, etc.

4.4.3 Flicker

The iMeter D7 provides the Flicker measurements in accordance with **Section 5.3** of **IEC 61000-4-30 Ed.3 Standard** for Class A performance (where **IEC 61000-4-15 Standard** applies). The **Nominal Frequency** (50Hz or 60Hz) and **the Flicker Curve** (120V or 230V) setup parameters, programmable via the Web Server or Communications, determines which model would be used for the following Flicker measurements.

- *Short-term flicker severity (Pst) measured over a 10-minute interval*
- *Long-term flicker severity (Plt) calculated from a sequence of 12 Pst according to the following formula:*

$$Plt = \sqrt[3]{\sum_{i=1}^{12} \frac{Pst_i^3}{12}}$$

The Pst and Plt measurement can be accessed through Front Panel (refer to **Section 3.1.3.2.7**) as well as via On-board Web Server (refer to **Section 3.2.3.3.6**).

4.4.4 Supply Voltage Dips and Swells

The iMeter D7 supports the detection of the **Supply Voltage Dips and Swells** using a method that is in accordance with **Section 5.4 of IEC 61000-4-30 Ed. 3 Standard** for Class A performance.

The iMeter D7 provides Dips/Swells detection for voltage quality monitoring on a per phase basis, which support multiple triggers at the same time, including **WFR/DWR/RMSR**, **DO**, **SOE**, and **Alarm Email**. The timestamp, duration and magnitudes of per phase voltage of each Dip/Swell would be recorded by the iMeter D7.

4.4.4.1 Dips/Swells Detection

As per IEC 61000-4-30 Ed. 3:

- ***Voltage Swells Detection***

  On polyphase systems a Swell begins when the $U_{rms(1/2)}$ voltage of one or more channels rises above the Swell Threshold and ends when the $U_{rms(1/2)}$ voltage on all measured channels is equal to or below the Swell Threshold minus the Hysteresis voltage.

- ***Voltage Dips Detection***

  On polyphase systems a Dip begins when the $U_{rms(1/2)}$ voltage of one or more channels is below the Dip Threshold and ends when the $U_{rms(1/2)}$ voltage on all measured channels is equal to or above the Dip Threshold plus the Hysteresis voltage.

PQ Disturbance Settings

The **PQ Disturbance** setup parameters can be programmed over the Web Interface or via Communications. The **Dip Threshold**, **Swell Threshold**, **Voltage Interruption Threshold** (See **Section 4.4.5**) and **Dip/Swell Hysteresis** should be configured to meet the following criteria:

a) The **Voltage Interruption Threshold** shall be set below the **Dip Threshold**.
b) The **Dip/Swell Hysteresis** must be less than the **Dip/Swell Thresholds**.
c) The **Rapid Voltage Changes (RVC) Threshold** must be less than the **Dip and Swell Thresholds**.
d) Regardless of whether **Dip/Swell** is enabled, the conditions for a), b) and c) must always be met.

The following table illustrates the ranges and default values for the PQ Disturbance parameters on the iMeter D7.

Parameter	Options/Range, Default*	Parameter	Options/Range, Default*
PQD Enable	Yes*, No	Dip Threshold	1 to 99 (%) of Udin/Usr, 90*
Reference Voltage	Udin*, Usr	Dip Hysteresis	1 to 100 (%) of Udin/Usr, 2*
PQD Trigger	WFR, DWR*, RMSR	Dip Trigger	Alarm, DO1, DO2
Swell Threshold	101 to 200 (%) of Udin/Usr, 110*	Interruption Threshold	0 to 50 (%) of Udin/Usr, 5*
Swell Hysteresis	1 to 100 (%) of Udin/Usr, 2*	Interruption Hysteresis	1 to 100 (%) of Udin/Usr, 2*
Swell Trigger	Alarm, DO1, DO2	Interruption Trigger	Alarm, DO1, DO2

Table 4-12 PQ Disturbance Parameters

4.4.4.2 Voltage Dips Evaluation

A **Voltage Dip** is characterized by a pair of data, the **Residual Voltage** (U_{res}) or **Depth** and **Duration**:

Parameter	Definition
Residual Voltage	The lowest $U_{rms\,(1/2)}$ value measured on any channel during the **Dip**.
Depth	The difference between the **Reference Voltage** and the **Residual Voltage**. It's generally expressed in percentage of the **Reference Voltage**.
Duration	The time span from the start time to the end time of the **Voltage Dip**.

Table 4-13 Dip Evaluation Parameter

As per the **Figure 4-6 Characteristics of Voltage Dip Event**:

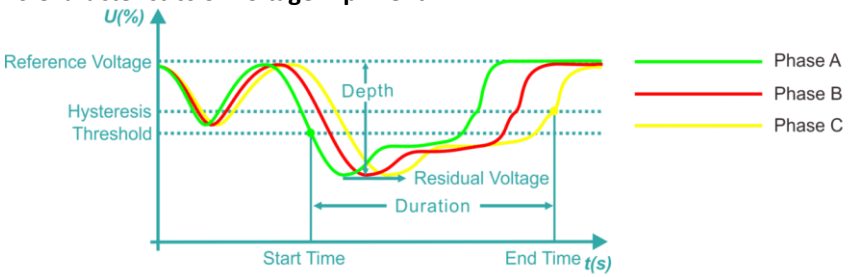


Figure 4-6 Characteristics of Voltage Dip Event

4.4.4.3 Voltage Swells Evaluation

A **Voltage Swell** is characterized by a pair of data, the **Maximum Swell Voltage Magnitude** and **Duration**:

Parameter	Definition
Max. Voltage Swell Magnitude	The largest $U_{rms\,(1/2)}$ value measured on any channel during the **Swell**.
Duration	The time span from the start time to the end time of the **Voltage Swell**.

Table 4-14 Swell Evaluation Parameter

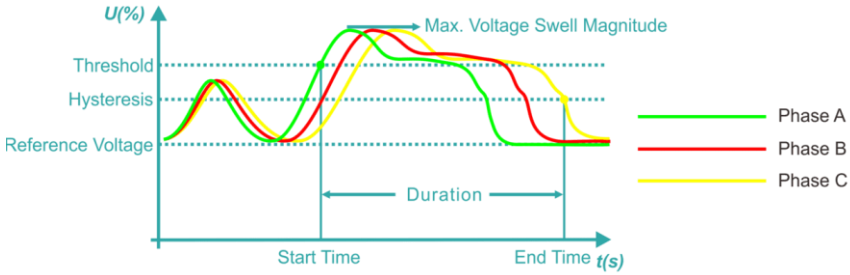


Figure 4-7 Characteristics of Voltage Swell Event

4.4.4.4 Sliding Reference Voltage (U_{sr})

A Sliding Reference Voltage uses measured values filtered with a 1-minute time constant. This filter is given by

$$U_{sr(n)} = 0.9967 \times U_{sr(n-1)} + 0.0033 \times U_{(10/12)rms}$$

where

$U_{sr(n)}$	is the present value of the **Sliding Reference Voltage**
$U_{sr(n-1)}$	is the previous value of the **Sliding Reference Voltage**
$U_{(10/12)rms}$	is the most recent 10/12-cycle r.m.s. value

Generally, the Sliding Reference Voltage Usr is not used in LV systems.

4.4.4.5 WFR of Dip/Swell

Figure 4-8 Dip Event @ 1024 samples/cycle x 40 cycles

Figure 4-9 Swell Event @ 1024 samples/cycle x 40 cycles

4.4.5 Voltage Interruptions

The iMeter D7 supports the detection of **Voltage Interruptions** using a method that is in accordance with **Section 5.5 of IEC 61000-4-30 Standard Ed.3** for Class A performance.

4.4.5.1 Voltage Interruption Evaluation

As per IEC 61000-4-30 Ed.2

☞ ***Voltage Interruption Detection***

On polyphase systems, a Voltage Interruption begins when the $U_{rms(1/2)}$ voltages of all channels fall below the Interruption Threshold and ends when the $U_{rms(1/2)}$ voltage on any one channel is equal to, or greater than, the Interruption Threshold plus the Hysteresis.

*The **Interruption Threshold** shall not be set below the uncertainty of **Residual Voltage** measurement plus the value of **Hysteresis**. Typically, the **Hysteresis** and **Interruption Threshold** are 2% of U_{din} and 5% of U_{din}, respectively.*

*The **Duration** of a voltage interruption is the time difference between the beginning and the end of the **Voltage Interruption**.*

4.4.5.2 WFR of Voltage Interruption

Figure 4-10 Interruption Event @ 1024 samples/cycle x 40 cycles

4.4.6 Transients Voltage

The iMeter D7 provides the capability for detecting transient voltages using the sliding-window method which compares the instantaneous value with the corresponding values on the previous cycle at a maximum resolution of 40µs (@50Hz) and in accordance with **Section 5.6** & **A.4.4** of **IEC 61000-4-30 Ed.3 Standard**.

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Threshold	5% to 500% of Udin, 35%*
Trigger	WFR*, DWR, RMSR, Alarm, DO1, DO2		

Table 4-15 Transient Parameters

4.4.6.1 WFR of Transient Event

Figure 4-11 Transient Event @ 1024 samples/cycle

4.4.7 Supply Voltage and Current Unbalance

The iMeter D7 provides both the Zero-Sequence and Negative-Sequence Unbalance measurements for Voltage and Current, using Symmetrical Components and in accordance with **Section 5.7**, **Section 5.13.6 of IEC 61000-4-30 Ed. 3 Standard** for Class A performance, respectively.

$$U2\ Unbalance = \frac{U2}{U1} x100\%,\ I2\ Unbalance = \frac{I2}{I1} x\,100\%$$ (Negative Sequence Unbalance)

$$U0\ Unbalance = \frac{U0}{U1} x100\%,\ I0\ Unbalance = \frac{I0}{I1} x\,100\%$$ (Zero Sequence Unbalance)

where
U0, U1, U2 are the Zero, Positive and Negative Sequence Components for Voltage, respectively.
and
I0, I1, I2 are the Zero, Positive and Negative Sequence Components for Current, respectively.

4.4.8 Harmonics and Interharmonics

The iMeter D7 provides the Harmonics and Interharmonics measurements in accordance with **Sections 5.8** and **5.9** of **IEC 61000-4-30 Ed. 3 Standard** for Class A performance using a 10/12 cycle gapless centered harmonic sub-group measurement, denoted $U_{sg,h}$ for Harmonics and $Y_{isg,h}$ for Interhamonics, as per **IEC 61000-4-7:2002**.

There are two methods to calculate the Harmonic Distortion (HD):

a) Fundamental Method:

Voltage K^{th} Harmonic/Interharmonic Distortion = $\frac{U_k}{U_1}$ X100% where U_1 is the Fundamental Voltage

Current K^{th} Harmonic/Interharmonic Distortion = $\frac{I_k}{I_1} X100\%$ where I_1 is the Fundamental Current

b) RMS Method:

Voltage K[th] Harmonic /Interharmonic Distortion = $\frac{U_k}{\sqrt{\sum_{K=1}^{\infty} U_K^2}} X100\%$ where the denominator is the RMS

Current K[th] Harmonic/Interharmonic Distortion = $\frac{I_k}{\sqrt{\sum_{K=1}^{\infty} I_K^2}} X100\%$ where the denominator is the RMS

The iMeter D7 provides measurements for Voltage Harmonics, Current Harmonics, K-Factor, Crest Factor (for Current only), Power Harmonics and Energy Harmonics.

K-Factor

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

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

I_h = h_{th} Harmonic Current in RMS
h_{max} = Highest harmonic order

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

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

$|X|_{peak}$ = Peak amplitude of the waveform
X_{rms} = RMS value

4.4.8.1 Harmonic/Interharmonic Voltage and Current

The iMeter D7 provides the following Harmonic/Interharmonic Voltage and Current measurements.

Measurements	Ua	Ub	Uc	U4	Ia	Ib	Ic	I4
THD, TOHD, TEHD, DC Components to HD63 (%)	▪	▪	▪	▪	▪	▪	▪	▪
TDD, TDD Odd, TDD Even (%)	--	--	--	--	▪	▪	▪	▪
K-Factor	--	--	--	--	▪	▪	▪	▪
Crest Factor	▪	▪	▪	▪	▪	▪	▪	▪
TH, TEH, TOH, DC Components to H63 (RMS)	▪	▪	▪	▪	▪	▪	▪	▪
TIHD, TOIHD, TEIHD, IHD00 to IHD63 (%)	▪	▪	▪	▪	▪	▪	▪	▪
TIH, TIEH, TIOH, IH00 to IH63 (RMS)	▪	▪	▪	▪	▪	▪	▪	▪

Table 4-16 Harmonic/Interharmonic Voltage and Current

4.4.8.2 Harmonic Power

The iMeter D7 provides Individual Harmonic to the 63[rd] order and the TH (Total Harmonic) P, Q, S and PF for 3Φ and Total. The Total 3Φ Harmonic Powers are only available via communications while the Individual Harmonic and TH (Total Harmonic) Powers for Phase A/B/C are available via both the Web Interface and communications.

4.4.8.3 Harmonic Energy

The iMeter D7 provides the Total Harmonic Energy Measurements for kWh, kvarh Import/Export/Net/Total and kVAh as well as the Individual Harmonic Energy Measurements to the 63[rd] order for kWh, kvarh Import/Export. The Harmonic Energy can be retrieved via the Front Panel, Web Interface and Communications.

4.4.9 MSV (Mains Signalling Voltage)

The iMeter D7 provides the Mains Signalling Voltage measurements in accordance with **Section 5.10** of **IEC 61000-4-30 Ed.3 Standard** for Class A performance.

- ☞ *Mains Signalling Voltage is RMS voltage of mains signal.*
- ☞ *Mains signalling voltage measurement shall be based on*

- *Either the corresponding 10/12-cycle r.m.s. value interharmonic bin*
- *Or the r.m.s. of the four nearest 10/12-cycle r.m.s. value interharmonic bins*

☞ *The beginning of a signalling emission shall be detected when the measured value of the concerned interharmonic exceeds a threshold. The measured values are recorded during a period of time specified by the user, in order to give the level and the sequence of the signal voltage.*

☞ *The user must select a detection threshold above 0.3% U_{din} as well as the length of the recording period up to 120s.*

The iMeter D7 can simultaneously detect three different frequencies for Mains Signalling Voltage. The emission signalling will trigger an event in SOE, recording the Trigger Channel and Max. Volt. of the three-phase voltages.

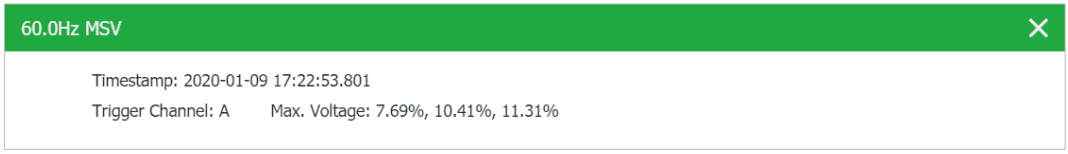


Figure 4-12 Event for 60.0Hz MSV in SOE

The iMeter D7 provides the following setup parameters which can be programmed over Web/Communication:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Frequency	60 to 3k Hz, 1k (MSV1)*, 2k (MSV2)*, 3k (MSV3)*
Threshold	0.3% to 100% of Udin, 5%*	Signalling Time	1 to 120s, 60s*

Table 4-17 MSV Parameters

4.4.10 RVC (Rapid Voltage Change)

The iMeter D7 provides the ability to capture RVC in accordance with **Section 5.11** & **A.5** the **IEC 61000-4-30 Ed.3 Standard** for Class A performance.

As per 5.11 of IEC 61000-4-30 Ed.3:

☞ *A rapid voltage change is a quick transition in RMS voltage occurring between two steady-state conditions and during which the RMS voltage does not exceed the dip/swell thresholds*

☞ *An RMS voltage is in a steady-state condition if all the immediately preceding 100/120 $U_{rms\ (1/2)}$ values remain within an RVC threshold from the arithmetic mean of those 100/120 $U_{rms\ (1/2)}$ values.*

☞ *The RVC threshold and hysteresis are set by the user according to the application, as percentage of Udin and the hysteresis should be less than the threshold.*

4.4.10.1 Rapid Voltage Change Evaluation

A Rapid Voltage Change event is characterized by 4 parameters: **Start time**, **Duration**, **ΔU_{max}** and **ΔU_{ss}**.

- Start Time — When the "Voltage-is-Steady-State" logic signal becomes False and initiates the RVC event.
- Duration — 100/120 half-cycle prior to the "Voltage-is-Steady-State" logic signal returns to True from False.
- ΔU_{max} — The absolute maximum difference between any of the $U_{rms\ (1/2)}$ values during the RVC event and the final arithmetic mean 100/120 $U_{rms\ (1/2)}$ value just prior to the RVC event.
- ΔU_{ss} — The absolute difference between the final arithmetic mean 100/120 $U_{rms\ (1/2)}$ value just prior to the RVC event and the first arithmetic mean 100/120 $U_{rms\ (1/2)}$ value after the RVC event.

The iMeter D7 provides the following setup parameters which can be programmed via the Web interface or through communications:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Threshold	0.2% to 10% of Udin, 5%*
Hysteresis	0.1 to 5 (%) of Udin, 2.5%*	Trigger	N/A*, WFR, DWR, RMSR, Alarm, DO1, DO2

4.4.10.2 RMSR for an RVC Event

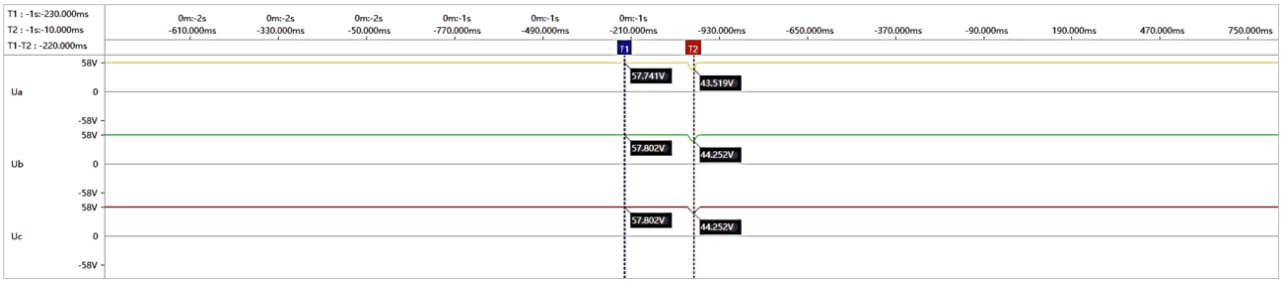


Figure 4-13 RMSR for an RVC Event

4.4.11 Underdeviation and overdeviation

The iMeter D7 provides the ability to capture **Voltage Deviation** in accordance with the **IEC 61000-4-30 Ed.3 Standard**.

As per Section 5.12 or Annex D (Informative) of IEC 61000-4-30 Ed.3

- *The 10/12-cycle r.m.s value, $U_{rms\ (10/12),\ i}$, should be used to assess the underdeviation and overdeviation parameters in percent of Udin. The underdeviation $U_{rms\text{-}under}$ and overdeviation $U_{rms\text{-}over}$ parameters are determined by the following equations:*

  Calculation of $U_{rms\text{-}under,\ i}$:

  If $U_{rms\ (10/12),\ i} > U_{din}$ then $U_{rms\text{-}under,\ i} = U_{din}$

  If $U_{rms\ (10/12),\ i} \leqslant U_{din}$ then $U_{rms\text{-}under,\ i} = U_{rms\ (10/12),\ i}$

  Calculation of $U_{rms\text{-}over,\ i}$:

  If $U_{rms\ (10/12),\ i} > U_{din}$ then $U_{rms\text{-}over,\ i} = U_{din}$

  If $U_{rms\ (10/12),\ i} \leqslant U_{din}$ then $U_{rms\text{-}over,\ i} = U_{rms\ (10/12),\ i}$

  And the Underdeviation/Overdeviation should be calculated based on the following:

  Underdeviation:

  $$U_{under} = \frac{U_{din} - \sqrt{\frac{\sum_{i=1}^{n} U_{rms-under,i}^2}{n}}}{U_{din}}$$

  Overdeviation:

  $$U_{over} = \frac{\sqrt{\frac{\sum_{i=1}^{n} u_{rms-over,i}^2}{n}} - U_{din}}{U_{din}}$$

  Where

  n = the number of 10/12 cycle RMS values for under or overdeviation

  and

  $U_{rms\text{-}under,\ i}$ / $U_{rms\text{-}over,\ i}$ is the i^{th} 10/12-cycle RMS value.

The iMeter D7 is capable of measuring Voltage with an accuracy of 0.1% and monitoring Voltage Deviation on line. In addition, the Voltage Deviation is supported by the setpoint function. Please refer to **Chapter 3 User Interface** for the Deviation parameters on the Front Panel and Web Interface.

4.4.12 Flagging Concept

The iMeter D7 supports the Flagging Concept as per ***Section 4.7 of IEC 61000-4-30 Ed.3 Standard:***

- *During a dip, swell, or interruption, the measurement algorithm for other parameters (for example, frequency measurement) might produce an unreliable value. The flagging concept therefore avoids counting single event more than once in different parameters (for example, counting a single dip as both a dip and a frequency variation) and indicates that an aggregated value might be unreliable.*
- *Flagging is only triggered by dips, swells and interruptions*. The detection of dips and swells is dependent on the threshold selected by the user and this selection will influence which data are "flagged".*
- *The flagging concept is applicable for Class A measurement performance during measurement of power frequency, voltage magnitude, flicker, supply voltage unbalance, voltage harmonics, voltage interharmonics, mains signalling and measurement of underdeviation and overdeviation parameters.*
- *If during a given time interval any value is flagged, the aggregate value indicating that value shall also be flagged. The flagged value shall be stored and also included in the aggregation process, for example, if during a given time interval any value is flagged the aggregated value that includes this value shall also be flagged and stored.*

*Besides, flagging will be triggered by the detection of I > 2In on iMeter D7.

The **Flagging Status** register (0080) indicates if a certain group of data has been **flagged** because of Dip / Swell / Interruption or Over Current Limit detected, with a bit value of 1 meaning **flagged** and 0 meaning **not flagged**. The following table illustrates the details of the **Flagging Status** register for real-time data.

Bit	Description		Bit	Description	
B0	Basic Measurements	Dip	B8	Pst.	Dip
B1		Swell	B9		Swell
B2		Interruption	B10		Interruption
B3		Over Current Limit	B11		Reserved
B4	Freq.	Dip	B12	Plt.	Dip
B5		Swell	B13		Swell
B6		Interruption	B14		Interruption
B7		Reserved	B15		Reserved

Table 4-18 Flagging Status Register (0080)

Basic Measurements include Voltage, Current, Frequency, Unbalance, Harmonics and Interharmonics measurements.

The **Flagging Setup** register (40825) defines if the flagging data should be kept or removed in a particular type of statistical log as illustrated in the following table, with a bit value of 0 meaning **Kept** and 1 meaning **Removed**.

Bit 15~Bit 4	Bit 3	Bit 2	Bit1	Bit 0
Reserved	EN50160	Min. Log	Max. Log	SDR Log

Table 4-19 Flagging Setup Register (40825)

For any Statistical Log (such as SDR Log, Max. Log, Min. Log and/or EN50160 Log), its log entry will be discarded and will not be included in the statistical evaluation if any data within the log entry has been **Flagged** while the bit representing the particular Log type in the **Flagging Setup** register is enabled (set to 1).

4.4.13 2 – 150 kHz Conducted Emissions

The iMeter D7 is capable of provide an overview of conducted voltage emissions in the supraharmonics 2-150 kHz range in a power quality context, as per **Annex C (Informative)** of **IEC 61000-4-30 Ed.3 Standard**.

- ☞ *These emissions are presumed to be quasi-steady-state levels, although they may have amplitude modulation.*
- ☞ *Useful Information about measurement in the 2 kHz to 150 kHz range can be found in **IEC 61000-4-7:2002, Annex B** (2 kHz to 9 kHz), and **CISPR 16** (9 kHz to 150 kHz).*

The Frequency band 2 – 9 kHz and 9 – 150 kHz are divided into 35 and 71 segments with 200 Hz and 2000 Hz resolution, respectively. The iMeter D7 provides the 3Φ average U_{rms} for each segment every 3s. All the real time measurements are retrievable via the Front Panel, Web Interface or Communications.

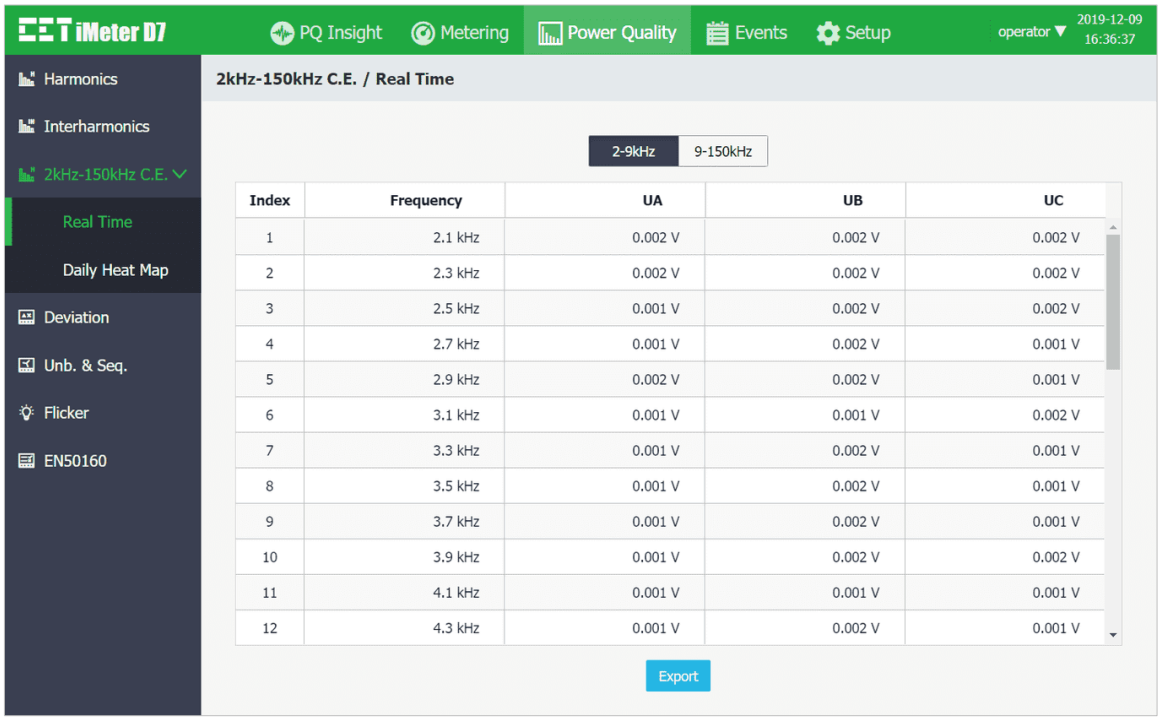


Figure 4-14 2 – 9 kHz Real Time C.E. on Web Interface

The iMeter D7 also records the Frequency, Timestamp and Daily Amplitudes for Max./Min./Average/Cp95 values of 3Φ U_{rms} in Frequency band 2 – 9 kHz and 9 – 150 kHz, with heat map as shown in Figure 4-15. The iMeter D7 can store up to 30 daily records based on a First-in-First-out principle. All the records can be downloaded from the Web Server or FTP Server. The historical daily records can be reset via Web Server or Communications.

Figure 4-15 Daily Heat Map

4.4.14 Inrush Current

Inrush current refers to the maximum instantaneous current drawn by a power supply or electrical device at turn-on, often several times their normal full-load current, when first energized such as the turning on of an AC electric motor or the energization of a transformer or a capacitor bank. The higher than normal inrush current typically only lasts for a few cycles before returning to their steady-state condition.

As per **Section A6.4** of **IEC61000-4-30 Ed.2 Standard**, the iMeter D7 supports the detection of Inrush Current as a supplement to voltage measurements, especially when trying to determine the causes of events such as voltage dip.

☞ *The inrush current begins when the* $I_{half\_cyc\_rms}$ *current rises above the* ***Inrush Threshold*** *and ends when the* $I_{half\_cycle\text{-}rms}$ *current is equal to or below the* ***Inrush Threshold*** *minus a user-selected* ***Inrush Hysteresis*** *value.*

☞ *The inrush current can be further characterized by*

- *the time duration between the beginning and the end of the inrush current*
- *the maximum value of the measurement inrush current* $I_{half\_cyc\_rms}$
- *the square root of the mean of the squared* $I_{half\text{-}cyc\text{-}rms}$ *values measured during the inrush duration*

The $I_{half\_cyc\_rms}$ is calculated by the following equation:

$$I_{half\_cyc\_rms} = \sqrt{\frac{1}{T/2}\int_0^{T/2} i^2(t)dt}$$

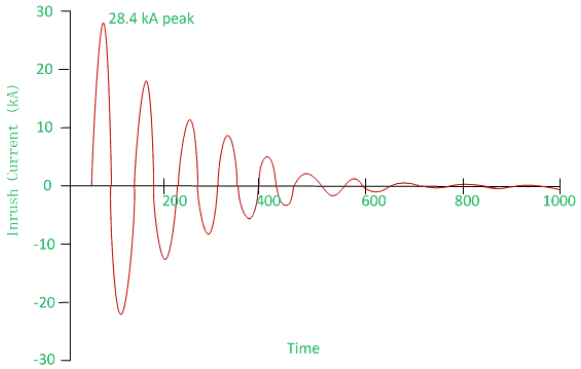


Figure 4-16 Inrush Current

The following table illustrates the ranges and default values for the Inrush Current parameters:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Threshold	100% to 500% of In, 120%*
Hysteresis	0.1% to 100% of In, 1%*	Trigger	WFR*, DWR, RMSR, Alarm, DO1, DO2

Table 4-20 Inrush Current Parameters

4.4.15 EN50160 Compliance Report

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

The iMeter D7 can measure, summarize data and statistical relevant data in accordance with the EN50160 standard. Further, the device will create a report per week for the following PQ parameters and store the report for one year.

- Power Frequency, including Maximum and Minimum
- Supply Voltage Variations, including Maximum and Minimum
- Flickers, including Max./Min. and CP95
- Voltage Unbalance, including Max./Min. and CP95
- Harmonic and Interharmonic Voltage, including Max./Min., average and CP95
- Mains Signalling Voltage, including Max./Min. and CP95
- Rapid Voltage Changes
- Dips and Swells with statistical parameters classified according to characteristic voltage and duration

- Interruptions with statistical parameters classified according to the duration
- Transient

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

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

Table 4-21 Default Values for EN50160 Settings

The programming of the EN50160 reporting is supported via the Web interface and communications. The EN50160 Report can be accessed through the Web Interface or via communications. The iMeter D7 can store up to 52 weekly reports. If there are more than 52 reports, the newest report will replace the oldest on a FIFO basis. Please refer to **Section 3.2.3.3.7** for an EN50160 sample report from the Web Interface.

4.4.16 ITIC/SEMI F47 Curve

The iMeter D7's Web Interface can display the ITIC plot for Dip, Swell and Interruption events but only SEMI F47 plot for Dip and Interruption events as illustrated in **Section 3.2.3.4.1** .

4.4.17 Disturbance Direction Location

The iMeter D7 provides the Disturbance Direction Indicator as an educated guess with confidence level for the disturbance direction of a Dip event, whether Upstream or Downstream, and records the information in the SOE Log.

Figure 4-17 Disturbance Direction Indicator

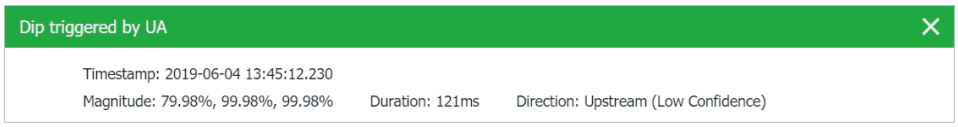


Figure 4-18 Disturbance Direction Location

4.5 Setpoints

The iMeter D7 comes standard with 40 user-programmable setpoints which provide extensive control by allowing user to initiate an action in response to a specific condition. All the setpoints can be set to Standard or High-speed based on the monitoring parameter. Typical setpoint applications include alarming, recording and power quality monitoring.

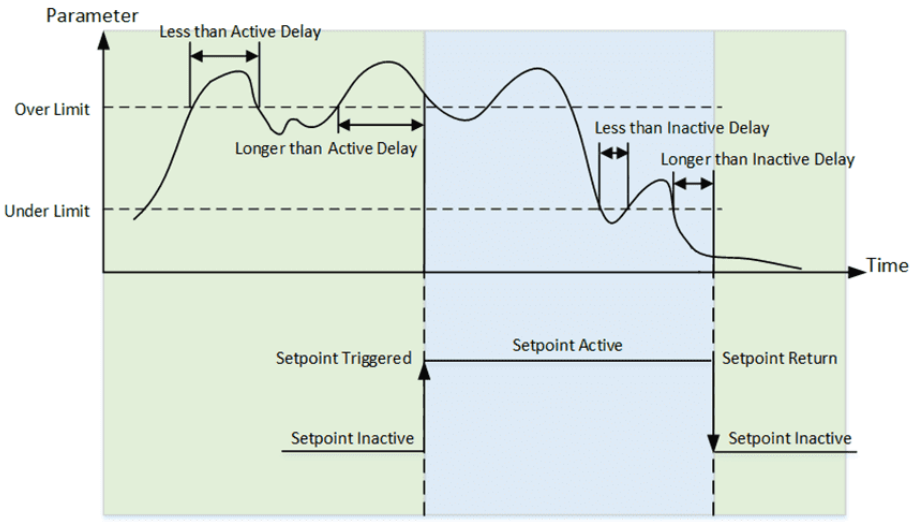


Figure 4-19 Over Setpoints

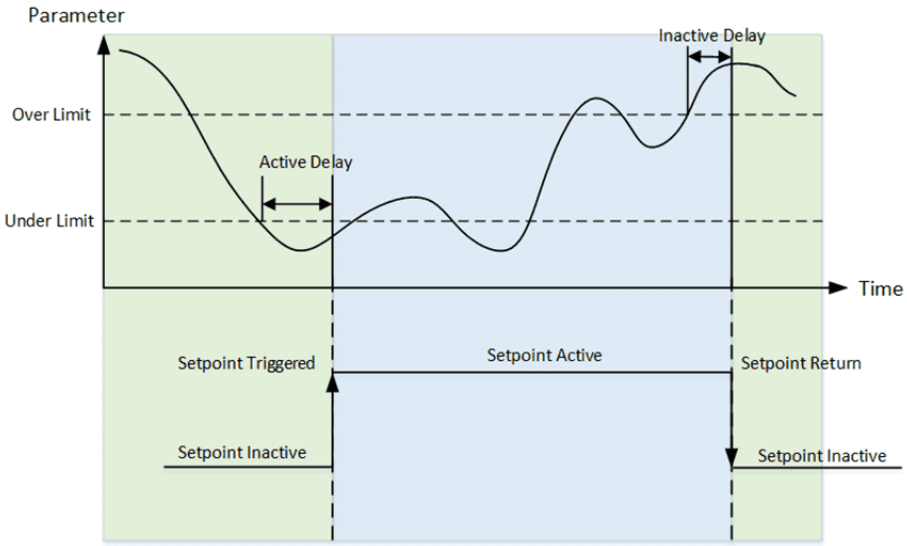


Figure 4-20 Under Setpoints

The Setpoints can be programmed via web interface or communications and have the following setup parameters:

Parameters	Definition	Options/Default*
Type	Disabled, Over, Under, HS Over, HS Under Setpoint.	0=Disabled* 1=Over Setpoint 2=Under Setpoint 3=HS Over Setpoint 4=HS Under Setpoint
Setpoint Parameter	Specify the parameter to be monitored.	See **Table 4-23**
Over Limit	Specify the value that the setpoint parameter must exceed for Over Setpoint or go below for Under Setpoint for the setpoint to become active.	999,999*
Under Limit	Specify the value that the setpoint parameter must go below for	999,999*

	Over Setpoint or exceed for Under Setpoint for the setpoint to become inactive.	
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. The range of the **Setpoint Active Delay** is between 0 and 9,999 seconds for Standard Setpoints and between 0 and 9,999 cycles for HS Setpoints.	0 to 9999 (s), 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. The range of the **Setpoint Inactive Delay** is between 0 and 9,999 seconds for Standard Setpoints and between 0 and 9,999 cycles for HS Setpoints.	0 to 9999 (s), 10*
Trigger	Specify what action a setpoint can take when it becomes active.	N/A*, DWR, WFR, RMSR, Alarm, DO1, DO2

Table 4-22 Description for Setpoint Parameters

The iMeter D7 provides the following Setpoint parameters, Standard Setpoint can monitor all parameters while the HS Setpoint only can monitor parameters 1 to 10.

Key	Parameter	Key	Parameter	Key	Parameter
0	Null	**29**	U TIHD	**58**	PF Total Pred. Demand
1	Uln	**30**	U TOIHD	**59**	Pst
2	Ull	**31**	U TEIHD	**60**	Plt
3	U4	**32**	I TIHD	**61**	Reserved
4	I	**33**	I TOIHD	**62**	Phase Loss
5	I4 (Optional)	**34**	I TEIHD	**63**	IR
6	Reserved	**35**	U TH RMS	**64**	TC
7	kW Total	**36**	U TOH RMS	**65**	AI1
8	kvar Total	**37**	U TEH RMS	**66**	AI2
9	kVA Total	**38**	I TH RMS	**0x20000**	U HD02
10	PF	**39**	I TOH RMS	**…**	…
11	U2 Unbalance	**40**	I TEH RMS	**0x3F0000**	U HD63
12	U0 Unbalance	**41**	U TIH RMS	**0x400000**	U H02 RMS
13	I2 Unbalance	**42**	U TOIH RMS	**…**	…
14	I0 Unbalance	**43**	U TEIH RMS	**0x7D0000**	U H63 RMS
15	U Fund.	**44**	I TIH RMS	**0x810000**	U IHD01
16	I Fund.	**45**	I TOIH RMS	**…**	…
17	Voltage Deviation	**46**	I TEIH RMS	**0xBF0000**	U IHD63
18	Voltage over Dev.	**47**	P Total Imp. Demand	**0x02000000**	I H02 RMS
19	Voltage Under Dev.	**48**	Q Total Imp. Demand	**…**	…
20	Frequency	**49**	P Total Exp. Demand	**0x3F000000**	I H63 RMS
21	Freq. Deviation	**50**	Q Total Exp. Demand	**0x40000000**	I HD02
22	Phase Reversal	**51**	S Total Demand	**…**	…
23	U THD	**52**	PF Total Demand	**0x7D000000**	I HD63
24	U TOHD	**53**	P Total Imp. Pred. Demand	**0x81000000**	I IH01 RMS
25	U TEHD	**54**	Q Total Imp. Pred. Demand	**…**	…
26	I THD	**55**	P Total Exp. Pred. Demand	**0xBF000000**	I IH63 RMS
27	I TOHD	**56**	Q Total Exp. Pred. Demand		
28	I TEHD	**57**	S Total Pred. Demand		

Table 4-23 Setpoint Parameters

4.6 Data Logging

4.6.1 IER/AER

The iMeter D7 provides a fixed capacity of 65535 entries for both IER (Interval Energy Recorder) and AER (Accumulative Energy Recorder) Logs for the parameters specified in **Table 4-24 IER/AER Parameters**. The IER records the amount of energy consumed during the last completed interval while the AER records a snapshot of the accumulated energy at the time of recording. The IER/AER Logs can only be retrieved through communications.

kWh		kvarh		kVAh
Imp. (Total RMS)	Imp. Fundamental	Imp. (Total RMS)	Imp. Fundamental	kVAh Total
Exp. (Total RMS)	Exp. Fundamental	Exp. (Total RMS)	Exp. Fundamental	
Net (Total RMS)	Imp. Harmonics	Net (Total RMS)	Imp. Harmonics	
Total (Total RMS)	Exp. Harmonics	Total (Total RMS)	Exp. Harmonics	

Table 4-24 IER/AER Parameters

The IER/AER setup parameters, which include **Recording Mode**, **Recording Interval** and **Start Time**, can be

programmed from the Front Panel (see **Section 3.1.3.5.2**), Web Interface (see **Section3.2.3.5.4.2**) or communications. Please note that changing any of the setup parameters would reset the IER/AER Logs. The following table illustrates the range of the Energy Log parameters where * indicates the default value.

Parameter	Range/Default*	Parameter	Range/Default*
Interval/Accumulative Energy			
Record Mode	Disable, Stop When Full, FIFO*	Interval	1 to 65535 min, 15 min*
Start Date	2000-01-01*	Start Time	00:00:00*

Table 4-25 Energy Log Parameters

4.6.2 WFR (Waveform Recorder)

The iMeter D7 supports the waveform recording of 4-phase Voltages and Currents at a maximum resolution of 1024 samples/cycle. WFR on the iMeter D7 can be triggered by PQ Disturbance (Dips/Swells/Interruptions), Transients, Rapid Voltage Changes, Inrush Current, Setpoints, DI Status Changes or even manually triggered through the Web Interface and communications. The manual trigger command has a higher priority. When a WFR is already in progress, other WFR commands will be ignored until the present recording has completed. The WFR has a capacity of 128 entries organized in a FIFO basis, with the newest WFR log replacing the oldest one. The WFR log is stored in the device's non-volatile memory in COMTRADE file format and will not suffer any loss in the event of power failure.

The WFR log can be viewed directly on the Front Panel and Web Interface as well as downloaded from the on-board FTP/Web Server or via communications. The programming of the WFR is supported via the Web Interface (Please refer to **Section 3.2.3.5.5.1**) or communications.

The following table illustrates the ranges and default values of the WFR parameters.

Parameter	Range/Default*	Parameter	Range/Default*
Pre-Fault Cycles	2-6, 5*	Post-Fault Cycles	2-6, 5*
Samples/Cycle	128, 256, 512*, 1024	No. of Cycles	See Table 4-27, 20*

Table 4-26 WFR Setup Parameters

Index	Samples / Cycles	No. of Cycles Range	Index	Samples / Cycles	No. of Cycles Range
0	128	2-384	2	512	2-192
1	256	2-96	3	1024	2-48

Table 4-27 WFR Format Settings

The iMeter D7 also provides the following settings for Scheduled WFR to trigger the WFR on the hour as pre-configured. The programming of the Scheduled WFR is supported via the Web Interface or Communications.

