

# iMeter D7

## DIN-Rail Advanced Power Quality Analyzer

User Manual  
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**ECO**  
**Explore**<sup>®</sup>  
Integrative ECO Solutions

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## Standards Compliance



### **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**

- EcoXplore 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.
- EcoXplore does not accept liability for any damage caused by meter malfunctions. EcoXplore 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 EcoXplore's duly authorized representative may open your meter. The unit should only be opened in a fully anti-static environment. Failure to do so may damage the electronic components and will void the warranty.

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## Chapter 1 Introduction

This manual explains how to use the iMeter 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 EcoXplore’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 EcoXplore 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 3 $\Phi$  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 2<sup>nd</sup> to 63<sup>rd</sup>
- U and I Individual Interharmonics (%IHD and RMS) from 1<sup>st</sup> to 63<sup>rd</sup>
- Total Harmonic P, Q, S and PF
- Harmonic P, Q, S and PF from 2<sup>nd</sup> to 63<sup>rd</sup> in RMS
- Fundamental U, I, P, Q, S, Phase Angle and Displacement PF
- Harmonic Phase Angle from 2<sup>nd</sup> to 63<sup>rd</sup>
- 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 2<sup>nd</sup> to 63<sup>rd</sup>  
# %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 ( $\frac{1}{2}$  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  $\frac{1}{2}$  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  $\frac{1}{2}$  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 @  $\frac{1}{2}$  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 kWh
- 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  $\pm 1$ ms 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  $\pm 1$ ms 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 1xResidual 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, SNMP, 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: BCO
  - WCDMA: B1/B8
  - TD-SCDMA: TD-SCDMA 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 ( $\leq 0.5s/day$ )
- Time Sync. via Modbus RTU protocol, SNMP, 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 Statistical Trend Charts.
- Export of IER, AER, SDR, MMR Logs as well as EN50160 Reports
- Generation and export of self-defined PQ Analysis Reports

### 3<sup>rd</sup> 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.

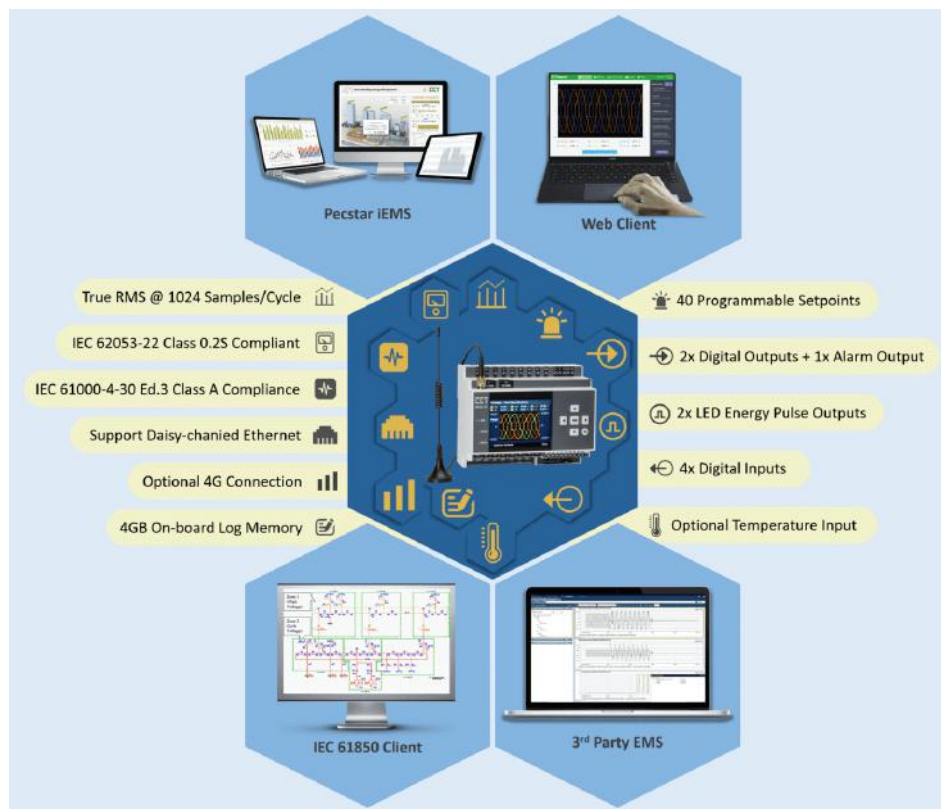


Figure 1-1 Typical Application

## 1.4 Getting more information

Additional information is available from EcoXplore via the following sources:

- Visit [www.EcoXplore.com](http://www.EcoXplore.com)

Contact CET directly via email at [admin@ecoxplore.com.sg](mailto:admin@ecoxplore.com.sg)

## 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

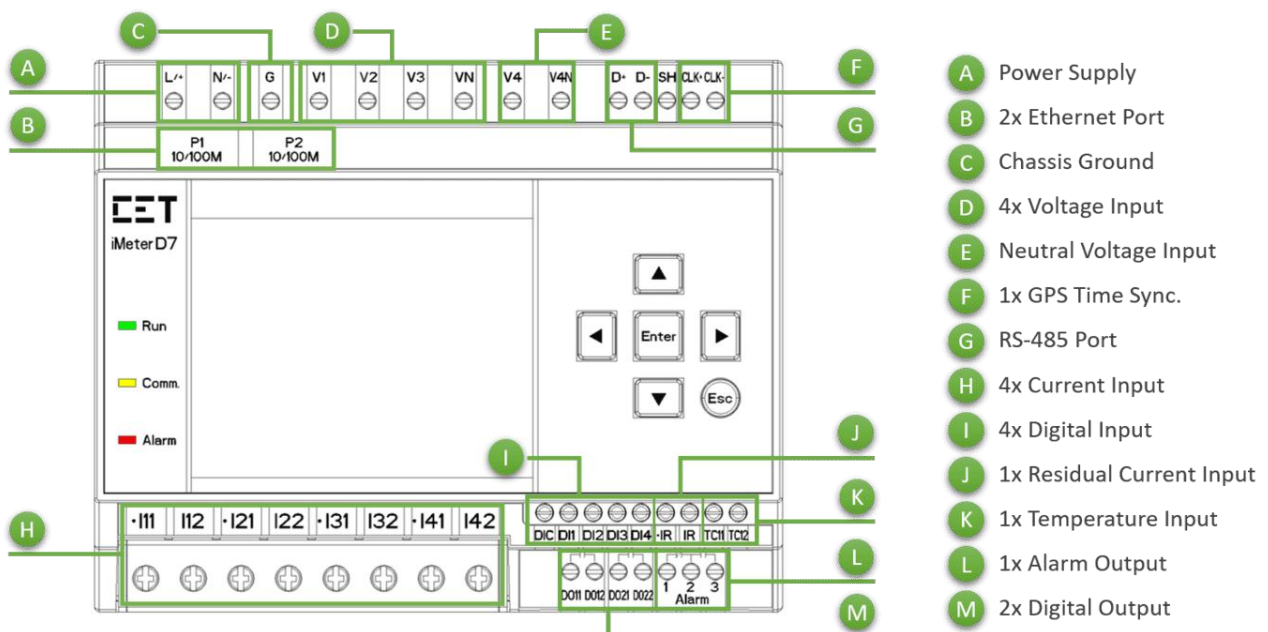


Figure 2-2 Terminals Diagram

## 2.2 Unit Dimensions

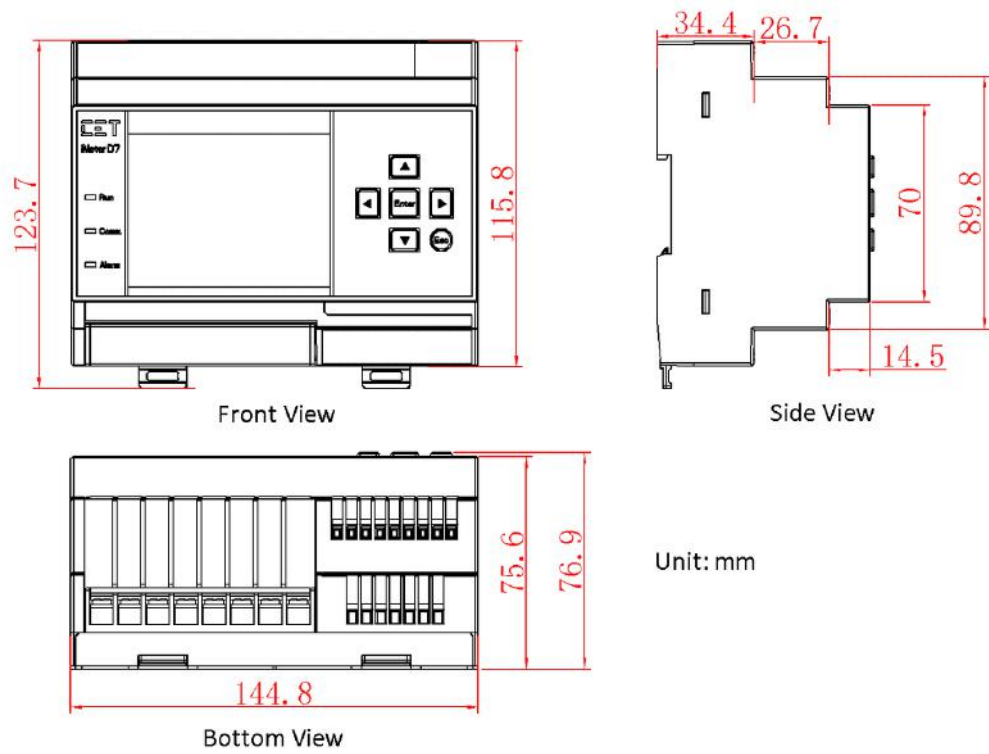
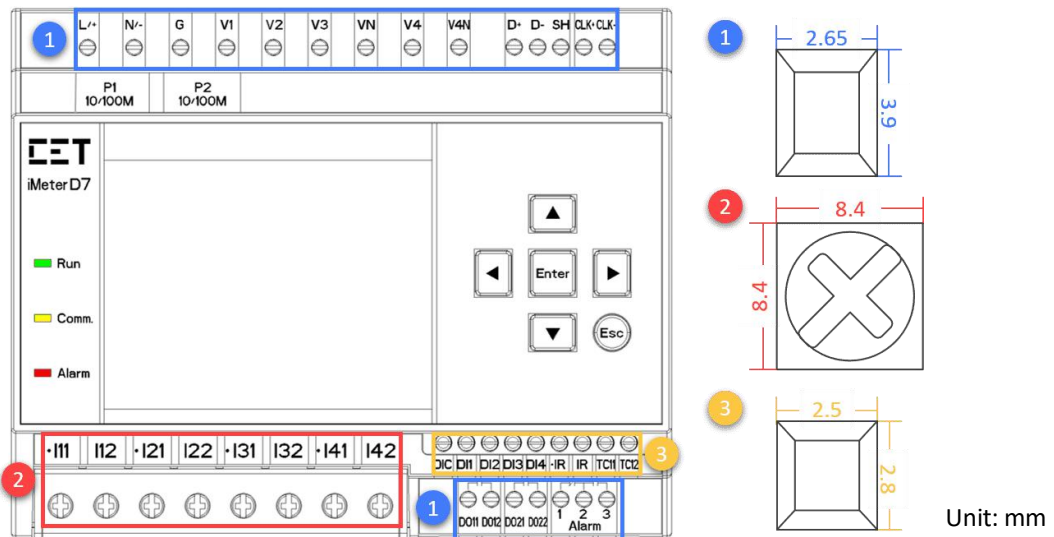


Figure 2-3 Dimensions

## 2.3 Terminal Dimensions



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

Figure 2-4 Terminal Dimensions

## 2.4 SSCP Dimensions

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

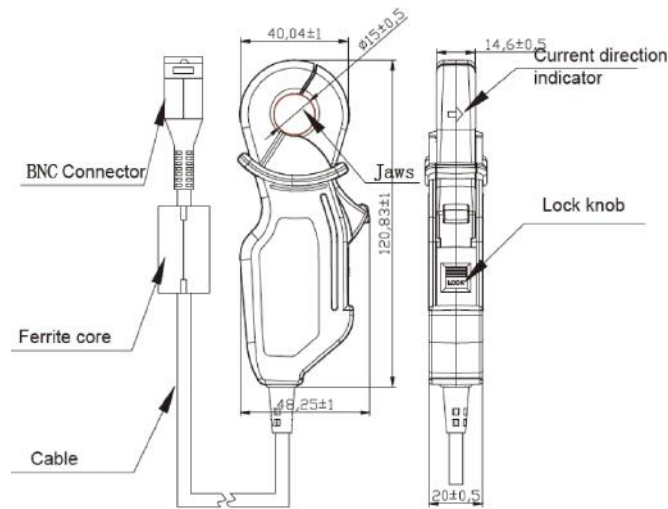


Figure 2-5 PMC-SCCP-50A-500mV-B-A-B Dimensions

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

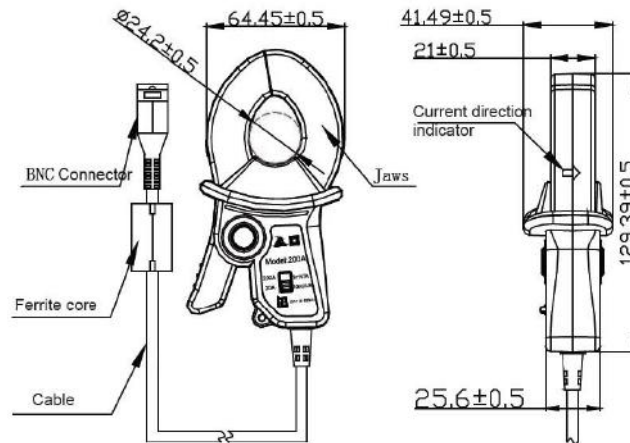


Figure 2-6 PMC-SCCP-200A-200mV-B-B-B Dimensions

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

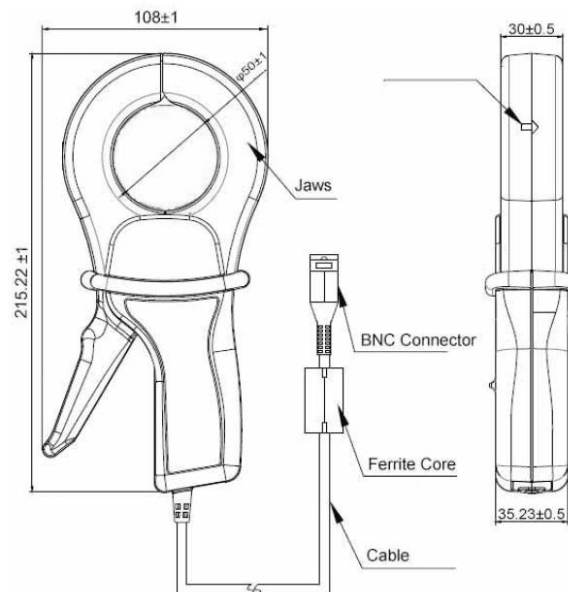
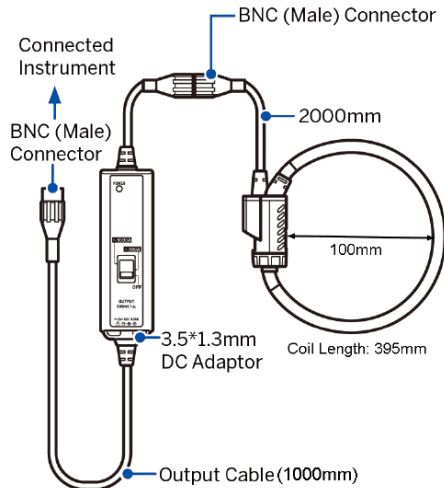


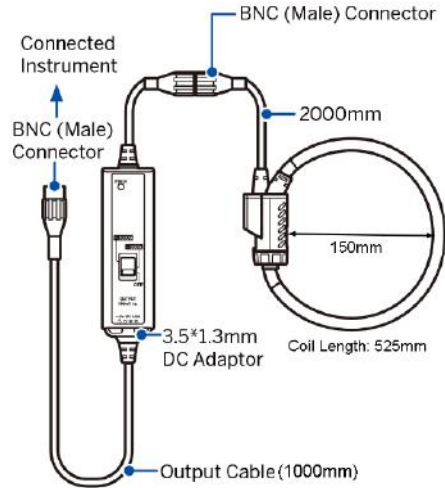
Figure 2-7 PMC-SCCP-500A-500mV-B-B-B Dimensions

• **PMC-SCCP-5kA-500mV-B-C-C-100**



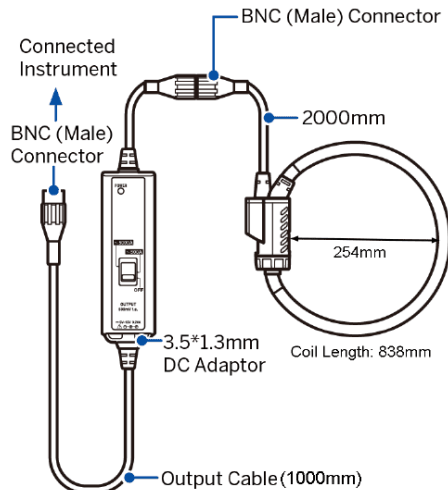
**Figure 2-8 PMC-SCCP-5kA-500mV-B-C-C-100 Dimensions**

• **PMC-SCCP-5kA-500mV-B-C-C-150**



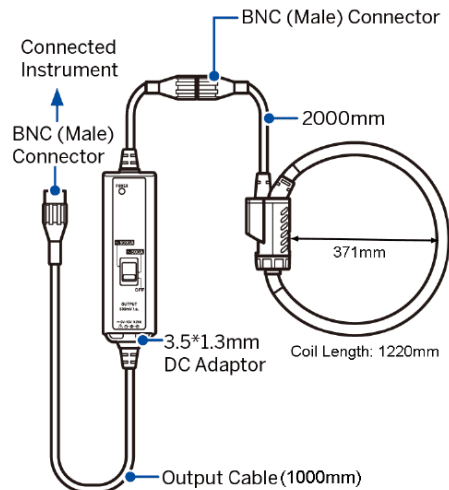
**Figure 2-9 PMC-SCCP-5kA-500mV-B-C-C-150 Dimensions**

• **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.

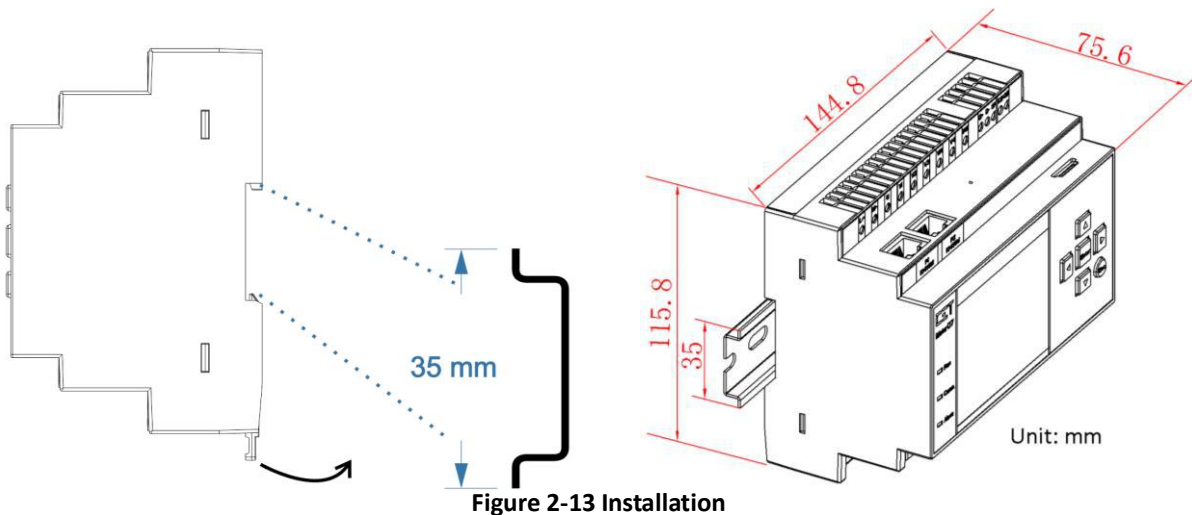


Figure 2-13 Installation

## 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.

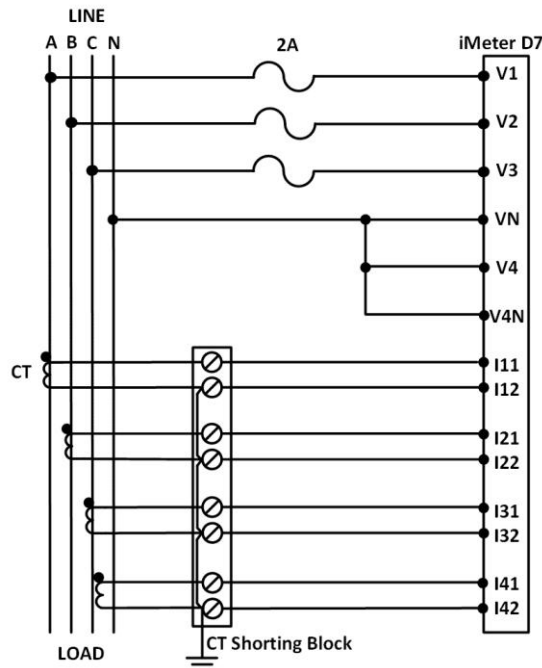


Figure 2-14 3-Phase 4-Wire Wye Direct Connection with 4CTs

### 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.

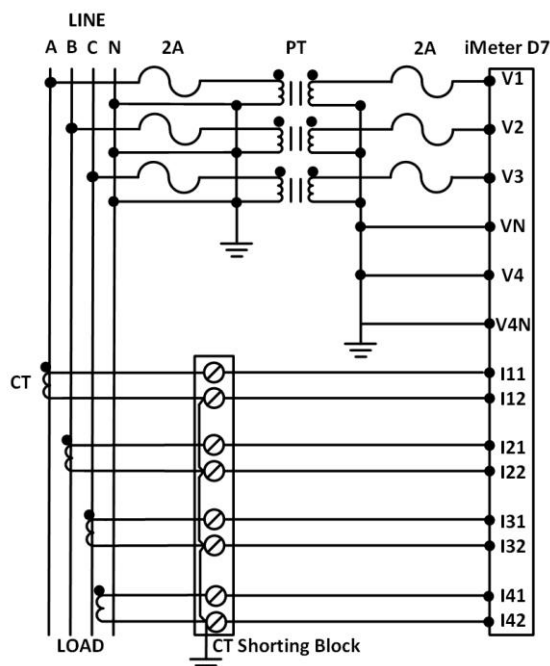


Figure 2-15 3-Phase 4-Wire Wye with 3PTs & 4CTs

### 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.

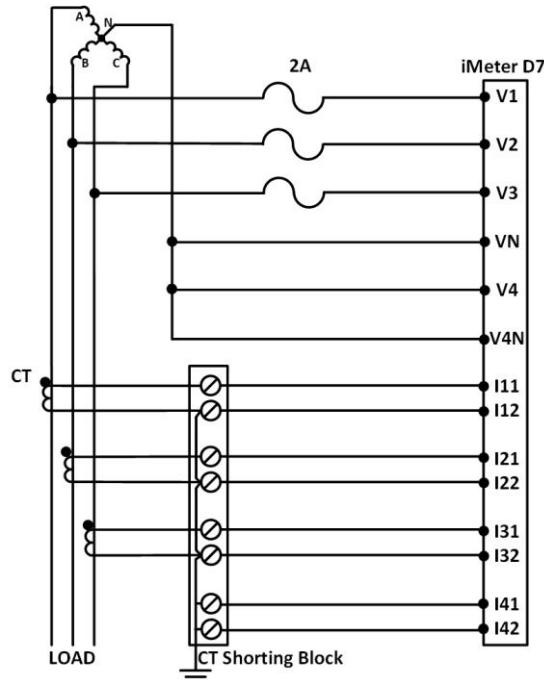


Figure 2-16 3-Phase 3-Wire Grounded Wye with no PTs & 3CTs

### 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.

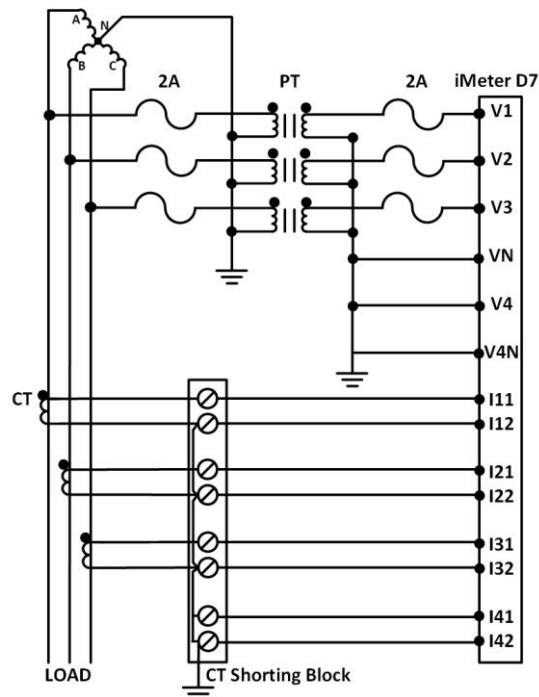


Figure 2-17 3-Phase 3-Wire Grounded Wye with 3PTs & 3CTs

### 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.

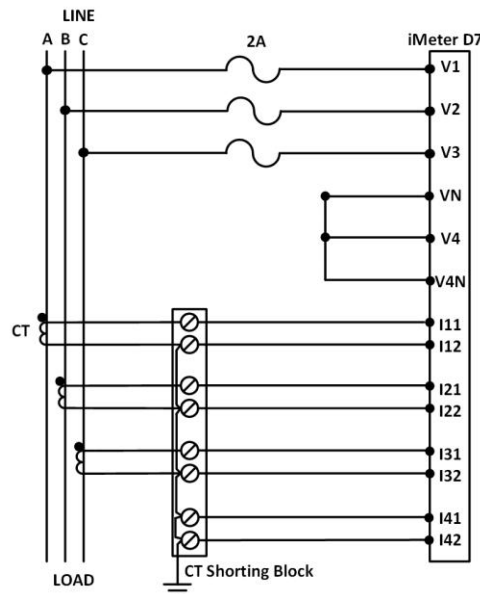


Figure 2-18 3-Phase 3-Wire Direct Delta Connection with 3CTs

### 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.

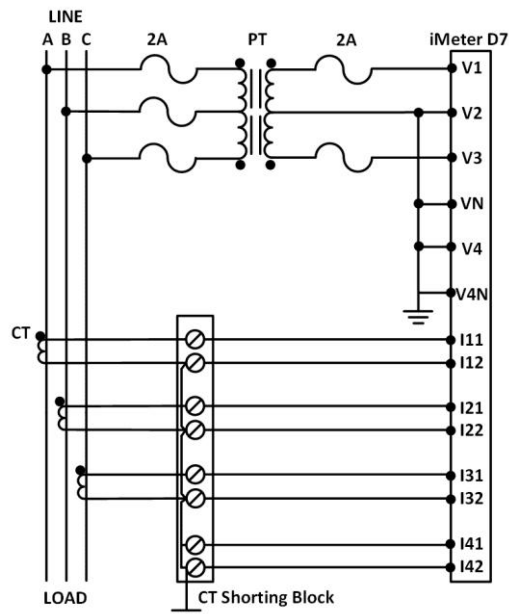


Figure 2-19 3-Phase 3-Wire Open Delta with 2PTs & 3CTs

### 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.

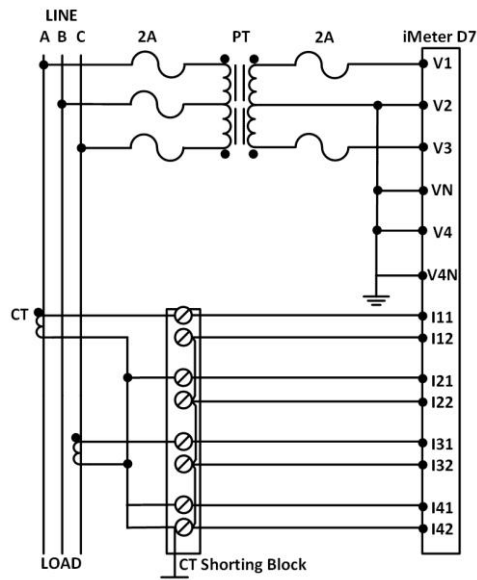


Figure 2-20 3-Phase 3-Wire Open Delta with 2PTs and 2CTs

## 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

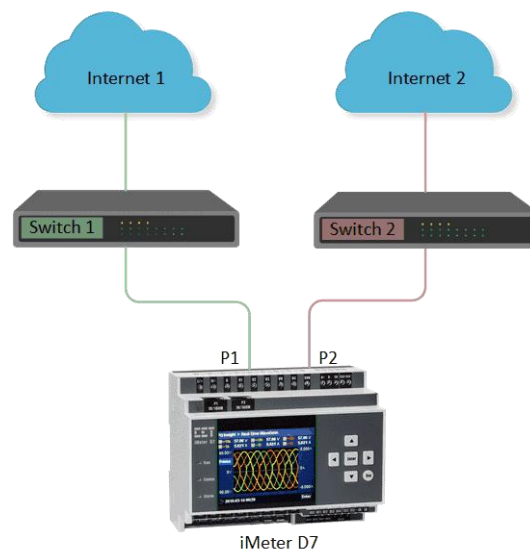


Figure 2-21 Normal Mode Connection

### 2.8.1.2 Switch Mode

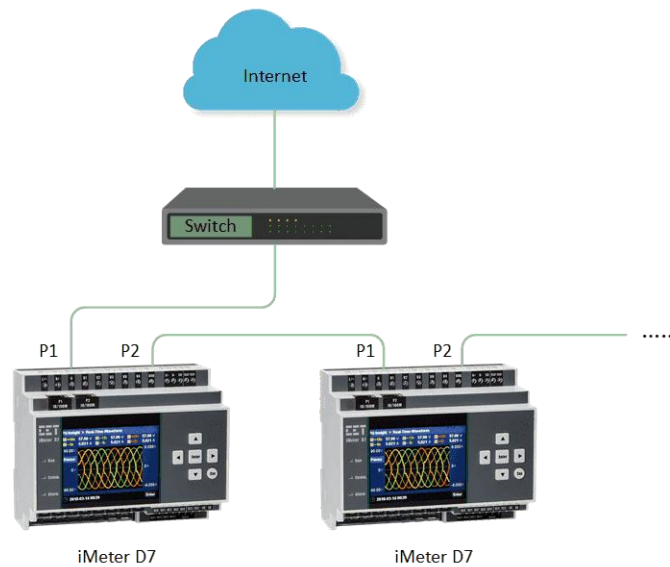


Figure 2-22 Switch Mode Connection

### 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:

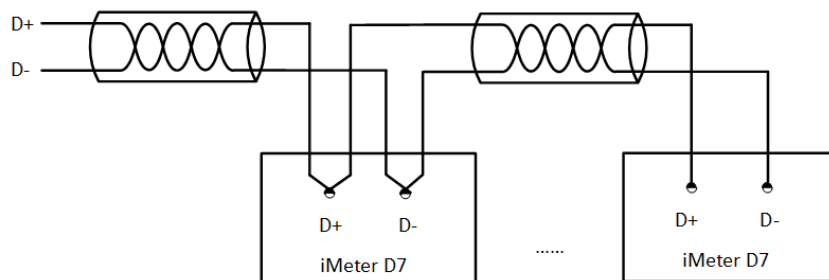


Figure 2-23 RS485 Communication Connections

### 2.9 Chassis Ground Wiring

Connect the G terminal to earth ground.

