

# Acuvim 3 Series Power Quality Meter Users Manual





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Please read this manual carefully before installation, operation, and maintenance of the Acuvim 3 series power quality meter.

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The following symbols in this manual appear throughout this documentation and on the Acuvim 3 series meter, in addition to the I/O modules to electrical warn of danger or safety risk during the installation and operation of the meters.



**Electrical Shock Hazard:** Contains information about procedures which must be followed to prevent the risk of electric shock and danger that can result in personal injury or death.



**Safety Warning:** Contains information about circumstances which if not considered may result in personal injury or death.

Installation and maintenance of the Acuvim 3 series meter shall only be performed by qualified, competent professionals who have received training and have experience with high voltage and current devices.

Accuenergy shall not be responsible or liable for any damage caused by improper meter installation and/or operation.



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# **Chapter 1: Introduction**

# 1.1 Acuvim 3 Overview

The Acuvim 3 advanced power quality meter is designed to deliver revenue-grade energy measurement and high-precision power quality analysis to energy managers and operators. In strict compliance with international metering standards, the Acuvim 3 offers robust features to accurately measure, monitor, and report a broad spectrum of electrical data.

### International Metering Standards

- IEC 62053-22 Class 0.1S and ANSI C12.20 Class 0.1 revenue metering, with TOU support
- IEC 61000-4-30 Class A compliant power quality analyzer
- IEC 61000-4-15 compliant flicker meter
- EN 50160
- IEEE 519 harmonics compliant power quality report
- IEEE C37.118 compliant synchrophasor measurement and data transfer
- IEC 60068-2 environmental standard
- IEC/UL 61010-1:2010 and IEC/UL 61010-2-030:2010 safety standards
- IEC 61000-4/-2-3-4-5-6-8-11-12-16-18, CISPR 32, Class B, IEC 62052-11, IEC 61326-1, IEC 61000-6-5 EMC standard

## Features

- Optional 7-inch HMI touchscreen colour LCD remote display unit
- Remote access management and control via webpage
- Advanced communications: Modbus-RTU, Modbus-TCP/IP, BACnet-IP, DNP3 TCP, IEC 61850, & SNMP
- Time synchronization with IRIG-B, NTP, SNTP and PTP
- Flexible data logging and data posting: Up to 15 dataloggers with user-selectable logging interval and parameters

# 1.1.1 Revenue Grade Energy Measurement

Acuvim 3 provides revenue-grade energy and power measurement with the following specifications:



- Active energy: IEC 62053-22 Class 0.1S and ANSI C12.20 Class 0.1
- Reactive energy: exceeds the requirement of IEC 62053-24 Class 0.5S
- Active power: IEC 61557-12 Class 0.1

Acuvim 3 measurements for:

- Active energy, reactive energy, and apparent energy
- Bidirectional energy, covering import/export/net/total
- Four quadrant energy
- Energy measurements for each phase and the overall system

TOU (Time of Use) metering with the following features:

- Accommodates up to 8 tariff rates
- Allows rate structure assignment at 30-minute intervals
- Record TOU net active energy, net reactive energy, apparent energy, and their maximum values for the configured billing period
- Retains records for the current billing period and the preceding 12 billing periods

## **1.1.2 Power Quality Analysis**

Compliant with IEC 61000-4-30/IEC 61000-4-15 Class-A standards for metering, offering high precision in the following measurements:

- Voltage/Current RMS measurement updated at 1/2 cycle, achieving IEC 61557-12 Class 0.1 accuracy
- Frequency measurement, with 1mHz accuracy
- Flicker measurement updated at 10-minutes and 2-hour
- Voltage/Current Harmonics up to the 127th order

Power quality event monitor for the following events:

- Voltage sag/swell/interruption
- Current sag/swell
- Voltage/current unbalance
- Transient voltage



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Acuvim 3 can log power quality events for the duration and extremum values. Based on the Acuvim 3 user configuration, it can send event notification emails with power quality event log and captured waveform with Fastlog.

Based on user configuration, the Acuvim 3 can capture:

- Up to 360 cycles, including pre-trigger and post-trigger
- Waveform for voltages and currents at up to 512 sample/cycle
- Fastlog, voltage/current RMS updated at half cycle

Waveform and Fastlog are generated as COMTRADE and CSV files, respectively, allowing users to download the files and/or post to remote servers.

Based on IEC 61000-4-30 power quality compliant measurements and logging, the Acuvim 3 meter generates reports, including:

- EN50160 compliant report
- IEEE519 compliant report
- ITIC/CBEMA curve
- SEMI curve

## 1.1.3 Synchrophasor

Acuvim 3 meter provides IEEE C37.118 compliant synchrophasor functions:

- Measurements compliant with IEEE C37.118.1 standard, including
  - Synchronized phasor
    - Acuvim 3 uses IRIG-B to synchronize its time in millisecond level precision
    - Magnitude and angle measurement for both voltage and current (individual channel and polyphase positive sequence convention)
  - Frequency
  - Rate of change of frequency
  - Configurable reporting rate
    - 50Hz: 10, 25, 50 frames/seconds
    - 60Hz: 10, 12, 15, 20, 30, 60 frames/seconds
- Communication protocol compliant with IEEE C37.118.2



- Producer (server) of synchrophasor data
- TCP/IP based with broadcast/multicast support
- Allow both spontaneous and commanded data frames

## **1.2 Areas of Application**

- Power Quality
- Energy Storage Systems
- Auxiliary Frequency Response Services and Incentives
- DER Microgrids and Virtual Power Plants
- Power Distribution Units and Data Center Infrastructures
- SCADA
- Critical Infrastructure
- UPS Systems
- Industrial Automation
- Manufacturing Facilities
- Transportation Monitoring
- Power Distribution Substations
- Healthcare Facilities EPSS Testing Systems
- Telecommunications
- University and Clinical Laboratories

# 1.3 Accuracy

| Metering     |          |                 |                                |                     |
|--------------|----------|-----------------|--------------------------------|---------------------|
| Parameters   | Accuracy | Resolution      | Range                          | Update Rate         |
| Voltage 0.1% | 0.0011/  | VLN:10V~400V    | 1/2 Cycle                      |                     |
|              | 0.001V   | VLL:17.3V~690V  | 200ms (10/12 Cycle)            |                     |
| Current 0.1% | 0.104    | 0.0014          | 1A:10mA~2A                     |                     |
|              |          |                 | 5A:50mA~10A                    | 1/2 Cycle           |
|              | 0.001A   | 333mV:3mV~400mV | ½ Cycle<br>200ms (10/12 Cycle) |                     |
|              |          |                 | Rogowski Coil:3mV~400mV        |                     |
| Power        | 0.404    | 1).4/           | -999999.999MW                  | 1/2 Cycle           |
|              | 0.1%     | I VV            | ~999999.999MW                  | 200ms (10/12 Cycle) |



| Metering                 |          |            |                                    |  |
|--------------------------|----------|------------|------------------------------------|--|
| Parameters               | Accuracy | Resolution | Range                              | Update Rate  |
| Reactive Power           | 0.1%     | 1var       | -999999.999Mvar<br>~999999.999Mvar | ½ Cycle<br>200ms (10/12 Cycle)                           |
| Apparent<br>Power        | 0.1%     | 1VA        | 0~999999.999MVA                    | <sup>1</sup> ⁄ <sub>2</sub> Cycle<br>200ms (10/12 Cycle) |
| Power Demand             | 0.1%     | 1W         | -999999.999MW<br>~999999.999MW     | ½ Cycle<br>200ms (10/12 Cycle)                           |
| Reactive Power<br>Demand | 0.1%     | 1var       | -999999.999Mvar<br>~999999.999Mvar | 1/2 Cycle<br>200ms (10/12 Cycle)                         |
| Apparent<br>Power Demand | 0.1%     | 1VA        | 0~999999.999MVA                    | ½ Cycle<br>200ms (10/12 Cycle)                           |
| Power Factor             | 0.1%     | 0.001      | -1.000~1.000                       |  |
| Frequency                |          | 1mHz       | 40.000Hz~70.000Hz                  | ½ Cycle<br>200ms (10/12 Cycle)<br>10s                    |
| Energy                   | 0.1%     | 0.001Wh    | 0~999999.999MWh                    | <sup>1</sup> / <sub>2</sub> Cycle<br>200ms (10/12 Cycle) |
| Reactive<br>Energy       | 0.1%     | 0.001varh  | 0~999999.999 Mvarh                 | ½ Cycle<br>200ms (10/12 Cycle)                           |
| Apparent<br>Energy       | 0.1%     | 0.001VAh   | 0~999999.999 MVAh                  | 1/2 Cycle<br>200ms (10/12 Cycle)                         |
| Harmonics                | 0.15%    | 0.001%     |                                    | 200ms (10/12 Cycle)                                      |
| Phase Angle              |          | 0.001°     | 0.000°~359.999°                    | ½ Cycle<br>200ms (10/12 Cycle)                           |
| Unbalance<br>Factor      | 0.15%    | 0.001%     | 0.000%~100.000%                    | 200ms (10/12 Cycle)                                      |
| Device Run<br>Time       |          | 1 minute   |                                    |  |
| Flicker                  | 5%       |            |                                    | Short term (10 mins)<br>Long term (2 hours)              |



# **Chapter 2: Hardware Installation**

#### **Considerations When Installing Acuvim 3**



## ELECTRIC SHOCK HAZARD



## SAFETY WARNING

- Installation of the Acuvim3 must be performed by qualified personnel who follow standard safety precautions through the installation procedures. Those personnel must have appropriate training and experience with high-voltage electrical devices. Appropriate safety gloves, safety glasses and protective clothing are strongly recommended.
- During normal operation, dangerous voltage levels may flow through many parts of the Acuvim 3, including terminals, and any connected current transformers (CTs) and potential transformers (PTs), all inputs and outputs(I/O) modules and their circuits. All primary and secondary circuits can, at times, produce lethal voltage and current levels. **AVOID** contact with any current-carrying surfaces.
- The Acuvim 3 and its I/O output channels are NOT designed as primary protection devices and shall NOT be used as primary circuit protection or in an energy limiting capacity. The Acuvim 3 and its I/O output channels can only be used as secondary protection. AVOID using the Acuvim3 under situations where failure of the Acuvim 3 may cause injury or death. AVOID using the Acuvim 3 for any application where the risk of fire may occur.
- All Acuvim 3's terminals shall be inaccessible after installation.
- Do **NOT** perform dielectric (HIPOT) test to any inputs, outputs, or communication terminals. High voltage testing may damage the electronic components of the Acuvim 3.
- Applying more than the maximum voltage the Acuvim 3 and/or its modules can withstand will permanently damage the Acuvim 3 and/or its modules. Please refer to the specifications for all devices before applying voltages.
- When removing Acuvim 3 for service, use shorting blocks and fuses for voltage leads and power supply to prevent hazardous voltage conditions or damage to CTs. CT grounding is optional.
- Accuenergy recommends using a dry cloth to wipe the Acuvim 3.