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Interval	1 to 960 h, 24 h*
Recording Interval (Repetition)	0 to 1000, 1*	Start Date	2000-01-01*
		Start Time	00:00:00*

Table 4-28 Scheduled WFR Setup Parameters

4.6.3 DWR (Disturbance Waveform Recorder)

The iMeter D7 supports the Disturbance Waveform Recording of 4-phase Voltages and Currents at a maximum resolution of 512 samples/cycle. The DWR can be triggered by Dips, Swells, Interruptions, Transients, RVC, Inrush Current, Setpoints, DI Status Changes or be triggered manually via web server and communications. The DWR Log is stored in the devices' non-volatile memory in COMTRADE file and will not suffer any loss in the event of power failure. The DWR has a capacity of 128 entries organized in a FIFO basis, with the newest DWR Log replacing the oldest one. Each DWR log consists of the following stages:

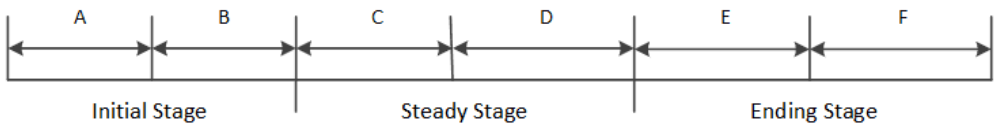
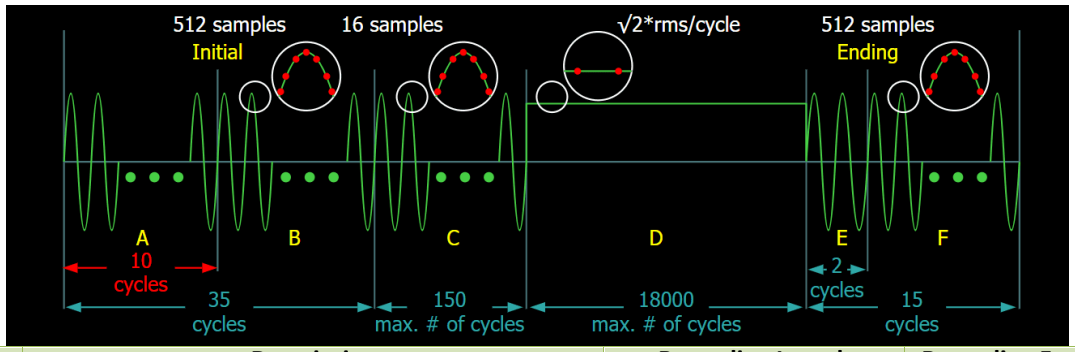


Figure 4-21 DWR Stages



Stage	Description	Recording Length	Recording Frequency
A	Pre-Fault cycles for the Initial Stage	5 to 10 cycles	512 Samples/Cycle
B	Post-Fault cycles for the Initial Stage	25 to 30 cycles	512 Samples/Cycle
C	Extended WFR during the Steady Stage	0 to 150 cycles	16 Samples/Cycle
D	RMS Recording during the Steady Stage	0 to 18,000 cycles	1 Sample/Cycle
E	Pre-Fault cycles of the Ending Stage	2 cycles	512 Samples/Cycle
F	Post-Fault cycles of the Ending Stage	13 cycles	512 Samples/Cycle

Table 4-29 Time Frames of Disturbance Waveform

Notes:

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

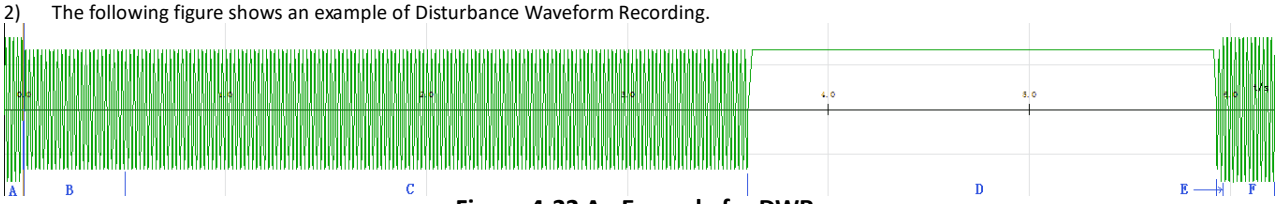


Figure 4-22 An Example for DWR

4.6.4 RMSR (RMS Recorder)

The iMeter D7 provides high-speed RMS recording which can be triggered by Dips, Swells, Interruptions, Transients, RVC, Inrush Current, Setpoints, DI status changes or manually via communications. The RMSR Logs are stored in the devices' non-volatile memory in COMTRADE file format and will not suffer any loss in the event of a power failure. The RMSR has a capacity of 128 entries based on FIFO.

All RMSR can be accessible via the on-board FTP Server or communications by our PecStar® iEMS. The programming of the RMSR is supported via the Web Server (See **Section 3.2.3.5.5.1**) or through communications.

The **Recording Depth** for RMSR is fixed at 7200 samples per parameter. The following table illustrates the ranges and default values for the RMSR parameters.

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Pre-fault Samples	100 to 500, 100*	Sample Interval	0 to 60, 0* (0 represents 0.5 cycle)

Table 4-30 RMSR Parameters

Table 4-31 below illustrates the available source parameters for RMSR recording.

ID	Parameter	ID	Parameter	ID	Parameter	ID	Parameter
0	Null	7	Ia	14	kWa	21	kVAb
1	Ua	8	Ib	15	kWb	22	kVAc
2	Ub	9	Ic	16	kWc	23	PFa
3	Uc	10	U4	17	kvara	24	PFb
4	Uab	11	I4	18	kvarb	25	PFc
5	Ubc	12	Frequency	19	kvarc		
6	Uca	13	Freq. Dev.	20	kVAa		

Table 4-31 Available Parameters for RMSR

4.6.5 Pst Log

iMeter D7's Pst Log can store up 56520 entries (i.e. 1-year: 365x24x6) about Voltage Pst in its non-volatile memory. Each record includes the timestamp in 1ms resolution, flagging status and the 3-phase Voltage Pst measurements.

The Pst Log can be retrieved via communications for display. If there are more than 52560 events, the newest event will replace the oldest event on a FIFO basis. The Pst Log can be reset from the Web Server (See **Section 3.2.3.5.10.3**) or via communications.

4.6.6 Plt Log

iMeter D7's Plt Log can store up to 4380 entries (i.e. 1-year: 365x12) about Voltage Plt in its non-volatile memory. Each record includes the timestamp in 1ms resolution, flagging status and the 3-phase Voltage Plt measurements.

The Plt Log can be retrieved via communications for display. If there are more than 4380 events, the newest event will replace the oldest event on a first-in-first-out basis. The Plt Log can be reset from the Web Server (See **Section 3.2.3.5.10.3** or via communications.

4.6.7 SDR (Statistics Data Recorder)

The iMeter D7 provides 8 groups of SDRs of 64 parameters each to record the Max. / Min. / Average / CP95 measurements with a recording depth of 43200 and configurable recording interval from 0 (disabled) to 60 mins. The SDR logs are stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The programming of the **SDR** is supported via the Web Server or through communications. Each **SDR** provides the following setup parameters:

Setup Parameters	Range/Default*
Record Interval	0 (disabled) to 60 min, 10 min*
Record Mode	0=Stop-when-Full, 1=First-In-First-Out*
Number of Parameters	0 (invalid) to 64, See **Section 5.12.7** for the Default Values of each group
Parameter 1 to 64	See Appendix A

Table 4-32 Setup Parameters for DR

The **SDR** is operational when the values of **Record Interval** and **Number of Parameters** are both non-zero.

4.6.8 Max./Min. Log

The iMeter D7 provides 4 Max./Min. Recorders of 20 parameters each for This Month (Since Last Reset) and Last Month (Before Last Reset). Each Log included the relevant max./min. values with timestamps. The recorded data is stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The programming of the Max./Min. recorders is supported via Web Server (please refer to **Section 3.2.3.5.5.3**) or through communications. Each Max./Min. recorder provides the following setup parameters:

Parameters	Value
Self-Read time	The same **Self-Read Time** for the **Max. Demand Recorder** is used to specify the time and day of the month for the **Max./Min.** Self-Read operation. Please refer to **Section 4.3.4**
# of Parameters	0 to 20
Parameter 1 to 20	See Appendix A

Table 4-33 Setup Parameters for Max./Min. Log

The Front Panel supports the display for This Max/Min logs since the last reset (See **Section 3.1.3.1.8**).

Both This Max/Min logs and the Last Max/Min logs can be accessed via web server (See **Section 3.2.3.2.6**) or through communications. And the Max./Min. logs can be reset via Front Panel (See **Section 3.1.3.5.8**) or Web Interface (See **Section 3.2.3.5.10.3**).

4.6.9 Max. Demand Recorder (Peak Demand)

The iMeter D7 records the **Max. Demand** for **This Month (Since Last Reset)** and **Last Month (Before Last Reset)** with timestamps for the parameters listed in **Table 4-34 Max. Demand Parameters**. The Max. Demand can be accessed from the Front Panel (See **Section 3.1.3.1.6**), Web Interface (See **Section 3.2.3.2.4**) or communications. Please refer to **Section 4.3.4** for a complete description of the **Self-Read Time** and its operation.

The Max. Demand of This Month can be reset manually via communications. The iMeter D7 provides the following Max. Demand parameters:

This Month (Since Last Reset) and Last Month (Before Last Reset)
kW Total Import/Export
kvar Total Import/Export
kVA Total
Ia/Ib/Ic
Ia/Ib/Ic/I4 FUND.

Table 4-34 Max. Demand Parameters

4.6.10 Max./Min. Log per Demand Period

The iMeter D7 calculates the Max./Min. value per demand period for the parameters as shown in Figure 4-23 and all the measurements can be accessed through communications.

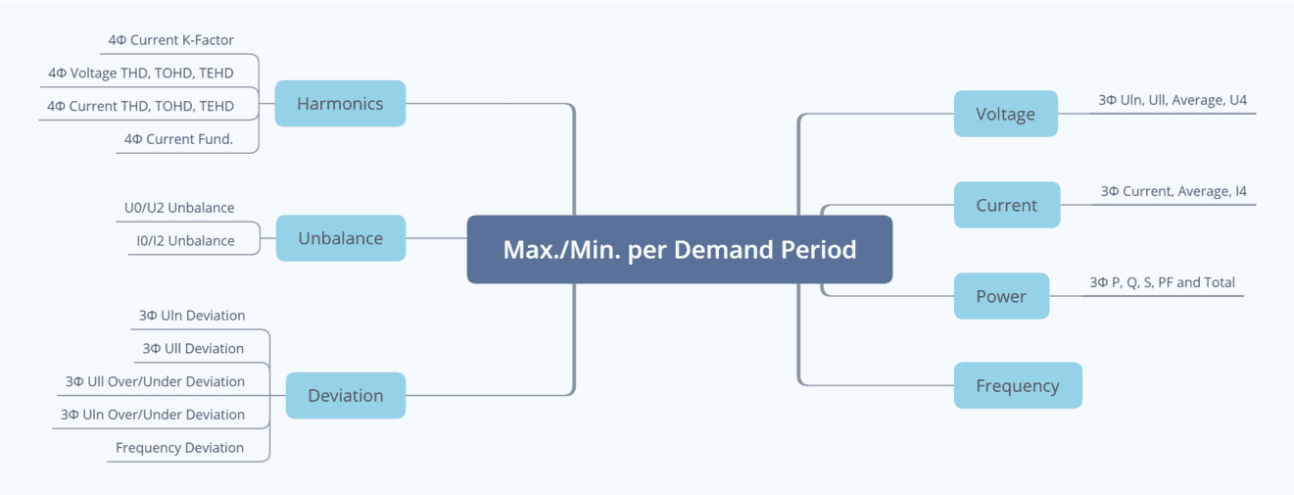


Figure 4-23 Max./Min. Parameters per Demand Period

4.6.11 SOE Log & Device Log

The SOE and Device Logs can be retrieved via the Front Panel (please refer to **Section 3.1.3.4.1 3.1.3.4.1** , **Section 3.1.3.4.2**), Web Interface (please refer to **Section3.2.3.4.1 , Section 3.2.3.4.2**) or communications.

The SOE Log and Device Log can be reset via the Front Panel (See **Section 3.1.3.5.8**) and Web Server (see **Section 3.2.3.5.10.3**) with the **Clear All Events** option.

The following sections address the basic properties for the SOE Log and Device Log.

4.6.11.1 SOE Log

The SOE Log can store up to 1024 events such as Setpoints, Digital Input status changes, Relay actions, Dips, Swells, Interruptions, Transient, Inrush Current and Rapid Voltage Changes, based on a First-In-First-Out principle. Each event record includes the event classification, its relevant parameter values and a timestamp in 1ms resolution.

4.6.11.2 Device Log

The Device Log can store up to 1024 events such as Power-on, Power-off, Setup Changes, Clear operations and TOU Schedule Switch in its non-volatile memory on a FIFO basis. Each event record includes the event classification, its relevant parameter values and timestamp in 1ms resolution.

4.6.12 PQ Counters

The iMeter D7 supports the counting of the different PQ Events as illustrated in Table 4-35 below. When a particular event is detected, the corresponding counter will increment. The maximum value of the PQ Counter is 2^{32} (4,294,96 7,296), and it will automatically roll over to 0 when the maximum value has been reached. The counter can be reset from the Front Panel (See **Section 3.1.3.5.8**), Web Server (see **Section3.2.3.5.10.3**) or Communications.

No	Event	No	Event	No	Event
1	Dip	4	Transient	7	MSV #2
2	Swell	5	RVC	8	MSV #3
3	Interruption	6	MSV #1	9	Total

Table 4-35 PQ Event Counter

4.7 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 D7 and accumulate energy consumption into different TOU tariffs based on the time of consumption.

The TOU feature on iMeter D7 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 D7 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 4-36 DIs and the Number of Tariffs Setup

Each TOU schedule has the following setup parameters and can be programmed via the Web Server (see **Section 3.2.3.5.4.3**) or through 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 4-37 TOU Setup Parameters

For each of the 8 Tariff Rates, the iMeter D7 provides the following measurements: kWh Import/Export, kvarh Import/ Export, kVAh, P/Q/S Max. Demand with their timestamps. The TOU Energy are available via the Front Panel, Web Interface and communications. And the TOU P/Q/S Max. Demand measurements are available via the Web Interface and communications. The TOU Logs can be reset through the Web Server or via communications.

4.8 Time Synchronization

The iMeter D7 provides timestamps for all recorded data so it's extremely important for the clock to be properly synchronized to achieve precise time stamping for Energy, Power Quality and Event Analysis. The different time sync. methods via hardware or software are discussed in the following sections.

4.8.1 RTC

The iMeter D7 is equipped 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 back-up battery keeps the real-time clock until power is restored. The **Clock Source Register (40800)** is set to **RTC** by default. This can be changed via the Front Panel, Web Server or Communications.

4.8.2 GPS

GPS receivers often provide a 1PPS (1 Pulse per Second) output which the iMeter D7 can be configured to synchronize its millisecond clock using its CLK+/CLK- terminals by having the Clock Source Register (40800) set to GPS. Please also refer to Figure 2-26 for the 1PPS wiring diagram.

4.8.3 IRIG-B

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

The iMeter D7 can be configured to synchronize its clock with an IRIG-B input using its CLK+/CLK- terminals by having the **Clock Source Register (40800)** set to IRIG-B. The CLK+/CLK- terminals should be connected to the IRIG-B's P+/P- output terminals.

The programming of the IRIG-B setup parameters is supported via the Front Panel, Web Server or communications.

Setup Parameters	Option
Clock Source	0=RTC, 1=SNTP, 2=GPS, 3=IRIG-B, 4=Reserved, 5=1588-P1, 6=1588-P2 Set **Clock Source**=3
IRIG-B Time Zone	GMT-12:00 / GMT-11:00 / GMT-10:00 / GMT-9:00 / GMT-8:00 / GMT-7:00 / GMT-6:00 / GMT-5:00 / GMT-4:00 / GMT-3:30 / GMT-3:00 / GMT-2:00 / GMT-1:00 / GMT-0:00 / GMT+1:00 / GMT+2:00 / GMT+3:00 / GMT+3:30 / GMT+4:00 / GMT+4:30/ GMT+5:00 / GMT+5:30 / GMT+5:45 / GMT+6:00 / GMT+6:30 / GMT+7:00 / GMT+8:00 (default)/ GMT+9:00 / GMT+9:30 / GMT+10:00 / GMT+11:00 / GMT+12:00 / GMT+13:00

Table 4-38 IRIG-B Setup Parameters

4.8.4 SNTP

SNTP (Simple Network Time Protocol) can be used to synchronize the iMeter D7's clock with an external **SNTP Server** providing that the network has been properly configured. The programming of the **SNTP** setup parameters is supported via the Front Panel, Web Server or communications. The SNTP provides the following setup parameters:

Setup Parameters	Option/Default*
Clock Source	0=RTC, 1=SNTP, 2=GPS, 3=IRIG-B, 4=Reserved, 5=1588-P1, 6=1588-P2 Set **Clock Source**=1
Time Zone	GMT-12:00 / GMT-11:00 / GMT-10:00 / GMT-9:00 / GMT-8:00 / GMT-7:00 / GMT-6:00 / GMT-5:00 / GMT-4:00 / GMT-3:30 / GMT-3:00 / GMT-2:00 / GMT-1:00 / GMT-0:00 / GMT+1:00 / GMT+2:00 / GMT+3:00 / GMT+3:30 / GMT+4:00 / GMT+4:30/ GMT+5:00 / GMT+5:30 / GMT+5:45 / GMT+6:00 / GMT+6:30 / GMT+7:00 / GMT+8:00 (default)/ GMT+9:00 / GMT+9:30 / GMT+10:00 / GMT+11:00 / GMT+12:00 / GMT+13:00
Time Sync. Interval	10 to 1440 minutes, 60*
SNTP Server IP	192.168.101.2*
SNTP Broadcast	Yes*, No

Table 4-39 SNTP Setup Parameters

4.8.5 Modbus RTU

The iMeter D7's clock can be synchronized through communications using the Modbus RTU protocol. Please refer to Table 5-115 Time Registers for a detailed description.

4.8.6 IEEE 1588 – PTP

The Precise Time Protocol (PTP) V2 as defined in the IEEE 1588 standard, provides the precise time synchronization for iMeter D7 over P1 or P2 Ethernet port with a maximum error of 200us.

4.8.7 PecStar iEMS

PecStar® iEMS can be configured to provide regular time synchronization by broadcasting time-sync packets over the connected medium, whether it is RS485 or Ethernet. The default time synchronization interval is 60 minutes. Please consult the PecStar iEMS's user manual for a complete description.

4.9 Alarm Email

The iMeter D7 can be configured to send Alarm Emails based on the Simple Mail Transfer Protocol (SMTP), which may be triggered by Setpoints, Dips, Swells, Interruptions, Transients, etc.

The Alarm Email Provides the following information in text format:

1) iMeter D7's serial number
2) Event description

3) Event time stamp

The programming of the Alarm Email is supported via the Web Server or through communications.

Parameters	Definition	Options/Default*
Server IP	The IP Address of the SMTP Server	0.0.0.0*
Port	The IP Port No. for the SMTP Server	0 to 65535, 25*
Username	SMTP Server's logon username for Sender's email address	See Note 1), N/A*
Password	SMTP Server's logon password for Sender's email address	See Note 2), N/A*
Sender E-mail	Sender's email address	See Note 3), N/A*
Receiver E-mail	Receiver's email address	See Note 3), N/A*
Trigger Source	Specify When the alarm email will send out	System, Setpoint, HS Setpoint, I/O, WFR, DWR, RMSR, Dip/Swell, Transient, Inrush Current, RVC, MSV, EN50160, N/A*

Table 4-40 Email Setup Parameters

Notes:
1) The **Username** should not exceed 40 ASCII Characters.
2) The **Password** should not exceed 20 ASCII Characters.
3) The **Sender** setup parameter should not exceed 40 ASCII characters.
4) The **Receiver** setup parameter should not exceed 90 ASCII characters, different receivers should be separated by ";" symbol.

Here is an example of how to configure a Setpoint to trigger an Alarm Email.

1. Click on Setup -> Setpoint as shown below. Select a particular Setpoint (e.g. No.1) to open the Setpoint 1 Settings dialog box and configure the parameters as required.

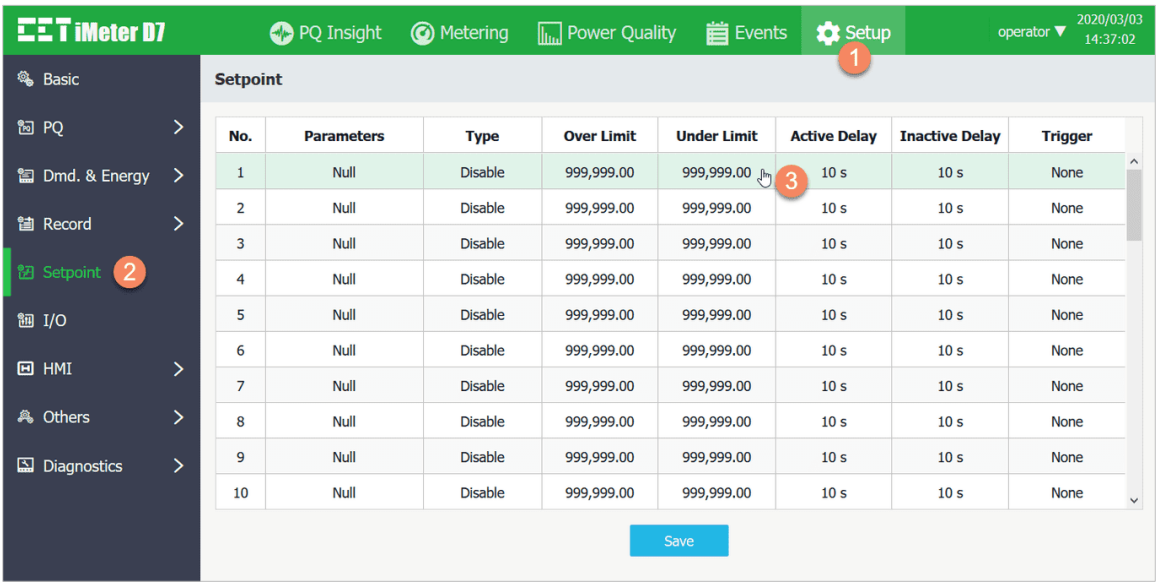


Figure 4-24 Setpoint Settings

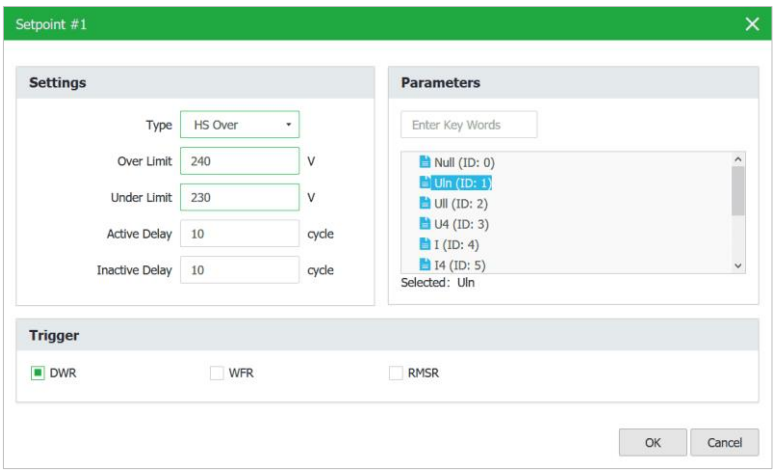


Figure 4-25 Setpoint #1 Settings Dialog

2. Click on **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 D7. The message “Operate Succeeded” will appear if the configuration is accepted by the meter.

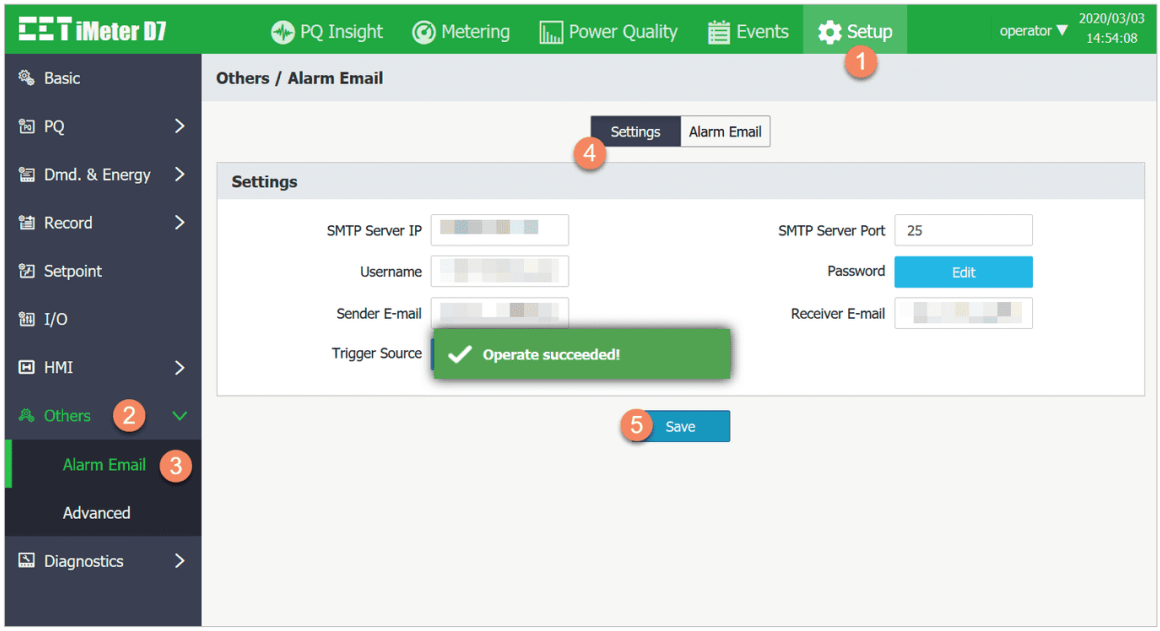


Figure 4-26 Alarm Email Setting via Web Server

3. Select the Alarm Email tab to send a Test email by clicking on Test. The message “Email 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 D7 should be checked that it is connected to the Internet.

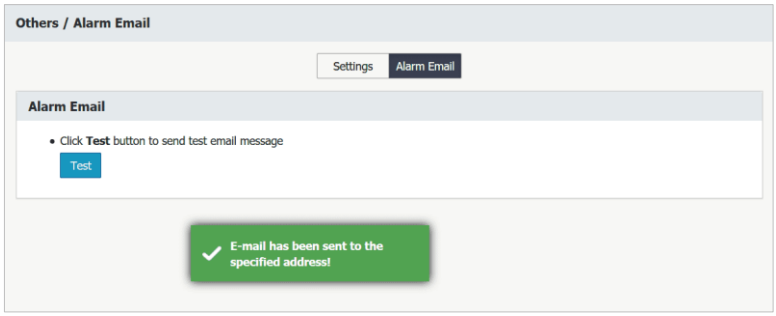


Figure 4-27 Send Test Email

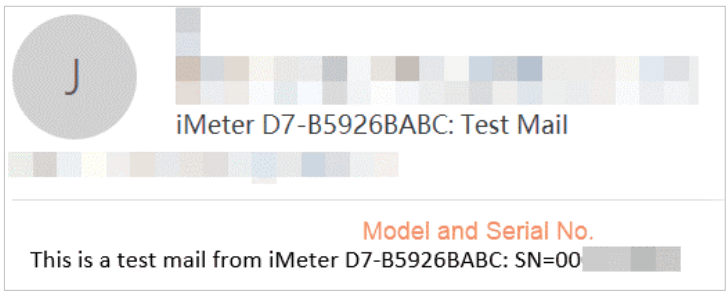


Figure 4-28 An Example of Test Email

4. If the Receiver receives the test email successfully, please return to **Alarm Email Settings** and click on “**More >>**” to open the **Trigger Source** dialog box. Check the **HS Setpoint** selection box and click **OK** to confirm the changes. Click Save to keep the changes.

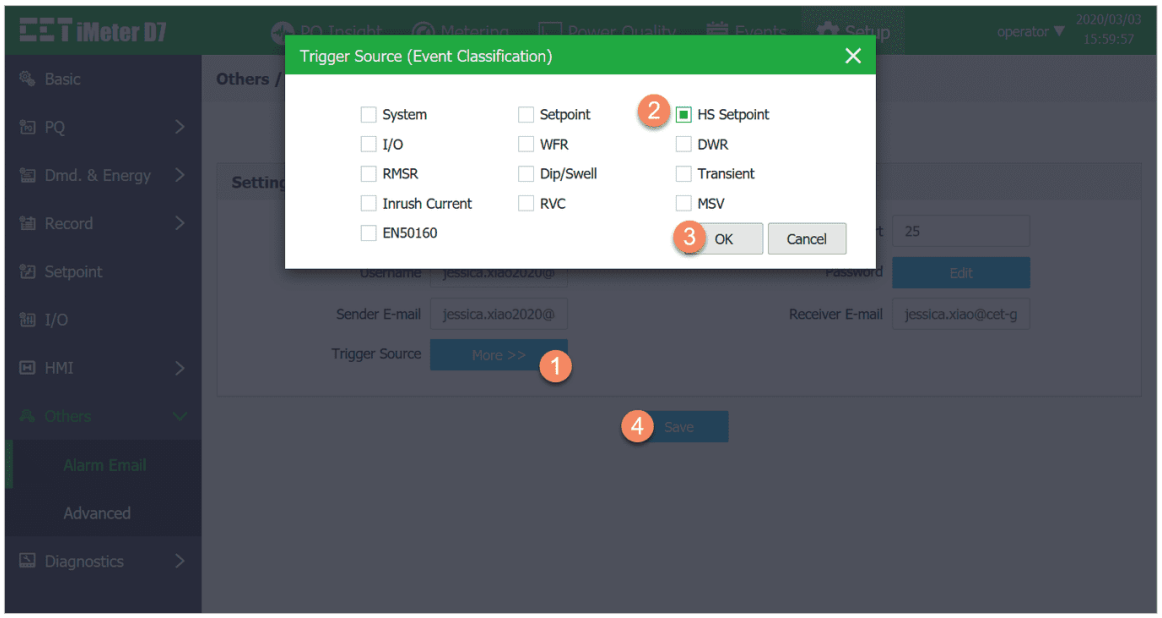


Figure 4-29 Trigger Source Dialog

5. When the Setpoint is activated, an Alarm Email will be sent to the Receiver by the iMeter D7, providing the SMTP configuration is correct.

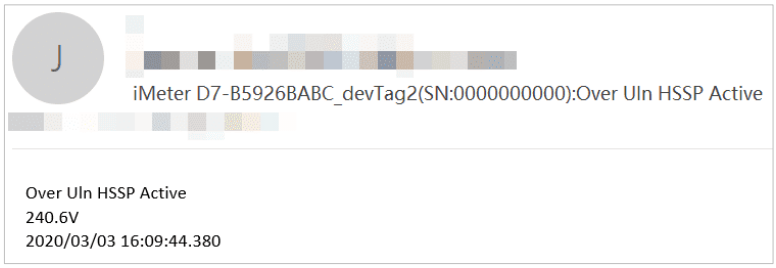


Figure 4-30 Alarm Email

4.10 Ethernet Gateway

The iMeter D7's **Ethernet Gateway** feature supports the gateway function for Modbus communications between the Master Software (e.g. PecStar iEMS) on a Local Area Network and other RS485-enabled devices (e.g. PMC-53A) via the iMeter D7's Ethernet (P1/P2) and RS485 ports (P3). This eliminates the need for an additional, external Ethernet-to-RS485 Gateway, simplifies the overall network design and saves cost. The Master Software sends a "Modbus RTU over TCP/IP" packet (Modbus RTU packet, i.e. the payload, encapsulated in a TCP/IP frame) to the iMeter D7's Ethernet port at its IP Address and the default IP Port No. 20000. The iMeter D7 receives this "Modbus RTU over TCP/IP" packet at its Ethernet port, extracts the "encapsulated" Modbus RTU packet, i.e. the payload, from the TCP/IP frame and then in turn forwards it to its RS485 port (such as P3). The RS485-enabled device receives the Modbus RTU packet and sends its response back to the iMeter D7, which in turn encapsulates the Modbus RTU response packet in a TCP/IP frame and then sends it back to the Master Software over Ethernet to complete the transaction.

The following illustrates the steps of configuring the iMeter D7's Ethernet Gateway via P3:

1) Go to **Setup**-> **Basic**-> **Comm.**-> **RS485 (P3)** to change the **Protocol** setup parameter from the default setting of **Modbus** to **Gateway,** either via the Web Interface or Front Panel.

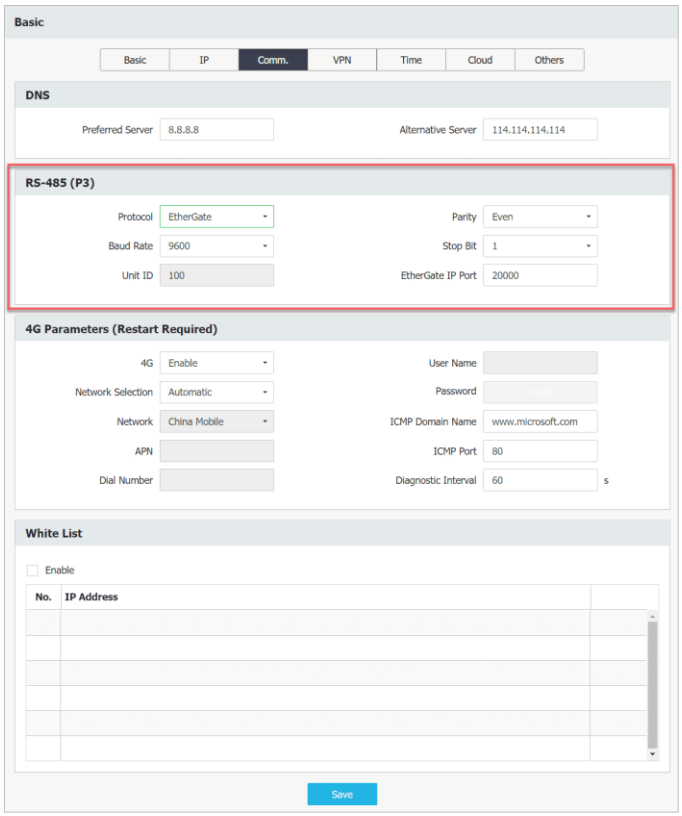


Figure 4-31 Select "EtherGate" Mode on Web Server

2) Connect the RS485-enabled devices (i.e. PMC-53A) to the RS485 port (P3) of the iMeter D7.

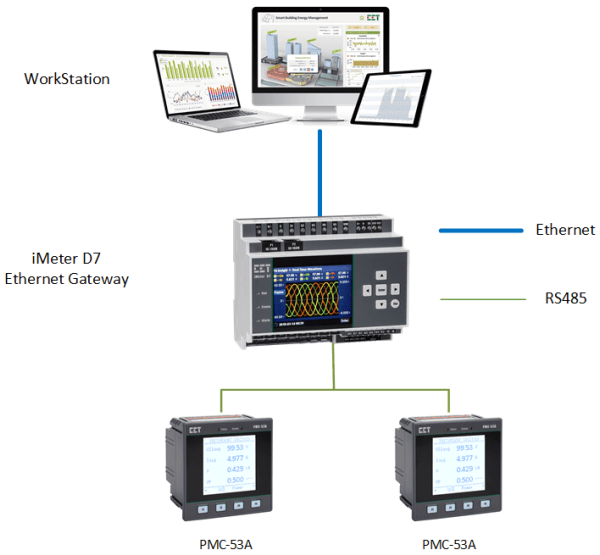


Figure 4-32 Typical Application for Ethernet Gateway

3) Configure the Master Software (e.g. PecStar iEMS) on the WorkStation to communicate with the RS485-enabled devices via iMeter D7's Ethernet port at IP port No. 20000. It should be noted that the Master Software must support the **Modbus RTU over TCP/IP** protocol for this to work.

4) Make sure the serial port settings such as Baud Rate and Data Format are identical between the iMeter D7's RS485 port and the RS485-enabled devices.

5) The Master Software should be able to communicate with the RS485-enabled devices via the iMeter D7's Ethernet Gateway, providing that all the necessary configuration is correct.

4.11 On-board FTP Server

The iMeter D7 provides access to its COMTRADE file, such as Waveform Log and RMS plot via the on-board FTP Server.

4.11.1 Access the FTP Server

The following illustrates the steps for accessing the iMeter D7's FTP Server.

1) Configure the FTP settings at **Setup** -> **Others** -> **Advanced** on the Web Server of the iMeter D7. It's recommended that the FTP settings be kept at the default values in case they are forgotten.

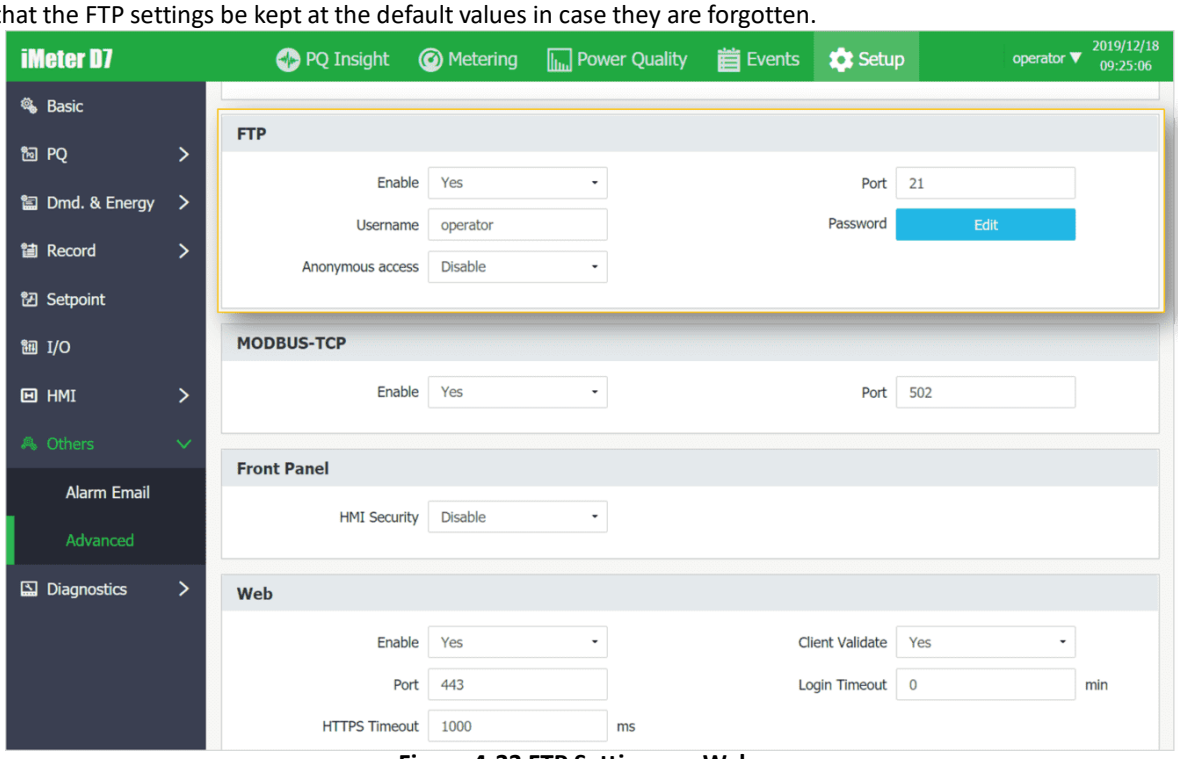


Figure 4-33 FTP Settings on Web

2) Connect to the FTP Server. Both the Windows OS and Mac OS provide multiple methods to connect to the FTP Server. Here is an example on Windows 10.

   a. Press " ⊞ " + "E" key together to open the **File Explorer** and then type in the FTP address, such as ftp://192.168.1.135.

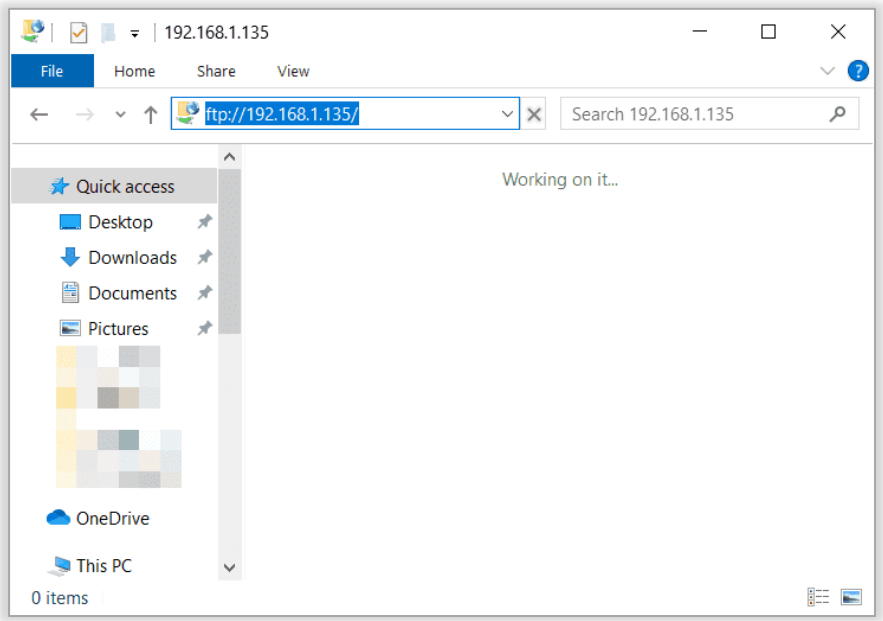


Figure 4-34 Windows File Explorer

   b. In the **Log On As** dialog box, enter the username and password which are confirmed by Step 1 and then press **Log On** button. The default username and password is "operator" and "abcd1234-", respectively.

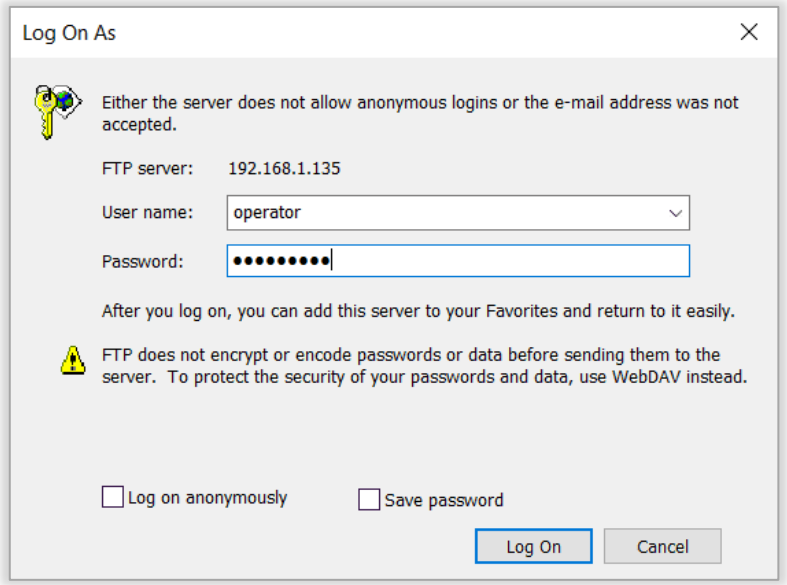


Figure 4-35 Log On As dialog

3) If the FTP Server is connected successfully, the following screen capture with the listed folders should appear.

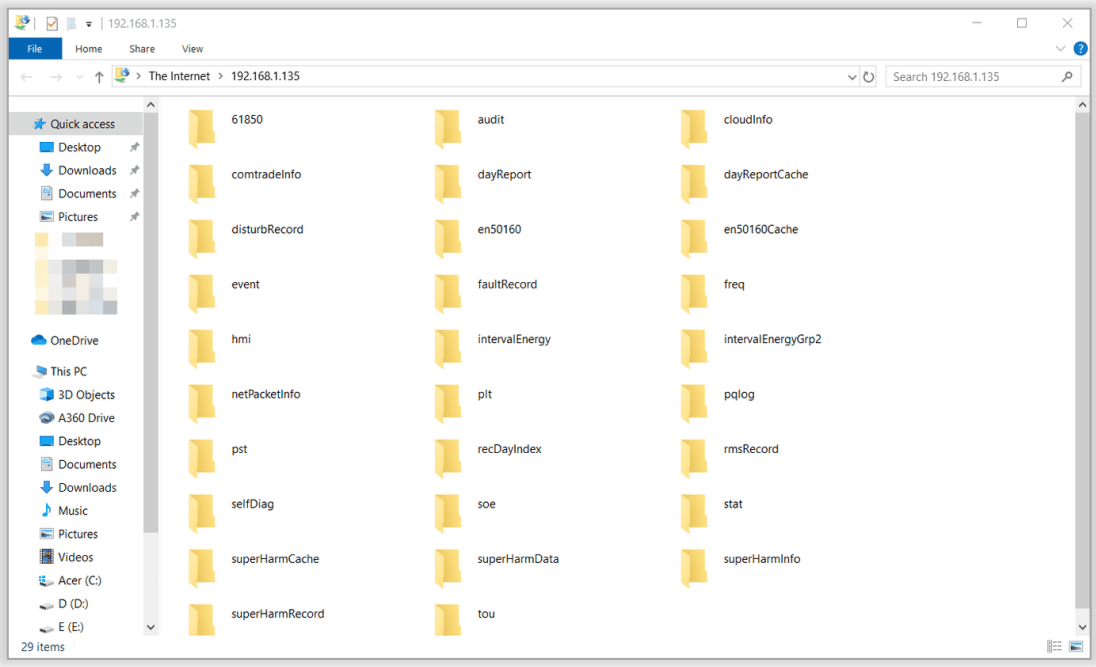


Figure 4-36 iMeter D7's FTP Server

4.11.2 Quick Overview for FTP Files

The following provides a quick overview for the disturbRecord, faultRecord, rmsRecord and superHarmRecord. Please copy the required files to your local computer before opening them using the appropriate application.