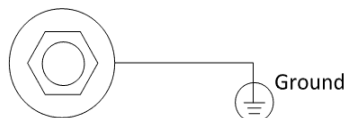


Figure 2-24 Chassis Ground Connection

### 2.10 Digital Input Wiring

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

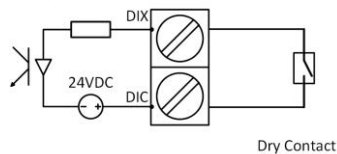


Figure 2-25 DI Connections

## 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:

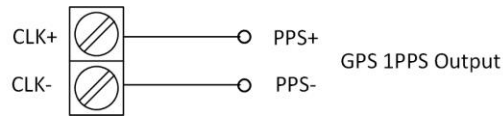


Figure 2-26 GPS 1PPS Input Wiring

## 2.12 Digital Output Wiring

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

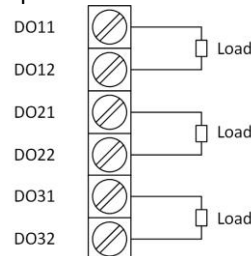


Figure 2-27 DO Connections

## 2.13 Residual Current (Ir) Wiring

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

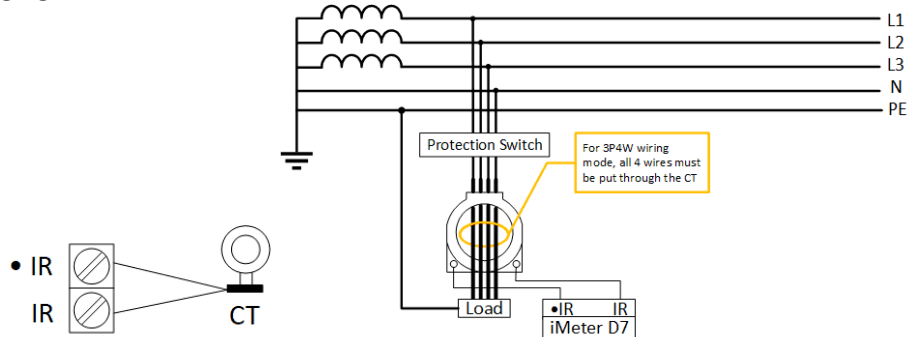


Figure 2-28 Residual Current Connections

### 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

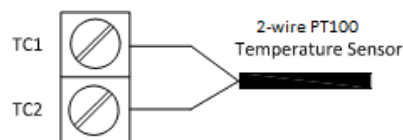


Figure 2-29 RTD Input Connections

## 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:

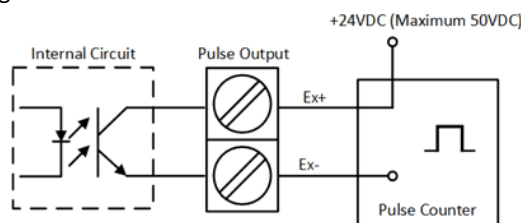


Figure 2-30 Pulse Output (Solid State Relay) Connections for Energy Pulsing

## 2.16 Analog Input Wiring

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

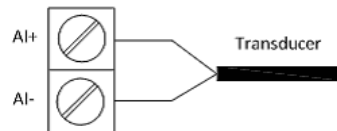


Figure 2-31 Analog Input Wiring

## 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.

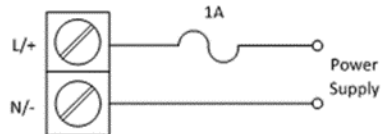


Figure 2-32 Power Supply Connections

## 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.

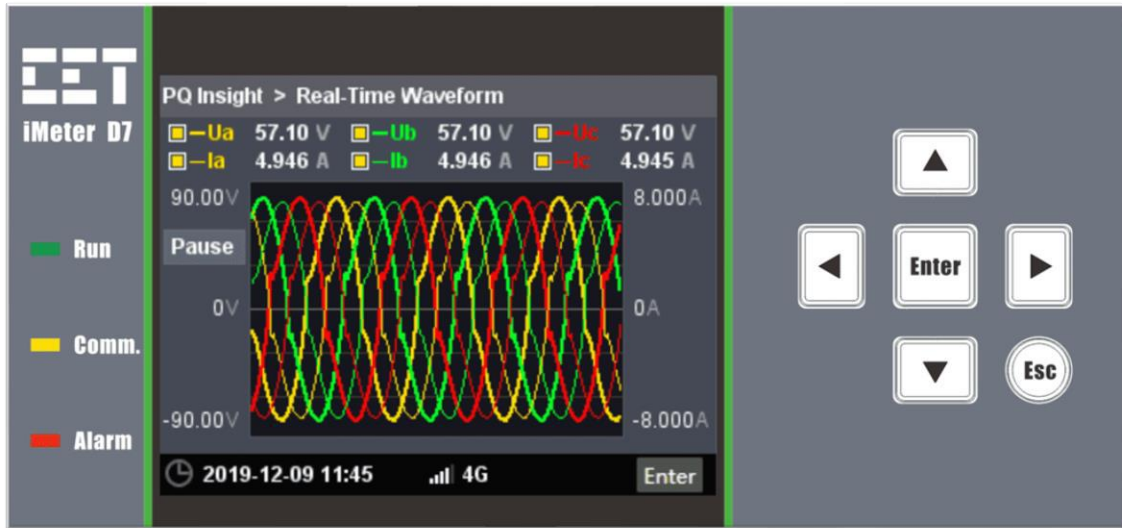


Figure 3-1 Front Panel Interface

#### 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.

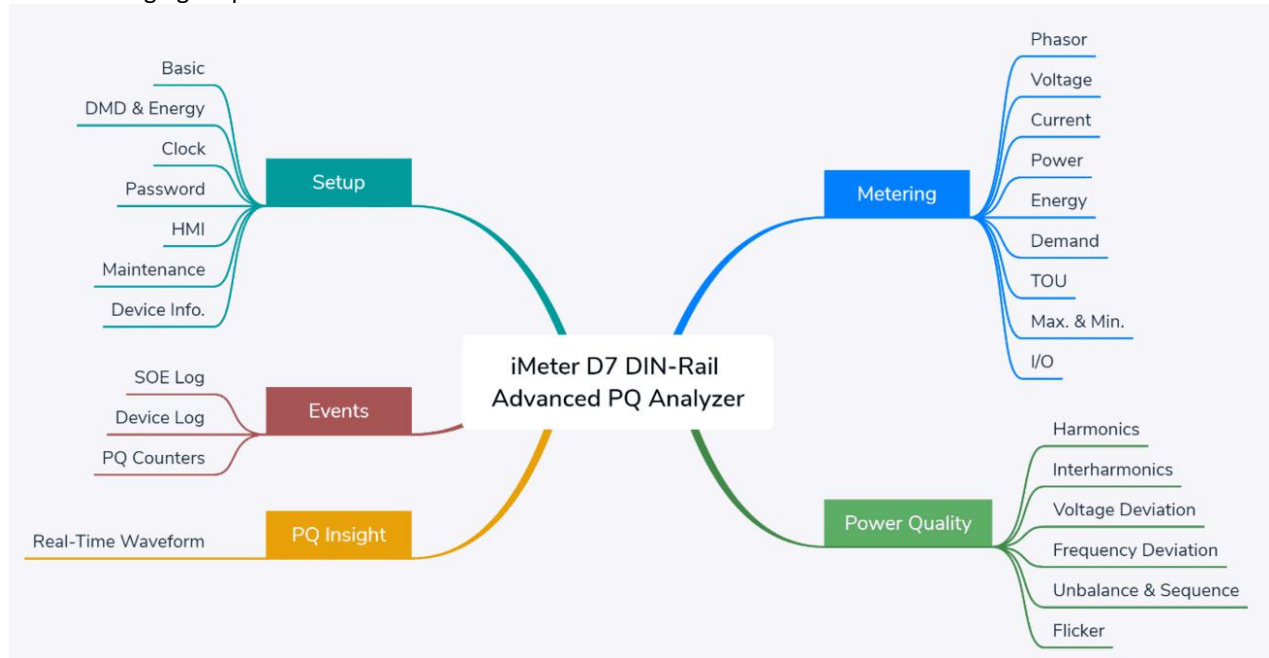


Figure 3-2 Overview for Front Panel Operations

### 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.

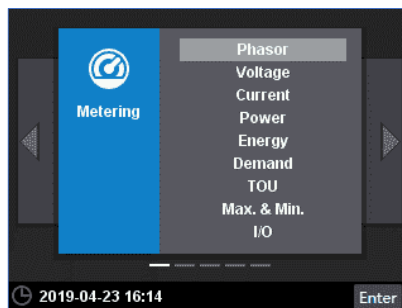


Figure 3-3 Metering Menu

#### 3.1.3.1.1 Phasor

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

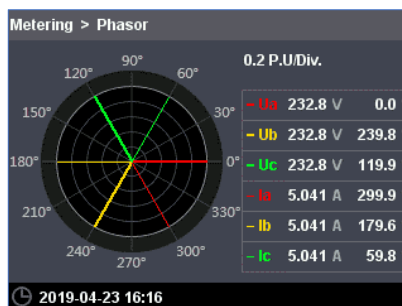


Figure 3-4 Phasor

### 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.

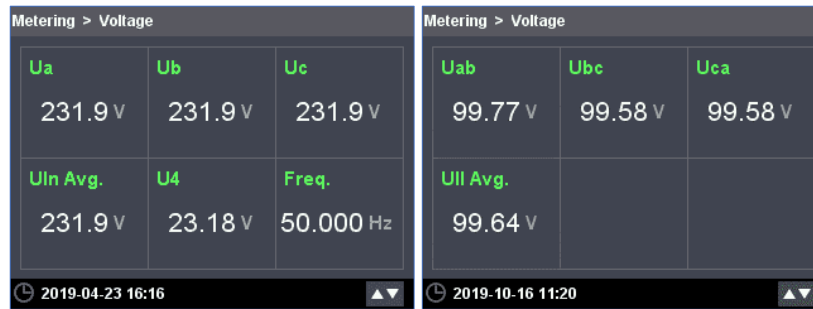


Figure 3-5 Voltage

### 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.

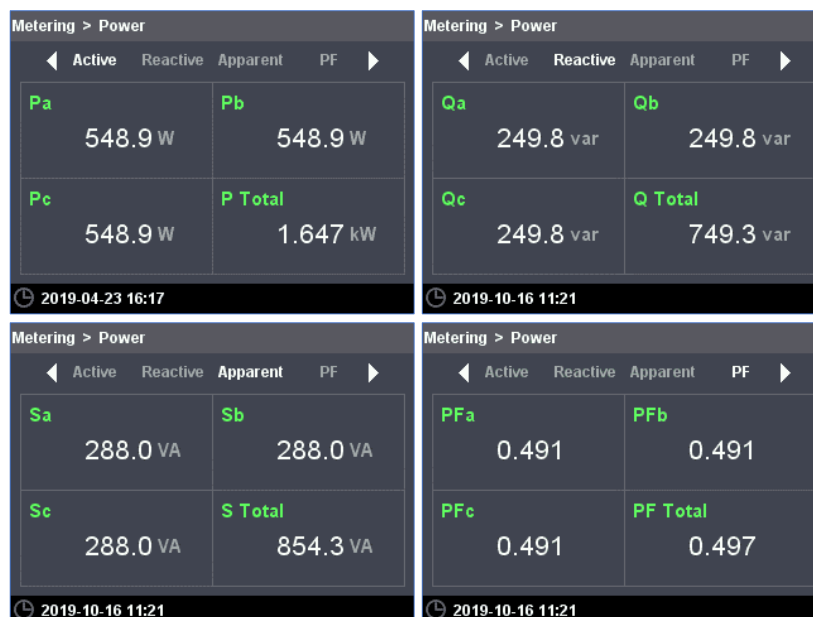


Figure 3-7 Power

### 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).

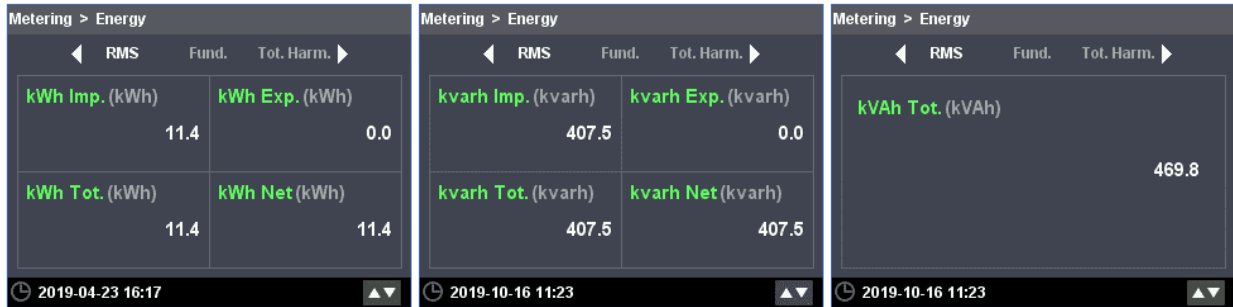


Figure 3-8 RMS Energy

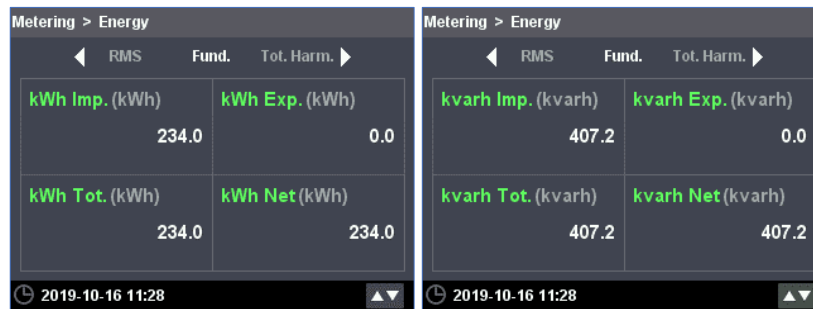


Figure 3-9 Fundamental Energy

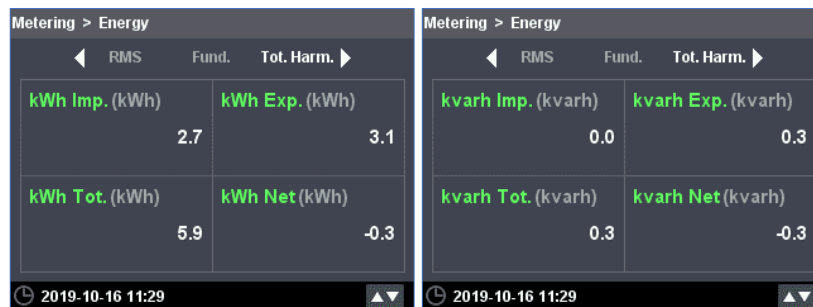


Figure 3-10 Total Harmonics Energy

### 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

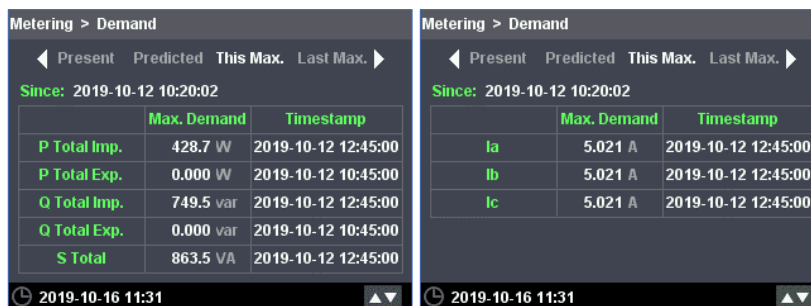


Figure 3-13 This Max. Demand

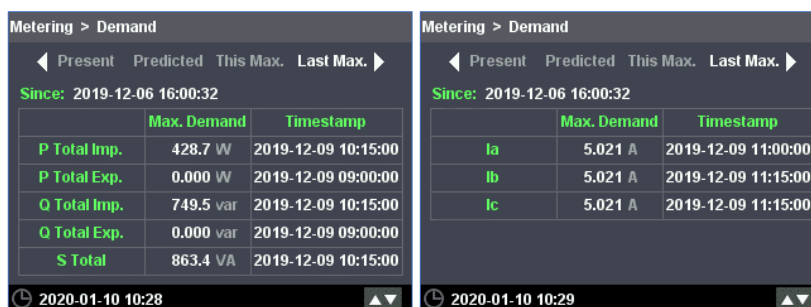


Figure 3-14 Last Max. Demand

### 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 corresponding 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.

| Metering > Max. & Min.     |           |                     |
|----------------------------|-----------|---------------------|
| ◀ #01 #02 #03 #04 ▶        |           |                     |
| Since: 2019-10-12 10:20:02 |           |                     |
|                            | Max.      | Timestamp           |
| Freq.                      | 50.000 Hz | 2019-10-12 10:20:07 |
| Ua                         | 58.74 V   | 2019-10-12 10:20:10 |
| Ub                         | 58.74 V   | 2019-10-12 10:20:10 |
| Uc                         | 58.74 V   | 2019-10-12 10:20:10 |
| Uab                        | 101.6 V   | 2019-10-12 10:20:10 |

| Metering > Max. & Min.     |           |                     |
|----------------------------|-----------|---------------------|
| ◀ #01 #02 #03 #04 ▶        |           |                     |
| Since: 2019-10-12 10:20:02 |           |                     |
|                            | Min.      | Timestamp           |
| Freq.                      | 50.000 Hz | 2019-10-12 10:20:07 |
| Ua                         | 0.000 V   | 2019-10-12 10:20:07 |
| Ub                         | 0.000 V   | 2019-10-12 10:20:07 |
| Uc                         | 0.000 V   | 2019-10-12 10:20:07 |
| Uab                        | 0.000 V   | 2019-10-12 10:20:07 |

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).

| Metering > I/O    |     |
|-------------------|-----|
| ◀ DI DO AI ▶      |     |
| DI1 Tariff Switch | 0   |
| DI2 Status        | OFF |
| DI3 Counter       | 0   |
| DI4 DMD Sync.     | --  |

| Metering > I/O |     |
|----------------|-----|
| ◀ DI DO AI ▶   |     |
| DO1            | OFF |
| DO2            | OFF |
| Alarm          | ON  |

| Metering > I/O |        |
|----------------|--------|
| ◀ DI DO AI ▶   |        |
| AI1            | 400.00 |
| AI2            | 400.00 |

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.

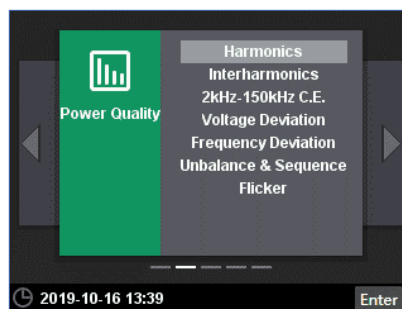


Figure 3-18 Power Quality

#### 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

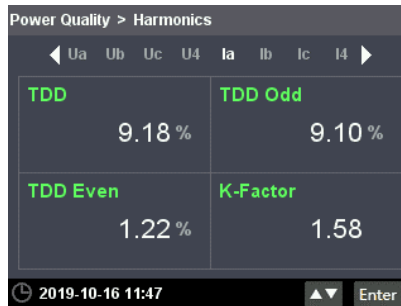


Figure 3-20 TDD/K-Factor for Current Harmonics

### 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.

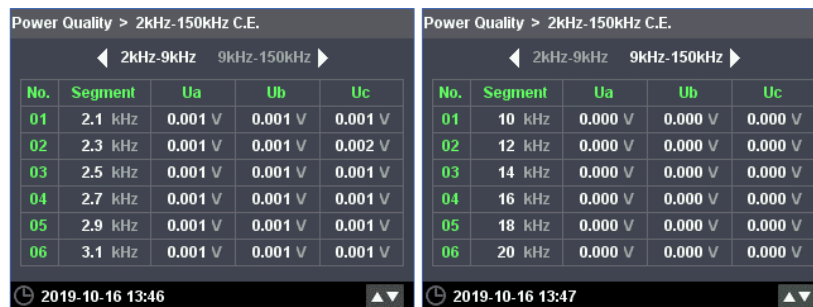


Figure 3-22 2kHz – 150kHz C.E.

#### 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 UIn and UII 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.

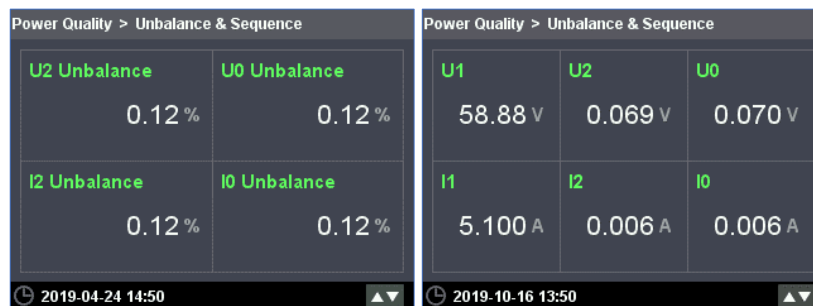


Figure 3-25 Unbalance & Sequence

#### 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.

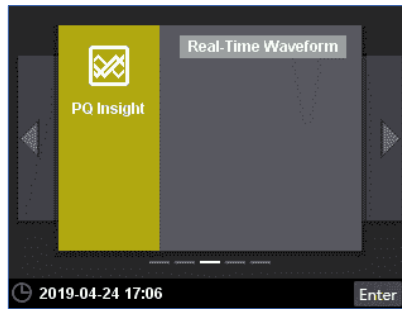


Figure 3-27 PQ Insight

#### 3.1.3.3.1 Real-Time Waveform

This screen shows the Real-Time Waveform Capture for 3 $\Phi$  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.

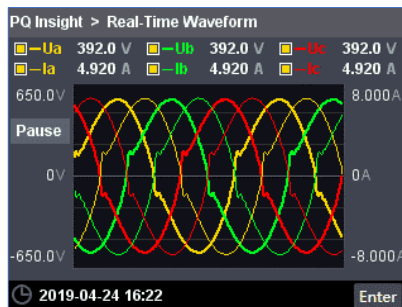


Figure 3-28 Real-Time Waveform

### 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.

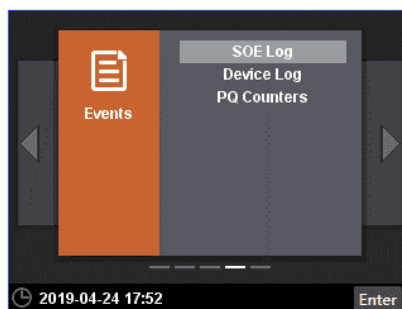


Figure 3-29 Events

#### 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 through the event list.

Press <Enter> to select and view the event details.

Press <◀> or <▶> to scroll through other event pages.

Events > SOE Log

| No. | Timestamp                  | Description                  | 1/2 |
|-----|----------------------------|------------------------------|-----|
| 1   | 2019-04-28<br>14:23:32.787 | WFR Triggered Manually       |     |
| 2   | 2019-04-26<br>16:45:06.419 | Dip/Swell Ended              |     |
| 3   | 2019-04-26<br>16:45:06.309 | Interruption triggered by UA |     |
| 4   | 2019-04-26<br>16:45:06.289 | Dip/Swell Started            |     |
| 5   | 2019-04-26<br>16:40:44.626 | Dip/Swell Ended              |     |

2019-04-28 16:19

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.

Events > SOE Log

| No. | Details                           | 1/4 |
|-----|-----------------------------------|-----|
| 1   | Description Dip Triggered by UA   |     |
| 2   | Timestamp 2020-01-10 13:41:47.205 |     |
| 3   | Magnitude 79.98%, 99.98%, 99.98%  |     |
| 4   | Duration 100ms                    |     |
| 5   | Direction Upstream                |     |
|     | Confidence Low Confidence         |     |
|     | WFR                               | DWR |

2020-01-10 14:29

Figure 3-31 Event Details

Here is an example for the waveform display:

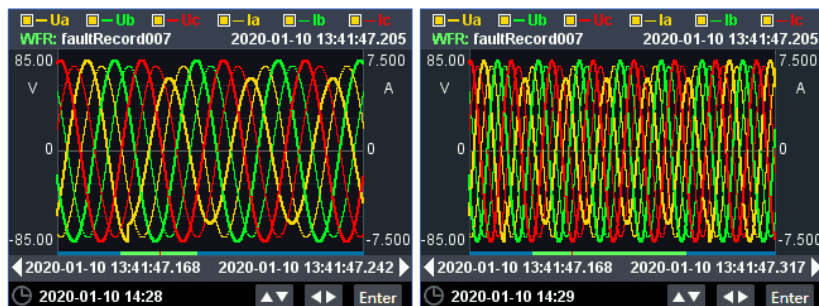


Figure 3-32 Waveform Display for Dip Triggered by Ua

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.

Events > Device Log

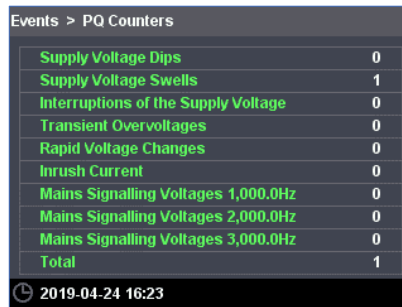
| No. | Timestamp                  | Description      | 1/1 |
|-----|----------------------------|------------------|-----|
| 1   | 2019-04-24<br>14:42:44.285 | Setup Changes    |     |
| 2   | 2019-04-24<br>11:40:46.466 | Setup Changes    |     |
| 3   | 2019-04-24<br>10:39:53.481 | Power On         |     |
| 4   | 2019-04-19<br>15:48:33.823 | Power Off        |     |
| 5   | 2019-04-19<br>15:46:49.966 | Clear All Events |     |

2019-04-24 16:23

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.



| Events > PQ Counters                |   |
|-------------------------------------|---|
| Supply Voltage Dips                 | 0 |
| Supply Voltage Swells               | 1 |
| Interruptions of the Supply Voltage | 0 |
| Transient Overvoltages              | 0 |
| Rapid Voltage Changes               | 0 |
| Inrush Current                      | 0 |
| Mains Signalling Voltages 1,000.0Hz | 0 |
| Mains Signalling Voltages 2,000.0Hz | 0 |
| Mains Signalling Voltages 3,000.0Hz | 0 |
| Total                               | 1 |

2019-04-24 16:23

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.

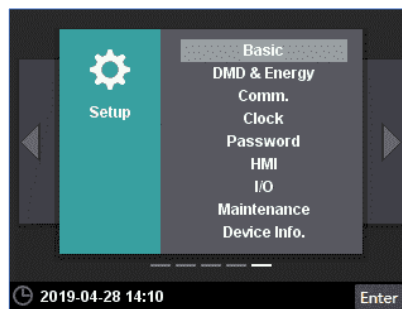


Figure 3-35 Setup Menu

#### 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.

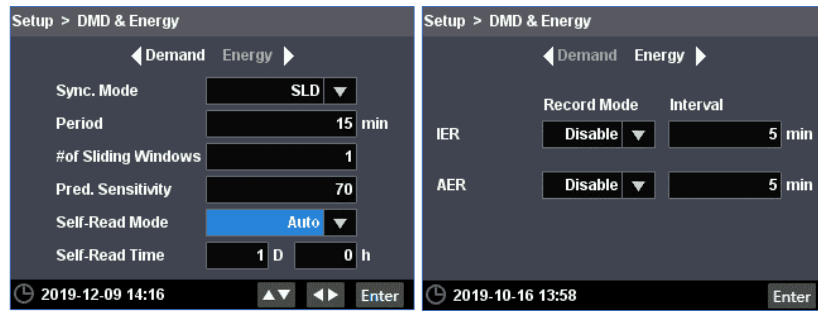


Figure 3-37 Demand &amp; Energy Setup Screens

### 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.

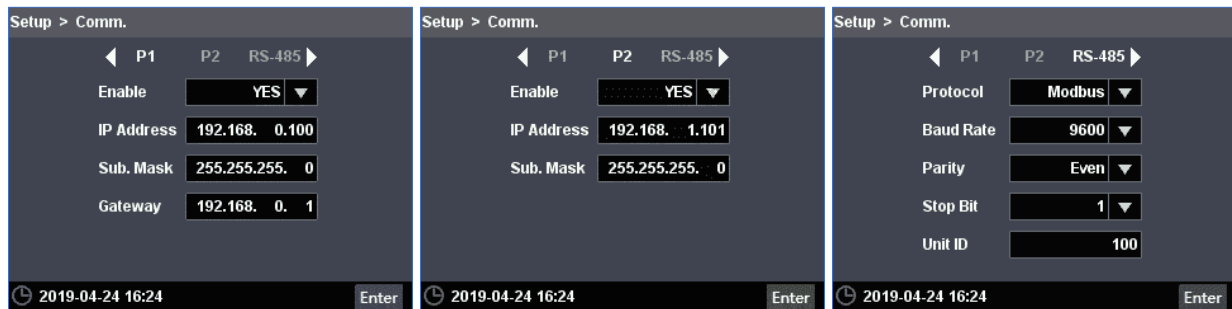


Figure 3-38 Comm. Setup Screens

### 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.

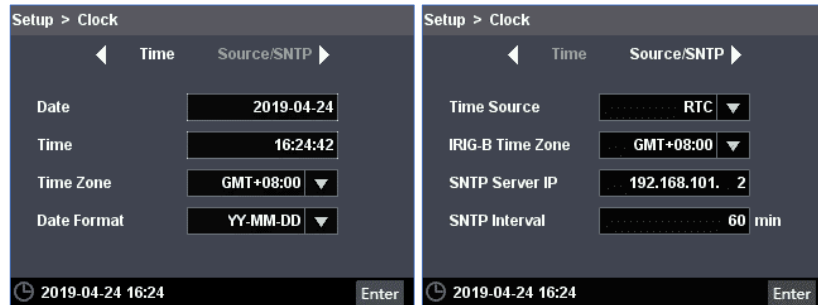


Figure 3-39 Clock Setup Screens

### 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.

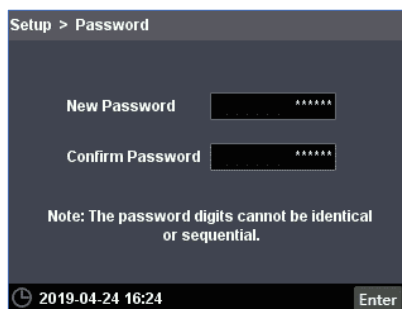


Figure 3-40 Password Setting

### 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.

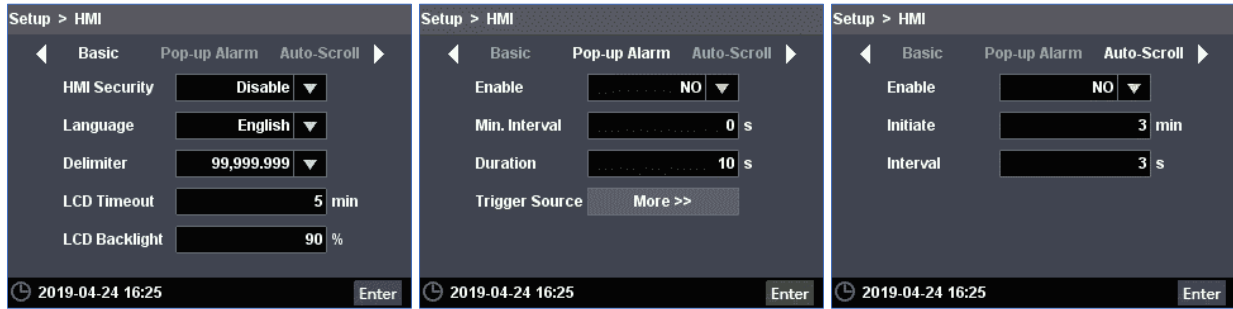


Figure 3-41 HMI Settings

### 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.

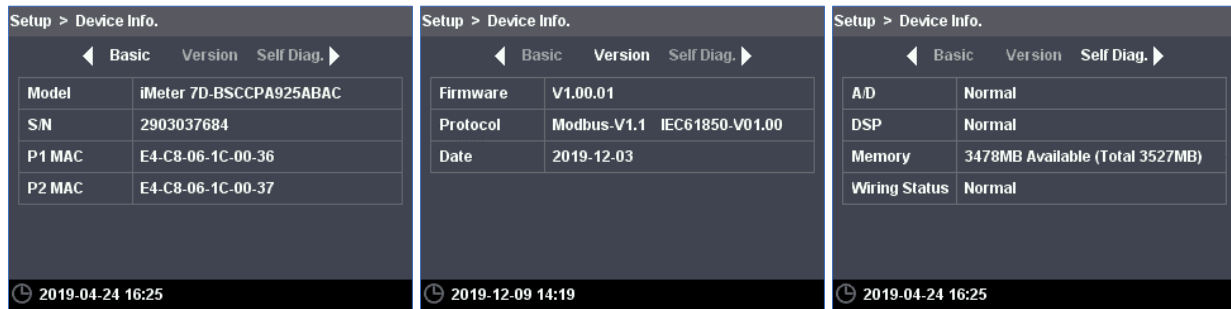


Figure 3-44 Device Info. Screens

## 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).

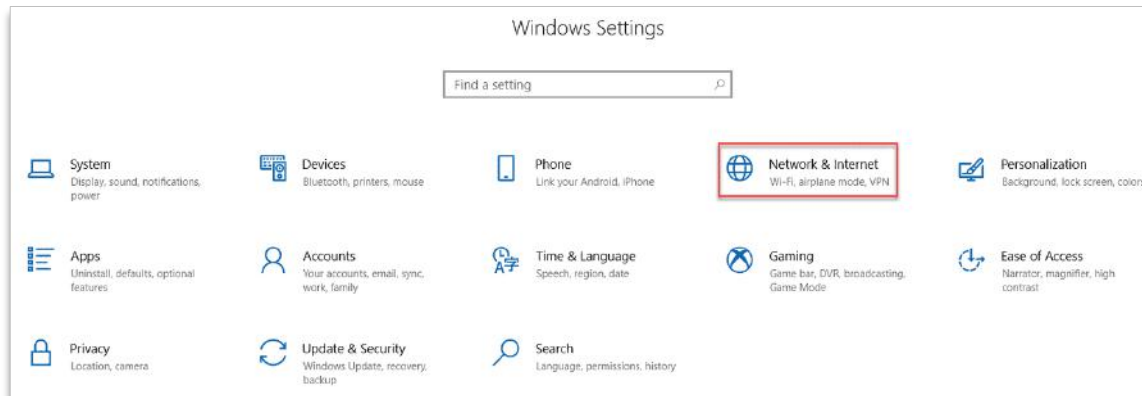


Figure 3-45 Settings-> Network & Internet

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.

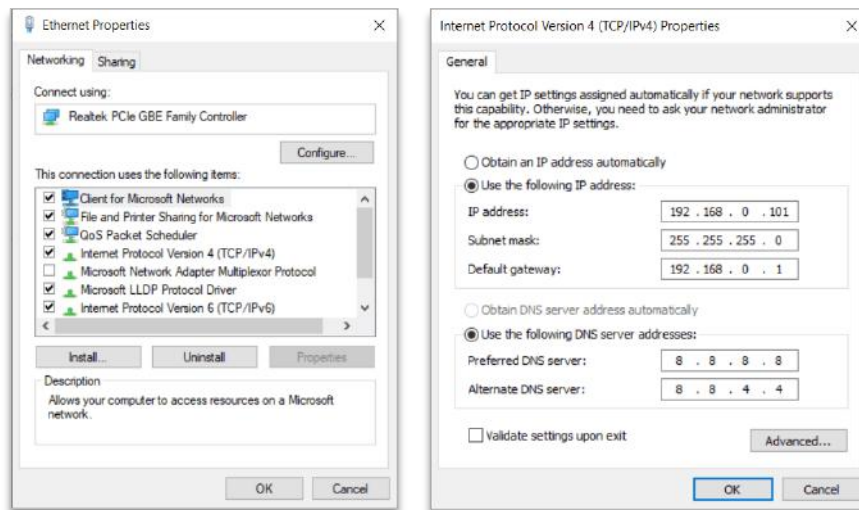


Figure 3-47 Setting PC's IP Address

### 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**.

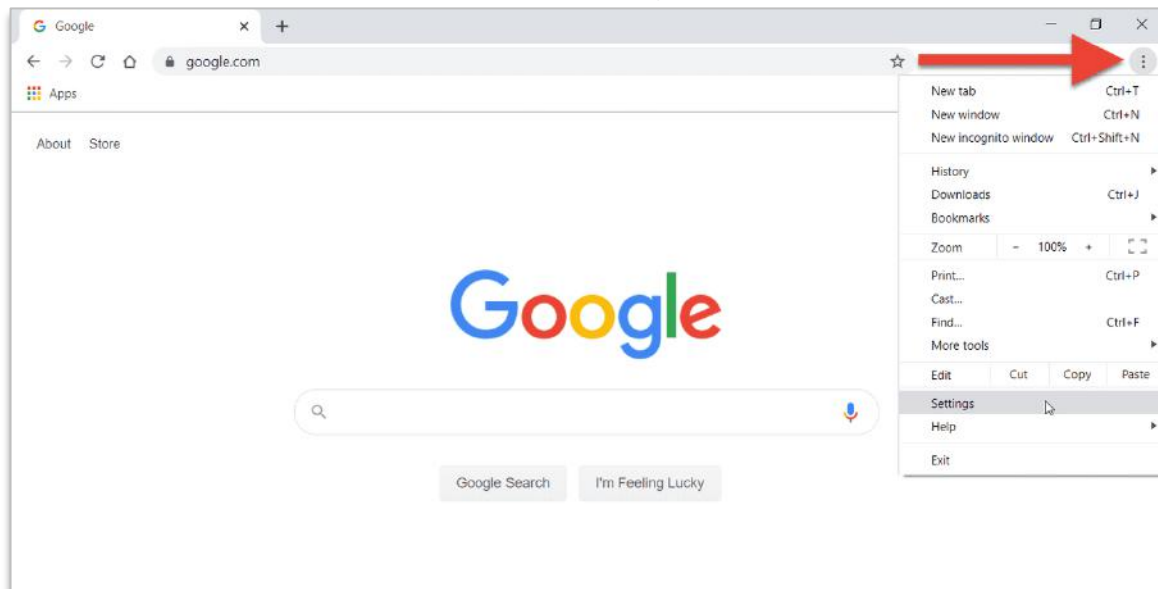


Figure 3-48 Chrome Settings

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

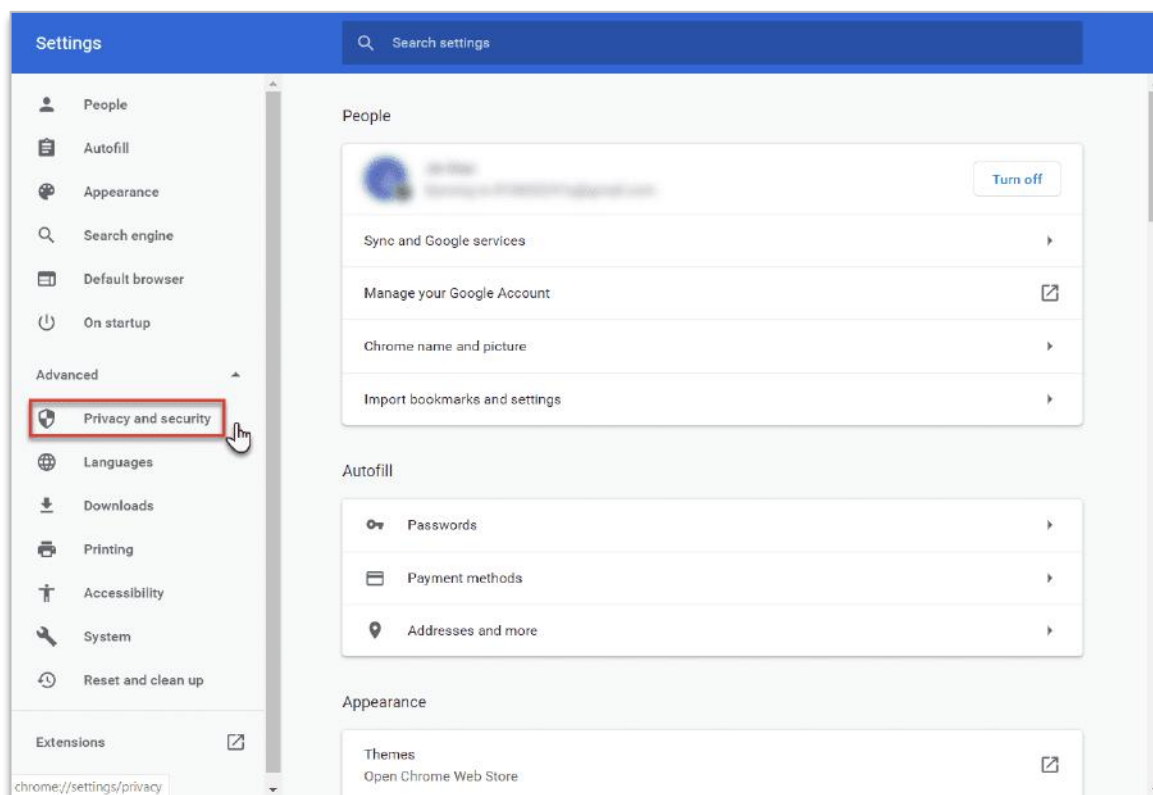


Figure 3-49 Privacy and security

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

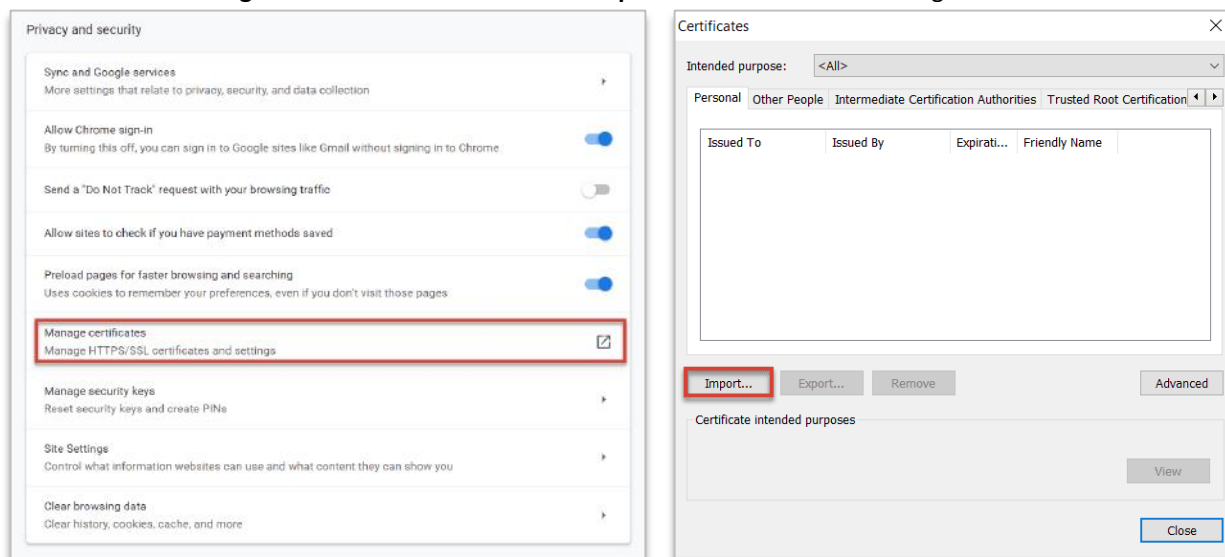


Figure 3-50 Manage certificates -> Import certificate

- 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.

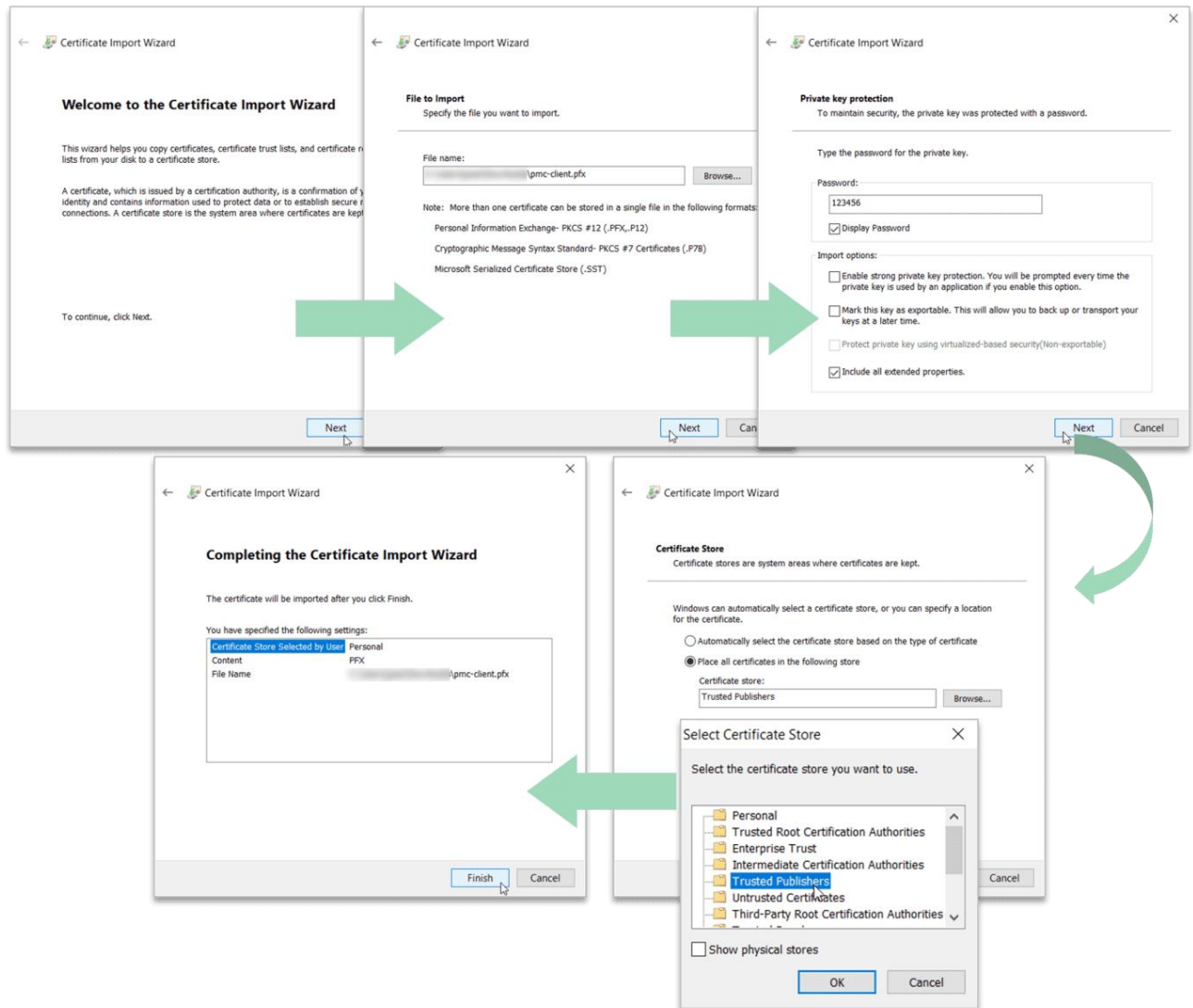


Figure 3-51 Import .pfx certificate

- 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>.

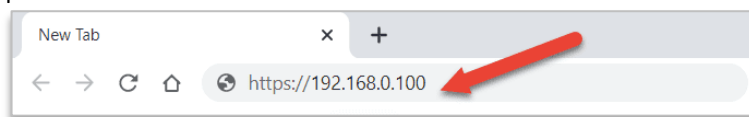


Figure 3-52 Web Logon

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

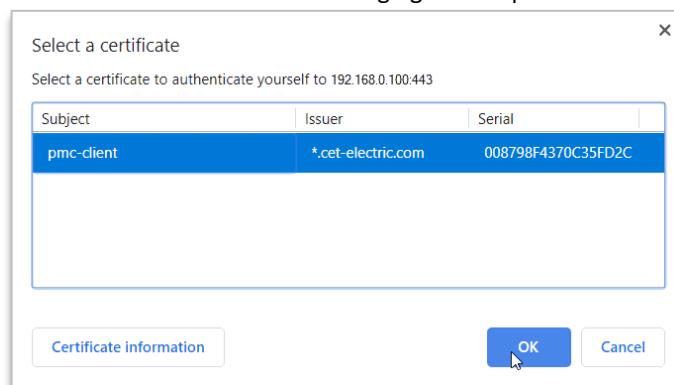


Figure 3-53 Select a certificate

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

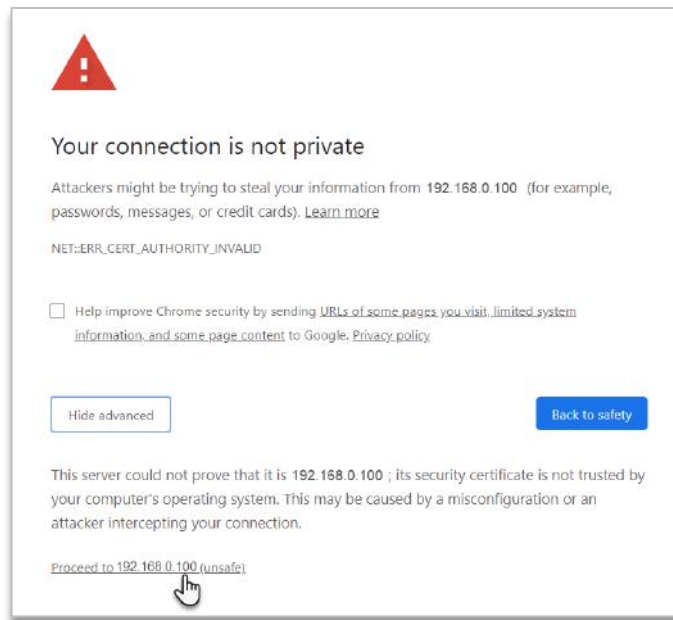


Figure 3-54 Privacy Error

- 5) The iMeter D7's login page appears.