**NOTE:** IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.



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**NOTE:** THERE IS NO REQUIRED PREVENTIVE MAINTENANCE OR INSPECTION NECESSARY FOR SAFETY. HOWEVER, ANY REPAIR OR MAINTENANCE SHOULD BE PERFORMED BY THE FACTORY.

DISCONNECT DEVICE: The following part is considered the equipment disconnect device. A SWITCH OR CIRCUIT-BREAKER SHALL BE INCLUDED IN THE INSTALLATION.

THE SWITCH SHALL BE IN CLOSE PROXIMITY TO THE EQUIPMENT AND WITHIN EASY REACH OF THE OPERATOR. THE SWITCH SHALL BE MARKED AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT.

## 2.1 Appearance and Dimensions



Figure 2-1a Acuvim 3 Panel Mount Appearance and Dimensions







# 2.2 Installation Methods

The Acuvim 3 should be installed in a dry and dust-free environment. Avoid exposing the Acuvim 3 to excessive heat, radiation, and high electrical noise sources.

#### Environmental

Before installation, check the environment, temperature, and humidity to ensure the Acuvim 3 is placed in a location where optimum performance will occur.

#### Temperature

Operation: -25°C to 70°C. (-13°F to 158°F) Storage: -40°C to 85°C. (-40°F to 185°F)

#### Humidity

5% to 95% non-condensing.

The Acuvim 3 is designed to be installed onto a DIN rail or into a panel mount.



## 2.2.1 DIN Rail Installation

The Acuvim 3 can be mounted on a standard 35 mm (1.38 inches) DIN rail. The following instructions below show how to install the meter onto a DIN rail.

1. Hold the clip ① in the orientation as shown in the image below. Carefully slide the clip onto the Acuvim 3 until it is attached. If the clip is already inserted on the Acuvim 3, skip this step.



Figure 2-2a Acuvim 3 DIN Rail Clip Attachment

- 2. When the clip is attached to the Acuvim 3, partially pull down the clip ① to allow space for the DIN rail bracket to be inserted.
- 3. Tilt the Acuvim 3 upright slightly and hang it on the top edge of the DIN rail mounting bracket (2).
- 4. Gently angle the bottom portion of the Acuvim 3 down towards the DIN rail bottom bracket ③. Fully insert it into the DIN rail groove.



Figure 2-2b Acuvim 3 DIN Rail Mount Installation



5. Press the clip 4 to lock the Acuvim 3 in place.



Figure 2-2c Acuvim 3 Lock Clip

6. Examine the Acuvim 3 and make sure it is securely fastened onto the DIN rail mount.

## 2.2.2 Panel Installation

The Acuvim 3 can be installed into a standard ANSI C39.1 (4-inch round) or an IEC 92mm DIN (square) form used in a panel mount installation.

The mounting windows on the panel should meet the dimensions below.



Figure 2-3a Acuvim 3 Panel Cutout



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Follow the steps below to install the Acuvim 3 to a panel mount.

1. The clip ① first needs to be removed from the Acuvim 3. To release the clip, use a flat-head screwdriver to lift the blockers away from the clip. Then pull the clip all the way down to remove it. If the clip is not attached to the Acuvim 3, skip this step.



Figure 2-3b Acuvim 3 Lift Blockers

2. Attach the butterfly clips (2) on both the left and right sides of the Acuvim 3, as shown below.



Figure 2-3c Acuvim 3 Butterfly Clips



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- 3. Place the panel between the Acuvim 3 and display screen ③, as shown in the diagram below. Position the Acuvim 3 securely through the panel window cutout. Align the display screen, panel cutout and, Acuvim 3 to attach together.
- 4. Engage the clips found at the top of the screen ④, then push the screen towards the Acuvim 3 until they are all securely locked in place.
- 5. Mount the Acuvim 3 head, screen, and mounting plate together using two M3 x 13 screws (5).
- 6. Push the side butterfly clips (6) towards the panel until they are firmly fastened in place. Check to ensure the Acuvim 3 is firmly affixed to the panel.



Figure 2-3d Acuvim 3 Panel Installation

# 2.3 Wiring



2.3.1 Terminals

Figure 2-4 Acuvim 3 Terminals



### 2.3.2 Safety Earth Connection



Before setting up the Acuvim 3's wiring, please make sure that the switch gear has an earth-ground terminal. Connect both the Acuvim 3's and the switch gear's ground terminal together. The following ground terminal symbol 🕒 is used in this user's manual.

#### 2.3.3 Power Requirement

There are two options for the Control Power of the Acuvim 3:

- P1: 100-415Vac, 100-300Vdc
- P2: 20-60Vdc

The two options must be chosen according to the application. Please see the ordering information in the appendix for further details.

The Acuvim 3 typically has a low power consumption requirement and can be supplied by an independent source or by the measured load line. A regulator or an uninterrupted power supply (UPS) should be used under high power fluctuation conditions. Terminals for the control power supply are (L, N, and P.E.). A switch or circuit-breaker shall be included in the building installation. It shall be in close proximity to the equipment, within immediate reach of the operator, and shall be marked as the disconnecting device for the equipment.



Figure 2-5 Acuvim 3 Power Supply



A fuse (typical 1A/250Vac) should be used in the auxiliary power supply loop. P.E. terminal must be connected to the switchgear ground terminal. An isolated transformer or EMC filter should be used in the control power supply loop if there is a power quality problem in the power supply.



Figure 2-6 Acuvim 3 Power Supply with EMC Filter

## 2.3.4 Voltage Input Wiring

#### Voltage Input Terminal

The voltage input terminal strip consists of four input terminals: V1, V2, V3, and VN.



Figure 2-7 Acuvim 3 Voltage Input Terminals

Maximum input voltage for the Acuvim 3 shall not exceed 400LN/690LL VAC RMS for three phase or 400LN VAC RMS for single-phase. Potential transformer (PT) must be used for high-voltage systems. Typical secondary output for PTs shall be 100V or 120V. Please make sure to select an



## Acuvim 3 Series Power Meter

appropriate PT to maintain the measurement accuracy of the Acuvim 3. When connecting using the star configuration wiring method, the PT's primary side rated voltage should be equal to or close to the phase voltage of the system to utilize the full range of the PT. When connecting using the delta configuration wiring method, the PT's primary side rated voltage should be equal to or close to the line voltage of the system. A fuse (typical 1A/250Vac) should be used in the voltage input loop. The wire for voltage input is AWG12~28.



**NOTE**: In no circumstance shall the PT secondary be shorted. The secondary of a PT must be grounded at one end. Please refer to the wiring diagram section for further details.

#### **Voltage Input Wiring Methods**

#### 3 Element 4 Wire Wye Mode (3LN)

Three-element four-wire Wye mode is commonly used in low-voltage electric distribution systems. For voltages lower than 400LN/690LL, the voltage lines can be connected directly to the Acuvim 3's voltage input terminal as shown in the following figure.



3 Element 4 Wire Y (3LN-Direct)

Figure 2-8a 3 Element 4 Wire Wye Direct Voltage Wiring Method

For high voltage systems (over 400LN/690LL), PTs (Potential Transformers) are required as shown in the following figure.





3 Element 4 Wire Y (3LN-PT Applied)

Figure 2-8b 3 Element 4 Wire Wye Voltage Wiring Method

#### 2 Element 3 Wire Delta Mode (3LL)

Two-element three-wire Delta mode is commonly used in low voltage electric distribution systems. For voltages lower than 400LN/690LL, the voltage lines can be connected directly to the Acuvim 3's voltage input terminal, as shown in the following figure.



2 Element 3 Wire Delta (3LL-Direct)

#### Figure 2-9a 2 Element 3 Wire Delta Direct Voltage Wiring Method

For high-voltage systems (over 400LN/690LL), potential transformers are required, as shown in the following figure.





2 Element 3 Wire Delta (3LL-PT Applied)



#### 2 Element 3 Wire 1 Phase Mode (1LL)

The two-element three-wire one-phase mode is a standard configuration commonly used in residential and light commercial applications. In this setup, two 120 VAC lines are provided. These two lines are out of phase by 180 degrees concerning each other when measured to the neutral wire.



2 Element 3 Wire 1 Phase

Figure 2-10 2 Element 3 Wire 1 Phase Voltage Wiring Method



#### 1 Element 2 Wire Mode (1LN)

The one-element two-wire mode is specifically designed for single-phase measurement. In this mode, only one voltage input channel is required for the connection, and other channels have not been grounded.





For high voltage systems that are over 400LN/690LL, PTs (potential transformers) are required, as shown in the following diagram.



Figure 2-11b 1 Element 2 Wire Voltage Wiring Method

#### Vn Connection

Vn is the reference point of the Acuvim 3 voltage input. Low wire resistance helps improve the measurement accuracy. Different system wiring modes require different Vn connection methods. Please refer to the wiring diagram section for more details.





## 2.3.5 Current Input Wiring

#### **Current Input Terminal**

Current transformers (CTs) are required in most electrical engineering applications. Typical rating for the secondary current of the CT shall be 5A (standard) or 1A (Optional). Please refer to the ordering information from the appendix for further details. CTs must be used if the system-rated current is over 5A. The accuracy of the CT should be better than 0.5% with a recommended rating over 3VA to preserve the Acuvim 3's accuracy. The wire between the CTs and Acuvim 3 should be the shortest possible length for better accuracy. The wire size of current input is AWG12~22.