- **disturbRecord** stores the **Disturbance Waveform Records** in COMTRADE format based on a First-In-First-Out Principle. Each DWR will generate 4 files which are disturbRecordXXX.cfg, disturbRecordXXX.dat, disturbRecordXXX.hdr and disturbRecordXXX.inf where XXX stands for the logging sequence (please refer to **Section 5.1 Note 4**).

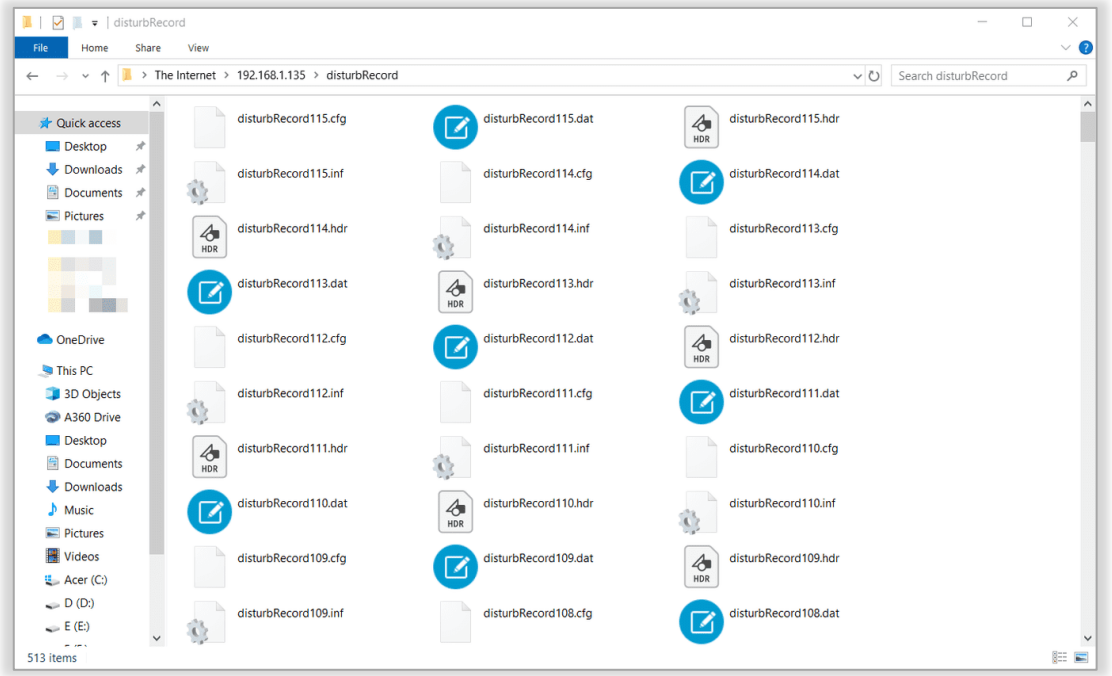


Figure 4-37 disturbRecord Files

faultRecord stores the **Waveform Records** in COMTRADE format based on a First-In-First-Out principle. Each WFR will generate 4 files which are faultRecordXXX.inf, faultRecordXXX.hdr, faultRecordXXX.dat and faultRecordXXX.cfg where XXX stands for the logging sequence (please refer to **Section 5.1 Note 4**).

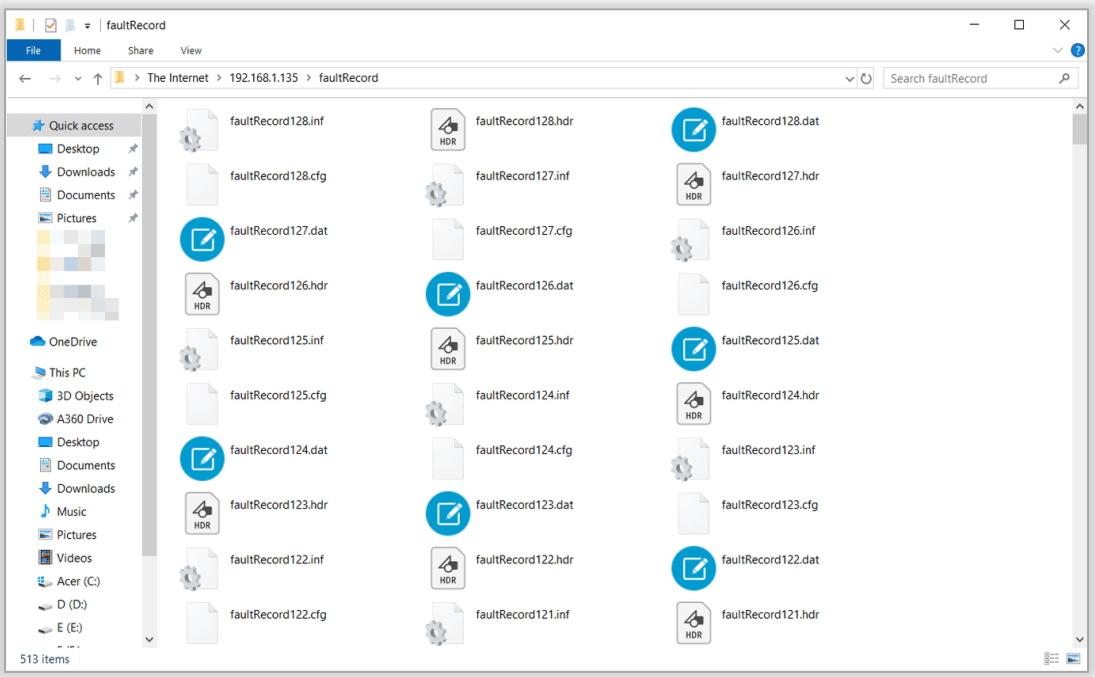


Figure 4-38 faultRecord Files

rmsRecord stores the **RMS Records** in COMTRADE format based on a First-In-First-Out principle. Each RMS Recorder will generate 4 files which are rmsReordXXX.inf, rmsRecordXXX.hdr, rmsRecordXXX.dat and rmsRecordXXX.cfg where XXX stands for the logging sequence (please refer to **Section 5.1 Note 4**).

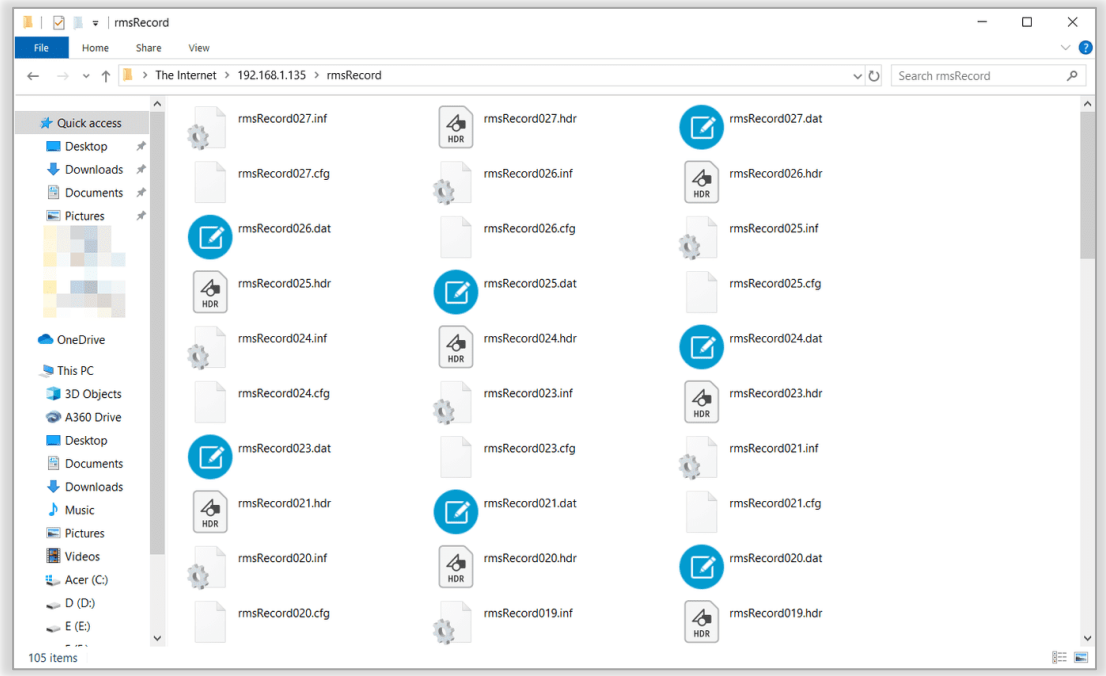


Figure 4-39 rmsRecord Files

superHarmRecord stores 4 files in .gz format for the **Daily Amplitudes** reports of Max./Min./Average/Cp95 values in **2 – 150 kHz** every day. The .csv spreadsheets can be open in Excel after downloading and then decompressing the .gz files.

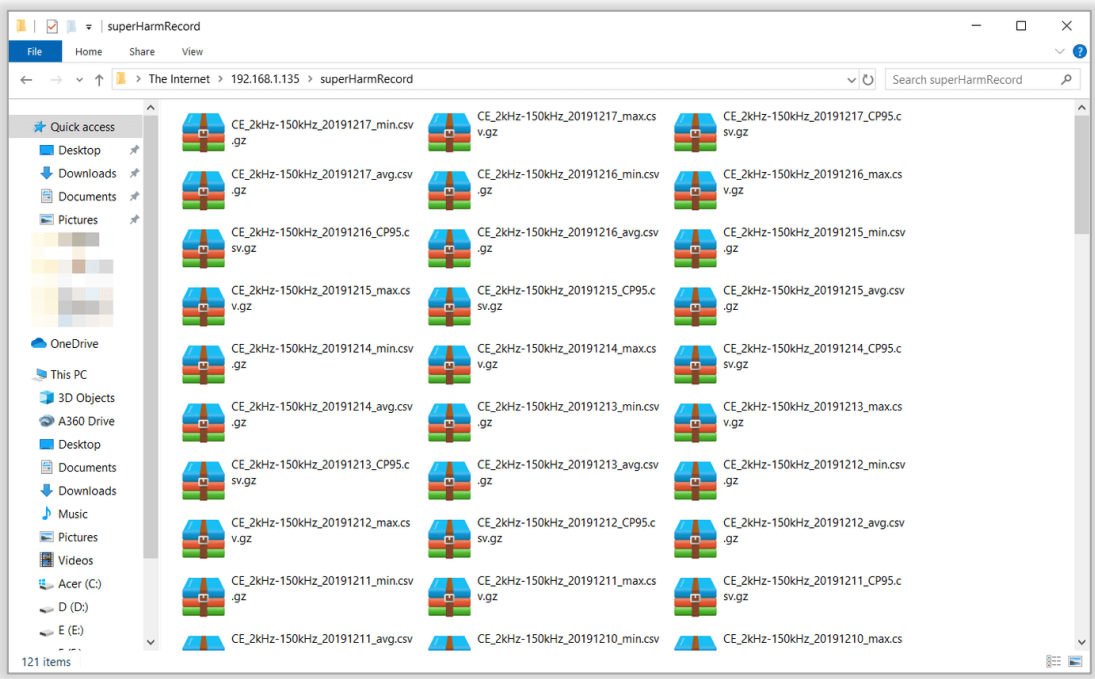


Figure 4-40 superHarmRecord Files

4.12 4G (Optional)

The iMeter D7 is optionally equipped with 4G module for Internet Access. It's required to insert a micro SIM card with the Network Type supported by iMeter D7 to get mobile network connected, which should be plug-and-play by default.

The following table illustrates the Mobile Network Frequencies supported by iMeter D7.

Network Type	Frequency Band
4G	FDD-LTE B1/B3/B8 (2100/1800+/900MHz), TDD-LTE B38/B39/B40/B41(2600/1900+/2300/2500)
3G	WCDMA B1/B8 (2100/900)
2G	E-GSM 900MHz, DCS 1800MHz

Table 4-41 Mobile Network Frequencies supported by iMeter D7

The following table illustrates the setup range and default values of the 4G parameters.

Parameters	Definition	Options/Default*
4G	Enable or disable 4G for Internet access.	0=Disable, 1=Enable*
Network Selection	Automatic – Match the Dial-up parameters automatically, Manual – Create the Dial-up profile by entering APN, Username and Password manually.	0=Manual, 1=Automatic*
Network	Display (Automatic mode) or Select (Manual mode) the ISP info.	0= China Mobile*, 1=China Unicom, 2=China Telecom
APN	Access Point Name, provided by ISP.	Less than 20 ASCII characters
Dial Number	Or Access Number, provided by ISP.	*99#(default), less than 20 ASCII characters
Username	Provided by ISP.	user*, less than 20 ASCII characters
Password	Provided by ISP.	password*, less than 20 ASCII characters
ICMP Domain Name	The given host or gateway to which diagnostic tool troubleshoots the 4G connectivity by using the ICMP protocol. Ensure the domain name specified can be resolved by using DNS queries.	www.microsoft.com*, less than 70 ASCII characters
ICMP Port	The ICMP port used for ICMP protocol.	1 to 65535, 80*
Diagnostic Interval	Specify the interval to send the Echo request to the ICMP Domain Name.	0 to 86400 (s), 60*

Table 4-42 4G Setup Parameters

The 4G information such as Status, Signal Strength and etc. are retrievable via the Web Interface (as shown in the following figure) or through communications. The Monthly Data Usage and Annual Data Usage can be reset via the Web Interface or through the Communications.

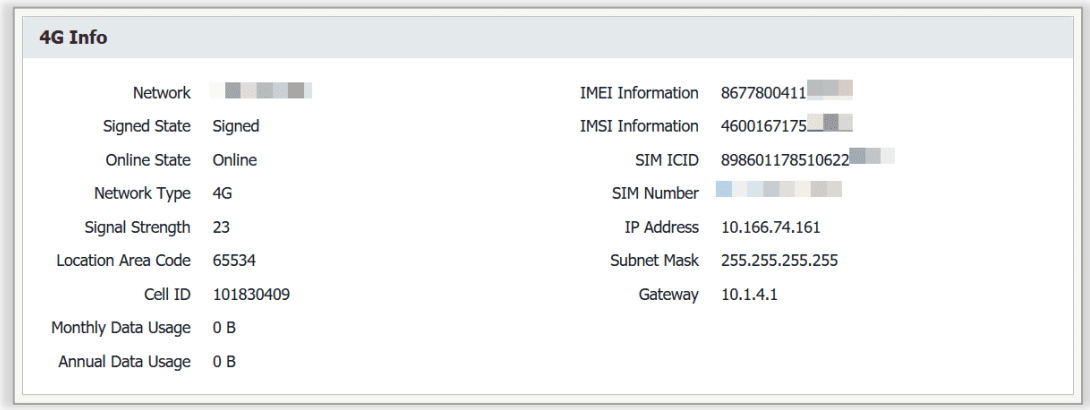


Figure 4-41 4G Information displayed on Web Interface

4.13 IPsec VPN

The iMeter D7 supports the implementation of the Internet Key Exchange (IKE) protocols which is required for IP security (IPsec) to protect data traffic between network peers. IPsec Tunnel is usually built to communicate hosts privately in two or more remote LANs via Internet as if the hosts are all in the same LAN. For more details about IPsec VPN, please refer to Wikipedia.

The VPN parameters are programmable via Web server or through communications. The following table illustrates the detailed definition and setup range of the iMeter D7 VPN parameters.

Parameters	Definition	Options/Default*
IKE Basic		
VPN Enable	Enable or disable VPN Function.	0=Disable*, 1=Enable
ID	Specify the identifier for the IKE SA. This ID will be used to map IPsec SAs to this IKE SA.	cetike* (less than 64 characters)
Remote Address	IP address of a remote IKE task from which a connection is to be accepted.	x.x.x.x (less than 16 characters)
Listen Port	Specify the connection for creating the VPN tunnel.	0=4G, 1=P1*, 2=P2
Exchange Version	Select the IKE version to be used.	0=V1*, 1=V2, 2=V1V2
Exchange Mode	Select the IKE Exchange Mode in Phase 1 as Main Mode or Aggressive Mode (For IKE V1 only). Main Mode provides identity protection and exchanges more information, which applies to the scenarios with higher requirement for identity protection. Aggressive mode establishes a faster connection but with relatively lower security.	0=Main, 1=Aggressive*
Method	Select the authentication method by exchange of the Preshared Key or Certificate (not supported at present).	0=Preshared Key
Preshared Key	Specify the key value for authenticate the VPN peers at the start of negotiation. Ensure both the peers use the same key.	Less than 64 ASCII characters
ESP Mode	Select the Encapsulation Mode as Tunnel Mode or Transport Mode. The tunnel mode should be chosen when the other endpoints of a tunnel is a security gateway.	0=Tunnel Mode*, 1=Transport Mode
Diffie-Hellman Key Exchange	Select the DH group to be used in key negotiation phase 1. The DH Group sets the strength of the algorithm in bits. Options include: Group 1: 768 bits, Group 2: 1024 bits, Group 5: 1536 bits.	0=Group 1, 1=Group2*, 2=Group 5
Hash Algorithm	Select the Hash Algorithm to be used to generate key material for IKE SA negotiation.	0=md5*, 1=sha-1
Encryption Algorithm	Select the encryption algorithm for IKE negotiation. Options include 3des(triple des, encrypts a plain text with 168-bit key), des(encrypts a 64-bit block of plain text with a 56-bit key), aes128/192/256 (encrypts with aes algorithm and 128/192/256 bits key).	0=3des*, 1=des, 2=aes128, 3=aes192, 4=aes256
Life Time	Specify the ISAKMP SA Life Time in IKE negotiation.	60 to 86400 (s), 28800*
IKE Advanced		
DPD Liveness	Specify the interval between sending DPD requests. The IKE endpoint can send a DPD request to the peer to inspect whether the IKE peer is alive.	60 to 86400 (s), 60*
Passive	Specify the IKE negotiation mode as Passive or Active. Passive means the iMeter D7 waits for the connection initiates by the peer. Active means the iMeter D7 initiates a connection to the peer.	0=Enable*, 1=Disable
Initial Contact	The iMeter D7 may have rebooted and peers have SAs that are no longer valid. Enable initial contact so that the meter can send a message to the peer to delete old SAs.	0=Enable*, 1=Disable
Local Identity	Local system identifier to be sent with ID payload during negotiation.	Less than 64 ASCII characters
Remote Identity	Remote system identifier.	
IP Sec		
ID	Specify the identifier used to negotiate the IPsec SA.	cetipsec* (less than 64 characters)
Source Address	Specify the local network to which the policy is applied. It's formed by IP address and subnet mask. For example, 192.168.0.100/24.	x.x.x./xx (less than 20 characters)
Destination Address	Specify the remote network to which the policy is applied. It's formed by IP address and subnet mask. For example, 192.168.0.100/24.	x.x.x./xx (less than 20 characters)
Life Time	Specify the IPsec SA life time in IKE negotiation.	60 to 86400 (s), 28800*
TFC	Traffic Flow Confidentiality. A security mechanism for protecting identifying information in IPsec packets.	0=Enable*, 1=Disable
ESN	ESN (extended sequence number) provides anti-replay support for high-speed IPsec implementations.	0=Enable*, 1=Disable
Diffie-Hellman Key Exchange	Select the Group used for Diffie-Hellman negotiations. The supported options are Group 1: modp768, Group 2: modp1024, Group 5:	0=Group 1, 1=Group2*, 2=Group 5

	modp1536.	
Security Protocol	Select the security protocol used by the SA. AH Provides data origin authentication, data integrity and anti-replay services. ESP provides data encryption in addition to origin authentication, data integrity and anti-replay services.	0=ESP*, 1=AH
Encryption Algorithm	Select the algorithm used to encrypt the data for ESP encryption. Options include 3des(triple des, encrypts a plain text with 168-bit key), des(encrypts a 64-bit block of plain text with a 56-bit key), aes128/192/256 (encrypts with aes algorithm and 128/192/256 bits key).	0=3des*, 1=des, 2=aes128, 3=aes192, 4= aes256
Hash Algorithm	Select the algorithm used to encrypt the data for AH/ESP authentication. MD5 takes a message of arbitrary length and generates a 128-bit message digest. SHA-1 takes a message less than 2^64 in bits and generate a 160-bit message digest.	0=md5*, 1=sha1

Table 4-43 VPN Setup Parameters

4.14 Cloud

The iMeter D7 supports the Cloud feature which allows the user to access the measurements remotely and securely. The user can view the Cloud connection status via the Front Panel, Web Interface or through communications.

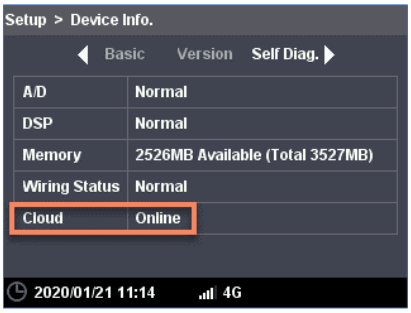


Figure 4-42 Cloud connection status

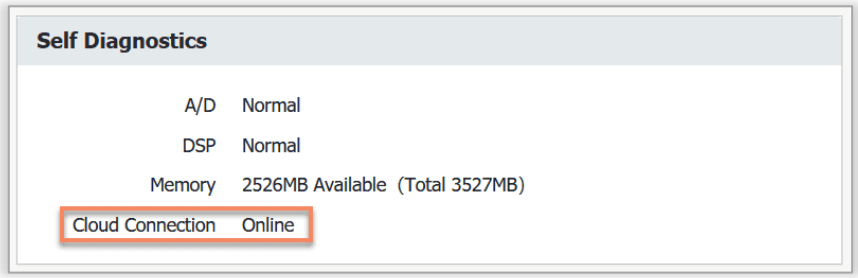


Figure 4-43 Cloud Connection Status

The following table illustrates the basic and upload parameters for Cloud feature.

Parameters	Definition	Options/Default*
Basic Settings		
Enable	Enable or Disable Cloud feature.	0=No*, 1=Yes
Encryption	Specify whether the data uploaded to the cloud is encrypted.	0=Disable*, 1=Enable
Server IP	Specify the Cloud Server IP address.	0.0.0.0
Server Port	Specify the port ID used for Cloud service.	1 to 65535, 18085*
Upload Settings		
Upload Interval	Specify the interval between uploading the data to the Cloud.	3 to 7200 (s), 10*
Real Time	Select the type of Real Time measurement uploaded to the Cloud.	See Table 5-58, 0*
Harmonics	Select the type of Harmonics measurement uploaded to the Cloud.	See Table 5-59, 0*
Interharmonics	Select the type of Interharmonics measurement uploaded to the Cloud.	See Table 5-60, 0*
2k – 150kHz C.E.	Select the type of 2k – 150kHz C.E. measurement uploaded to the Cloud.	See Section 5.11.7 Note 4, 0*
Record	Select the type of Record uploaded to the Cloud.	See Table 5-61

Table 4-44 Cloud Setup Parameters

4.15 Static Route

Static Route is a pre-defined path that the data packet must be transmitted to a specific host or network regardless of other considerations.

The following table illustrates the definitions for the Static Route parameters.

Parameters	Definitions
IP Address	Specify the destination IP address the route leads to. It can't be in the same subnet segment with P1 or P2.
Subnet Mask	Specify the subnet mask of the destination network.
Gateway	In Normal mode, the Gateway should be in the same segment with P1/P2. (In Switch Mode, the Gateway should be in the same segment with P1).

Table 4-45 Definitions for Static Route parameters

For example, in the following topology, the iMeter D7 prefers to upload the data to Energy Management System remotely via 4G communication. Providing a workstation (172.16.2.100) and the iMeter D7 (P1:192.168.0.100) are in the different subnet segments of the business router, the iMeter D7's respond to workstation's request will be abandoned because the Gateway (10.0.0.1) won't forward the respond to the host in a different subnet.

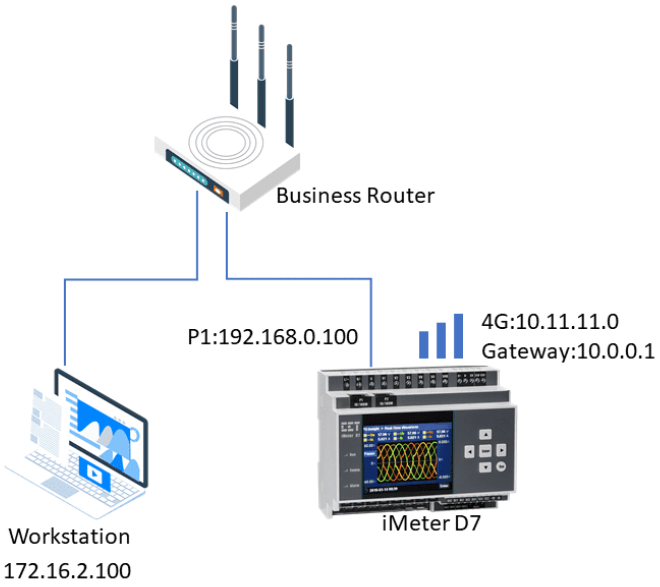


Figure 4-44 A Topology for Static Route

In this case, the Static Route configurations below will setup the communications between the workstation and meter.

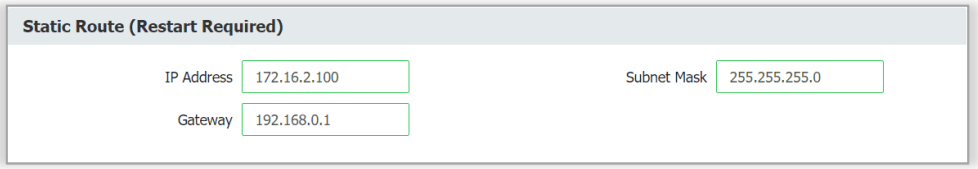


Figure 4-45 Static Route Configuration on Web

Chapter 5 Modbus Map

This chapter provides a complete description of the Modbus register map (**Protocol Version 1.1**) for the iMeter D7 to facilitate the development of 3rd party Modbus RTU communications driver for accessing information on the meter.

The iMeter D7 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)

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

5.1 Basic Measurements

Register	Property	Description	Format	Unit
0000	RO	Ua[1]	Float	V
0002	RO	Ub[1]	Float	V
0004	RO	Uc[1]	Float	V
0006	RO	ULN average[1]	Float	V
0008	RO	Uab	Float	V
0010	RO	Ubc	Float	V
0012	RO	Uca	Float	V
0014	RO	ULL average	Float	V
0016	RO	Ia	Float	A
0018	RO	Ib	Float	A
0020	RO	Ic	Float	A
0022	RO	I average	Float	A
0024	RO	kWa[1]	Float	W
0026	RO	kWb[1]	Float	W
0028	RO	kWc[1]	Float	W
0030	RO	kW Total[1]	Float	W
0032	RO	kvara[1]	Float	var
0034	RO	kvarb[1]	Float	var
0036	RO	kvarc[1]	Float	var
0038	RO	kvar Total[1]	Float	var
0040	RO	kVAa[1]	Float	VA
0042	RO	kVAb[1]	Float	VA
0044	RO	kVAc[1]	Float	VA
0046	RO	kVA Total[1]	Float	VA
0048	RO	PF a[1]	Float	--
0050	RO	PF b[1]	Float	--
0052	RO	PF c[1]	Float	--
0054	RO	PF Total[1]	Float	--
0056	RO	Frequency	Float	Hz
0058	RO	U4	Float	V
0060	RO	I4	Float	A
0062	--	Reserved	--	--
0064	RO	Real-time Data Timestamp/Sec (UNIX Time)	UINT32	s
0066	RO	Real-time Data Timestamp/Millisecond (UNIX Time)	UINT32	ms
0068	RO	Freq. Timestamp/Sec (UNIX Time)	UINT32	s
0070	RO	Freq. Timestamp/Millisecond (UNIX Time)	UINT32	ms
0072	RO	Pst. Timestamp/Sec (UNIX Time)	UINT32	s
0074	RO	Pst. Timestamp/Millisecond (UNIX Time)	UINT32	ms
0076	RO	Plt. Timestamp/Sec (UNIX Time)	UINT32	s
0078	RO	Plt. Timestamp/Millisecond (UNIX Time)	UINT32	ms
0080	RO	Flagging Status of Real-time Data[2]	UINT16	--
0081 ~ 0092	--	Reserved	--	--
0093	RO	Setpoint Status #1[3]	UINT32	--
0095	RO	Setpoint Status #2[3]	UINT32	--
0097 ~ 0113	--	Reserved	UINT32	--
0115	RO	Dip Event Counter	UINT32	--
0117	RO	Swell Event Counter	UINT32	--
0119	RO	Interruption Event Counter	UINT32	--
0121	RO	Transient Event Counter	UINT32	--
0123	RO	RVC Event Counter	UINT32	--
0125	RO	Inrush Current Counter	UINT32	--
0127	--	Reserved	--	--

0129	RO	MSV #1 Event Counter	UINT32	--
0131	RO	MSV #2 Event Counter	UINT32	--
0133	RO	MSV #3 Event Counter	UINT32	
0135	RO	Total PQ Counter	UINT32	
0137	RO	SOE Log Pointer[4]	UINT32	
0139	RO	PQ Log Pointer[4]	UINT32	
0141	RO	WFR Log Pointer[4]	UINT32	--
0143	RO	RMS Log Pointer[4]	UINT32	--
0145	RO	DWR Pointer[4]	UINT32	--
0147 ~ 0157	--	Reserved	--	--
0159	RO	SDR #1 Pointer[4]	UINT32	--
0161	RO	SDR #2 Pointer[4]	UINT32	--
0163~0171	RO	...	UINT32	--
0173	RO	SDR #8 Pointer[4]	UINT32	--
0175~0237	--	Reserved	--	--
0239	RO	Pst Log Pointer[4]	UINT32	--
0241	RO	Plt Log Pointer[4]	UINT32	--
0243	RO	Reserved	UINT32	--
0245	RO	IER Log Pointer[4]	UINT32	--
0247	RO	EN50160 Pointer[4]	UINT32	--
0249	--	Reserved	--	--
0251	RO	Historical TOU Log Pointer[4]	UINT32	--
0253~0255	--	Reserved	--	--
0257	RO	AER Log Pointer[4]	UINT32	--
0259	--	Reserved	--	--
0261	RO	2-150kHz C.E. Report Pointer[4]	UINT32	--
0263~0292	--	Reserved	UINT32	--
0294	RO	High-speed Frequency	Float	--
0296~0298	--	Reserved	--	--
0300	RO	AI1	Float	--
0302	RO	AI2	Float	--
0304~0306	RO	Reserved	--	--
0308	RO	DI Status[5]	UINT16	--
0309	RO	Reserved	--	--
0310	RO	DO Status[6]	UINT16	--
0311~0314	RO	Reserved	--	--
0316	RO	Ir	Float	--
0318	RO	TC	Float	--

Table 5-1 Basic Measurements

Notes:

1. When the Wiring Mode is 3P3W, the per phase Uln, kW, kvar, kVA and PF have no meaning and their registers are reserved.
2. Please refer to **Section 4.4.12** for a detailed description of the Flagging Status register.

Bit	Description		Bit	Description	
B0	Basic Measurement	Dip	**B8**	Pst.	Dip
B1		Swell	**B9**		Swell
B2		Interruption	**B10**		Interruption
B3		Over Current Limit	**B11**		Reserved
B4	Freq.	Dip	**B12**	Plt.	Dip
B5		Swell	**B13**		Swell
B6		Interruption	**B14**		Interruption
B7		Reserved	**B15**		Reserved

Table 5-2 Flagging Status

3. The B0 to B31 of Setpoint Status #1 register indicate the setpoint states for Setpoint 1 to 32, and the B0 to B7 of Setpoint Status #2 register indicate the setpoint states for Setpoint 33 to 40, with a bit value of 1 meaning active and 0 meaning inactive.
4. The **Log Pointer** indicates its current logging position with a range of 0 to 0xFFFFFFFF and it is incremented by one for every new log generated and will roll over to 0 if its current value is 0xFFFFFFFF. A value of 0 indicates that the recorder doesn't contain any log. If a **Clear Log** is performed via communications, its **Log Pointer** will be reset to zero, which will be recorded into SOE log. When the number of logs is larger than the Log Depth, only the latest **N** x logs (N represents the value of **Log Depth**) will be stored (Providing the Record Mode = FIFO).

   The latest log location is determined by the following equation:

   Location = Modulo [Log Pointer/Log Depth]

   The Log Depth are different for various Log Recorders, as indicated in the following table.

Recorder	Depth	Recorder	Depth	Recorder	Depth	Recorder	Depth	Recorder	Depth
SOE	1024	DWR	128	Plt	4380	Historical TOU	12	2 – 150 kHz C.E.	30
PQ	1024	RMS	128	IER	65535	AER	65535		
WFR	128	Pst	56520	EN 50160	52	SDR (1-8)	43200		

Table 5-3 Log Depth

5. For the **DI Status** register, the bit values of B0 to B3 represent the states of DI1 to DI4, respectively, with "1" meaning Active (Closed) and "0"

meaning Inactive (Open).

6. For the **DO Status** register, the bit values of B0 to B2 represent the states of Alarm Output, DO1 to DO2, respectively, with "1" meaning Operated and "0" meaning Released.

5.2 Energy Measurements

When **Energy Short Rollover** (Register 40758) is enabled, the Energy registers have a maximum value of 1,000,000,000,000. Or if the **Energy Short Rollover** is disabled, the Energy registers will roll over to zero automatically when it is reached to the maximum value of 100,000,000,000,000.

Register	Property	Description	Format	Scale	Unit
0500	RW	∑kWh Import	INT64	1	Wh
0504	RW	∑kWh Export	INT64	1	Wh
0508	RW	∑kvarh Import	INT64	1	varh
0512	RW	∑kvarh Export	INT64	1	varh
0516	RW	∑kVAh	INT64	1	VAh
0520	RW	∑kWh Net	INT64	1	Wh
0524	RW	∑kWh Total	INT64	1	Wh
0528	RW	∑kvarh Net	INT64	1	varh
0532	RW	∑kvarh Total	INT64	1	varh

Table 5-4 Energy Measurements

5.3 DI Pulse Counter

Register	Property	Description	Format	Scale
0650	RW	DI1 Counter	INT32	0 to 999,999,999
0652	RW	DI2 Counter	INT32	
0654	RW	DI3 Counter	INT32	
0656	RW	DI4 Counter	INT32	

Table 5-5 DI Pulse Counter

Notes:

1) DI Counter Register Value = DI Counter *DI Pulse Weight, for example, DI Pulse Weight is 5 and DI Counter is 400, then DI Counter Register Value = 5*400 =2000.

2) The Counter registers have a maximum value of 999,999,999 and will roll over to zero automatically when it is reached.

5.4 PQ Measurements

Register	Property	Description	Format	Unit
0700	RO	Ua Deviation[1]	Float	--
0702	RO	Ub Deviation[1]	Float	
0704	RO	Uc Deviation[1]	Float	
0706	RO	Uab Deviation	Float	
0708	RO	Ubc Deviation	Float	
0710	RO	Uca Deviation	Float	
0712	RO	Ua Over Deviation[1]	Float	
0714	RO	Ub Over Deviation[1]	Float	
0716	RO	Uc Over Deviation[1]	Float	
0718	RO	Uab Over Deviation	Float	
0720	RO	Ubc Over Deviation	Float	
0722	RO	Uca Over Deviation	Float	
0724	RO	Ua Under Deviation[1]	Float	
0726	RO	Ub Under Deviation[1]	Float	
0728	RO	Uc Under Deviation[1]	Float	
0730	RO	Uab Under Deviation	Float	
0732	RO	Ubc Under Deviation	Float	
0734	RO	Uca Under Deviation	Float	
0736	RO	Frequency Deviation	Float	Hz
0738~0748	--	Reserved	--	--
0750	RO	U0 Unbalance	Float	
0752	RO	U2 Unbalance	Float	
0754	RO	I0 Unbalance	Float	
0756	RO	I2 Unbalance	Float	
0758	RO	U0	Float	V
0760	RO	U1	Float	V
0762	RO	U2	Float	V
0764	RO	I0	Float	A
0766	RO	I1	Float	A
0768	RO	I2	Float	A
0770	RO	Ua / Uab Pst. [2]	Float	--
0772	RO	Ub / Ubc Pst. [2]	Float	
0774	RO	Uc / Uca Pst. [2]	Float	

0776	RO	Ua / Uab Plt. [2]	Float	
0778	RO	Ub / Ubc Plt. [2]	Float	
0780	RO	Uc / Uca Plt. [2]	Float	
0782	--	Reserved	--	
0784	RO	Ia TDD	Float	
0786	RO	Ib TDD	Float	
0788	RO	Ic TDD	Float	
0790	RO	I4 TDD	Float	
0792	--	Reserved	--	
0794	RO	Ia TDD Odd	Float	
0796	RO	Ib TDD Odd	Float	
0798	RO	Ic TDD Odd	Float	
0800	RO	I4 TDD Odd	Float	
0802	--	Reserved	--	
0804	RO	Ia TDD Even	Float	
0806	RO	Ib TDD Even	Float	
0808	RO	Ic TDD Even	Float	
0810	RO	I4 TDD Even	Float	
0812	--	Reserved	--	
0814	RO	Ia K-Factor	Float	
0816	RO	Ib K-Factor	Float	
0818	RO	Ic K-Factor	Float	
0820	RO	I4 K-Factor	Float	
0822	--	Reserved	--	
0824	RO	Ia Crest Factor	Float	
0826	RO	Ib Crest Factor	Float	
0828	RO	Ic Crest Factor	Float	
0830	RO	I4 Crest Factor	Float	
0832	--	Reserved	--	
0834	RO	Ua Crest Factor	Float	
0836	RO	Ub Crest Factor	Float	
0838	RO	Uc Crest Factor	Float	
0840	RO	U4 Crest Factor	Float	
0842	RO	MSV #1 Ua/Uab[2]	Float	
0844	RO	MSV #1 Ub/Ubc[2]	Float	
0846	RO	MSV #1 Uc/Uca[2]	Float	
0848	RO	MSV #2 Ua/Uab[2]	Float	
0850	RO	MSV #2 Ub/Ubc[2]	Float	V
0852	RO	MSV #2 Uc/Uca[2]	Float	
0854	RO	MSV #3 Ua/Uab[2]	Float	
0856	RO	MSV #3 Ub/Ubc[2]	Float	
0858	RO	MSV #3 Uc/Uca[2]	Float	

Table 5-6 PQ Measurements

Notes:

1. When the **Wiring Mode** is **3P3W**, the 3Φ Uln deviations have no meaning and their registers are reserved.
2. When the **Wiring Mode** is **3P3W**, the phase A/B/C Voltage Pst., Plt. and MSV #X mean phase AB/BC/CA Voltage Pst., Plt. and MSV #X.

5.5 Harmonic Measurements

5.5.1 Harmonic Distortion

Register	Property	Description	Format	Unit
1000	RO	Ua / Uab THD[1]	Float	
1002	RO	Ub / Ubc THD[1]	Float	
1004	RO	Uc / Uca THD[1]	Float	
1006	RO	U4 THD	Float	%
1008	RO	Ia THD	Float	
1010	RO	Ib THD	Float	
1012	RO	Ic THD	Float	
1014	RO	I4 THD	Float	
1016	--	Reserved	--	--
1018	RO	Ua / Uab TOHD[1]	Float	
1020	RO	Ub / Ubc TOHD[1]	Float	
1022	RO	Uc / Uca TOHD[1]	Float	%
1024	RO	U4 TOHD	Float	
1026	RO	Ia TOHD	Float	
1028	RO	Ib TOHD	Float	

1030	RO	Ic TOHD	Float	
1032	RO	I4 TOHD	Float	
1034	--	Reserved	--	--
1036	RO	Ua / Uab TEHD[1]	Float	
1038	RO	Ub / Ubc TEHD[1]	Float	
1040	RO	Uc / Uca TEHD[1]	Float	
1042	RO	U4 TEHD	Float	%
1044	RO	Ia TEHD	Float	
1046	RO	Ib TEHD	Float	
1048	RO	Ic TEHD	Float	
1050	RO	I4 TEHD	Float	
1052	--	Reserved	--	--
1054	RO	Ua / Uab HD00[1]	Float	
1056	RO	Ub / Ubc HD00[1]	Float	
1058	RO	Uc / Uca HD00[1]	Float	
1060	RO	U4 HD00	Float	%
1062	RO	Ia HD00	Float	
1064	RO	Ib HD00	Float	
1066	RO	Ic HD00	Float	
1068	RO	I4 HD00	Float	
1070	--	Reserved	--	--
1072	RO	Ua / Uab HD01[1]	Float	
1074	RO	Ub / Ubc HD01[1]	Float	
1076	RO	Uc / Uca HD01[1]	Float	
1078	RO	U4 HD01	Float	%
1080	RO	Ia HD01	Float	
1082	RO	Ib HD01	Float	
1084	RO	Ic HD01	Float	
1086	RO	I4 HD01	Float	
1088	--	Reserved	--	--
...	...	...	Float	
2188	RO	Ua / Uab HD63[1]	Float	
2190	RO	Ub / Ubc HD63[1]	Float	
2192	RO	Uc / Uca HD63[1]	Float	
2194	RO	U4 HD63	Float	%
2196	RO	Ia HD63	Float	
2198	RO	Ib HD63	Float	
2200	RO	Ic HD63	Float	
2202	RO	I4 HD63	Float	

Table 5-7 Harmonic Distortion

Note:

1. When the **Wiring Mode** is **3P3W**, the Phase A/B/C Voltage THD, TOHD, TEHD and Individual Harmonics mean Phase AB/BC/CA Voltage THD, TOHD, TEHD and Individual Harmonics.

5.5.2 Harmonic RMS Measurements

Register	Property	Description	Format	Unit
2300	RO	Ua / Uab TH RMS[1]	Float	V
2302	RO	Ub / Ubc TH RMS[1]	Float	V
2304	RO	Uc / Uca TH RMS[1]	Float	V
2306	RO	U4 TH RMS	Float	V
2308	RO	Ia TH RMS	Float	A
2310	RO	Ib TH RMS	Float	A
2312	RO	Ic TH RMS	Float	A
2314	RO	I4 TH RMS	Float	A
2316	--	Reserved	--	--
2318	RO	Ua / Uab TOH RMS[1]	Float	V
2320	RO	Ub / Ubc TOH RMS[1]	Float	V
2322	RO	Uc / Uca TOH RMS[1]	Float	V
2324	RO	U4 TOH RMS	Float	V
2326	RO	Ia TOH RMS	Float	A
2328	RO	Ib TOH RMS	Float	A
2330	RO	Ic TOH RMS	Float	A
2332	RO	I4 TOH RMS	Float	A
2334	--	Reserved	--	--
2336	RO	Ua / Uab TEH RMS[1]	Float	V
2338	RO	Ub / Ubc TEH RMS[1]	Float	V
2340	RO	Uc / Uca TEH RMS[1]	Float	V
2342	RO	U4 TEH RMS	Float	V

2344	RO	Ia TEH RMS	Float	A
2346	RO	Ib TEH RMS	Float	A
2348	RO	Ic TEH RMS	Float	A
2350	RO	I4 TEH RMS	Float	A
2352	--	Reserved	--	--
2354	RO	Ua / Uab DC Component RMS[1]	Float	V
2356	RO	Ub / Ubc DC Component RMS[1]	Float	V
2358	RO	Uc / Uca DC Component RMS[1]	Float	V
2360	RO	U4 DC Component RMS	Float	V
2362	RO	Ia DC Component RMS	Float	A
2364	RO	Ib DC Component RMS	Float	A
2366	RO	Ic DC Component RMS	Float	A
2368	RO	I4 DC Component RMS	Float	A
2370	--	Reserved	--	--
2372	RO	Ua / Uab Fund. RMS[1]	Float	V
2374	RO	Ub / Ubc Fund. RMS[1]	Float	V
2376	RO	Uc / Uca Fund. RMS[1]	Float	V
2378	RO	U4 Fund. RMS	Float	V
2380	RO	Ia Fund. RMS	Float	A
2382	RO	Ib Fund. RMS	Float	A
2384	RO	Ic Fund. RMS	Float	A
2386	RO	I4 Fund. RMS	Float	A
2388	--	Reserved	--	--
...	RO	...	Float	...
3488	RO	Ua / Uab H63 RMS[1]	Float	V
3490	RO	Ub / Ubc H63 RMS[1]	Float	V
3492	RO	Uc / Uca H63 RMS[1]	Float	V
3494	RO	U4 H63 RMS	Float	V
3496	RO	Ia H63 RMS	Float	A
3498	RO	Ib H63 RMS	Float	A
3500	RO	Ic H63 RMS	Float	A
3502	RO	I4 H63 RMS	Float	A

Table 5-8 Harmonic RMS Measurements

Note:

1. When the **Wiring Mode** is **3P3W**, the TH/TOH/TEH RMS and Individual Harmonic RMSs for Ua/Ub/Uc mean the TH/TOH/TEH RMS and Individual Harmonic RMSs for Uab/Ubc/Uca.