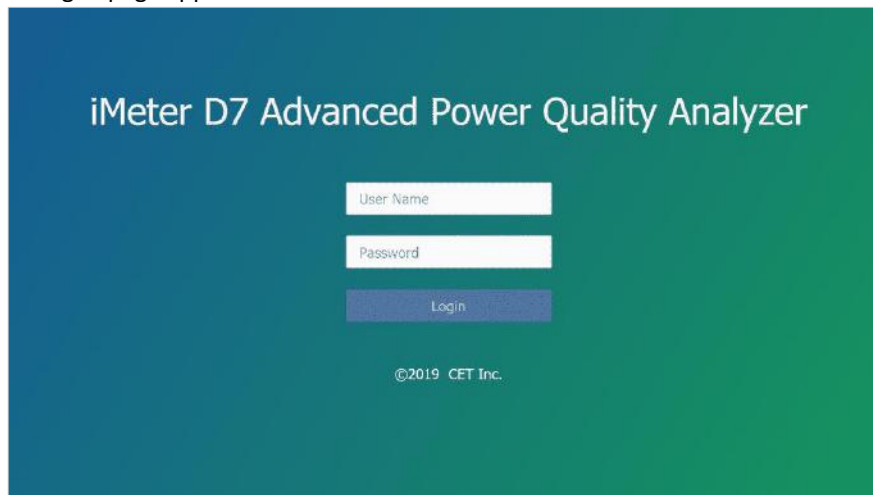


Figure 3-55 Web Interface

- 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.

|  |                 |                                                                                                  |
|--|-----------------|--------------------------------------------------------------------------------------------------|
|  | <b>Operator</b> | Modify/Backup/Restore Setup Parameters<br>Reset Max./Min.<br>Clear Operations<br>Firmware Update |
|  | <b>User</b>     | View Data<br>View Setup Parameters                                                               |

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**

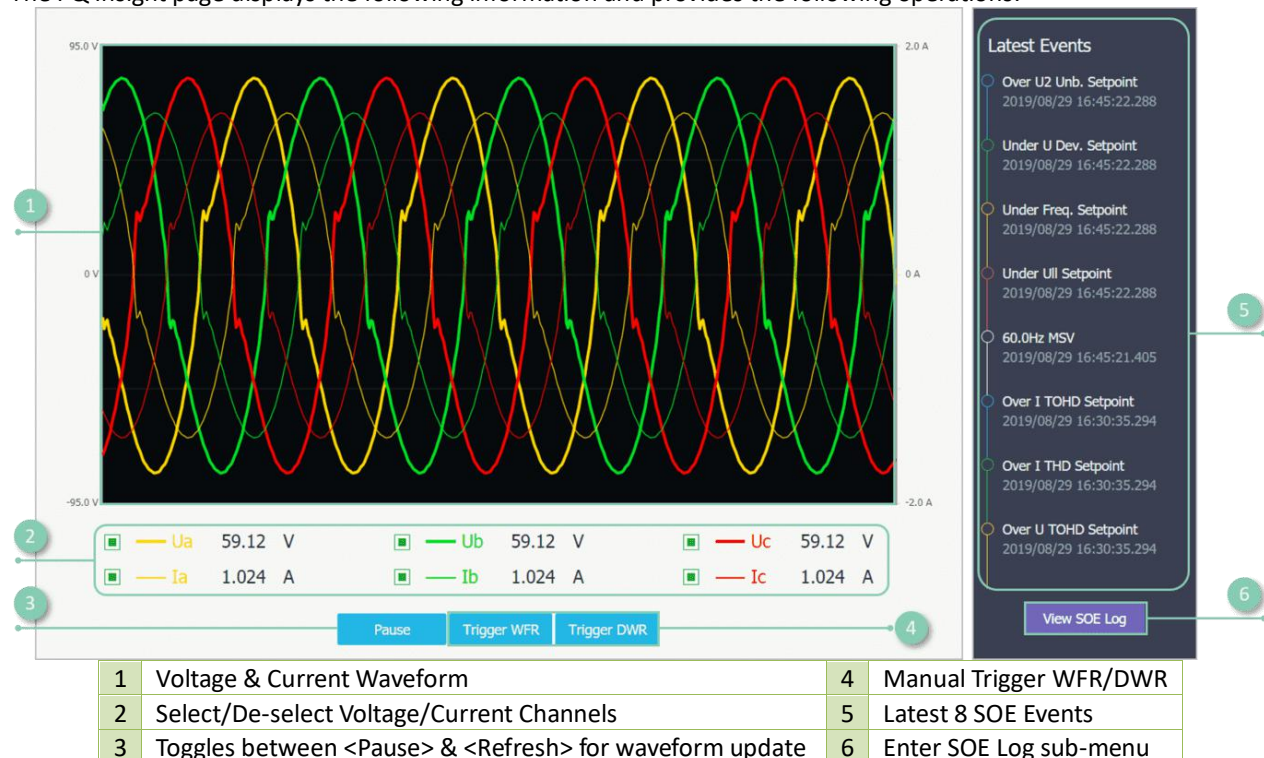
- 8) The Web Interface's login password can be changed by clicking on the inverse triangle at the upper right-hand corner of the page and then selecting **Change Password** as shown below. The new password must consist of a combination of numbers, letters (case-sensitive) and ASCII special characters.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



**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.

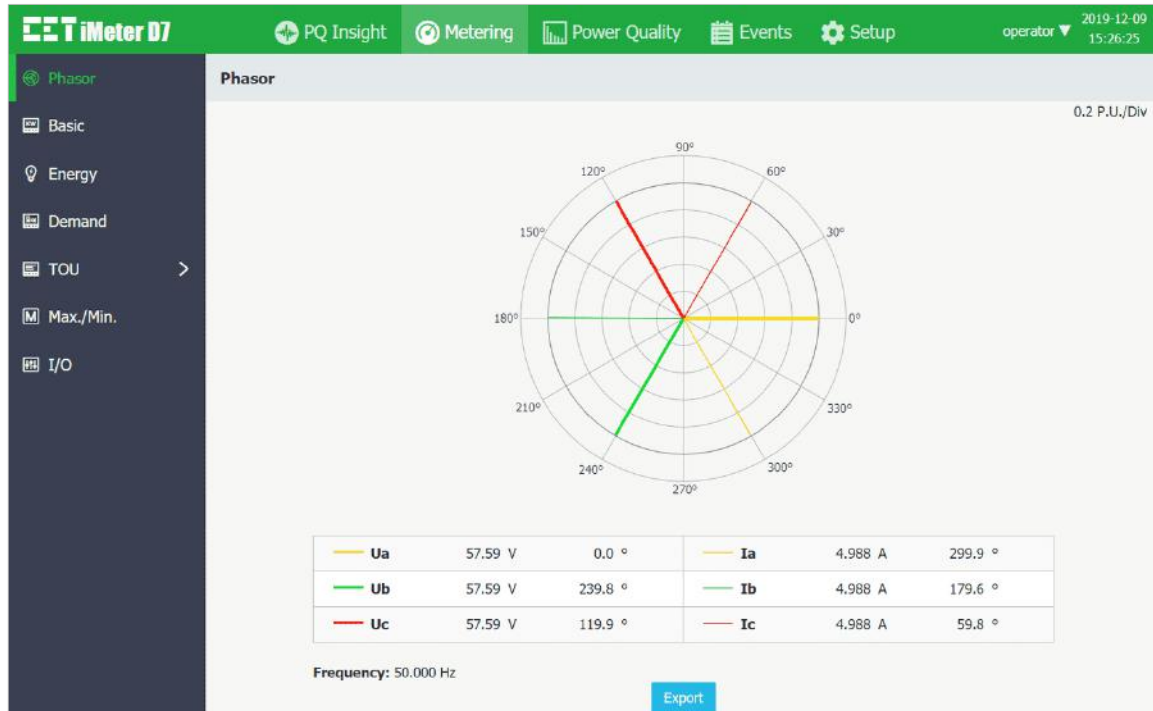


Figure 3-60 Phasor Diagram

#### 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.

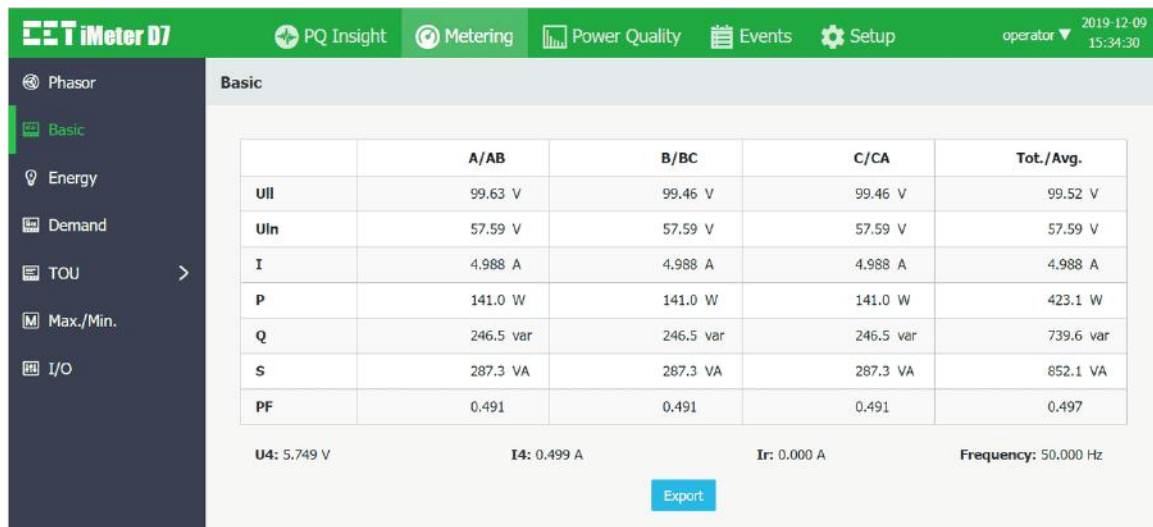


Figure 3-61 Basic Information

### 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.

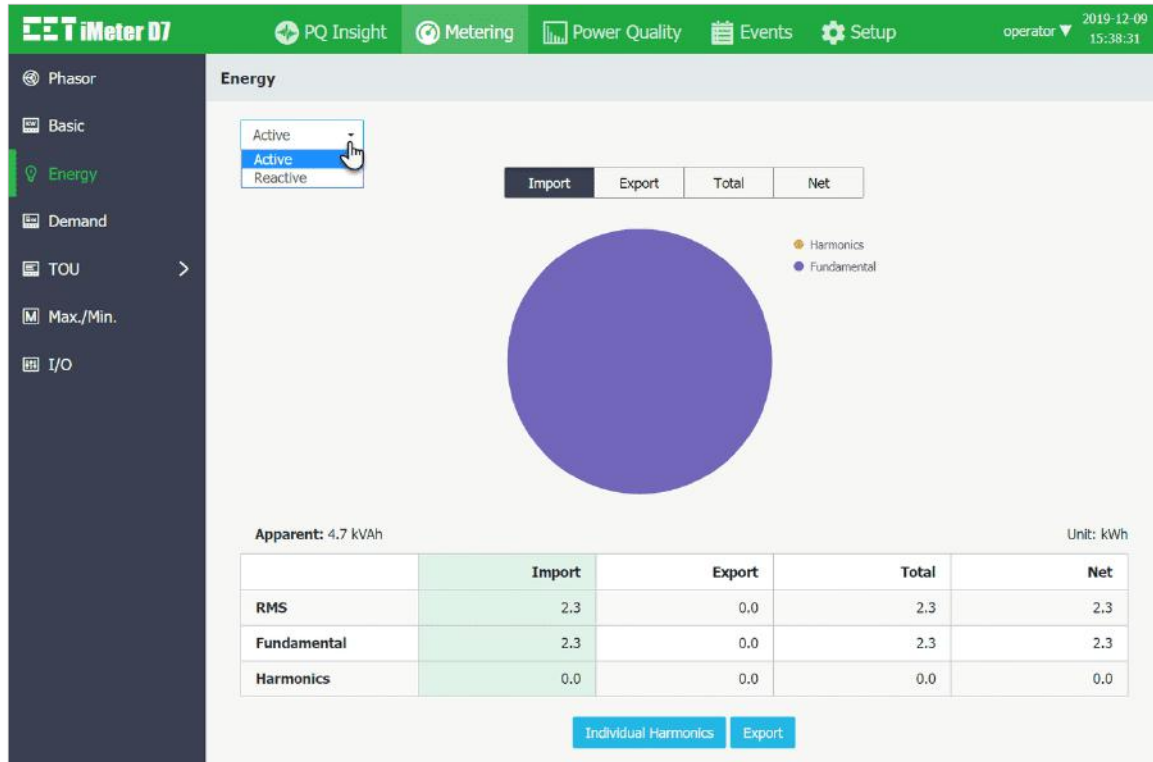


Figure 3-62 Energy Interface

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.

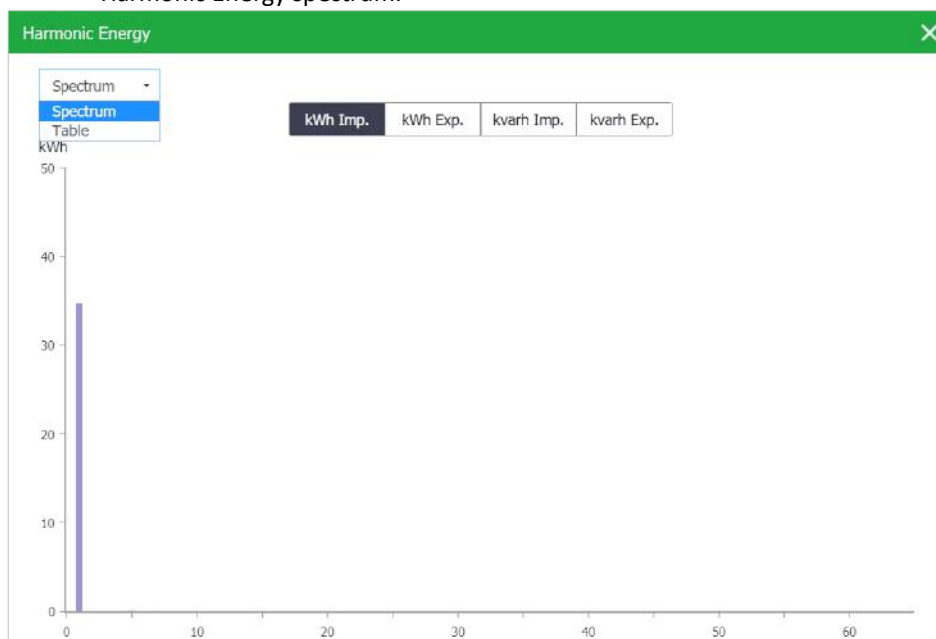


Figure 3-63 Individual Harmonics in Spectrum

- Table

| Harmonic Energy |                |                |                    |                    |
|-----------------|----------------|----------------|--------------------|--------------------|
| 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.

| EcoXplore iMeter D7                                                                                                                                         |                                            |           |           |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------|-----------|-----------|
| <span>PQ Insight</span> <span>Metering</span> <span>Power Quality</span> <span>Events</span> <span>Setup</span> <span>operator 2019-12-09 15:42:29</span>   |                                            |           |           |           |
| <ul style="list-style-type: none"> <li>Phasor</li> <li>Basic</li> <li>Energy</li> <li><b>Demand</b></li> <li>TOU</li> <li>Max./Min.</li> <li>I/O</li> </ul> | <b>Demand</b> <span>Reset This Max.</span> |           |           |           |
|                                                                                                                                                             | Present                                    | Predicted | This Max. | Last Max. |
| P Total Imp.                                                                                                                                                | 428.7 W                                    | 428.7 W   | 428.7 W   | 428.7 W   |
| P Total Exp.                                                                                                                                                | 0.000 W                                    | 0.000 W   | 0.000 W   | 0.000 W   |
| Q Total Imp.                                                                                                                                                | 749.5 var                                  | 749.4 var | 749.5 var | 749.5 var |
| Q Total Exp.                                                                                                                                                | 0.000 var                                  | 0.000 var | 0.000 var | 0.000 var |
| S Total                                                                                                                                                     | 863.4 VA                                   | 863.4 VA  | 863.4 VA  | 863.4 VA  |
| Ia                                                                                                                                                          | 5.021 A                                    | 5.021 A   | 5.021 A   | 5.021 A   |
| Ib                                                                                                                                                          | 5.021 A                                    | 5.021 A   | 5.021 A   | 5.021 A   |
| Ic                                                                                                                                                          | 5.021 A                                    | 5.021 A   | 5.021 A   | 5.021 A   |
| <span>Export</span>                                                                                                                                         |                                            |           |           |           |

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.

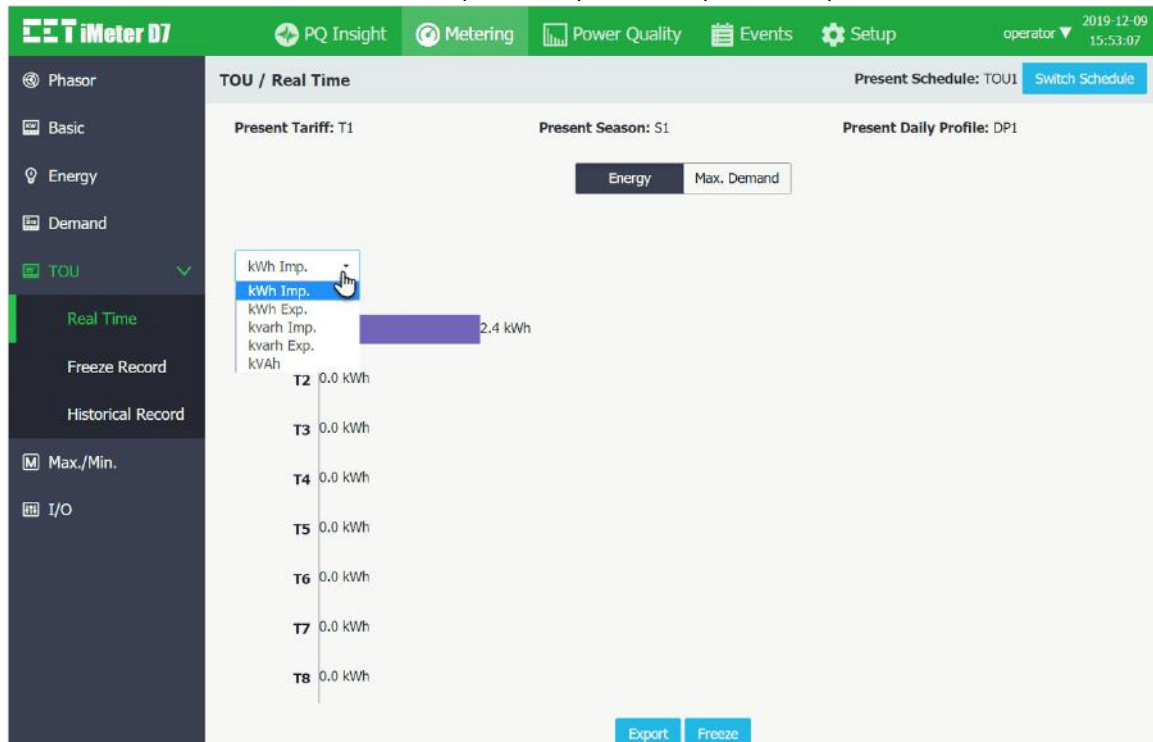


Figure 3-66 Real Time TOU Energy

- 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.

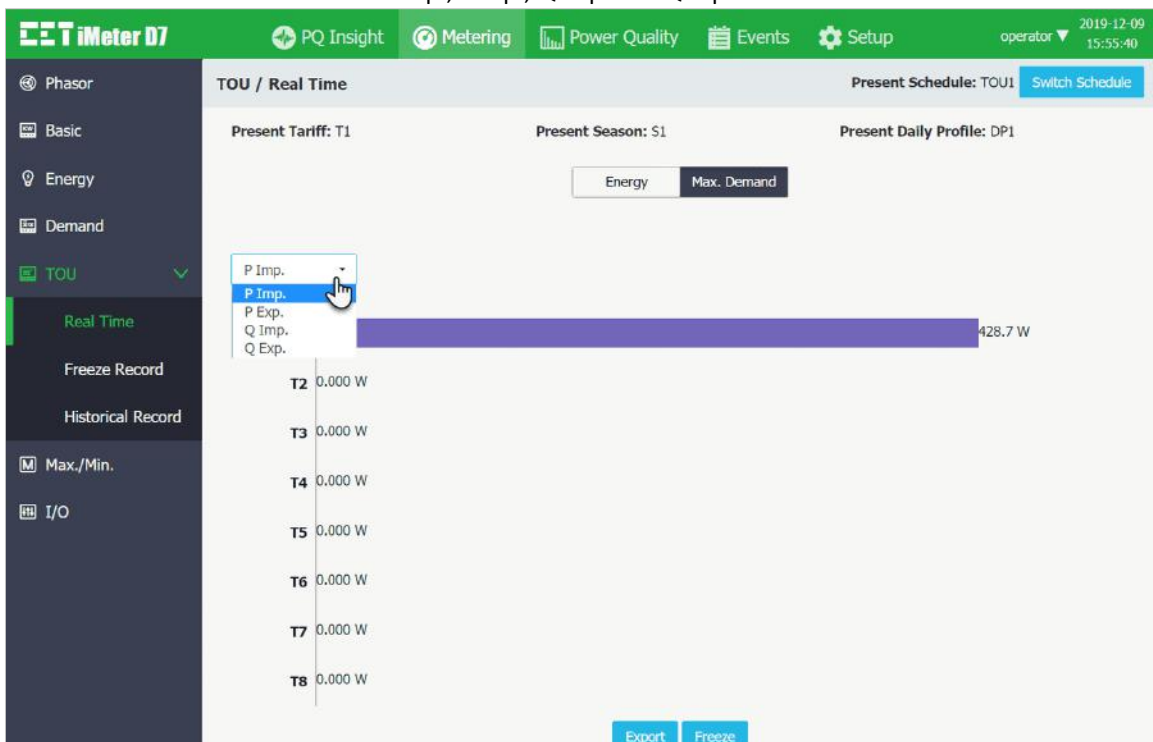


Figure 3-67 Real Time TOU Max. Demand

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.

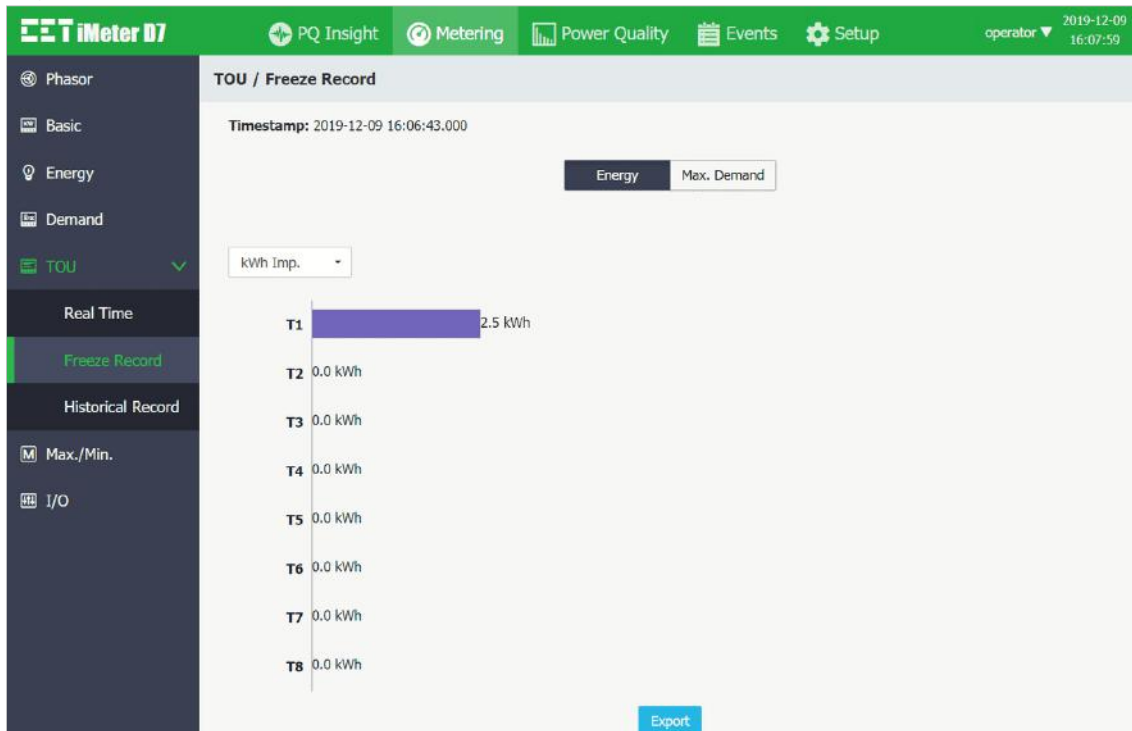


Figure 3-68 TOU Freeze Record

### 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.

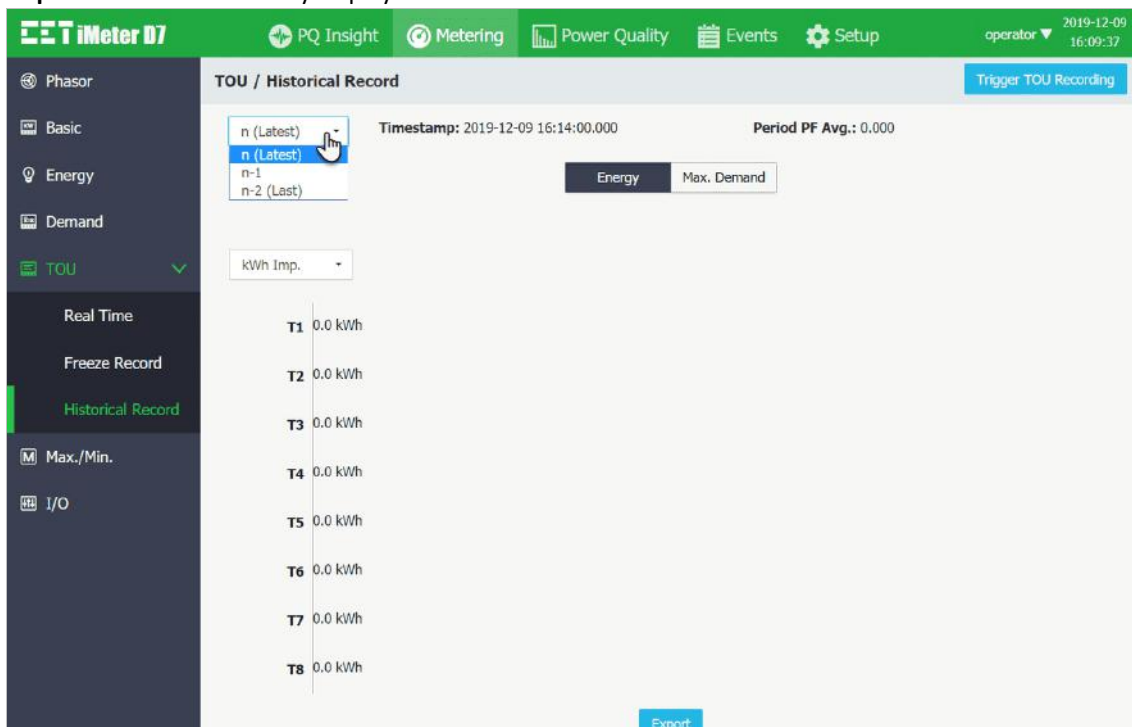


Figure 3-69 Historical TOU Record

### 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.

**Max./Min.**

Max. Record: Max. Record, Log 1

|       | Max.      | This Max. Timestamp     | Last Max. | Last Max. Timestamp |
|-------|-----------|-------------------------|-----------|---------------------|
| Freq. | 50.000 Hz | 2019-12-09 16:19:42.000 | --        | --                  |
| Ua    | 58.34 V   | 2019-12-09 16:19:45.000 | --        | --                  |
| Ub    | 58.34 V   | 2019-12-09 16:19:45.000 | --        | --                  |
| Uc    | 58.34 V   | 2019-12-09 16:19:45.000 | --        | --                  |
| Uab   | 100.9 V   | 2019-12-09 16:19:45.000 | --        | --                  |
| Ubc   | 100.8 V   | 2019-12-09 16:19:45.000 | --        | --                  |
| Uca   | 100.8 V   | 2019-12-09 16:19:45.000 | --        | --                  |
| Ia    | 5.053 A   | 2019-12-09 16:19:45.000 | --        | --                  |
| Ib    | 5.053 A   | 2019-12-09 16:19:45.000 | --        | --                  |
| Ic    | 5.053 A   | 2019-12-09 16:19:45.000 | --        | --                  |

Export

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.

**I/O**

**DI**

| DI  | Status |
|-----|--------|
| DI1 | OFF    |
| DI2 | OFF    |
| DI3 | OFF    |
| DI4 | OFF    |

**DO**

| DO    | Status |
|-------|--------|
| DO1   | OFF    |
| DO2   | OFF    |
| Alarm | ON     |

**Temperature**

| TC | Status |
|----|--------|
| TC | --     |

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 63<sup>rd</sup> 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.

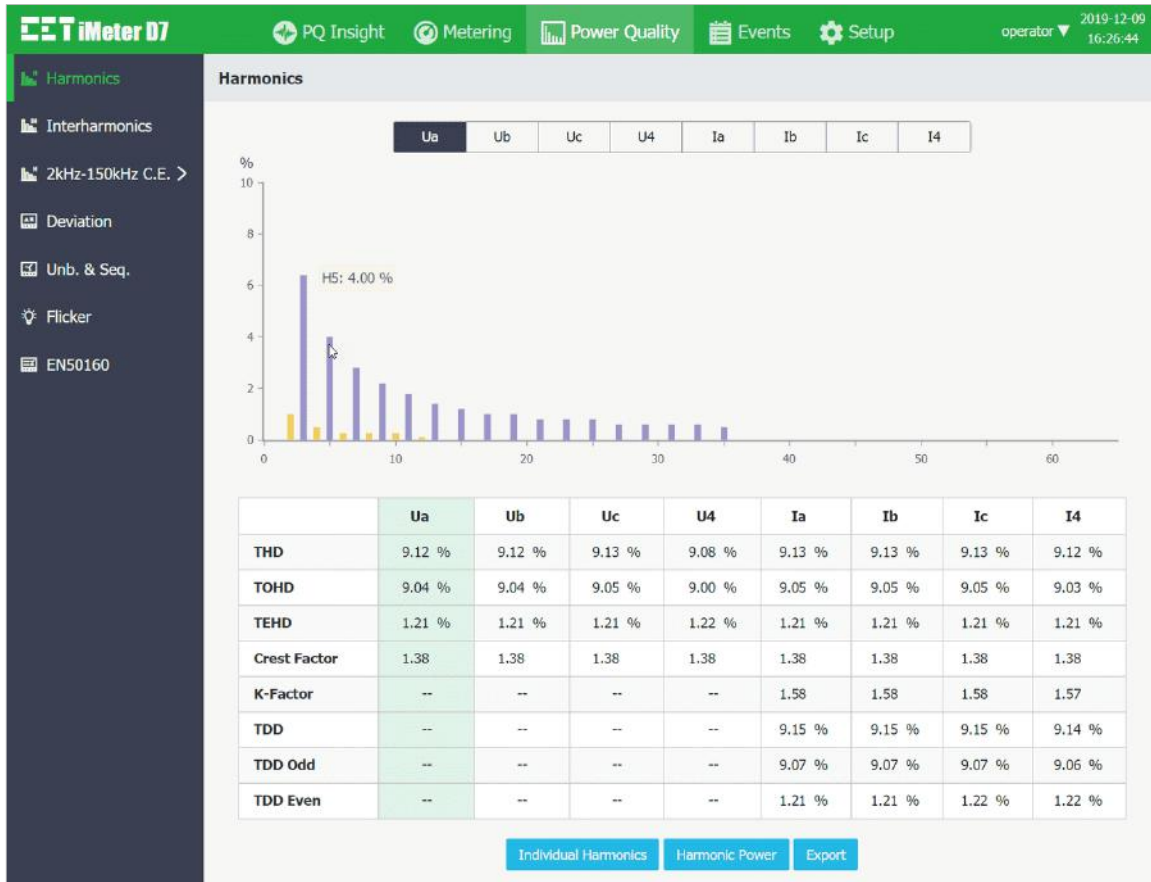


Figure 3-72 Harmonics

- 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.

| Individual Harmonics |          |    |    |         |    |        |    |
|----------------------|----------|----|----|---------|----|--------|----|
|                      | Ua       | Ub | Uc | U4      | Ia | Ib     | Ic |
|                      | %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 3Φ P, Q, S, and PF in Table format.

| Harmonic Power |          |            |          |        |
|----------------|----------|------------|----------|--------|
|                | L1       | L2         | L3       |        |
|                | 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.



### 3.2.3.3.3 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.

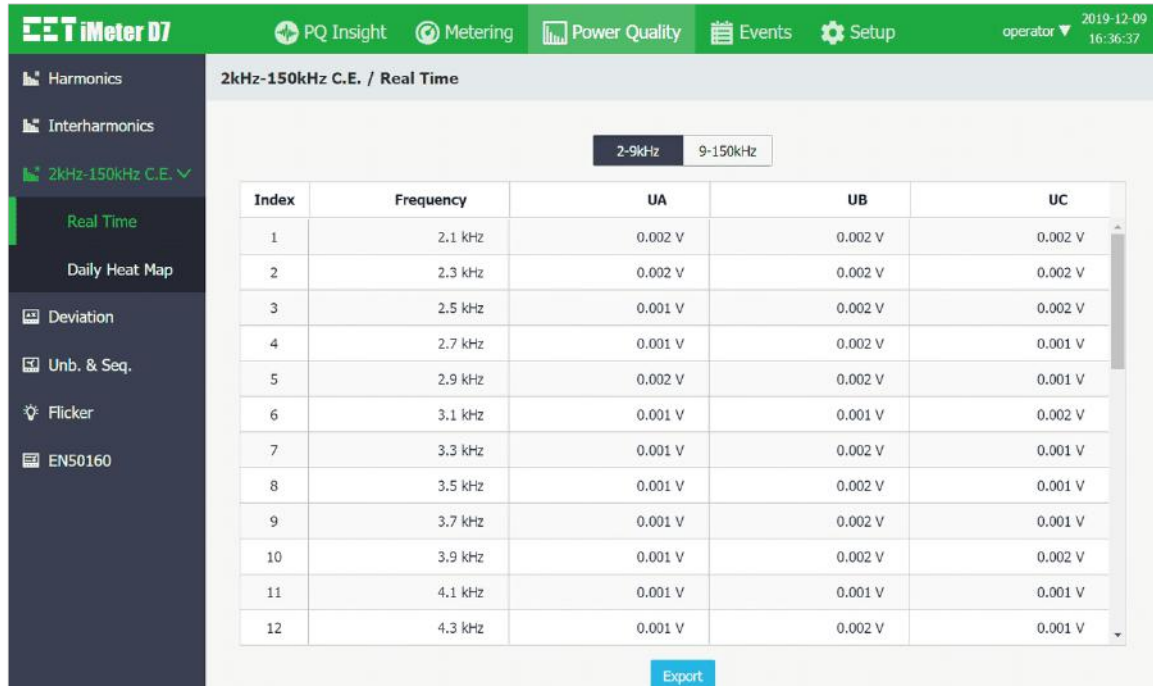


Figure 3-77 2 – 150 kHz Real Time Conducted Emissions

#### 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.

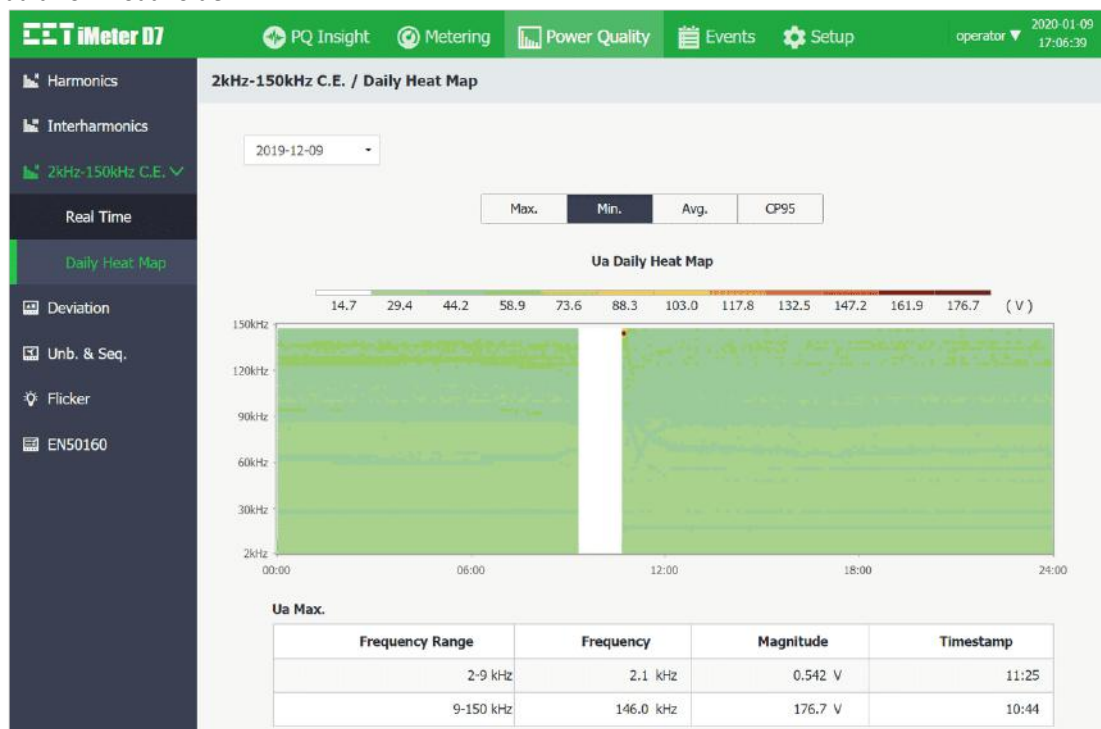


Figure 3-78 Daily Heat Map – Peak value for Min. Ua

### 3.2.3.3.4 Deviation

Click **Deviation** on the left-hand pane to display the Over/Under Deviation for 3 $\Phi$  UIn and UII as well as the Frequency Deviation.