Figure 2-12 Current Input Terminal

The Acuvim 3 has a current input terminal with eight current input channels available to include four current transformers.

- Terminal (I1+) and (I1-) are for a phase A current transformer, where the CT positive lead is terminated to I1+, and the negative lead is terminated to I1-.
- Terminal (I2+) and (I2-) are for a phase B current transformer, where the CT positive lead is terminated to I2+, and the negative lead is terminated to I2-.
- Terminal (I3+) and (I3-) are for a phase C current transformer, where the CT positive lead is terminated to I3+, and the negative lead is terminated to I3-.
- Terminal (I4+) and (I4-) are for the neutral current transformer, where the CT positive lead is terminated to I4+, and the negative lead is terminated to I4-.



**NOTE**: The secondary side of the CT should not be open circuit in any circumstance when the power is on. There should not be any fuse or switch as part of the CT loop. One end of the CT loop must be connected to the ground.



#### **Current Input Wiring Methods**





2 Elements 3 Wire Delta - 3CT

Figure 2-13 2 Element 3 Wire Delta 3CT Current Wiring Method

2CT



Figure 2-14 2 Element 3 Wire Delta 2CT Current Wiring Method







Figure 2-15 1 Element 2 Wire Current Wiring Method

#### **I4** Connection

If In is calculated, then I4+ and I4- should be connected to the ground.

If In is measured, then I4+ and I4- should be connected to I4CT.

## 2.3.6 Common Wiring Methods

The Acuvim 3 supports various wiring methods to accommodate different electrical configurations. These include:

- 1 Element 2 Wire
- 2 Element 3 Wire 1 Phase
- 2 Element 3 Wire Delta 3CT
- 2 Element 3 Wire Delta 2CT
- 3 Element 4 Wire Wye



#### 1 Element 2 Wire



Figure 2-16 1 Element 2 Wire Wiring Method

#### 2 Element 3 Wire 1 Phase



Figure 2-17 2 Element 3 Wire 1 Phase Wiring Method



#### 2 Element 3 Wire Delta - 3CT



2 Elements 3 Wire Delta - 3CT Figure 2-18 2 Element 3 Wire Delta 3 CT Wiring Method

#### 2 Element 3 Wire Delta - 2CT



Figure 2-19 2 Element 3 Wire Delta 2 CT Wiring Method



#### 3 Element 4 Wire Wye

Three-phase four-wire wye mode is commonly used in low-voltage electric distribution systems. For voltages lower than 400LN/690LL, the voltage lines can be connected directly to the Acuvim 3's voltage input terminal, as shown in the following figure.



Figure 2-20 3 Element 4 Wire Wye Wiring Method

# 2.4 Communications Interface

The Acuvim 3 includes multiple communication interface options to cater to various connectivity applications. These include a single RS485 port, a USB port, dual RJ45 Ethernet ports, and Wi-Fi wireless connectivity. For a comprehensive guide on configuring and utilizing these communication features, please consult the Communications chapter in the Acuvim 3 's manual.

## 2.4.1 Serial RS485 Communications

The Acuvim 3 supports RS485 serial communication using the Modbus RTU protocol. The RS485 terminals are labeled A, B, and S.

- A is the positive differential signal
- **B** is the negative differential signal
- S is connected to the shield of the twisted pair cables





Figure 2-21 Acuvim 3 RS-485 Port

#### **RS485 Wiring and Configuration**

The next picture shows the wiring of the RS485 device to the Acuvim 3's communication port terminals. There can be a maximum of 32 devices that can be connected on an RS485 bus.

For the wiring, use a good quality shielded twisted pair cable that is AWG22 (0.5mm<sup>2</sup>) or higher. The overall length of the RS485 cable connecting all devices should not exceed 1200m (4000ft) for optimal performance.



Figure 2-22 RS485 Connection to Acuvim 3

The Acuvim 3 operates as the slave device for master devices such as a PC, PLC, data collector, or RTU. If the master does not have an RS485 communication port, a converter (such as an RS232/RS485 or a USB/RS485 converter) will be required. Typical RS485 network topology includes line, circle, and star (Wye). The shield of each segment of the RS485 cable must be connected to the ground at one end only.

Every A(+) should be connected to A(+), and B(-) to B(-). **S must be grounded**, otherwise it will affect the network or may damage the communication interface.



The connection should avoid a "T" type topology, meaning there is a new branch, and it does not begin at the beginning point.

Keep communication cables away from sources of electrical noise whenever possible.

When using long communication cables to connect several devices, an anti-reflecting resistor (typical value  $120\Omega$ - $300\Omega$ /0.25W) is normally added at the end of the cable next to the last Acuvim 3 if the communication quality is experiencing distortion.

Use RS232-to-RS485 or a USB-to-RS485 converter with an optical isolated output and surge protection.

## 2.4.2 USB Communications

The Acuvim 3 is equipped with a USB Type-C port designed for additional RS485 communication with other devices. To establish an RS485 communication connection with another device using the USB port involves a two-step conversion process:

- 1. USB-to-RS485 Converter with Acuvim 3: Connect the USB Type-C end of the converter into the Acuvim 3 USB port. The converter needs to be specifically designed to translate the USB Type-C signal to an RS485 signal.
- 2. RS485-to-USB Converter with Connected Device: To enable communication with another device use an RS485-to-USB converter. This converter will translate the RS485 signal back to a USB format that can be recognized by the receiving device such as a PC or control system.



Figure 2-23 Acuvim 3 Type C USB Port



## 2.4.3 Ethernet Communications

The Acuvim 3 uses two standard RJ45 connectors to access an Ethernet network. The mechanical and electrical characteristics of the connector are consistent with the requirements of IEC 603-7.



Top View

Figure 2-24 RJ45 Connector

#### Table 2-1 RJ45 Connector Pins

| Pin number | Name | Description      |
|------------|------|------------------|
| 1          | TX+  | Transceive Data+ |
| 2          | TX-  | Transceive Data- |
| 3          | RX+  | Receive Data+    |
| 4          | n/c  | Not connected    |
| 5          | n/c  | Not connected    |
| 6          | RX-  | Receive Data-    |
| 7          | n/c  | Not connected    |
| 8          | n/c  | Not connected    |

**LED\_L (Yellow):** Displays the speed status. When the LED is on, it indicates a transmission speed of 100Mpbs. When the LED is off, it represents a speed of 10Mbps.

**LED\_R (Green):** Displays the link and activity status. When the green LED is illuminated, it indicates the Ethernet port is establishing a connection. When the LED is blinking, it indicates there is data transmission activity.




Figure 2-25 Acuvim 3 Ethernet Port

# 2.4.4 Wi-Fi Communications

The Acuvim 3 offers the capability to connect wirelessly through a Wi-Fi network. For optimal performance, it is recommended to improve the optimal Wi-Fi signal strength by adding an external antenna. This ensures a more stable and reliable wireless connection, particularly in environments where the internal Wi-Fi signal may be insufficient.



Figure 2-26 Acuvim 3 External Antenna Port

By default, the Acuvim 3 will be in Access Point (AP) mode with an IP address 192.168.100.1. Check to ensure the device is in the same subnet as the Acuvim 3. The Acuvim 3 SSID will appear as Acuvim-3-WIFI-(serial number of the module) as the name of the wireless network.

# Wireless Connection and Access to Acuvim 3 Webpage Interface

- 1. Select Acuvim-3-WIFI-(serial number of Acuvim 3 meter)
- 2. Connect to the network by entering the default network security key as "accuenergy".



- 3. Once connected to the network, open an internet browser and type in the Acuvim 3 IP address 192.168.100.1 in the search bar
- 4. Enter the username 'admin' for administrative level access, and the default password 'admin'.

# 2.5 On-board Input/Output Ports

The Acuvim 3 is equipped with integrated on-board I/O capabilities, including four isolated digital inputs (DIs), and one digital output (DO).

# 2.5.1 Digital Input

The four isolated digital inputs (DIs) can be used for status indication or pulse counting. For more detailed information, please refer to Chapter 4 in the user manual.



Figure 2-27 Acuvim 3 Onboard DI Port

# 2.5.2 Digital Output

A single digital output (DO) can be used for output energy pulse and alarm signals. For more detailed information, please refer to Chapter 4 in the user manual.





Figure 2-28 Acuvim 3 Onboard DO Port



# **Chapter 3: Extended Modules**

# 3.1 Input/Output Modules

The Acuvim 3 includes with built-in input and output (I/O) terminal connectors. Additional extended modules can be directly connected to the Acuvim 3 for more I/O functionalities. These functions can encompass digital input status, pulse counting, relay outputs, analog outputs, or analog input options. These I/O functions are applicable for various metering applications, including pulse signal processing for water, air, gas, electricity, and steam (W.A.G.E.S.), as well as 4-20mA analog signal communication with PLC controllers.

Acuvim 3 supports three types of extended I/O modules: AXM-IO1, AXM-IO2, and AXM-IO3.

A maximum of three external modules can be attached to the Acuvim 3. When two I/O modules of the same type are connected to the Acuvim 3 simultaneously, they must have unique logic numbers. For example, if two AXM-IO2 modules are used, the logic numbers should be 1 and 2, respectively.



# 3.1.1 Appearance and Dimensions

Figure 3-1 I/O Module Dimensions

| Table | 3-1 | I/O | Module | Description |
|-------|-----|-----|--------|-------------|
|-------|-----|-----|--------|-------------|

| Number | Description      |
|--------|------------------|
| 1      | Enclosure        |
| 2      | Wiring Terminals |
| 3      | Linking Pins     |



| Number | Description         |
|--------|---------------------|
| 4      | Linking Socket      |
| 5      | Installation Screw  |
| 6      | Counterpart of Clip |
| 7      | Installation Clip   |

# 3.1.2 I/O Functionality

### AXM-IO1 module ports:

#### 6 Digital Inputs (DI)

- Each digital input can be used in pulse counter or digital status mode.
  - Digital status mode enables the DI to detect remote signals. The Acuvim 3 will log the time/ date of each detected event and store it in the SOE (sequence of events) log.
  - Pulse counter mode enables the DI to count digital pulses.
- Terminals **DI1** to **DIC** are the digital input ports, where DIC is the common terminal for DI1 to DI6 circuits.