5.5.3 Individual Harmonics for Total Power

Register	Property	Description	Format	Unit
27000	RO	∑kW Fund.	Float	W
27002	RO	∑kvar Fund.	Float	var
27004	RO	∑kVA Fund.	Float	VA
27006	RO	dPF	Float	--
27008	RO	∑kW H02	Float	W
27010	RO	∑kvar H02	Float	var
27012	RO	∑kVA H02	Float	VA
27014	RO	PF H02	Float	--
...	RO	...	Float	...
27496	RO	∑kW H63	Float	W
27498	RO	∑kvar H63	Float	var
27500	RO	∑kVA H63	Float	VA
27502	RO	PF H63	Float	--

Table 5-9 Individual Harmonics for Total Power

5.5.4 Phase A/B/C Harmonic Powers

Register	Property	Description	Format	Unit
28000	RO	kWa TH[1]	Float	W
28002	RO	kWb TH[1]	Float	W
28004	RO	kWc TH[1]	Float	W
28006	RO	kW TH	Float	W
28008	RO	kvara TH[1]	Float	var
28010	RO	kvarb TH[1]	Float	var
28012	RO	kvarc TH[1]	Float	var
28014	RO	kvar TH	Float	var
28016	RO	kVAa TH[1]	Float	VA
28018	RO	kVAb TH[1]	Float	VA
28020	RO	kVAc TH[1]	Float	VA
28022	RO	kVA TH	Float	VA

28024	RO	PFa TH[1]	Float	--
28026	RO	PFb TH[1]	Float	--
28028	RO	PFc TH[1]	Float	--
28030	RO	PF TH	Float	--
28032~28038	--	Reserved	--	--
28040	RO	kWa H01[1]	Float	W
28042	RO	kWb H01[1]	Float	W
28044	RO	kWc H01[1]	Float	W
28046	RO	kvara H01[1]	Float	var
28048	RO	kvarb H01[1]	Float	var
28050	RO	kvarc H01[1]	Float	var
28052	RO	kVAa H01[1]	Float	VA
28054	RO	kVAb H01[1]	Float	VA
28056	RO	kVAc H01[1]	Float	VA
28058	RO	PFa H01[1]	Float	--
28060	RO	PFb H01[1]	Float	
28062	RO	PFc H01[1]	Float	
...	RO	...	Float	
29528	RO	kWa H63[1]	Float	W
29530	RO	kWb H63[1]	Float	W
29532	...	kWc H63[1]	Float	W
29534	RO	kvara H63[1]	Float	var
29536	RO	kvarb H63[1]	Float	var
29538	RO	kvarc H63[1]	Float	var
29540	RO	kVAa H63[1]	Float	VA
29542	RO	kVAb H63[1]	Float	VA
29544	RO	kVAc H63[1]	Float	VA
29546	RO	PFa H63[1]	Float	--
29548	RO	PFb H63[1]	Float	
29550	RO	PFc H63[1]	Float	

Table 5-10 Phase A/B/C Harmonic Powers

Note:

1. When the **Wiring Mode** is **3P3W**, the Total Harmonics and Individual Harmonics for Phase A/B/C kW, kvar, kVA and PF have no meaning and their registers are reserved.

5.5.5 Harmonic Angles

Register	Property	Description	Format	Unit
30018	RO	Ua / Uab Fund. Angle[1]	Float	°
30020	RO	Ub / Ubc Fund. Angle[1]	Float	
30022	RO	Uc / Uca Fund. Angle[1]	Float	
30024	RO	U4 Fund. Angle	Float	
30026	RO	Ia Fund. Angle	Float	
30028	RO	Ib Fund. Angle	Float	
30030	RO	Ic Fund. Angle	Float	
30032	RO	I4 Fund. Angle	Float	
30034	--	Reserved	--	--
...	RO	...	Float	°
31134	RO	Ua / Uab Angle H63[1]	Float	
31136	RO	Ub / Ubc Angle H63[1]	Float	
31138	RO	Uc / Uca Angle H63[1]	Float	
31140	RO	U4 Angle H63	Float	
31142	RO	Ia Angle H63	Float	
31144	RO	Ib Angle H63	Float	
31146	RO	Ic Angle H63	Float	
31148	RO	I4 Angle H63	Float	

Table 5-11 Harmonic Angles

Note:

1. When the **Wiring Mode** is **3P3W**, the Phase A/B/C Voltage Individual Angles mean Phase AB/BC/CA Voltage Individual Angles, Respectively.

5.5.6 Harmonic Energy

Register	Property	Description	Format	Unit
31500	RW	kWh Imp. TH	INT64	wh
31504	RW	kWh Exp. TH	INT64	wh
31508	RW	kvarh Imp. TH	INT64	varh
31512	RW	kvarh Exp. TH	INT64	varh
31516	RO	kWh Net TH	INT64	wh
31520	RO	kWh Total TH	INT64	wh

31524	RO	kvarh Net TH	INT64	varh
31528	RO	kvarh Total TH	INT64	varh
31532~31598	--	Reserved	--	--
31600	RW	kWh Imp. Fund.	INT64	wh
31604	RW	kWh Exp. Fund.	INT64	wh
31608	RW	kvarh Imp. Fund.	INT64	varh
31612	RW	kvarh Exp. Fund.	INT64	varh
31616	RW	kWh Imp. H02	INT64	wh
31620	RW	kWh Exp. H02	INT64	wh
31624	RW	kvarh Imp. H02	INT64	varh
31628	RW	kvarh Exp. H02	INT64	varh
...	RW	...	INT64	...
32592	RW	kWh Imp. H63	INT64	wh
32596	RW	kWh Exp. H63	INT64	wh
32600	RW	kvarh Imp. H63	INT64	varh
32604	RW	kvarh Exp. H63	INT64	varh
32608~32996	--	Reserved	--	--
33000	RO	kWh Net Fund.	INT64	Wh
33004	RO	kWh Total Fund.	INT64	Wh
33008	RO	kvarh Net Fund.	INT64	varh
33012	RO	kvarh Total Fund.	INT64	varh

Table 5-12 Harmonic Energy

5.6 Interharmonic Measurements

5.6.1 Interharmonic Distortion

Register	Property	Description	Format	Unit
33100	RO	Ua / Uab TIHD[1]	Float	%
33102	RO	Ub / Ubc TIHD[1]	Float	
33104	RO	Uc / Uca TIHD[1]	Float	
33106	RO	U4 TIHD	Float	
33108	RO	Ia TIHD	Float	
33110	RO	Ib TIHD	Float	
33112	RO	Ic TIHD	Float	
33114	RO	I4 TIHD	Float	
33116	--	Reserved	--	--
33118	RO	Ua / Uab TOIHD[1]	Float	%
33120	RO	Ub / Ubc TOIHD[1]	Float	
33122	RO	Uc / Uca TOIHD[1]	Float	
33124	RO	U4 TOIHD	Float	
33126	RO	Ia TOIHD	Float	
33128	RO	Ib TOIHD	Float	
33130	RO	Ic TOIHD	Float	
33132	RO	I4 TOIHD	Float	
33134	--	Reserved	--	--
33136	RO	Ua / Uab TEIHD[1]	Float	%
33138	RO	Ub / Ubc TEIHD[1]	Float	
33140	RO	Uc / Uca TEIHD[1]	Float	
33142	RO	U4 TEIHD	Float	
33144	RO	Ia TEIHD	Float	
33146	RO	Ib TEIHD	Float	
33148	RO	Ic TEIHD	Float	
33150	RO	I4 TEIHD	Float	
33152	--	Reserved	--	--
33154	RO	Ua / Uab IHD00[1]	Float	%
33156	RO	Ub / Ubc IHD00[1]	Float	
33158	RO	Uc / Uca IHD00[1]	Float	
33160	RO	U4 IHD00	Float	
33162	RO	Ia IHD00	Float	
33164	RO	Ib IHD00	Float	
33166	RO	Ic IHD00	Float	
33168	RO	I4 IHD00	Float	
33170	--	Reserved	--	--
...	...	....	...	%
34288	RO	Ua / Uab IHD63[1]	Float	
34290	RO	Ub / Ubc IHD63[1]	Float	
34292	RO	Uc / Uca IHD63[1]	Float	
34294	RO	U4 IHD63	Float	

34296	RO	Ia IHD63	Float	
34298	RO	Ib IHD63	Float	
34300	RO	Ic IHD63	Float	
34302	RO	I4 IHD63	Float	

Table 5-13 Interharmonic Distortion

Note:

1. When the **Wiring Mode** is **3P3W**, the Ua/Ub/Uc TIHD, TOIHD, TEIHD, and Individual IHDs mean Uab/Ubc/Uca TIHD, TOIHD, TEIHD and Individual IHDs, respectively.

5.6.2 Interharmonic RMS Measurements

Register	Property	Description	Format	Unit
34500	RO	Ua / Uab TIH RMS[1]	Float	V
34502	RO	Ub / Ubc TIH RMS[1]	Float	V
34504	RO	Uc / Uca TIH RMS[1]	Float	V
34506	RO	U4 TIH RMS	Float	V
34508	RO	Ia TIH RMS	Float	A
34510	RO	Ib TIH RMS	Float	A
34512	RO	Ic TIH RMS	Float	A
34514	RO	I4 TIH RMS	Float	A
34516	--	Reserved	--	--
34518	RO	Ua / Uab TOIH RMS[1]	Float	V
34520	RO	Ub / Ubc TOIH RMS[1]	Float	V
34522	RO	Uc / Uca TOIH RMS[1]	Float	V
34524	RO	U4 TOIH RMS	Float	V
34526	RO	Ia TOIH RMS	Float	A
34528	RO	Ib TOIH RMS	Float	A
34530	RO	Ic TOIH RMS	Float	A
34532	RO	I4 TOIH RMS	Float	A
34534	--	Reserved	--	--
35436	RO	Ua / Uab TEIH RMS[1]	Float	V
34538	RO	Ub / Ubc TEIH RMS[1]	Float	V
34540	RO	Uc / Uca TEIH RMS[1]	Float	V
34542	RO	U4 TEIH RMS	Float	V
34544	RO	Ia TEIH RMS	Float	A
34546	RO	Ib TEIH RMS	Float	A
34548	RO	Ic TEIH RMS	Float	A
34550	RO	I4 TEIH RMS	Float	A
34552	--	Reserved	--	--
34554	RO	Ua / Uab IH00 RMS[1]	Float	V
34556	RO	Ub / Ubc IH00 RMS[1]	Float	V
34558	RO	Uc / Uca IH00 RMS[1]	Float	V
34560	RO	U4 IH00 RMS	Float	V
34562	RO	Ia IH00 RMS	Float	A
34564	RO	Ib IH00 RMS	Float	A
34566	RO	Ic IH00 RMS	Float	A
34568	RO	I4 IH00 RMS	Float	A
34570	--	Reserved	--	--
34572	RO	Ua / Uab IH01 RMS[1]	Float	V
34574	RO	Ub / Ubc IH01 RMS[1]	Float	V
34576	RO	Uc / Uca IH01 RMS[1]	Float	V
34578	RO	U4 IH01 RMS	Float	V
34580	RO	Ia IH01 RMS	Float	A
34582	RO	Ib IH01 RMS	Float	A
34584	RO	Ic IH01 RMS	Float	A
34586	RO	I4 IH01 RMS	Float	A
34588	--	Reserved	--	--
.....	RO	...	Float	
35688	RO	Ua / Uab IH63 RMS[1]	Float	V
35690	RO	Ub / Ubc IH63 RMS[1]	Float	V
35692	RO	Uc / Uca IH63 RMS[1]	Float	V
35694	RO	U4 IH63 RMS	Float	V
35696	RO	Ia IH63 RMS	Float	A
35698	RO	Ib IH63 RMS	Float	A
35700	RO	Ic IH63 RMS	Float	A
35702	RO	I4 IH63 RMS	Float	A

Table 5-14 Interharmonic RMS Measurements

Note:

1. When the **Wiring Mode** is **3P3W**, the TIH/TOIH/TEIH RMS and Individual IH RMSs for Ua/Ub/Uc mean TIH/TOIH/TEIH RMS and Individual IH RMSs for Uab/Ubc/Uca.

5.7 Demands

5.7.1 Present Demand

Register	Property	Description	Format	Unit
3600	RO	Ua[1]	Float	V
3602	RO	Ub[1]	Float	V
3604	RO	Uc[1]	Float	V
3606	RO	ULN Avg[1]	Float	V
3608	RO	U4	Float	V
3610	RO	Uab	Float	V
3612	RO	Ubc	Float	V
3614	RO	Uca	Float	V
3616	RO	ULL Avg.	Float	V
3618	RO	Ia	Float	A
3620	RO	Ib	Float	A
3622	RO	Ic	Float	A
3624	RO	I Avg.	Float	A
3626	RO	I4	Float	A
3628	--	Reserved	--	--
3630	RO	kWa Imp. [1]	Float	W
3632	RO	kWb Imp. [1]	Float	W
3634	RO	kWc Imp. [1]	Float	W
3636	RO	kW Total Imp.	Float	W
3638	RO	kWa Exp. [1]	Float	W
3640	RO	kWb Exp. [1]	Float	W
3642	RO	kWc Exp. [1]	Float	W
3644	RO	kW Total Exp.	Float	W
3646	RO	kvara Imp. [1]	Float	var
3648	RO	kvarb Imp. [1]	Float	var
3640	RO	kvarc Imp. [1]	Float	var
3652	RO	kvar Total Imp.	Float	var
3654	RO	kvara Exp. [1]	Float	var
3656	RO	kvarb Exp. [1]	Float	var
3658	RO	kvarc Exp. [1]	Float	var
3660	RO	kvar Total Exp.	Float	var
3662	RO	kVAa[1]	Float	VA
3664	RO	kVAb[1]	Float	VA
3666	RO	kVAc[1]	Float	VA
3668	RO	kVA Total	Float	VA
3670	RO	PFa[1]	Float	--
3672	RO	PFb[1]	Float	--
3674	RO	PFc[1]	Float	--
3676	RO	PF Total	Float	--
3678	RO	Freq.	Float	Hz
3680	RO	Ua Deviation[1]	Float	100%
3682	RO	Ub Deviation[1]	Float	100%
3684	RO	Uc Deviation[1]	Float	100%
3686	RO	Uab Deviation	Float	100%
3688	RO	Ubc Deviation	Float	100%
3690	RO	Uca Deviation	Float	100%
3692	RO	Ua Over Deviation[1]	Float	100%
3694	RO	Ub Over Deviation[1]	Float	100%
3696	RO	Uc Over Deviation[1]	Float	100%
3698	RO	Uab Over Deviation	Float	100%
3700	RO	Ubc Over Deviation	Float	100%
3702	RO	Uca Over Deviation	Float	100%
3704	RO	Ua Under Deviation[1]	Float	100%
3706	RO	Ub Under Deviation[1]	Float	100%
3708	RO	Uc Under Deviation[1]	Float	100%
3710	RO	Uab Under Deviation	Float	100%
3712	RO	Ubc Under Deviation	Float	100%
3714	RO	Uca Under Deviation	Float	100%
3716	RO	Freq. Deviation	Float	100%
3718	RO	U0 Unbal.	Float	--

3720	RO	U2 Unbal.	Float	
3722	RO	I0 Unbal.	Float	
3724	RO	I2 Unbal.	Float	
3726	RO	Ia K-Factor	Float	
3728	RO	Ib K-Factor	Float	
3730	RO	Ic K-Factor	Float	
3732	RO	I4 K-Factor	Float	
3734	--	Reserved	--	
3736	RO	Ua / Uab THD[2]	Float	
3738	RO	Ub / Ubc THD[2]	Float	
3740	RO	Uc / Uca THD[2]	Float	
3742	RO	U4 THD	Float	
3744	RO	Ia THD	Float	
3746	RO	Ib THD	Float	
3748	RO	Ic THD	Float	
3750	RO	I4 THD	Float	
3752	--	Reserved	--	
3754	RO	Ua / Uab TOHD[2]	Float	
3756	RO	Ub / Ubc TOHD[2]	Float	
3758	RO	Uc / Uca TOHD[2]	Float	
3760	RO	U4 TOHD	Float	
3762	RO	Ia TOHD	Float	
3764	RO	Ib TOHD	Float	
3766	RO	Ic TOHD	Float	
3768	RO	I4 TOHD	Float	
3770	--	Reserved	--	
3772	RO	Ua / Uab TEHD[2]	Float	
3774	RO	Ub / Ubc TEHD[2]	Float	
3776	RO	Uc / Uca TEHD[2]	Float	
3778	RO	U4 TEHD	Float	
3780	RO	Ia TEHD	Float	
3782	RO	Ib TEHD	Float	
3784	RO	Ic TEHD	Float	
3786	RO	I4 TEHD	Float	
3788	--	Reserved	--	
3790	RO	Ia FUND.	Float	A
3792	RO	Ib FUND.	Float	A
3794	RO	Ic FUND.	Float	A
3796	RO	I4 FUND.	Float	A

Table 5-15 Present Demand

Note:

1. When the **Wiring Mode** is **3P3W**, the Present Demands for Ua/Ub/Uc, ULN Average, kW Import/Export, kvar Import/Export, kVA, PF, Voltage Deviation, have no meaning and their registers are reserved.
2. When the **Wiring Mode** is **3P3W**, the Present Demands for Ua/Ub/Uc THD, TOHD and TEHD mean the Demands for Uab/Ubc/Uca THD, TOHD and TEHD.

5.7.2 Predicted Demand

Register	Property	Description	Format	Unit
3900	RO	Ua[1]	Float	V
3902	RO	Ub[1]	Float	V
3904	RO	Uc[1]	Float	V
3906	RO	ULN Avg.[1]	Float	V
3908	RO	U4	Float	V
3910	RO	Uab	Float	V
3912	RO	Ubc	Float	V
3914	RO	Uca	Float	V
3916	RO	ULL Avg.	Float	V
3918	RO	Ia	Float	A
3920	RO	Ib	Float	A
3922	RO	Ic	Float	A
3924	RO	I Avg.	Float	A
3926	RO	I4	Float	A
3928	--	Reserved	--	--
3930	RO	kWa Imp.[1]	Float	W
3932	RO	kWb Imp.[1]	Float	W
3934	RO	kWc Imp.[1]	Float	W
3936	RO	kW Total Imp.	Float	W

3938	RO	kWa Exp. [1]	Float	W
3940	RO	kWb Exp. [1]	Float	W
3942	RO	kWc Exp. [1]	Float	W
3944	RO	kW Total Exp.	Float	W
3946	RO	kvara Imp. [1]	Float	var
3948	RO	kvarb Imp. [1]	Float	var
3940	RO	kvarc Imp. [1]	Float	var
3952	RO	kvar Total Imp.	Float	var
3954	RO	kvara Exp. [1]	Float	var
3956	RO	kvarb Exp. [1]	Float	var
3958	RO	kvarc Exp. [1]	Float	var
3960	RO	kvar Total Exp.	Float	var
3962	RO	kVAa[1]	Float	VA
3964	RO	kVAb[1]	Float	VA
3966	RO	kVAc[1]	Float	VA
3968	RO	kVA Total	Float	VA
3970	RO	PFa[1]	Float	--
3972	RO	PFb[1]	Float	--
3974	RO	PFc[1]	Float	--
3976	RO	PF Total	Float	--
3978	RO	Freq.	Float	Hz

Table 5-16 Predicted Demand

Note:

1. When the **Wiring Mode** is **3P3W**, the Predicted Demands for Ua/Ub/Uc, ULN Average, kW Import/Export, kvar Import/Export, kVA and PF, have no meaning and their registers are reserved.

5.7.3 Max./Min. Value per Demand Period

Register		Property	Description	Format	Unit
Max.	Min.				
4100	4800	RO	Ua[1]	See Table 5-18	V
4106	4806	RO	Ub[1]		V
4112	4812	RO	Uc[1]		V
4118	4818	RO	Uln Avg[1]		V
4124	4824	RO	U4		V
4130	4830	RO	Uab		V
4136	4836	RO	Ubc		V
4142	4842	RO	Uca		V
4148	4848	RO	Ull Avg		V
4154	4854	RO	Ia		A
4160	4860	RO	Ib		A
4166	4866	RO	Ic		A
4172	4872	RO	I Avg		A
4178	4878	RO	I4		A
4184	4884	--	Reserved	--	--
4190	4890	RO	kWa Imp. [1]	See Table 5-18	W
4196	4896	RO	kWb Imp. [1]		W
4202	4902	RO	kWc Imp. [1]		W
4208	4908	RO	∑kW Imp.		W
4214	4914	RO	kWa Exp. [1]		W
4220	4920	RO	kWb Exp. [1]		W
4226	4926	RO	kWc Exp. [1]		W
4232	4932	RO	∑kW Exp.		W
4238	4938	RO	kvara Imp. [1]		var
4244	4944	RO	kvarb Imp. [1]		var
4250	4950	RO	kvarc Imp. [1]		var
4256	4956	RO	∑kvar Imp.		var
4262	4962	RO	kvara Exp. [1]		var
4268	4968	RO	kvarb Exp. [1]		var
4274	4974	RO	kvarc Exp. [1]		var
4280	4980	RO	∑kvar Exp.		var
4286	4986	RO	kVAa[1]		VA
4292	4992	RO	kVAb[1]		VA
4298	4998	RO	kVAc[1]		VA
4304	5004	RO	kVA Total		VA
4310	5010	RO	PFa[1]		--
4316	5016	RO	PFb[1]		--
4322	5022	RO	PFc[1]		--

4328	5028	RO	PF		Hz
4334	5034	RO	Frequency		%
4340	5040	RO	Ua Deviation[1]		%
4346	5046	RO	Ub Deviation[1]		%
4352	5052	RO	Uc Deviation[1]		%
4358	5058	RO	Uab Deviation		%
4364	5064	RO	Ubc Deviation		%
4370	5070	RO	Uca Deviation		%
4376	5076	RO	Ua Over Deviation[1]		%
4382	5082	RO	Ub Over Deviation[1]		%
4388	5088	RO	Uc Over Deviation[1]		%
4394	5094	RO	Uab Over Deviation		%
4400	5100	RO	Ubc Over Deviation		%
4406	5106	RO	Uca Over Deviation		%
4412	5112	RO	Ua Under Deviation[1]		%
4418	5118	RO	Ub Under Deviation[1]		%
4424	5124	RO	Uc Under Deviation[1]		%
4430	5130	RO	Uab Under Deviation		%
4436	5136	RO	Ubc Under Deviation		%
4442	5142	RO	Uca Under Deviation		%
4448	5148	RO	Freq. Deviation		%
4454	5154	RO	U0 Unbalance		--
4460	5160	RO	U2 Unbalance		--
4466	5166	RO	I0 Unbalance		--
4472	5172	RO	I2 Unbalance		--
4478	5178	RO	Ia K-Factor		--
4484	5184	RO	Ib K-Factor		--
4490	5190	RO	Ic K-Factor		--
4496	5196	RO	I4 K-Factor		--
4502	5202	--	Reserved	--	--
4508	5208	RO	Ua/Uab THD[2]	**See Table 5-18**	%
4514	5214	RO	Ub/Ubc THD[2]		%
4520	5220	RO	Uc/Uca THD[2]		%
4526	5226	RO	U4 THD		%
4532	5232	RO	Ia THD		%
4538	5238	RO	Ib THD		%
4544	5244	RO	Ic THD		%
4550	5250	RO	I4 THD		%
4556	5256	--	Reserved	--	--
4562	5262	RO	Ua/Uab TOHD[2]	**See Table 5-18**	%
4568	5268	RO	Ub/Ubc TOHD[2]		%
4574	5274	RO	Uc/Uca TOHD[2]		%
4580	5280	RO	U4 TOHD		%
4586	5286	RO	Ia TOHD		%
4592	5292	RO	Ib TOHD		%
4598	5298	RO	Ic TOHD		%
4604	5304	RO	I4 TOHD		%
4610	5310	--	Reserved	--	--
4616	5316	RO	Ua/Uab TEHD[2]	**See Table 5-18**	%
4622	5322	RO	Ub/Ubc TEHD[2]		%
4628	5328	RO	Uc/Uca TEHD[2]		%
4634	5334	RO	U4 TEHD		%
4640	5340	RO	Ia TEHD		%
4646	5346	RO	Ib TEHD		%
4652	5352	RO	Ic TEHD		%
4658	5358	RO	I4 TEHD		%
4664	5364	--	Reserved		--
4670	5370	RO	Ia FUND.		A
4676	5376	RO	Ib FUND.		A
4682	5382	RO	Ic FUND.		A
4688	5388	RO	I4 FUND.		A

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

Notes:

1. When the **Wiring Mode** is **3P3W**, the Max./Min. value for Ua/Ub/Uc, Uln Average, kW Import/ Export, kvar Import/ Export, kVA, PF and Voltage Deviations per Demand Period have no meaning, and their registers are reserved.
2. When the **Wiring Mode** is **3P3W**, the Max./Min. value for Ua/Ub/Uc THD, TOHD and TEHD mean the Max./Min. value for Uab/Ubc/Uca THD, TOHD and TEHD per Demand Period.

3. The following table illustrates Max./Min. Value per Demand Period Data Structure:

Offset		Description
+0	High	Year (-2000)
	Low	Month
+1	High	Day
	Low	Hour
+2	High	Minute
	Low	Second
+3	--	Reserved
+4 ~ +5	--	Record Value (Float)

Table 5-18 Max./Min. Value per Demand Period Data Structure

5.7.4 This/Last Max. Demand Log

Register		Property	Description	Format	Unit
This Max.	Last Max.				
5500	5700	RO	kW Imp. Total	See Table 5-18	W
5506	5706	RO	kW Exp. Total		W
5512	5712	RO	kvar Imp. Total		var
5518	5718	RO	kvar Exp. Total		var
5524	5724	RO	kVA Total		VA
5530	5730	RO	Ia		A
5536	5736	RO	Ib		A
5542	5742	RO	Ic		A
5548	5748	RO	Ia FUND.		A
5554	5754	RO	Ib FUND.		A
5560	5760	RO	Ic FUND.		A
5566	5766	RO	I4 FUND.		A

Table 5-19 Max./Min. Demand Log

5.8 Real-Time IER & AER

Register		Property	Description	Format	Unit
IER	AER				
6000	6100	RO	kWh Imp.	INT64	wh
6004	6104	RO	kWh Exp.	INT64	wh
6008	6108	RO	kWh Total	INT64	wh
6012	6112	RO	kvarh Imp.	INT64	varh
6016	6116	RO	kvarh Exp.	INT64	varh
6020	6120	RO	kvarh Total	INT64	varh
6024	6124	RO	kVAh	INT64	VAh
6028	6128	RO	kWh Imp. Fund.	INT64	wh
6032	6132	RO	kWh Exp. Fund.	INT64	wh
6036	6136	RO	kvarh Imp. Fund.	INT64	varh
6040	6140	RO	kvarh Exp. Fund.	INT64	varh
6044	6144	RO	kWh Imp. TH	INT64	wh
6048	6148	RO	kWh Exp. TH	INT64	wh
6052	6152	RO	kvarh Imp. TH	INT64	varh
6056	6156	RO	kvarh Exp. TH	INT64	varh
6060	6160	RO	kWh Net	INT64	wh
6064	6164	RO	kvarh Net	INT64	varh

Table 5-20 Real-Time IER & AER

5.9 Real-Time 2kHz – 150kHz C.E.

Register	Property	Description	Format	Unit
6200	RO	Timestamp/Second (UNIX)	UINT32	s
6202	RO	Timestamp/Millisecond (UNIX)	UINT32	ms
6204	RO	Ua 2.1kHz	Float	V
6206	RO	Ub 2.1kHz	Float	V
6208	RO	Uc 2.1kHz	Float	V
6210	RO	Ua 2.3kHz	Float	V
6212	RO	Ub 2.3kHz	Float	V
6214	RO	Uc 2.3kHz	Float	V
6216	RO	Ua 2.5kHz	Float	V
6218	RO	Ub 2.5kHz	Float	V
6220	RO	Uc 2.5kHz	Float	V
6220~6406	RO	...	Float	V
6408	RO	Ua 8.9kHz	Float	V
6410	RO	Ub 8.9kHz	Float	V
6412	RO	Uc 8.9kHz	Float	V

6414	RO	Ua 10kHz	Float	V
6416	RO	Ub 10kHz	Float	V
6418	RO	Uc 10kHz	Float	V
6420	RO	Ua 12kHz	Float	V
6422	RO	Ub 12kHz	Float	V
6424	RO	Uc 12kHz	Float	V
6426	RO	Ua 14kHz	Float	V
6428	RO	Ub 14kHz	Float	V
6430	RO	Uc 14kHz	Float	V
6432~6832	RO	…	Float	V
6834	RO	Ua 150kHz	Float	V
6836	RO	Ub 150kHz	Float	V
6838	RO	Uc 150kHz	Float	V

Table 5-21 Real-Time 2kHz – 150kHz C.E.

5.10 Data Logging

5.10.1 SOE Log Buffer

The iMeter D7 can store up to 1024 entries SOE Logs. Writing N to the **SOE Log Index** register will update the #N to #N+9 SOE Log Buffer with SOE Log Events. For example, if the **SOE Log Pointer (Register 0137)** = 2000, writing 1991 to register 10000 will update the log buffer with the latest 9 logs and writing 977 will load the oldest 9 logs.

Register	Property	Description	Format
10000	RW	SOE Log Index N	UINT32
10002~10037	RO	Event #N	See Table 5-23
10038~10073	RO	Event #N+1	
…	RO	…	
10326~10361	RO	Event #N+9	

Table 5-22 SOE Log Buffer

Offset	Property	Description	Format	Unit
+0	RO	High-order Byte: Event Classification	UINT16	-
	RO	Low-order Byte: Sub-Classification		
+1	RO	Record Time: Year	UINT16	0-99 (Year-2000)
	RO	Record Time: Month		1 to 12
+2	RO	Record Time: Day	UINT16	1 to 31
	RO	Record Time: Hour		0 to 23
+3	RO	Record Time: Minute	UINT16	0 to 59
	RO	Record Time: Second		0 to 59
+4	RO	Record Time: Millisecond	UINT16	0 to 999
+5	RO	Reserved	--	--
+6 to +35	RO	Event Values	See Appendix B	-

Table 5-23 SOE Log Data Structure

5.10.2 PQ Log Buffer

The iMeter D7 can store up to 1024 entries PQ Logs. Writing N to the **PQ Log Index** register will update the #N to #N+9 PQ Log Buffer with PQ Log Events. For example, if the **PQ Log Pointer (Register 0139)** = 2000, writing 1991 to register 10500 will update the log buffer with the latest 9 logs and writing 977 will load the oldest 9 logs.

Register	Property	Description	Format
10500	RW	PQ Log Index N	UINT32
10502~10537	RO	Event #N	See Table 5-25
10538~10573	RO	Event #N+1	
…		…	
10826~10861	RO	Event #N+9	

Table 5-24 PQ Log Buffer

Offset	Property	Description	Format	Unit
+0	RO	High-order Byte: Event Classification	UINT16	-
	RO	Low-order Byte: Sub-Classification		
+1	RO	Record Time: Year	UINT16	0-99 (Year-2000)
	RO	Record Time: Month		1 to 12
+2	RO	Record Time: Day	UINT16	1 to 31
	RO	Record Time: Hour		0 to 23
+3	RO	Record Time: Minute	UINT16	0 to 59
	RO	Record Time: Second		0 to 59
+4	RO	Record Time: Millisecond	UINT16	0 to 999

+5	RO	Reserved	--	--
+6 to +35	RO	Event Values	See Appendix C	--

Table 5-25 PQ Log Data Structure

5.10.3 SDR Log

5.10.3.1 SDR Log Buffer

Register	Description	Format
11000~11518	SDR Log #1 Buffer	See **Table 5-27 SDR Log Buffer Structure**
11600~12118	SDR Log #2 Buffer	
12200~12718	SDR Log #3 Buffer	
12800~13318	SDR Log #4 Buffer	
13400~13918	SDR Log #5 Buffer	
14000~14518	SDR Log #6 Buffer	
14600~15118	SDR Log #7 Buffer	
15200~15718	SDR Log #8 Buffer	

Table 5-26 SDR Log Buffer

5.10.3.2 SDR Log Buffer Structure

The iMeter D7 provides 8 groups of SDR with each recording depth of 43200. Writing N to the **SDR #X Log Index** register will update the #N to #N+63 Data Item of SDR #X Log Buffer. For example, if the **SDR #1 Log Pointer (Register 0159)** =50000 (providing the recording mode = First-In-First-Out), writing 49938 to register 11000 will load the latest 63 Data Items and writing 6800 will load the oldest 63 Data Item to the SDR #1 Log Buffer.

Offset	Property	Description	Format	Note
+0	RW	SDR #X Index N (1≤X≤8)	UINT32	--
+2~+4	RO	End Time of the Record[2]	Bitmap	--
+5	RO	Flagging Data Status	UINT16	0 = Not Flagged 1 = Flagged & Removed 2 = Flagged & Kept
+6~+13	RO	Data Item #N	Float	See **Table 5-29 SDR Data Item Structure**
+14~+22	RO	Data Item #N+1		
…		…		
+510~+517	RO	Data Item #N+63		

Table 5-27 SDR Log Buffer Structure

Notes:

1. The data items can be configured as any real-time data. Please see refer to **Section 5.12.7**
2. The following table illustrates the structure for the end time of the SDR Log.

Offset	Property	Description	Format	Unit
+0	RO	Year	UINT16	0-99 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day	UINT16	1 to 31
	RO	Hour		0 to 23
+2	RO	Minute	UINT16	0 to 59
	RO	Second		0 to 59

Table 5-28 Time Structure

3. SDR Data Structure

Offset	Property	Description
+0	RO	Maximum
+2	RO	Minimum
+4	RO	Average
+6	RO	CP95

Table 5-29 SDR Data Item Structure

5.10.4 MM Log (Max/Min Log)

5.10.4.1 MM Log Buffer

Register	Description	Format
22200-22306	Max. Log #1 Buffer	See **Table 5-31 MM Log Buffer Structure**
22350~22456	Max. Log #2 Buffer	
22500~22606	Max. Log #3 Buffer	
22650~22756	Max. Log #4 Buffer	
22800~22906	Min. Log #1 Buffer	
22950~23056	Min. Log #2 Buffer	
23100~23206	Min. Log #3 Buffer	
23250~23356	Min. Log #4 Buffer	

Table 5-30 MM Log Buffer

5.10.4.2 MM Log Buffer Structure

Offset	Property	Description	Format	Range/Options
+0	RW	Max./Min. #X Log Index N (1≤X≤4)	UINT32	0 = Since Last Reset/This Month 1 = Before Last Reset/Last Month
+2	RO	Recording Time[2]	Bitmap	--
+5	RO	Flagging Data Status	UINT16	0 = No Flag 1 = Flagged & Removed 2 = Flagged & Kept
+6~+10	RO	Data Item #1	Bitmap	See Table 5-34
+11~+15	RO	Data Item #2		
…		…		
+101~+105	RO	Data Item #20		

Table 5-31 MM Log Buffer Structure

Notes:

1. The data items can be configured as any real-time data. Please see **Appendix A**.
2. Please refer to Table 5-32 for the Recording Time data structure. Please note that the Recording Time means the Start Time of a Max. Recorder while the End Time of a Min. Recorder.

Offset	Property	Description	Format	Unit
+0	RO	Year	UINT16	0-99 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day	UINT16	1 to 31
	RO	Hour		0 to 23
+2	RO	Minute	UINT16	0 to 59
	RO	Second		0 to 59

Table 5-32 Time Structure

3. The following table illustrates the data structure of the MM Log.

Offset	Property	Description		
+0	RO	Timestamp	Hi	Year (-2000)
			Low	Month
+1	RO		Hi	Day
			Low	Hour
+2	RO		Hi	Minute
			Low	Second
+3~+4	RO	Max. or Min. Value (Float)		

Table 5-33 MM Data Structure

5.10.5 Pst/Plt Log

5.10.5.1 Pst Log Buffer

The iMeter D7 can store up to 56520 Pst Log based on a First-In-First-Out principle. Writing N to **Pst Log Index** register will update the #N to #N+9 log of the Log Buffer. For example, if the **Pst Log Pointer (Register 0239)** = 60000, writing 59990 to register 23400 will load the latest 9 log buffers and writing 3480 will load the oldest 9 log buffers.

Register	Property	Description	Format
23400	RW	Pst Log Index N	UINT32
23402~23411	RO	Log #N	See **Table 5-36 Pst/Plt Data Structure**
23412~23421	RO	Log #N+1	
…	RO	…	
23492~23501	RO	Log #N+9	

Table 5-34 Pst Log Buffer

5.10.5.2 Plt Log Buffer

The iMeter D7 can store up to 4380 Plt Log based on a First-In-First-Out principle. Writing N to Plt Log Index register will update the #N to #N+9 log of the Log Buffer. For example, if the Plt Log Pointer (Register 0241) = 5000, writing 4990 to register 23600 will load the latest 9 log buffers and writing 620 will load the oldest 9 log buffers.

Register	Property	Description	Format
23600	RW	Plt Log Index N	UINT32
23602~23611	RO	Log #N	See **Table 5-36 Pst/Plt Data Structure**
23612~23621	RO	Log #N+1	
…	RO	…	
23692~23701	RO	Log #N+9	

Table 5-35 Plt Log Buffer

5.10.5.3 Pst/Plt Data Structure

Offset	Property	Description		Format	Unit
+0	RO	Record Time	Hi-Year (-2000)	Bitmap	
			Low- Month		
+1	RO		Hi- Day		
			Low- Hour		
+2	RO		Hi- Minute		
			Low- Second		
+3	RO	Flagging Status[1]		UINT16	
+4	RO	Ua Pst/Plt		Float	V
+6	RO	Ub Pst/Plt		Float	V
+8	RO	Uc Pst/Plt		Float	V

Table 5-36 Pst/Plt Data Structure

Note:

1. The Flagging Status register indicates whether this Pst/Plt log is flagged due to Dip (Bit0), Swell (Bit1), or Interruption (Bit2), with a bit value of "1" meaning Flagged while "0" meaning not flagged.

5.10.6 IER & AER Log

The iMeter D7 can store up to 65535 IER and AER Logs independently. Writing N to the **IER / AER Log Index** will update the #N to #N+1 Log Buffer. For example, if the **IER Log Pointer (Register 0245)** = 65530, writing 65529 to register 23800 to update the log buffer with the latest 2 logs and writing 1 to load the oldest 2 logs.

5.10.6.1 IER / AER Log Buffer

Register		Property	Description	Format
IER	AER			
23800	24000	RW	IER / AER Log Index N	UINT32
23802~23875	24002~24075	RO	Log #N	See **Table 5-38**
23876~23949	24076~24149	RO	Log #N+1	
23950	24150	RO	Reserved	

Table 5-37 IER Log Buffer

5.10.6.2 IER / AER Data Structure

Offset	Property	Description	Format	Note/Unit
+0~+2	RO	Start Time	UINT32	See **Table 5-39**
+3~+5	RO	End Time	UINT32	
+6~+9	RO	kWh Imp.	Int64	kWh
+10~+13	RO	kWh Exp.	Int64	kWh
+14~+17	RO	kWh Total	Int64	kWh
+18~+21	RO	kvarh Imp.	Int64	kvarh
+22~+25	RO	kvarh Exp.	Int64	kvarh
+26~+29	RO	kvarh Total	Int64	kvarh
+30~+33	RO	kVAh Total	Int64	kVAh
+34~+37	RO	kWh Imp. Fund.	Int64	kWh

+38~+41	RO	kWh Exp. Fund.	Int64	kWh
+42~+45	RO	kvarh Imp. Fund.	Int64	kvarh
+46~+49	RO	kvarh Exp. Fund.	Int64	kvarh
+50~+53	RO	kWh Imp. TH	Int64	kWh
+54~+57	RO	kWh Exp. TH	Int64	kWh
+58~+61	RO	kvarh Imp. TH	Int64	kvarh
+62~+65	RO	kvarh Exp. TH	Int64	kvarh
+66~+69	RO	kWh Net	Int64	kWh
+70~+73	RO	kvarh Net	Int64	kvarh

Table 5-38 IER / AER Data Structure

Note:

1. The following table illustrates the Data Structure of the Start/End Time.

Offset	Property	Description	Format	Unit
+0	RO	Year	UINT16	0-99 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day	UINT16	1 to 31
	RO	Hour		0 to 23
+2	RO	Minute	UINT16	0 to 59
	RO	Second		0 to 59

Table 5-39 Time Structure

5.10.7 EN50160 Log

The iMeter D7 can store up to 52 entries EN50160 Log for a year. Retrieve the newest 52 entries EN50160 logs through writing entry number which you can get from **EN50160 Report Pointer** (Register 0247) into **EN50160 Log Index X** (Register 24200). For example, if the value for **EN50160 Report Pointer** is 100, then you can write 100 to 49 into **24200** register where 100 means the newest logs and 49 means the oldest logs.