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

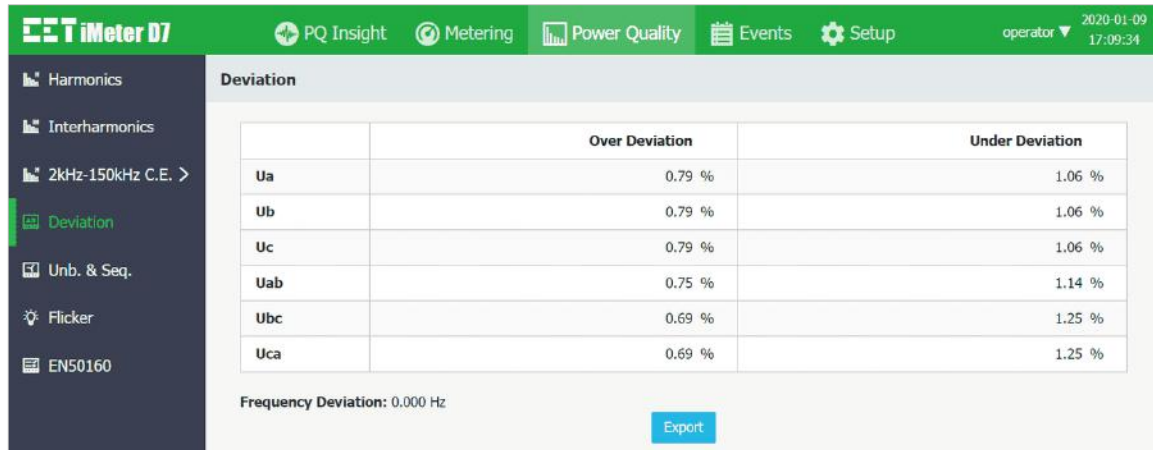


Figure 3-79 Deviation

### 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.

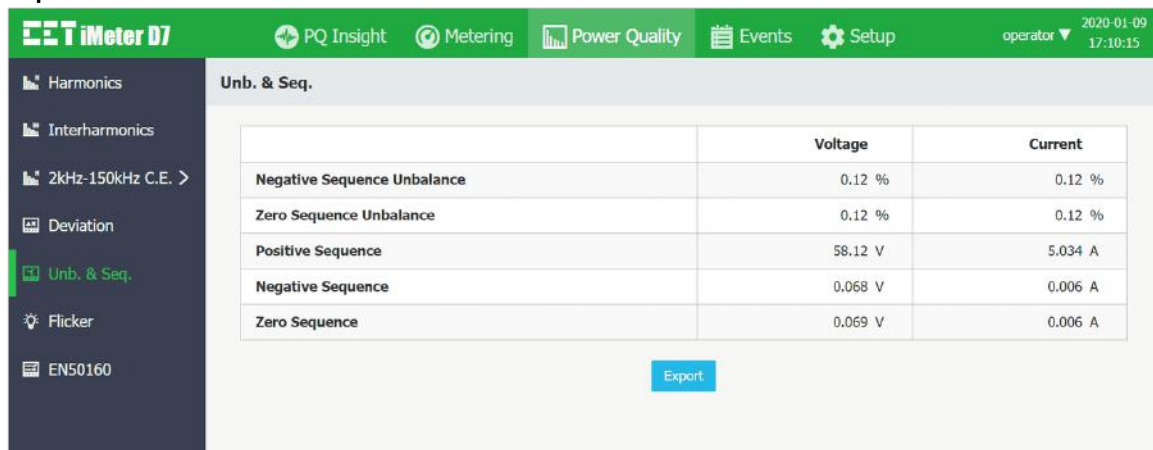


Figure 3-80 Unbalances & Sequences Interface

### 3.2.3.3.6 Flicker

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

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

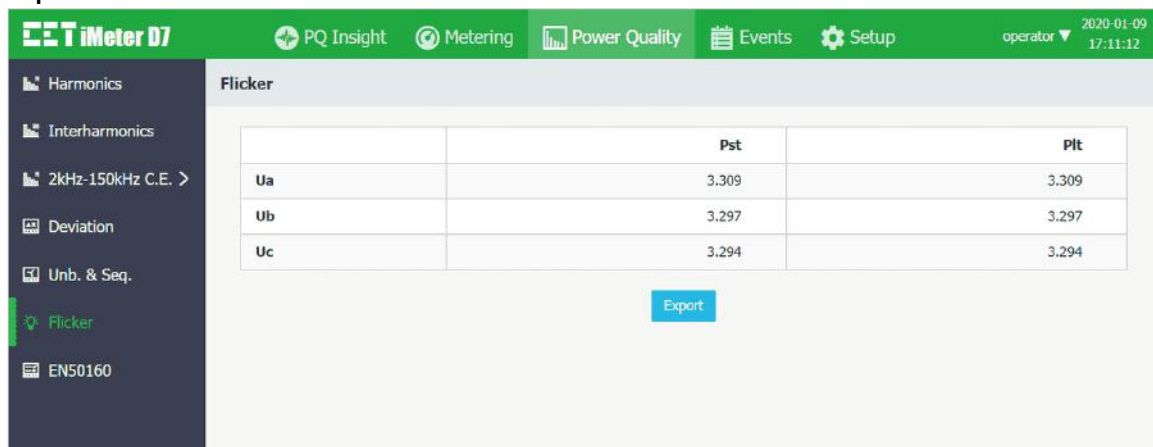


Figure 3-81 Flicker

### 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.

**EN50160 Summary Report**

Search Period: Week49 2019-12-09 08:38:00 - 2020-01-09 16:39:00

**Continuous Phenomena**

| 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 Voltage          | ✗          |
| 07  | Interharmonic Voltage     |            |
| 08  | Mains Signalling Voltages | ✓          |

**Voltage Events**

| No. | Power Quality Parameters            | Conclusion |
|-----|-------------------------------------|------------|
| 09  | Interruptions of the Supply Voltage |            |
| 10  | Supply Voltage Dips                 |            |
| 11  | Supply Voltage Swells               |            |
| 12  | Transient Overvoltages              |            |

Buttons: Export, Print

Figure 3-82 EN50160 Summary

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

- **Power Frequency**

| EN50160 Report (Week42 2019/10/21 - 2019/10/27) |              |            |            |
|-------------------------------------------------|--------------|------------|------------|
| Power Frequency                                 |              |            |            |
| Limit %                                         | Compliance % | Measured % | Conclusion |
| 99.00 ~ 101.00                                  | 99.50        | 100.00     | ✓          |
| 94.00 ~ 104.00                                  | 100.00       | 100.00     | ✓          |

Measured: 50.000 Hz ~ 50.000 Hz

Figure 3-83 Power Frequency

- **Supply Voltage Variations**

| EN50160 Report (Week42 2019/10/21 - 2019/10/27) |              |            |        |        |            |
|-------------------------------------------------|--------------|------------|--------|--------|------------|
| Supply Voltage Variations                       |              |            |        |        |            |
| Limit %                                         | Compliance % | Measured % |        |        | Conclusion |
|                                                 |              | Ua         | Ub     | Uc     |            |
| 90.00 ~ 110.00                                  | 95.00        | 100.00     | 100.00 | 100.00 | ✓          |
| 85.00 ~ 110.00                                  | 100.00       | 100.00     | 100.00 | 100.00 | ✓          |

Measured Ua: 120.3 kV ~ 120.3 kV    Measured Ub: 120.3 kV ~ 120.3 kV    Measured Uc: 120.3 kV ~ 120.3 kV

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                             |            |
| Pit ≤ 1.000                                     | 95.00        | 0.00                           | 0.00 | 0.00                           | ✗          |
| Measured Ua Pit: 3.308 ~ 3.310                  |              | Measured Ub Pit: 3.298 ~ 3.300 |      | Measured Uc Pit: 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<br>h                                      | Avg.<br>% |      |      | CP95<br>% |      |      | Max.<br>% |      |      |
|                                                 | 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<br>Hz                      | Limit<br>% | Compliance<br>% | Measured<br>% |        |        | 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 |
| <b>Conclusion</b><br>Continuous Phenomena <span style="float: right;">Period: 2019/08/01 - 2019/08/04</span> |                           |                |
| 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.

| No. | Timestamp               | Description                  |
|-----|-------------------------|------------------------------|
| 1   | 2020-01-09 17:22:54.797 | Ia Inrush Current            |
| 2   | 2020-01-09 17:22:53.801 | 60.0Hz MSV                   |
| 3   | 2020-01-09 17:20:40.166 | PQ Disturbance Ended         |
| 4   | 2020-01-09 17:20:40.066 | Interruption Triggered by UA |
| 5   | 2020-01-09 17:20:40.046 | PQ Disturbance Started       |
| 6   | 2020-01-09 17:20:16.456 | PQ Disturbance Ended         |
| 7   | 2020-01-09 17:20:16.356 | Dip Triggered by UA          |
| 8   | 2020-01-09 17:20:16.356 | PQ Disturbance Started       |
| 9   | 2020-01-09 17:19:52.866 | PQ Disturbance Ended         |
| 10  | 2020-01-09 17:19:52.766 | Swell Triggered by UA        |

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 3 $\Phi$  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**

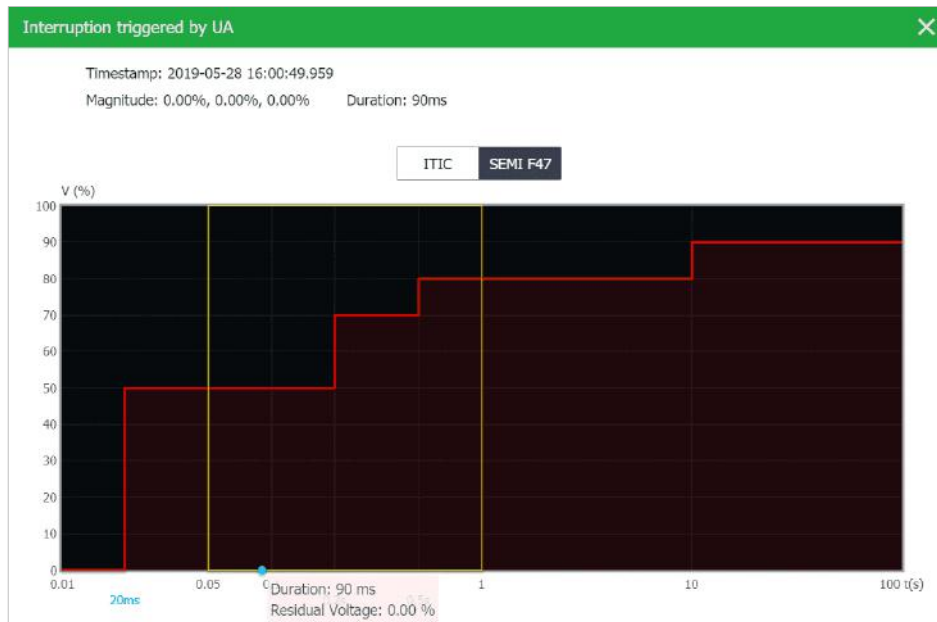


Figure 3-101 Interruption on SEMI F47 Interface

### 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.

iMeter D7   PQ Insight   Metering   Power Quality   Events   Setup   operator   2020-01-09 17:33:27

SOE Log   **Device Log**   PQ Counters

Device Log   Search Period   Keyword Search

Entire Log   Enter Key Words

| No. | Timestamp               | Description                     |
|-----|-------------------------|---------------------------------|
| 1   | 2020-01-09 17:22:40.549 | Setup Changes                   |
| 2   | 2020-01-09 17:22:40.349 | Setup Changes                   |
| 3   | 2020-01-09 17:22:13.447 | Setup Changes                   |
| 4   | 2020-01-09 17:22:03.759 | Setup Changes                   |
| 5   | 2020-01-09 17:21:36.658 | Setup Changes                   |
| 6   | 2019-12-09 16:25:11.777 | Factory Setup Changes           |
| 7   | 2019-12-09 16:19:39.030 | Setup Changes                   |
| 8   | 2019-12-09 16:14:00.385 | TOU Recorder Triggered Manually |
| 9   | 2019-12-09 16:13:55.461 | TOU Recorder Triggered Manually |
| 10  | 2019-12-09 16:09:30.300 | TOU Recorder Triggered Manually |

No. of Events: 60, No. of Filtered Events: 60

Export

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.

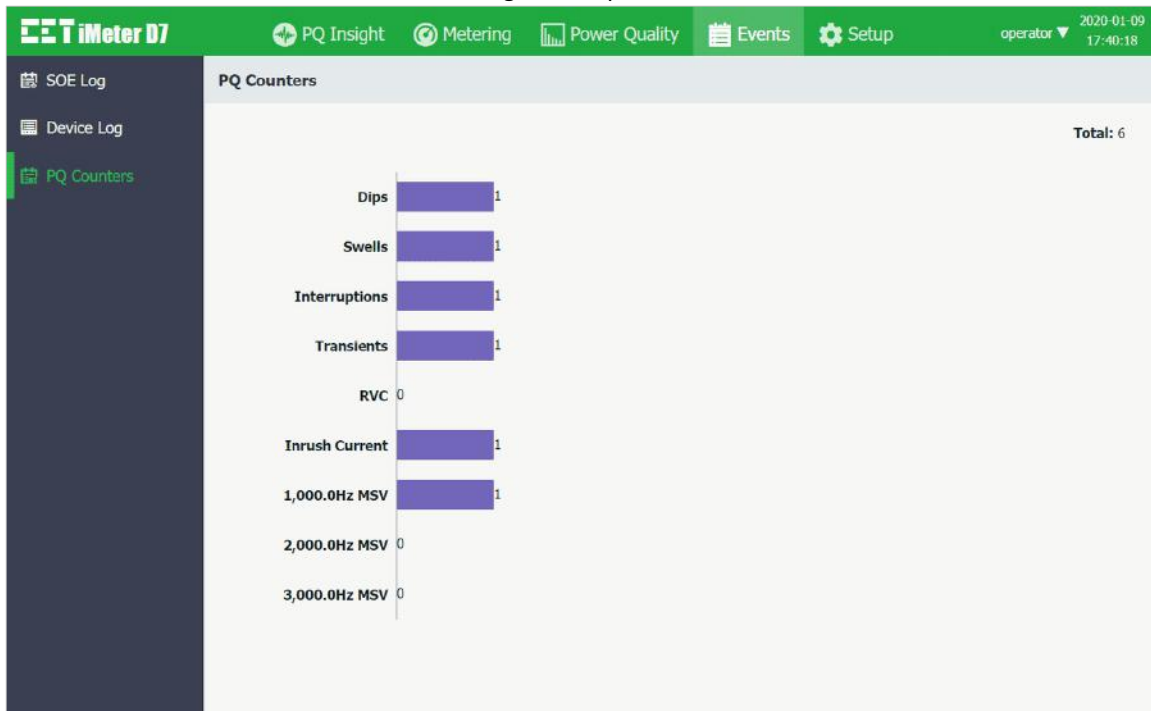


Figure 3-103 PQ Counters

### 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.

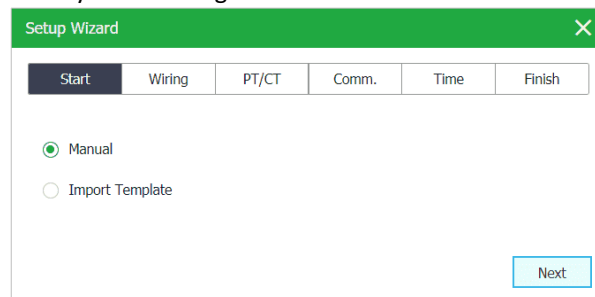


Figure 3-104 Start

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

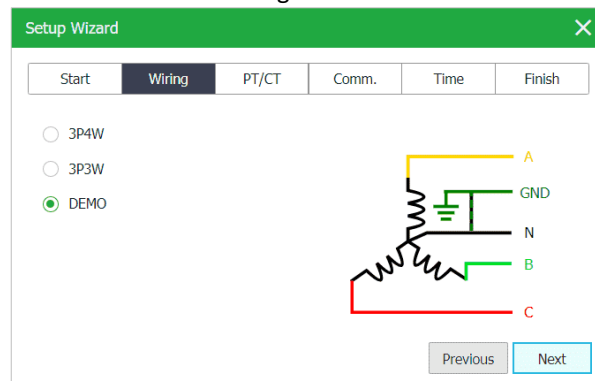


Figure 3-105 Wiring

- **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*       |
|----------------------|--------------------------------------------------------------------------------------------------|--------------|----------------------|
| <b>Wiring</b>        |                                                                                                  | <b>PT/CT</b> |                      |
| Wiring Mode          | 3P4W*, 3P3W, DEMO                                                                                | U/I 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*    |
| Ia/Ib/Ic/I4 Polarity | Ia Normal*/Reverse, Ib Normal*/Reverse, Ic Normal*/Reverse, I4 Normal*/Reverse                   | CT Primary   | 1 to 30000A, 5A*     |
|                      |                                                                                                  | CT Secondary | 1 to 50A, 5A*        |
|                      |                                                                                                  | 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.

The White List settings interface includes a checkbox to 'Enable' the list. Below it is a table with two columns: 'No.' and 'IP Address'. The table has 10 rows for adding entries. A 'Save' button is located at the bottom right of the interface.

Figure 3-117 White List Settings

### 3.2.3.5.2.4 Basic > VPN

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

The VPN Settings Interface is divided into several sections under the 'Basic' tab:

- IKE Basic (Restart Required):** Includes fields for Enable (Disable), Remote Address, Exchange Version (V1), Method (Shared key), ESP Mode (Tunnel), Hash (md5), Life Time (28800 s), ID (cetike), Listen Port (P1), Exchange Mode (Aggressive), Shared Key, Diffie-Hellman Key Exchange (Group 2), and Encryption (3des).
- IKE Advanced (Restart Required):** Includes fields for PDP Liveness (60 s), Initial Contact (Off), Remote Identity, Passive (On), and Local Identity.
- IP Sec (Restart Required):** Includes fields for ID (cetipsec), Dest Address, TFC (On), Diffie-Hellman Key Exchange (Group 2), Encryption (3des), Source Address, Life Time (28800 s), ESN (On), Security Protocol (ESP), and Hash (md5).

A 'Save' button is located at the bottom of the interface.

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**.

**Basic**

Basic IP Comm. VPN **Time** Cloud Others

**Date (Unsynchronized)**

Date: 2020/01/17

Time: 13 : 46 : 06

Time Zone: GMT+08:00

Date Format: YY/MM/DD

☐ Sync. with PC



**Time Sync.**

Clock Source: RTC

IRIG-B Time Zone: GMT+08:00

SNTP Server IP: 0.0.0.0

SNTP Interval: 60 min

SNTP Broadcast: Yes

Save

Figure 3-119 Time Settings Interface

### 3.2.3.5.2.6 Basic > Cloud

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

**Basic**

Basic IP Comm. VPN Time **Cloud** Others

**Basic Settings**

Enable: No

Encryption: No

Server IP: 0.0.0.0

Server Port: 18085

**Upload Settings**

Upload Interval: 10 s

Harmonics: More >>

2k-150kHz C.E.: More >>

Real Time: More >>

Interharmonics: More >>

Record: More >>

Save

Figure 3-120 Cloud Settings Interface

### 3.2.3.5.2.7 Basic > Others

**Basic**

Basic IP Comm. VPN Time Cloud **Others**

**Others**

Language: English

Delimiter: 99,999,999

**Algorithm**

PF Convention: IEC

KVA Calculation: Vector

HD Calculation: % of FUND

Harm. Calc. Method: Subgroup

THD Order: 63

Save

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**

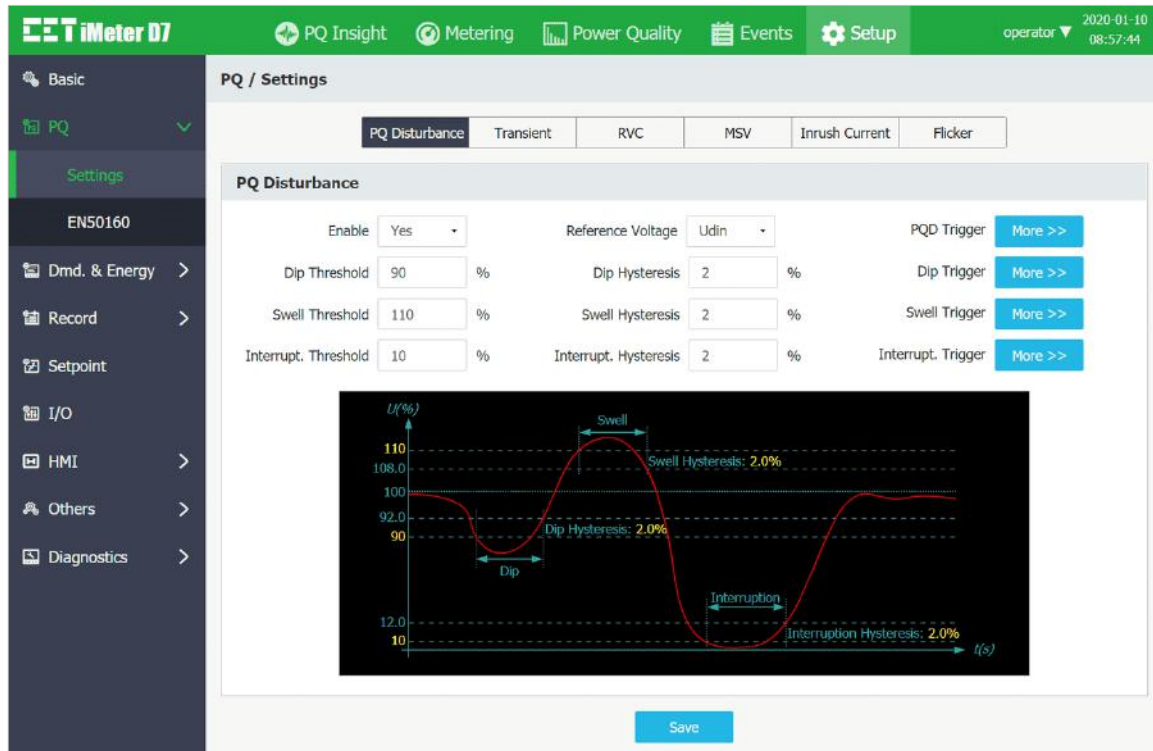


Figure 3-122 PQ Disturbance Settings Interface

- Transient**

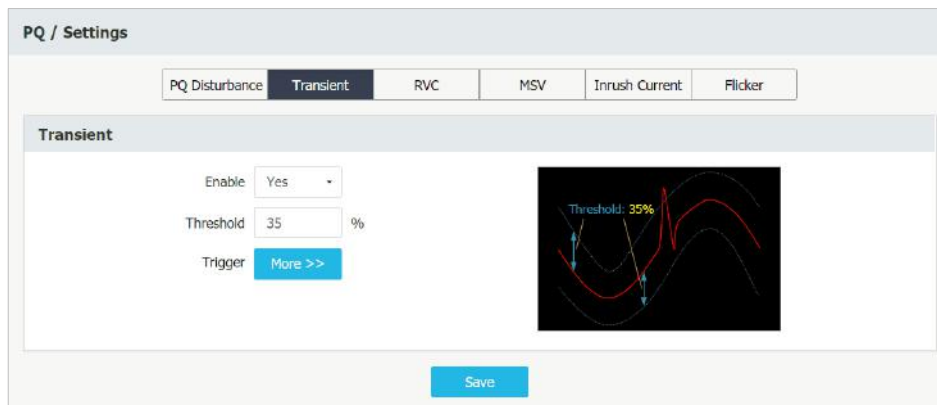


Figure 3-123 Transient Settings Interface

- RVC

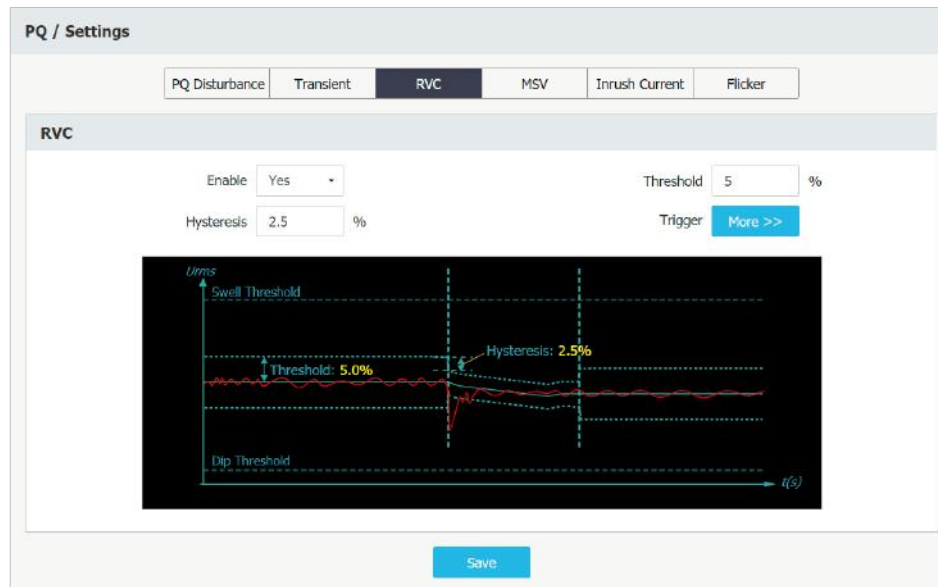


Figure 3-124 RVC Settings Interface

- MSV

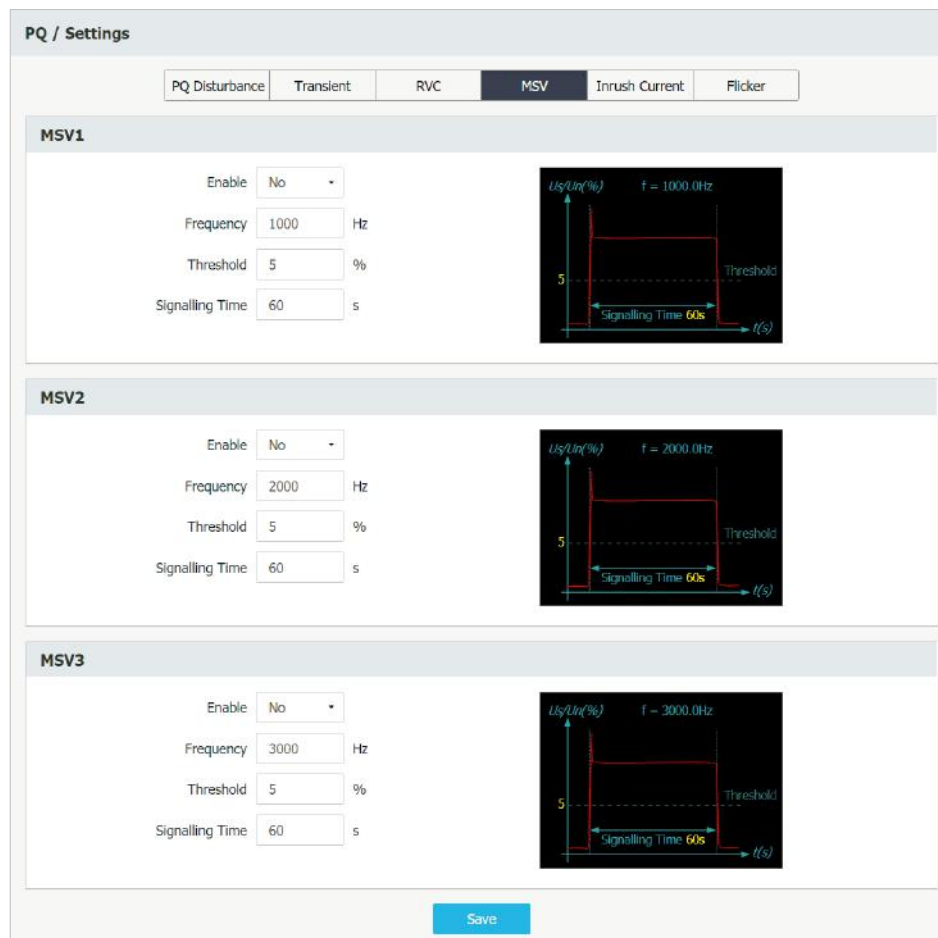


Figure 3-125 MSV Settings Interface

- Inrush Current

PQ / Settings

PQ Disturbance Transient RVC MSV **Inrush Current** Flicker

**Inrush Current**

Enable: No

Threshold: 120 %

Hysteresis: 1 %

Trigger: More >>

Save

Figure 3-126 Inrush Current Settings Interface

- Flicker

PQ / Settings

PQ Disturbance Transient RVC MSV Inrush Current **Flicker**

**Flicker**

Flicker Curve: 230V

Save

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.

**iMeter D7** PQ Insight Metering Power Quality Events Setup operator 2020-01-10 09:06:45

Basic PQ Settings **EN50160** Dmd. & Energy Record

PQ / EN50160

Basic Low Voltage

**Basic**

Voltage Level: Low First Day of Week: Sunday

Save

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

PQ / EN50160

Basic Low Voltage

**Power Frequency**

Wide Tolerance: 100 %

Narrow Tolerance: 99.5 %

Wide Tolerance Limit: 94 ~ 104 %

Narrow Tolerance Limit: 99 ~ 101 %

Figure 3-129 Power Frequency

- Supply Voltage Variations

| Supply Voltage Variations |                                  |   |                                    |
|---------------------------|----------------------------------|---|------------------------------------|
| Wide Tolerance            | <input type="text" value="100"/> | % |                                    |
| Narrow Tolerance          | <input type="text" value="95"/>  | % |                                    |
| Wide Tolerance Limit      | <input type="text" value="85"/>  | ~ | <input type="text" value="110"/> % |
| Narrow Tolerance Limit    | <input type="text" value="90"/>  | ~ | <input type="text" value="110"/> % |

Figure 3-130 Supply Voltage Variations

- Flicker Severity

| Flicker Severity |                                   |
|------------------|-----------------------------------|
| Tolerance        | <input type="text" value="95"/> % |
| Limit            | <input type="text" value="1"/>    |

Figure 3-131 Flicker Severity

- Supply Voltage Unbalance

| Supply Voltage Unbalance |                                   |
|--------------------------|-----------------------------------|
| Tolerance                | <input type="text" value="95"/> % |
| Limit                    | <input type="text" value="2"/> %  |

Figure 3-132 Supply Voltage Unbalance

- Voltage Harmonic Limits

| Voltage Harmonic Limits |                                    |       |                                    |
|-------------------------|------------------------------------|-------|------------------------------------|
| Tolerance               | <input type="text" value="95"/> %  | Total | <input type="text" value="8"/> %   |
| H02                     | <input type="text" value="2"/> %   | H03   | <input type="text" value="5"/> %   |
| H04                     | <input type="text" value="1"/> %   | H05   | <input type="text" value="6"/> %   |
| H06                     | <input type="text" value="0.5"/> % | H07   | <input type="text" value="5"/> %   |
| H08                     | <input type="text" value="0.5"/> % | H09   | <input type="text" value="1.5"/> % |
| H10                     | <input type="text" value="0.5"/> % | H11   | <input type="text" value="3.5"/> % |
| H12                     | <input type="text" value="0.5"/> % | H13   | <input type="text" value="3"/> %   |
| H14                     | <input type="text" value="0.5"/> % | H15   | <input type="text" value="0.5"/> % |
| H16                     | <input type="text" value="0.5"/> % | H17   | <input type="text" value="2"/> %   |
| H18                     | <input type="text" value="0.5"/> % | H19   | <input type="text" value="1.5"/> % |
| H20                     | <input type="text" value="0.5"/> % | H21   | <input type="text" value="0.5"/> % |
| H22                     | <input type="text" value="0.5"/> % | H23   | <input type="text" value="1.5"/> % |
| H24                     | <input type="text" value="0.5"/> % | H25   | <input type="text" value="1.5"/> % |

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.

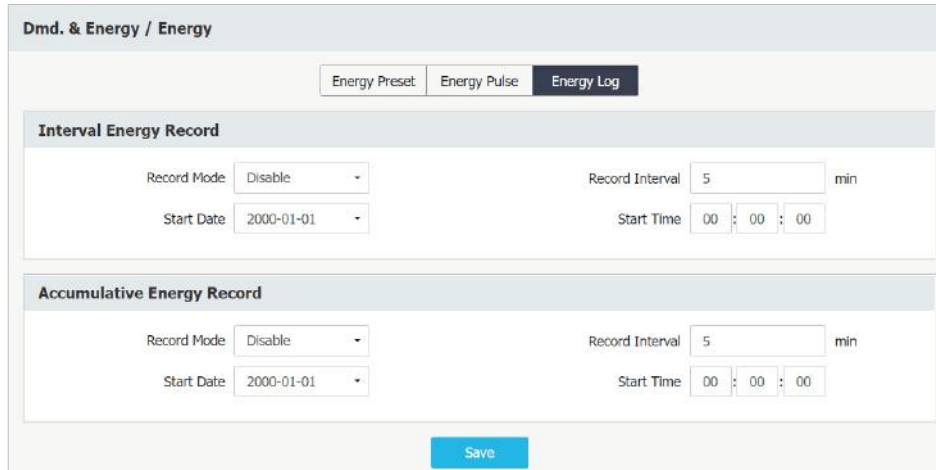
- Energy Preset** Supports the presetting of kWh Import/Export, kvarh Import/Export and kVAh Total. The valid range for the pre-defined energy should be between 0 to 99,999,999,999.

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.



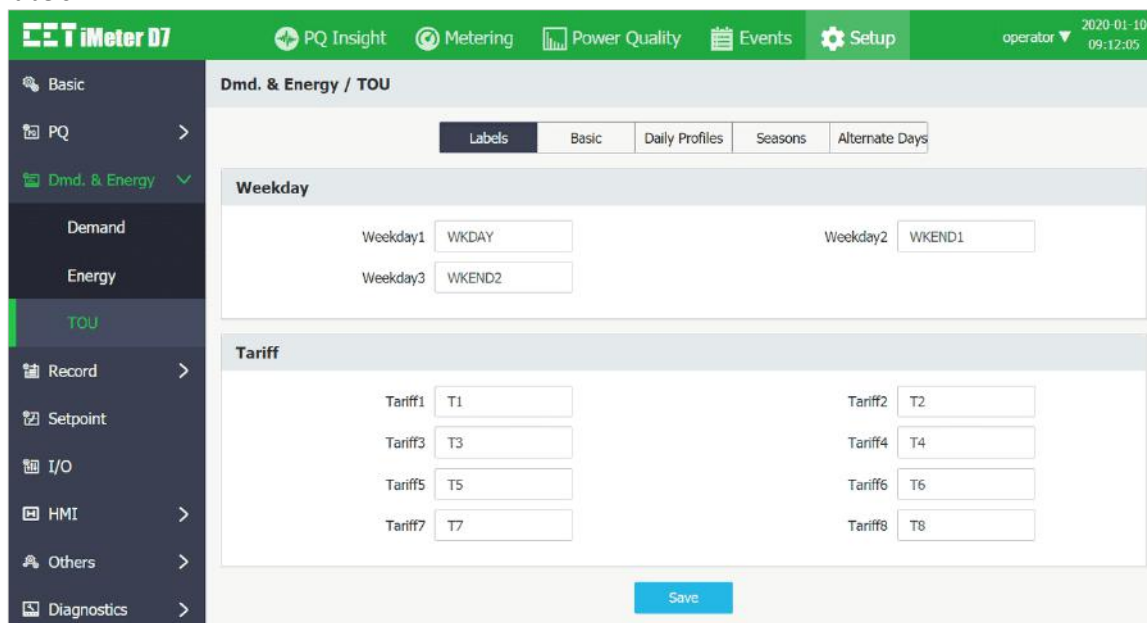
The interface is titled "Dmd. & Energy / Energy". It features three tabs: "Energy Preset", "Energy Pulse", and "Energy Log", with "Energy Log" being the active tab. Below the tabs are two sections: "Interval Energy Record" and "Accumulative Energy Record". Each section contains a "Record Mode" dropdown menu set to "Disable", a "Record Interval" input field set to "5" with a "min" unit, a "Start Date" dropdown menu set to "2000-01-01", and a "Start Time" input field set to "00 : 00 : 00". A blue "Save" button is located at the bottom center of the interface.

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**



The interface is titled "Dmd. & Energy / TOU". It features a sidebar on the left with a tree view containing "Basic", "PQ", "Dmd. & Energy" (expanded), "Demand", "Energy", "TOU" (selected), "Record", "Setpoint", "I/O", "HMI", "Others", and "Diagnostics". The main area has five tabs: "Labels", "Basic", "Daily Profiles", "Seasons", and "Alternate Days", with "Labels" being the active tab. Below the tabs are two sections: "Weekday" and "Tariff". The "Weekday" section contains three input fields: "Weekday1" set to "WKDAY", "Weekday2" set to "WKEND1", and "Weekday3" set to "WKEND2". The "Tariff" section contains eight input fields: "Tariff1" to "Tariff7" set to "T1" through "T7" respectively, and "Tariff8" set to "T8". A blue "Save" button is located at the bottom center of the interface.

Figure 3-138 Labels Setup Interface

- Basic

**Dmd. & Energy / TOU**

Labels Basic Daily Profiles Seasons Alternate Days

**Define Day Types**

Sunday WKDAY  
Monday WKDAY  
Tuesday WKDAY  
Wednesday WKDAY  
Thursday WKDAY  
Friday WKDAY  
Saturday WKDAY

**TOU Record Self-Read Time**

☒ Each Month 01 Day 0 Hour  
☐ Manual

**Switching Time of TOU1 and TOU2**

☐ 2000 Year 1 Month 01 Day 0 Hour  
☒ Manual

Save

Figure 3-139 Basic Settings Interface

- Daily Profiles

**Dmd. & Energy / TOU**

Labels Basic Daily Profiles Seasons Alternate Days

**TOU1**

| No. | Daily Profile Name | Details        |
|-----|--------------------|----------------|
| 1   | DP1                | 00:00-24:00 T1 |
| 2   | DP2                | 00:00-24:00 T1 |
| 3   | DP3                | 00:00-24:00 T1 |
| 4   | DP4                | 00:00-24:00 T1 |

**TOU2**

| No. | Daily Profile Name | Details        |
|-----|--------------------|----------------|
| 1   | DP1                | 00:00-24:00 T1 |
| 2   | DP2                | 00:00-24:00 T1 |
| 3   | DP3                | 00:00-24:00 T1 |
| 4   | DP4                | 00:00-24:00 T1 |

Save

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**.

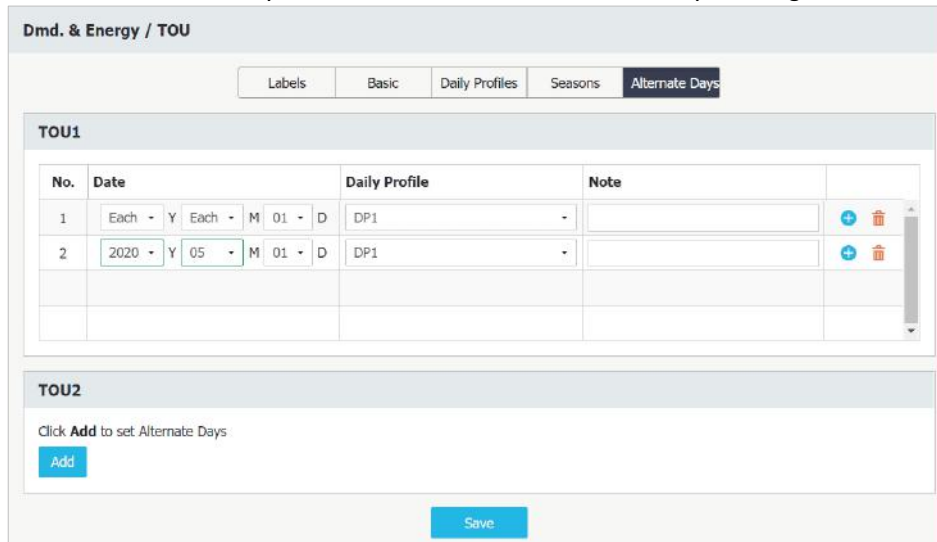
Figure 3-142 Season Setup Interface

- 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.



**Dmd. & Energy / TOU**

Labels Basic Daily Profiles Seasons **Alternate Days**

**TOU1**

| No. | Date                     | Daily Profile | Note |                                                                                                                                                                         |
|-----|--------------------------|---------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Each - Y Each - M 01 - D | DP1 -         |      |   |
| 2   | 2020 - Y 05 - M 01 - D   | DP1 -         |      |   |

**TOU2**

Click **Add** to set Alternate Days

**Add**

**Save**

Figure 3-144 Alternate Days Setup Interface

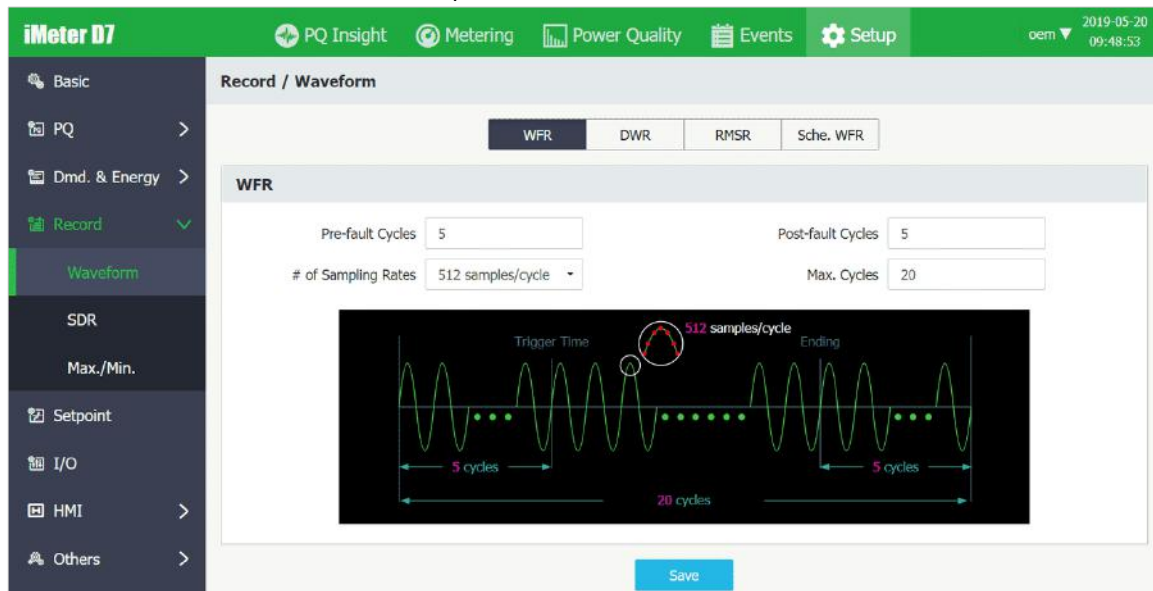
### 3.2.3.5.5 Record

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**



**iMeter D7** PQ Insight Metering Power Quality Events Setup 2019-05-20 09:48:53

Basic PQ Dmd. & Energy **Record** Waveform SDR Max./Min. Setpoint I/O HMI Others

**Record / Waveform**

WFR DWR RMSR Sche. WFR

**WFR**

Pre-fault Cycles 5 Post-fault Cycles 5

# of Sampling Rates 512 samples/cycle Max. Cycles 20

Trigger Time 512 samples/cycle Ending

5 cycles 20 cycles 5 cycles

**Save**

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**

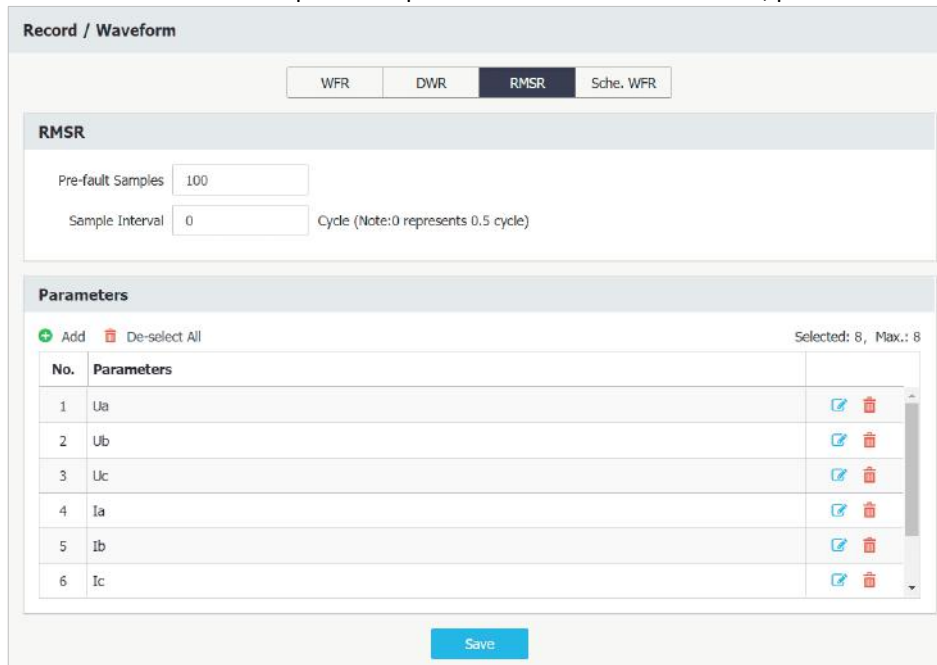


Figure 3-147 RMSR Setup Interface

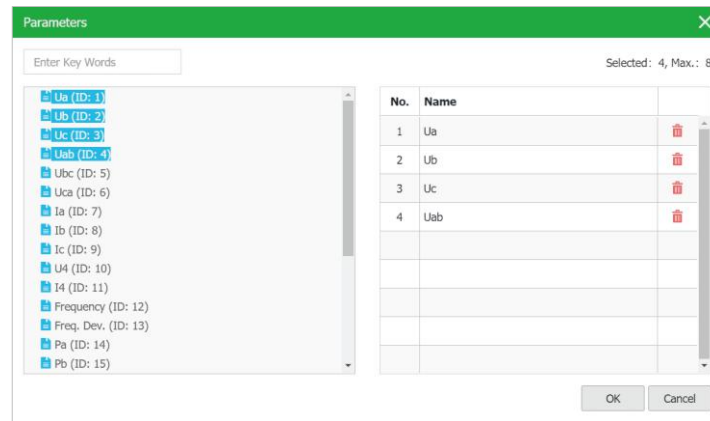


Figure 3-148 RMSR Source Parameters Dialog Box

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

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

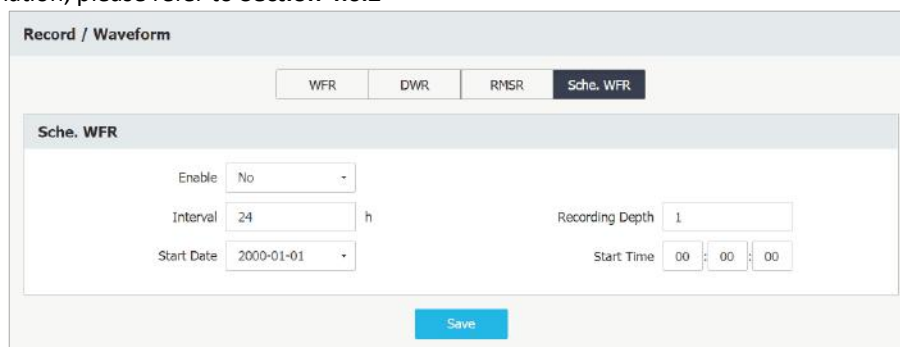


Figure 3-149 Sched. WFR Setup Interface

### 3.2.3.5.2 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.

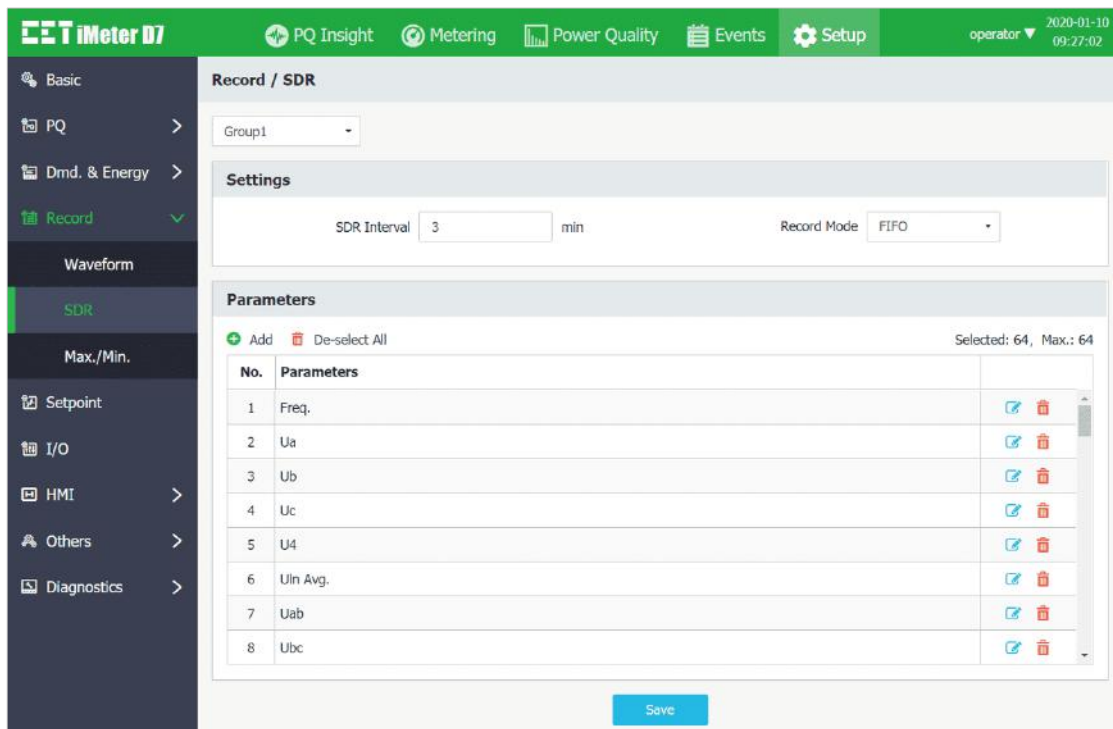


Figure 3-150 SDR Setup Interface

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.