### 2 Relay Outputs (RO)

- The relay outputs can be used in two different modes, control mode or alarm mode, where both relay channels will operate in the same mode.
  - Control mode enables users to configure the relay to work in either latch mode (ON/OFF remains in current state until explicit instructions to change states) or momentary mode (ON/OFF for a certain time interval).
  - Alarm mode will turn the relay ON/OFF based on a status configured on the alarm in the Acuvim 3.
- Terminals **RO1** to **ROC** are the relay output ports, where ROC is the common terminal for RO1 and RO2 circuits.

### 24Vdc Power Supply

- Used as an auxiliary power supply for the digital input pulse circuits.
- The voltage of the DI auxiliary power supply is 24V(1W).
- Terminals V+ and V- are the terminals for the 24Vdc power supply.



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Figure 3-2 AXM-IO1 Module

### AXM-IO2 module ports:

### 4 Digital Inputs (DI)

- Each digital input can be used in pulse counter or digital status mode.
  - Digital status mode enables the DI to detect remote signals. The Acuvim 3 will log the time/ date of each detected event and store it in the SOE (sequence of events) log.
  - Pulse counter mode enables the DI to count digital pulses.
- Terminals **DI1** to **DIC** are the digital input ports, where DIC is the common terminal for DI1 to DI4 circuits.

# 2 Analog Outputs (AO)

- Depending on the AXM-IO2 output signal type, it can output either an analog voltage or analog current based on parameters measured by the Acuvim 3. The AXM-IO2 module has 4 AO types, 4 to 20mA, 0 to 20mA, 1 to 5V, and 0 to 5V.
- Terminals AO1+ to AO2- are analog output ports.

**NOTE:** Each AXM-IO2 module can only output one type of analog signal upon purchase. The AO types for AXM-IO2 can be configured on Acuvim3's webpage, please check Table 4-20 in Chapter 4 for more details.

# 2 Digital Outputs (DO)

- When the digital output is set as either alarm mode or energy pulse output mode, both DO channels will operate in the same mode.
  - Energy pulse mode will send digital pulses based on various types of energy (consumed/ generated or real/reactive) reading measured by the Acuvim 3.
  - Alarm mode will output a digital pulse when an alarm is triggered.



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 Terminals DO1 to DOC are the digital output ports, where DOC is the common terminals for DO1 and DO2.



Figure 3-3 AXM-IO2 Module

### AXM-IO3 module ports:

### 4 Digital Inputs (DI)

- Each digital input can be used in pulse counter or digital status mode.
  - Digital status mode enables the DI to detect remote signals. The Acuvim 3 will log the time/ date of each detected event and store it in the SOE (sequence of events) log.
  - Pulse counter mode enables the DI to count digital pulses.
- Terminals **DI1** to **DIC** are the digital input ports, where DIC is the common terminal for DI1 to DI4 circuits.

# 2 Relay Outputs (RO)

- The relay outputs can be used in two different modes, control mode or alarm mode, where both relay channels will operate in the same mode.
  - Control mode allows users to configure the relay to work in either latch mode (ON/OFF remains in current state until explicit instructions to change states) or momentary mode (ON/OFF for a certain time interval).
  - Alarm mode will turn the relay ON/OFF based on the status configured on the alarm in the Acuvim 3.
- Terminals **RO1** to **ROC** are the relay output ports, where ROC is the common terminal for RO1 and RO2 circuits.

# 2 Analog Inputs (AI)

- Can detect input analog voltage or analog current.
  - When it detects input analog voltage, the range of voltage is from 0 to 5V or from 1 to 5V.
  - When it detects input analog current, the range of current is from 0 to 20mA or from 4 to 20mA.



• Terminals Al1+ to Al2- are analog input terminals.

**NOTE:** Each AXM-IO3 module can only read input from one type of analog signal. The AI types for AXM-IO2 can be configured on Acuvim3's webpage, please check Table 4-19 in Chapter 4 for more details.



Figure 3-4 AXM-IO3 Module

#### Table 3-2 I/O Module Functionality Table

| Function                    | AXM-IO1 | AXM-IO2 | AXM-IO3 |
|-----------------------------|---------|---------|---------|
| Detection of Remote Signals | •       | •       | •       |
| SOE Recording               | •       | •       | •       |
| Pulse Counting              | •       | •       | •       |
| Relay Control               | •       |         | •       |
| Relay Control by Alarm      | •       |         | •       |
| Digital Output by Alarm     |         | •       |         |
| Digital Pulse Output        |         | •       |         |
| Analog Output               |         | •       |         |
| Analog Input                |         |         | •       |
| 24Vdc Power Supply          | •       |         |         |

# 3.1.3 Installation Method

### Environment

Please verify that the installation environment meets the following requirements:

### Temperature

Operation: -25°C to 70°C (-13°F to 158°F)

Storage: -40°C to 85°C (-40°F to 176°F)

### Humidity

5% to 95% non-condensing.



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### Location

The Acuvim 3 and I/O modules should be installed in a dry and dust-free environment, and they should be kept away from heat, radiation, and high levels of electrical noise or interference.

#### Installation Method

1. Remove the **Ext. Port** cover from the back of the Acuvim 3 and any I/O module so that the pin socket connectors ① are visible.





Figure 3-5 External Port Cover

- 2. Insert the counterpart clips (2) of the module into the Acuvim 3 and then press the module down gently to establish the link.
- 3. Tighten the installation screws (3).
- 4. Install other modules following the steps above.

**NOTE:** Install each module carefully to avoid damage. Under no circumstances should any installation be done with the Acuvim 3 powered on. Operating the Acuvim 3 with power may cause permanent damage to the device.

NOTE: The maximum number of modules that can be attached to the Acuvim 3 is three.





Figure 3-6 Installation of I/O Module to Acuvim 3 Meter

# 3.1.4 I/O Module Wiring

### 3.1.4.1 Digital Input Wiring

# Wiring of Digital Input Circuit

There are six DI channels available for the AXM-IO1 and four DI channels for the AXM-IO2 and AXM-IO3 modules. The digital input circuits within each module are the same for both pulse counter and digital status modes. The digital input circuitry can be described from the wiring schematic diagram below. When switch K is open, then output OUT is in the high state. When switch K is closed, then output OUT is in the low state.







### **Digital Input Ratings**

- External Power Supply Rating: 24-160Vac/Vdc
- Maximum Loop Current: 2mA
- Max Pulse Frequency: 100Hz, 50% Duty Cycle (5ms ON and 5ms OFF)

#### **Typical Digital Input Wiring**



Figure 3-8 Digital Input Pulse Counter Wiring Using 24Vdc on AXM-IO1 Module



Figure 3-9 Multiple Channel Digital Input Wiring Using 24Vdc on AXM-IO1 Module







#### Figure 3-10 Digital Input Wiring Using AXM-IO2 and AXM-IO3 Modules

**NOTE:** The wire gauge to use with the DI should be chosen between AWG22 and 16.

### 3.1.4.2 Relay Output Wiring

There are two relay output channels in the AXM-IO1 and AXM-IO3 modules. The RO circuits can work in either control mode or alarm mode. The following diagram shows the schematic diagram of the relay output circuit, which is the same regardless of the operating mode.

The relay type is a mechanical form A contact with 3A/250Vac or 3A/30Vdc. When using the relay output, it is recommended that an intermediate relay is used to control the output device.

# **Relay Output Ratings**

- Switching Voltage (Max): 250Vac, 30Vdc
- Load Current: 5A (R), 2A (L)
- Set Time: 10ms (Max)
- Contact Resistance: 30mΩ (Max)
- Isolation Voltage: 2500Vac
- Mechanical Life: 1.5e7



# **Typical Relay Output Wiring**



Figure 3-11 Relay Output Diagram

**NOTE:** The wire gauge to be used with the relay output should be chosen between AWG22 and 16.

# 3.1.4.3 Digital Output Wiring

There are two digital output channels on the AXM-IO2 module. The DO circuit can operate in either alarm mode or in energy pulse output mode.

The DO circuit is of Photo-MOS form. The simplified circuit is shown in Fig 3-12.

# **Digital Output Ratings**

- Voltage Range: 0-250Vac/dc
- Load Current: 100mA (Max)
- Isolation Voltage: 2500Vac
- Output Frequency: 40Hz, (20ms ON, 5ms OFF)
- Minimum Pulse Width: 20ms
- Minimum Pulse Interval: 5ms

# Wiring of Digital Output Circuit

When the internal signal J is in a low state and output OUT is also in a low state, this results in no pulse output. When J is in a high state and output OUT is in the high state, this results in a pulse output.





Figure 3-12 Digital Output Circuit

**NOTE:** The digital output is a dry contact and requires a voltage supply to generate the pulse signal.

The circuit for the alarm mode with a buzzer is shown in Figure 3-13.



Figure 3-13 Digital Output as Alarm Mode





Figure 3-14 Digital Output to Pulse Counter

NOTE: The power supply can be 0-250Vac/dc.

**NOTE:** The wire gauge to use for the DO should be chosen between AWG22 and 16.

# 3.1.4.4 Analog Output Wiring

There are two analog output channels on the AXM-IO2 module. The AO circuit can convert metering parameters into an AO signal as either a voltage or current signal. An AXM-IO2 module supports either voltage or current. The AO circuit within this module can provide either a 0-20mA or 4-20mA current output if the module supports current, or a 0-5V and 1-5V voltage output if the module supports voltage.

# Wiring of Analog Output Circuit







# Acuvim 3 Series Power Meter

### **Analog Output Ratings**

- For the current output (0-20mA/4-20mA): The max load resistance is 5000hms.
- For the voltage output(0-5V/1-5V): The max load current is 20mA.
- Accuracy: 0.5%
- Temperature Drift: 50ppm/°C Typical
- Isolation Voltage: 500Vdc
- Open Circuit Voltage: 15V



# Chapter 4: Site Map and Metering

# 4.1 Site Map

Acuvim 3 features a built-in web server to serve as the primary user interface for viewing power quality analysis and real-time metering data, and managing Acuvim 3's configurations.