Register	Property	Description	Format	Note
24200	RW	EN50160 Log Index X	UINT32	
24202	RO	Start Time	Bitmap	See **Table 5-28**
24205	RO	End Time	Bitmap	
24208	RO	Flagging Data Status	UINT32	0=Not Flagged, 1=Flagged & Kept 2=Flagged & Removed
24210	RO	Freq. Evaluation Result	UINT32	0=Pass, 1=Failed
24212	RO	Freq N Valid	UINT32	Number of valid intervals
24214	RO	Freq N Invalid	UINT32	Number of invalid intervals
24216	RO	Freq Wide Limit Result	UINT32	0=Pass, 1=Failed
24218	RO	Freq N2	UINT32	Number of valid intervals in which the Freq. deviates from the nominal by more than user defined wide limit
24220	RO	Freq (1 - N2/N)	Float	--
24222	RO	Freq Narrow Limit Result	UINT32	0=Pass, 1=Failed
24224	RO	Freq N1	UINT32	Number of valid intervals in which the freq. deviates from the nominal by more than user defined narrow limit
24226	RO	Freq (1 - N1/N)	Float	--
24228	RO	Freq Max-op	Float	Hz, maximum mean Frequency (Freq mean-ep) over 1week
24230	RO	Freq Min-op	Float	Hz, minimum mean Frequency (Freq mean-ep) over 1week
24232	RO	U Magnitude Conclusion	UINT32	0=Pass, 1=Failed
24234	RO	U Mag N Valid	UINT32	Number of valid intervals
24236	RO	U Mag Invalid N	UINT32	Number of invalid intervals
24238	RO	U Mag Wide Conclusion	UINT32	0=Pass, 1=Failed
24240	RO	Ua Mag N2	UINT32	Number of valid intervals in which the voltage on 3-phase deviates from nominal by more than user defined wide limit
24242	RO	Ub Mag N2	UINT32	
24244	RO	Uc Mag N2	UINT32	
24246	RO	Ua Mag (1 - N2/N)	Float	--
24248	RO	Ub Mag (1 - N2/N)	Float	--
24250	RO	Uc Mag (1 - N2/N)	Float	--
24252	RO	U Mag Narrow Conclusion	UINT32	0=Pass, 1=Failed
24254	RO	Ua Mag N1	UINT32	Number of valid intervals in which the voltage on 3-phase deviates from nominal by more than user defined narrow limit
24256	RO	Ub Mag N1	UINT32	
24258	RO	Uc Mag N1	UINT32	
24260	RO	Ua Mag (1 - N1/N)	Float	--

24262	RO	Ub Mag (1 - N1/N)	Float	--
24264	RO	Uc Mag (1 - N1/N)	Float	--
24266	RO	Ua mean Max.	Float	Max. of average voltage Ua/Ub/Uc over 1 week
24268	RO	Ub mean Max.	Float	
24270	RO	Uc mean Max.	Float	
24272	RO	Ua mean Min.	Float	Min. of average voltage Ua/Ub/Uc over 1 week
24274	RO	Ub mean Min.	Float	
24276	RO	Uc mean Min.	Float	
24278	RO	Flicker Evaluation Conclusion	UINT32	0=Pass, 1=Failed
24280	RO	Plt N Valid	UINT32	Number of valid intervals
24282	RO	Plt N invalid	UINT32	Number of invalid intervals
24284	RO	Ua Plt N1	UINT32	Number of valid intervals in which Plt on 3-phase is greater than 1
24286	RO	Ub Plt N1	UINT32	
24288	RO	Uc Plt N1	UINT32	
24290	RO	Ua (1 - N1/N)	Float	--
24292	RO	Ub (1 - N1/N)	Float	--
24294	RO	Uc (1 - N1/N)	Float	--
24296	RO	Ua Plt Max.	Float	Maximum Plt for 3-phase over 1 week
24298	RO	Ub Plt Max.	Float	
24300	RO	Uc Plt Max.	Float	
24302	RO	Ua Plt Min.	Float	Minimum Plt for 3-phase over 1 week
24304	RO	Ub Plt Min.	Float	
24306	RO	Uc Plt Min.	Float	
24308	RO	Ua Plt CP95	Float	CP95 of Plt for 3-phase over 1 week
24300	RO	Ub Plt CP95	Float	
24312	RO	Uc Plt CP95	Float	
24314	RO	U Unbalance Conclusion	UINT32	0=Pass, 1=Failed
24316	RO	U Unbalance N valid	UINT32	Number of valid intervals
24318	RO	U Unbalance N invalid	UINT32	Number of invalid intervals
24320	RO	U Unbalance N1	UINT32	Number of valid intervals in which the voltage unbalance exceeds user defined unbalance limit value
24322	RO	U Unbalance (1 - N1/N)	Float	--
24324	RO	U Unbalance Max.	Float	Maximum/Minimum/CP95 voltage unbalance value over 1 week
24326	RO	U Unbalance Min.	Float	
24328	RO	U Unbalance CP95	Float	
24330	RO	Harmonic Conclusion	UINT32	0=Pass, 1=Failed
24332	RO	Harmonic N Valid	UINT32	Number of valid intervals
24334	RO	Harmonic N Invalid	UINT32	Number of invalid intervals
24336	RO	THD Conclusion	UINT32	0=Pass, 1=Failed
24338	RO	Ua THD N1	UINT32	Number of intervals in which the THD on 3-phase exceed user defined limits
24340	RO	Ub THD N1	UINT32	
24342	RO	Uc THD N1	UINT32	
24344	RO	Ua THD (1 - N1/N)	Float	--
24346	RO	Ub THD (1 - N1/N)	Float	--
24348	RO	Uc THD (1 - N1/N)	Float	--
24350~24376	--	Reserved	--	--
24378	RO	H02 Harm Conclusion	UINT32	0=Pass, 1=Failed
24380	RO	Ua H02 N1	UINT32	Number of intervals in which the 2nd Harmonics on 3-phase exceed user defined limits
24382	RO	Ub H02 N1	UINT32	
24384	RO	Uc H02 N1	UINT32	
24386	RO	Ua H02 (1 - N1/N)	Float	--
24388	RO	Ub H02 (1 - N1/N)	Float	--
24400	RO	Uc H02 (1 - N1/N)	Float	--
.....	RO	.....	UINT32	.....
24700	RO	H25 Conclusion	UINT32	0=Pass, 1=Failed
24702	RO	Ua H25 N1	UINT32	Number of intervals in which the 25th Harmonics on 3-phase exceed user defined limits
24704	RO	Ub H25 N1	UINT32	
24706	RO	Uc H25 N1	UINT32	
24708	RO	Ua H25 (1 - N1/N)	Float	--
24710	RO	Ub H25 (1 - N1/N)	Float	--
24712	RO	Uc H25 (1 - N1/N)	Float	--
24714	RO	Ua THD Max.	Float	Max. THD on 3-phase over 1 week
24716	RO	Ub THD Max.	Float	
24718	RO	Uc THD Max.	Float	
24720	RO	Ua THD Min.	Float	Min. THD on 3-phase over 1 week

24722	RO	Ub THD Min.	Float	
24724	RO	Uc THD Min.	Float	
24726	RO	Ua THD CP95	Float	CP95 average THD on 3-phase over 1 week
24728	RO	Ub THD CP95	Float	
24730	RO	Uc THD CP95	Float	
24732	RO	Ua THD Avg	Float	Average THD on 3-phase over 1 week
24734	RO	Ub THD Avg	Float	
24736	RO	Uc THD Avg	Float	
24738~24748	--	Reserved	--	--
24750	RO	Ua H02 Max.	Float	Maximum 2nd harmonics on 3-phase over 1 week
24752	RO	Ub H02 Max.	Float	
24754	RO	Uc H02 Max.	Float	
24756~24886	RO	……	Float	……
24888	RO	Ua H25 Max.	Float	Maximum 25th harmonics on 3-phase over 1 week
24890	RO	Ub H25 Max.	Float	
24892	RO	Uc H25 Max.	Float	
24894~24904	--	Reserved	--	--
24906	RO	Ua H02 Min.	Float	Minimum 2nd harmonics on 3-phase over 1 week
24908	RO	Ub H02 Min.	Float	
24910	RO	Uc H02 Min.	Float	
24912~25042	RO	……	Float	……
25044	RO	Ua H25 Min.	Float	Minimum 25th harmonics on 3-phase over 1 week
25046	RO	Ub H25 Min.	Float	
25048	RO	Uc H25 Min.	Float	
25050~25060	--	Reserved	--	--
25062	RO	Ua H02 CP95	Float	CP95 2nd harmonics on 3-phase over 1 week
25064	RO	Ub H02 CP95	Float	
25066	RO	Uc H02 CP95	Float	
25068~25198	RO	……	Float	……
25200	RO	Ua H25 CP95	Float	CP95 25th harmonics on 3-phase over 1 week
25202	RO	Ub H25 CP95	Float	
25204	RO	Uc H25 CP95	Float	
25206~25216	--	Reserved	--	--
25218	RO	Ua H02 Avg	Float	Average 2nd harmonics on 3-phase over 1 week
25220	RO	Uc H02 Avg	Float	
25222	RO	Uc H02 Avg	Float	
25224~25354	RO	……	Float	……
25356	RO	Ua H25 Avg	Float	Average 25th harmonics on 3-phase over 1 week
25358	RO	Uc H25 Avg	Float	
25360	RO	Uc H25 Avg	Float	
25362	RO	Interharmonics N Valid	UINT32	Number of valid intervals
25364	RO	Interharmonics N Invalid	UINT32	Number of invalid intervals
25366	RO	Ua TIHD Max.	Float	Maximum TIHD on 3-phase over 1 week
25368	RO	Ub TIHD Max.	Float	
25370	RO	Uc TIHD Max.	Float	
25372	RO	Ua TIHD Min.	Float	Minimum TIHD on 3-phase over 1 week
25374	RO	Ub TIHD Min.	Float	
25376	RO	Uc TIHD Min.	Float	
25378	RO	Ua TIHD CP95	Float	CP95 of TIHD on 3-phase over 1 week
25380	RO	Ub TIHD CP95	Float	
25382	RO	Uc TIHD CP95	Float	
25384	RO	Ua TIHD Avg	Float	Average TIHD on 3-phase over 1 week
25386	RO	Ub TIHD Avg	Float	
25388	RO	Uc TIHD Avg	Float	
25390~25394	--	Reserved	--	--
25396	RO	Ua IH01 Max.	Float	Maximum 1st Interharmonics on 3-phase over 1 week
25398	RO	Ub IH01 Max.	Float	
25400	RO	Uc IH01 Max.	Float	
25402~25538	RO	……	Float	……
25540	RO	Ua IH25 Max.	Float	Maximum 25th Interharmonics on 3-phase over 1 week
25542	RO	Ub IH25 Max.	Float	
25544	RO	Uc IH25 Max.	Float	
25546~25550	RO	Reserved	Float	--
25552	RO	Ua IH01 Min.	Float	Minimum 1st Interharmonics on 3-phase over 1 week
25554	RO	Ub IH01 Min.	Float	
25556	RO	Uc IH01 Min.	Float	
	RO	……	Float	……

25696	RO	Ua IH25 Min.	Float	Minimum 25th Interharmonics on 3-phase over 1 week
25698	RO	Ub IH25 Min.	Float	
25700	RO	Uc IH25 Min.	Float	
25702~25706	RO	Reserved	Float	--
25708	RO	Ua IH01 CP95	Float	CP95 1st Interharmonics on 3-phase over 1 week
25710	RO	Ub IH01 CP95	Float	
25712	RO	Uc IH01 CP95	Float	
	RO	.....	Float	.....
25852	RO	Ua IH25 CP95	Float	CP95 25th Interharmonics on 3-phase over 1 week
25854	RO	Ub IH25 CP95	Float	
25856	RO	Uc IH25 CP95	Float	
25858~25862	--	Reserved	--	--
25864	RO	Ua IH01 Avg	Float	Average 1st Interharmonics on 3-phase over 1 week
25866	RO	Ub IH01 Avg	Float	
25868	RO	Uc IH01 Avg	Float	
25870~26006	RO	.....	Float	.....
26008	RO	Ua IH25 Avg	Float	Average 25th Interharmonics on 3-phase over 1 week
26010	RO	Ub IH25 Avg	Float	
26012	RO	Uc IH25 Avg	Float	
26014	RO	MSV Conclusion	UINT32	0=Pass, 1=Failed
26016	RO	MSV N Valid	UINT32	Number of valid intervals
26018	RO	MSV N Invalid	UINT32	Number of invalid intervals
26020	RO	MSV1 Conclusion	UINT32	0=Pass, 1=Failed
26022	RO	Ua MSV1 N1	UINT32	# of valid intervals in which the signaling voltage of Freq. #1 on 3-phase exceeds user-defined limit
26024	RO	Ub MSV1 N1	UINT32	
26026	RO	Uc MSV1 N1	UINT32	
26028	RO	Ua MSV1 (1 - N1/N)	Float	--
26030	RO	Ub MSV1 (1 - N1/N)	Float	--
26032	RO	Uc MSV1 (1 - N1/N)	Float	--
26034~26046	RO	.....	.....	.....
26048	RO	MSV3 Conclusion	UINT32	0=Pass, 1=Failed
26050	RO	Ua MSV3 N1	UINT32	# of valid intervals in which the signaling voltage of Freq. #3 on 3-phase exceeds user-defined limit
26052	RO	Ub MSV3 N1	UINT32	
26054	RO	Uc MSV3 N1	UINT32	
26056	RO	Ua MSV3 (1 - N1/N)	Float	--
26058	RO	Ub MSV3 (1 - N1/N)	Float	--
26060	RO	Uc MSV3 (1 - N1/N)	Float	--
26062	RO	Ua MSV1 Max.	Float	Maximum Mains Signaling value of Freq. #1 on 3-phase over 1 week
26064	RO	Ub MSV1 Max.	Float	
26066	RO	Uc MSV1 Max.	Float	
26068	RO	Ua MSV2 Max.	Float	Maximum Mains Signaling value of Freq. #2 on 3-phase over 1 week
26070	RO	Ub MSV2 Max.	Float	
26072	RO	Uc MSV2 Max.	Float	
26074	RO	Ua MSV3 Max.	Float	Maximum Mains Signaling value of Freq. #3 on 3-phase over 1 week
26076	RO	Ub MSV3 Max.	Float	
26078	RO	Uc MSV3 Max.	Float	
26080	RO	Ua MSV1 Min.	Float	Minimum Mains Signaling value of Freq. #1 on 3-phase over 1 week
26082	RO	Ub MSV1 Min.	Float	
26084	RO	Uc MSV1 Min.	Float	
26086	RO	Ua MSV2 Min.	Float	Minimum Mains Signaling value of Freq. #2 on 3-phase over 1 week
26088	RO	Ub MSV2 Min.	Float	
26090	RO	Uc MSV2 Min.	Float	
26092	RO	Ua MSV3 Min.	Float	Minimum Mains Signaling value of Freq. #3 on 3-phase over 1 week
26094	RO	Ub MSV3 Min.	Float	
26096	RO	Uc MSV3 Min.	Float	
26098	RO	Ua MSV1 CP95	Float	CP95 Mains Signaling value of Freq. #1 on 3-phase over 1 week
26100	RO	Ub MSV1 CP95	Float	
26102	RO	Uc MSV1 CP95	Float	
26104	RO	Ua MSV2 CP95	Float	CP95 Mains Signaling value of Freq. #2 on 3-phase over 1 week
26106	RO	Ub MSV2 CP95	Float	
26108	RO	Uc MSV2 CP95	Float	
26110	RO	Ua MSV3 CP95	Float	CP95 Mains Signaling value of Freq. #3 on 3-phase over 1 week
26112	RO	Ub MSV3 CP95	Float	
26114	RO	Uc MSV3 CP95	Float	
26116	RO	Ua RVC N1	UINT32	RVC counter occurs on 3-phase within a week
26118	RO	Ub RVC N1	UINT32	
26120	RO	Uc RVC N1	UINT32	

26122	--	Reserved	--	--
26124	--	Reserved	--	--
26126	RO	Swell N11	UINT32	See Note 1)
26128	RO	Swell N21	UINT32	
26130	RO	Swell N31	UINT32	
26132	RO	Swell N41	UINT32	
26134	RO	Swell N12	UINT32	
26136	RO	Swell N22	UINT32	
26138	RO	Swell N32	UINT32	
26140	RO	Swell N42	UINT32	
26142	RO	Swell N13	UINT32	
26144	RO	Swell N23	UINT32	
26146	RO	Swell N33	UINT32	
26148	RO	Swell N43	UINT32	
26150	RO	Swell N14	UINT32	
26152	RO	Swell N24	UINT32	
26154	RO	Swell N34	UINT32	
26156	RO	Swell N44	UINT32	
26158	RO	Swell N15	UINT32	
26160	RO	Swell N25	UINT32	
26162	RO	Swell N35	UINT32	
26164	RO	Swell N45	UINT32	
26166	RO	Dip N11	UINT32	
26168	RO	Dip N21	UINT32	
26170	RO	Dip N31	UINT32	
26172	RO	Dip N41	UINT32	
26174	RO	Dip N51	UINT32	
26176	RO	Dip N61	UINT32	
26178	RO	Dip N12	UINT32	
26180	RO	Dip N22	UINT32	
26182	RO	Dip N32	UINT32	
26184	RO	Dip N42	UINT32	
26186	RO	Dip N52	UINT32	
26188	RO	Dip N62	UINT32	
26190	RO	Dip N13	UINT32	
26192	RO	Dip N23	UINT32	
26194	RO	Dip N33	UINT32	
26196	RO	Dip N43	UINT32	
26198	RO	Dip N53	UINT32	
26200	RO	Dip N63	UINT32	
26202	RO	Dip N14	UINT32	
26204	RO	Dip N24	UINT32	
26206	RO	Dip N34	UINT32	
26208	RO	Dip N44	UINT32	
26210	RO	Dip N54	UINT32	
26212	RO	Dip N64	UINT32	
26214	RO	Dip N15	UINT32	
26216	RO	Dip N25	UINT32	
26218	RO	Dip N35	UINT32	
26220	RO	Dip N45	UINT32	
26222	RO	Dip N55	UINT32	
26224	RO	Dip N65	UINT32	
26226	RO	Interruptions N11	UINT32	
26228	RO	Interruption N21	UINT32	
26230	RO	Interruption N31	UINT32	
26232	RO	Ua Transient N1	UINT32	Transients occur on 3-Phase over 1 week
26234	RO	Ub Transient N1	UINT32	
26236	RO	Uc Transient N1	UINT32	

Table 5-40 EN50160 Log

Note:

1) Nxx have following definitions:

Swell (t indicates Duration, while u indicates Residual Voltage)				
Counter	10ms≤ *t*≤500ms	500ms < t ≤5000ms	5000ms < t ≤60000ms	t>60000ms
110%<u<120%	N11	N21	N31	N41
120%≤u<140%	N12	N22	N32	N42
140%≤u<160%	N13	N23	N33	N43

160%≤u<200%	N14	N24	N34	N44
u≥200%	N15	N25	N35	N45

Table 5-41 Swell Counter Definition

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

Table 5-42 Dip Counter Definition

Interruption (t indicates Duration, while u indicates Residual Voltage)			
Counter	t <= 1s	t <= 180000ms	t > 180000ms
	N11	N21	N31

Table 5-43 Interruption Counter Definition

5.10.8 TOU Log

5.10.8.1 Present TOU Status

Register	Property	Description	Format	Note/Range
36000	RO	Present Tariff Schedule	UINT16	0~7: T1~T8
36001	RO	Present Season Schedule	UINT16	0~11: Season1~12
36002	RO	Present Period of Daily Profile	UINT16	0~11: Period 1~12
36003	RO	Present Daily Profile Index	UINT16	0~19: Daily Profile Index 1~20
36004	RO	Present Weekday Type	UINT16	0 = Weekday 1, 1 = Weekday 2 2 = Weekday 3, 3 = Alternate Day
36005	RO	Present TOU Schedule	UINT16	0~1
36006	RO	TOU Log Pointer	UINT32	

Table 5-44 TOU Real-time Status

5.10.8.2 Real-Time TOU Log

Register	Description	Format
36100~36139	Tariff #1 Data	**See 5.10.8.5**
36140~36179	Tariff #2 Data	
36180~36219	Tariff #3 Data	
36220~36259	Tariff #4 Data	
36260~36299	Tariff #5 Data	
36300~36339	Tariff #6 Data	
36340~36379	Tariff #7 Data	
36380~36419	Tariff #8 Data	

Table 5-45 TOU Real-time Log

5.10.8.3 TOU Historical Log

The iMeter D7 can store up to 12 months of TOU Historical Log. Retrieve the newest 12 entries TOU logs through writing entry number which you can get from **Historical TOU Data Record Pointer** (Register 0251) into **Log Index X** (Register 36500). For example, if the value for **Historical TOU Data Record Pointer** is 100, then you can write 100 to 89 into **36500** register where 100 means the newest logs and 89 means the oldest logs.

Register	Property	Description	Format
36500	RW	Log Index N	UINT32
36502	RO	Record Time	See Table 5-49
36505	RO	Period PF Avg. (Avg. PF over the Period)	Float
36507~36546	RO	Tariff #1 Data	**See 5.10.8.5**
36547~36586	RO	Tariff #2 Data	
36587~36626	RO	Tariff #3 Data	
36627~36666	RO	Tariff #4 Data	
36667~36706	RO	Tariff #5 Data	
36707~36746	RO	Tariff #6 Data	
36747~36786	RO	Tariff #7 Data	
36787~36826	RO	Tariff #8 Data	

Table 5-46 TOU Historical Log

5.10.8.4 TOU Freeze Record

Register	Property	Description	Format
36900	RO	Record Time	See Table 5-49
36903~36942	RO	Tariff #1 Data	**See 5.10.8.5**
36943~36982	RO	Tariff #2 Data	
36983~37022	RO	Tariff #3 Data	
37023~37062	RO	Tariff #4 Data	
37063~37102	RO	Tariff #5 Data	
37103~37142	RO	Tariff #6 Data	
37143~37182	RO	Tariff #7 Data	
37183~37223	RO	Tariff #8 Data	

Table 5-47 TOU Freeze Record

5.10.8.5 TOU Data Structure

Offset	Property	Description	Format
0	RW	kWh Imp.	INT64
4	RW	kWh Exp.	INT64
8	RW	kvarh Imp.	INT64
12	RW	kvarh Exp.	INT64
16	RW	kVAh	INT64
20	RW	kW Imp. Max. Demand	Float
22	RW	kW Imp. Max. Demand Timestamp[1]	Bitmap
25	RW	kW Exp. Max. Demand	Float
27	RW	kW Exp. Max. Demand Timestamp[1]	Bitmap
30	RW	kvar Imp. Max. Demand	Float
32	RO	kvar Imp. Max. Demand Timestamp[1]	Bitmap
35	RO	kvar Exp. Max. Demand	Float
37	RO	kvar Exp. Max. Demand Timestamp[1]	Bitmap

Table 5-48 TOU Log Data Structure

Notes:

1) The following table illustrates the register of timestamp:

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

Table 5-49 Timestamp Format

5.11 Device Setup

5.11.1 VPN Setup

Register	Property	Description	Format	Range/Default*
39000	RW	VPN Enable	UINT16	0=Disabled*, 1=Enabled
39001~39032	RW	IKE SA ID	CHAR	cetike* (less than 64 Characters)
39033~39040	RW	Remote Address	CHAR	x.x.x.x (less than 16 characters)
39041	RW	Listen Port	UINT16	0=4G (optional), 1=P1*, 2=P2
39042	RW	IKE Version	UINT16	0=V1*, 1=V2, 2=V1V2
39043	RW	IKE Exchange Mode	UINT16	0=Main, 1=Aggressive*
39044	RW	Authentication Method	UINT16	0=Preshared Key
39045~39076	RW	Preshared Key	CHAR	Less than 64 ASCII characters
39077	RW	ESP Mode	UINT16	0=Tunnel*, 1=Transport
39078	RW	IKE Diffie-Hellman Key Exchange	UINT16	0=Group1, 2=Group2*, 3=Group5
39079	RW	Hash Algorithm for IKE SA	UINT16	0=md5*, 1=sha-1
39080	RW	Encryption Algorithm for IKE SA	UINT16	0=3des*, 1=des, 2=aes128, 3=aes192, 4=aes256
39081	RW	ISAKMP SA Life Time	UINT32	60 to 86400 (s), 28800*
39083	RW	DPD Liveness	UINT32	60* to 86400 (s)
39085	RW	Passive Mode	UINT16	0=ON*, 1=OFF
39086	RW	Initial Contact	UINT16	0=ON, 1=OFF*
39087~39094	RW	Local Identity	CHAR	Less than 64 ASCII characters
39095~39102	RW	Remote Identity	CHAR	Less than 64 ASCII characters
39103~39134	RW	IPsec SA ID	CHAR	cetipsec*(less than 64 characters)
39135~39144	RW	Source Address	CHAR	x.x.x.x/xx (less than 20 characters)

39145~39154	RW	Destination Address	CHAR	x.x.x.x/xx (less than 20 characters)
39155	RW	Life Time	UINT32	60 to 86400 (s), 28800*
39157	RW	TFC	UINT16	0=ON*, 1=OFF
39158	RW	ESN	UINT16	0=ON*, 1=OFF
39159	RW	Diffie-Hellman Key Exchange	UINT16	0=Group1, 2=Group2*, 3=Group5
39160	RW	Security Protocol	UINT16	0=ESP*, 1=AH
39161	RW	ESP Encryption	UINT16	0=3des*, 1=des, 2=aes128, 3=aes192, 4=aes256
39162	RW	AH/ESP Hash Algorithm	UINT16	0=md5*, 1=sha-1

Table 5-50 VPN Setup Parameters

5.11.2 Comm. Setup

Register	Property	Description		Format	Range/Default*
40000	RW	RS-485 (P3)	Unit ID	UINT16	1 to 247, 100*
40001	RW		Baudrate[1]	UINT16	0 to 5, 3*
40002	RW		Parity	UINT16	0=None, 1=Odd, 2=Even*
40003	RW		Stop Bit	UINT16	1=1 Bit*, 2=2 Bits
40004	RW		Protocol	UINT16	0=Modbus*, 1=EtheGate, 2=Disable
40005	RW		EtherGate Port	UINT16	20000* to 60000
40006~40009	RW	--	Reserved	--	--
40010	RW	Static Route	IP Address	UINT32	0*
40012	RW		Subnet Mask	UINT32	0*
40014	RW		Gateway	UINT32	0*
40016	RW	Ethernet (P1)	IP1	UINT32	192.168.0.100*
40018	RW		Subnet Mask1	UINT32	255.255.255.0*
40020	RW		Default Gateway	UINT32	192.168.0.1*
40022	RW	--	Reserved	UINT32	--
40024	RW	Ethernet (P2)	IP2	UINT32	192.168.1.100*
40026	RW		Subnet Mask2	UINT32	255.255.255.0*
40028	--	Reserved		--	--
40030	RW	Ethernet Mode		UINT16	1=Switch, 2=Normal*
40032	RW	Access Control		UINT16	0=Disabled*, 1=Enabled
40033	RW	Access Control List IP1		UINT32	0*
40035	RW	Access Control List IP2		UINT32	0*
...	RW	...		UINT32	...
40063	RW	Access Control List IP16		UINT32	0*
40065	RW	SNTP Server IP		UINT32	0.0.0.0*
40067	RW	SNTP Interval		UINT32	1 to 1440 (mins), 60*
40068	RW	SNTP Broadcast		UINT16	0=Disabled, 1=Enabled*
40069	RW	Preferred DNS		UINT32	8.8.8.8*
40071	RW	Alternative DNS		UINT32	114.114.114.114*

Table 5-51 Communication Setup

Notes:

1. Baudrate options: 0=1200, 1=2400, 2=4800, 3=9600*, 4=19200, 5=38400

5.11.3 DI Setup

Register	Property	Description	Format	Range/Default*
40100	RW	DI1 Mode[1]	UINT16	0=Status Input*, 1=Pulse Counter, 2=DMD Sync, 3=Tariff Switch
40101	RW	DI1 Debounce	UINT16	1 to 9999 (ms), 20*
40102	RW	DI1 Pulse Weight	UINT32	1* to 1000000
40104	RW	DI1 Setpoint Type[2]	UINT16	0=Any*, 1=Positive, 2=Negative
40105	RW	DI1 Setpoint Trigger[3]	UINT32	0*
40107~40108	--	Reserved	--	--
...	RW	...		...
40127	RW	DI4 Mode[1]	UINT16	0= Status Input*, 1=Pulse Counter, 2=DMD Sync
40128	RW	DI4 Debounce	UINT16	1 to 9999 (ms), 20*
40129	RW	DI4 Pulse Weight	UINT32	1* to 1000000
40131	RW	DI4 Setpoint Type[2]	UINT16	0=Any *, 1=Positive, 2=Negative
40132	RW	DI4 Setpoint Trigger[3]	UINT32	0*

Table 5-52 DI Setup

Notes:

1. Only one **DI** should be programmed as the DMD Sync. Input. To use a different DI for Demand Sync., the existing **DI** must first be reset back to **Status Input** before programming the new **DI** for Demand Sync. Otherwise the configuration will be unsuccessful. Only DI1 to DI3 can be set as **Tariff Switch**.
2. The **DIx Setpoint Type** only affects which edge would trigger the Waveform Recorder if configured.
3. The table below illustrates the details of DIx's Setpoint Trigger, with a value of "1" meaning active and "0" meaning inactive.

Bit	Trigger	Bit	Trigger	Bit	Trigger	Bit	Trigger
B0	Alarm	B2	DO2	B27	DWR	B29	RMSR
B1	DO1	B3 to B26	Reserved	B28	WFR		

Table 5-53 DIx Trigger

5.11.4 DO Setup

Register	Property	Description	Format	Range, Default*
40300	RW	LOP Alarm Enable	UINT16	0=No, 1=Yes*
40301	RW	Arm Before Execute	UINT16	0=Disabled, 1=Enabled*
40302	RW	Alarm Pulse Width	UINT16	0 to 6000 (x0.1s), 0*
40303	RW	DO1 Pulse Width	UINT16	
40304	RW	DO2 Pulse Width	UINT16	

Table 5-54 DO Setup Parameters

5.11.5 4G Setup (Optional)

Register	Property	Description	Format	Range, Default*
40310	RW	4G Enable	UINT16	0=No, 1=Yes*
40311-40314	--	Reserved	--	--
40315-40324	RW	APN	CHAR	See Note 1 & 2
40325-40334	RW	APN Username	CHAR	See Note 2, user*
40335-40344	RW	APN Password	CHAR	See Note 2, password*
40345-40379	RW	ICMP Domain Name	CHAR	See Note 3, www.microsoft.com*
40380	RW	ICMP port	UINT16	1-65535, 80*

Table 5-55 4G Setup Parameters

Note:

1. The default APN is left blank. Please consult the Internet Service Provider to retrieve the correct APN settings.
2. The APN, APN Username and APN Password should not exceed 20 ASCII Characters.
3. The **4G ICMP Domain Name** should not exceed 70 ASCII Characters.

5.11.6 AI Setup (Optional)

Register	Property	Description	Format	Range/Default*
40400	RW	AI1 Type	UINT16	0=4-20mA*, 1=0-20mA
40401	RW	AI1 Zero Scale	INT32	-999,999 to +999,999, 400*
40403	RW	AI1 Full Scale	INT32	-999,999 to +999,999, 200*
40405	RW	AI2 Type	UINT16	0=4-20mA*, 1=0-20mA
40406	RW	AI2 Zero Scale	INT32	-999,999 to +999,999, 400*
40408	RW	AI2 Full Scale	INT32	-999,999 to +999,999, 200*

Table 5-56 AI Setup

5.11.7 Cloud Access Setup

Register	Property	Description	Format	Range/Default*
40430	RW	Cloud Access Enable	UINT16	0=No*, 1=Yes
40431	RW	Encryption	UINT16	0=No*, 1=Yes
40432	RW	Server IP	UINT16	0.0.0.0*
40434	RW	Server Port	UINT16	1~65535, 18085*
40435	RW	Upload Interval	UINT32	3~7200s, 10s*
40437	RW	Real-Time Measurement Upload Type	UINT32	See Table 5-58, 0*
40439	RW	Harmonics Upload Type	UINT32	See Table 5-59, 0*
40441	RW	Interharmonics Upload Type	UINT32	See Table 5-60, 0*
40443	RW	2-150kHz C.E. Upload Type	UINT32	See Note 4, 0*
40445	RW	Record Upload Type	UINT32	See Table 5-61

Table 5-57 Cloud Access Setup

Notes:

1. The following table illustrates the Real-Time Measurement Upload Type with a bit value of "1" meaning uploaded and "0" meaning not uploaded.

Bit	Type	Bit	Type	Bit	Type
B0	RMS	B5	Demand	B10	Max
B1	Fundamental	B6	TOU	B11	Min
B2	Energy	B7	I/O	B12	Power Quality

B3	Harmonic Energy	B8	Realtime Waveform		
B4	Individual Harmonic Energy	B9	This Max. Demand		

Table 5-58 Real-Time Measurement Upload Type

2. The following table illustrates the Harmonics Upload Type with a bit value of "1" meaning uploaded and "0" meaning not uploaded.

Bit	Type	Bit	Type	Bit	Type	Bit	Type	Bit	Type
B0	Ia HD	B5	Ia TH RMS	B10	Ua/Uab HD	B15	Ua/Uab TH RMS	B20	P Total TH
B1	Ib HD	B6	Ib TH RMS	B11	Ub/Ubc HD	B16	Ub/Ubc TH RMS	B21	Pa TH
B2	Ic HD	B7	Ic TH RMS	B12	Uc/Uca HD	B17	Uc/Uca TH RMS	B22	Pb TH
B3	I4 HD	B8	I4 TH RMS	B13	U4 HD	B18	U4 TH RMS	B23	Pc TH
B4	Reserved	B9	Reserved	B14	Reserved	B19	Reserved		

Table 5-59 Harmonic Upload Type

3. The following table illustrates the Interharmonic Upload Type with a bit value of "1" meaning uploaded and "0" meaning not uploaded.

Bit	Type	Bit	Type	Bit	Type	Bit	Type
B0	Ia IHD	B4	Ia TIH RMS	B8	Ua/Uab IHD	B12	Ua/Uab TIH RMS
B1	Ib IHD	B5	Ib TIH RMS	B9	Ub/Ubc IHD	B13	Ub/Ubc TIH RMS
B2	Ic IHD	B6	Ic TIH RMS	B10	Uc/Uca IHD	B14	Uc/Uca TIH RMS
B3	I4 IHD	B7	I4 TIH RMS	B11	U4 IHD	B15	U4 TIH RMS

Table 5-60 Interharmonic Upload Tpe

4. The B0 to B2 of "**2 – 150kHz C.E. Upload Type**" Register illustrates the upload states for Ua/Uab C.E. RMS, Ub/Ubc C.E. RMS and Uc/Uca C.E RMS, respectively with a bit value of "1" meaning uploaded and "0" meaning not uploaded.

5. The following table illustrates the Record Upload Type with a bit value of "1" meaning uploaded and "0" meaning not uploaded.

Bit	Type	Bit	Type	Bit	Type	Bit	Type
B0	Device Log	B5	AER	B10	Pst	B15	DWR
B1	SOE	B6	TOU Log	B11	Plt	B16	RMSR
B2	Reserved	B7	Last Max. Demand	B12	EN50160		
B3	SDR	B8	Last Max. Record	B13	2 – 150kHz C.E.		
B4	IER	B9	Last Min Record	B14	WFR		

Table 5-61 Record Upload Type

5.11.8 Algorithm Setup

Register	Property	Description	Format	Range/Default*
40530	RW	PF Convention[1]	UINT16	0=IEC*, 1=IEEE, 2=-IEEE
40531	RW	kVA Calculation[2]	UINT16	0=Vector*, 1=Scalar
40532	RW	HD Calculation	UINT16	0=% of Fund. *, 1=% of RMS, 2=% of Nom.
40533	RW	Harmonic Calculation Method	UINT16	0=Subgroup*, 1=Group
40534	RW	Order of Harmonic Calculation	UINT16	2 to 63*
40535	RW	Flicker Curve	UINT16	0=120V, 1=230V*

Table 5-62 Algorithm Setup

Notes:

1. PF Convention: -IEEE is the same as IEEE but with the opposite sign.

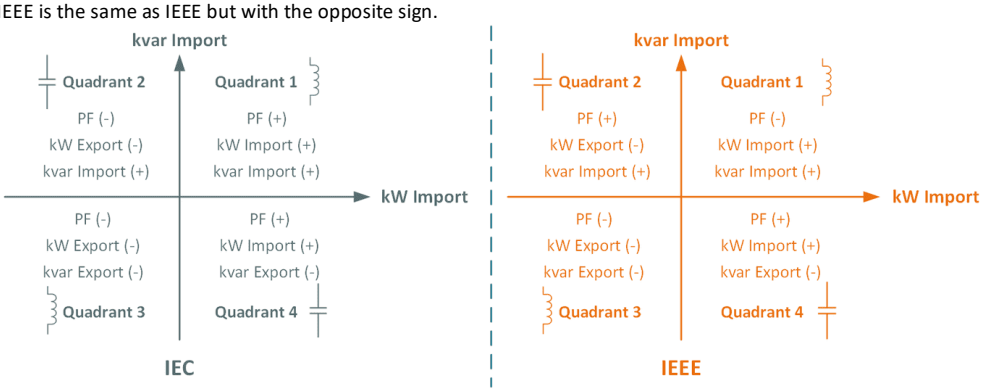


Figure 5-1 Power Factor Definitions

2. There are two ways to calculate kVA:

Mode V (Vector method)**:** $kVA^2_{total}=\sqrt{kW^2_{total}+kvar^2_{total}}$

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

5.11.9 Auto-Scroll Setup

Register	Property	Description	Format	Range/Default*
40550	RW	Auto-Scroll Enable	UINT16	0=No*, 1=Yes
40551	RW	Initiate after this duration	UINT16	1-60 (mins), 3*
40552	RW	Switch Interval	UINT16	1-60 (s), 3*
40553	RW	Page 1	UINT16	See Note 1, 1*

40554	RW	Page 2	UINT16	See Note 1, 2*
40555	RW	Page 3	UINT16	See Note 1, 3*
40556	RW	Page 4	UINT16	See Note 1, 4*
40557	RW	Page 5	UINT16	See Note 1, 8*
40558	RW	Page 6	UINT16	See Note 1, 10*
40559	RW	Page 7	UINT16	See Note 1, 12*
40560	RW	Page 8	UINT16	See Note 1, 13*
40561	RW	Page 9	UINT16	See Note 1, 14*
40562	RW	Page 10	UINT16	See Note 1, 15*

Table 5-63 Auto-Scroll Setup

Note:

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

ID	Parameter	ID	Parameter	ID	Parameter
0	Null	7	TOU	14	Unbalance & Sequence
1	Phasor	8	Max. & Min.	15	Flicker
2	Voltage	9	I/O	16	Reserved
3	Current	10	Harmonics	17	Waveform
4	Power	11	Interharmonics	18	SOE Log
5	Energy	12	Voltage Deviation	19	Device Log
6	Demand	13	Frequency Deviation	20	PQ Counters

Table 5-64 Available Screen options for Auto-Scroll Setup

5.11.10 Pop-up Alarm Setup

Register	Property	Description	Format	Range/Default*
40570	RW	Enable	UINT16	0=Disabled*, 1=Enabled
40571	RW	Minimum Interval	UINT16	0*to 3600 (s)
40572	RW	Duration	UINT16	0 to 3600 (s), 10*
40573	RW	Trigger Source	UINT32	See Note 1, 0x01 (Dip/Swell)*

Table 5-65 Pop-Up Alarm Setup

Note:

1. The following table illustrates the Trigger Source for Pop-up Alarm with a bit value of "1" meaning Selected while "0" meaning unselected.

Bit	Parameter	Bit	Parameter	Bit	Parameter
0	Dip/Swell	3	RVC	7	HS Setpoint
1	Transient	4	MSV	8	DI
2	Inrush Current	5	Standard Setpoint	9	DO

Table 5-66 Available Trigger Source Options

5.11.11 Others Setup

Register	Property	Description	Format	Range / Options
40751	RW	Dip/Swell RMS Update[1]	UINT16	0=1-cycle*, 1= ½ -cycle
40752	RW	Interruption Mode[2]	UINT16	0=Single Phase, 1=Three Phase*
40753	RW	Dip/Swell Filter[3]	UINT16	0=Disable*, 1=Enable
40754	RW	Dip/Swell Max. Duration[3]	UINT16	1~600s, 60*
40755	RW	Swell Max. Magnitude[3]	UINT16	101~500 (%), 500*
40756	RW	Enable Audit Log Alarm	UINT16	0=No*, 1=Yes
40757	RW	RTD Compensation	UINT16	0 to 2000 (x0.01Ω), 0*
40758	RW	Energy Short Rollover	UINT16	0=Disable*, 1=Enabled
40759~40796	--	Reserved	--	--
40797	RW	SSH Enable	UINT16	0=No*, 1=Yes
40798	--	Reserved	--	--
40799	RW	Delimiter[4]	UINT16	0=Option 1*, 1=Option 2
40800	RW	Clock Source	UINT16	0=RTC*, 1=SNTP, 2=GPS, 3=IRIG-B, 4=Reserved, 5=1588-P1, 6=1588-P2
40801	RW	Time Zone	UINT16	0 to 32, 26*
40802	RW	IRIG-B Time Zone[5]	UINT16	0 to 32, 26*
40803	RW	Language[5]	UINT16	0=English*, 1=Simplified Chinese
40804	RW	Date Format	UINT16	0=YYYY/MM/DD*, 1=MM/DD/YYYY 2=DD/MM/YYYY, 3=YYYY-MM-DD 4=MM-DD-YYYY, 5=DD-MM-YYYY
40805	--	Reserved	--	--
40806	RW	Backlight Timeout	UINT16	0 to 60 min (0 means disabled), 5*
40807	RW	LCD Contrast (%)	UINT16	50 to 100 (%), 90*
40808	RW	Phase A Color	UINT16	See Note 6, 1*
40809	RW	Phase B Color	UINT16	See Note 6, 4*

40810	RW	Phase C Color	UINT16	See Note 6, 8*
40811	RW	Phase N Color	UINT16	See Note 6, 13*
40812	RW	Earth Wire Color	UINT16	0=Green,1=Yellow-Green*
40813	RW	Set Password[7]	UINT32	0~999999, 1*
40815	--	Reserved	--	--
40817	RW	Block Flagged Data in Setpoint	UINT32	0=No, 1=Yes*
40819	RW	Time Format[8]	UINT16	See Note 8, 0*
40820	RW	PQ Curve	UINT16	0=ITIC*, 1=SEMI F47
40821	RW	Aggregation Interval[9]	UINT16	0=50/60-cycle*, 1=150/180-cycle 2=10-min, 3=2-hour
40822	RW	Freq. Interval	UINT16	0=1s*, 1=3s, 2=10s
40823	--	Reserved	--	--
40824	RW	Sampling Rates in CFG File[10]	UINT16	0=0*, 1=Actual Sampling
40825	RW	Keep/Remove Flagged Data[11]	UINT16	0=Keep*, 1=Remove
40826~40833	RW	FTP User Name	CHAR	See Note 12, operator*
40834~40841	RW	FTP User Password	CHAR	See Note 12, abcd1234-*
40842	RW	FTP Anonymous Logon[13]	UINT16	0=Enabled, 1=Disabled*
40843	RW	FTP Enable[13]	UINT16	0=Yes*, 1=No
40844	RW	TELNET Enable[13]	UINT16	0=Yes, 1=No*
40845~40856	--	Reserved	--	--
40857	RW	Web Enable[13]	UINT16	0=No, 1=Yes*
40858	RW	Enable Web Client Validate	UINT16	0=No, 1=Yes*
40859	RW	WEB Port	UINT16	1 to 65535, 80*
40860	RW	FTP Port	UINT16	1 to 65535, 21*
40861	RW	TELNET Port	UINT16	1 to 65535, 23*
40862	RW	Diagsys Enable[14]	UINT16	0=No, 1=Yes*
40863	RW	Diagsys Port[14]	UINT16	1 to 65535, 60001*
40864	RW	Modbus TCP Enable[13]	UINT16	0=No, 1=Yes*
40865	RW	Modbus TCP Port[13]	UINT16	1 to 65535, 502*
40866	RW	HMI Security Enable[13]	UINT16	0=No, 1=Yes*
40867	RW	IEC61850 Enable[14]	UINT16	0=No, 1=Yes*
40868	RW	P1 Enable[13]	UINT16	0=No, 1=Yes*
40869	RW	P2 Enable[13]	UINT16	0=No, 1=Yes*
40870~40877	--	Reserved	--	--
40878	RW	Enable IEC61850 Authentication[13]	UINT16	0=No*, 1=Yes
40879~40886	RW	IEC61850 Password	CHAR	6365742D656C6563747269632E636F6D* (cet-electric.com)
40887~40892	RW	IEC61850 Security Key	CHAR	Blank*
40893	RW	IEC61850 Timeout	UINT16	0*
40894	RW	Value Type in COMTRADE	UINT16	0=Primary*, 1=Secondary
40895	RW	Web Login Timeout	UINT16	0~1440 min (0 means disabled), 5*
40896	RW	IEC61850 Port[14]	UINT16	1 to 65535, 102*
40897	RW	Enable Wiring Diagnostic	UINT16	0=No, 1=Yes*
40898	RW	HTTPS Timeout	UINT16	100 to 500 (ms), 1000*
40899	RW	Enable Freq. Dev. Record	UINT16	0=No*, 1=Yes

Table 5-67 System Setup Parameters

Notes:

1. The **Dip/Swell RMS Update** register determines if the Urms is computed every cycle and then shifted by ½ cycle (register value = 0) or if the Urms is computed every ½ cycle and then shifted by ½ cycle (register value = 1).
2. The **Interruption Mode** register determines if an Interruption event should start when the Urms of all 3 phases (register value = 1) or when the Urms of any 1 phase (register value = 0) fall below the **Interruption Threshold**.
3. The **Dip/Swell Filter** determines if a Dip/Swell event should be recorded when the Dip/Swell duration exceeds the preset value of **Dip/Swell Max. Duration** register or if a Swell event should be recorded if the U_{rms} exceeds the preset value of **Swell Max. Magnitude** register. The **Dip/Swell Max. Duration** and **Swell Max. Magnitude** registers are disregarded if the **Dip/Swell Filter** is disabled.
4. The **Delimiter** setup register supports two options, 1 and 2:
   Option 1: "," is used as the x1000 delimiter and "." as the decimal point (e.g. 123,456,789.0).
   Option 2: " " is used as the x1000 delimiter and "," as the decimal point (e.g. 123 456 789,0).
5. The following table lists the Codes for different Time Zones. The IRIG-B Time Zone parameter should be configured when **Clock Source** is set to IRIG-B.