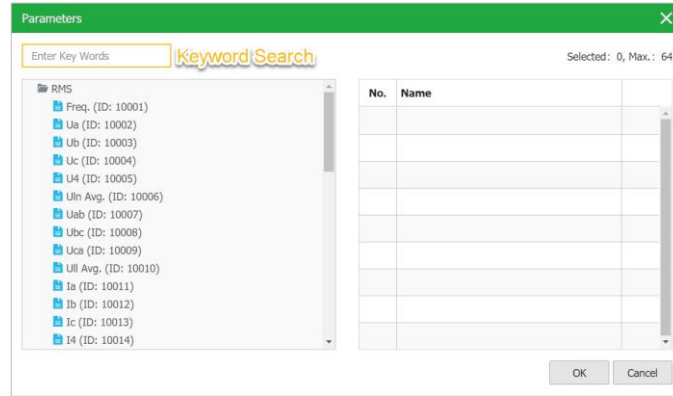


Figure 3-151 SDR Source Parameters Dialog Box

### 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.

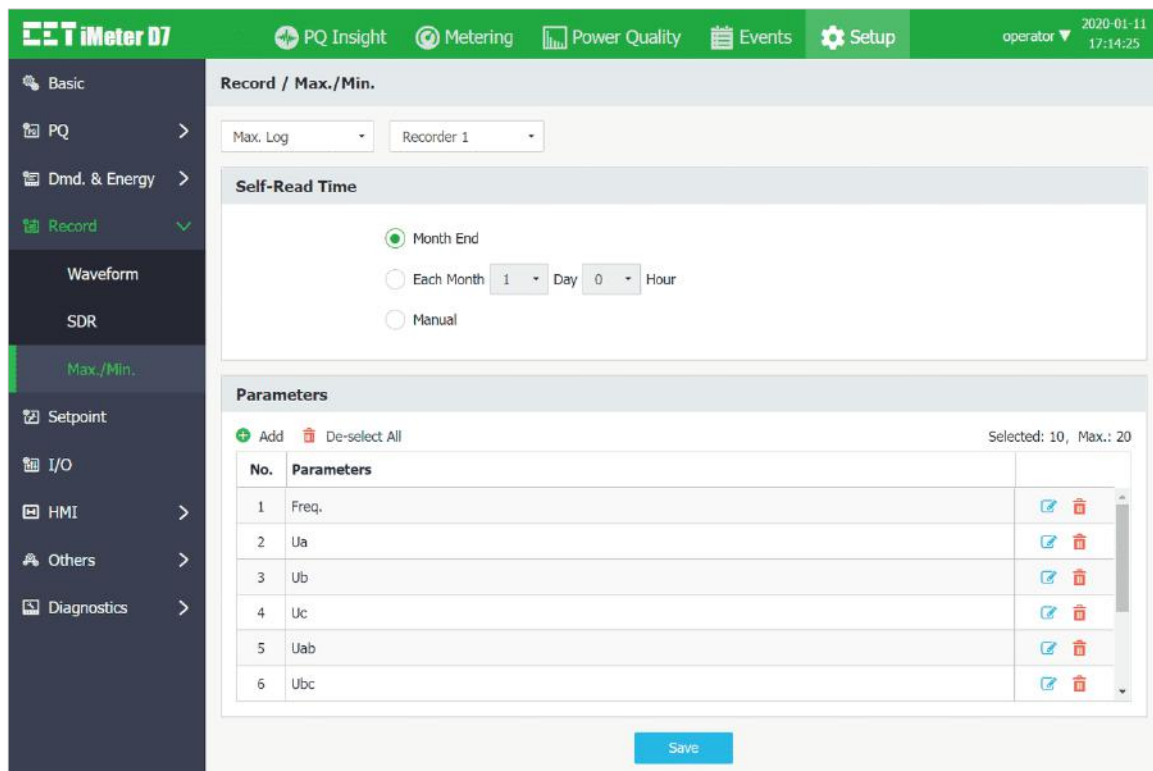


Figure 3-152 Max./Min. Recorder Setup Interface

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.

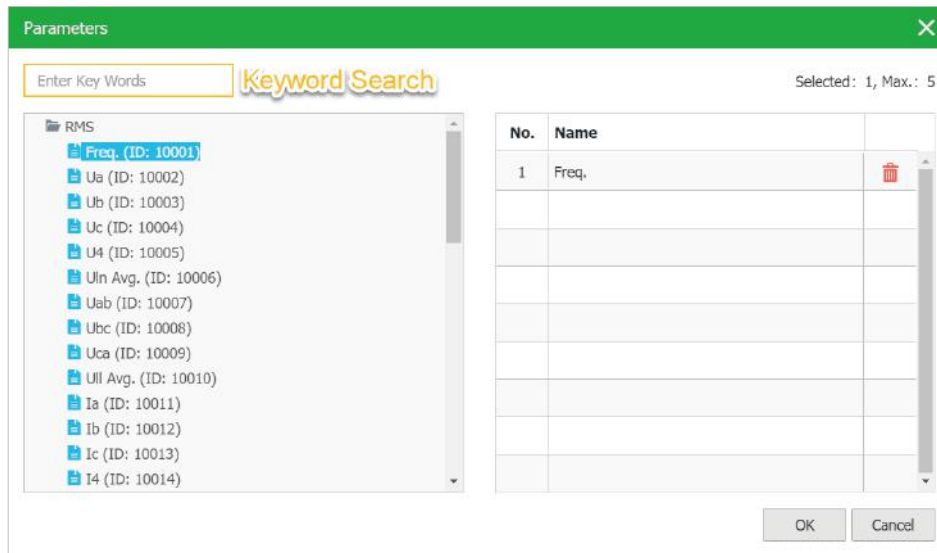


Figure 3-153 Max./Min. Source Parameters Dialog Box

### 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**.

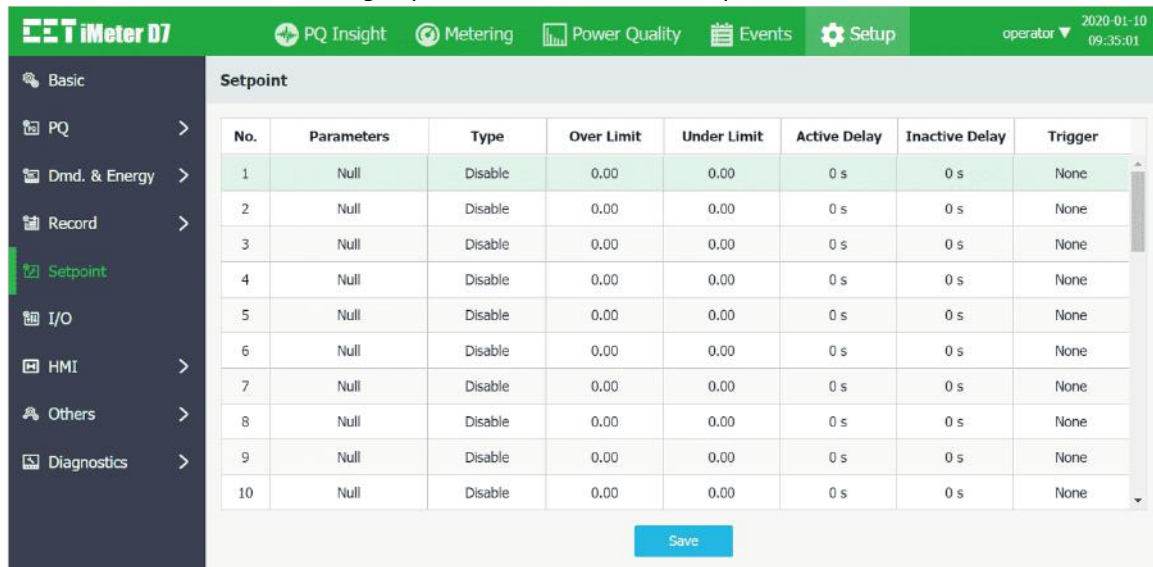


Figure 3-154 Setpoint Setup Interface

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

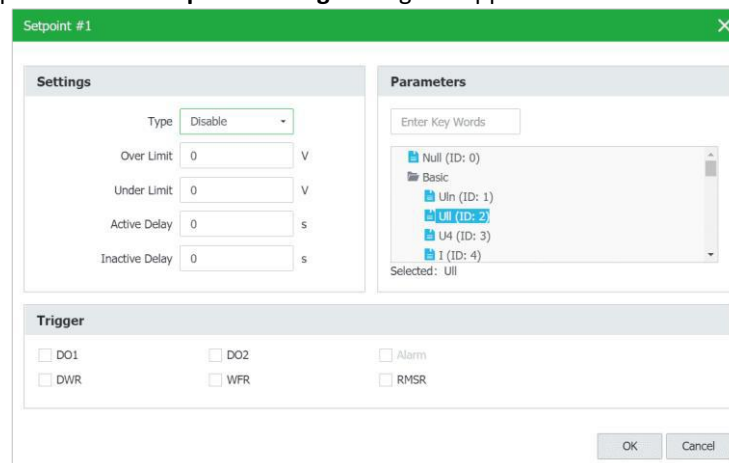


Figure 3-155 Setpoint Settings Dialog Box

### 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**

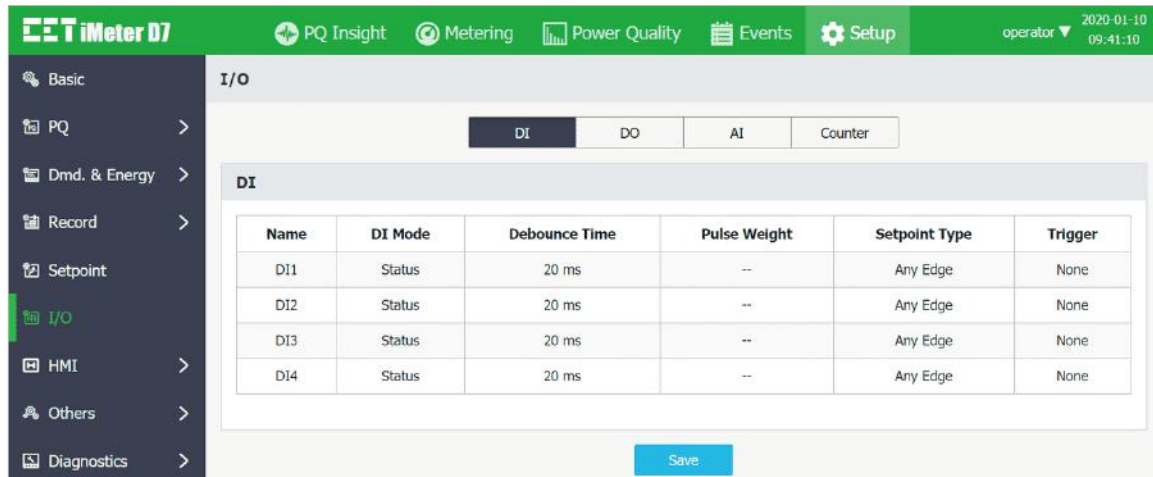


Figure 3-156 DI Setup Interface

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**

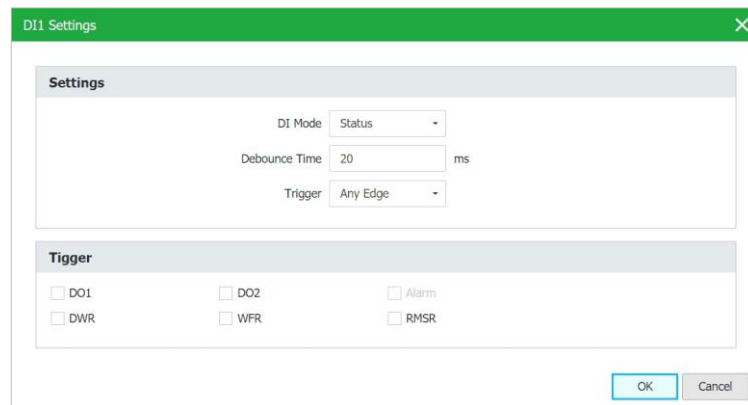


Figure 3-157 DI Status Setup Interface

- **DI Mode = Counter**

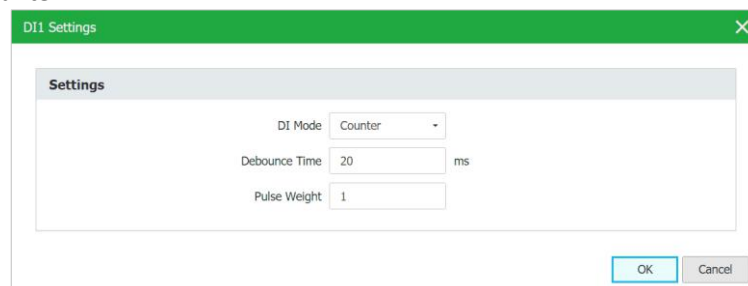


Figure 3-158 DI Counter Setup Interface

- **DI Mode = DMD Sync.**

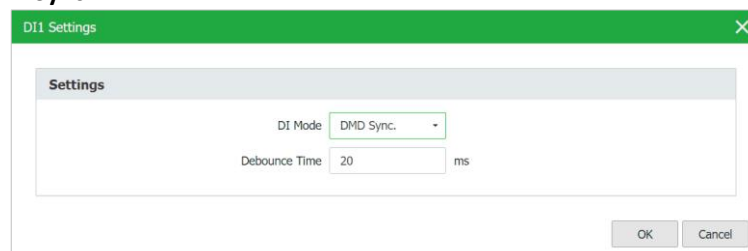


Figure 3-159 DI DMD Sync. Setup Interface

- **DI Mode = Tariff Switch**

The image shows a 'DI1 Settings' dialog box with a green header. Inside, there's a 'Settings' section. 'DI Mode' is set to 'Tariff Switch' (indicated by a green border around the dropdown). 'Debounce Time' is set to '20' ms. At the bottom right are 'OK' and 'Cancel' buttons.

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.

The image shows the 'I/O' configuration page with the 'DO' tab selected. It contains settings for 'DO1' and 'DO2'. 'LOP Alarm' and 'Arm Before Execute' are both set to 'Enable'. 'DO1 Pulse Width' and 'DO2 Pulse Width' are both set to '1' s. 'Alarm Pulse Width' is also set to '1' s. A 'Save' button is at the bottom.

Figure 3-161 DO Setup Interface

- **AI (Optional)**

The image shows the 'I/O' configuration page with the 'AI' tab selected. It shows settings for 'AI1' and 'AI2'. Both 'AI Type' dropdowns are set to '4~20mA'. For both, 'Zero Scale' is '400' and 'Full Scale' is '2000'. A 'Save' button is at the bottom.

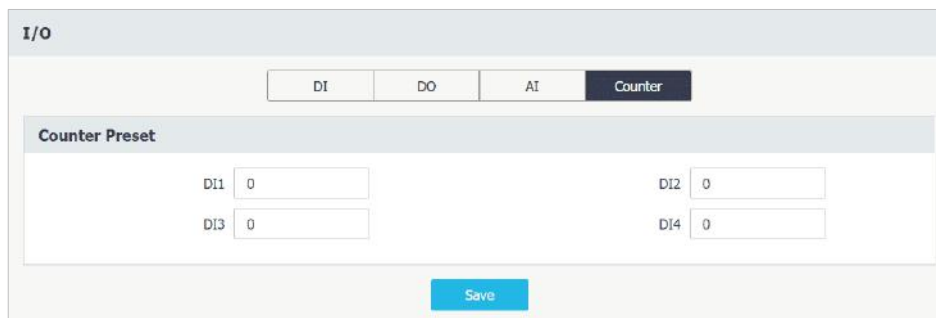
Figure 3-162 Optional AI Settings Interface

- **RTD (Optional)**

The image shows the 'I/O' configuration page with the 'RTD' tab selected. It contains a single setting: 'RTD Compensation' set to '0' Ω. A 'Save' button is at the bottom.

Figure 3-163 Optional RTD Settings Interface

- Counter



The screenshot shows the 'I/O' configuration page with the 'Counter' tab selected. Below the tab, there is a 'Counter Preset' section containing four input fields: DI1, DI2, DI3, and DI4, each with a value of 0. A 'Save' button is located at the bottom right of the preset section.

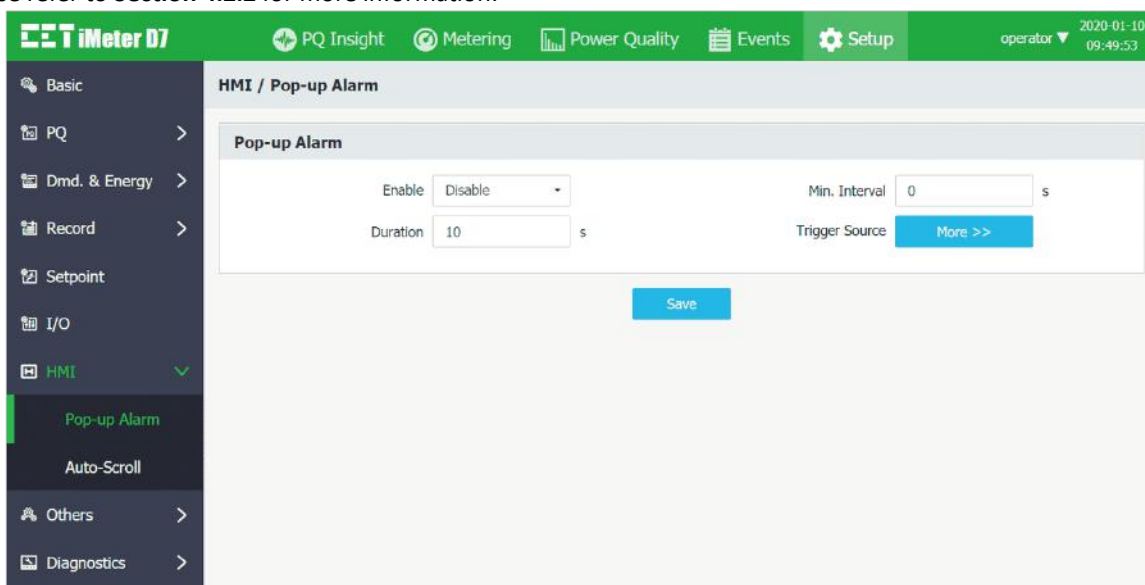
Figure 3-164 DI Counter Preset Settings

### 3.2.3.5.8 HMI

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

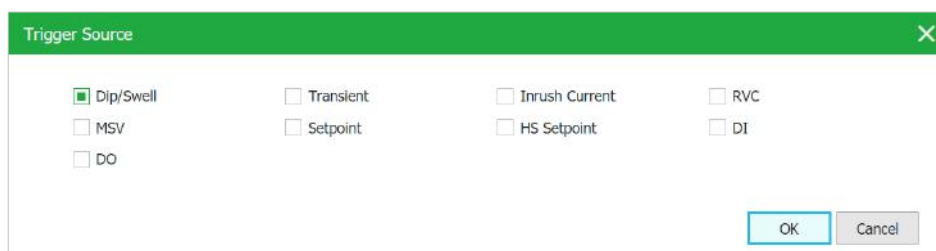
#### 3.2.3.5.8.1 Pop-up Alarm

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



The screenshot shows the 'HMI / Pop-up Alarm' configuration page. The 'Pop-up Alarm' section includes an 'Enable' dropdown set to 'Disable', a 'Duration' input field set to 10, and a 'Min. Interval' input field set to 0. A 'Trigger Source' button labeled 'More >>' is also present. A 'Save' button is located at the bottom center of the page.

Figure 3-165 Pop-up Alarm Settings



The screenshot shows the 'Trigger Source' dialog box. It contains a grid of checkboxes for various alarm sources: Dip/Swell (checked), MSV, DO, Transient, Setpoint, Inrush Current, HS Setpoint, RVC, and DI. 'OK' and 'Cancel' buttons are located at the bottom right.

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

**iMeter D7** PQ Insight Metering Power Quality Events Setup operator 2020-01-10 09:50:25

**HMI / Auto-Scroll**

**Auto-Scroll**

Enable: Disable

Initiate: 3 min Interval: 3 s

**Parameters**

| No. | Parameters        |  |
|-----|-------------------|--|
| 1   | Phasor            |  |
| 2   | Voltage           |  |
| 3   | Current           |  |
| 4   | Power             |  |
| 5   | Max. & Min.       |  |
| 6   | Harmonics         |  |
| 7   | Voltage Deviation |  |

Save

**Figure 3-167 Auto-Scroll Setup Interface**

Click on and the Source Parameters dialog box appears.

**Parameters**

Enter Key Words

- Null (ID: 0)
- Phasor (ID: 1)
- Voltage (ID: 2)
- Current (ID: 3)
- Power (ID: 4)
- Energy (ID: 5)
- Demand (ID: 6)
- TOU (ID: 7)
- Max. & Min. (ID: 8)
- I/O (ID: 9)
- Harmonics (ID: 10)
- Interharmonics (ID: 11)
- Voltage Deviation (ID: 12)
- Frequency Deviation (ID: 13)
- Unbalance & Sequence (ID: 14)

Selected: Phasor

OK Cancel

**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.

| Others / Advanced           |                      |
|-----------------------------|----------------------|
| <b>Time Format</b>          |                      |
| Modbus                      | Local                |
| COMTRADE                    | Local                |
| <b>Flagged Data</b>         |                      |
| SDR                         | Keep                 |
| Max. Log                    | Keep                 |
| Min. Log                    | Keep                 |
| EN50160                     | Keep                 |
| Setpoint Trigger            | Disable              |
| <b>COMTRADE</b>             |                      |
| # of Sampling Rates         | 0                    |
| Stored Values               | Primary              |
| Custom Label                |                      |
| <b>DiagSys</b>              |                      |
| Enable                      | Yes                  |
| Port                        | 60001                |
| <b>PQ Disturbance</b>       |                      |
| D/S RMS Update              | 1-cycle              |
| Interruption Mode           | Three Phase          |
| D/S Filter                  | Disable              |
| D/S Max. Duration           | 60 s                 |
| Swell Max. Magnitude        | 500 %                |
| Adaptive WFR                | Disable              |
| <b>IEC61850</b>             |                      |
| Enable                      | Yes                  |
| Authentication              | No                   |
| Port                        | 102                  |
| Timeout                     | 0 s                  |
| Password                    | <a href="#">Edit</a> |
| Security Key                | <a href="#">Edit</a> |
| <b>FTP</b>                  |                      |
| Enable                      | Yes                  |
| Port                        | 21                   |
| Username                    | operator             |
| Password                    | <a href="#">Edit</a> |
| Anonymous access            | Disable              |
| <b>MODBUS-TCP</b>           |                      |
| Enable                      | Yes                  |
| Port                        | 502                  |
| <b>Front Panel</b>          |                      |
| HMI Security                | Enable               |
| <b>Web</b>                  |                      |
| Enable                      | Yes                  |
| Client Validate             | No                   |
| Port                        | 443                  |
| Login Timeout               | 0 min                |
| HTTPS Timeout               | 1000 ms              |
| <b>Aggregation Interval</b> |                      |
| Parameter Magnitudes        | 50/60-cycle          |
| Frequency                   | 1 s                  |
| <b>Others</b>               |                      |
| Audit Log                   | Disable              |
| Wiring Diagnostics          | Enable               |
| Freq. Dev. Record           | Disable              |
| HS Frequency                | Disable              |
| Energy Value Reverse        | Disable              |
| <a href="#">Save</a>        |                      |

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.

The screenshot shows the 'iMeter D7' interface with a green top bar containing 'PQ Insight', 'Metering', 'Power Quality', 'Events', and 'Setup' icons. The left sidebar lists 'Basic', 'PQ', 'Dmd. & Energy', 'Record', 'Setpoint', 'I/O', 'HMI', 'Others', 'Diagnostics' (expanded), 'Device & Site Info.', 'User Management', and 'Maintenance'. The main content area is titled 'Diagnostics / Device & Site Info.' and has two tabs: 'Device' (selected) and 'Site'. The 'Device' tab displays the following information:

| Basic          |                         |
|----------------|-------------------------|
| Model          | iMeter D7-BSCCPA925AAAE |
| S/N            | 2903037684              |
| P1 MAC Address | E4-C8-06-1C-00-36       |
| P2 MAC Address | E4-C8-06-1C-00-37       |

| Version  |                             |
|----------|-----------------------------|
| Hardware | V1.00.00                    |
| Firmware | V1.00.01 2019-06-13         |
| Protocol | Modbus-V1.1 IEC61850-V13.04 |

| Self Diagnostics |                                 |
|------------------|---------------------------------|
| A/D              | Normal                          |
| DSP              | Normal                          |
| Memory           | 2312MB Available (Total 3527MB) |

Figure 3-173 Device Info.

- **Site Info.**

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

The screenshot shows the 'iMeter D7' interface with the 'Site' tab selected. The main content area is titled 'Diagnostics / Device & Site Info.' and has two tabs: 'Device' and 'Site' (selected). The 'Site' tab displays the following information:

| Substation Information |         |
|------------------------|---------|
| Tag 1                  | devTag0 |
| Tag 2                  | devTag1 |
| Tag 3                  | devTag2 |
| Tag 4                  | devTag3 |
| Tag 5                  | devTag4 |

| Site Information |             |
|------------------|-------------|
| Tag 1            | circuitTag0 |
| Tag 2            | circuitTag1 |
| Tag 3            | circuitTag2 |
| Tag 4            | circuitTag3 |
| Tag 5            | circuitTag4 |
| Tag 6            | circuitTag5 |
| Tag 7            | circuitTag6 |
| Tag 8            | circuitTag7 |
| Tag 9            | circuitTag8 |
| Tag 10           | circuitTag9 |

A 'Save' button is located at the bottom right of the form.

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.

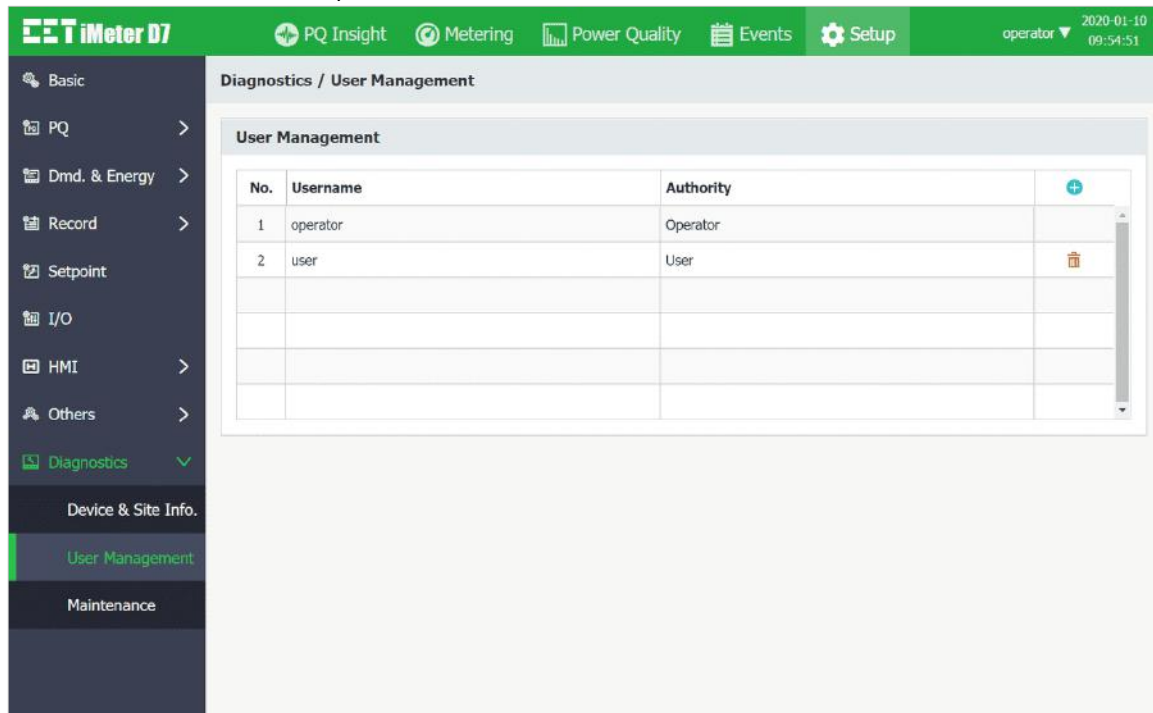


Figure 3-175 User Management

### 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.

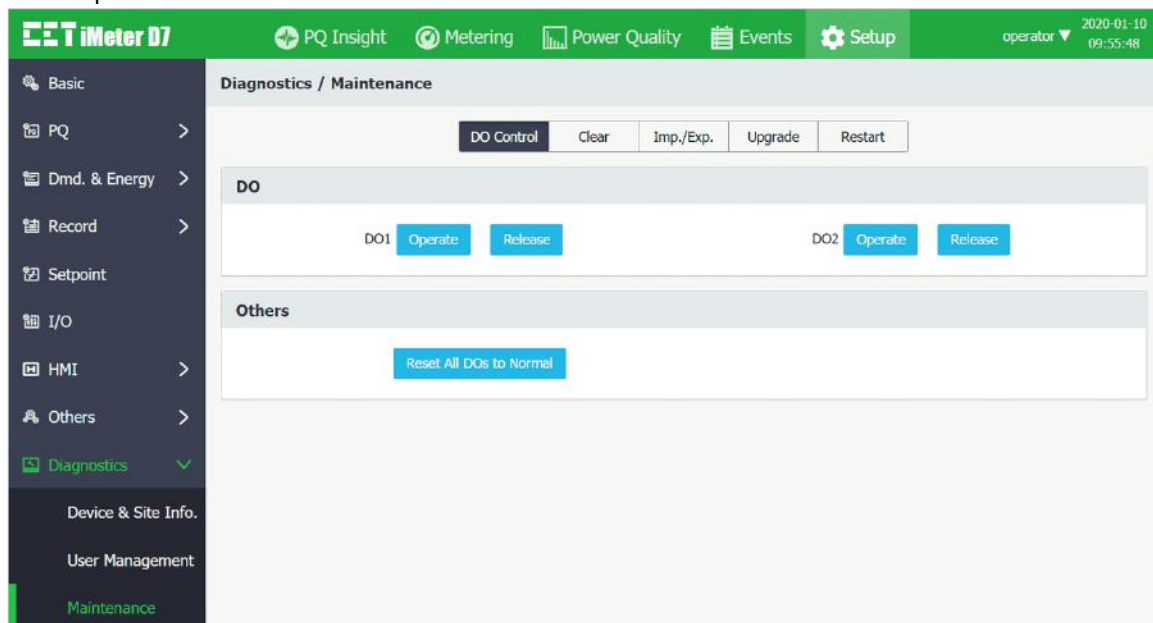


Figure 3-176 Maintenance

- 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.

Diagnostics / Maintenance

DO Control
Clear
Imp./Exp.
Upgrade
Restart

Groups

Clear All Events

Clear All Demands

Clear PQ Counters

Clear All DI Counters

Clear All SDR

Clear 2kHz-150kHz C.E. Log

Clear ENS0160 Log

Clear Present Max. Demand

Clear Present Max./Min. Log

Clear Energy

Clear All Max./Min. Log

Individuals

Clear WFR Log

Clear RMSR Log

Clear Pst Log

Clear AER Log

Clear Swells Counter

Clear Interruptions Counter

Clear RVC Counter

Clear MSV #1 Counter

Clear MSV #3 Counter

Clear SDR #2

Clear SDR #4

Clear SDR #6

Clear SDR #8

Clear DI2 Counter

Clear DI4 Counter

Clear Max. Log #2

Clear Max. Log #4

Clear Min. Log #2

Clear Min. Log #4

Clear DWR Log

Clear PIt Log

Clear IER Log

Clear TOU Log

Clear Dips Counter

Clear Transients Counter

Clear Inrush Current Counter

Clear MSV #2 Counter

Clear SDR #1

Clear SDR #3

Clear SDR #5

Clear SDR #7

Clear DI1 Counter

Clear DI3 Counter

Clear Max. Log #1

Clear Max. Log #3

Clear Min. Log #1

Clear Min. Log #3

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.

The screenshot shows the 'Diagnostics / Maintenance' page with the 'Imp./Exp.' tab selected. It contains three sections: 'Setup Parameters', 'Comm. Parameters', and 'Users Configuration'. Each section has instructions for exporting and importing data, along with 'Export' and 'Import' buttons. The 'Setup Parameters' section also includes a file selection field and a 'Browse' button.

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.

The screenshot shows the 'Diagnostics / Maintenance' page with the 'Upgrade' tab selected. It contains two sections: 'IEC61850 SCL File' and 'Firmware Package'. Each section has instructions for importing files, along with 'Browse' and 'Upgrade' buttons. The 'Firmware Package' section also includes a file selection field and a 'Browse' button.

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.

The screenshot shows the 'Diagnostics / Maintenance' page with the 'Restart' tab selected. It contains one section: 'Device Reboot'. It has instructions for rebooting the device, along with a 'Reboot' button.

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                                                    |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Dlx Function</b>                  | Each <b>DI</b> can be configured as a Status Input, Pulse Counter or SYNC DI. Only DI1 to DI3 can be configured as <b>Tariff Switch</b> .                                               | 0=Status Input*<br>1=Pulse Counter<br>2=DMD Sync<br>3=Tariff Switch |
| <b>Dlx Debounce</b>                  | Specifies the minimum duration the <b>DI</b> must remain in the Active or Inactive state before a state change is considered to be valid.                                               | 1 to 9999 (ms)<br>(Default=20ms)                                    |
| <b>Dlx Pulse Weight</b>              | 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                                                     |
| <b>Dlx Setpoint Type<sup>1</sup></b> | 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*,<br>Positive, Negative                                    |
| <b>Dlx Trigger<sup>2</sup></b>       | 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<br>/DWR/RMSR                                            |

**Table 4-1 DI Setup Parameters**

**Note:**

1. The Dlx 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*                     |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <b>LOP Alarm</b>             | 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*                |
| <b>Arm Before Execute</b>    | Enable or disable the Arm Before Execute feature for Alarm/DO                                                                                 | 0=Disabled, 1=Enabled*                |
| <b>Alarm/DOx Pulse Width</b> | 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 <sup>2</sup> | 100, 1000, 3200, 5000*, 6400, 12800 | E1 / E2 / E3 | See <b>Table 4-4</b> , 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  $Z = V_{\text{nominal}} \times I_{\text{nominal}} \times 2$ , where  $V_{\text{nominal}}$  and  $I_{\text{nominal}}$  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  $(100^{\circ}\text{C} - (-25^{\circ}\text{C})) \times (12\text{mA} - 4\text{mA}) / (20\text{mA} - 4\text{mA}) + (-25^{\circ}\text{C}) = 37.50^{\circ}\text{C}$ .

#### 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:

$$\text{RTD Compensation} = 0.29 \times L \quad \text{where } L \leq 8 \text{ is the PT100 sensor's cable length in m}$$

#### 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.

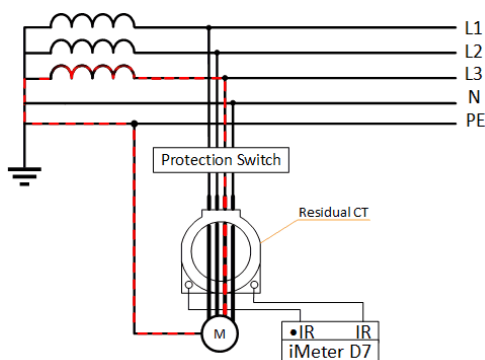


Figure 4-1 Example for Residual Current Measurement

## 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**.

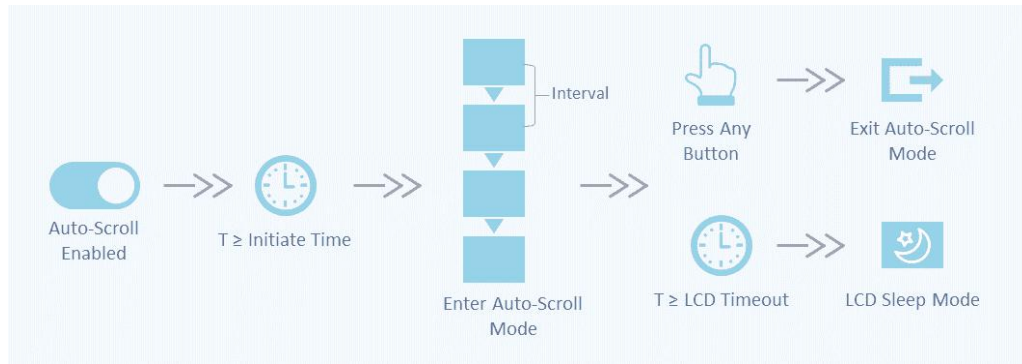


Figure 4-2 Auto-Scroll Logical Diagram

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.