To access the webpage interface, enter the module's IP address in the internet browser search bar. The browser will redirect the user to a login webpage to connect to the Acuvim 3 built-in web server. Refer to Table 4-1 for the default login credentials.

| AC              | CUENERGY            |
|-----------------|---------------------|
|                 | Sign in to continue |
| User Name       |                     |
| Enter User Name | 2                   |
| Password        |                     |
| Enter Password  |                     |
|                 | Sign In             |
|                 | SSL Certificate 🛓   |

Figure 4-1 Sign In Webpage

| Default Login                    | Username | Password |
|----------------------------------|----------|----------|
| For configuration/<br>management | admin    | admin    |
| For view                         | view     | view     |

#### Table 4-1 Default Webpage Login Username and Password

Users logging in will load the Acuvim 3 'Realtime' webpage by default.



| Ltd Metering - A Power Quality and Alarm - D Logs - |         |         |         |         |        |
|---|---------|---------|---------|---------|--------|
| Metering Realtime                                   |         |         |         |         |        |
| pdate Rate  |         |         |         |         |        |
| 3 s 🗢   |         |         |         |         |        |
| ealtime   |         |         |         |         |        |
| Parameter   | Phase A | Phase B | Phase C | Average | System |
| ine-to-Neutral Voltage v                            | 119.969 | 120.055 | 120.002 | 120.009 | -      |
| ine-to-Neutral Voltage Phase Angle                  | 0.000   | 240.002 | 120.001 | -       | -      |
| ine-to-Line Voltage v                               | 207.864 | 207.896 | 207.822 | 207.861 | -      |
| Line-to-Line Voltage Phase Angle                    | 30.013  | 269.994 | 149.996 | -       | -      |
| Current A   | 5.003   | 5.003   | 5.006   | 5.004   | -      |
| Current Phase Angle                                 | 299.938 | 179.974 | 59.920  | -       | -      |
| Neutral Current A                                   | -       | -       | -       | -       | 0.003  |
| Active Power kw                                     | 0.300   | 0.300   | 0.300   | -       | 0.899  |
| Reactive Power kvar                                 | 0.520   | 0.520   | 0.521   | -       | 1.561  |
| Apparent Power kVA                                  | 0.600   | 0.601   | 0.601   | -       | 1.802  |
| .oad Nature   | L       | L       | L       | -       | L      |
| Power Factor  | 0.499   | 0.500   | 0.499   | -       | 0.499  |
| Leading Power Factor                                | 0.000   | 0.000   | 0.000   | -       | 0.000  |
| Lagging Power Factor                                | 0.499   | 0.500   | 0.499   | -       | 0.499  |
| Frequency Hz  | 60.000  |         |         |         |        |





The Acuvim 3 webpage main menu is structured into three tabs: **About, Settings**, and **Acuvim 3**. For a detailed breakdown of the webpage's hierarchical structure, refer to Table 4-2.



| Main Menu Tab | Sub Menu Tab            | Webpage                 |
|---------------|-------------------------|-------------------------|
|               |                         | Information             |
| About         |                         | Installation Record     |
| About         |                         | Inspection Record       |
|               |                         | Nameplate               |
|               | Installation            | General                 |
|               |                         | I/O                     |
|               | Revenue and Energy      | TOU                     |
|               |                         | Power Quality Event     |
|               |                         | Alarm                   |
|               |                         | DI Trigger              |
|               | Power Quality and Alarm | Waveform and Fastlog    |
|               |                         | Mains Signaling Voltage |
|               |                         | Power Quality Reporting |
|               |                         | Email Notification      |
|               |                         | RS485 and USB           |
|               |                         | Network                 |
|               |                         | Webpage                 |
| Setting       |                         | Time/Date               |
|               |                         | Access Control          |
|               |                         | Remote Access           |
|               | Communication           | Email                   |
|               | Communication           | Modbus                  |
|               |                         | BACnet                  |
|               |                         | SNMP                    |
|               |                         | DNP                     |
|               |                         | IEC61850                |
|               |                         | EtherNet/IP             |
|               |                         | PMU                     |
|               |                         | Data Log                |
|               | Data Log/Post           | Data Post               |
|               |                         | AcuCloud                |

# Table 4-2 Acuvim 3 Webpages Hierarchical Structure



# Acuvim 3 Series Power Meter

| Main Menu Tab | Sub Menu Tab               | Webpage                        |  |
|---------------|----------------------------|--------------------------------|--|
|               |                            | User Configuration             |  |
|               |                            | Role Configuration             |  |
|               | User Management            | Password Policy                |  |
|               |                            | Password Configuration         |  |
|               |                            | API Token Management           |  |
|               |                            | Operations                     |  |
|               | Maintonanco and Managomont | Configuration Management       |  |
|               | Maintenance and Management | Network Diagnostic             |  |
|               |                            | Firmware                       |  |
|               |                            | Module Information             |  |
|               | HMI                        | Configuration                  |  |
|               |                            | Realtime                       |  |
|               |                            | Fundamental                    |  |
|               |                            | Energy and Demand              |  |
|               |                            | Min/Max                        |  |
|               | Metering                   | THD and Flicker                |  |
|               |                            | Harmonics                      |  |
|               |                            | Sequence                       |  |
|               |                            | IO                             |  |
|               |                            | TOU Energy                     |  |
|               |                            | Alarm Status                   |  |
|               |                            | Alarm Log                      |  |
| Acuvim 3      |                            | Power Quality Event            |  |
|               |                            | Power Quality Reports          |  |
|               | Power Quality and Alarm    | Mains Signaling Voltage Log    |  |
|               |                            | Mains Signaling Voltage Record |  |
|               |                            | Fast Log                       |  |
|               |                            | Waveform Capture               |  |
|               |                            | Transient Voltage Log          |  |
|               |                            | SOE Log                        |  |
|               |                            | Trend Log                      |  |
|               | Logs                       | Trend Log Management           |  |
|               |                            | Data Log                       |  |
|               |                            | Event Log                      |  |



# 4.2 About

# 4.2.1 Meter Information

To access the Information section,

- 1. Click on **About** from the main menu.
- 2. Select Information from the menu tab. This webpage will display general information for the Acuvim 3.

| Information        | Installation Record | Inspection Record | Nameplate |                      |
|--------------------|---------------------|-------------------|-----------|----------------------|
| -<br>Information   |                     |                   |           |                      |
| Meter              |                     |                   |           |                      |
| Meter Model        |                     |                   |           | Acuvim-3-5A-P1       |
| Meter Serial Num   | nber                |                   |           | ASP22100025          |
| Device Description | on                  |                   |           | Acuvim 3             |
| Meter Hardware     | Version             |                   |           | v1.04                |
| Meter Firmware \   | /ersion             |                   |           | v0.32                |
| Ethernet 1 MAC a   | address             |                   |           | EC:C3:8A:22:10:27    |
| Ethernet 2 MAC a   | address             |                   |           | EC:C3:8A:22:10:28    |
| Wi-Fi MAC addre    | ss                  |                   |           | C0:EE:40:83:04:B0    |
| Firmware Update    | Date                |                   |           |                      |
| Seal Status        |                     |                   |           | Off                  |
| eMMC Health Sta    | atus                |                   |           | Normal               |
| Disk Usage         |                     |                   |           | 6.5%                 |
| Device Run Time    |                     |                   |           | 985 Hours 49 Minutes |

### Figure 4-3 Information Webpage

The available types of information are listed in the table below.

### Table 4-3 Acuvim 3 Information Webpage Structure

| Information Type       | Details  |
|------------------------|--|
| Meter Model            | Meter type-current terminal type- power supply type.         |
| Meter Serial Number    | Unique product serial number.                                |
| Device Description     | Customized device name.                                      |
| Meter Hardware Version | Hardware version number.                                     |
| Meter Firmware Version | Firmware version number.                                     |
| Ethernet 1 MAC Address | Unique hardware number on Ethernet 1 adapter.                |
| Ethernet 2 MAC Address | Unique hardware number on Ethernet 2 adapter.                |
| Wi-Fi MAC Address      | Unique hardware number on Wi-Fi adapter.                     |
| Firmware Update Date   | Most recent date on which the Acuvim 3 firmware was updated. |



| Information Type   | Details                                |
|--------------------|--|
| Seal Status        | OFF/ON                                 |
| EMMC Health Status | Lifetime estimation of EMMC memory.    |
| Disk Usage         | Percentage of the memory that is used. |
| Device Run Time    | Unit in Hours and Minutes.             |

# 4.2.2 Installation Record

To access the Installation Record section,

- 1. Click on **About** from the main menu.
- 2. Select **Installation Record** from the menu tab. This webpage will display the installation records for Acuvim 3.