Code	Time Zone	Code	Time Zone	Code	Time Zone
0	GMT-12:00	**11**	GMT-2:00	**22**	GMT+5:45
1	GMT-11:00	**12**	GMT-1:00	**23**	GMT+6:00
2	GMT-10:00	**13**	GMT-0:00	**24**	GMT+6:30
3	GMT-9:00	**14**	GMT+1:00	**25**	GMT+7:00
4	GMT-8:00	**15**	GMT+2:00	**26**	GMT+8:00
5	GMT-7:00	**16**	GMT+3:00	**27**	GMT+9:00

6	GMT-6:00	**17**	GMT+3:30	**28**	GMT+9:30
7	GMT-5:00	**18**	GMT+4:00	**29**	GMT+10:00
8	GMT-4:00	**19**	GMT+4:30	**30**	GMT+11:00
9	GMT-3:30	**20**	GMT+5:00	**31**	GMT+12:00
10	GMT-3:00	**21**	GMT+5:30	**32**	GMT+13:00

Table 5-68 Time Zones

6. The following table lists the Color options for different wires.

No.	Color (R, G, B)	No.	Color (R, G, B)	No.	Color (R, G, B)	No.	Color (R, G, B)
0	Brown (153,51,0)	4	Yellow (255,216,0)	8	Blue (0,0,255)	12	White (255,255,255)
1	Red (255,0,0)	5	Turquoise (0,162,132)	9	Violet (112,48,160)	13	Black (0,0,0)
2	Pink (255,173,177)	6	Green (0,255,36)	10	Grey (159,159,159)		
3	Orange (255,102,0)	7	Light-blue (79,204,246)	11	Neutral Grey (193,193,193)		

Table 5-69 Wire Color Options

7. The password digits cannot be identical or sequential.
8. The timestamp for different data is programmable by writing the "Time Format" register, with the bit value of "0" meaning LOCAL time, while "1" meaning UTC time. The following table illustrates the details of this register.

BIT	Description	Note
B0	MODBUS	Timestamp of retrieved Data logs via Modbus: Real-time measurement, SOE, PQ LOG, SDR, Max./Min. Log, Plt/Pst, EN50160 Log, TOU Log, IER and AER Log.
B1	COMTRADE	Timestamp of COMTRADE file including the first/trigger point in .cfg file

Table 5-70 Time Format Register

9. The basic measurement interval shall be a 10-cycle period for 50 Hz power system and a 12-cycle period for 60 Hz power system. The 10/12-cycle measurement are then aggregated over 4 additional intervals: 50/60-cycle, 150/180-cycle, 10 min, 2-hour.
10. "0" means the DWR file in COMTRADE format doesn't include any sampling section information.
11. For **Keep/Remove Flagged Data** register, the bit value of "0" means to Keep Flagged Data in the log while "1" means to remove. The following table illustrates the details of this register.

Bit4~Bit15	Bit3	Bit2	Bit1	Bit0
Reserved	EN50160 Log	Min. Log	Max. Log	SDR Log

Table 5-71 Keep/Remove Flagged Data Register

12. The FTP Username and Password should not exceed 16 characters.
13. Modification written to this register will take effect at once.
14. Modification written to this register requires a device reboot to take effect.

5.11.12 SMTP Setup

Register	Property	Description	Format	Range/Options
40900	RW	SMTP Event Classification	Bitmap	Note 1
40902	RW	SMTP Port	UINT16	1 to 65535 (Default=25)
40903	RW	SMTP Server Address	UINT32	Note 2
40905	RW	Sender Address	CHAR	Note 3
40925	RW	Sender Username	CHAR	Note 4
40935	RW	Login Password	CHAR	Note 5
40945	RW	Receiver Address	CHAR	Note 6

Table 5-72 SMTP Setup

Notes:

1. **SMTP Event Classification** register determines if a newly generated SOE/PQ Log should be sent out by email. The following table illustrates the Bitmap definition of this register. When a particular bit is set to 1, its corresponding events will be sent out by email.

Bit	Classification	Event Type	Bit	Classification	Event Type
Bit 0	1=System Events	SOE	Bit 16	0x81=Dip/Swell/Interruption	PQ Log
Bit 1	2=Standard Setpoints Events		Bit 17	0x82=Transient	
Bit 2	3=High-speed Setpoints Events		Bit 18	0x83 = Inrush Current	
Bit 3	4=I/O Changes		Bit 19	0x84 = RVC	
Bit 4	5 =WFR		Bit 20	0x85 = MSV	
Bit 5	6 = DWR		Bit 21 ~ 24	Reserved	
Bit 6 ~ 9	Reserved		Bit 25	EN50160 Report	
Bit 10	RMS				

Table 5-73 SMTP Event Classification Register (40900)

2. If the SMTP Server Address is 192.168.0.100, write "0xC0A00064" to the register.
3. This string parameter may be up to 40 ASCII characters long and specifies the sender email address that appears in the "**From**" field of the email. For example, if the email address is iMeter D7@cet-electric.com, set the parameter as"69 4D 65 74 65 72 20 44 37 40 63 65 74 2D 65 6C 65 63 74 72 69 63 2E 63 6F 6D 00 00" where the characters "00 00" at the end of the string are the terminator.
4. This string parameter may be up to 40 characters long and specifies the "**Sender Username**" that appears in the email. For example, if the username is "abc", set the parameter as "61 62 63 00 00" where the two zero characters "00 00" at the end of the string are the string terminator.

5. This string parameter may be up to 20 characters long and specifies the Logon Password to login the "**Sender Address**" account. For example, if the password is "iMeter D7", set the parameter as "69 4D 65 74 65 72 20 44 37 00 00" where the two zero characters "00 00" at the end of the string are the string terminator.
6. This string parameter may be up to 90 characters long and specifies the receiver email address that appears in the "**To**" field of the email. For example, if the email address is iMeter D7@cet-global.com, so set the registers as" 69 4D 65 74 65 72 20 44 37 40 63 65 74 2D 67 6C 6F 62 61 6C 2E 63 6F 6D 00 00" where the two zero characters "00 00" at the end of the string are the string terminator. Use ";" (0x3b) to separate different receiver addresses.

5.12 System Setup

5.12.1 Basic Setup

Register	Property	Description	Format	Range/Default*
41000	RW	Wiring Mode	UINT16	1=3P4W *, 3=3P3W, 4=Demo
41001	RW	PT Primary	UINT32	1 to 1,000,000 (V), 100*
41003	RW	PT Secondary	UINT32	1 to 1500 (V), 100*
41005	RW	CT Primary	UINT32	1 to 30000 (A), 5*
41007	RW	CT Secondary	UINT32	1 to 50(A), 5*
41009	RW	U4 Primary	UINT32	1 to 1,000,000 (V), 100*
41011	RW	U4 Secondary	UINT32	1 to 1500 (V), 100*
41013	RW	I4 Primary	UINT32	1 to 30000 (A), 5*
41015	RW	I4 Secondary	UINT32	1 to 50 (A), 5*
41017~41019	RW	Reserved	UINT32	--
41021	RW	ULL Nominal	UINT32	1 to 1500 (V), 100*
41023	RW	Nominal Current (Inominal)	UINT32	1 to 1000 (A), 5*
41025	RW	CT Polarity	UINT16	See Note 1, 0*
41026	RW	Composite Current	UINT16	0=Disabled*, 1=Phase A, 2=Phase B, 3=Phase C
41027-41033	--	Reserved	--	--
41035	RW	SCCP Model	UINT16	0=5A (50A) @10mV/A*, 1=20A @ 10mV/A, 2=200A @ 1mV/A, 3=500A @ 1mV/A, 4=500A (550A) @ 1mV/A, 5=5kA @ 0.1 mV/A

Table 5-74 Basic Setup

Notes:

1. The **CT Polarity** register defines the polarity for the Current Inputs as illustrated in the following table with a bit value of "1" meaning Normal and "1" meaning Reverse.

Bit 15~Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	I4	Ic	Ib	Ia

Table 5-75 CT Polarity Register

5.12.2 PQ Setup

Register	Property	Description	Format	Range, Default*
41100	RW	Dip/Swell Enable	UINT16	0=No, 1=Yes*
41101	RW	Dip/Swell Reference Voltage	UINT16	0=Udin*, 1=Usr
41102	RW	Swell Threshold[1]	UINT16	101 to 200 (x0.01Udin/Usr), 110*
41103	RW	Dip Threshold[1]	UINT16	1 to 99 (x0.01 Udin/Usr), 90*
41104	RW	Interruption Threshold[1]	UINT16	0 to 50 (x0.01 Udin/Usr), 10*
41105	RW	Swell Hysteresis[1]	UINT16	1 to 1000 (x0.001 Udin/Usr), 20*
41106	RW	Dip Hysteresis[1]	UINT16	
41107	RW	Interruption Hysteresis[1]	UINT16	
41108	RW	PQD Trigger[2]	UINT32	0x800000000(DWR) *
41110	RW	Dip/Swell Trigger[3]	UINT32	See Note 3, 0*
41112	RW	Transient Enable	UINT16	0=No*, 1=Yes
41113	RW	Transient Threshold	UINT16	5 to 500 (%), 35*
41114	RW	Transient Trigger[4]	UINT32	0x10000000 (WFR)*
41116~41119	--	Reserved	--	--
41120	RW	Inrush Current Enable	UINT16	0=No*, 1=Yes
41121	RW	Inrush Current Threshold	UINT16	100 to 500 (%), 120*
41122	RW	Inrush Current Hysteresis	UINT16	1 to 1000 (0.1% to 100%), 10*
41123	RW	Inrush Current Trigger[4]	UINT32	0x10000000 (WFR)*
41125~41127	--	Reserved	--	--
41128	RW	RVC Enable	UINT16	0=No*, 1=Yes
41129	RW	RVC Threshold	UINT32	2 to 100 (0.2% to 10%Un), 50*
41131	RW	RVC Hysteresis	UINT32	1 to 50 (0.1% to 5%Un), 25*
41133	RW	RVC Trigger[4]	UINT32	0*
41135~41153	--	Reserved	--	--
41154	RW	MSV #1 Enable	UINT16	0=No*, 1=Yes
41155	RW	MSV #1 Frequency	UINT16	See Note 5, 10000*

41156	RW	MSV #1 Threshold	UINT16	3 to 1000 (x0.001Un), 50*
41157	RW	MSV #1 Signalling Time	UINT16	1 to 120s, 60s*
41158~41159	--	Reserved	--	--
41160	RW	MSV #2 Enable	UINT16	0=No*, 1=Yes
41161	RW	MSV #2 Frequency	UINT16	See Note 5, 20000*
41162	RW	MSV #2 Threshold	UINT16	3 to 1000 (x0.001Un), 50*
41163	RW	MSV #2 Signalling Time	UINT16	1 to 120s, 60s*
41164~41165	--	Reserved	--	--
41166	RW	MSV #3 Enable	UINT16	0=No*, 1=Yes
41167	RW	MSV #3 Frequency	UINT16	3 to 1000 (x0.001Un), 50*
41168	RW	MSV #3 Threshold	UINT16	See Note 5, 30000*
41169	RW	MSV #3 Signalling Time	UINT16	1 to 120s, 60s*

Table 5-76 PQ Setup

Notes:

1. The values for the **Dip Threshold**, **Swell Threshold**, **Voltage Interruption Threshold** and **Dip/Swell Hysteresis** should be configured to meet the following criteria:
   a) The **Voltage Interruption Threshold** shall be set below **Dip Threshold**.
   b) The **Dip/Swell Hysteresis** must be less than the **Dip/Swell Thresholds**.
   c) The **Rapid Voltage Changes (RVC) Threshold** must be less than the **Dip and Swell Thresholds**.
   d) Regardless of whether **Dip/Swell** is enabled, the conditions for a), b) and c) must always be met.
2. The following table illustrates the details of the **PQD Trigger** register with a bit value of "1" meaning Active while "0" meaning Inactive.

Bit	Trigger	Bit	Trigger	Bit	Trigger	Bit	Trigger
B0 to B26	Reserved	B27	DWR	B28	WFR	B29	RMSR

Table 5-77 PQD Trigger Register

3. The following table illustrates the details for **Dip/Swell Trigger** register with a bit value of "1" meaning Active while "0" meaning Inactive.

Bit	Trigger	Event Type	Bit	Trigger	Event Type	Bit	Trigger	Event Type
B0	Alarm	Dip	B8	Alarm	Swell	B16	Alarm	Interruption
B1	DO1		B9	DO1		B17	DO1	
B2	DO2		B10	DO2		B18	DO2	

Table 5-78 Dip/Swell Trigger Register

4. The following table illustrates the details for **Transient/Inrush Current/RVC** Trigger register with a bit value of "1" meaning Active while "0" meaning Inactive.

Bit	Trigger	Bit	Trigger	Bit	Trigger	Bit	Trigger
B0	Alarm	B2	DO2	B27	DWR	B29	RMSR
B1	DO1	B3 to B26	Reserved	B28	WFR		

Table 5-79 Transient/Inrush Current/RVC Trigger Register

5. The MSV Frequency Range is 600 to 30000 (x0.1Hz) for 50Hz power system or 700 to 30000 (x0.1Hz) for 60Hz power system.

5.12.3 Demand Setup

Register	Property	Description	Format	Range/Default*
41250	RW	Demand Sync. Mode	UINT16	0=SLD*, 1=SYNC DI
41251	RW	Demand Period	UINT16	1 to 60 (minute), 15*
41252	RW	Number of Sliding Windows	UINT16	1* to 15
41253	RW	Self-read Time[1]	UINT16	Default = 0xFFFF
41254	RW	Predicted Response	UINT16	70* to 99

Table 5-80 Demand Setup

Notes:

1. 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 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**.

5.12.4 WFR Setup

Register	Property	Description	Format	Range/Default*
41300	RW	Pre-fault Cycles of WFR	UINT16	2 to 6 (cycles), 5*
41301	RW	Post Fault Cycles of WFR	UINT16	2 to 6 (cycles), 5*
41302	RW	No. of Cycles	UINT16	See Table 5-82, 20*
41303	RW	Sampling Rate	UINT16	0=128, 1=256, 2=512*, 3=1024
41304	RW	Adaptive WFR Length	UINT16	0=Enable, 1=Disable*

41305	--	Reserved	--	--
41306	RW	Pre-fault Cycles of DWR	UINT16	5* to 10 Cycles
41307	RW	Enable Scheduled WFR	UINT16	0=No*, 1=Yes
41308	RW	Start Time	UINT16	See Note 1
41311	RW	Recording Interval	UINT16	1 to 960 Hours, 24 Hours*
41312	RW	Repetitions	UINT16	0 (recording continuously) to 10000, 1*
41313	RW	Pre-fault Samples of RMSR	UINT16	100* to 500 samples
41314	RW	Sampling Interval	UINT16	0-60 cycles (0 represents 1/2 cycle)
41315	RW	Channel 1	UINT16	See, 1*
41316	RW	Channel 2	UINT16	See, 2*
41317	RW	Channel 3	UINT16	See, 3*
41318	RW	Channel 4	UINT16	See, 7*
41319	RW	Channel 5	UINT16	See, 8*
41320	RW	Channel 6	UINT16	See, 9*
41321	RW	Channel 7	UINT16	See, 12*
41322	RW	Channel 8	UINT16	See, 13*

Table 5-81 Waveform Recorder Setup

Notes:

1. The following table illustrates the No. of Cycles range for specified Sampling Rate.

Index	Samples / Cycles	No. of Cycles Range	Index	Samples / Cycles	No. of Cycles Range
0	128	2-384	2	512	2-192
1	256	2-96	3	1024	2-48

Table 5-82 No. of Cycles range

2. The following table illustrates the **Scheduled WFR Start Time** structure.

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

Table 5-83 Scheduled WFR Start Time Structure

3. The available parameters for the **RMSR channel** with bit value are listed below.

Value	Parameter	Value	Parameter	Value	Parameter	Value	Parameter
0	Null	7	Ia	14	kWa	21	kVAb
1	Ua	8	Ib	15	kWb	22	kVAc
2	Ub	9	Ic	16	kWc	23	PFa
3	Uc	10	U4	17	kvara	24	PFb
4	Uab	11	I4	18	kvarb	25	PFc
5	Ubc	12	Frequency	19	kvarc		
6	Uca	13	Freq. Dev.	20	kVAa		

Table 5-84 Available parameters for RMSR Channel

5.12.5 Energy Pulse Setup

Register	Property	Description	Format	Range/Default*
41350	RW	Energy Pulse Constant[2]	UINT16	0=100, 1=1000, 2=3200, 3=5000*, 4=6400, 5=12800
41351-41352	RW	Reserved	UINT16	--
41353	RW	Energy Pulse Output 1	UINT16	See Table 5-86
41355	RW	Energy Pulse Output 2	UINT16	
41357	RW	Energy Pulse Output 3	UINT16	

Table 5-85 Energy Pulse Setup

Notes:

1. The following table illustrates the available options for the Energy Pulse parameters.

ID	Parameter	ID	Parameter	ID	Parameter
1	kWh Total	7	kWh Total TH	13	kvarh Total Fund.
2	kWh Imp.	8	kWh Imp. TH	14	kvarh Imp. Fund.
3	kWh Exp.	9	kWh Exp. TH	15	kvarh Exp. Fund.
4	kWh Total Fund.	10	kvarh Total	16	kvarh Total TH
5	kWh Imp. Fund.	11	kvarh Imp.	17	kvarh Imp. TH
6	kWh Exp. Fund.	12	kvarh Exp.	18	kvarh Exp. TH

Table 5-86 Available options for Energy Pulse

2. The **Pulse Constant** can be configured as 100/1000/3200/5000/6400/12800 impulses per kWh or kvarh Pulse. It's important to understand that energy pulsing is always based on the secondary ratings as it would be impossible to generate the required number or pulses based on the primary ratings. The following table illustrates the recommended settings for the **Energy Pulse Constant** based on $Z = V_{nominal} \times I_{nominal} \times 2$, where $V_{nominal}$ and $I_{nominal}$ are the secondary voltage and current nominal ratings, respectively. In general, one would use a higher **Pulse Constant** for a smaller **Z** value in an accuracy testing situation to reduce the test time.

Z	Energy Pulse Constant	Default
≤1000	100/1000/3200/5000/6400/12800	5000
≤2000	100/1000/3200/5000/6400	5000
≤2600	100/1000/3200/5000	5000
≤4000	100/1000/3200	5000
≤13000	100/1000	5000
>130000	100	5000

Table 5-87 Recommended Settings for Energy Pulse Constant

5.12.6 Setpoint Setup

Register	Property	Description	Format	Range/Default*
41400	RW	Setpoint Parameter	UINT32	See Table 5-89, 0=Null*
41402	RW	Setpoint #1 Type	UINT16	0=Disabled*, 1=Over, 2=Under 3=HS Over, 4=HS Under
41403	RW	Over Limit	Float	999,999*
41405	RW	Under Limit	Float	999,999*
41407	RW	Active Delay	UINT16	0 to 9999* (s), 10*
41408	RW	Inactive Delay	UINT16	0 to 9999* (s), 10*
41409	RW	Trigger Action	UINT32	See Table 5-90, 0*
...	...	...	...	...
41907	RW	Setpoint #40 Parameter	UINT32	See Setpoint #1
41909	RW	Setpoint #40 Type	UINT32	
41910	RW	Over Limit	UINT16	
41912	RW	Under Limit	Float	
41914	RW	Active Delay	Float	
41915	RW	Inactive Delay	UINT16	
41916	RW	Trigger Action	UINT16	

Table 5-88 Setpoint Setup

Notes:

1. The iMeter D7 provides the following Setpoint parameters, Standard Setpoint can monitor all parameters while the HS Setpoint only can monitor parameters 1 to 10.

Key	Parameter	Key	Parameter	Key	Parameter
0	Null	**29**	U TIHD	**58**	PF Total Pred. Demand
1	Uln	**30**	U TOIHD	**59**	Pst
2	Ull	**31**	U TEIHD	**60**	Plt
3	U4	**32**	I TIHD	**61**	Reserved
4	I	**33**	I TOIHD	**62**	Phase Loss
5	I4 (Optional)	**34**	I TEIHD	**63**	IR
6	Reserved	**35**	U TH RMS	**64**	TC
7	kW Total	**36**	U TOH RMS	**65**	AI1
8	kvar Total	**37**	U TEH RMS	**66**	AI2
9	kVA Total	**38**	I TH RMS	**0x20000**	U HD02
10	PF	**39**	I TOH RMS	**...**	...
11	U2 Unbalance	**40**	I TEH RMS	**0x3F0000**	U HD63
12	U0 Unbalance	**41**	U TIH RMS	**0x400000**	U H02 RMS
13	I2 Unbalance	**42**	U TOIH RMS	**...**	...
14	I0 Unbalance	**43**	U TEIH RMS	**0x7D0000**	U H63 RMS
15	U Fund.	**44**	I TIH RMS	**0x810000**	U IHD01
16	I Fund.	**45**	I TOIH RMS	**...**	...
17	Voltage Deviation	**46**	I TEIH RMS	**0xBF0000**	U IHD63
18	Voltage over Dev.	**47**	P Total Imp. Demand	**0x02000000**	I H02 RMS
19	Voltage Under Dev.	**48**	Q Total Imp. Demand	**...**	...
20	Frequency	**49**	P Total Exp. Demand	**0x3F000000**	I H63 RMS
21	Freq. Deviation	**50**	Q Total Exp. Demand	**0x40000000**	I HD02
22	Phase Reversal	**51**	S Total Demand	**...**	...
23	U THD	**52**	PF Total Demand	**0x7D000000**	I HD63
24	U TOHD	**53**	P Total Imp. Pred. Demand	**0x81000000**	I IH01 RMS
25	U TEHD	**54**	Q Total Imp. Pred. Demand	**...**	...
26	I THD	**55**	P Total Exp. Pred. Demand	**0xBF000000**	I IH63 RMS
27	I TOHD	**56**	Q Total Exp. Pred. Demand		
28	I TEHD	**57**	S Total Pred. Demand		

Table 5-89 Setpoint Parameters Range

2. The following table illustrates the Setpoint Trigger details with a bit value of "1" meaning Active and "0" meaning Inactive.

Bit	Trigger	Bit	Trigger	Bit	Trigger	Bit	Trigger
B0	Alarm	B2	DO2	B27	DWR	B29	RMSR
B1	DO1	B3 to B26	Reserved	B28	WFR		

Table 5-90 Setpoint Trigger

5.12.7 SDR Setup

5.12.7.1 SDR #1

Register	Property	Description	Format	Range/Options	Default
45700	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10*
45701	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
45702	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	62
45703	RW	Parameter #1	UINT16	Freq.	10001
45704	RW	Parameter #2	UINT16	Ua RMS	10002
45705	RW	Parameter #3	UINT16	Ub RMS	10003
45706	RW	Parameter #4	UINT16	Uc RMS	10004
45707	RW	Parameter #5	UINT16	U4 RMS	10005
45708	RW	Parameter #6	UINT16	ULN RMS Avg	10006
45709	RW	Parameter #7	UINT16	Uab RMS	10007
45710	RW	Parameter #8	UINT16	Ubc RMS	10008
45711	RW	Parameter #9	UINT16	Uca RMS	10009
45712	RW	Parameter #10	UINT16	ULL RMS Avg	10010
45713	RW	Parameter #11	UINT16	Ia RMS	10011
45714	RW	Parameter #12	UINT16	Ib RMS	10012
45715	RW	Parameter #13	UINT16	Ic RMS	10013
45716	RW	Parameter #14	UINT16	I4 RMS	10014
45717	RW	Parameter #15	UINT16	Current RMS Avg	10016
45718	RW	Parameter #16	UINT16	kWa Total	10017
45719	RW	Parameter #17	UINT16	kWb Total	10018
45720	RW	Parameter #18	UINT16	kWc Total	10019
45721	RW	Parameter #19	UINT16	kW Total	10020
45722	RW	Parameter #20	UINT16	kvara Total	10021
45723	RW	Parameter #21	UINT16	kvarb Total	10022
45724	RW	Parameter #22	UINT16	kvarc Total	10023
45725	RW	Parameter #23	UINT16	kvar Total	10024
45726	RW	Parameter #24	UINT16	kVAa Total	10025
45727	RW	Parameter #25	UINT16	kVAb Total	10026
45728	RW	Parameter #26	UINT16	kVAc Total	10027
45729	RW	Parameter #27	UINT16	kVA Total	10028
45730	RW	Parameter #28	UINT16	PFa	10029
45731	RW	Parameter #29	UINT16	PFb	10030
45732	RW	Parameter #30	UINT16	PFc	10031
45733	RW	Parameter #31	UINT16	PF Total	10032
45734	RW	Parameter #32	UINT16	Ua FUND. RMS	11107
45735	RW	Parameter #33	UINT16	Ub FUND. RMS	11108
45736	RW	Parameter #34	UINT16	Uc FUND. RMS	11109
45737	RW	Parameter #35	UINT16	U4 FUND. RMS	11110
45738	RW	Parameter #36	UINT16	Uab FUND. RMS	10130
45739	RW	Parameter #37	UINT16	Ubc FUND. RMS	10131
45740	RW	Parameter #38	UINT16	Uca FUND. RMS	10132
45741	RW	Parameter #39	UINT16	Ia FUND. RMS	11364
45742	RW	Parameter #40	UINT16	Ib FUND. RMS	11365
45743	RW	Parameter #41	UINT16	Ic FUND. RMS	11366
45744	RW	Parameter #42	UINT16	I4 FUND. RMS	11367
45745	RW	Parameter #43	UINT16	Pa FUND.	11971
45746	RW	Parameter #44	UINT16	Pb FUND.	11972
45747	RW	Parameter #45	UINT16	Pc FUND.	11973
45748	RW	Parameter #46	UINT16	P Total FUND.	11719
45749	RW	Parameter #47	UINT16	Qa FUND.	11974
45750	RW	Parameter #48	UINT16	Qb FUND.	11975
45751	RW	Parameter #49	UINT16	Qc FUND.	11976
45752	RW	Parameter #50	UINT16	Q Total FUND.	11720
45753	RW	Parameter #51	UINT16	Sa FUND.	11977
45754	RW	Parameter #52	UINT16	Sb FUND.	11978
45755	RW	Parameter #53	UINT16	Sc FUND.	11979
45756	RW	Parameter #54	UINT16	S Total FUND.	11721
45757	RW	Parameter #55	UINT16	dPFa	11980
45758	RW	Parameter #56	UINT16	dPFb	11981
45759	RW	Parameter #57	UINT16	dPFc	11982
45760	RW	Parameter #58	UINT16	dPF Total	11722
45761	RW	Parameter #59	UINT16	I Residual	56000
45762	RW	Parameter #60	UINT16	RTD	56001

45763	RW	Parameter #61	UINT16	AI1	55000
45764	RW	Parameter #62	UINT16	AI2	55001
45765~ 45766	RW	Parameter 63 to 64	UINT16	Reserved	0

Table 5-91 SDR #1 Setup

5.12.7.2 SDR #2

Register	Property	Description	Format	Range/Options	Default
45800	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10
45801	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
45802	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	60
45803	RW	Parameter #1	UINT16	Ua Angle	13933
45804	RW	Parameter #2	UINT16	Ub Angle	13934
45805	RW	Parameter #3	UINT16	Uc Angle	13935
45806	RW	Parameter #4	UINT16	U4 Angle	13936
45807	RW	Parameter #5	UINT16	Uab Angle	15777
45808	RW	Parameter #6	UINT16	Ubc Angle	15778
45809	RW	Parameter #7	UINT16	Uca Angle	15779
45810	RW	Parameter #8	UINT16	Ia Angle	13937
45811	RW	Parameter #9	UINT16	Ib Angle	13938
45812	RW	Parameter #10	UINT16	Ic Angle	13939
45813	RW	Parameter #11	UINT16	I4 Angle	13940
45814	RW	Parameter #12	UINT16	Ua Fund. Angle	13942
45815	RW	Parameter #13	UINT16	Ub Fund. Angle	13943
45816	RW	Parameter #14	UINT16	Uc Fund. Angle	13944
45817	RW	Parameter #15	UINT16	U4 Fund. Angle	13945
45818	RW	Parameter #16	UINT16	Uab Fund. Angle	15780
45819	RW	Parameter #17	UINT16	Ubc Fund. Angle	15781
45820	RW	Parameter #18	UINT16	Uca Fund. Angle	15782
45821	RW	Parameter #19	UINT16	Ia Fund. Angle	14194
45822	RW	Parameter #20	UINT16	Ib Fund. Angle	14195
45823	RW	Parameter #21	UINT16	Ic Fund. Angle	14196
45824	RW	Parameter #22	UINT16	I4 Fund. Angle	14197
45825	RW	Parameter #23	UINT16	U0	10059
45826	RW	Parameter #24	UINT16	U2	10060
45827	RW	Parameter #25	UINT16	U1	10061
45828	RW	Parameter #26	UINT16	I0	10062
45829	RW	Parameter #27	UINT16	I2	10063
45830	RW	Parameter #28	UINT16	I1	10064
45831	RW	Parameter #29	UINT16	U2 Unbalance	10055
45832	RW	Parameter #30	UINT16	I2 Unbalance	10056
45833	RW	Parameter #31	UINT16	U0 Unbalance	10057
45834	RW	Parameter #32	UINT16	I0 Unbalance	10058
45835	RW	Parameter #33	UINT16	Ua Deviation	10033
45836	RW	Parameter #34	UINT16	Ub Deviation	10034
45837	RW	Parameter #35	UINT16	Uc Deviation	10035
45838	RW	Parameter #36	UINT16	Uab Deviation	10036
45839	RW	Parameter #37	UINT16	Ubc Deviation	10037
45840	RW	Parameter #38	UINT16	Uca Deviation	10038
45841	RW	Parameter #39	UINT16	Ua Over Deviation	10039
45842	RW	Parameter #40	UINT16	Ub Over Deviation	10040
45843	RW	Parameter #41	UINT16	Uc Over Deviation	10041
45844	RW	Parameter #42	UINT16	Uab Over Deviation	10042
45845	RW	Parameter #43	UINT16	Ubc Over Deviation	10043
45846	RW	Parameter #44	UINT16	Uca Over Deviation	10044
45847	RW	Parameter #45	UINT16	Ua Under Deviation	10045
45848	RW	Parameter #46	UINT16	Ub Under Deviation	10046
45849	RW	Parameter #47	UINT16	Uc Under Deviation	10047
45850	RW	Parameter #48	UINT16	Uab Under Deviation	10048
45851	RW	Parameter #49	UINT16	Ubc Under Deviation	10049
45852	RW	Parameter #50	UINT16	Uca Under Deviation	10050
45853	RW	Parameter #51	UINT16	Freq. Deviation	10051
45854	RW	Parameter #52	UINT16	Uab THD	15768
45855	RW	Parameter #53	UINT16	Ubc THD	15769
45856	RW	Parameter #54	UINT16	Uca THD	15770
45857	RW	Parameter #55	UINT16	Uab TOHD	15771
45858	RW	Parameter #56	UINT16	Ubc TOHD	15772

45859	RW	Parameter #57	UINT16	Uca TOHD	15773
45860	RW	Parameter #58	UINT16	Uab TEHD	15774
45861	RW	Parameter #59	UINT16	Ubc TEHD	15775
45862	RW	Parameter #60	UINT16	Uca TEHD	15776
45863~ 45866	RW	Parameter #61 to 64	UINT16	Reserved	0

Table 5-92 SDR #2 Setup

5.12.7.3 SDR #3

Register	Property	Description	Format	Range/Options	Default
45900	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10
45901	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
45902	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	56
45903	RW	Parameter #1	UINT16	Ua THD	10103
45904	RW	Parameter #2	UINT16	Ub THD	10104
45905	RW	Parameter #3	UINT16	Uc THD	10105
45906	RW	Parameter #4	UINT16	U4 THD	10106
45907	RW	Parameter #5	UINT16	Ia THD	10115
45908	RW	Parameter #6	UINT16	Ib THD	10116
45909	RW	Parameter #7	UINT16	Ic THD	10117
45910	RW	Parameter #8	UINT16	I4 THD	10118
45911	RW	Parameter #9	UINT16	Ua TOHD	10107
45912	RW	Parameter #10	UINT16	Ub TOHD	10108
45913	RW	Parameter #11	UINT16	Uc TOHD	10109
45914	RW	Parameter #12	UINT16	U4 TOHD	10110
45915	RW	Parameter #13	UINT16	Ia TOHD	10120
45916	RW	Parameter #14	UINT16	Ib TOHD	10121
45917	RW	Parameter #15	UINT16	Ic TOHD	10122
45918	RW	Parameter #16	UINT16	I4 TOHD	10123
45919	RW	Parameter #17	UINT16	Ua TEHD	10111
45920	RW	Parameter #18	UINT16	Ub TEHD	10112
45921	RW	Parameter #19	UINT16	Uc TEHD	10113
45922	RW	Parameter #20	UINT16	U4 TEHD	10114
45923	RW	Parameter #21	UINT16	Ia TEHD	10125
45924	RW	Parameter #22	UINT16	Ib TEHD	10126
45925	RW	Parameter #23	UINT16	Ic TEHD	10127
45926	RW	Parameter #24	UINT16	I4 TEHD	10128
45927	RW	Parameter #25	UINT16	Ia K-Factor	10080
45928	RW	Parameter #26	UINT16	Ib K-Factor	10081
45929	RW	Parameter #27	UINT16	Ic K-Factor	10082
45930	RW	Parameter #28	UINT16	I4 K-Factor	10083
45931	RW	Parameter #29	UINT16	Ia TDD	10065
45932	RW	Parameter #30	UINT16	Ib TDD	10066
45933	RW	Parameter #31	UINT16	Ic TDD	10067
45934	RW	Parameter #32	UINT16	I4 TDD	10068
45935	RW	Parameter #33	UINT16	Ua TIHD	12727
45936	RW	Parameter #34	UINT16	Ub TIHD	12728
45937	RW	Parameter #35	UINT16	Uc TIHD	12729
45938	RW	Parameter #36	UINT16	U4 TIHD	12730
45939	RW	Parameter #37	UINT16	Ia TIHD	12739
45940	RW	Parameter #38	UINT16	Ib TIHD	12740
45941	RW	Parameter #39	UINT16	Ic TIHD	12741
45942	RW	Parameter #40	UINT16	I4 TIHD	12742
45943	RW	Parameter #41	UINT16	Ua TOIHD	12731
45944	RW	Parameter #42	UINT16	Ub TOIHD	12732
45945	RW	Parameter #43	UINT16	Uc TOIHD	12733
45946	RW	Parameter #44	UINT16	U4 TOIHD	12734
45947	RW	Parameter #45	UINT16	Ia TOIHD	12744
45948	RW	Parameter #46	UINT16	Ib TOIHD	12745
45949	RW	Parameter #47	UINT16	Ic TOIHD	12746
45950	RW	Parameter #48	UINT16	I4 TOIHD	12747
45951	RW	Parameter #49	UINT16	Ua TEIHD	12735
45952	RW	Parameter #50	UINT16	Ub TEIHD	12736
45953	RW	Parameter #51	UINT16	Uc TEIHD	12737
45954	RW	Parameter #52	UINT16	U4 TEIHD	12738
45955	RW	Parameter #53	UINT16	Ia TEIHD	12749
45956	RW	Parameter #54	UINT16	Ib TEIHD	12750

45957	RW	Parameter #55	UINT16	Ic TEIHD	12751
45958	RW	Parameter #56	UINT16	I4 TEIHD	12752
45959~ 45966	RW	Parameter #57~ Parameter 64	UINT16	Reserved	0

Table 5-93 SDR #3 Setup

5.12.7.4 SDR #4

Register	Property	Description	Format	Range/Options	Default
46000	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10
46001	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
46002	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	63
46003	RW	Parameter #1	UINT16	Ua TH RMS	11076
46004	RW	Parameter #2	UINT16	Ub TH RMS	11077
46005	RW	Parameter #3	UINT16	Uc TH RMS	11078
46006	RW	Parameter #4	UINT16	U4 TH RMS	11079
46007	RW	Parameter #5	UINT16	Ia TH RMS	11088
46008	RW	Parameter #6	UINT16	Ib TH RMS	11089
46009	RW	Parameter #7	UINT16	Ic TH RMS	11090
46010	RW	Parameter #8	UINT16	I4 TH RMS	11091
46011	RW	Parameter #9	UINT16	Pa TH	11679
46012	RW	Parameter #10	UINT16	Pb TH	11680
46013	RW	Parameter #11	UINT16	Pc TH	11681
46014	RW	Parameter #12	UINT16	P Total TH	11715
46015	RW	Parameter #13	UINT16	Qa TH	11682
46016	RW	Parameter #14	UINT16	Qb TH	11683
46017	RW	Parameter #15	UINT16	Qc TH	11684
46018	RW	Parameter #16	UINT16	Q Total TH	11716
46019	RW	Parameter #17	UINT16	Sa TH	11685
46020	RW	Parameter #18	UINT16	Sb TH	11686
46021	RW	Parameter #19	UINT16	Sc TH	11687
46022	RW	Parameter #20	UINT16	S Total TH	11717
46023	RW	Parameter #21	UINT16	PFa TH	11688
46024	RW	Parameter #22	UINT16	PFb TH	11689
46025	RW	Parameter #23	UINT16	PFc TH	11690
46026	RW	Parameter #24	UINT16	PF TH	11718
46027	RW	Parameter #25	UINT16	Ua DC Component	11103
46028	RW	Parameter #26	UINT16	Ub DC Component	11104
46029	RW	Parameter #27	UINT16	Uc DC Component	11105
46030	RW	Parameter #28	UINT16	U4 DC Component	11106
46031	RW	Parameter #29	UINT16	Uab DC Component	15000
46032	RW	Parameter #30	UINT16	Ubc DC Component	15001
46033	RW	Parameter #31	UINT16	Uca DC Component	15002
46034	RW	Parameter #32	UINT16	Ia DC Component	11359
46035	RW	Parameter #33	UINT16	Ib DC Component	11360
46036	RW	Parameter #34	UINT16	Ic DC Component	11361
46037	RW	Parameter #35	UINT16	I4 DC Component	11362
46038	RW	Parameter #36	UINT16	Ua HD01	10504
46039	RW	Parameter #37	UINT16	Ub HD01	10505
46040	RW	Parameter #38	UINT16	Uc HD01	10506
46041	RW	Parameter #39	UINT16	U4 HD01	10507
46042	RW	Parameter #40	UINT16	Ua HD03	10512
46043	RW	Parameter #41	UINT16	Ub HD03	10513
46044	RW	Parameter #42	UINT16	Uc HD03	10514
46045	RW	Parameter #43	UINT16	U4 HD03	10515
46046	RW	Parameter #44	UINT16	Ua HD05	10520
46047	RW	Parameter #45	UINT16	Ub HD05	10521
46048	RW	Parameter #46	UINT16	Uc HD05	10522
46049	RW	Parameter #47	UINT16	U4 HD05	10523
46050	RW	Parameter #48	UINT16	Ua HD07	10528
46051	RW	Parameter #49	UINT16	Ub HD07	10529
46052	RW	Parameter #50	UINT16	Uc HD07	10530
46053	RW	Parameter #51	UINT16	U4 HD07	10531
46054	RW	Parameter #52	UINT16	Ua HD09	10536
46055	RW	Parameter #53	UINT16	Ub HD09	10537
46056	RW	Parameter #54	UINT16	Uc HD09	10538
46057	RW	Parameter #55	UINT16	U4 HD09	10539
46058	RW	Parameter #56	UINT16	Ua HD11	10544

46059	RW	Parameter #57	UINT16	Ub HD11	10545
46060	RW	Parameter #58	UINT16	Uc HD11	10546
46061	RW	Parameter #59	UINT16	U4 HD11	10547
46062	RW	Parameter #60	UINT16	Ua HD13	10552
46063	RW	Parameter #61	UINT16	Ub HD13	10553
46064	RW	Parameter #62	UINT16	Uc HD13	10554
46065	RW	Parameter #63	UINT16	U4 HD13	10555
46066	RW	Parameter #64	UINT16	Reserved	0

Table 5-94 SDR #4 Setup

5.12.7.5 SDR #5

Register	Property	Description	Format	Range/Options	Default
46100	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10
46101	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
46102	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	64
46103	RW	Parameter #1	UINT16	Ua HD15	10560
46104	RW	Parameter #2	UINT16	Ub HD15	10561
46105	RW	Parameter #3	UINT16	Uc HD15	10562
46106	RW	Parameter #4	UINT16	U4 HD15	10563
46107	RW	Parameter #5	UINT16	Ua HD17	10568
46108	RW	Parameter #6	UINT16	Ub HD17	10569
46109	RW	Parameter #7	UINT16	Uc HD17	10570
46110	RW	Parameter #8	UINT16	U4 HD17	10571
46111	RW	Parameter #9	UINT16	Ua HD19	10576
46112	RW	Parameter #10	UINT16	Ub HD19	10577
46113	RW	Parameter #11	UINT16	Uc HD19	10578
46114	RW	Parameter #12	UINT16	U4 HD19	10579
46115	RW	Parameter #13	UINT16	Ua HD21	10584
46116	RW	Parameter #14	UINT16	Ub HD21	10585
46117	RW	Parameter #15	UINT16	Uc HD21	10586
46118	RW	Parameter #16	UINT16	U4 HD21	10587
46119	RW	Parameter #17	UINT16	Ua HD23	10592
46120	RW	Parameter #18	UINT16	Ub HD23	10593
46121	RW	Parameter #19	UINT16	Uc HD23	10594
46122	RW	Parameter #20	UINT16	U4 HD23	10595
46123	RW	Parameter #21	UINT16	Ua HD25	10600
46124	RW	Parameter #22	UINT16	Ub HD25	10601
46125	RW	Parameter #23	UINT16	Uc HD25	10602
46126	RW	Parameter #24	UINT16	U4 HD25	10603
46127	RW	Parameter #25	UINT16	Ua HD27	10608
46128	RW	Parameter #26	UINT16	Ub HD27	10609
46129	RW	Parameter #27	UINT16	Uc HD27	10610
46130	RW	Parameter #28	UINT16	U4 HD27	10611
46131	RW	Parameter #29	UINT16	Ua HD29	10616
46132	RW	Parameter #30	UINT16	Ub HD29	10617
46133	RW	Parameter #31	UINT16	Uc HD29	10618
46134	RW	Parameter #32	UINT16	U4 HD29	10619
46135	RW	Parameter #33	UINT16	Ua HD31	10624
46136	RW	Parameter #34	UINT16	Ub HD31	10625
46137	RW	Parameter #35	UINT16	Uc HD31	10626
46138	RW	Parameter #36	UINT16	U4 HD31	10627
46139	RW	Parameter #37	UINT16	Ua HD33	10632
46140	RW	Parameter #38	UINT16	Ub HD33	10633
46141	RW	Parameter #39	UINT16	Uc HD33	10634
46142	RW	Parameter #40	UINT16	U4 HD33	10635
46143	RW	Parameter #41	UINT16	Ua HD35	10640
46144	RW	Parameter #42	UINT16	Ub HD35	10641
46145	RW	Parameter #43	UINT16	Uc HD35	10642
46146	RW	Parameter #44	UINT16	U4 HD35	10643
46147	RW	Parameter #45	UINT16	Ua HD37	10648
46148	RW	Parameter #46	UINT16	Ub HD37	10649
46149	RW	Parameter #47	UINT16	Uc HD37	10650
46150	RW	Parameter #48	UINT16	U4 HD37	10651
46151	RW	Parameter #49	UINT16	Ua HD39	10656
46152	RW	Parameter #50	UINT16	Ub HD39	10657
46153	RW	Parameter #51	UINT16	Uc HD39	10658
46154	RW	Parameter #52	UINT16	U4 HD39	10659

46155	RW	Parameter #53	UINT16	Ua HD41	10664
46156	RW	Parameter #54	UINT16	Ub HD41	10665
46157	RW	Parameter #55	UINT16	Uc HD41	10666
46158	RW	Parameter #56	UINT16	U4 HD41	10667
46159	RW	Parameter #57	UINT16	Ua HD43	10672
46160	RW	Parameter #58	UINT16	Ub HD43	10673
46161	RW	Parameter #59	UINT16	Uc HD43	10674
46162	RW	Parameter #60	UINT16	U4 HD43	10675
46163	RW	Parameter #61	UINT16	Ua HD45	10680
46164	RW	Parameter #62	UINT16	Ub HD45	10681
46165	RW	Parameter #63	UINT16	Uc HD45	10682
46166	RW	Parameter #64	UINT16	U4 HD45	10683