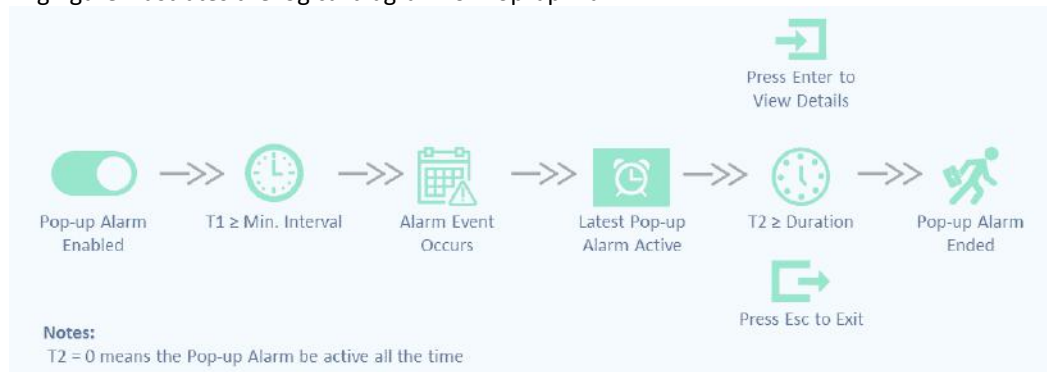


Figure 4-3 Pop-up Alarm Logical Diagram

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  $\pm 100,000,000,000.000$ . 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:

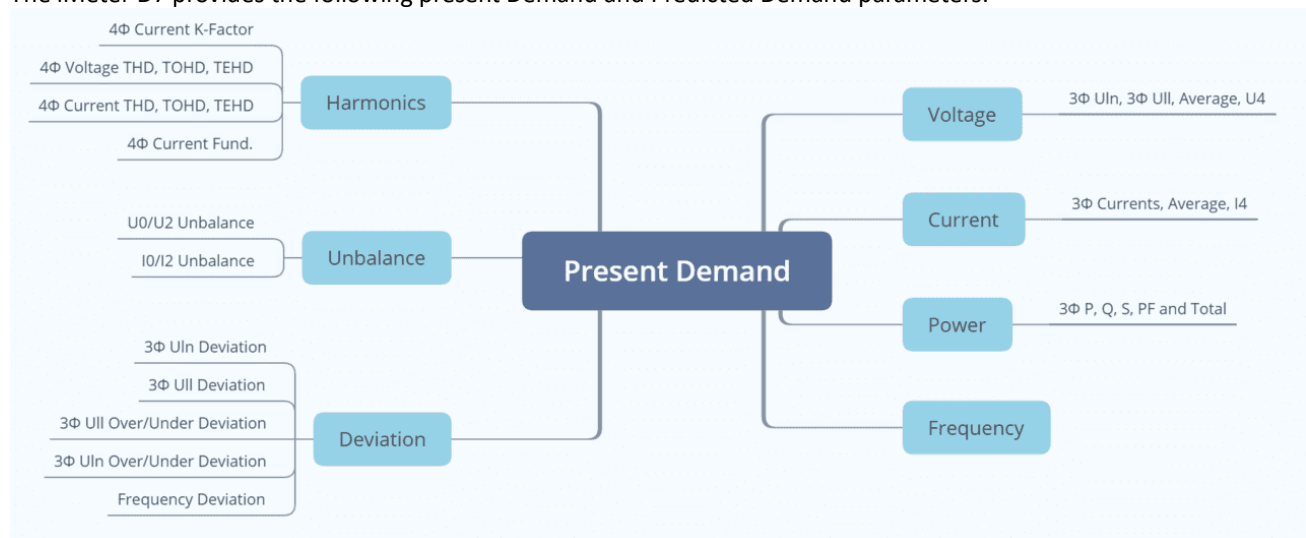


Figure 4-4 Present Demand Parameters



Figure 4-5 Predicted Demand

The iMeter D7 provides the following setup parameters.

| Setup Parameter             | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Options/Default*         |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Sync. Mode</b>           | <b>SLD</b> – Internally synchronized to the meter’s real-time clock<br><b>Sync. DI</b> – Externally synchronized to a DI that has been programmed as a Demand Sync Input by setting the DI Function as “DMD Sync”.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0 = SLD*<br>1 = Sync. DI |
| <b>Demand Period</b>        | 1 to 60 minutes. For example, if the <b># of Sliding Windows</b> is set as 1 and the <b>Demand Period</b> is 15, the demand cycle will be 1×15=15min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 to 60 min,<br>15*      |
| <b># of Sliding Windows</b> | The number of Sliding Windows.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1* to 15                 |
| <b>Self-Read Time</b>       | The <b>Self-Read Time</b> allows the user to specify the time and day of the month for the Max. Demand Self-Read operation. The <b>Self-Read Time</b> supports three options: <ul style="list-style-type: none"> <li>A zero value means that the Self-Read will take place at 00:00 of the first day of each month.</li> <li>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.</li> <li>A 0xFFFF value will disable the <b>Self-Read</b> operation and replace it with <b>Manual</b> operation. A manual reset will cause the Max. Demand of <b>This Month</b> to be transferred to the Max. Demand of <b>Last Month</b> and then reset. The terms <b>This Month</b> and <b>Last Month</b> will become <b>Since Last Reset</b> and <b>Before Last Reset</b>.</li> </ul> | Default=0xFFFF           |
| <b>Predicted Response</b>   | The Predicted 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:

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

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 ( $P_{st}$ ) measured over a 10-minute interval
- ☞ Long-term flicker severity ( $P_{lt}$ ) calculated from a sequence of 12  $P_{st}$  according to the following formula:

$$P_{lt} = \sqrt[3]{\sum_{i=1}^{12} \frac{P_{st_i}^3}{12}}$$

The  $P_{st}$  and  $P_{lt}$  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:

- The **Voltage Interruption Threshold** shall be set below the **Dip Threshold**.
- The **Dip/Swell Hysteresis** must be less than the **Dip/Swell Thresholds**.
- The **Rapid Voltage Changes (RVC) Threshold** must be less than the **Dip and Swell Thresholds**.
- 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 $U_{din}/U_{sr}$ , 90* |
| Reference Voltage | $U_{din}$ *, $U_{sr}$                     | Dip Hysteresis          | 1 to 100 (%) of $U_{din}/U_{sr}$ , 2* |
| PQD Trigger       | WFR, DWR*, RMSR                           | Dip Trigger             | Alarm, DO1, DO2                       |
| Swell Threshold   | 101 to 200 (%) of $U_{din}/U_{sr}$ , 110* | Interruption Threshold  | 0 to 50 (%) of $U_{din}/U_{sr}$ , 5*  |
| Swell Hysteresis  | 1 to 100 (%) of $U_{din}/U_{sr}$ , 2*     | Interruption Hysteresis | 1 to 100 (%) of $U_{din}/U_{sr}$ , 2* |
| Swell Trigger     | Alarm, DO1, DO2                           | Interruption Trigger    | Alarm, DO1, DO2                       |

**Table 4-12 PQ Disturbance Parameters**

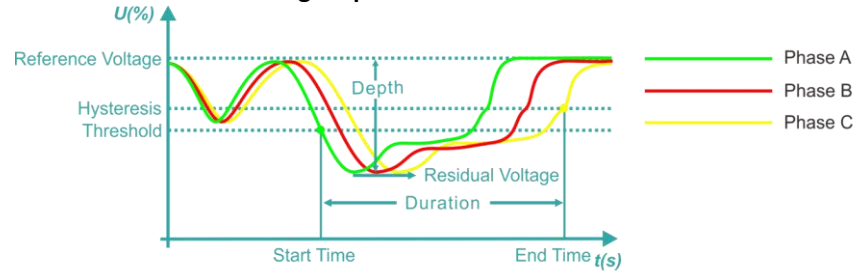
##### 4.4.4.2 Voltage Dips Evaluation

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 <b>Dip</b> .                                                                                |
| Depth            | The difference between the <b>Reference Voltage</b> and the <b>Residual Voltage</b> . It's generally expressed in percentage of the <b>Reference Voltage</b> . |
| Duration         | The time span from the start time to the end time of the <b>Voltage Dip</b> .                                                                                  |

**Table 4-13 Dip Evaluation Parameter**

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



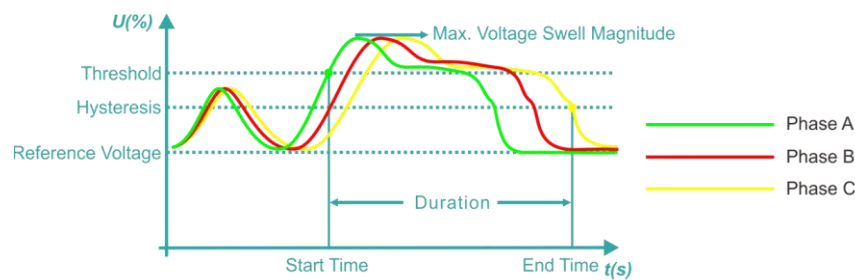
**Figure 4-6 Characteristics of Voltage Dip Event**

#### 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 <b>Swell</b> . |
| Duration                     | The time span from the start time to the end time of the <b>Voltage Swell</b> .    |

**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  $U_{sr}$  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 U <sub>din</sub> , 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.

$$U2 \text{ Unbalance} = \frac{U_2}{U_1} \times 100\%, \quad I2 \text{ Unbalance} = \frac{I_2}{I_1} \times 100\% \quad (\text{Negative Sequence Unbalance})$$

$$U0 \text{ Unbalance} = \frac{U_0}{U_1} \times 100\%, \quad I0 \text{ Unbalance} = \frac{I_0}{I_1} \times 100\% \quad (\text{Zero Sequence Unbalance})$$

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 Interharmonics, as per **IEC 61000-4-7:2002**.

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

##### a) Fundamental Method:

$$\text{Voltage } K^{\text{th}} \text{ Harmonic/Interharmonic Distortion} = \frac{U_k}{U_1} \times 100\% \quad \text{where } U_1 \text{ is the Fundamental Voltage}$$

$$\text{Current } K^{\text{th}} \text{ Harmonic/Interharmonic Distortion} = \frac{I_k}{I_1} \times 100\% \quad \text{where } I_1 \text{ is the Fundamental Current}$$

**b) RMS Method:**

$$\text{Voltage } K^{\text{th}} \text{ Harmonic / Interharmonic Distortion} = \frac{U_k}{\sqrt{\sum_{k=1}^{\infty} U_k^2}} \times 100\% \quad \text{where the denominator is the RMS}$$

$$\text{Current } K^{\text{th}} \text{ Harmonic / Interharmonic Distortion} = \frac{I_k}{\sqrt{\sum_{k=1}^{\infty} I_k^2}} \times 100\% \quad \text{where the denominator is the RMS}$$

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.

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

$I_h$  =  $h^{\text{th}}$  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:

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

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

$X_{\text{rms}}$  = 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<sup>rd</sup> 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<sup>rd</sup> 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.

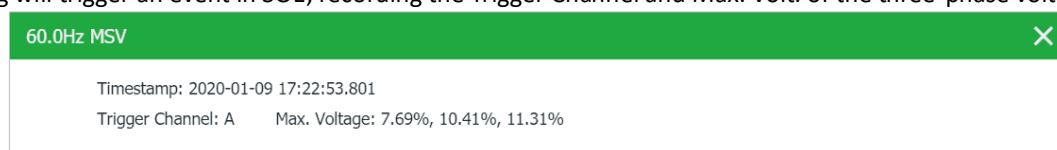


Figure 4-12 Event for 60.0Hz MSV in SOE

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 $U_{din}$ , 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  $U_{din}$  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**,  **$\Delta U_{max}$**  and  **$\Delta U_{ss}$** .

- **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.
- **$\Delta U_{max}$**  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.
- **$\Delta U_{ss}$**  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 $U_{din}$ , 5%*        |
| Hysteresis | 0.1 to 5 (%) of $U_{din}$ , 2.5%* | Trigger   | N/A*, WFR, DWR, RMSR, Alarm, DO1, DO2 |

##### 4.4.10.2 RMSR for an RVC Event

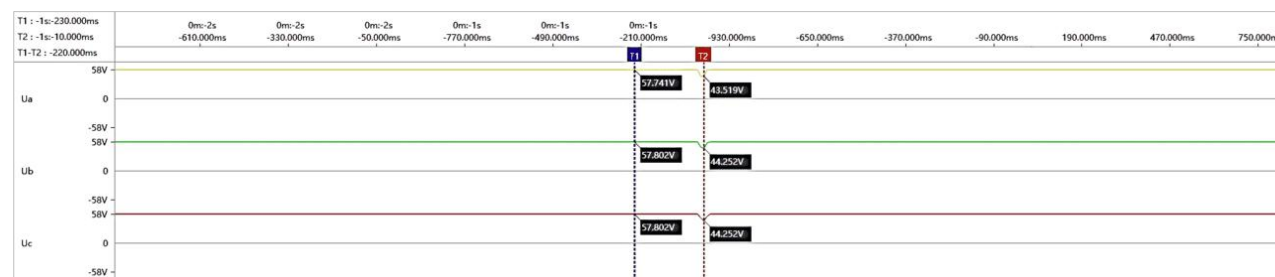


Figure 4-13 RMSR for an RVC Event

#### 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  $U_{din}$ . The underdeviation  $U_{rms-under}$  and overdeviation  $U_{rms-over}$  parameters are determined by the following equations:

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

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

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

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

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

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

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

$U_{rms-under, i} / U_{rms-over, i}$  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  $I > 2I_n$  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 | B8  | Dip                |
| B1  |                    | B9  | Swell              |
| B2  |                    | B10 | Interruption       |
| B3  |                    | B11 | Over Current Limit |
| B4  | Freq.              | B12 | Dip                |
| B5  |                    | B13 | Swell              |
| B6  |                    | B14 | Interruption       |
| B7  |                    | 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.

| 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 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  $I_{\text{half\_cyc\_rms}}$  current rises above the **Inrush Threshold** and ends when the  $I_{\text{half\_cycle-rms}}$  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  $I_{\text{half\_cyc\_rms}}$
- the square root of the mean of the squared  $I_{\text{half\_cyc\_rms}}$  values measured during the inrush duration

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

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

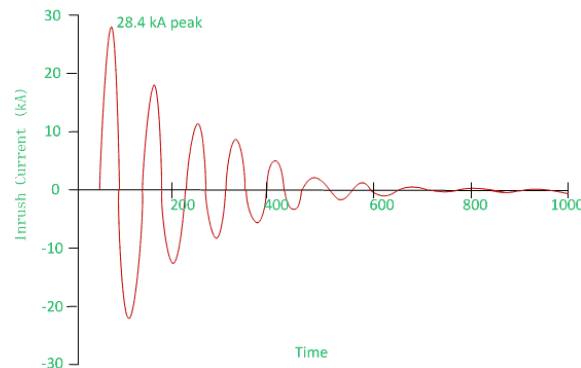


Figure 4-16 Inrush Current

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 $I_n$ , 120%*    |
| Hysteresis | 0.1% to 100% of $I_n$ , 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                                             | 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**

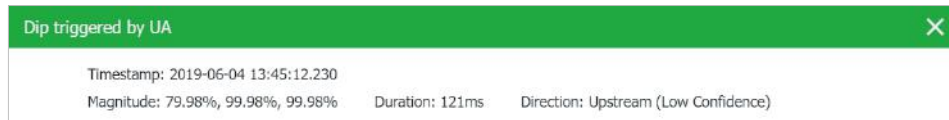


Figure 4-18 Disturbance Direction Location

## 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.

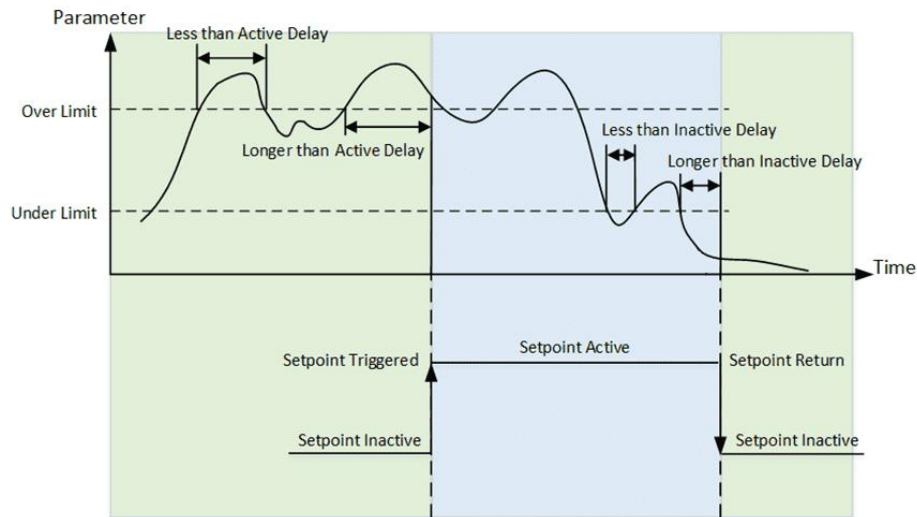


Figure 4-19 Over Setpoints

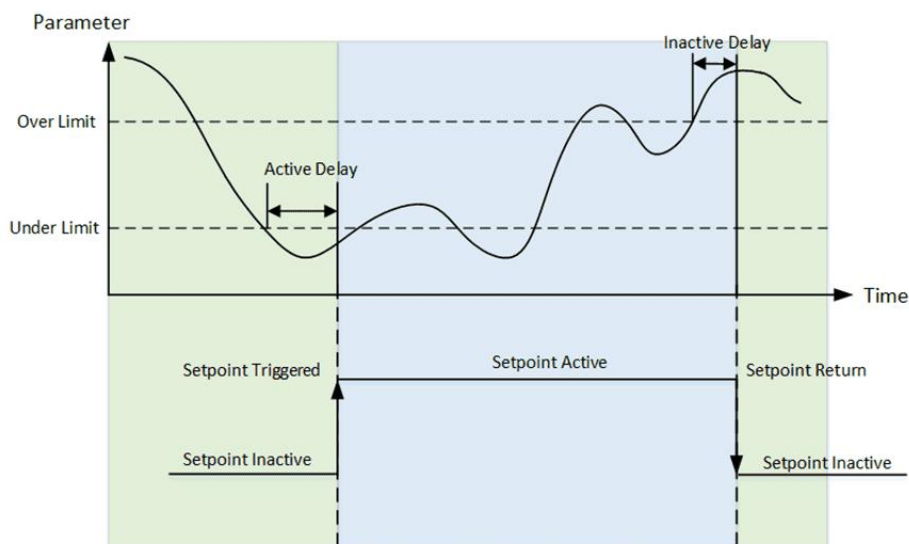


Figure 4-20 Under Setpoints

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*<br>1=Over Setpoint<br>2=Under Setpoint<br>3=HS Over Setpoint<br>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.                                                                                                                                                                                                                                                |                                       |
| <b>Active Delay</b>   | 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 <b>Setpoint Active Delay</b> 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*                    |
| <b>Inactive Delay</b> | 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 <b>Setpoint Inactive Delay</b> 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*                    |
| <b>Trigger</b>        | 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   | UIn                | 30  | U TOIHD                   | 59         | Pst                   |
| 2   | UII                | 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 **Section 3.2.3.5.4.2**) 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**

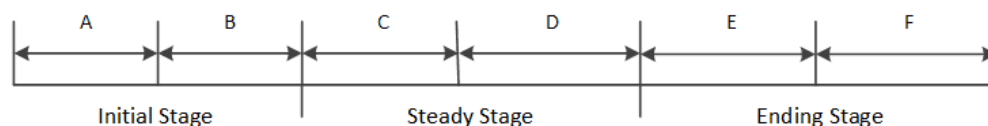
The iMeter D7 also provides the following settings for Scheduled WFR to trigger the WFR on the hour as pre-configured. The programming of the Scheduled WFR is supported via the Web Interface or Communications.

| 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*               |

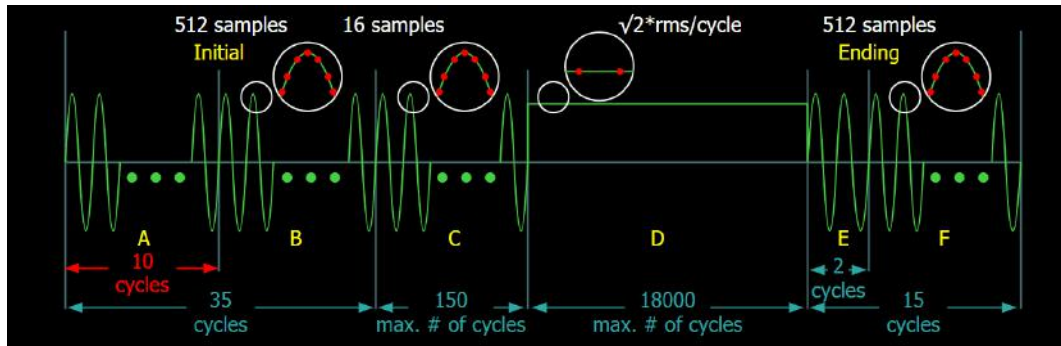
**Table 4-28 Scheduled WFR Setup Parameters**

#### 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 device's 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:**

- The data for Stage A, B, D and E are always recorded.
- 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.
- The following figure shows an example of Disturbance Waveform Recording.

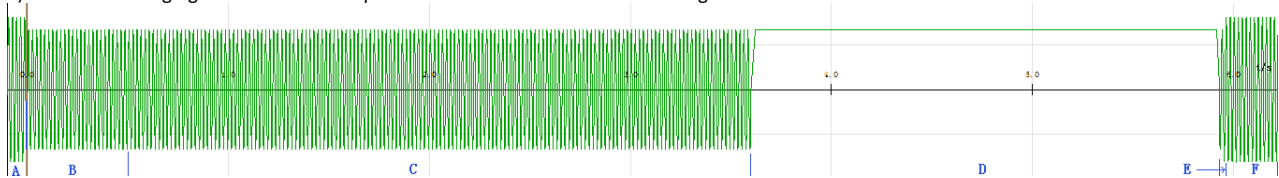


Figure 4-22 An Example for DWR

#### 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 <b>Section 5.12.7</b> 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 <b>Self-Read Time</b> for the <b>Max. Demand Recorder</b> is used to specify the time and day of the month for the <b>Max./Min.</b> Self-Read operation. Please refer to <b>Section 4.3.4</b> |
| # 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.

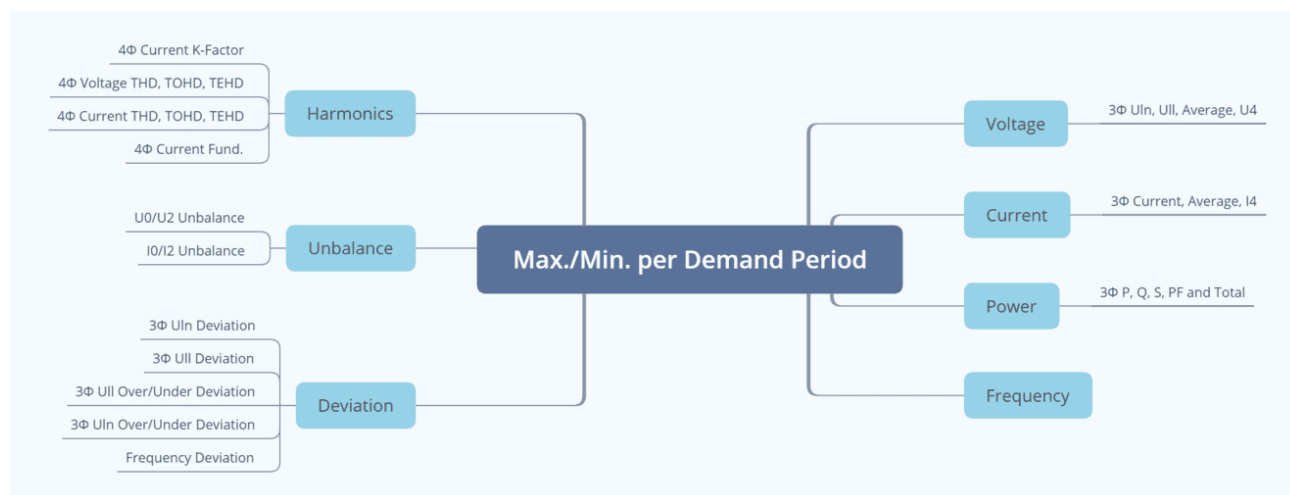


Figure 4-23 Max./Min. Parameters per Demand Period

#### 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 **Section 3.2.3.4.1** , **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  $2^{32}$  (4,294,967,296), 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 **Section 3.2.3.5.10.3** ) 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                                                                      |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <b>Daily Profile #</b>  | Specify a daily rate schedule which can be divided into a maximum of 12 periods in 15-min intervals.<br>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. |
| <b>Season #</b>         | 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 1 <sup>st</sup>                                 |
| <b>Alternate Days #</b> | A day can be defined as an Alternate Day, such as May 1 <sup>st</sup> . Each Alternate Day is assigned a Daily Profile.                                                              | 1 to 90.                                                                     |
| <b>Day Types</b>        | 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                              |
| <b>Switching Time</b>   | Specify when to switch from one TOU schedule to another. Writing 0xFFFFFFFF to this parameter disables switching between TOU schedules.                                              | Format:<br>YYYYMMDDHH<br>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                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Clock Source</b>     | 0=RTC, 1=SNTP, 2=GPS, 3=IRIG-B, 4=Reserved, 5=1588-P1, 6=1588-P2<br>Set <b>Clock Source</b> =3                                                                                                                                                                                                                                                                                            |
| <b>IRIG-B Time Zone</b> | 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*                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Clock Source</b>        | 0=RTC, 1=SNTP, 2=GPS, 3=IRIG-B, 4=Reserved, 5=1588-P1, 6=1588-P2<br>Set <b>Clock Source</b> =1                                                                                                                                                                                                                                                                                            |
| <b>Time Zone</b>           | 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 |
| <b>Time Sync. Interval</b> | 10 to 1440 minutes, 60*                                                                                                                                                                                                                                                                                                                                                                   |
| <b>SNTP Server IP</b>      | 192.168.101.2*                                                                                                                                                                                                                                                                                                                                                                            |
| <b>SNTP Broadcast</b>      | 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*                                                                                                  |
|------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Server IP</b>       | The IP Address of the SMTP Server                       | 0.0.0.0*                                                                                                          |
| <b>Port</b>            | The IP Port No. for the SMTP Server                     | 0 to 65535, 25*                                                                                                   |
| <b>Username</b>        | SMTP Server's logon username for Sender's email address | See Note 1), N/A*                                                                                                 |
| <b>Password</b>        | SMTP Server's logon password for Sender's email address | See Note 2), N/A*                                                                                                 |
| <b>Sender E-mail</b>   | Sender's email address                                  | See Note 3), N/A*                                                                                                 |
| <b>Receiver E-mail</b> | Receiver's email address                                | See Note 3), N/A*                                                                                                 |
| <b>Trigger Source</b>  | 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.

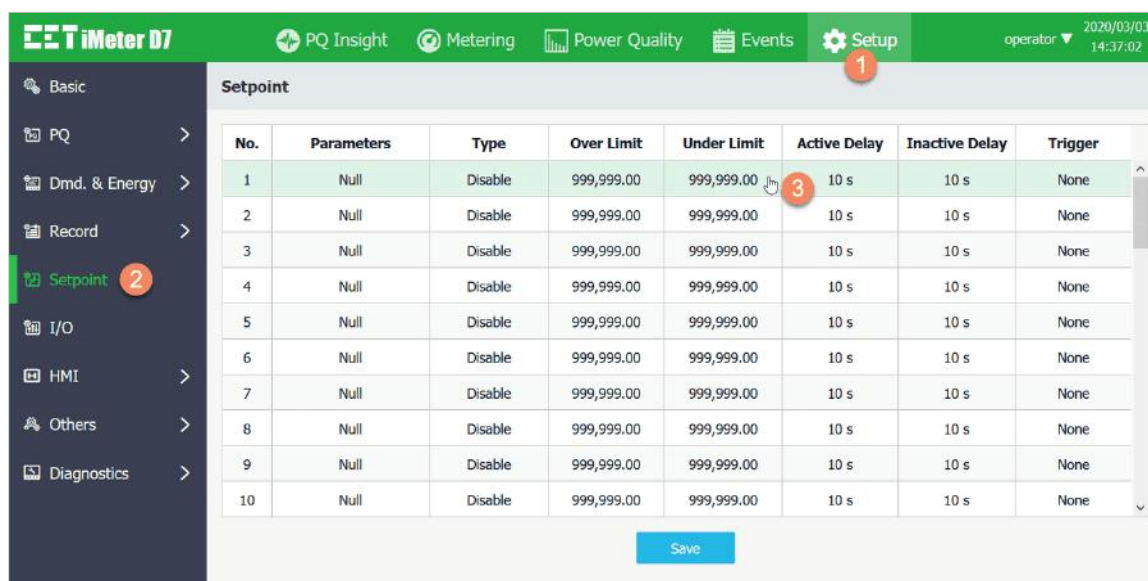


Figure 4-24 Setpoint Settings

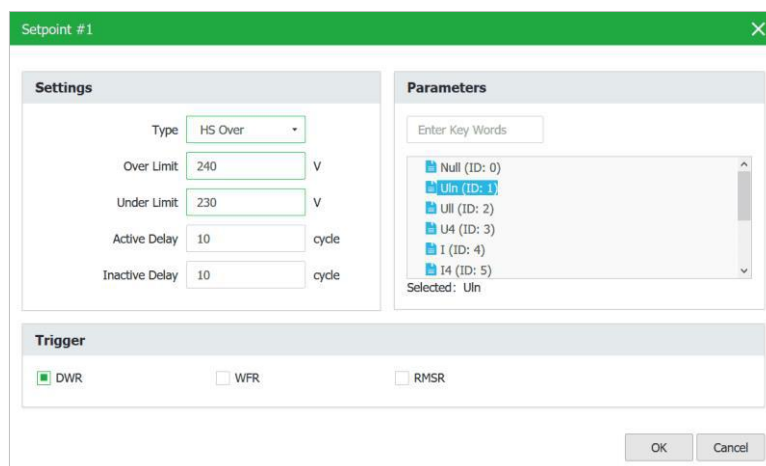


Figure 4-25 Setpoint #1 Settings Dialog

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.

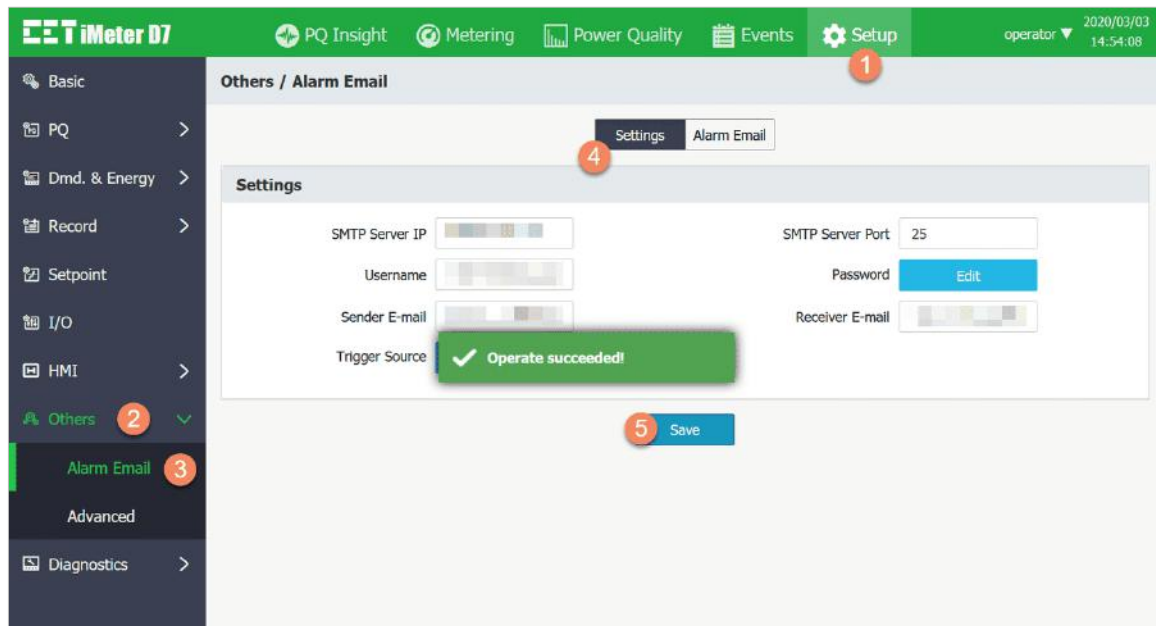


Figure 4-26 Alarm Email Setting via Web Server

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.

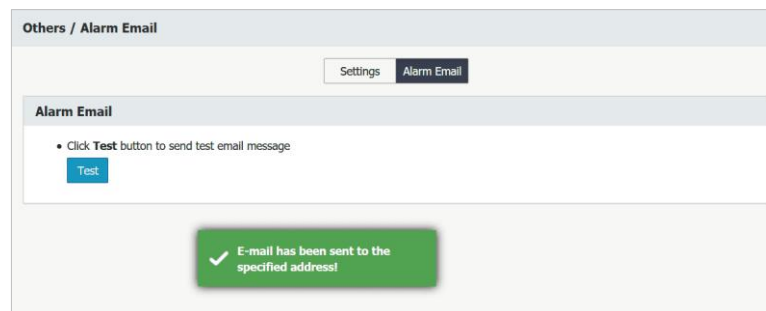


Figure 4-27 Send Test Email

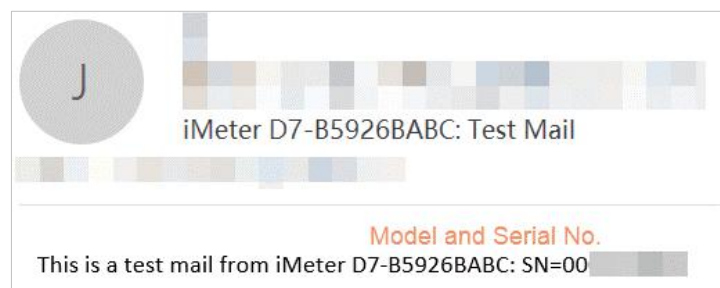


Figure 4-28 An Example of Test Email

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.

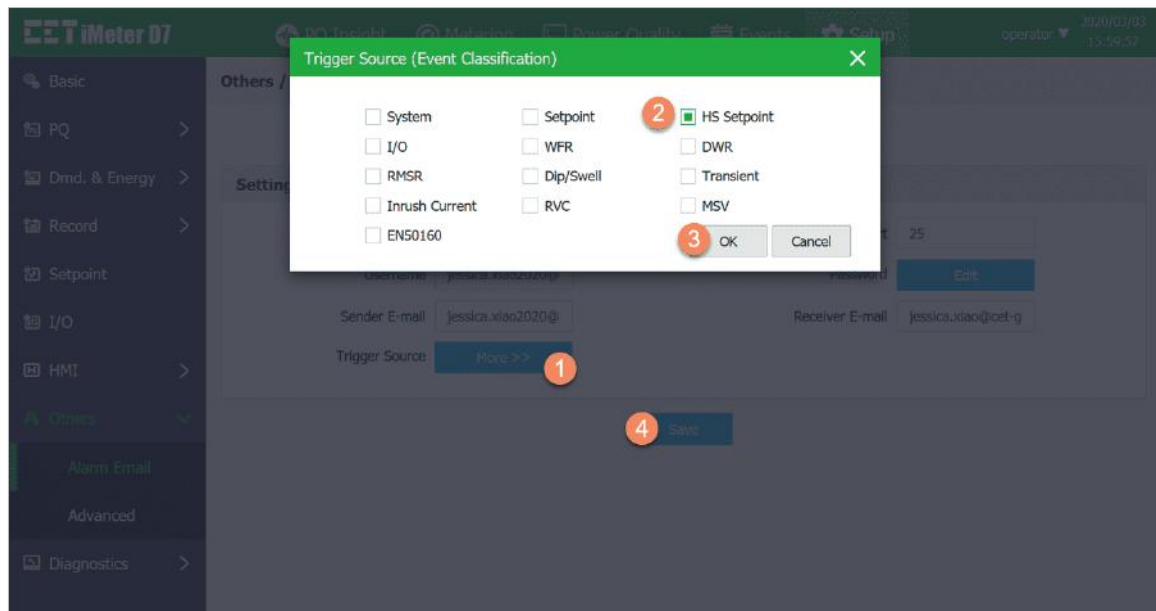


Figure 4-29 Trigger Source Dialog

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

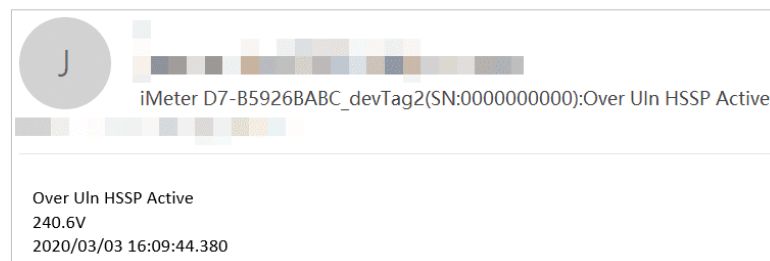


Figure 4-30 Alarm Email

#### 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.

The screenshot shows the 'Basic' configuration page of the iMeter D7 web interface. The 'Comm.' tab is selected. Under the 'RS-485 (P3)' section, the 'Protocol' is set to 'EtherGate', 'Baud Rate' is 9600, 'Unit ID' is 100, 'Parity' is Even, 'Stop Bit' is 1, and 'EtherGate IP Port' is 20000. Below this, the '4G Parameters (Restart Required)' section shows '4G' set to 'Enable', 'Network Selection' to 'Automatic', 'Network' to 'China Mobile', 'APN' is empty, 'Dial Number' is empty, 'User Name' is empty, 'Password' is empty, 'ICMP Domain Name' is 'www.microsoft.com', 'ICMP Port' is 80, and 'Diagnostic Interval' is 60 seconds. A 'White List' section is also present with an 'Enable' checkbox and a table for IP addresses. A 'Save' button is at the bottom.

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.

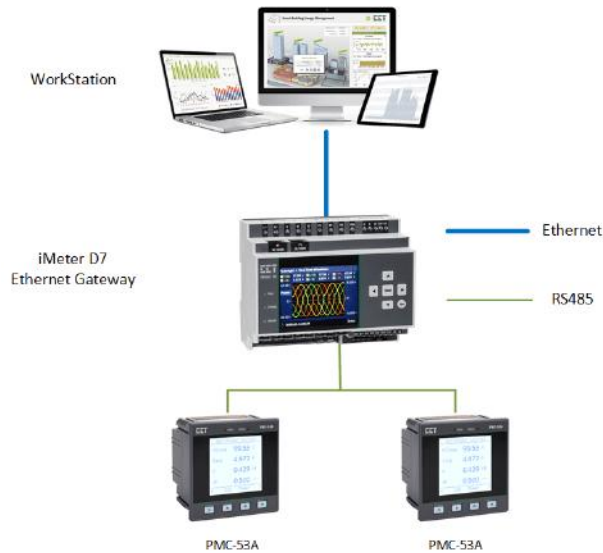


Figure 4-32 Typical Application for Ethernet Gateway

- 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.

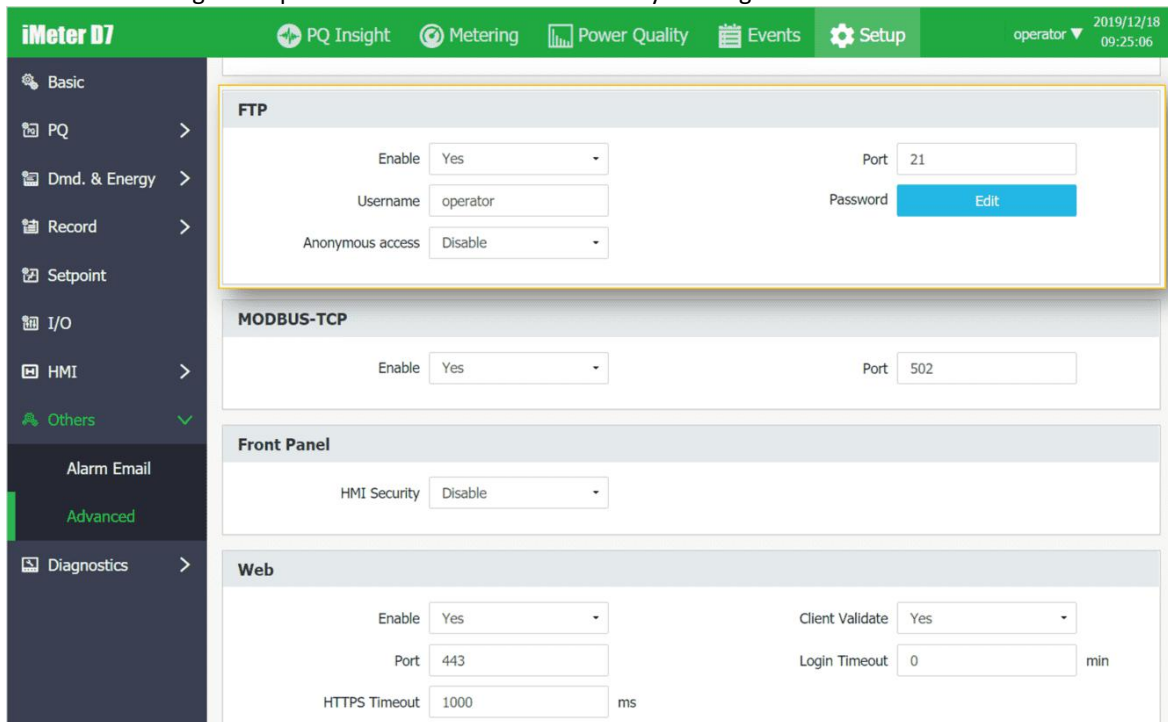


Figure 4-33 FTP Settings on Web

- 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>.