| Installati         | on Record    |             |                     |                      |                    |                         |            |                                 |            |                           |
|--------------------|--------------|-------------|---------------------|----------------------|--------------------|-------------------------|------------|---------------------------------|------------|---------------------------|
|                    |              |             |                     |                      |                    |                         | _          | _                               |            |                           |
|                    |              |             |                     |                      |                    | Cownload Installation R | Record     | New Installation                | Record     | Clear Installation Record |
| Client Information |              |             |                     |                      | Installation Infor | rmation                 | 1          |                                 |            |                           |
| Client             |              |             | Test                |                      | Installation Date  |                         | 203        | 24-04-01                        |            |                           |
| Address            |              |             | 22 Howden           | Rd                   |                    | Installer Name          |            | Na                              | cun        |                           |
|                    |              |             |                     |                      |                    | Meter Location          |            | Tes                             | st Bench   |                           |
| Device Into        | ormation     |             |                     |                      |                    |                         |            |                                 |            |                           |
| Meter Mod          | el           |             | Acuvim-3-           | -5A-P1               |                    | Description             |            | Acu                             | vim 3      |                           |
| Serial Num         | ber          |             | ASP22100            | 1025                 |                    | Nominal Voltage (V)     |            | 1201                            | v          |                           |
| Ethernet 11        | MAC Address  |             | EC:C3:8A:           | 22:10:27             |                    | Nominal Current (A)     |            | 5A                              |            |                           |
| etnernet 2         | Address      |             | CO:EE:401           | 22-10-28<br>92-04-P0 |                    | Service Configuratio    | (rtz)      | 50H                             | omont du   | uiro V                    |
| Seal Status        | nudress      |             | Off                 | 03-04-DU             |                    | Puise Constant (kW)     | hinulse)   | 3 68                            | unione kw  | him ise                   |
| ocal Status        |              |             |                     |                      |                    | T also collisiant (KWI  | (disalise) | 0.10                            | 0000 KW    | ( ( paras                 |
| PT Installa        | tion Table   |             |                     |                      |                    |                         |            |                                 |            |                           |
| Phase              | Color Co     | de          | PT Model            |                      | PT Serial Num      | ber                     | PT Ra      | tio P                           | Panel Des  | scription                 |
| A                  | red          |             | ACCU-PT1            | 1                    | PT22100003         |                         |            |                                 |            |                           |
| В                  | green        |             | ACCU-PT:            | 2                    | PT22100004         |                         | 120V:1     | 120V ti                         | est panel  |                           |
| C                  | Diack        |             | ACCO-PT.            | 3                    | P122100005         |                         |            |                                 |            |                           |
| CT Installa        | tion Table   |             |                     |                      |                    |                         |            |                                 |            |                           |
| Phase              | Color Co     | ode         | CT Mode             | ы                    | CT Serial Nur      | nber                    | ст         | Ratio Pi                        | anel Des   | cription                  |
| Α                  | greenyel     | low         | ACCU-CT             | F1                   | CT22100003         |                         |            |                                 |            |                           |
| В                  | yellowgr     | een         | ACCU-CT             | F2                   | CT22100004         |                         | 5A:8       | 5A rd                           | d test pan | el                        |
| C                  | greenblu     | ie          | ACCU-CT3 CT22100005 |                      |                    |                         |            |                                 |            |                           |
| Communic           | ation Inform | ation       |                     |                      |                    |                         |            |                                 |            |                           |
| Ethernet 1         | DHCP         | Manual      |                     |                      |                    |                         |            |                                 |            |                           |
| Ethernet 1         | IP           | 192.168.1.2 | 54                  |                      |                    | Ethernet 1 Status       |            | Disconnected                    |            |                           |
| Ethernet 2         | DHCP         | Auto        |                     |                      |                    |                         |            |                                 |            |                           |
| Ethomat 0          | 10           | 102 169 19  | 0.054               |                      |                    | Ethernet 2 Status       |            | Easthlad                        |            |                           |
| WE E Fach          |              | Fachlad     |                     |                      |                    | Ethernet 2 Olders       |            | Chabled                         |            |                           |
| WI-FI Enac         |              | chabled     |                     |                      |                    |                         |            |                                 |            |                           |
| WI-FI Mod          | 0            | SIA         |                     |                      |                    | WI-FI Status            |            | Fuebled                         |            |                           |
| Wi-Fi IP           |              | 192.168.1.1 | )                   |                      |                    | Wi+Fi SSID              |            | AccuOP1                         |            |                           |
| Modbus T           | CP Enable    | Enabled     |                     |                      |                    | Modbus TCP Port         |            | 502                             |            |                           |
| RS485 Pro          | tocol        | Modbus R1   | U Slave             | RS485 E              | Baud Rate          | 115200 bps              |            | RS485 Modbus R<br>Slave Address | TU         | 1                         |
|                    |              | Modbus DT   | 11 Clause           | LISE Bai             | ud Pate            | 115200 bos              |            | USB Modbus RTU                  | Slave      | 1                         |

Figure 4-4 Installation Record Webpage



## **Configuration Settings**

**Download Installation Record:** Download the newly generated installation record as a PDF for printed document.

**New Installation Record:** Generate a new inspection record, make the necessary edits, and click 'Save' button to preserve the record.

Clear Installation Record: Delete the current installation record.

A full summary of the installation record information is listed in the following table.

| Information Type         | Field                      | Input Source                 |  |
|--------------------------|----------------------------|------------------------------|--|
| Client Information       | Client                     | Manualipput                  |  |
| Client Information       | Address                    | Manual Input                 |  |
|                          | Installation Data          |                              |  |
| Installation Information | Installer Name             | Manual input                 |  |
|                          | Meter Location             |                              |  |
|                          | Meter Model                |                              |  |
|                          | Serial Number              |                              |  |
|                          | Ethernet1 MAC Address      |                              |  |
|                          | Ethernet2 MAC Address      |                              |  |
|                          | Wi-Fi MAC Address          |                              |  |
| Davies lefermatics       | Seal Status                |                              |  |
| Device mormation         | Device Description         | Automatic input from setting |  |
|                          | Nominal Voltage (V)        |                              |  |
|                          | Nominal Current (A)        |                              |  |
|                          | Nominal Frequency (Hz)     |                              |  |
|                          | Service Configuration      |                              |  |
|                          | Pulse Constant (kWh/pulse) |                              |  |
|                          | Colour Code                |                              |  |
|                          | PT Model                   | Manualinaut                  |  |
| PT Installation Table    | PT Serial Number           |                              |  |
|                          | Panel Description          |                              |  |
|                          | PT Ratio                   | Automatic input from setting |  |
|                          | Colour Code                |                              |  |
|                          | CT Model                   | Manualinaut                  |  |
| CT Installation Table    | CT Serial Number           | iviariuai iriput             |  |
|                          | Panel Description          |                              |  |
|                          | CT Ratio                   | Automatic input from setting |  |

Table 4-4 Acuvim 3 Installation Record Structure



| Information Type          | Field                          | Input Source                 |
|---------------------------|--------------------------------|------------------------------|
|                           | Ethernet DHCP Type             |                              |
|                           | Ethernet Status                |                              |
|                           | Ethernet IP                    |                              |
|                           | Wi-Fi Enable/Disable           |                              |
|                           | Wi-Fi Status                   |                              |
|                           | Wi-Fi Mode                     |                              |
|                           | Wi-Fi IP                       |                              |
| Communication Information | Modbus TCP Enable/Disable      | Automatic input from setting |
|                           | Modbus TCP Port                |                              |
|                           | RS485 Protocol                 |                              |
|                           | RS485 Baud Rate                |                              |
|                           | RS485 Modbus RTU Slave Address |                              |
|                           | USB Protocol                   |                              |
|                           | USB Baud Rate                  |                              |
|                           | USB Modbus RTU Slave Address   |                              |

# 4.2.3 Inspection Record

To access the Inspection Record section,

- 1. Click on **About** from the main menu.
- 2. Select **Inspection Record** from the menu tab. This webpage will display the inspection records for Acuvim 3.

| Inspectio                 | n Record       |             |                            |                        |                  |             |                    |                           |
|---------------------------|----------------|-------------|----------------------------|------------------------|------------------|-------------|--------------------|---------------------------|
|                           |                |             |                            |                        |                  |             |                    |                           |
|                           |                |             |                            | Download In            | spection Record  | New Inspect | tion Record        | Clear Installation Record |
| Client Info               | rmation        |             |                            | Installa               | tion Information |             |                    |                           |
| Client                    |                | Test        |                            | Installa               | tion Date        |             | 2024-04-01         |                           |
| Address                   |                | 22 Howden R | d                          | Installe               | r Name           |             | Nacun              |                           |
|                           |                |             |                            | Meter I                | ocation          |             | Test Bench         |                           |
| Commissio                 | on Information |             |                            | Inspec                 | tion Information |             |                    |                           |
| Commissio                 | n Date         |             |                            | Inspection Date        |                  | 2024-04-07  |                    |                           |
| Commissioner -            |                |             | Inspector                  |                        | Nacun            |             |                    |                           |
| Device Info               | ormation       |             |                            |                        |                  |             |                    |                           |
| Meter Mod                 | el             | Acuvim-3-5  | A-P1                       | Descripti              | on               |             | Acuvim 3           |                           |
| Serial Number ASP22100025 |                | 25          | Nominal                    | /oltage (V)            |                  | 120V        |                    |                           |
| Ethernet 1                | MAC Address    | EC:C3:8A:22 | ::10:27                    | Nominal Current (A)    |                  |             | 5A                 |                           |
| Ethernet 2                | MAC Address    | EC:C3:8A:22 | ::10:28                    | Nominal Frequency (Hz) |                  |             | 50Hz               |                           |
| Wi-Fi MAC                 | Address        | C0:EE:40:83 | :04:B0                     | Service Configuration  |                  |             | 3 element 4 wire Y |                           |
| Seal Status Off           |                |             | Pulse Constant (kWh/pulse) |                        | 0.100000 kWh     | pulse       |                    |                           |
| PT Inspect                | ion Table      |             |                            |                        |                  |             |                    |                           |
| Phase                     | Color Code     | PT Model    | PT Serial Number           |                        | PT Ratio         | Voltage     | Panel D            | escription                |
| A                         | red            | ACCU-PT1    | PT22100003                 |                        |                  | 119.969     |                    |                           |
| в                         | green          | ACCU-PT2    | PT22100004                 |                        | 120V:120V        | 120.056     | test par           | el                        |
|                           | 11             | 10011070    | PTOOLOOOD                  |                        | 110.000          |             |                    |                           |