Table 5-95 SDR #5 Setup

5.12.7.6 SDR #6

Register	Property	Description	Format	Range/Options	Default
46200	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10
46201	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
46202	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	62
46203	RW	Parameter #1	UINT16	Ua HD47	10688
46204	RW	Parameter #2	UINT16	Ub HD47	10689
46205	RW	Parameter #3	UINT16	Uc HD47	10690
46206	RW	Parameter #4	UINT16	U4 HD47	10691
46207	RW	Parameter #5	UINT16	Ua HD49	10696
46208	RW	Parameter #6	UINT16	Ub HD49	10697
46209	RW	Parameter #7	UINT16	Uc HD49	10698
46210	RW	Parameter #8	UINT16	U4 HD49	10699
46211	RW	Parameter #9	UINT16	Ia HD03	10771
46212	RW	Parameter #10	UINT16	Ib HD03	10772
46213	RW	Parameter #11	UINT16	Ic HD03	10773
46214	RW	Parameter #12	UINT16	Ia HD05	10781
46215	RW	Parameter #13	UINT16	Ib HD05	10782
46216	RW	Parameter #14	UINT16	Ic HD05	10783
46217	RW	Parameter #15	UINT16	Ia HD07	10791
46218	RW	Parameter #16	UINT16	Ib HD07	10792
46219	RW	Parameter #17	UINT16	Ic HD07	10793
46220	RW	Parameter #18	UINT16	Ia HD09	10801
46221	RW	Parameter #19	UINT16	Ib HD09	10802
46222	RW	Parameter #20	UINT16	Ic HD09	10803
46223	RW	Parameter #21	UINT16	Ia HD11	10811
46224	RW	Parameter #22	UINT16	Ib HD11	10812
46225	RW	Parameter #23	UINT16	Ic HD11	10813
46226	RW	Parameter #24	UINT16	Ia HD13	10821
46227	RW	Parameter #25	UINT16	Ib HD13	10822
46228	RW	Parameter #26	UINT16	Ic HD13	10823
46229	RW	Parameter #27	UINT16	Ia HD15	10831
46230	RW	Parameter #28	UINT16	Ib HD15	10832
46231	RW	Parameter #29	UINT16	Ic HD15	10833
46232	RW	Parameter #30	UINT16	Ia HD17	10841
46233	RW	Parameter #31	UINT16	Ib HD17	10842
46234	RW	Parameter #32	UINT16	Ic HD17	10843
46235	RW	Parameter #33	UINT16	Ia HD19	10851
46236	RW	Parameter #34	UINT16	Ib HD19	10852
46237	RW	Parameter #35	UINT16	Ic HD19	10853
46238	RW	Parameter #36	UINT16	Ia HD21	10861
46239	RW	Parameter #37	UINT16	Ib HD21	10862
46240	RW	Parameter #38	UINT16	Ic HD21	10863
46241	RW	Parameter #39	UINT16	Ia HD23	10871
46242	RW	Parameter #40	UINT16	Ib HD23	10872
46243	RW	Parameter #41	UINT16	Ic HD23	10873
46244	RW	Parameter #42	UINT16	Ia HD25	10881
46245	RW	Parameter #43	UINT16	Ib HD25	10882
46246	RW	Parameter #44	UINT16	Ic HD25	10883
46247	RW	Parameter #45	UINT16	Ia HD27	10891
46248	RW	Parameter #46	UINT16	Ib HD27	10892
46249	RW	Parameter #47	UINT16	Ic HD27	10893
46250	RW	Parameter #48	UINT16	Ia HD29	10901

46251	RW	Parameter #49	UINT16	Ib HD29	10902
46252	RW	Parameter #50	UINT16	Ic HD29	10903
46253	RW	Parameter #51	UINT16	Ia HD31	10911
46254	RW	Parameter #52	UINT16	Ib HD31	10912
46255	RW	Parameter #53	UINT16	Ic HD31	10913
46256	RW	Parameter #54	UINT16	Ia HD33	10921
46257	RW	Parameter #55	UINT16	Ib HD33	10922
46258	RW	Parameter #56	UINT16	Ic HD33	10923
46259	RW	Parameter #57	UINT16	Ia HD35	10931
46260	RW	Parameter #58	UINT16	Ib HD35	10932
46261	RW	Parameter #59	UINT16	Ic HD35	10933
46262	RW	Parameter #60	UINT16	Ia HD37	10941
46263	RW	Parameter #61	UINT16	Ib HD37	10942
46264	RW	Parameter #62	UINT16	Ic HD37	10943
46265~ 46266	RW	Parameter #63~ Parameter #64	UINT16	Reserved	0

Table 5-96 SDR #6 Setup

5.12.7.7 SDR #7

Register	Property	Description	Format	Range/Options	Default
46300	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10
46301	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
46302	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	62
46303	RW	Parameter #1	UINT16	Ia HD39	10951
46304	RW	Parameter #2	UINT16	Ib HD39	10952
46305	RW	Parameter #3	UINT16	Ic HD39	10953
46306	RW	Parameter #4	UINT16	Ia HD41	10961
46307	RW	Parameter #5	UINT16	Ib HD41	10962
46308	RW	Parameter #6	UINT16	Ic HD41	10963
46309	RW	Parameter #7	UINT16	Ia HD43	10971
46310	RW	Parameter #8	UINT16	Ib HD43	10972
46311	RW	Parameter #9	UINT16	Ic HD43	10973
46312	RW	Parameter #10	UINT16	Ia HD45	10981
46313	RW	Parameter #11	UINT16	Ib HD45	10982
46314	RW	Parameter #12	UINT16	Ic HD45	10983
46315	RW	Parameter #13	UINT16	Ia HD47	10991
46316	RW	Parameter #14	UINT16	Ib HD47	10992
46317	RW	Parameter #15	UINT16	Ic HD47	10993
46318	RW	Parameter #16	UINT16	Ia HD49	11001
46319	RW	Parameter #17	UINT16	Ib HD49	11002
46320	RW	Parameter #18	UINT16	Ic HD49	11003
46321	RW	Parameter #19	UINT16	Ia H03 RMS	11374
46322	RW	Parameter #20	UINT16	Ib H03 RMS	11375
46323	RW	Parameter #21	UINT16	Ic H03 RMS	11376
46324	RW	Parameter #22	UINT16	I4 H03 RMS	11377
46325	RW	Parameter #23	UINT16	Ia H05 RMS	11384
46326	RW	Parameter #24	UINT16	Ib H05 RMS	11385
46327	RW	Parameter #25	UINT16	Ic H05 RMS	11386
46328	RW	Parameter #26	UINT16	I4 H05 RMS	11387
46329	RW	Parameter #27	UINT16	Ia H07 RMS	11394
46330	RW	Parameter #28	UINT16	Ib H07 RMS	11395
46331	RW	Parameter #29	UINT16	Ic H07 RMS	11396
46332	RW	Parameter #30	UINT16	I4 H07 RMS	11397
46333	RW	Parameter #31	UINT16	Ia H09 RMS	11404
46334	RW	Parameter #32	UINT16	Ib H09 RMS	11405
46335	RW	Parameter #33	UINT16	Ic H09 RMS	11406
46336	RW	Parameter #34	UINT16	I4 H09 RMS	11407
46337	RW	Parameter #35	UINT16	Ia H11 RMS	11414
46338	RW	Parameter #36	UINT16	Ib H11 RMS	11415
46339	RW	Parameter #37	UINT16	Ic H11 RMS	11416
46340	RW	Parameter #38	UINT16	I4 H11 RMS	11417
46341	RW	Parameter #39	UINT16	Ia H13 RMS	11424
46342	RW	Parameter #40	UINT16	Ib H13 RMS	11425
46343	RW	Parameter #41	UINT16	Ic H13 RMS	11426
46344	RW	Parameter #42	UINT16	I4 H13 RMS	11427
46345	RW	Parameter #43	UINT16	Ia H15 RMS	11434
46346	RW	Parameter #44	UINT16	Ib H15 RMS	11435

46347	RW	Parameter #45	UINT16	Ic H15 RMS	11436
46348	RW	Parameter #46	UINT16	I4 H15 RMS	11437
46349	RW	Parameter #47	UINT16	Ia H17 RMS	11444
46350	RW	Parameter #48	UINT16	Ib H17 RMS	11445
46351	RW	Parameter #49	UINT16	Ic H17 RMS	11446
46352	RW	Parameter #50	UINT16	I4 H17 RMS	11447
46353	RW	Parameter #51	UINT16	Ia H19 RMS	11454
46354	RW	Parameter #52	UINT16	Ib H19 RMS	11455
46355	RW	Parameter #53	UINT16	Ic H19 RMS	11456
46356	RW	Parameter #54	UINT16	I4 H19 RMS	11457
46357	RW	Parameter #55	UINT16	Ia H21 RMS	11464
46358	RW	Parameter #56	UINT16	Ib H21 RMS	11465
46359	RW	Parameter #57	UINT16	Ic H21 RMS	11466
46360	RW	Parameter #58	UINT16	I4 H21 RMS	11467
46361	RW	Parameter #59	UINT16	Ia H23 RMS	11474
46362	RW	Parameter #60	UINT16	Ib H23 RMS	11475
46363	RW	Parameter #61	UINT16	Ic H23 RMS	11476
46364	RW	Parameter #62	UINT16	I4 H23 RMS	11477
46365~ 46366	RW	Parameter #63~ Parameter #64	UINT16	Reserved	0

Table 5-97 SDR #7 Setup

5.12.7.8 SDR #8

Register	Property	Description	Format	Range/Options	Default
46400	RW	Recording Interval	UINT16	0 to 60 min (0 means disabled)	10
46401	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out	1
46402	RW	# of Parameters	UINT16	0 to 64 (0 means disabled)	58
46403	RW	Parameter #1	UINT16	Ia H25 RMS	11484
46404	RW	Parameter #2	UINT16	Ib H25 RMS	11485
46405	RW	Parameter #3	UINT16	Ic H25 RMS	11486
46406	RW	Parameter #4	UINT16	I4 H25 RMS	11487
46407	RW	Parameter #5	UINT16	Ia H27 RMS	11494
46408	RW	Parameter #6	UINT16	Ib H27 RMS	11495
46409	RW	Parameter #7	UINT16	Ic H27 RMS	11496
46410	RW	Parameter #8	UINT16	I4 H27 RMS	11497
46411	RW	Parameter #9	UINT16	Ia H29 RMS	11504
46412	RW	Parameter #10	UINT16	Ib H29 RMS	11505
46413	RW	Parameter #11	UINT16	Ic H29 RMS	11506
46414	RW	Parameter #12	UINT16	I4 H29 RMS	11507
46415	RW	Parameter #13	UINT16	Ia H31 RMS	11514
46416	RW	Parameter #14	UINT16	Ib H31 RMS	11515
46417	RW	Parameter #15	UINT16	Ic H31 RMS	11516
46418	RW	Parameter #16	UINT16	I4 H31 RMS	11517
46419	RW	Parameter #17	UINT16	Ia H33 RMS	11524
46420	RW	Parameter #18	UINT16	Ib H33 RMS	11525
46421	RW	Parameter #19	UINT16	Ic H33 RMS	11526
46422	RW	Parameter #20	UINT16	I4 H33 RMS	11527
46423	RW	Parameter #21	UINT16	Ia H35 RMS	11534
46424	RW	Parameter #22	UINT16	Ib H35 RMS	11535
46425	RW	Parameter #23	UINT16	Ic H35 RMS	11536
46426	RW	Parameter #24	UINT16	I4 H35 RMS	11537
46427	RW	Parameter #25	UINT16	Ia H37 RMS	11544
46428	RW	Parameter #26	UINT16	Ib H37 RMS	11545
46429	RW	Parameter #27	UINT16	Ic H37 RMS	11546
46430	RW	Parameter #28	UINT16	I4 H37 RMS	11547
46431	RW	Parameter #29	UINT16	Ia H39 RMS	11554
46432	RW	Parameter #30	UINT16	Ib H39 RMS	11555
46433	RW	Parameter #31	UINT16	Ic H39 RMS	11556
46434	RW	Parameter #32	UINT16	I4 H39 RMS	11557
46435	RW	Parameter #33	UINT16	Ia H41 RMS	11564
46436	RW	Parameter #34	UINT16	Ib H41 RMS	11565
46437	RW	Parameter #35	UINT16	Ic H41 RMS	11566
46438	RW	Parameter #36	UINT16	I4 H41 RMS	11567
46439	RW	Parameter #37	UINT16	Ia H43 RMS	11574
46440	RW	Parameter #38	UINT16	Ib H43 RMS	11575
46441	RW	Parameter #39	UINT16	Ic H43 RMS	11576
46442	RW	Parameter #40	UINT16	I4 H43 RMS	11577

46443	RW	Parameter #41	UINT16	Ia H45 RMS	11584
46444	RW	Parameter #42	UINT16	Ib H45 RMS	11585
46445	RW	Parameter #43	UINT16	Ic H45 RMS	11586
46446	RW	Parameter #44	UINT16	I4 H45 RMS	11587
46447	RW	Parameter #45	UINT16	Ia H47 RMS	11594
46448	RW	Parameter #46	UINT16	Ib H47 RMS	11595
46449	RW	Parameter #47	UINT16	Ic H47 RMS	11596
46450	RW	Parameter #48	UINT16	I4 H47 RMS	11597
46451	RW	Parameter #49	UINT16	Ia H49 RMS	11604
46452	RW	Parameter #50	UINT16	Ib H49 RMS	11605
46453	RW	Parameter #51	UINT16	Ic H49 RMS	11606
46454	RW	Parameter #52	UINT16	I4 H49 RMS	11607
46455	RW	Parameter #53	UINT16	Ua Pst	50001
46456	RW	Parameter #54	UINT16	Ub Pst	50002
46457	RW	Parameter #55	UINT16	Uc Pst	50003
46458	RW	Parameter #56	UINT16	Ua Plt	50004
46459	RW	Parameter #57	UINT16	Ub Plt	50005
46460	RW	Parameter #58	UINT16	Uc Plt	50006
46455~ 46466	RW	Parameter #53~ Parameter #64	UINT16	Reserved	0

Table 5-98 SDR #8 Setup

5.12.8 MMR Setup

5.12.8.1 MMR #1

Register		Property	Description	Format	Range/Options	Default
Max.	Min.					
48900	49301	RW	Self-read Time	UINT16	See Note 1	0xFFFF
48901	49302	RW	# of Parameters	UINT16	0 to 20	19
48902	49303	RW	Parameter #1	UINT16	Uab	10007
48903	49304	RW	Parameter #2	UINT16	Ubc	10008
48904	49305	RW	Parameter #3	UINT16	Uca	10009
48905	49306	RW	Parameter #4	UINT16	Ull avg	10010
48906	49307	RW	Parameter #5	UINT16	Ia	10011
48907	49308	RW	Parameter #6	UINT16	Ib	10012
48908	49309	RW	Parameter #7	UINT16	Ic	10013
48909	49310	RW	Parameter #8	UINT16	I avg	10015
48910	49311	RW	Parameter #9	UINT16	P Total	10020
48911	49312	RW	Parameter #10	UINT16	Q Total	10024
48912	49313	RW	Parameter #11	UINT16	S Total	10028
48913	49314	RW	Parameter #12	UINT16	PF Total	10032
48914	49315	RW	Parameter #13	UINT16	Freq	10001
48915	49316	RW	Parameter #14	UINT16	Ua	10002
48916	49317	RW	Parameter #15	UINT16	Ub	10003
48917	49318	RW	Parameter #16	UINT16	Uc	10004
48918	49319	RW	Parameter #17	UINT16	Uln avg	10006
48919	49320	RW	Parameter #18	UINT16	U4	10005
48920	49321	RW	Parameter #19	UINT16	I4	10014
48921	49301	RW	Parameter #20	UINT16	Reserved	0

Table 5-99 MMR #1 Setup

5.12.8.2 MMR #2

Register		Property	Description	Format	Range/Options	Default
Max.	Min.					
49000	49400	RW	Self-read Time	UINT16	See Note 1	0xFFFF
49001	49401	RW	# of Parameters	UINT16	0 to 20	16
49002	49402	RW	Parameter #1	UINT16	Pa	10017
49003	49403	RW	Parameter #2	UINT16	Pb	10018
49004	49404	RW	Parameter #3	UINT16	Pc	10019
49005	49405	RW	Parameter #4	UINT16	Qa	10021
49006	49406	RW	Parameter #5	UINT16	Qb	10022
49007	49407	RW	Parameter #6	UINT16	Qc	10023
49008	49408	RW	Parameter #7	UINT16	Sa	10025
49009	49409	RW	Parameter #8	UINT16	Sb	10026
49010	49410	RW	Parameter #9	UINT16	Sc	10027
49011	49411	RW	Parameter #10	UINT16	PFa	10029
49012	49412	RW	Parameter #11	UINT16	PFb	10030

49013	49413	RW	Parameter #12	UINT16	PFc	10031
49014	49414	RW	Parameter #13	UINT16	U0 Unb.	10055
49015	49415	RW	Parameter #14	UINT16	I0 Unb.	10056
49016	49416	RW	Parameter #15	UINT16	U2 Unb.	10057
49017	49417	RW	Parameter #16	UINT16	I2 Unb.	10058
49018	49418	RW	Parameter #17	UINT16	I Residual	56000
49019	49419	RW	Parameter #18	UINT16	RTD	56001
49020	49420	RW	Parameter #19	UINT16	AI1	55000
49021	49421	RW	Parameter #20	UINT16	AI2	55001

Table 5-100 MMR #2 Setup

5.12.8.3 MMR #3

Register		Property	Description	Format	Range/Options	Default
Max.	Min.					
49100	49500	RW	Self-read Time	UINT16	See Note 1	0xFFFF
49101	49501	RW	# of Parameters	UINT16	0 to 20	18
49102	49502	RW	Parameter #1	UINT16	Ua THD	10103
49103	49503	RW	Parameter #2	UINT16	Ub THD	10104
49104	49504	RW	Parameter #3	UINT16	Uc THD	10105
49105	49505	RW	Parameter #4	UINT16	Ia THD	10115
49106	49506	RW	Parameter #5	UINT16	Ib THD	10116
49107	49507	RW	Parameter #6	UINT16	Ic THD	10117
49108	49508	RW	Parameter #7	UINT16	Ia TDD	10065
49109	49509	RW	Parameter #8	UINT16	Ib TDD	10066
49110	49510	RW	Parameter #9	UINT16	Ic TDD	10067
49111	49511	RW	Parameter #10	UINT16	Ia K-Factor	10080
49112	49512	RW	Parameter #11	UINT16	Ib K-Factor	10081
49113	49513	RW	Parameter #12	UINT16	Ic K-Factor	10082
49114	49514	RW	Parameter #13	UINT16	Ua Crest Factor	10090
49115	49515	RW	Parameter #14	UINT16	Ub Crest Factor	10091
49116	49516	RW	Parameter #15	UINT16	Uc Crest Factor	10092
49117	49517	RW	Parameter #16	UINT16	Ia Crest Factor	10085
49118	49518	RW	Parameter #17	UINT16	Ib Crest Factor	10086
49119	49519	RW	Parameter #18	UINT16	Ic Crest Factor	10087
49120~ 49121	49520~ 49521	RW	Parameter #19~ Parameter #20	UINT16	Reserved	0

Table 5-101 MMR #3 Setup

5.12.8.4 MMR #4

Register		Property	Description	Format	Range/Options	Default
Max.	Min.					
49200	49600	RW	Self-read Time	UINT16	See Note 1	0xFFFF
49201	49601	RW	# of Parameters	UINT16	0 to 20	20
49202	49602	RW	Parameter #1	UINT16	U0 (Zero Sequence)	10059
49203	49603	RW	Parameter #2	UINT16	U1 (+ve Sequence)	10061
49204	49604	RW	Parameter #3	UINT16	U2 (-ve Sequence)	10060
49205	49605	RW	Parameter #4	UINT16	I0 (Zero Sequence)	10062
49206	49606	RW	Parameter #5	UINT16	I1 (+ve Sequence)	10064
49207	49607	RW	Parameter #6	UINT16	I2 (-ve Sequence)	10063
49208	49608	RW	Parameter #7	UINT16	Ua Pst	50001
49209	49609	RW	Parameter #8	UINT16	Ub Pst	50002
49210	49610	RW	Parameter #9	UINT16	Uc Pst	50003
49211	49611	RW	Parameter #10	UINT16	Ua Plt	50004
49212	49612	RW	Parameter #11	UINT16	Ub Plt	50005
49213	49613	RW	Parameter #12	UINT16	Uc Plt	50006
49214	49614	RW	Parameter #13	UINT16	Uab Deviation	10036
49215	49615	RW	Parameter #14	UINT16	Ubc Deviation	10037
49216	49616	RW	Parameter #15	UINT16	Uca Deviation	10038
49217	49617	RW	Parameter #16	UINT16	Ua Deviation	10033
49218	49618	RW	Parameter #17	UINT16	Ub Deviation	10034
49219	49619	RW	Parameter #18	UINT16	Uc Deviation	10035
49220	49620	RW	Parameter #19	UINT16	Freq. Dev.	10051
49221	49621	RW	Parameter #20	UINT16	Reserved	0

Table 5-102 MMR #4 Setup

Note:

1. 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 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**.

5.12.9 IER & AER Setup

Register		Property	Description		Format	Range, Default*
IER	AER					
49700	49730	RW	Recording Mode		UINT16	0=Disabled 1=Stop-When-Full 2=First-In-First-Out*
49701	49731	--	Reserved		--	--
49702	49732	--	Reserved		--	--
49703	49733	RW	Recording Interval		UINT16	1 to 65535min, 15*
49704 ~ 49706	49734 ~ 49736	RW	Start Time	High-order Byte: Year	UINT16	0-99 (Year-2000)
				Low-order Byte: Month		1 to 12
				High-order Byte: Day	UINT16	1 to 31
				Low-order Byte: Hour		0 to 23
				High-order Byte: Minute	UINT16	0 to 59
				Low-order Byte: Second		0 to 59

Table 5-103 IER & AER Setup

5.12.10 EN50160 Setup

The default values in **Table 5-105 EN50160 Parameters Setup** may be different for LV, MV and HV levels such that it's required to set **Register 49790 Voltage Level** first.

5.12.10.1 Basic

Register	Property	Description	Format	Range, Default*
49790	RW	Voltage Level	UINT16	0=LV*, 1=MV, 2=HV
49791	RW	Start Week	UINT16	0=Sunday* 1~6=Monday to Saturday

Table 5-104 EN50160 Basic Setup

5.12.10.2 EN50160 Parameters

Register	Property	Description	Format	Default* (%)
49800	RW	Freq Wide Tolerance	Float	1.0
49802	RW	Freq Positive Deviation Wide Limit	Float	1.04
49804	RW	Freq Negative Deviation Wide Limit	Float	0.94
49806	RW	Freq Narrow Tolerance	Float	0.995
49808	RW	Freq Positive Deviation Narrow Limit	Float	1.01
49810	RW	Freq Negative Deviation Narrow Limit	Float	0.99
49812	RW	Voltage Wide Tolerance	Float	1.0
49814	RW	Voltage Positive Deviation Wide Limit	Float	LV: 1.1, MV/LV: 1.15
49816	RW	Voltage Negative Deviation Wide Limit	Float	0.85
49818	RW	Voltage Narrow Tolerance	Float	LV: 0.95, MV/HV: 0.99
49820	RW	Voltage Positive Deviation Narrow Limit	Float	1.1
49822	RW	Voltage Negative Deviation Narrow Limit	Float	0.9
49824	RW	Flicker Tolerance	Float	0.95
49826	RW	Flicker Limit	Float	1
49828	RW	Voltage Unbalance Tolerance	Float	0.95
49830	RW	Voltage Unbalance Limit	Float	0.02
49832	RW	Harmonic Voltage Tolerance	Float	0.95
49834	RW	THD Limit	Float	0.08
49836	--	Reserved	--	--
49838	--	Reserved	--	--
49840	RW	H02 Voltage Limit	Float	LV/MV: 0.02, HV: 0.019
49842	RW	H03 Voltage Limit	Float	LV/MV: 0.05, HV: 0.03
49844	RW	H04 Voltage Limit		0.01
49846	RW	H05 Voltage Limit	Float	LV/MV: 0.06, HV: 0.05
49848	RW	H06 Voltage Limit	Float	0.005
49850	RW	H07 Voltage Limit	Float	LV/MV: 0.05, HV: 0.04
49852	RW	H08 Voltage Limit	Float	0.005

49854	RW	H09 Voltage Limit	Float	LV/MV:0.015, HV: 0.013
49856	RW	H10 Voltage Limit	Float	0.005
49858	RW	H11 Voltage Limit	Float	LV/MV:0.035, HV: 0.03
49860	RW	H12 Voltage Limit	Float	0.005
49862	RW	H13 Voltage Limit	Float	LV/MV:0.03, HV: 0.025
49864	RW	H14 Voltage Limit	Float	0.005
49866	RW	H15 Voltage Limit	Float	0.005
49868	RW	H16 Voltage Limit	Float	0.005
49870	RW	H17 Voltage Limit	Float	0.02
49872	RW	H18 Voltage Limit	Float	0.005
49874	RW	H19 Voltage Limit	Float	0.015
49876	RW	H20 Voltage Limit	Float	0.005
49878	RW	H21 Voltage Limit	Float	0.005
49880	RW	H22 Voltage Limit	Float	0.005
49882	RW	H23 Voltage Limit	Float	0.015
49884	RW	H24 Voltage Limit	Float	0.005
49886	RW	H25 Voltage Limit	Float	0.015

Table 5-105 EN50160 Parameters Setup

5.12.11 TOU Setup

5.12.11.1 Basic

Register	Property	Description	Format	Range, Default*
50100	RW	Sunday Setup	UINT16	0=Weekday1* 1=Weekday2 2=Weekday3
50101	RW	Monday Setup	UINT16	
50102	RW	Tuesday Setup	UINT16	
50103	RW	Wednesday Setup	UINT16	
50104	RW	Thursday Setup	UINT16	
50105	RW	Friday Setup	UINT16	
50106	RW	Saturday Setup	UINT16	
50107	RW	TOU Switch Time	UINT32	See Note 2)
50109	RW	TOU Self-read Time	UINT16	High-order Byte: Day Low-order Byte: Hour

Table 5-106 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 5-107 TOU Switch Time

5.12.11.2 Season Setup

The iMeter D7 has two sets of Season setup parameters. The base addresses for two sets are 50200 and 50300 respectively. Register Address = Base Address + Register Offset, for example, the season #2's start date of second schedule is 50300+4 = 50304.

Offset	Property	Description	Format	Range, Default*
0	RW	Season #1: Start Date[1]	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	
…	RW	…	UINT16	See Season #2: Start Date
…	RW	…	UINT16	0* to 19
…	RW	…	UINT16	
…	RW	…	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 5-108 TOU – Season Setup

Notes:

1) **Start Date** for Season#1 is Jan. 1st and cannot be modified.
2) It is invalid when set **Start Date** as 0xFFFF. If one of season's start time is set as 0xFFFF, then all the later seasons' **Start Date** must be 0xFFFF which means the valid period of last season is from **Start Date** to the end of this year.
3) The previous season must be earlier than the later season.

5.12.11.3 Daily Profile

The iMeter D7 has two sets of Daily Profile setup parameters, one for each TOU.

Register		Property	Description	Format
DP #1	DP #2			
50400~50423	50900~50923	RW	Daily Profile #1	See **Table 5-110 Daily Profile Data Structure Setup**
50424~50447	50924~50947	RW	Daily Profile #2	
50448~50471	50948~50971	RW	Daily Profile #3	
50472~50495	50972~50995	RW	Daily Profile #4	
50496~50519	50996~51019	RW	Daily Profile #5	
50520~50543	51020~51043	RW	Daily Profile #6	
50544~50567	51044~51067	RW	Daily Profile #7	
50568~50591	51068~51091	RW	Daily Profile #8	
50592~50615	51092~50615	RW	Daily Profile #9	
50616~50639	51116~51139	RW	Daily Profile #10	
50640~50663	51140~51163	RW	Daily Profile #11	
50664~50687	51164~51187	RW	Daily Profile #12	
50688~50711	51188~51211	RW	Daily Profile #13	
50712~50735	51212~51235	RW	Daily Profile #14	
50736~50760	51236~51260	RW	Daily Profile #15	
50760~50783	51260~51283	RW	Daily Profile #16	
50784~50807	51284~51307	RW	Daily Profile #17	
50808~50831	51308~51331	RW	Daily Profile #18	
50832~50855	51332~51355	RW	Daily Profile #19	
50856~50879	51356~51379	RW	Daily Profile #20	

Table 5-109 TOU – 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 5-110 Daily Profile Data Structure Setup

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 interval of a period should be 15n (n=1, 2, etc.) minutes.
4) The **Start Time** of a particular Period must be later than the previous Period's.

5.12.11.4 Alternate Days Setup

The Alternate Days has higher priority than season, that means if one day is set as alternate day, then this day's rate distribution will according to Alternate Days schedule.
The iMeter D7 has two sets of Alternate Days setup parameters, one for each TOU. The Base Addresses for the two sets are 51400 and 51700, respectively, where the Register Address = Base Address + Offset. For example, the register address for TOU #2's Alternative Day #2's Date is: 51700+3 = 51703.

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

Table 5-111 TOU – Alternate Days Setup

Notes:
1) The following table illustrate the register of date:

Byte3	Byte2	Byte1	Byte0
Reserved	Year	Month	Day

Table 5-112 Date Format

The Year and Month can be set as **0xFF** which indicates the alternate day is repeated by year or month, that is the day of every year or every month is alternate day.

5.13 Control Setup

5.13.1 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 D7 does not support the Read Coils command (Function Code 0x01) because DO Control registers are "Write-Only". The DO Status register 0310 should be read instead to determine the current DO status.

The iMeter D7 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 (40301), which is enabled by default. Before executing an OPEN or CLOSE command on a Relay Output, it must be "Armed" first. This is achieved by writing the value 0xFF00 to the appropriate register to "Arm" a particular RO operation. The RO 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 Alarm Close	UINT16	Writing "0xFF00"
9101	WO	Execute Alarm Close	UINT16	
9102	WO	Arm Alarm Open	UINT16	
9103	WO	Execute Alarm Open	UINT16	
9104	WO	Arm DO1 Close	UINT16	
9105	WO	Execute DO1 Close	UINT16	
9106	WO	Arm DO1 Open	UINT16	
9107	WO	Execute DO1 Open	UINT16	
9108	WO	Arm DO2 Close	UINT16	
9109	WO	Execute DO2Close	UINT16	
9110	WO	Arm DO2 Open	UINT16	
9111	WO	Execute DO2 Open	UINT16	

Table 5-113 RO Control

5.13.2 Clear/Reset Control

Register	Property	Description	Format	Note
9200	WO	Send Test Email[1]	UINT16	Writing "0xFF00"
9201	WO	Clear DI1 Counter	UINT16	
9202	WO	Clear DI2 Counter	UINT16	
9203	WO	Clear DI3 Counter	UINT16	
9204	WO	Clear DI4 Counter	UINT16	
9205~9216	WO	Reserved	UINT16	
9217	WO	Clear All DI Counters	UINT16	
9218	WO	Reset All DOs to Normal for Front Panel Control	UINT16	
9219	WO	Clear All Data[2]	UINT16	
9220~9225	--	Reserved	--	--
9226	WO	Clear 4G Usage	UINT16	Writing "0xFF00"
9227~9252	--	Reserved	--	--
9253	WO	Manual Trigger WFR	UINT16	Writing "0xFF00"
9254	WO	Manual Trigger RMSR	UINT16	
9255	WO	Manual Trigger DWR	UINT16	
9256	WO	Manual Freeze TOU Log	UINT16	
9257	WO	Manual Trigger TOU Recording	UINT16	
9258	WO	Manual Switch TOU Schedules	UINT16	
9259~9260	--	Reserved	--	--
9261	WO	Clear SOE Log	UINT16	Writing "0xFF00"
9262	WO	Clear PQ Log	UINT16	
9263	WO	Clear Energy Registers[3]	UINT16	
9264	WO	Clear IER Log	UINT16	
9625	WO	Clear AER Log	UINT16	
9266~9274	--	Reserved	--	--
9275	WO	Clear Plt Log	UINT16	Writing "0xFF00"
9276	WO	Clear Pst Log	UINT16	
9277	WO	Clear WFR	UINT16	
9278	WO	Clear DWR	UINT16	
9279~9281	--	Reserved	--	--
9282	WO	Clear All MM Log[4]	UINT16	Writing "0xFF00"
9283	WO	Clear Max. Log #1[5]	UINT16	

9284	WO	Clear Max. Log #2[5]	UINT16	
9285	WO	Clear Max. Log #3[5]	UINT16	
9286	WO	Clear Max. Log #4[5]	UINT16	
9287	--	Reserved	--	--
9288	WO	Clear Min. Log #1[5]	UINT16	Writing "0xFF00"
9289	WO	Clear Min. Log #2[5]	UINT16	
9290	WO	Clear Min. Log #3[5]	UINT16	
9291	WO	Clear Min. Log #4[5]	UINT16	
9292	--	Reserved	--	--
9293	WO	Clear All Demand[6]	UINT16	Writing "0xFF00"
9294	WO	Clear This Max. Demand Log[7]	UINT16	
9295	WO	Clear EN50160 Log	UINT16	
9296	--	Reserved	--	--
9297	WO	Clear SDR Log #1	UINT16	Writing "0xFF00"
9298	WO	Clear SDR Log #2	UINT16	
9299	WO	Clear SDR Log #3	UINT16	
9300	WO	Clear SDR Log #4	UINT16	
9301	WO	Clear SDR Log #5	UINT16	
9302	WO	Clear SDR Log #6	UINT16	
9303	WO	Clear SDR Log #7	UINT16	
9304	WO	Clear SDR Log #8	UINT16	
9305~9312	--	Reserved	--	--
9313	WO	Clear All SDR Logs	UINT16	Writing "0xFF00"
9314~9331	--	Reserved	--	--
9332	WO	Clear Dips Counter	UINT16	Writing "0xFF00"
9333	WO	Clear Swells Counter	UINT16	
9334	WO	Clear Interruptions Counter	UINT16	
9335	WO	Clear Transients Counter	UINT16	
9336	WO	Clear RVC Counter	UINT16	
9337	WO	Clear Inrush Current Counter	UINT16	
9338	--	Reserved	--	--
9339	WO	Clear MSV#1 Counter	UINT16	Writing "0xFF00"
9340	WO	Clear MSV#2 Counter	UINT16	
9341	WO	Clear MSV#3 Counter	UINT16	
9342	WO	Clear All PQ Counter	UINT16	
9343	WO	Clear All TOU Data	UINT16	
9344	WO	Trigger Demo Swell Event	UINT16	
9345	WO	Trigger Demo Dip Event	UINT16	
9346	WO	Trigger Demo Interruption Event	UINT16	
9347	WO	Trigger Demo Transient Event	UINT16	
9348	WO	Trigger Demo Inrush Current Event	UINT16	
9349~9350	--	Reserved	--	--
9351	WO	Clear RMSR	UINT16	Writing "0xFF00"
9352	WO	Clear All Events	UINT16	
9353~9354	WO	Reserved	--	--
9355	WO	Clear 2 – 150 kHz C.E. Reports	UINT16	Writing "0xFF00"

Table 5-114 Clear/Reset Control Setup

Notes:

1. The **Send Test Email** register can verify if the SMTP functions normally providing the SMTP configurations are correct.
2. Writing 0xFF00 to the **Clear All Data** register will clear all the data stored in iMeter D7 and reboot the meter.
3. Writing 0xFF00 to the **Clear Energy Register** will clear all IER and AER logs.
4. Writing 0xFF00 to the **Clear All MM Log** register will clear all Max./Min. Logs (Max Demand Logs are excluded).
5. Writing 0xFF00 to the **Clear Max/Min Log #X** register to clear the Max/Min log of This Month (Since Last Reset) when the **Self-Read Time** register is set for automatic Self-Read operation. The Max/Min log of Last Month will not be cleared. If the **Self-Read Time** register is set for manual operation with a register value of 0xFFFF, the Max/Min log of This Month (Since Last Reset) will be transferred to the Max/Min log of Last Month (Before Last Reset) and then cleared.
6. Writing 0xFF00 to the **Clear All Demand** register to clear the Present/Predicated Demand, as well as This Max./Last Max. Demand.
7. Writing 0xFF00 to the **Clear This Max. Demand** Log register to clear Max. Demand Log of This Month (Since Last Reset) when the **Self-Read Time** register is set for automatic Self-Read operation. The Max. Demand of Last Month will not be cleared. If the **Self-Read Time** register is set for manual operation with a register value of 0xFFFF, the Peak Demand of This Month (Since Last Reset) will be transferred to the Peak Demand of Last Month (Before Last Reset) and then cleared.

5.14 Time Registers

There are two sets of Time registers supported by the iMeter D7 - Year / Month / Day / Hour / Minute / Second (Registers # 60000 to 60002 for 6-digit addressing and Registers # 9000 to 9002 for 5-digit addressing) and UNIX Time

(Registers # 60004 to 600005 for 6-digit addressing and Registers # 9004 to 9005 for 5-digit addressing). When sending time to the iMeter D7 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 (or 9000 to 9004 for 5-digit addressing) 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 (9004) where the time specified in registers 60000 to 60003 (9000-9003 for 5-digit addressing) will be ignored. Writing to the Millisecond register 60003 (9003 for 5-digit addressing) 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.

Address		Property	Description	Format	Range/Note
9000	60000	RW	High-order Byte: Year	UINT16	0-37 (Year-2000)
			Low-order Byte: Month		1 to 12
9001	60001	RW	High-order Byte: Day	UINT16	1 to 31
			Low-order Byte: Hour		0 to 23
9002	60002	RW	High-order Byte: Minute	UINT16	0 to 59
			Low-order Byte: Second		0 to 59
9003	60003	RW	Millisecond	UINT16	0 to 999
9004 ~ 9005	60004 ~ 60005	RW	UINX Time	UINT32	0x386D4380 to 0x 7FE8177F The corresponding time is 2000.01.01 00:00:00 to 2037.12.31 23:59:59 (GMT+00:00 Time Zone)
9006	60006	RO	Time Synchronized Status	UINT16	0=Unsynchronized, 1=Synchronized

Table 5-115 Time Registers

5.15 Information

5.15.1 Meter Information

Register		Property	Description	Format	Note
9800~9819	60200~60219	RO	Meter Model[1]	CHAR	See Note 1
9820	60220	RO	Firmware Version	UINT16	e.g. 11005 shows the version is V1.10.05
9821	60221	RO	Modbus Version	UINT16	e.g. 33 shows the version is V3.3
9822	60222	RO	IEC 61850 Version	UINT16	e.g. 0107 means the version is V01.07 e.g. 0000 means no 61850 support or 61850 version number error
9823	60223	RO	Hardware Version	UINT16	e.g. 10 shows the version is V1.0
9824	60224	RO	Firmware Update Date: Year-2000	UINT16	e.g. 1907012 means July 12, 2019
9825	60225	RO	Firmware Update Date: Month	UINT16	
9826	60226	RO	Firmware Update Date: Day	UINT16	
9827	60227	RO	Serial Number	UINT32	e.g. 1701030100 means the 100th iMeter D7 that was manufactured on January 3rd, 2017
9829	60229	--	Reserved	--	--
9830	60230	RO	Feature Code[2]	UINT32	--
9832	60232	--	Reserved	--	--
9833	60233	--	Device Temperature	Float	°C
9835	60235	RO	PPC Diagnostic Info.	UINT32	Bit0: System Parameters Error Bit1: Secret Parameters Error Bit2: Invalid Bit3: Audit Log ≥ 90% Bit 4 to Bit 7: Invalid Bit8: Memory
9837	60237	RO	DSP Diagnostic Info.	UINT32	Bit0: AD Error
9839	60239	--	Reserved	--	--
9841	60241	--	Reserved	--	--
9843	60243	RO	MAC 1 Address-01	UINT16	0x00A0
9844	60244	RO	MAC 1 Address-23	UINT16	0x1EA0

9845	60245	RO	MAC 1 Address-45	UINT16	0xAAA0
9846	60246	RO	MAC 2 Address-01	UINT16	0x00A0
9847	60247	RO	MAC 2 Address-23	UINT16	0x1EA1
9848	60248	RO	MAC 2 Address-45	UINT16	0xAAA0
9849	60249	RO	Total Memory	UINT16	Units: MB
9850	60250	RO	Available Memory	UINT16	Units: MB
9851	60251	RO	Network Type	UINT16	0=No Service, 1= 2G, 2=3G, 3=4G
9852	60252	RO	Signal Strength	UINT16	0 to 31 (Larger Number means stronger signal)
9853	60253	RO	LAC (Location Area Code)	UINT32	--
9855	60255	RO	CID (Cell ID)	UINT32	--
9857	60257	RO	Monthly Data Usage	INT64	MB
9861	60261	RO	Annual Data Usage	INT64	MB

Table 5-116 Meter Information

Notes:

1. The Meter Model appears in registers 60200 to 60219 and contains the ASCII encoding of the string "iMeter D7" as shown in the following table.