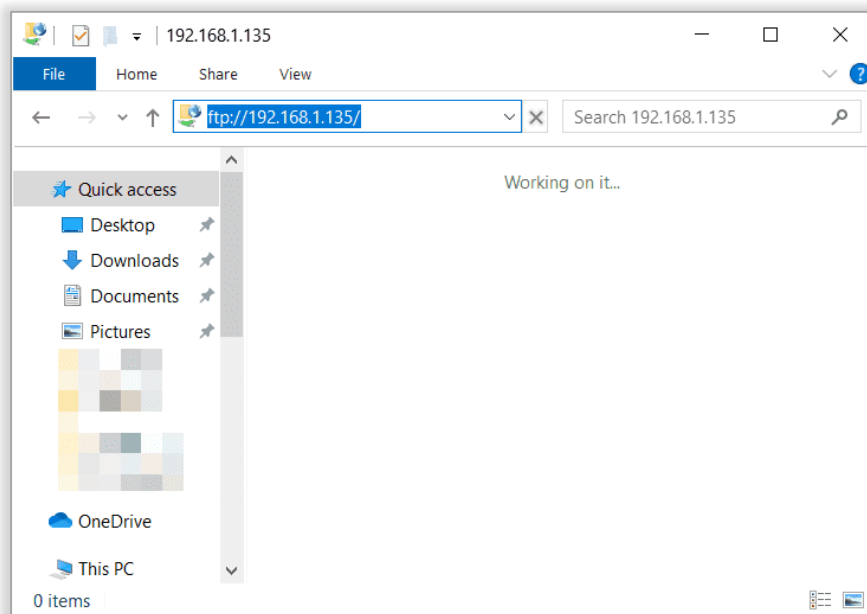


Figure 4-34 Windows File Explorer

- 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.

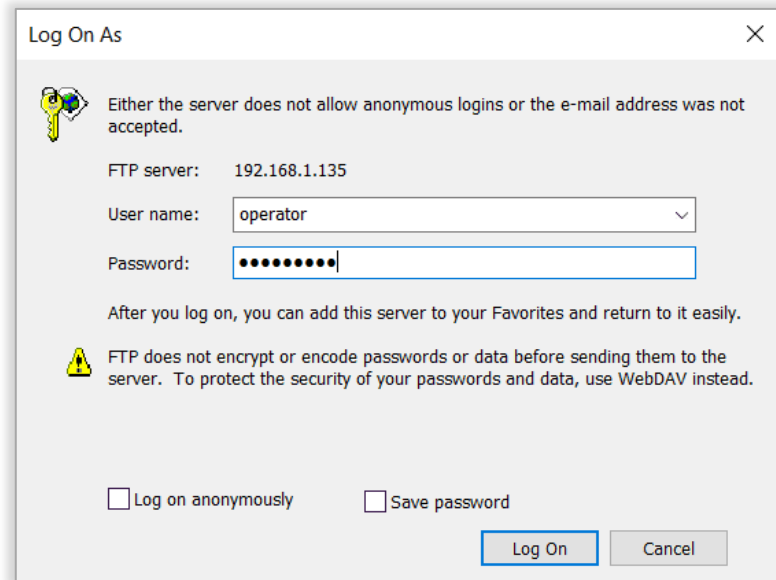


Figure 4-35 Log On As dialog

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

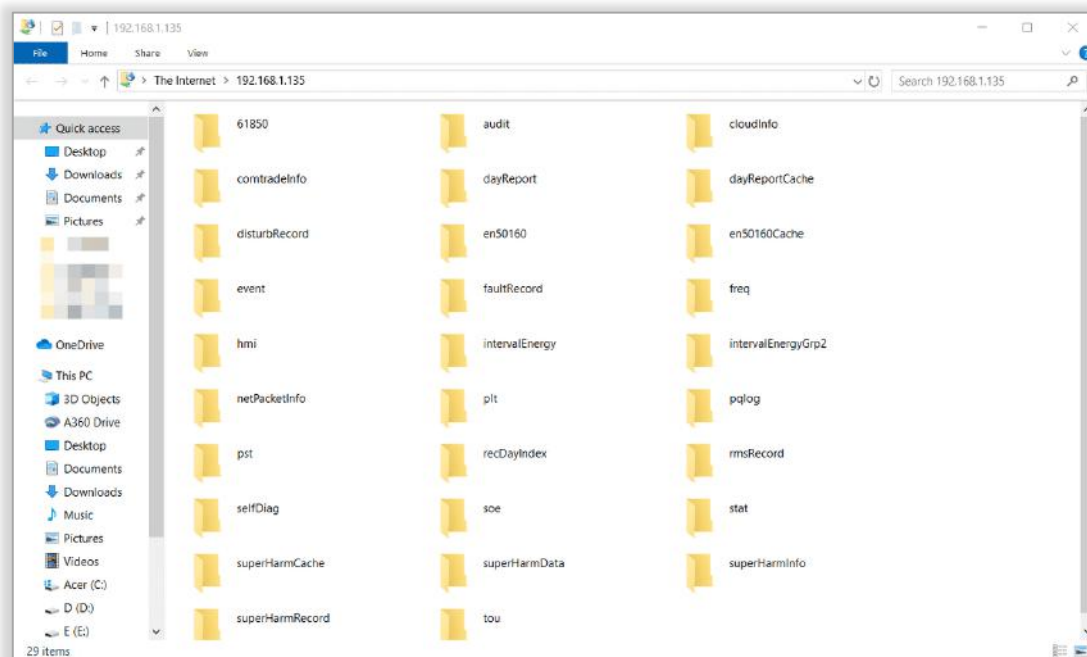


Figure 4-36 iMeter D7's FTP Server

#### 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**).

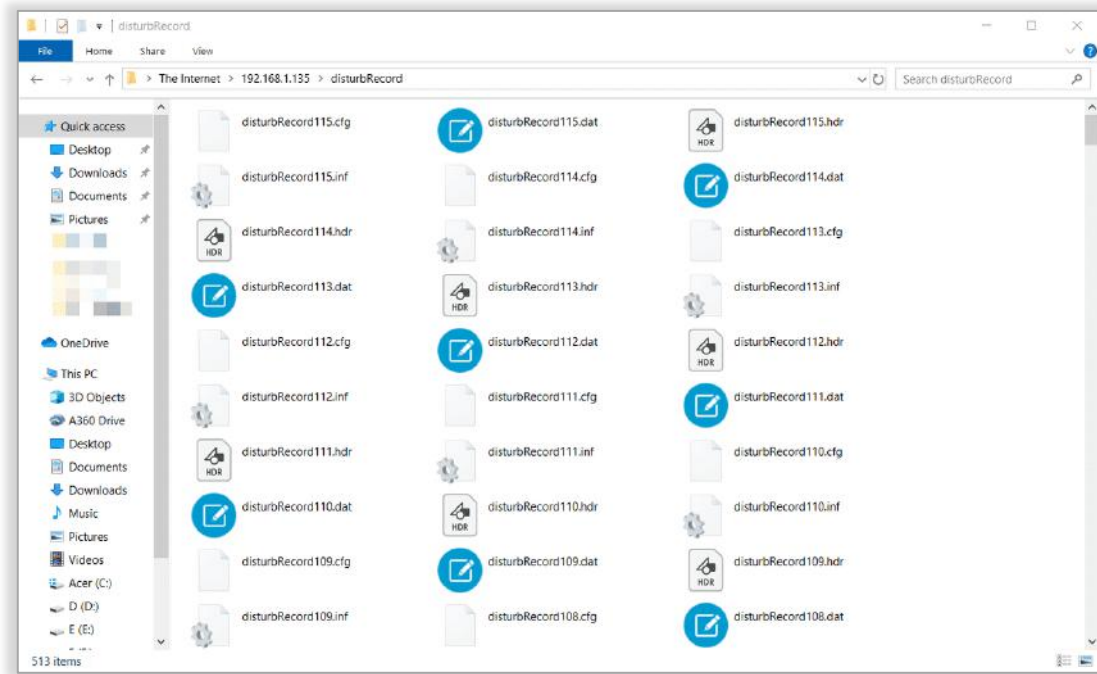


Figure 4-37 disturbRecord Files

- 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**).

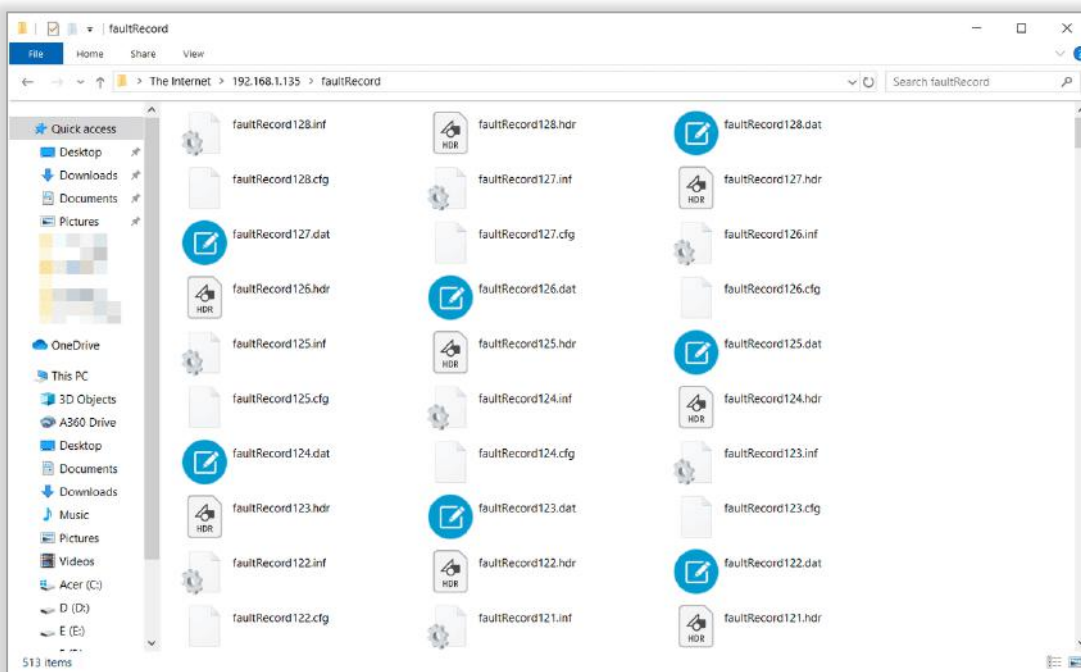


Figure 4-38 faultRecord Files

- 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**).

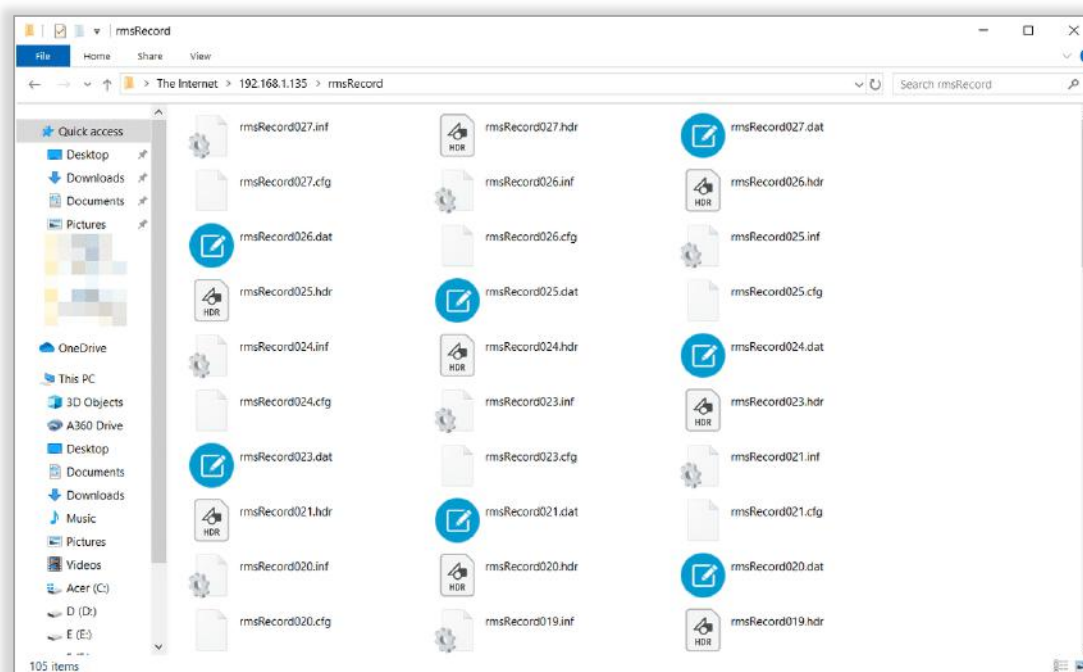


Figure 4-39 rmsRecord Files

- 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.

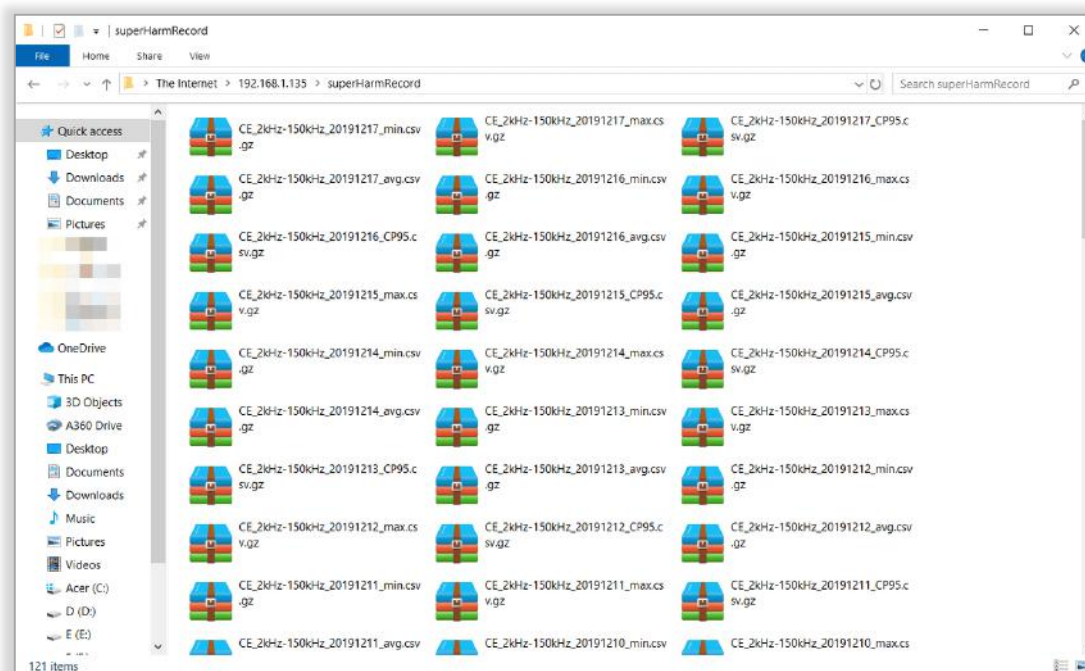


Figure 4-40 superHarmRecord Files

## 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                                                           |

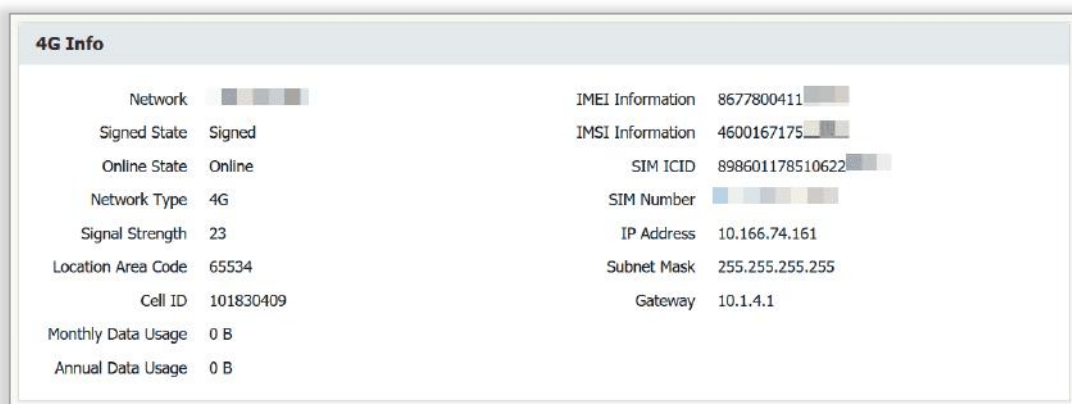
**Table 4-41 Mobile Network Frequencies supported by iMeter D7**

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*,<br>1=China Unicom,<br>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. | <a href="http://www.microsoft.com">www.microsoft.com</a> *, 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 <sup>64</sup> 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.

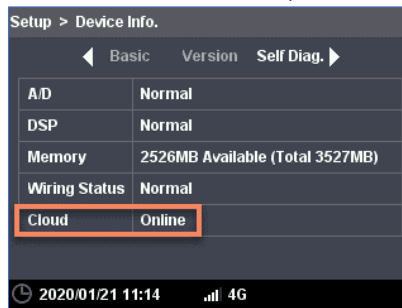


Figure 4-42 Cloud connection status

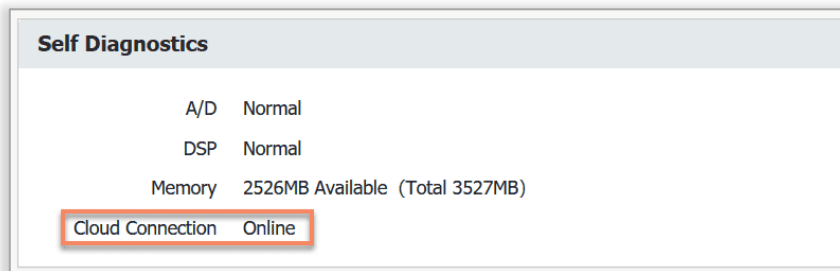


Figure 4-43 Cloud Connection Status

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

| Parameters             | Definition                                                             | Options/Default*              |
|------------------------|------------------------------------------------------------------------|-------------------------------|
| <b>Basic Settings</b>  |                                                                        |                               |
| 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*            |
| <b>Upload Settings</b> |                                                                        |                               |
| 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

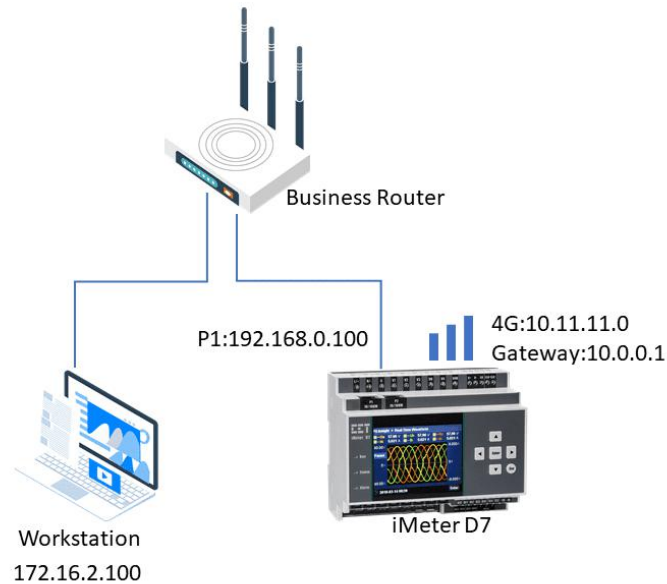
Static Route is a pre-defined path that the data packet must be transmitted to a specific host or network regardless of other considerations.

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.

**Static Route (Restart Required)**

IP Address
172.16.2.100

Subnet Mask
255.255.255.0

Gateway
192.168.0.1

**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 3<sup>rd</sup> 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 <sup>1</sup>                                  | Float  | V    |
| 0002        | RO       | Ub <sup>1</sup>                                  | Float  | V    |
| 0004        | RO       | Uc <sup>1</sup>                                  | Float  | V    |
| 0006        | RO       | ULN average <sup>1</sup>                         | 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 <sup>1</sup>                                 | Float  | W    |
| 0026        | RO       | kWb <sup>1</sup>                                 | Float  | W    |
| 0028        | RO       | kWc <sup>1</sup>                                 | Float  | W    |
| 0030        | RO       | kW Total <sup>1</sup>                            | Float  | W    |
| 0032        | RO       | kvara <sup>1</sup>                               | Float  | var  |
| 0034        | RO       | kvarb <sup>1</sup>                               | Float  | var  |
| 0036        | RO       | kvarc <sup>1</sup>                               | Float  | var  |
| 0038        | RO       | kvar Total <sup>1</sup>                          | Float  | var  |
| 0040        | RO       | kVAa <sup>1</sup>                                | Float  | VA   |
| 0042        | RO       | kVAb <sup>1</sup>                                | Float  | VA   |
| 0044        | RO       | kVAc <sup>1</sup>                                | Float  | VA   |
| 0046        | RO       | kVA Total <sup>1</sup>                           | Float  | VA   |
| 0048        | RO       | PF a <sup>1</sup>                                | Float  | --   |
| 0050        | RO       | PF b <sup>1</sup>                                | Float  | --   |
| 0052        | RO       | PF c <sup>1</sup>                                | Float  | --   |
| 0054        | RO       | PF Total <sup>1</sup>                            | 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 <sup>2</sup>   | UINT16 | --   |
| 0081 ~ 0092 | --       | Reserved                                         | --     | --   |
| 0093        | RO       | Setpoint Status #1 <sup>3</sup>                  | UINT32 | --   |
| 0095        | RO       | Setpoint Status #2 <sup>3</sup>                  | 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 <sup>4</sup>              | UINT32 |    |
| 0139        | RO | PQ Log Pointer <sup>4</sup>               | UINT32 |    |
| 0141        | RO | WFR Log Pointer <sup>4</sup>              | UINT32 | -- |
| 0143        | RO | RMS Log Pointer <sup>4</sup>              | UINT32 | -- |
| 0145        | RO | DWR Pointer <sup>4</sup>                  | UINT32 | -- |
| 0147 ~ 0157 | -- | Reserved                                  | --     | -- |
| 0159        | RO | SDR #1 Pointer <sup>4</sup>               | UINT32 | -- |
| 0161        | RO | SDR #2 Pointer <sup>4</sup>               | UINT32 | -- |
| 0163~0171   | RO | ...                                       | UINT32 | -- |
| 0173        | RO | SDR #8 Pointer <sup>4</sup>               | UINT32 | -- |
| 0175~0237   | -- | Reserved                                  | --     | -- |
| 0239        | RO | Pst Log Pointer <sup>4</sup>              | UINT32 | -- |
| 0241        | RO | Plt Log Pointer <sup>4</sup>              | UINT32 | -- |
| 0243        | RO | Reserved                                  | UINT32 | -- |
| 0245        | RO | IER Log Pointer <sup>4</sup>              | UINT32 | -- |
| 0247        | RO | EN50160 Pointer <sup>4</sup>              | UINT32 | -- |
| 0249        | -- | Reserved                                  | --     | -- |
| 0251        | RO | Historical TOU Log Pointer <sup>4</sup>   | UINT32 | -- |
| 0253~0255   | -- | Reserved                                  | --     | -- |
| 0257        | RO | AER Log Pointer <sup>4</sup>              | UINT32 | -- |
| 0259        | -- | Reserved                                  | --     | -- |
| 0261        | RO | 2-150kHz C.E. Report Pointer <sup>4</sup> | 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 <sup>5</sup>                    | UINT16 | -- |
| 0309        | RO | Reserved                                  | --     | -- |
| 0310        | RO | DO Status <sup>6</sup>                    | UINT16 | -- |
| 0311~0314   | RO | Reserved                                  | --     | -- |
| 0316        | RO | Ir                                        | Float  | -- |
| 0318        | RO | TC                                        | Float  | -- |

Table 5-1 Basic Measurements

## Notes:

- When the Wiring Mode is 3P3W, the per phase Ul<sub>n</sub>, kW, kvar, kVA and PF have no meaning and their registers are reserved.
- Please refer to **Section 4.4.12** for a detailed description of the Flagging Status register.

| Bit | Description       | Bit | Description  |
|-----|-------------------|-----|--------------|
| B0  | Basic Measurement | B8  | Dip          |
| B1  |                   | B9  | Swell        |
| B2  |                   | B10 | Interruption |
| B3  |                   | B11 | Reserved     |
| B4  | Freq.             | B12 | Dip          |
| B5  |                   | B13 | Swell        |
| B6  |                   | B14 | Interruption |
| B7  |                   | B15 | Reserved     |

Table 5-2 Flagging Status

- 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.
- 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:

$$\text{Location} = \text{Modulo} [\text{Log Pointer} / \text{Log Depth}]$$

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

- 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       | $\Sigma$ kWh Import   | INT64  | 1     | Wh   |
| 0504     | RW       | $\Sigma$ kWh Export   | INT64  | 1     | Wh   |
| 0508     | RW       | $\Sigma$ kvarh Import | INT64  | 1     | varh |
| 0512     | RW       | $\Sigma$ kvarh Export | INT64  | 1     | varh |
| 0516     | RW       | $\Sigma$ kVAh         | INT64  | 1     | VAh  |
| 0520     | RW       | $\Sigma$ kWh Net      | INT64  | 1     | Wh   |
| 0524     | RW       | $\Sigma$ kWh Total    | INT64  | 1     | Wh   |
| 0528     | RW       | $\Sigma$ kvarh Net    | INT64  | 1     | varh |
| 0532     | RW       | $\Sigma$ 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:

- 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.
- 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 <sup>1</sup>       | Float  | --   |
| 0702      | RO       | Ub Deviation <sup>1</sup>       | Float  |      |
| 0704      | RO       | Uc Deviation <sup>1</sup>       | Float  |      |
| 0706      | RO       | Uab Deviation                   | Float  |      |
| 0708      | RO       | Ubc Deviation                   | Float  |      |
| 0710      | RO       | Uca Deviation                   | Float  |      |
| 0712      | RO       | Ua Over Deviation <sup>1</sup>  | Float  |      |
| 0714      | RO       | Ub Over Deviation <sup>1</sup>  | Float  |      |
| 0716      | RO       | Uc Over Deviation <sup>1</sup>  | Float  |      |
| 0718      | RO       | Uab Over Deviation              | Float  |      |
| 0720      | RO       | Ubc Over Deviation              | Float  |      |
| 0722      | RO       | Uca Over Deviation              | Float  |      |
| 0724      | RO       | Ua Under Deviation <sup>1</sup> | Float  |      |
| 0726      | RO       | Ub Under Deviation <sup>1</sup> | Float  |      |
| 0728      | RO       | Uc Under Deviation <sup>1</sup> | 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. <sup>2</sup>      | Float  | --   |
| 0772      | RO       | Ub / Ubc Pst. <sup>2</sup>      | Float  |      |
| 0774      | RO       | Uc / Uca Pst. <sup>2</sup>      | Float  |      |

|      |    |                            |       |  |
|------|----|----------------------------|-------|--|
| 0776 | RO | Ua / Uab Plt. <sup>2</sup> | Float |  |
| 0778 | RO | Ub / Ubc Plt. <sup>2</sup> | Float |  |
| 0780 | RO | Uc / Uca Plt. <sup>2</sup> | 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 <sup>2</sup> | Float |  |
| 0844 | RO | MSV #1 Ub/Ubc <sup>2</sup> | Float |  |
| 0846 | RO | MSV #1 Uc/Uca <sup>2</sup> | Float |  |
| 0848 | RO | MSV #2 Ua/Uab <sup>2</sup> | Float |  |
| 0850 | RO | MSV #2 Ub/Ubc <sup>2</sup> | Float |  |
| 0852 | RO | MSV #2 Uc/Uca <sup>2</sup> | Float |  |
| 0854 | RO | MSV #3 Ua/Uab <sup>2</sup> | Float |  |
| 0856 | RO | MSV #3 Ub/Ubc <sup>2</sup> | Float |  |
| 0858 | RO | MSV #3 Uc/Uca <sup>2</sup> | Float |  |

Table 5-6 PQ Measurements

## Notes:

1. When the **Wiring Mode** is **3P3W**, the 3Φ UIn 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 <sup>1</sup>  | Float  | %    |
| 1002     | RO       | Ub / Ubc THD <sup>1</sup>  | Float  |      |
| 1004     | RO       | Uc / Uca THD <sup>1</sup>  | 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 <sup>1</sup> | Float  | %    |
| 1020     | RO       | Ub / Ubc TOHD <sup>1</sup> | Float  |      |
| 1022     | RO       | Uc / Uca TOHD <sup>1</sup> | 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 <sup>1</sup> | Float | %  |
| 1038 | RO  | Ub / Ubc TEHD <sup>1</sup> | Float |    |
| 1040 | RO  | Uc / Uca TEHD <sup>1</sup> | 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 <sup>1</sup> | Float | %  |
| 1056 | RO  | Ub / Ubc HD00 <sup>1</sup> | Float |    |
| 1058 | RO  | Uc / Uca HD00 <sup>1</sup> | 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 <sup>1</sup> | Float | %  |
| 1074 | RO  | Ub / Ubc HD01 <sup>1</sup> | Float |    |
| 1076 | RO  | Uc / Uca HD01 <sup>1</sup> | 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 <sup>1</sup> | Float |    |
| 2190 | RO  | Ub / Ubc HD63 <sup>1</sup> | Float |    |
| 2192 | RO  | Uc / Uca HD63 <sup>1</sup> | 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 <sup>1</sup>  | Float  | V    |
| 2302     | RO       | Ub / Ubc TH RMS <sup>1</sup>  | Float  | V    |
| 2304     | RO       | Uc / Uca TH RMS <sup>1</sup>  | 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 <sup>1</sup> | Float  | V    |
| 2320     | RO       | Ub / Ubc TOH RMS <sup>1</sup> | Float  | V    |
| 2322     | RO       | Uc / Uca TOH RMS <sup>1</sup> | 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 <sup>1</sup> | Float  | V    |
| 2338     | RO       | Ub / Ubc TEH RMS <sup>1</sup> | Float  | V    |
| 2340     | RO       | Uc / Uca TEH RMS <sup>1</sup> | 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 <sup>1</sup> | Float | V   |
| 2356 | RO | Ub / Ubc DC Component RMS <sup>1</sup> | Float | V   |
| 2358 | RO | Uc / Uca DC Component RMS <sup>1</sup> | 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 <sup>1</sup>        | Float | V   |
| 2374 | RO | Ub / Ubc Fund. RMS <sup>1</sup>        | Float | V   |
| 2376 | RO | Uc / Uca Fund. RMS <sup>1</sup>        | 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 <sup>1</sup>          | Float | V   |
| 3490 | RO | Ub / Ubc H63 RMS <sup>1</sup>          | Float | V   |
| 3492 | RO | Uc / Uca H63 RMS <sup>1</sup>          | 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       | $\Sigma$ kW Fund.   | Float  | W    |
| 27002    | RO       | $\Sigma$ kvar Fund. | Float  | var  |
| 27004    | RO       | $\Sigma$ kVA Fund.  | Float  | VA   |
| 27006    | RO       | dPF                 | Float  | --   |
| 27008    | RO       | $\Sigma$ kW H02     | Float  | W    |
| 27010    | RO       | $\Sigma$ kvar H02   | Float  | var  |
| 27012    | RO       | $\Sigma$ kVA H02    | Float  | VA   |
| 27014    | RO       | PF H02              | Float  | --   |
| ...      | RO       | ...                 | Float  | ...  |
| 27496    | RO       | $\Sigma$ kW H63     | Float  | W    |
| 27498    | RO       | $\Sigma$ kvar H63   | Float  | var  |
| 27500    | RO       | $\Sigma$ 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 <sup>1</sup>   | Float  | W    |
| 28002    | RO       | kWb TH <sup>1</sup>   | Float  | W    |
| 28004    | RO       | kWc TH <sup>1</sup>   | Float  | W    |
| 28006    | RO       | kW TH                 | Float  | W    |
| 28008    | RO       | kvara TH <sup>1</sup> | Float  | var  |
| 28010    | RO       | kvarb TH <sup>1</sup> | Float  | var  |
| 28012    | RO       | kvarc TH <sup>1</sup> | Float  | var  |
| 28014    | RO       | kvar TH               | Float  | var  |
| 28016    | RO       | kVAa TH <sup>1</sup>  | Float  | VA   |
| 28018    | RO       | kVAb TH <sup>1</sup>  | Float  | VA   |
| 28020    | RO       | kVAc TH <sup>1</sup>  | Float  | VA   |
| 28022    | RO       | kVA TH                | Float  | VA   |

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

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

**Note:**

- 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 <sup>1</sup> | Float  | °    |
| 30020    | RO       | Ub / Ubc Fund. Angle <sup>1</sup> | Float  |      |
| 30022    | RO       | Uc / Uca Fund. Angle <sup>1</sup> | 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 <sup>1</sup>   | Float  |      |
| 31136    | RO       | Ub / Ubc Angle H63 <sup>1</sup>   | Float  |      |
| 31138    | RO       | Uc / Uca Angle H63 <sup>1</sup>   | 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:**

- 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 <sup>1</sup>  | Float  | %    |
| 33102    | RO       | Ub / Ubc TIHD <sup>1</sup>  | Float  |      |
| 33104    | RO       | Uc / Uca TIHD <sup>1</sup>  | 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 <sup>1</sup> | Float  | %    |
| 33120    | RO       | Ub / Ubc TOIHD <sup>1</sup> | Float  |      |
| 33122    | RO       | Uc / Uca TOIHD <sup>1</sup> | 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 <sup>1</sup> | Float  | %    |
| 33138    | RO       | Ub / Ubc TEIHD <sup>1</sup> | Float  |      |
| 33140    | RO       | Uc / Uca TEIHD <sup>1</sup> | 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 <sup>1</sup> | Float  | %    |
| 33156    | RO       | Ub / Ubc IHD00 <sup>1</sup> | Float  |      |
| 33158    | RO       | Uc / Uca IHD00 <sup>1</sup> | 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 <sup>1</sup> | Float  |      |
| 34290    | RO       | Ub / Ubc IHD63 <sup>1</sup> | Float  |      |
| 34292    | RO       | Uc / Uca IHD63 <sup>1</sup> | 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 <sup>1</sup>  | Float  | V    |
| 34502    | RO       | Ub / Ubc TIH RMS <sup>1</sup>  | Float  | V    |
| 34504    | RO       | Uc / Uca TIH RMS <sup>1</sup>  | 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 <sup>1</sup> | Float  | V    |
| 34520    | RO       | Ub / Ubc TOIH RMS <sup>1</sup> | Float  | V    |
| 34522    | RO       | Uc / Uca TOIH RMS <sup>1</sup> | 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                       | --     | --   |
| 34536    | RO       | Ua / Uab TEIH RMS <sup>1</sup> | Float  | V    |
| 34538    | RO       | Ub / Ubc TEIH RMS <sup>1</sup> | Float  | V    |
| 34540    | RO       | Uc / Uca TEIH RMS <sup>1</sup> | 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 <sup>1</sup> | Float  | V    |
| 34556    | RO       | Ub / Ubc IH00 RMS <sup>1</sup> | Float  | V    |
| 34558    | RO       | Uc / Uca IH00 RMS <sup>1</sup> | 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 <sup>1</sup> | Float  | V    |
| 34574    | RO       | Ub / Ubc IH01 RMS <sup>1</sup> | Float  | V    |
| 34576    | RO       | Uc / Uca IH01 RMS <sup>1</sup> | 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 <sup>1</sup> | Float  | V    |
| 35690    | RO       | Ub / Ubc IH63 RMS <sup>1</sup> | Float  | V    |
| 35692    | RO       | Uc / Uca IH63 RMS <sup>1</sup> | 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 <sup>1</sup>                 | Float  | V    |
| 3602     | RO       | Ub <sup>1</sup>                 | Float  | V    |
| 3604     | RO       | Uc <sup>1</sup>                 | Float  | V    |
| 3606     | RO       | ULN Avg <sup>1</sup>            | 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. <sup>1</sup>           | Float  | W    |
| 3632     | RO       | kWb Imp. <sup>1</sup>           | Float  | W    |
| 3634     | RO       | kWc Imp. <sup>1</sup>           | Float  | W    |
| 3636     | RO       | kW Total Imp.                   | Float  | W    |
| 3638     | RO       | kWa Exp. <sup>1</sup>           | Float  | W    |
| 3640     | RO       | kWb Exp. <sup>1</sup>           | Float  | W    |
| 3642     | RO       | kWc Exp. <sup>1</sup>           | Float  | W    |
| 3644     | RO       | kW Total Exp.                   | Float  | W    |
| 3646     | RO       | kvara Imp. <sup>1</sup>         | Float  | var  |
| 3648     | RO       | kvarb Imp. <sup>1</sup>         | Float  | var  |
| 3640     | RO       | kvarc Imp. <sup>1</sup>         | Float  | var  |
| 3652     | RO       | kvar Total Imp.                 | Float  | var  |
| 3654     | RO       | kvara Exp. <sup>1</sup>         | Float  | var  |
| 3656     | RO       | kvarb Exp. <sup>1</sup>         | Float  | var  |
| 3658     | RO       | kvarc Exp. <sup>1</sup>         | Float  | var  |
| 3660     | RO       | kvar Total Exp.                 | Float  | var  |
| 3662     | RO       | kVAa <sup>1</sup>               | Float  | VA   |
| 3664     | RO       | kVAb <sup>1</sup>               | Float  | VA   |
| 3666     | RO       | kVAc <sup>1</sup>               | Float  | VA   |
| 3668     | RO       | kVA Total                       | Float  | VA   |
| 3670     | RO       | PFa <sup>1</sup>                | Float  | --   |
| 3672     | RO       | PFb <sup>1</sup>                | Float  | --   |
| 3674     | RO       | PFc <sup>1</sup>                | Float  | --   |
| 3676     | RO       | PF Total                        | Float  | --   |
| 3678     | RO       | Freq.                           | Float  | Hz   |
| 3680     | RO       | Ua Deviation <sup>1</sup>       | Float  | 100% |
| 3682     | RO       | Ub Deviation <sup>1</sup>       | Float  | 100% |
| 3684     | RO       | Uc Deviation <sup>1</sup>       | 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 <sup>1</sup>  | Float  | 100% |
| 3694     | RO       | Ub Over Deviation <sup>1</sup>  | Float  | 100% |
| 3696     | RO       | Uc Over Deviation <sup>1</sup>  | 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 <sup>1</sup> | Float  | 100% |
| 3706     | RO       | Ub Under Deviation <sup>1</sup> | Float  | 100% |
| 3708     | RO       | Uc Under Deviation <sup>1</sup> | 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 <sup>2</sup>  | Float |   |
| 3738 | RO | Ub / Ubc THD <sup>2</sup>  | Float |   |
| 3740 | RO | Uc / Uca THD <sup>2</sup>  | 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 <sup>2</sup> | Float |   |
| 3756 | RO | Ub / Ubc TOHD <sup>2</sup> | Float |   |
| 3758 | RO | Uc / Uca TOHD <sup>2</sup> | 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 <sup>2</sup> | Float |   |
| 3774 | RO | Ub / Ubc TEHD <sup>2</sup> | Float |   |
| 3776 | RO | Uc / Uca TEHD <sup>2</sup> | 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:**