| CT Inspe                      | ection Table                |          |                  |               |                 |             |                       |                  |                   |
|-------------------------------|-----------------------------|----------|------------------|---------------|-----------------|-------------|-----------------------|------------------|-------------------|
| Phase                         | Color Code                  | CT Model | CT Serial Number | CT Ratio      | Current         | Phase Angle | Active Power          | Power Factor     | Panel Description |
| A                             | greenyellow                 | ACCU-CT1 | CT22100003       |               | 5.003           | 300.036     | 0.300                 | 0.501            |                   |
| В                             | yellowgreen                 | ACCU-CT2 | CT22100004       | 5A:5A         | 5.003           | 180.032     | 0.301                 | 0.500            | rd test panel     |
| С                             | greenblue                   | ACCU-CT3 | CT22100005       |               | 5.005           | 60.055      | 0.301                 | 0.501            |                   |
| Commu                         | nication Inform             | mation   |                  |               |                 |             |                       |                  |                   |
| Etherne                       | t 1 DHCP                    | Manual   |                  |               |                 |             |                       |                  |                   |
| Etherne                       | Ethernet 1 IP 192.168.1.254 |          |                  | Et            | hernet 1 Status | Disconnec   | Disconnected          |                  |                   |
| Etherne                       | t 2 DHCP                    | Auto     |                  |               |                 |             |                       |                  |                   |
| Ethernet 2 IP 192.168.183.254 |                             | Ef       | hernet 2 Status  | Enabled       | Enabled         |             |                       |                  |                   |
| Wi-Fi Er                      | nable                       | Enabled  |                  |               |                 |             |                       |                  |                   |
| Wi-Fi Mode STA                |                             | W        | i-Fi Status      | Enabled       | Enabled         |             |                       |                  |                   |
| Wi-Fi IP 192.168.1.10         |                             | W        | i-Fi SSID        | AccuOP1       | AccuOP1         |             |                       |                  |                   |
| Modbus TCP Enable Enabled     |                             | м        | odbus TCP Port   | 502           | 502             |             |                       |                  |                   |
| RS485                         | Protocol                    | Modbus R | TU Slave RS      | 485 Baud Rate | 11              | 5200 bps    | RS485 Mo<br>Slave Add | dbus RTU<br>ress | 1                 |
| USB Pro                       | otocol                      | Modbus R | TU Slave US      | B Baud Rate   | 11              | 5200 bps    | USB Mode<br>Address   | ous RTU Slave    | 1                 |

#### Figure 4-5 Inspection Record Webpage

#### **Configuration Settings**

**Download Inspection Record:** Download the newly generated inspection record as a PDF for printed document.

**New Inspection Record:** Generate a new inspection record, make the necessary edits, and click 'Save' button to preserve the record.

Clear Inspection Record: Delete the current Inspection record.

A full summary of the inspection record information is listed in the following table.

| Information Type         | Field              | Input Source                     |  |
|--------------------------|--------------------|----------------------------------|--|
| Client Information       | Client             | Manual input/Input from existing |  |
|                          | Address            | installation record              |  |
|                          | Installation Data  |                                  |  |
| Installation Information | Installer Name     | Manual input/Input from existing |  |
|                          | Meter Location     |                                  |  |
| Commission Information   | Commission Date    | Manual input                     |  |
| Commission information   | Commissioner       |                                  |  |
|                          | Inspection Date    |                                  |  |
| Inspection Information   | Inspector          | Manual input                     |  |
|                          | Device Information |                                  |  |

#### Table 4-5 Acuvim 3 Inspection Record Structure



# Acuvim 3 Series Power Meter

| Information Type      | Field  | Input Source   |
|-----------------------|--|--|
|                       | Meter Model<br>Serial Number<br>Ethernet1 MAC Address<br>Ethernet2 MAC Address<br>Wi-Fi MAC address  |  |
| Device Information    | Seal Status<br>Device Description<br>Nominal Voltage (V)<br>Nominal Current (A)<br>Nominal Frequency (Hz)<br>Service Configuration<br>Pulse Constant (kWh/pulse) | Automatic input from setting   |
| PT Installation Table | Colour Code<br>PT Model<br>PT Serial Number<br>Panel Description   | Manual input/Input from existing<br>installation record  |
|                       | PT Ratio   | Automatic input from setting   |
|                       | Voltage  | Verify action required to acquire the<br>real-time measurement readings<br>Click 'Accepted' to seal the verification |
| CT Installation Table | Colour Code<br>CT Model<br>CT Serial Number<br>Panel Description   | Manual input/Input from existing<br>Installation Record  |
|                       | CT Ratio   | Automatic input from setting   |
|                       | Current<br>Phase Angle<br>Active Power<br>Power Factor   | Verify action required to acquire the<br>real-time measurement readings<br>Click 'Accepted' to seal the verification |



| Information Type          | Field  | Input Source                 |
|---------------------------|--|------------------------------|
|                           | Ethernet DHCP type                             |                              |
|                           | Ethernet Status                                |                              |
|                           | Ethernet IP                                    |                              |
|                           | Wi-Fi Enable/Disable                           |                              |
|                           | Wi-Fi Status                                   |                              |
|                           | Wi-Fi Mode                                     |                              |
|                           | Wi-Fi IP                                       |                              |
| Communication Information | Modbus TCP Enable/Disable                      | Automatic input from setting |
|                           | Modbus TCP Port                                |                              |
|                           | RS485 Protocol                                 |                              |
|                           | RS485 Baud Rate                                |                              |
|                           | RS485 Modbus RTU Slave Address                 |                              |
|                           | USB Protocol                                   |                              |
|                           | USB Baud Rate                                  |                              |
|                           | USB Modbus RTU Slave Address                   |                              |
| Notes                     |  | Manual input                 |
|                           | Installation Tested and Verified               |                              |
| Inspection Status         | Installation Tested, Corrected and<br>Verified | Drop-down manual selection   |
|                           | Installation Rejected                          |                              |
|                           | Inspection Status                              | Manual input                 |

# 4.2.4 Nameplate

To access the Nameplate section,

- 1. Click on **About** from the main menu.
- 2. Select Nameplate from the menu tab. This webpage will display the nameplate for Acuvim 3.



# Acuvim 3 Series Power Meter

|                                    | Logout Wednesday, April 24, 2024 2 | ::55 PM ( About Settings Acuvim 3 ALLU-N-Rb)   |
|------------------------------------|------------------------------------|--|
| Information Installation Record In | spection Record Nameplate          |  |
| Nameplate                          |                                    |  |
| Meter                              |                                    |  |
| Model                              |                                    | Acuvim-3-5A-P1   |
| Manufacturer                       |                                    | Accuenergy (CANADA) Inc.   |
| Power Supply                       |                                    | 50/60Hz 100-415Vac, 100-300Vdc   |
| Temperature Range                  |                                    | -25~70°C   |
| Frequency Range                    |                                    | 40-70Hz  |
| Rated Voltage                      |                                    | 120-347 VLN, 208-600 VLL   |
| Current Range                      |                                    | 0.05A to 10A   |
| MAC Address                        |                                    | Ethernet 1: EC:C3:8A:22:10:27<br>Ethernet 2: EC:C3:8A:22:10:28<br>WI-Fi: C0:EE:40:83:04:80 |
| Serial Number                      |                                    | ASP22100025  |

#### Figure 4-6 Nameplate Webpage

A full summary of the nameplate information for non-Measurement Canada (MC) sealed Acuvim 3 is listed in table 4-6, and for Measurement Canada (MC) sealed Acuvim 3 is in table 4-7.

| Nameplate Information | Details                                       |  |  |
|-----------------------|---|--|--|
| Model                 | Meter name - Current type - Power supply type |  |  |
| Manufacturer          | Accuenergy (CANADA) Inc.                      |  |  |
| Power Supply          | 50/60Hz 100-415ac, 100-300Vdc                 |  |  |
| Temperature Range     | -25~70°C (-13~158°F)                          |  |  |
| Frequency Range       | 40-70Hz                                       |  |  |
| Rated Voltage         | 10-400VLN, 690VLL                             |  |  |
| Current Dange         | 1A nominal: 0.01A to 2 A                      |  |  |
| Current Range         | 5A nominal: 0.05A to 10A                      |  |  |
|                       | Unique hardware number on Ethernet 1 adapter. |  |  |
| MAC Address           | Unique hardware number on Ethernet 2 adapter. |  |  |
|                       | Unique hardware number on Wi-Fi adapter.      |  |  |
| Serial Number         | Unique product serial number.                 |  |  |

#### Table 4-6 Acuvim 3 Non-Measurement Canada Nameplate Structure



| MC Nameplate Information | Details  |  |  |
|--------------------------|--|--|--|
| Model                    | Meter name- Current type- Power supply type-MC |  |  |
| Manufacturer             | Accuenergy (CANADA) Inc.                       |  |  |
| Meter Type               | Transformer Rated kWh Meter                    |  |  |
| Configuration            | Applied wiring configuration                   |  |  |
| Power Supply             | 60Hz 100-415ac, 100-300Vdc                     |  |  |
| Temperature Range        | -25~53°C (-13~127.4°F)                         |  |  |
| Rated Voltage            | 120-347VLN, 208-600 VLL                        |  |  |
|                          | 1A nominal: 0.01A to 2 A                       |  |  |
| Current Range            | 5A nominal: 0.05A to 10A                       |  |  |
|                          | (only show the applied nominal setting)        |  |  |
|                          | Kwh/pulse                                      |  |  |
| Pulse Constant           | Pulse/kwh                                      |  |  |
|                          | (applied pulse constant settings)              |  |  |
| MC Approval Number       | AE-xxxx  |  |  |
|                          | Unique hardware number on Ethernet 1 adapter.  |  |  |
| MAC Address              | Unique hardware number on Ethernet 2 adapter.  |  |  |
|                          | Unique hardware number on Wi-Fi adapter.       |  |  |
| Serial Number            | Unique product serial number                   |  |  |

| <b>Table 4-7 Acuvim</b> | 3 Measurement Canada | Nameplate Structure |
|-------------------------|----------------------|---------------------|
|-------------------------|----------------------|---------------------|

# 4.3 Metering

# 4.3.1 Realtime Webpage

Real-time parameters provide instantaneous insights into the electrical network's performance, including voltage, current, and power. Acuvim 3 captures these parameters with high precision, measuring at 1024 samples per cycle, ensuring accurate and detailed monitoring for optimal system operation.

To access the Realtime section,

- 1. Click on **Acuvim 3** from the main menu.
- 2. Select Metering from the tab menu.
- 3. Click on the **Realtime** menu option. This webpage displays the various real-time parameter readings and a phasor diagram for Acuvim 3.