Register	Register	Value (Hex)	ANSCII
9800	60200	0x69	i
9801	60201	0x4D	M
9802	60202	0x65	e
9803	60203	0x74	t
9804	60204	0x65	e
9805	60205	0x72	r
9806	60206	0x20	<space>
9807	60207	0x44	D
9808	60208	0x37	7
9809	60209	0x2D	-
9810	60210	0x41	A
9811	60211	0x35	5
9812	60212	0x39	9
9813	60213	0x32	2
9814	60214	0x35	5
9815	60215	0x41	A
9816	60216	0x58	X
9817	60217	0x41	A
9818	60218	0x45	E
9819	60219	0x00	<Null>

Table 5-117 ASCII Encoding of "iMeter D7-A5925AXAE"

2. The following table illustrates the iMeter D7's Feature Code:

BIT	Description	Value	Meaning
Bit0-Bit1	Basic Feature	00	IEC 61000-4-30 Ed.3 Class A Compliance
		01	IEC 61000-4-30 Ed.3 Class A Compliance with 2-150kHz
Bit2-Bit3	Current Input	00	5A
		01	1A
		10	SCCPA
Bit4-Bit5	Voltage Input	00	400VLN/690VLL +20%
Bit6	Power Supply	00	95-250VAC/DC ± 10%, 47-440Hz
Bit7-Bit8	Frequency	00	50Hz
		01	60Hz
Bit9-Bit10	I/O	00	4DI+3DO
		01	4DI+3SS Pulse Output
Bit11-Bit12	Analog Inputs	00	None
		01	2AI
		10	1IR+1RTD
Bit13-Bit14	Communications	00	2x100BaseT+1xRS-485
		01	2x100BaseT+1xRS-485+4G
Bit15	Language	00	English
		01	Chinese

Table 5-118 Feature Code

5.15.2 Substation Information

Register	Property	Description	Format	Default
40600	RW	Supply Company Tag 1	Char	devTag 0

40630	RW	Supply Company Tag 2	Char	devTag 1
40660	RW	Substation Name	Char	devTag 2
40690	RW	Voltage Level	Char	devTag 3

Table 5-119 Tag Information Circuit Tag Information

5.15.3 Site Information

Register	Property	Description	Format	Note
52000	RW	Circuit Name	Char	Less than 16 characters
52008	RW	Bus Name	Char	
52038	RW	Monitoring Name	Char	
52068	RW	Monitoring Voltage Level	Char	
52098	RW	Assets Management ID	Char	
52128	RW	Monitoring Network ID	Char	
52158	RW	Commissioning Date	Char	
52188	RW	Exclusive Use (Yes/No)	Char	
52218	RW	Minimum Short Circuit Capacity	Char	
52248	RW	Power Supply Capacity	Char	
52278	RW	Customer Usage Agreement	Char	
52308	RW	COMTRADE Tag	Char	Less than 60 characters

Table 5-120 Site Information

Appendix A – Source Parameters for SDR and Max./Min. Recorders

Key ID				Parameter	Key ID				Parameter
50-cycle	150-cycle	10-min	2-hour		50-cycle	150-cycle	10-min	2-hour	
1	10001	20001	30001	Freq.	1674	11674	21674	31674	Ia H63 RMS
2	10002	20002	30002	Ua	1675	11675	21675	31675	Ib H63 RMS
3	10003	20003	30003	Ub	1676	11676	21676	31676	Ic H63 RMS
4	10004	20004	30004	Uc	1677	11677	21677	31677	I4 H63 RMS
5	10005	20005	30005	U4	--	--	--	--	Reserved
6	10006	20006	30006	Uln Avg.	1679	11679	21679	31679	kWa TH
7	10007	20007	30007	Uab	1680	11680	21680	31680	kWb TH
8	10008	20008	30008	Ubc	1681	11681	21681	31681	kWc TH
9	10009	20009	30009	Uca	1682	11682	21682	31682	kvara TH
10	10010	20010	30010	Ull Avg.	1683	11683	21683	31683	kvarb TH
11	10011	20011	30011	Ia	1684	11684	21684	31684	kvarc TH
12	10012	20012	30012	Ib	1685	11685	21685	31685	kVAa TH
13	10013	20013	30013	Ic	1686	11686	21686	31686	kVAb TH
14	10014	20014	30014	I4	1687	11687	21687	31687	kVAc TH
--	--	--	--	Reserved	1688	11688	21688	31688	PFa TH
16	10016	20016	30016	I Avg.	1689	11689	21689	31689	PFb TH
17	10017	20017	30017	kWa	1690	11690	21690	31690	PFc TH
18	10018	20018	30018	kWb	1691	11691	21691	31691	kWa TH SUM
19	10019	20019	30019	kWc	1692	11692	21692	31692	kWb TH SUM
20	10020	20020	30020	kW Total	1693	11693	21693	31693	kWc TH SUM
21	10021	20021	30021	kvara	1694	11694	21694	31694	kvara TH SUM
22	10022	20022	30022	kvarb	1695	11695	21695	31695	kvarb TH SUM
23	10023	20023	30023	kvarc	1696	11696	21696	31696	kvarc TH SUM
24	10024	20024	30024	kvar Total	1697	11697	21697	31697	kVAa TH SUM
25	10025	20025	30025	kVAa	1698	11698	21698	31698	kVAb TH SUM
26	10026	20026	30026	kVAb	1699	11699	21699	31699	kVAc TH SUM
27	10027	20027	30027	kVAc	1703	11703	21703	31703	kWa TH ABS
28	10028	20028	30028	kVA	1704	11704	21704	31704	kWb TH ABS
29	10029	20029	30029	PFa	1705	11705	21705	31705	kWc TH ABS
30	10030	20030	30030	PFb	1706	11706	21706	31706	kvara TH ABS
31	10031	20031	30031	PFc	1707	11707	21707	31707	kvarb TH ABS
32	10032	20032	30032	PF Avg.	1708	11708	21708	31708	kvarc TH ABS
33	10033	20033	30033	Ua Dev.	1709	11709	21709	31709	kVAa TH ABS
34	10034	20034	30034	Ub Dev.	1710	11710	21710	31710	kVAb TH ABS
35	10035	20035	30035	Uc Dev.	1711	11711	21711	31711	kVAc TH ABS
36	10036	20036	30036	Uab Dev.	1715	11715	21715	31715	kW TH
37	10037	20037	30037	Ubc Dev.	1716	11716	21716	31716	kvar TH
38	10038	20038	30038	Uca Dev.	1717	11717	21717	31717	kVA TH
39	10039	20039	30039	Ua Over Dev.	1718	11718	21718	31718	PF Avg. TH
40	10040	20040	30040	Ub Over Dev.	1719	11719	21719	31719	kW Fund.
41	10041	20041	30041	Uc Over Dev.	1720	11720	21720	31720	kvar Fund.
42	10042	20042	30042	Uab Over Dev.	1721	11721	21721	31721	kVA Fund.
43	10043	20043	30043	Ubc Over Dev.	1722	11722	21722	31722	dPF
44	10044	20044	30044	Uca Over Dev.	1723	11723	21723	31723	kW H02
45	10045	20045	30045	Ua Under Dev.	1724	11724	21724	31724	kvar H02
46	10046	20046	30046	Ub Under Dev.	1725	11725	21725	31725	kVA H02
47	10047	20047	30047	Uc Under Dev.	1726	11726	21726	31726	PF Avg. H02
48	10048	20048	30048	Uab Under Dev.	1727	11727	21727	31727	kW H03
49	10049	20049	30049	Ubc Under Dev.	1728	11728	21728	31728	kvar H03
50	10050	20050	30050	Uca Under Dev.	1729	11729	21729	31729	kVA H03
51	10051	20051	30051	Freq. Dev.	1730	11730	21730	31730	PF Avg.H03
--	--	--	--	Reserved	...	...	...	...	...
55	10055	20055	30055	U0 Unb.	1963	11963	21963	31963	kW H62
56	10056	20056	30056	U2 Unb.	1964	11964	21964	31964	kvar H62
57	10057	20057	30057	I0 Unb.	1965	11965	21965	31965	kVA H62
58	10058	20058	30058	I2 Unb.	1966	11966	21966	31966	PF Avg. H62
59	10059	20059	30059	U0	1967	11967	21967	31967	kW H63
60	10060	20060	30060	U2	1968	11968	21968	31968	kvar H63
61	10061	20061	30061	U1	1969	11969	21969	31969	kVA H63
62	10062	20062	30062	I0	1970	11970	21970	31970	PF Avg.H63
63	10063	20063	30063	I2	1971	11971	21971	31971	kWa Fund.
64	10064	20064	30064	I1	1972	11972	21972	31972	kWb Fund.

65	10065	20065	30065	Ia TDD	1973	11973	21973	31973	kWc Fund.
66	10066	20066	30066	Ib TDD	1974	11974	21974	31974	kvara Fund.
67	10067	20067	30067	Ic TDD	1975	11975	21975	31975	kvarb Fund.
68	10068	20068	30068	I4 TDD	1976	11976	21976	31976	kvarc Fund.
--	--	--	--	Reserved	1977	11977	21977	31977	kVAa Fund.
70	10070	20070	30070	Ia TDD Odd	1978	11978	21978	31978	kVAb Fund.
71	10071	20071	30071	Ib TDD Odd	1979	11979	21979	31979	kVAc Fund.
72	10072	20072	30072	Ic TDD Odd	1980	11980	21980	31980	dPFa
73	10073	20073	30073	I4 TDD Odd	1981	11981	21981	31981	dPFb
--	--	--	--	Reserved	1982	11982	21982	31982	dPFc
75	10075	20075	30075	Ia TDD Even	1983	11983	21983	31983	kWa H02
76	10076	20076	30076	Ib TDD Even	1984	11984	21984	31984	kWb H02
77	10077	20077	30077	Ic TDD Even	1985	11985	21985	31985	kWc H02
78	10078	20078	30078	I4 TDD Even	1986	11986	21986	31986	kvara H02
--	--	--	--	Reserved	1987	11987	21987	31987	kvarb H02
80	10080	20080	30080	Ia K-Factor	1988	11988	21988	31988	kvarc H02
81	10081	20081	30081	Ib K-Factor	1989	11989	21989	31989	kVAa H02
82	10082	20082	30082	Ic K-Factor	1990	11990	21990	31990	kVAb H02
83	10083	20083	30083	I4 K-Factor	1991	11991	21991	31991	kVAc H02
--	--	--	--	Reserved	1992	11992	21992	31992	PFa H02
85	10085	20085	30085	Ia Crest Factor	1993	11993	21993	31993	PFb H02
86	10086	20086	30086	Ib Crest Factor	1994	11994	21994	31994	PFc H02
87	10087	20087	30087	Ic Crest Factor	...	...	...	...	...
88	10088	20088	30088	I4 Crest Factor	2715	12715	22715	32715	kWa H63
--	--	--	--	Reserved	2716	12716	22716	32716	kWb H63
90	10090	20090	30090	Ua Crest Factor	2717	12717	22717	32717	kWc H63
91	10091	20091	30091	Ub Crest Factor	2718	12718	22718	32718	kvara H63
92	10092	20092	30092	Uc Crest Factor	2719	12719	22719	32719	kvarb H63
93	10093	20093	30093	U4 Crest Factor	2720	12720	22720	32720	kvarc H63
94	10094	20094	30094	Ua MSV #1	2721	12721	22721	32721	kVAa H63
95	10095	20095	30095	Ub MSV #1	2722	12722	22722	32722	kVAb H63
96	10096	20096	30096	Uc MSV #1	2723	12723	22723	32723	kVAc H63
97	10097	20097	30097	Ua MSV #2	2724	12724	22724	32724	PFa H63
98	10098	20098	30098	Ub MSV #2	2725	12725	22725	32725	PFb H63
99	10099	20099	30099	Uc MSV #2	2726	12726	22726	32726	PFc H63
100	10100	20100	30100	Ua MSV #3	2727	12727	22727	32727	Ua TIHD
101	10101	20101	30101	Ub MSV #3	2728	12728	22728	32728	Ub TIHD
102	10102	20102	30102	Uc MSV #3	2729	12729	22729	32729	Uc TIHD
103	10103	20103	30103	Ua THD	2730	12730	22730	32730	U4 TIHD
104	10104	20104	30104	Ub THD	2731	12731	22731	32731	Ua TOIHD
105	10105	20105	30105	Uc THD	2732	12732	22732	32732	Ub TOIHD
106	10106	20106	30106	U4 THD	2733	12733	22733	32733	Uc TOIHD
107	10107	20107	30107	Ua TOHD	2734	12734	22734	32734	U4 TOIHD
108	10108	20108	30108	Ub TOHD	2735	12735	22735	32735	Ua TEIHD
109	10109	20109	30109	Uc TOHD	2736	12736	22736	32736	Ub TEIHD
110	10110	20110	30110	U4 TOHD	2737	12737	22737	32737	Uc TEIHD
111	10111	20111	30111	Ua TEHD	2738	12738	22738	32738	U4 TEIHD
112	10112	20112	30112	Ub TEHD	2739	12739	22739	32739	Ia TIHD
113	10113	20113	30113	Uc TEHD	2740	12740	22740	32740	Ib TIHD
114	10114	20114	30114	U4 TEHD	2741	12741	22741	32741	Ic TIHD
115	10115	20115	30115	Ia THD	2742	12742	22742	32742	I4 TIHD
116	10116	20116	30116	Ib THD	--	--	--	--	Reserved
117	10117	20117	30117	Ic THD	2744	12744	22744	32744	Ia TOIHD
118	10118	20118	30118	I4 THD	2745	12745	22745	32745	Ib TOIHD
--	--	--	--	Reserved	2746	12746	22746	32746	Ic TOIHD
120	10120	20120	30120	Ia TOHD	2747	12747	22747	32747	I4 TOIHD
121	10121	20121	30121	Ib TOHD	--	--	--	--	Reserved
122	10122	20122	30122	Ic TOHD	2749	12749	22749	32749	Ia TEIHD
123	10123	20123	30123	I4 TOHD	2750	12750	22750	32750	Ib TEIHD
--	--	--	--	Reserved	2751	12751	22751	32751	Ic TEIHD
125	10125	20125	30125	Ia TEHD	2752	12752	22752	32752	I4 TEIHD
126	10126	20126	30126	Ib TEHD	--	--	--	--	Reserved
127	10127	20127	30127	Ic TEHD	2754	12754	22754	32754	Ua IHD00
128	10128	20128	30128	I4 TEHD	2755	12755	22755	32755	Ub IHD00
--	--	--	--	Reserved	2756	12756	22756	32756	Uc IHD00
130	10130	20130	30130	Uab Fund.	2757	12757	22757	32757	U4 IHD00

131	10131	20131	30131	Ubc Fund.	2758	12758	22758	32758	Ua IHD01
132	10132	20132	30132	Uca Fund.	2759	12759	22759	32759	Ub IHD01
--	--	--	--	Reserved	2760	12760	22760	32760	Uc IHD01
500	10500	20500	30500	Ua HD00	2761	12761	22761	32761	U4 IHD01
501	10501	20501	30501	Ub HD00	...	...	...	...	...
502	10502	20502	30502	Uc HD00	3006	13006	23006	33006	Ua IHD63
503	10503	20503	30503	U4 HD00	3007	13007	23007	33007	Ub IHD63
504	10504	20504	30504	Ua HD01	3008	13008	23008	33008	Uc IHD63
505	10505	20505	30505	Ub HD01	3009	13009	23009	33009	U4 IHD63
506	10506	20506	30506	Uc HD01	3010	13010	23010	33010	Ia IHD00
507	10507	20507	30507	U4 HD01	3011	13011	23011	33011	Ib IHD00
...	...	...	...	...	3012	13012	23012	33012	Ic IHD00
748	10748	20748	30748	Ua HD62	3013	13013	23013	33013	I4 IHD00
749	10749	20749	30749	Ub HD62	--	--	--	--	Reserved
750	10750	20750	30750	Uc HD62	3015	13015	23015	33015	Ia IHD01
751	10751	20751	30751	U4 HD62	3016	13016	23016	33016	Ib IHD01
752	10752	20752	30752	Ua HD63	3017	13017	23017	33017	Ic IHD01
753	10753	20753	30753	Ub HD63	3018	13018	23018	33018	I4 IHD01
754	10754	20754	30754	Uc HD63	--	--	--	--	Reserved
755	10755	20755	30755	U4 HD63	...	...	...	...	...
756	10756	20756	30756	Ia HD00	3325	13325	23325	33325	Ia IHD63
757	10757	20757	30757	Ib HD00	3326	13326	23326	33326	Ib IHD63
758	10758	20758	30758	Ic HD00	3327	13327	23327	33327	Ic IHD63
759	10759	20759	30759	I4 HD00	3328	13328	23328	33328	I4 IHD63
--	--	--	--	Reserved	--	--	--	--	Reserved
761	10761	20761	30761	Ia HD01	3330	13330	23330	33330	Ua TIH RMS
762	10762	20762	30762	Ib HD01	3331	13331	23331	33331	Ub TIH RMS
763	10763	20763	30763	Ic HD01	3332	13332	23332	33332	Uc TIH RMS
764	10764	20764	30764	I4 HD01	3333	13333	23333	33333	U4 TIH RMS
--	--	--	--	Reserved	3334	13334	23334	33334	Ua TOIH RMS
...	...	...	...	...	3335	13335	23335	33335	Ub TOIH RMS
1066	11066	21066	31066	Ia HD62	3336	13336	23336	33336	Uc TOIH RMS
1067	11067	21067	31067	Ib HD62	3337	13337	23337	33337	U4 TOIH RMS
1068	11068	21068	31068	Ic HD62	3338	13338	23338	33338	Ua TEIH RMS
1069	11069	21069	31069	I4 HD62	3339	13339	23339	33339	Ub TEIH RMS
--	--	--	--	Reserved	3340	13340	23340	33340	Uc TEIH RMS
1071	11071	21071	31071	Ia HD63	3341	13341	23341	33341	U4 TEIH RMS
1072	11072	21072	31072	Ib HD63	3342	13342	23342	33342	Ia TIH RMS
1073	11073	21073	31073	Ic HD63	3343	13343	23343	33343	Ib TIH RMS
1074	11074	21074	31074	I4 HD63	3344	13344	23344	33344	Ic TIH RMS
--	--	--	--	Reserved	3345	13345	23345	33345	I4 TIH RMS
1076	11076	21076	31076	Ua TH RMS	--	--	--	--	Reserved
1077	11077	21077	31077	Ub TH RMS	3347	13347	23347	33347	Ia TOIH RMS
1078	11078	21078	31078	Uc TH RMS	3348	13348	23348	33348	Ib TOIH RMS
1079	11079	21079	31079	U4 TH RMS	3349	13349	23349	33349	Ic TOIH RMS
1080	11080	21080	31080	Ua TOH RMS	3350	13350	23350	33350	I4 TOIH RMS
1081	11081	21081	31081	Ub TOH RMS	--	--	--	--	Reserved
1082	11082	21082	31082	Uc TOH RMS	3352	13352	23352	33352	Ia TEIH RMS
1083	11083	21083	31083	U4 TOH RMS	3353	13353	23353	33353	Ib TEIH RMS
1084	11084	21084	31084	Ua TEH RMS	3354	13354	23354	33354	Ic TEIH RMS
1085	11085	21085	31085	Ub TEH RMS	3355	13355	23355	33355	I4 TEIH RMS
1086	11086	21086	31086	Uc TEH RMS	--	--	--	--	Reserved
1087	11087	21087	31087	U4 TEH RMS	3357	13357	23357	33357	Ua IH00 RMS
1088	11088	21088	31088	Ia TH RMS	3358	13358	23358	33358	Ub IH00 RMS
1089	11089	21089	31089	Ib TH RMS	3359	13359	23359	33359	Uc IH00 RMS
1090	11090	21090	31090	Ic TH RMS	3360	13360	23360	33360	U4 IH00 RMS
1091	11091	21091	31091	I4 TH RMS	3361	13361	23361	33361	Ua IH01 RMS
--	--	--	--	Reserved	3362	13362	23362	33362	Ub IH01 RMS
1093	11093	21093	31093	Ia TOH RMS	3363	13363	23363	33363	Uc IH01 RMS
1094	11094	21094	31094	Ib TOH RMS	3364	13364	23364	33364	U4 IH01 RMS
1095	11095	21095	31095	Ic TOH RMS	...	...	...	...	...
1096	11096	21096	31096	I4 TOH RMS	3609	13609	23609	33609	Ua IH63 RMS
--	--	--	--	Reserved	3610	13610	23610	33610	Ub IH63 RMS
1098	11098	21098	31098	Ia TEH RMS	3611	13611	23611	33611	Uc IH63 RMS
1099	11099	21099	31099	Ib TEH RMS	3612	13612	23612	33612	U4 IH63 RMS
1100	11100	21100	31100	Ic TEH RMS	3613	13613	23613	33613	Ia IH00 RMS

1101	11101	21101	31101	I4 TEH RMS	3614	13614	23614	33614	Ib IH00 RMS
--	--	--	--	Reserved	3615	13615	23615	33615	Ic IH00 RMS
1103	11103	21103	31103	Ua DC Component	3616	13616	23616	33616	I4 IH00 RMS
1104	11104	21104	31104	Ub DC Component	--	--	--	--	Reserved
1105	11105	21105	31105	Uc DC Component	3618	13618	23618	33618	Ia IH01 RMS
1106	11106	21106	31106	U4 DC Component	3619	13619	23619	33619	Ib IH01 RMS
1107	11107	21107	31107	Ua Fund.	3620	13620	23620	33620	Ic IH01 RMS
1108	11108	21108	31108	Ub Fund.	3621	13621	23621	33621	I4 IH01 RMS
1109	11109	21109	31109	Uc Fund.	--	--	--	--	Reserved
1110	11110	21110	31110	U4 Fund.	…	…	…	…	…
1111	11111	21111	31111	Ua H02 RMS	3928	13928	23928	33928	Ia IH63 RMS
1112	11112	21112	31112	Ub H02 RMS	3929	13929	23929	33929	Ib IH63 RMS
1113	11113	21113	31113	Uc H02 RMS	3930	13930	23930	33930	Ic IH63 RMS
1114	11114	21114	31114	U4 H02 RMS	3931	13931	23931	33931	I4 IH63 RMS
1115	11115	21115	31115	Ua H03 RMS	--	--	--	--	Reserved
1116	11116	21116	31116	Ub H03 RMS	3933	13933	23933	33933	Ua Angle
1117	11117	21117	31117	Uc H03 RMS	3934	13934	23934	33934	Ub Angle
1118	11118	21118	31118	U4 H03 RMS	3935	13935	23935	33935	Uc Angle
…	…	…	…	…	3936	13936	23936	33936	U4 Angle
1351	11351	21351	31351	Ua H62 RMS	3937	13937	23937	33937	Ia Angle
1352	11352	21352	31352	Ub H62 RMS	3938	13938	23938	33938	Ib Angle
1353	11353	21353	31353	Uc H62 RMS	3939	13939	23939	33939	Ic Angle
1354	11354	21354	31354	U4 H62 RMS	3940	13940	23940	33940	I4 Angle
1355	11355	21355	31355	Ua H63 RMS	--	--	--	--	Reserved
1356	11356	21356	31356	Ub H63 RMS	3942	13942	23942	33942	Ua Fund. Angle
1357	11357	21357	31357	Uc H63 RMS	3943	13943	23943	33943	Ub Fund. Angle
1358	11358	21358	31358	U4 H63 RMS	3944	13944	23944	33944	Uc Fund. Angle
1359	11359	21359	31359	Ia DC Component	3945	13945	23945	33945	U4 Fund. Angle
1360	11360	21360	31360	Ib DC Component	3946	13946	23946	33946	Ua H02 Angle
1361	11361	21361	31361	Ic DC Component	3947	13947	23947	33947	Ub H02 Angle
1362	11362	21362	31362	I4 DC Component	3948	13948	23948	33948	Uc H02 Angle
--	--	--	--	Reserved	3949	13949	23949	33949	U4 H02 Angle
1364	11364	21364	31364	Ia Fund.	…	…	…	…	…
1365	11365	21365	31365	Ib Fund.	4190	14190	24190	34190	Ua H63 Angle
1366	11366	21366	31366	Ic Fund.	4191	14191	24191	34191	Ub H63 Angle
1367	11367	21367	31367	I4 Fund.	4192	14192	24192	34192	Uc H63 Angle
--	--	--	--	Reserved	4193	14193	24193	34193	U4 H63 Angle
1369	11369	21369	31369	Ia H02 RMS	4194	14194	24194	34194	Ia Fund. Angle
1370	11370	21370	31370	Ib H02 RMS	4195	14195	24195	34195	Ib Fund. Angle
1371	11371	21371	31371	Ic H02 RMS	4196	14196	24196	34196	Ic Fund. Angle
1372	11372	21372	31372	I4 H02 RMS	4197	14197	24197	34197	I4 Fund. Angle
--	--	--	--	Reserved	--	--	--	--	Reserved
1374	11374	21374	31374	Ia H03 RMS	4199	14199	24199	34199	Ia H02 Angle
1375	11375	21375	31375	Ib H03 RMS	4200	14200	24200	34200	Ib H02 Angle
1376	11376	21376	31376	Ic H03 RMS	4201	14201	24201	34201	Ic H02 Angle
1377	11377	21377	31377	I4 H03 RMS	4202	14202	24202	34202	I4 H02 Angle
--	--	--	--	Reserved	--	--	--	--	Reserved
…	…	…	…	…	…	…	…	…	…
1669	11669	21669	31669	Ia H62 RMS	4504	14504	24504	34504	Ia H63 Angle
1670	11670	21670	31670	Ib H62 RMS	4505	14505	24505	34505	Ib H63 Angle
1671	11671	21671	31671	Ic H62 RMS	4506	14506	24506	34506	Ic H63 Angle
1672	11672	21672	31672	I4 H62 RMS	4507	14507	24507	34507	I4 H63 Angle
--	--	--	--	Reserved					

Notes:

All the parameters' values are single precision float type except energy parameters which are 32-bit signed integer type.

Appendix B – Modbus SOE Classification

Classification	Sub-Classification	Description	Event Value
1=System	0	Power On	None
	1	Power Off	None
	2	Setup Changes	None
	3	Factory Setup Changes	None
	4	Set Clock	None
	5	Clear All Data	None
	6	Restore Factory Defaults	None
	7	Initialize Device	Bit0: 0=Front Panel, 1=Web
	8	Clear Setup Parameters	None
	9	Clear Factory Setup Parameters	None
	10	Clear SOE	None
	11	Clear PQ Log	None
	12	Clear SDR	See Note 1
	15	Clear Energy	None
	16	Clear IER Log	None
	17	Clear DI Counter	See Note 2
	18	Clear Flicker Log	Bit0: 0=Pst, 1=Plt
	19	Clear WFR	None
	20	Clear DWR	None
	22	Clear All MM Log	None
	23	Clear Max. Log	See Note 3
	24	Clear Min. Log	See Note 3
	25	Clear Max. Demand	Bit0: 0=This Max. DMD, 1=All Max. DMD
	26	Clear EN50160 Log	None
	28	Clear PQ Counters	See Note 4
	29	Clear TOU Log	None
	30	Manual Freeze TOU Log	None
	31	Preset TOU Energy Value	None
	32	Manual Trigger TOU Log	None
	33	Switch TOU Schedule	See Note 5
	34	Hardware Alarm	See Note 6
	35	Hardware Normal	None
	37	AI Zero Adjusted	None
	38	Clear RMS Log	None
	39	Format Storage	None
	40	Tariff Switched by DI	See Note 7
	41	Tariff Switch by DI Enabled	Bit0~Bit7: T1 to T8
	42	Tariff Switch by DI Disabled	None
	43	SD Card not inserted!	None
	44	Audit Log > 90% Capacity	None
	45	Audit Log unexpectedly exit	None
	50	Clear AER Log	None
	51	Clear All Events	None
	56	TC Zero Adjusted	None
	57	Ir Zero Adjusted	None
	59	Clear 2 – 150kHz C.E. Report	None
	60	Clear 4G Data Usage	None
2=Standard Setpoint	0	Over Setpoint Active	See Note 8
	1	Over Setpoint Return	See Note 9
	128	Under Setpoint Active	See Note 8
	129	Under Setpoint Return	See Note 9
3=HS Setpoint	0	Over Setpoint Active	See Note 8
	1	Over Setpoint Return	See Note 9
	128	Under Setpoint Active	See Note 8
	129	Under Setpoint Return	See Note 9
4=I/O Changes	0	DI Closed	Bit0~Bit3: DI1 to DI4
	1	DI Opened	
	2	DO Operated by Setpoint	Alarm, DO1 and DO2
	3	DO Released by Setpoint	
	4	DO Operated by HSSP	
	5	DO Released by HSSP	
	6	DO Operated by Remote Control	
	7	DO Released by Remote Control	

	8	DO Released by Impulse Control	See Note 10
	11	DO Operated by DI	Bit0~Bit2: Alarm, DO1 and DO2
	12	DO Released by DI	
	15	DO Operated by Dip/Swell	See Note 11
	16	DO Released by Dip/Swell	
	17	DO Operated by Transient	
	18	DO Released by Transient	
	19	DO Operated by RVC	Bit0~Bit2: Alarm, DO1 and DO2
	20	DO Released by RVC	
	21	DO Operated by Inrush Current	
	22	DO Released by Inrush Current	
	25	DO Operated by Front Panel	
	26	DO Released by Front Panel	
5=WFR	1	WFR Triggered by Dip/Swell	None
	2	WFR Triggered by Transient	
	3	WFR Triggered by Standard Setpoint	B0~B39: Setpoint 1 to 40
	4	WFR Triggered by HS Setpoint	B0~B39: Setpoint 1 to 40
	5	WFR Triggered by DI	Bit0~Bit3: DI1~DI4
	6	WFR Triggered by RVC	None
	7	WFR Triggered by Inrush Current	
	8	WFR Triggered Manually	
	9	Scheduled WFR Triggered	
6=DWR	1	DWR Triggered by Dip/Swell	None
	2	DWR Triggered by Transient	
	3	DWR Triggered by Standard Setpoint	B0~B39: Setpoint 1 to 40
	4	DWR Triggered by HS Setpoint	B0~B39: Setpoint 1 to 40
	5	DWR Triggered by DI	Bit0~Bit3:DI1~DI4
	6	DWR Triggered by RVC	None
	7	DWR Triggered by Inrush Current	
	8	DWR Triggered Manually	
	9	DWR End	
	10	DWR Triggered by Motor Startup	
7=MSV	0	MSV Triggered	Bit0~Bit2=MSV#1~MSV#3
10=RMSR	1	RMSR Triggered by Dip/Swell	None
	2	RMR Triggered by Transient	
	3	RMSR Triggered by Standard Setpoint	B0~B39: Setpoint 1 to 40
	4	RMSR Triggered by HS Setpoint	B0~B39: Setpoint 1 to 40
	5	RMSR Triggered by DI	Bit0~Bit3:DI1~DI4
	6	RMSR Triggered by RVC	None
	7	RMSR Triggered by Inrush Current	
	8	RMSR Triggered Manually	

Notes：

1. The bit value “1” for Bit0 to Bit7 of the returned value indicates the SDR Group 1 to 8 is cleared, respectively. The value “0xFFFFFFFF” means all SDR are cleared.
2. The bit value “1” for Bit0 to Bit 3 of the returned value indicates the DI Counter 1 to 4 is cleared, respectively. The value “0xFFFFFFFF” means all DI Counters are cleared.
3. The bit value “1” for Bit0 to Bit3 of the returned value indicates the Max./Min Recorder 1 to 4 is cleared, respectively.
4. The following table illustrates the detail of the returned value for Clear PQ Counters event with a bit value of “1” meaning clear.

B0	Dip Counter	**B3**	Transient Counter	**B6**	Reserved	**B9**	MSV #3 Counter
B1	Swell Counter	**B4**	RVC Counter	**B7**	MSV #1 Counter	**B10**	All PQ Counters
B2	Interruption Counter	**B5**	Inrush Current Counter	**B8**	MSV #2 Counter		

5. The event value of Switch TOU Schedule are illustrated in the table below:

Value	Description	Value	
1	Switch Schedule 1 to Schedule 2 manually	3	Switch Schedule 1 to Schedule 2 automatically
2	Switch Schedule 2 to Schedule 1 manually	4	Switch Schedule 2 to Schedule 1 automatically

6. The following table illustrates the structure of Hardware Alarm event value occupying 4 registers, with a bit value of “1” meaning Error.

Offset	Format	Description
+0	UINT32	PPC Diagnostic Result, please refer to Register 9835/60235 in **Table 5-116 Meter Information**
+2	UINT32	DSP Diagnostic Result, please refer to Register 9837/60237 in **Table 5-116 Meter Information**

7. The following table illustrates the structure of Tariff Switched by DI event value occupying 4 registers.

Offset	Format	Description
+0	UINT32	No. of Tariff before Switching
+2	UINT32	No. of Tariff after Switching

8. The following table illustrates the structure of Over/Under Setpoint Active event value occupying 6 registers.

Offset	Format	Description
+0	UINT32	Setpoint Parameters, See Table 5-89
+2	FP32	Active Value (Invalid if the Setpoint Parameter is Phase Loss or Phase Reversal)
+4	UINT32	Setpoint Group # (B0~39 for 1~40 Setpoint)

9. The following table illustrates the structure of Over/Under Setpoint Return event value occupying 10 registers.

Offset	Format	Description
+0	UINT32	Setpoint Parameters, See Table 5-89
+2	FP32	Returned Value (Invalid if the Setpoint Parameter is Phase Loss or Phase Reversal)
+4	UINT32	Setpoint Group # (B0~39 for 1~40 Setpoint)
+6	FP32	Max. Magnitude during Setpoint Duration
+8	UINT32	Duration

10. The following table illustrates the structure of DO Released by Impulse Control event value occupying 4 registers.

Offset	Format	Description
+0	UINT32	B0~B2 represents Alarm, DO1 and DO2
+2	UINT32	Pulse Width (x0.1s)

11. The following table illustrates the structure of DO Operated/Released by Dip/Swell/Transient event value occupying 4 registers.

Offset	Format	Description
+0	UINT32	B0~B2 represents Alarm, DO1 and DO2
+2	UINT32	Event Type (0=Transient, 1=Dip, 2=Swell, 3=Interruption)

Appendix C – PQ Log Classification

Classification	Sub-Classification	Description	PQ Value Scale/Option
0X81: Dip/Swell	0	Voltage Swell Start	UINT32 Start Phase Bit0: A Phase, Bit1: B Phase, Bit2: C Phase Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase
	1	Voltage Swell End	FP32: Residual Voltage Max. (%) UINT32: Duration (ms) FP32: Ua Residual FP32: Ub Residual FP32: Uc Residual FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
	2	Voltage Dips Start	UINT32 Start Phase Bit0: A Phase, Bit1: B Phase, Bit2: C Phase Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase
	3	Voltage Dips Swell End	FP32: Residual Voltage Min. (%) UINT32: Duration (ms) FP32: Ua Residual FP32: Ub Residual FP32: Uc Residual FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
	4	Voltage Interruption Start	UINT32 Bit0: A Phase, Bit1: B Phase, Bit2: C Phase Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase
	5	Voltage Interruption End	FP32: Residual Voltage Min. (%) UINT32: Duration (ms) FP32: Ua Residual FP32: Ub Residual FP32: Uc Residual FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
	6	Dips Location Detective	UINT32: Location 0=UpStream, 1=DownStream UINT32: Confidence 0=Low, 1=Middle, 2=High
	7	PQ Disturbance Start	None
	8	PQ Disturbance End	FP32: Ua Residual FP32: Ub Residual FP32: Uc Residual FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
0X82: Transient	0	Voltage Transient	FP32: Disturbance Max./Min. (%) UINT32: Duration (μs) FP32: Ua Disturbance (%) FP32: Ub Disturbance (%) FP32: Uc Disturbance (%)
0X83: Inrush Current	0	Inrush Ia Active	None
	1	Inrush Ib Active	
	2	Inrush Ic Active	
	3	Inrush Ia Inactive	UINT32: Duration (μs) FP32: Phase Current Disturbance (%) FP32: I_{rms} during Disturbance UINT32: Start Time (s) UINT32: Start Time (ms)
	4	Inrush Ib Inactive	
	5	Inrush Ic Inactive	
0X84: RVC	0	Rapid Voltage Change	UINT32: Start Time (s) UINT32: Start Time (ms) UINT32: Duration (ms) FP32: Max. Voltage Change Rate (%) FP32: Voltage Change Rate (%) UINT32 Start Phase Bit0: A Phase, Bit1: B Phase, Bit2: C Phase Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase
0X85: MSV	0/2/4	MSV #1/2/3 Active	FP32: Frequency (Hz) uint32: Phase

			Bit0=Phase A, Bit1= Phase B, Bit2= Phase C Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase
	1/3/5	MSV #1/2/3 Inactive	FP32: Frequency (Hz) FP32: Ua MSV Max. (%) FP32: Ub MSV Max. (%) FP32: Uc MSV Max. (%)

Appendix D – Technical Specifications

Voltage Inputs (V1, V2, V3, VN, V4, V4N)	
Standard (Un)	400VLN/690VLL+ 20%
Range	5V to 200% Un for 400VLN nominal
Overload	2xUn continuous, 4xUn for 1s
Burden	< 0.5VA/per phase
PT Primary	1-1,000,000V
PT Secondary	1-1,500V
V4 Primary	1-1,000,000V
V4 Secondary	1-1,500V
Frequency	40Hz-60Hz @ 50Hz, 48Hz-72Hz @ 60Hz
Current Inputs (I11, I12, I21, I22, I31, I32, I41, I42)	
Standard (In)	5A (Standard), 1A (Optional)
Range	1% to 400% In
Starting Current	0.1% In
Overload	4xIn continuous, 10xIn for 1s
Burden	< 0.5VA/per phase @ 5A < 0.1VA/per phase @ 1A
Optional SCCP Options	Split-Core Current Probe Input @ 500mV
SCCP-50A-500mV	5A/50A (In/Imax), Max. 500mV Output
SCCP-200A-200mV	20A/200A (In/Imax), Max. 200mV Output
SCCP-500A-500mV	500A Imax, Max. 500mV Output
SCCP-5000A-500mV	Selectable 500A/5000A (Imax) Rogowski Coil, Max. 500mV Output
CT Primary	1-30,000A
CT Secondary	1-50A
I4 Primary	1-30,000A
I4 Secondary	1-50A
Power Supply (L+, N-, G)	
Standard	95-250VAC/VDC ± 10%, 47-440 Hz
Burden	< 10W
Digital Inputs (COM, DI1, DI2, DI3, DI4)	
Standard	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Hysteresis	1ms minimum
Optional Form A Relay Outputs (DO11, DO12, DO21, DO22)	
Type	Form A Mechanical Relay
Loading	5A @ 30VDC
Optional Form C Relay Outputs (Alarm 1, 2, 3)	
Type	Form C Mechanical Relay
Loading	8A @ 24VDC
Optional Pulse Outputs (E1+, E1-, E2+, E2-, E3+, E3-)	
Type	Form A Solid State Relay
Isolation	Optical
Max. Load Voltage	30V DC
Max. Forward Current	100mA
Optional Analog Input (AI1+, AI1-, AI2+, AI2-)	
Type	0-20 / 4-20 mA
Overload	24 mA maximum
Optional Residual Current Input (·IR, IR)	
In	0.5mA
Range	10-2000mA
CT Type	Solid-Core or Split-Core Residual Current CT
Optional RTD Temperature Inputs (TC11, TC12)	
RTD Type	2-Wire PT100 (sensor not included)
Range	-40°C to +200°C
Environmental Conditions	
Operating Temp.	-25°C to 70°C
Storage Temp.	-40°C to 85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	63 kPa to 110 kPa
Pollution Degree	2
Measurement Category	CAT III 600V
Mechanical Characteristics	
Mounting	35mm DIN Rail
Unit Dimensions	145*124*77 mm
IP Rating	30

Appendix E – Accuracy Specifications

Parameters	Accuracy	Resolution
Voltage (U)	±0.1%	0.001V
I1, I2, I3, I4	5A/1A Option: ±0.1% SCCPA Option (±0.1%+Error of SCCP)	0.001A
P, Q, S	5A/1A Option: ±0.2% SCCPA Option: ±0.5%	0.001kX
kWh, kVAh	IEC 62053-22 Class 0.2S SCCPA Option: IEC 62053-21 Class 1	0.1kXh
kvarh	5A/1A Option: IEC 62053-24 Class 0.5S SCCPA Option: IEC 62053-24 Class 1	0.1kvarh
PF	5A/1A Option: ±0.2% SCCPA Option: ±0.5%	0.001
Frequency	±0.003 Hz	0.001Hz
Harmonics	IEC 61000-4-7 Class A	0.01%
K-Factor	IEC 61000-4-7 Class A	0.01
Phase angles	5A/1A Option: ±0.2° SCCPA Option: ±0.2°+ Phase Error of SCCP	0.1°
Voltage Unbalance	±0.1 %	0.01%
Current Unbalance	±0.5%	0.01%
Pst, Plt	±5%	0.001

Appendix F – Standards Compliance

Safety Requirements	
CE LVD 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 EN 61010-1: 2010
EMC Compatibility CE EMC Directive 2014 / 30 / EU (EN 61326: 2013)	
Immunity (EN50082-2)	
Electrostatic Discharge	EN 61000-4-2: 2009
Radiated Fields	EN 61000-4-3: 2006+A1: 2008+A2: 2010
Fast Transients	EN 61000-4-4: 2012
Surges	EN 61000-4-5: 2014+A1: 2017
Conducted Disturbances	EN 61000-4-6: 2014
Magnetic Fields	EN 61000-4-8: 2010
V Dips, Interruptions & Variations	EN 61000-4-11:2004+A1: 2017
Emission (EN50081-2)	
Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment	EN 55011: 2016
Limits and methods of measurement of radio disturbance characteristics of information technology equipment	EN 55032: 2015
Limits for harmonic current emissions for equipment with rated current ≤16 A	EN 61000-3-2: 2014
Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16 A	EN 61000-3-3: 2013
Emission standard for 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
Power Quality	
Voltage characteristics of electricity supplied by public distribution systems	EN 50160
General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto	IEC 61000-4-7
Flicker meter - Functional and design specifications	IEC 61000-4-15
Testing and measurement techniques - Power quality measurement methods	IEC 61000-4-30 Ed.3 Class A Compliant

Appendix G – Ordering Guide

CET Electric Technology

Version 20200428

Product Code	Description
iMeter D7 DIN-Rail Advanced Power Quality Analyzer	
Basic Feature	
A	IEC 61000-4-30 Ed. 3 Class A Compliance
B*	IEC 61000-4-30 Ed. 3 Class A Compliance with 2-150kHz C.E. Measurements
Input Current	
5	5A
1	1A
SCCT	For use with 100A/200A/400A/800A/1600A to 40mA SCCTs
SCCPA^	SCCP Option for use with CT Clamps with max. 500mV output.
Input Voltage	
9	400VLN/690VLL + 20%
Power Supply	
2	95-250VAC/DC ± 10%, 47-440Hz
System Frequency	
5	50Hz
6	60Hz
I/O	
A	4xDI + 3xDO (Mechanical Relay)
B	4xDI + 3xSS Pulse Outputs
Analog Inputs	
X	None
A*	2xAI
B*	1xIr + 1xRTD
Communications	
A	2x100BaseT + 1xRS-485
B*	2x100BaseT + 1xRS-485 + 4G
Display Language	
E	English

iMeter D7	-	A	5	9	2	5	A	X	A	E	iMeter D7-A5925AXAE (Standard Model)

*Additional charges apply

^ The SCCPA option is comptaible with the SCCP models listed in the "SCCP Option" sheet. This option does not come with any Current Clamp. Please refer to the "SCCP Option" sheet for more information and order the desired model and quantity as a separate item.

SCCP Option

CET Electric Technology

Version 20181217

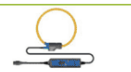
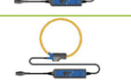
Product Code	Description
PMC-SCCP Split-Core Current Probe	
Current (Imax) - Output Voltage	
50A-500mV	5A Nominal, 50A max. (10mV/A)
200A-200mV	20A/200A (10mV/A @ 20A or 1mV/A @ 200A)
500A-500mV	500A max. (1mV/A)
5000A-500mV	500A/5000A Rogowski Coil @ CAT III 1kV & CAT IV 600V (1mV/A @ 500A or 0.1mV/A @ 5000A)
Termination	
B	BNC Connector
CAT III	
A	300V (Applies to the 50A SCCP)
B	600V (Applies to the 200A and 500A SCCPs)
C	1000V (Applies to the 5000A SCCP)
Version	
B	Applies to the 50A. 200A and 500A SCCPs
C	Applies to the 5000A SCCP with 254mm Coil Diameter
D	Applies to the 5000A SCCP with 180mm Coil Diameter
E	Applies to the 5000A SCCP with 100mm Coil Diameter

PMC-SCCP	-	**50A**	-	**500mV**	-	**B**	-	**A**	-	**B**	**PMC-SCCP-50A-500mV-B-A-B (Standard)**

CET Electric Technology

Version 20181217

CT Clamp

Model No.	Measurement Range	Max. Allowable Current	Output Voltage	Accuracy	Protection	Diameter	Cable Length	Termination	Appearance
PMC-SCCP-50A-500mV-B-A-B	5A (50A Imax)	50A	AC 10mV/A (Max. 500mV)	±0.3% rdg. ±0.02% f.s.	CAT III 300V	15mm	3m	BNC	
PMC-SCCP-200A-200mV-B-B-B	20A/200A (200A Imax)	260A	AC 10mV/A @ 20A AC 1mV/A @ 200A (Max. 200mV)	±0.3% rdg. ±0.02% f.s.	CAT III 600V	24mm	3m	BNC	
PMC-SCCP-500A-500mV-B-B-B	500A (500A Imax)	500A	AC 1mV/A (Max. 500mV)	±0.5% rdg. ±0.02% f.s.	CAT III 600V	50mm	3m	BNC	
PMC-SCCP-5000A-500mV-B-C-C* (254mm Coil Diameter)	500A/5000A Rogowski Coil (10,000A Imax)	10,000A	AC 1mV/A @ 500A AC 0.1mV/A @ 5000A (Max. 500mV)	±2.0% rdg. ±1.5mV	CAT III 1000V CAT IV 600V	254mm	3m	BNC	
PMC-SCCP-5000A-500mV-B-C-D* (180mm Coil Diameter)	500A/5000A Rogowski Coil (10,000A Imax)	10,000A	AC 1mV/A @ 500A AC 0.1mV/A @ 5000A (Max. 500mV)	±2.0% rdg. ±1.5mV	CAT III 1000V CAT IV 600V	180mm	3m	BNC	
PMC-SCCP-5000A-500mV-B-C-E* (100mm Coil Diameter)	500A/5000A Rogowski Coil (10,000A Imax)	10,000A	AC 1mV/A @ 500A AC 0.1mV/A @ 5000A (Max. 500mV)	±2.0% rdg. ±1.5mV	CAT III 1000V CAT IV 600V	100mm	3m	BNC	

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