- 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.
- 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 <sup>1</sup>       | Float  | V    |
| 3902     | RO       | Ub <sup>1</sup>       | Float  | V    |
| 3904     | RO       | Uc <sup>1</sup>       | Float  | V    |
| 3906     | RO       | ULN Avg. <sup>1</sup> | 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. <sup>1</sup> | Float  | W    |
| 3932     | RO       | kWb Imp. <sup>1</sup> | Float  | W    |
| 3934     | RO       | kWc Imp. <sup>1</sup> | Float  | W    |
| 3936     | RO       | kW Total Imp.         | Float  | W    |

|      |    |                                     |       |     |
|------|----|-------------------------------------|-------|-----|
| 3938 | RO | kW <sub>a</sub> Exp. <sup>1</sup>   | Float | W   |
| 3940 | RO | kW <sub>b</sub> Exp. <sup>1</sup>   | Float | W   |
| 3942 | RO | kW <sub>c</sub> Exp. <sup>1</sup>   | Float | W   |
| 3944 | RO | kW Total Exp.                       | Float | W   |
| 3946 | RO | kvar <sub>a</sub> Imp. <sup>1</sup> | Float | var |
| 3948 | RO | kvar <sub>b</sub> Imp. <sup>1</sup> | Float | var |
| 3940 | RO | kvar <sub>c</sub> Imp. <sup>1</sup> | Float | var |
| 3952 | RO | kvar Total Imp.                     | Float | var |
| 3954 | RO | kvar <sub>a</sub> Exp. <sup>1</sup> | Float | var |
| 3956 | RO | kvar <sub>b</sub> Exp. <sup>1</sup> | Float | var |
| 3958 | RO | kvar <sub>c</sub> Exp. <sup>1</sup> | Float | var |
| 3960 | RO | kvar Total Exp.                     | Float | var |
| 3962 | RO | kVA <sub>a</sub> <sup>1</sup>       | Float | VA  |
| 3964 | RO | kVA <sub>b</sub> <sup>1</sup>       | Float | VA  |
| 3966 | RO | kVA <sub>c</sub> <sup>1</sup>       | Float | VA  |
| 3968 | RO | kVA Total                           | Float | VA  |
| 3970 | RO | PF <sub>a</sub> <sup>1</sup>        | Float | --  |
| 3972 | RO | PF <sub>b</sub> <sup>1</sup>        | Float | --  |
| 3974 | RO | PF <sub>c</sub> <sup>1</sup>        | 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 U<sub>a</sub>/U<sub>b</sub>/U<sub>c</sub>, 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       | U <sub>a</sub> <sup>1</sup>         | See Table 5-18 | V    |
| 4106     | 4806 | RO       | U <sub>b</sub> <sup>1</sup>         |                | V    |
| 4112     | 4812 | RO       | U <sub>c</sub> <sup>1</sup>         |                | V    |
| 4118     | 4818 | RO       | ULN Avg <sup>1</sup>                |                | V    |
| 4124     | 4824 | RO       | U <sub>4</sub>                      |                | V    |
| 4130     | 4830 | RO       | U <sub>ab</sub>                     |                | V    |
| 4136     | 4836 | RO       | U <sub>bc</sub>                     |                | V    |
| 4142     | 4842 | RO       | U <sub>ca</sub>                     |                | V    |
| 4148     | 4848 | RO       | ULI Avg                             |                | V    |
| 4154     | 4854 | RO       | I <sub>a</sub>                      |                | A    |
| 4160     | 4860 | RO       | I <sub>b</sub>                      |                | A    |
| 4166     | 4866 | RO       | I <sub>c</sub>                      |                | A    |
| 4172     | 4872 | RO       | I Avg                               |                | A    |
| 4178     | 4878 | RO       | I <sub>4</sub>                      |                | A    |
| 4184     | 4884 | --       | Reserved                            | --             | --   |
| 4190     | 4890 | RO       | kW <sub>a</sub> Imp. <sup>1</sup>   | See Table 5-18 | W    |
| 4196     | 4896 | RO       | kW <sub>b</sub> Imp. <sup>1</sup>   |                | W    |
| 4202     | 4902 | RO       | kW <sub>c</sub> Imp. <sup>1</sup>   |                | W    |
| 4208     | 4908 | RO       | ΣkW Imp.                            |                | W    |
| 4214     | 4914 | RO       | kW <sub>a</sub> Exp. <sup>1</sup>   |                | W    |
| 4220     | 4920 | RO       | kW <sub>b</sub> Exp. <sup>1</sup>   |                | W    |
| 4226     | 4926 | RO       | kW <sub>c</sub> Exp. <sup>1</sup>   |                | W    |
| 4232     | 4932 | RO       | ΣkW Exp.                            |                | W    |
| 4238     | 4938 | RO       | kvar <sub>a</sub> Imp. <sup>1</sup> |                | var  |
| 4244     | 4944 | RO       | kvar <sub>b</sub> Imp. <sup>1</sup> |                | var  |
| 4250     | 4950 | RO       | kvar <sub>c</sub> Imp. <sup>1</sup> |                | var  |
| 4256     | 4956 | RO       | Σkvar Imp.                          |                | var  |
| 4262     | 4962 | RO       | kvar <sub>a</sub> Exp. <sup>1</sup> |                | var  |
| 4268     | 4968 | RO       | kvar <sub>b</sub> Exp. <sup>1</sup> |                | var  |
| 4274     | 4974 | RO       | kvar <sub>c</sub> Exp. <sup>1</sup> |                | var  |
| 4280     | 4980 | RO       | Σkvar Exp.                          |                | var  |
| 4286     | 4986 | RO       | kVA <sub>a</sub> <sup>1</sup>       |                | VA   |
| 4292     | 4992 | RO       | kVA <sub>b</sub> <sup>1</sup>       |                | VA   |
| 4298     | 4998 | RO       | kVA <sub>c</sub> <sup>1</sup>       |                | VA   |
| 4304     | 5004 | RO       | kVA Total                           |                | VA   |
| 4310     | 5010 | RO       | PF <sub>a</sub> <sup>1</sup>        |                | --   |
| 4316     | 5016 | RO       | PF <sub>b</sub> <sup>1</sup>        |                | --   |
| 4322     | 5022 | RO       | PF <sub>c</sub> <sup>1</sup>        |                | --   |

|      |      |    |                                 |                |    |
|------|------|----|---------------------------------|----------------|----|
| 4328 | 5028 | RO | PF                              |                | Hz |
| 4334 | 5034 | RO | Frequency                       |                | %  |
| 4340 | 5040 | RO | Ua Deviation <sup>1</sup>       |                | %  |
| 4346 | 5046 | RO | Ub Deviation <sup>1</sup>       |                | %  |
| 4352 | 5052 | RO | Uc Deviation <sup>1</sup>       |                | %  |
| 4358 | 5058 | RO | Uab Deviation                   |                | %  |
| 4364 | 5064 | RO | Ubc Deviation                   |                | %  |
| 4370 | 5070 | RO | Uca Deviation                   |                | %  |
| 4376 | 5076 | RO | Ua Over Deviation <sup>1</sup>  |                | %  |
| 4382 | 5082 | RO | Ub Over Deviation <sup>1</sup>  |                | %  |
| 4388 | 5088 | RO | Uc Over Deviation <sup>1</sup>  |                | %  |
| 4394 | 5094 | RO | Uab Over Deviation              |                | %  |
| 4400 | 5100 | RO | Ubc Over Deviation              |                | %  |
| 4406 | 5106 | RO | Uca Over Deviation              |                | %  |
| 4412 | 5112 | RO | Ua Under Deviation <sup>1</sup> |                | %  |
| 4418 | 5118 | RO | Ub Under Deviation <sup>1</sup> |                | %  |
| 4424 | 5124 | RO | Uc Under Deviation <sup>1</sup> |                | %  |
| 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 <sup>2</sup>         | See Table 5-18 | %  |
| 4514 | 5214 | RO | Ub/Ubc THD <sup>2</sup>         |                | %  |
| 4520 | 5220 | RO | Uc/Uca THD <sup>2</sup>         |                | %  |
| 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 <sup>2</sup>        | See Table 5-18 | %  |
| 4568 | 5268 | RO | Ub/Ubc TOHD <sup>2</sup>        |                | %  |
| 4574 | 5274 | RO | Uc/Uca TOHD <sup>2</sup>        |                | %  |
| 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 <sup>2</sup>        | See Table 5-18 | %  |
| 4622 | 5322 | RO | Ub/Ubc TEHD <sup>2</sup>        |                | %  |
| 4628 | 5328 | RO | Uc/Uca TEHD <sup>2</sup>        |                | %  |
| 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:**

- 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.
- 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     |                |
| ...         | RO       | ...            |                |
| 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 ( $1 \leq X \leq 8$ ) | UINT32 | --                                                             |
| +2~+4     | RO       | End Time of the Record <sup>2</sup>  | Bitmap | --                                                             |
| +5        | RO       | Flagging Data Status                 | UINT16 | 0 = Not Flagged<br>1 = Flagged & Removed<br>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:

- The data items can be configured as any real-time data. Please see refer to **Section 5.12.7**
- 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 ( $1 \leq X \leq 4$ ) | UINT32 | 0 = Since Last Reset/This Month<br>1 = Before Last Reset/Last Month |
| +2        | RO       | Recording Time <sup>2</sup>                    | Bitmap | --                                                                  |
| +5        | RO       | Flagging Data Status                           | UINT16 | 0 = No Flag<br>1 = Flagged & Removed<br>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:

- The data items can be configured as any real-time data. Please see **Appendix A**.
- 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

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

| Offset | Property | Description                |
|--------|----------|----------------------------|
| +0     | RO       | 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                  | Bitmap |                 |
|        |          |                              |        | Hi-Year (-2000) |
|        |          |                              |        | Low- Month      |
| +1     | RO       |                              |        | Hi- Day         |
|        |          |                              |        | Low- Hour       |
| +2     | RO       |                              |        | Hi- Minute      |
|        |          |                              |        | Low- Second     |
| +3     | RO       | Flagging Status <sup>1</sup> | 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:

- 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 |                                                                                                                              |
| 24210    | RO       | Freq. Evaluation Result  | UINT32 | 0=Not Flagged, 1=Flagged & Kept<br>2=Flagged & Removed                                                                       |
| 24212    | RO       | Freq N Valid             | UINT32 | 0=Pass, 1=Failed                                                                                                             |
| 24214    | RO       | Freq N Invalid           | UINT32 | Number of valid intervals                                                                                                    |
| 24216    | RO       | Freq Wide Limit Result   | UINT32 | Number of invalid intervals                                                                                                  |
|          |          |                          |        | 0=Pass, 1=Failed                                                                                                             |
| 24218    | RO       | Freq N2                  | UINT32 | Number of valid intervals in which the<br>Freq. deviates from the nominal by more<br>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<br>freq. deviates from the nominal by more<br>than user defined narrow limit          |
| 24226    | RO       | Freq (1 - N1/N)          | Float  | --                                                                                                                           |
| 24228    | RO       | Freq Max-op              | Float  | Hz, maximum mean Frequency (Freq<br>mean-ep) over 1week                                                                      |
| 24230    | RO       | Freq Min-op              | Float  | Hz, minimum mean Frequency (Freq<br>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<br>voltage on 3-phase deviates from nominal<br>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<br>voltage on 3-phase deviates from nominal<br>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 2 <sup>nd</sup> 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 25 <sup>th</sup> 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 2 <sup>nd</sup> 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 25 <sup>th</sup> 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 2 <sup>nd</sup> 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 25 <sup>th</sup> 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 2 <sup>nd</sup> 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 25 <sup>th</sup> 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 2 <sup>nd</sup> 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 25 <sup>th</sup> 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 1 <sup>st</sup> 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 25 <sup>th</sup> 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 1 <sup>st</sup> 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 25 <sup>th</sup> 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 1 <sup>st</sup> 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 25 <sup>th</sup> 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 1 <sup>st</sup> 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 25 <sup>th</sup> 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 | Transients occur on 3-Phase over 1 week |
| 26228 | RO | Interruption N21  | UINT32 |                                         |
| 26230 | RO | Interruption N31  | UINT32 |                                         |
| 26232 | RO | Ua Transient N1   | UINT32 |                                         |
| 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≤5000ms | 5000ms< t≤60000ms | t>60000ms |
| u<5%                                                           | N11           | N21              | N31              | N41             | N51               | N61       |
| 5%≤u<40%                                                       | N12           | N22              | N32              | N42             | N52               | N62       |
| 40%≤u<70%                                                      | N13           | N23              | N33              | N43             | N53               | N63       |
| 70%≤u<80%                                                      | N14           | N24              | N34              | N44             | N54               | N64       |
| 80%≤u<90%                                                      | N15           | N25              | N35              | N45             | N55               | N65       |

Table 5-42 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<br>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 <sup>1</sup>   | Bitmap |
| 25     | RW       | kW Exp. Max. Demand                          | Float  |
| 27     | RW       | kW Exp. Max. Demand Timestamp <sup>1</sup>   | Bitmap |
| 30     | RW       | kvar Imp. Max. Demand                        | Float  |
| 32     | RO       | kvar Imp. Max. Demand Timestamp <sup>1</sup> | Bitmap |
| 35     | RO       | kvar Exp. Max. Demand                        | Float  |
| 37     | RO       | kvar Exp. Max. Demand Timestamp <sup>1</sup> | 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=Preshaed Key                               |
| 39045~39076 | RW       | Preshaed 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       | Unit ID                  | UINT16 | 1 to 247, 100*                   |
| 40001       | RW       | Baudrate <sup>1</sup>    | 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       | IP Address               | UINT32 | 0*                               |
| 40012       | RW       | Subnet Mask              | UINT32 | 0*                               |
| 40014       | RW       | Gateway                  | UINT32 | 0*                               |
| 40016       | RW       | 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       | 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 <sup>1</sup>             | 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 <sup>2</sup>    | UINT16 | 0=Any*, 1=Positive, 2=Negative                                |
| 40105       | RW       | DI1 Setpoint Trigger <sup>3</sup> | UINT32 | 0*                                                            |
| 40107~40108 | --       | Reserved                          | --     | --                                                            |
| ...         | RW       | ...                               | ...    | ...                                                           |
| 40127       | RW       | DI4 Mode <sup>1</sup>             | 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 <sup>2</sup>    | UINT16 | 0=Any*, 1=Positive, 2=Negative                                |
| 40132       | RW       | DI4 Setpoint Trigger <sup>3</sup> | UINT32 | 0*                                                            |

Table 5-52 DI Setup

**Notes:**

- 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**.
- The **Dlx Setpoint Type** only affects which edge would trigger the Waveform Recorder if configured.
- The table below illustrates the details of Dlx'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 Dlx 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, <a href="http://www.microsoft.com">www.microsoft.com</a> * |
| 40380       | RW       | ICMP port        | UINT16 | 1-65535, 80*                                                           |

**Table 5-55 4G Setup Parameters****Note:**

- The default APN is left blank. Please consult the Internet Service Provider to retrieve the correct APN settings.
- The APN, APN Username and APN Password should not exceed 20 ASCII Characters.
- 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:**

- 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 <sup>1</sup>    | UINT16 | 0=IEC*, 1=IEEE, 2=-IEEE                 |
| 40531    | RW       | kVA Calculation <sup>2</sup>  | 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.

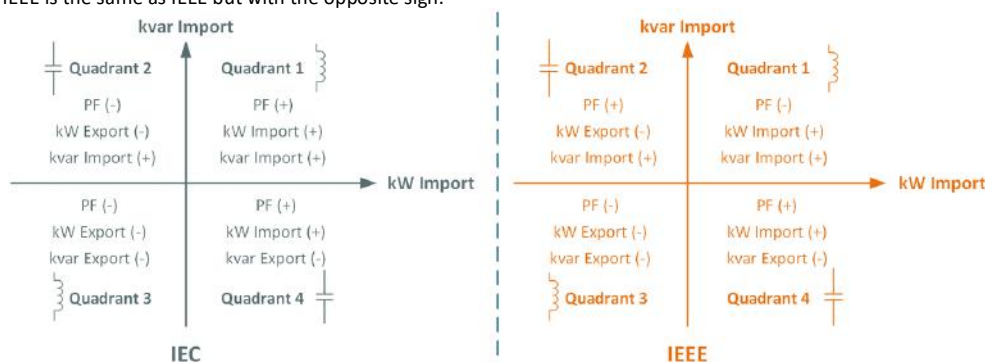


Figure 5-1 Power Factor Definitions

2. There are two ways to calculate kVA:

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

**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 <sup>1</sup>    | UINT16 | 0=1-cycle*, 1= ½ -cycle                                                                 |
| 40752       | RW       | Interruption Mode <sup>2</sup>       | UINT16 | 0=Single Phase, 1=Three Phase*                                                          |
| 40753       | RW       | Dip/Swell Filter <sup>3</sup>        | UINT16 | 0=Disable*, 1=Enable                                                                    |
| 40754       | RW       | Dip/Swell Max. Duration <sup>3</sup> | UINT16 | 1~600s, 60*                                                                             |
| 40755       | RW       | Swell Max. Magnitude <sup>3</sup>    | 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 <sup>4</sup>               | 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 <sup>5</sup>        | UINT16 | 0 to 32, 26*                                                                            |
| 40803       | RW       | Language <sup>5</sup>                | UINT16 | 0=English*, 1=Simplified Chinese                                                        |
| 40804       | RW       | Date Format                          | UINT16 | 0=YYYY/MM/DD*, 1=MM/DD/YYYY<br>2=DD/MM/YYYY, 3=YYYY-MM-DD<br>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 <sup>7</sup>                    | UINT32 | 0~999999, 1*                                            |
| 40815       | -- | Reserved                                     | --     | --                                                      |
| 40817       | RW | Block Flagged Data in Setpoint               | UINT32 | 0=No, 1=Yes*                                            |
| 40819       | RW | Time Format <sup>8</sup>                     | UINT16 | See Note 8, 0*                                          |
| 40820       | RW | PQ Curve                                     | UINT16 | 0=ITIC*, 1=SEMI F47                                     |
| 40821       | RW | Aggregation Interval <sup>9</sup>            | UINT16 | 0=50/60-cycle*, 1=150/180-cycle<br>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 <sup>10</sup>     | UINT16 | 0=0*, 1=Actual Sampling                                 |
| 40825       | RW | Keep/Remove Flagged Data <sup>11</sup>       | 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 <sup>13</sup>            | UINT16 | 0=Enabled, 1=Disabled*                                  |
| 40843       | RW | FTP Enable <sup>13</sup>                     | UINT16 | 0=Yes*, 1=No                                            |
| 40844       | RW | TELNET Enable <sup>13</sup>                  | UINT16 | 0=Yes, 1=No*                                            |
| 40845~40856 | -- | Reserved                                     | --     | --                                                      |
| 40857       | RW | Web Enable <sup>13</sup>                     | 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 <sup>14</sup>                 | UINT16 | 0=No, 1=Yes*                                            |
| 40863       | RW | Diagsys Port <sup>14</sup>                   | UINT16 | 1 to 65535, 60001*                                      |
| 40864       | RW | Modbus TCP Enable <sup>13</sup>              | UINT16 | 0=No, 1=Yes*                                            |
| 40865       | RW | Modbus TCP Port <sup>13</sup>                | UINT16 | 1 to 65535, 502*                                        |
| 40866       | RW | HMI Security Enable <sup>13</sup>            | UINT16 | 0=No, 1=Yes*                                            |
| 40867       | RW | IEC61850 Enable <sup>14</sup>                | UINT16 | 0=No, 1=Yes*                                            |
| 40868       | RW | P1 Enable <sup>13</sup>                      | UINT16 | 0=No, 1=Yes*                                            |
| 40869       | RW | P2 Enable <sup>13</sup>                      | UINT16 | 0=No, 1=Yes*                                            |
| 40870~40877 | -- | Reserved                                     | --     | --                                                      |
| 40878       | RW | Enable IEC61850 Authentication <sup>13</sup> | UINT16 | 0=No*, 1=Yes                                            |
| 40879~40886 | RW | IEC61850 Password                            | CHAR   | 6365742D656C6563747269632E636F6D*<br>(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 <sup>14</sup>                  | 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:

- 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).
- 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**.
- The **Dip/Swell Filter** determines if a Dip/Swell event should be recorded when the Dip/Swell duration exceeds the preset value of **Dip/Swell Max. Duration** register or if a Swell event should be recorded if the Urms exceeds the preset value of **Swell Max. Magnitude** register. The **Dip/Swell Max. Duration** and **Swell Max. Magnitude** registers are disregarded if the **Dip/Swell Filter** is disabled.
- 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).
- 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, PIt/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](mailto: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.

- 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.
- 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](mailto: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:

- 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 “0” 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 <sup>1</sup>         | UINT16 | 101 to 200 (x0.01Udin/Usr), 110* |
| 41103       | RW       | Dip Threshold <sup>1</sup>           | UINT16 | 1 to 99 (x0.01 Udin/Usr), 90*    |
| 41104       | RW       | Interruption Threshold <sup>1</sup>  | UINT16 | 0 to 50 (x0.01 Udin/Usr), 10*    |
| 41105       | RW       | Swell Hysteresis <sup>1</sup>        | UINT16 | 1 to 1000 (x0.001 Udin/Usr), 20* |
| 41106       | RW       | Dip Hysteresis <sup>1</sup>          | UINT16 |                                  |
| 41107       | RW       | Interruption Hysteresis <sup>1</sup> | UINT16 |                                  |
| 41108       | RW       | PQD Trigger <sup>2</sup>             | UINT32 | 0x80000000(DWR) *                |
| 41110       | RW       | Dip/Swell Trigger <sup>3</sup>       | 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 <sup>4</sup>       | 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 <sup>4</sup>  | 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 <sup>4</sup>             | 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:**

- The values for the **Dip Threshold**, **Swell Threshold**, **Voltage Interruption Threshold** and **Dip/Swell Hysteresis** should be configured to meet the following criteria:
  - The **Voltage Interruption Threshold** shall be set below **Dip Threshold**.
  - The **Dip/Swell Hysteresis** must be less than the **Dip/Swell Thresholds**.
  - The **Rapid Voltage Changes (RVC) Threshold** must be less than the **Dip and Swell Thresholds**.
  - Regardless of whether **Dip/Swell** is enabled, the conditions for a), b) and c) must always be met.
- 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

- 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

- 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

- 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 <sup>1</sup> | UINT16 | Default = 0xFFFF      |
| 41254    | RW       | Predicted Response          | UINT16 | 70* to 99             |

Table 5-80 Demand Setup

**Notes:**

- 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 <sup>2</sup> | 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  $Z = V_{\text{nominal}} \times I_{\text{nominal}} \times 2$ , where  $V_{\text{nominal}}$  and  $I_{\text{nominal}}$  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<br>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:

- 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   | UIn                | 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

- 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~<br>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~<br>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~<br>45966 | RW | Parameter #57~<br>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~<br>46266 | RW | Parameter #63~<br>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~<br>46366 | RW | Parameter #63~<br>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~<br>46466 | RW | Parameter #53~<br>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~<br>49121 | 49520~<br>49521 | RW       | Parameter #19~<br>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:**

- 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  $0 \leq \text{Hour} \leq 23$  and  $1 \leq \text{Day} \leq 28$ . 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<br>1=Stop-When-Full<br>2=First-In-First-Out* |                  |
| 49701               | 49731               | --       | Reserved           | --                      | --                                                      |                  |
| 49702               | 49732               | --       | Reserved           | --                      | --                                                      |                  |
| 49703               | 49733               | RW       | Recording Interval | UINT16                  | 1 to 65535min, 15*                                      |                  |
| 49704<br>~<br>49706 | 49734<br>~<br>49736 | RW       | Start Time         | High-order Byte: Year   | UINT16                                                  | 0-99 (Year-2000) |
|                     |                     |          |                    | Low-order Byte: Month   | UINT16                                                  | 1 to 12          |
|                     |                     |          |                    | High-order Byte: Day    | UINT16                                                  | 1 to 31          |
|                     |                     |          |                    | Low-order Byte: Hour    | UINT16                                                  | 0 to 23          |
|                     |                     |          |                    | High-order Byte: Minute | UINT16                                                  | 0 to 59          |
|                     |                     |          |                    | Low-order Byte: Second  | UINT16                                                  | 0 to 59          |

Table 5-103 IER &amp; 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*<br>1=Weekday2<br>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<br>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 20<sup>th</sup>, 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 <sup>1</sup> | 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<br>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. 1<sup>st</sup> 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 <sup>1</sup>  | UINT32 | See Notes 1)   |
| 2      | RW       | Alternate Day #1 Daily Profile      | UINT16 | 0* to 19       |
| 3      | RW       | Alternate Day #2 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 5      | RW       | Alternate Day #2 Daily Profile      | UINT16 | 0* to 19       |
| 6      | RW       | Alternate Day #3 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 8      | RW       | Alternate Day #3 Daily Profile      | UINT16 | 0* to 19       |
| 9      | RW       | Alternate Day #4 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 11     | RW       | Alternate Day #4 Daily Profile      | UINT16 | 0* to 19       |
| 12     | RW       | Alternate Day #5 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 14     | RW       | Alternate Day #5 Daily Profile      | UINT16 | 0* to 19       |
| 15     | RW       | Alternate Day #6 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 17     | RW       | Alternate Day #6 Daily Profile      | UINT16 | 0* to 19       |
| 18     | RW       | Alternate Day #7 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 19     | RW       | Alternate Day #7 Daily Profile      | UINT16 | 0* to 19       |
| 21     | RW       | Alternate Day #8 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 22     | RW       | Alternate Day #8 Daily Profile      | UINT16 | 0* to 19       |
| 24     | RW       | Alternate Day #9 Date <sup>1</sup>  | UINT32 | See Notes 1)   |
| 25     | RW       | Alternate Day #9 Daily Profile      | UINT16 | 0* to 19       |
| 27     | RW       | Alternate Day #10 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 29     | RW       | Alternate Day #10 Daily Profile     | UINT16 | 0* to 19       |
| ...    |          | ...                                 |        |                |
| ...    |          | ...                                 |        |                |
| 240    | RW       | Alternate Day #81 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 162    | RW       | Alternate Day #81 Daily Profile     | UINT16 | 0* to 19       |
| 243    | RW       | Alternate Day #82 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 245    | RW       | Alternate Day #82 Daily Profile     | UINT16 | 0* to 19       |
| 246    | RW       | Alternate Day #83 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 248    | RW       | Alternate Day #83 Daily Profile     | UINT16 | 0* to 19       |
| 249    | RW       | Alternate Day #84 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 251    | RW       | Alternate Day #84 Daily Profile     | UINT16 | 0* to 19       |
| 252    | RW       | Alternate Day #85 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 254    | RW       | Alternate Day #85 Daily Profile     | UINT16 | 0* to 19       |
| 255    | RW       | Alternate Day #86 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 256    | RW       | Alternate Day #86 Daily Profile     | UINT16 | 0* to 19       |
| 258    | RW       | Alternate Day #87 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 260    | RW       | Alternate Day #87 Daily Profile     | UINT16 | 0* to 19       |
| 261    | RW       | Alternate Day #88 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 263    | RW       | Alternate Day #88 Daily Profile     | UINT16 | 0* to 19       |
| 264    | RW       | Alternate Day #89 Date <sup>1</sup> | UINT32 | See Notes 1)   |
| 266    | RW       | Alternate Day #89 Daily Profile     | UINT16 | 0* to 19       |
| 267    | RW       | Alternate Day #90 Date <sup>1</sup> | 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 <sup>1</sup>                    | 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 <sup>2</sup>                     | 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 <sup>3</sup>             | UINT16 |                  |
| 9264      | WO       | Clear IER Log                                   | UINT16 |                  |
| 9265      | 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 <sup>4</sup>                   | UINT16 | Writing “0xFF00” |
| 9283      | WO       | Clear Max. Log #1 <sup>5</sup>                  | UINT16 |                  |

|           |    |                                         |        |                  |
|-----------|----|-----------------------------------------|--------|------------------|
| 9284      | WO | Clear Max. Log #2 <sup>5</sup>          | UINT16 | Writing "0xFF00" |
| 9285      | WO | Clear Max. Log #3 <sup>5</sup>          | UINT16 |                  |
| 9286      | WO | Clear Max. Log #4 <sup>5</sup>          | UINT16 |                  |
| 9287      | -- | Reserved                                | --     |                  |
| 9288      | WO | Clear Min. Log #1 <sup>5</sup>          | UINT16 | Writing "0xFF00" |
| 9289      | WO | Clear Min. Log #2 <sup>5</sup>          | UINT16 |                  |
| 9290      | WO | Clear Min. Log #3 <sup>5</sup>          | UINT16 |                  |
| 9291      | WO | Clear Min. Log #4 <sup>5</sup>          | UINT16 |                  |
| 9292      | -- | Reserved                                | --     | --               |
| 9293      | WO | Clear All Demand <sup>6</sup>           | UINT16 | Writing "0xFF00" |
| 9294      | WO | Clear This Max. Demand Log <sup>7</sup> | 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 60005 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<br>~<br>9005 | 60004<br>~<br>60005 | RW       | UNIX Time                | UINT32 | 0x386D4380 to 0x 7FE8177F<br>The corresponding time is<br>2000.01.01 00:00:00 to 2037.12.31<br>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 <sup>1</sup>        | 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<br>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 100 <sup>th</sup> iMeter D7 that was manufactured on January 3 <sup>rd</sup> , 2017                                                         |
| 9829      | 60229       | --       | Reserved                        | --     | --                                                                                                                                                                    |
| 9830      | 60230       | RO       | Feature Code <sup>2</sup>       | UINT32 | --                                                                                                                                                                    |
| 9832      | 60232       | --       | Reserved                        | --     | --                                                                                                                                                                    |
| 9833      | 60233       | --       | Device Temperature              | Float  | °C                                                                                                                                                                    |
| 9835      | 60235       | RO       | PPC Diagnostic Info.            | UINT32 | Bit0: System Parameters Error<br>Bit1: Secret Parameters Error<br>Bit2: Invalid<br>Bit3: Audit Log ≥ 90%<br>Bit 4 to Bit 7: Invalid<br>Bit8: Memory<br>Bit0: AD Error |
| 9837      | 60237       | RO       | DSP Diagnostic Info.            | UINT32 |                                                                                                                                                                       |
| 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,<br>2=3G, 3=4G                  |
| 9852 | 60252 | RO | Signal Strength          | UINT16 | 0 to 31 (Larger<br>Number means<br>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:**

- 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) | ANSII   |
|----------|----------|-------------|---------|
| 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"

- 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    | 400V <sub>LN</sub> /690V <sub>L</sub> +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            |                               |
|         | 16 | DO Released by Dip/Swell            | See Note 11                   |
|         | 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  | RMSR 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:**

- 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.
- 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.
- The bit value "1" for Bit0 to Bit3 of the returned value indicates the Max./Min Recorder 1 to 4 is cleared, respectively.
- The following table illustrates the detail of the returned value for Clear PQ Counters event with a bit value of "1" meaning clear.

|           |                      |           |                        |           |                |            |                 |
|-----------|----------------------|-----------|------------------------|-----------|----------------|------------|-----------------|
| <b>B0</b> | Dip Counter          | <b>B3</b> | Transient Counter      | <b>B6</b> | Reserved       | <b>B9</b>  | MSV #3 Counter  |
| <b>B1</b> | Swell Counter        | <b>B4</b> | RVC Counter            | <b>B7</b> | MSV #1 Counter | <b>B10</b> | All PQ Counters |
| <b>B2</b> | Interruption Counter | <b>B5</b> | Inrush Current Counter | <b>B8</b> | MSV #2 Counter |            |                 |

- The event value of Switch TOU Schedule are illustrated in the table below:

| Value | Description                              | Value | Description                                   |
|-------|------------------------------------------|-------|-----------------------------------------------|
| 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 |

- 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 <b>Table 5-116 Meter Information</b> |
| +2     | UINT32 | DSP Diagnostic Result, please refer to Register 9837/60237 in <b>Table 5-116 Meter Information</b> |

- 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  |

- 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:<br>Dip/Swell      | 0                  | Voltage Swell Start        | UINT32 Start Phase<br>Bit0: A Phase, Bit1: B Phase, Bit2: C Phase<br>Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase                                                                                                                                                      |
|                         | 1                  | Voltage Swell End          | FP32: Residual Voltage Max. (%)<br>UINT32: Duration (ms)<br>FP32: Ua Residual<br>FP32: Ub Residual<br>FP32: Uc Residual<br>FP32: Ua Benchmark<br>FP32: Ub Benchmark<br>FP32: Uc Benchmark                                                                                |
|                         | 2                  | Voltage Dips Start         | UINT32 Start Phase<br>Bit0: A Phase, Bit1: B Phase, Bit2: C Phase<br>Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase                                                                                                                                                      |
|                         | 3                  | Voltage Dips Swell End     | FP32: Residual Voltage Min. (%)<br>UINT32: Duration (ms)<br>FP32: Ua Residual<br>FP32: Ub Residual<br>FP32: Uc Residual<br>FP32: Ua Benchmark<br>FP32: Ub Benchmark<br>FP32: Uc Benchmark                                                                                |
|                         | 4                  | Voltage Interruption Start | UINT32<br>Bit0: A Phase, Bit1: B Phase, Bit2: C Phase<br>Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase                                                                                                                                                                  |
|                         | 5                  | Voltage Interruption End   | FP32: Residual Voltage Min. (%)<br>UINT32: Duration (ms)<br>FP32: Ua Residual<br>FP32: Ub Residual<br>FP32: Uc Residual<br>FP32: Ua Benchmark<br>FP32: Ub Benchmark<br>FP32: Uc Benchmark                                                                                |
|                         | 6                  | Dips Location Detective    | UINT32: Location 0=UpStream, 1=DownStream<br>UINT32: Confidence 0=Low, 1=Middle, 2=High                                                                                                                                                                                  |
|                         | 7                  | PQ Disturbance Start       | None                                                                                                                                                                                                                                                                     |
|                         | 8                  | PQ Disturbance End         | FP32: Ua Residual<br>FP32: Ub Residual<br>FP32: Uc Residual<br>FP32: Ua Benchmark<br>FP32: Ub Benchmark<br>FP32: Uc Benchmark                                                                                                                                            |
| 0X82: Transient         | 0                  | Voltage Transient          | FP32: Disturbance Max./Min. (%)<br>UINT32: Duration (µs)<br>FP32: Ua Disturbance (%)<br>FP32: Ub Disturbance (%)<br>FP32: Uc Disturbance (%)                                                                                                                             |
| 0X83: Inrush<br>Current | 0                  | Inrush Ia Active           | None                                                                                                                                                                                                                                                                     |
|                         | 1                  | Inrush Ib Active           |                                                                                                                                                                                                                                                                          |
|                         | 2                  | Inrush Ic Active           |                                                                                                                                                                                                                                                                          |
|                         | 3                  | Inrush Ia Inactive         | UINT32: Duration (µs)<br>FP32: Phase Current Disturbance (%)                                                                                                                                                                                                             |
|                         | 4                  | Inrush Ib Inactive         | FP32: I <sub>rms</sub> during Disturbance                                                                                                                                                                                                                                |
|                         | 5                  | Inrush Ic Inactive         | UINT32: Start Time (s)<br>UINT32: Start Time (ms)                                                                                                                                                                                                                        |
| 0X84: RVC               | 0                  | Rapid Voltage Change       | UINT32: Start Time (s)<br>UINT32: Start Time (ms)<br>UINT32: Duration (ms)<br>FP32: Max. Voltage Change Rate (%)<br>FP32: Voltage Change Rate (%)<br>UINT32 Start Phase<br>Bit0: A Phase, Bit1: B Phase, Bit2: C Phase<br>Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase |
| 0X85: MSV               | 0/2/4              | MSV #1/2/3 Active          | FP32: Frequency (Hz)<br>uint32: Phase                                                                                                                                                                                                                                    |

|  |       |                     |                                                                                                 |
|--|-------|---------------------|-------------------------------------------------------------------------------------------------|
|  |       |                     | Bit0=Phase A, Bit1= Phase B, Bit2= Phase C<br>Bit3: AB Phase, Bit4: BC Phase, Bit5: CA Phase    |
|  | 1/3/5 | MSV #1/2/3 Inactive | FP32: Frequency (Hz)<br>FP32: Ua MSV Max. (%)<br>FP32: Ub MSV Max. (%)<br>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<br>< 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 $\pm$ 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)       | $\pm 0.1\%$                                                                                    | 0.001V     |
| I1, I2, I3, I4    | 5A/1A Option: $\pm 0.1\%$<br>SCCPA Option ( $\pm 0.1\% + \text{Error of SCCP}$ )               | 0.001A     |
| P, Q, S           | 5A/1A Option: $\pm 0.2\%$<br>SCCPA Option: $\pm 0.5\%$                                         | 0.001kX    |
| kWh, kVAh         | IEC 62053-22 Class 0.2S<br>SCCPA Option:<br>IEC 62053-21 Class 1                               | 0.1kXh     |
| kvarh             | 5A/1A Option:<br>IEC 62053-24 Class 0.5S<br>SCCPA Option:<br>IEC 62053-24 Class 1              | 0.1kvarh   |
| PF                | 5A/1A Option: $\pm 0.2\%$<br>SCCPA Option: $\pm 0.5\%$                                         | 0.001      |
| Frequency         | $\pm 0.003$ 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: $\pm 0.2^\circ$<br>SCCPA Option:<br>$\pm 0.2^\circ + \text{Phase Error of SCCP}$ | 0.1°       |
| Voltage Unbalance | $\pm 0.1\%$                                                                                    | 0.01%      |
| Current Unbalance | $\pm 0.5\%$                                                                                    | 0.01%      |
| Pst, Plt          | $\pm 5\%$                                                                                      | 0.001      |

## Appendix F – Standards Compliance

| Safety Requirements                                                                                                                                    |                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| CE LVD 2014 / 35 / EU                                                                                                                                  | EN61010-1: 2010<br>EN61010-2-030: 2010                       |
| Electrical safety in low voltage distribution systems up to 1000Vac and 1500 Vdc                                                                       | IEC 61557-12: 2018 (PMD)                                     |
| Insulation                                                                                                                                             | IEC 62052-11: 2003<br>IEC 62053-22: 2003<br>EN 61010-1: 2010 |
| AC Voltage: 2kV @ 1 minute<br>Insulation Resistance: >100MΩ<br>Impulse voltage: 6kV, 1.2/50μs                                                          |                                                              |
| 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

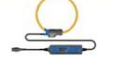
|  |                                                                         |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Version 20200428                                                                  |                                                                         |
| Product Code                                                                      | Description                                                             |
| iMeter D7 DIN-Rail Advanced Power Quality Analyzer                                |                                                                         |
| <b>Basic Feature</b>                                                              |                                                                         |
| 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 |
| <b>Input Current</b>                                                              |                                                                         |
| 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.              |
| <b>Input Voltage</b>                                                              |                                                                         |
| 9                                                                                 | 400VLN/690VLL + 20%                                                     |
| <b>Power Supply</b>                                                               |                                                                         |
| 2                                                                                 | 95-250VAC/DC ± 10%, 47-440Hz                                            |
| <b>System Frequency</b>                                                           |                                                                         |
| 5                                                                                 | 50Hz                                                                    |
| 6                                                                                 | 60Hz                                                                    |
| <b>I/O</b>                                                                        |                                                                         |
| A                                                                                 | 4xDI + 3xDO (Mechanical Relay)                                          |
| B                                                                                 | 4xDI + 3xSS Pulse Outputs                                               |
| <b>Analog Inputs</b>                                                              |                                                                         |
| X                                                                                 | None                                                                    |
| A*                                                                                | 2xAI                                                                    |
| B*                                                                                | 1xIr + 1xRTD                                                            |
| <b>Communications</b>                                                             |                                                                         |
| A                                                                                 | 2x100BaseT + 1xRS-485                                                   |
| B*                                                                                | 2x100BaseT + 1xRS-485 + 4G                                              |
| <b>Display Language</b>                                                           |                                                                         |
| 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 compatible 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

|  |                                                                                        |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Version 20181217                                                                    |                                                                                        |
| Product Code                                                                        | Description                                                                            |
| PMC-SCCP Split-Core Current Probe                                                   |                                                                                        |
| <b>Current (Imax) - Output Voltage</b>                                              |                                                                                        |
| 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) |
| <b>Termination</b>                                                                  |                                                                                        |
| B                                                                                   | BNC Connector                                                                          |
| <b>CAT III</b>                                                                      |                                                                                        |
| A                                                                                   | 300V (Applies to the 50A SCCP)                                                         |
| B                                                                                   | 600V (Applies to the 200A and 500A SCCPs)                                              |
| C                                                                                   | 1000V (Applies to the 5000A SCCP)                                                      |
| <b>Version</b>                                                                      |                                                                                        |
| 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)                                                    |

| <div>  <div>Version 20181217</div> </div> |                                                            |                        |                                                       |                           |                              |          |              |             |                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------|-------------------------------------------------------|---------------------------|------------------------------|----------|--------------|-------------|-------------------------------------------------------------------------------------|
| 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<br>(50A I <sub>max</sub> )                              | 50A                    | AC 10mV/A<br>(Max. 500mV)                             | ±0.3% rdg.<br>±0.02% f.s. | CAT III 300V                 | 15mm     | 3m           | BNC         |  |
| PMC-SCCP-200A-200mV-B-B-B                                                                                                  | 20A/200A<br>(200A I <sub>max</sub> )                       | 260A                   | AC 10mV/A @ 20A<br>AC 1mV/A @ 200A<br>(Max. 200mV)    | ±0.3% rdg.<br>±0.02% f.s. | CAT III 600V                 | 24mm     | 3m           | BNC         |  |
| PMC-SCCP-500A-500mV-B-B-B                                                                                                  | 500A<br>(500A I <sub>max</sub> )                           | 500A                   | AC 1mV/A<br>(Max. 500mV)                              | ±0.5% rdg.<br>±0.02% f.s. | CAT III 600V                 | 50mm     | 3m           | BNC         |  |
| PMC-SCCP-5000A-500mV-B-C-C*<br>(254mm Coil Diameter)                                                                       | 500A/5000A<br>Rogowski Coil<br>(10,000A I <sub>max</sub> ) | 10,000A                | AC 1mV/A @ 500A<br>AC 0.1mV/A @ 5000A<br>(Max. 500mV) | ±2.0% rdg.<br>±1.5mV      | CAT III 1000V<br>CAT IV 600V | 254mm    | 3m           | BNC         |  |
| PMC-SCCP-5000A-500mV-B-C-D*<br>(180mm Coil Diameter)                                                                       | 500A/5000A<br>Rogowski Coil<br>(10,000A I <sub>max</sub> ) | 10,000A                | AC 1mV/A @ 500A<br>AC 0.1mV/A @ 5000A<br>(Max. 500mV) | ±2.0% rdg.<br>±1.5mV      | CAT III 1000V<br>CAT IV 600V | 180mm    | 3m           | BNC         |  |
| PMC-SCCP-5000A-500mV-B-C-E*<br>(100mm Coil Diameter)                                                                       | 500A/5000A<br>Rogowski Coil<br>(10,000A I <sub>max</sub> ) | 10,000A                | AC 1mV/A @ 500A<br>AC 0.1mV/A @ 5000A<br>(Max. 500mV) | ±2.0% rdg.<br>±1.5mV      | CAT III 1000V<br>CAT IV 600V | 100mm    | 3m           | BNC         |  |

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