# Acuvim 3 Series Power Meter

|                                     | larm + "9 Logs + |         |         |         |        |
|-------------------------------------|------------------|---------|---------|---------|--------|
| Metering Realtime                   |                  |         |         |         |        |
| Update Rate                         |                  |         |         |         |        |
| 3 s 🗢                               |                  |         |         |         |        |
| Realtime                            |                  |         |         |         |        |
| Parameter                           | Phase A          | Phase B | Phase C | Average | System |
| Line-to-Neutral Voltage v           | 119.974          | 120.047 | 120.003 | 120.008 | -      |
| Line-to-Neutral Voltage Phase Angle | 0.000            | 240.002 | 119.994 |         | -      |
| Line-to-Line Voltage v              | 207.862          | 207.897 | 207.820 | 207.860 | -      |
| Line-to-Line Voltage Phase Angle    | 30.011           | 269.992 | 149.993 | -       | -      |
| Current A                           | 5.003            | 5.003   | 5.006   | 5.004   | -      |
| Current Phase Angle                 | 299.934          | 179.971 | 59.917  |         | -      |
| Neutral Current A                   | -                |         | -       | -       | 0.003  |
| Active Power xw                     | 0.300            | 0.300   | 0.300   | -       | 0.899  |
| Reactive Power kvar                 | 0.520            | 0.520   | 0.521   | -       | 1.561  |
| Apparent Power kVA                  | 0.600            | 0.601   | 0.601   |         | 1.801  |
| Load Nature                         | L                | L       | L       | -       | L      |
| Power Factor                        | 0.499            | 0.500   | 0.499   | -       | 0.499  |
| Leading Power Factor                | 0.000            | 0.000   | 0.000   | -       | 0.000  |
| Lagging Power Factor                | 0.499            | 0.500   | 0.499   |         | 0.499  |





### **Configuration Settings**

**Update Rate:** Select how often parameters will refresh on the Acuvim 3 Realtime webpage. Interval options are for every 3-second, 10-minute, or 2-hour.

A full summary of the real-time parameters is listed in the following table.

| Parameters                          | Accuracy | Resolution | Range           |  |  |  |  |  |  |
|-------------------------------------|----------|------------|-----------------|--|--|--|--|--|--|
| Line-to-Neutra Voltage<br>Magnitude | 0.1%     | 0.001      | 10V~1000kV      |  |  |  |  |  |  |
| Line-to-Neutra Voltage<br>Angle     | 0.1%     | 0.001°     | 0.000°~359.999° |  |  |  |  |  |  |
| Line-to-Line Voltage<br>Magnitude   | 0.1%     | 0.001      | 17.3V~1730kV    |  |  |  |  |  |  |

#### **Table 4-8 Acuvim 3 Realtime Parameters**



# Site Map and Metering

| Parameters                 | Accuracy | Resolution | Range                              |
|----------------------------|----------|------------|------------------------------------|
| Line-to-Line Voltage Angle | 0.1%     | 0.001°     | 0.000°~359.999°                    |
| Line Current magnitude     | 0.1%     | 0.001      | 10mA~50000A                        |
| Line Current Angle         | 0.1%     | 0.001°     | 0.000°~359.999°                    |
| Neutral Current            | 0.1%     | 0.001      | 10mA~50000A                        |
| Active Power               | 0.1%     | 1W         | -999999.999MW<br>~999999.999MW     |
| Reactive Power             | 0.1%     | 1Var       | -999999.999Mvar<br>~999999.999Mvar |
| Apparent Power             | 0.1%     | 1VA        | 0~999999.999MVA                    |
| Load Nature                | N/A      | N/A        | R/C/L                              |
| Power Factor               | 0.1%     | 0.001      | -1.000~1.000                       |
| Leading Power Factor       | 0.1%     | 0.001      | 0.000~1.000                        |
| Lagging Power Factor       | 0.1%     | 0.001      | 0.000~1.000                        |
| Frequency                  |          | 0.001Hz    | 40.000Hz~70.000Hz                  |

# 4.3.2 Fundamental Webpage

To access the Fundamental section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select **Metering** from the tab menu.
- 3. Click on the **Fundamental** menu option. This webpage displays the various fundamental parameter readings for Acuvim 3.

|  | 🕒 Logout | Wednesday, April 24, 2024 2:57 PM | About   | 🛱 Settings | Acuvim 3 | ACCUENERGY |
|--|----------|-----------------------------------|---------|------------|----------|------------|
| Lad Metering - A Power Quality and Alarm | - "Du    | ogs -                             |         |            |          |            |
| Metering Fundamental                     |          |                                   |         |            |          |            |
| Fundamental                              |          |                                   |         |            |          |            |
| Parameter                                |          | Phase A                           | Phase B | Phase C    | Average  | System     |
| Fundamental Line-to-Neutral Voltage v    |          | 119.975                           | 120.046 | 119.996    | 120.006  | -          |
| Fundamental Line-to-Line Voltage v       |          | 207.859                           | 207.894 | 207.814    | 207.856  | -          |
| Neutral Fundamental Line Current A       |          | -                                 | -       | -          | -        | 0.005      |
| Fundamental Line Current A               |          | 5.003                             | 5.003   | 5.006      | 5.004    | -          |
| Fundamental Active Power kw              |          | 0.300                             | 0.300   | 0.300      | -        | 0.899      |
| Fundamental Reactive Power kvar          |          | 0.520                             | 0.520   | 0.521      | -        | 1.561      |
| Fundamental Apparent Power kva           |          | 0.600                             | 0.601   | 0.601      | -        | 1.801      |
| Displacement Power Factor                |          | 0.499                             | 0.500   | 0.499      | -        | 0.499      |

#### Figure 4-8 Fundamental Readings Webpage

**NOTE:** The fundamental readings exclude harmonics and should only be compared with fundamental RMS values for accuracy.



A full summary of the fundamental parameters is listed in the following table.

| Parameters                             | Accuracy | Resolution | Range                              |  |  |  |  |  |
|--|----------|------------|------------------------------------|--|--|--|--|--|
| Fundamental Line-to-<br>Neutra Voltage | 0.1%     | 0.001      | 10V~1000kV                         |  |  |  |  |  |
| Fundamental Line-to-Line<br>Voltage    | 0.1%     | 0.001      | 17.3V~1730kV                       |  |  |  |  |  |
| Neutral Fundamental Line<br>Current    | 0.1%     | 0.001      | 10mA~50000A                        |  |  |  |  |  |
| Fundamental Line Current               | 0.1%     | 0.001      | 10mA~50000A                        |  |  |  |  |  |
| Fundamental Active Power               | 0.1%     | 1W         | -999999.999MW<br>~999999.999MW     |  |  |  |  |  |
| Fundamental Reactive<br>Power          | 0.1%     | 1Var       | -999999.999Mvar<br>~999999.999Mvar |  |  |  |  |  |
| Fundamental Apparent<br>Power          | 0.1%     | 1VA        | 0~999999.999MVA                    |  |  |  |  |  |
| Displacement Power Factor              | 0.1%     | 0.001      | -1.000 ~ 1.000                     |  |  |  |  |  |

| Table 4-9 | Acuvim | 3 Fundamental | Parameters |
|-----------|--------|---------------|------------|
|-----------|--------|---------------|------------|

# 4.3.3 Energy and Demand Webpage

To access the Energy and Demand section,

- 1. Click on **Acuvim 3** from the main menu.
- 2. Select **Metering** from the tab menu.
- 3. Click on the **Energy and Demand** menu option. This webpage displays the various energy and demand parameter readings for Acuvim 3.



# Site Map and Metering

| -                            | a a a a a a a a a a a a a a a a a a a | 0.000      |         |                          |                          |         |
|------------------------------|---------------------------------------|------------|---------|--------------------------|--------------------------|---------|
| Metering Energy and Deman    | d                                     |            |         |                          |                          |         |
| Energy Data Type             |                                       |            |         | Un                       | it                       |         |
| Import/Export                | ٠                                     |            |         | k                        | VAh/kvarh/kWh            |         |
| Manual Edit                  |                                       |            |         |                          |                          |         |
| Energy                       |                                       |            |         |                          |                          |         |
| Parameter                    |                                       |            | Phase A | Phase B                  | Phase C                  | System  |
| Active Energy-Import kWh     |                                       |            | 123.175 | 120.453                  | 118.356                  | 463.092 |
| Reactive Energy-Import kvarh |                                       |            | 22.985  | 25.693                   | 25.621                   | 78.205  |
| Active Energy-Export kWh     |                                       |            | 20.545  | 20.581                   | 20.570                   | 68.768  |
| Reactive Energy-Export kvarh |                                       |            | 11.113  | 10.966                   | 11.204                   | 85.978  |
| Active Energy-Net kWh        |                                       |            | 102.630 | 99.872                   | 97.786                   | 394.324 |
| Reactive Energy-Net kvarh    |                                       |            | 11.872  | 14.727                   | 14.417                   | -7.773  |
| Active Energy-Total kWh      |                                       |            | 143.721 | 141.035                  | 138.926                  | 531.859 |
| Reactive Energy-Total kvarh  |                                       |            | 34.098  | 36.659                   | 36.824                   | 164.183 |
| Apparent Energy kVAh         |                                       |            | 160.636 | 159.463                  | 157.392                  | 573.955 |
| Demand                       |                                       |            |         |                          |                          |         |
| Parameter                    | Phase                                 | Instaneous | Max     | Max Dema                 | and Timestamp            |         |
|                              | Phase A                               | 0.300      | 0.735   | 2024-04-22T15:49:00-0400 |                          |         |
| Anthen Deven LAW             | Phase B                               | 0.300      | 0.601   | 2024-04-23T09:15:00-0400 |                          |         |
| Active Power Kiv             | Phase C                               | 0.300      | 0.601   | 2024-04-2                | 23T09:08:00-0400         |         |
|                              | System                                | 0.899      | 1.936   | 2024-04-2                | 22T15:49:00-0400         |         |
|                              | Phase A                               | 0.520      | 0.520   | 2024-04-2                | 23T14:49:00-0400         |         |
| Reactive Power kvar          | Phase B                               | 0.520      | 0.520   | 2024-04-2                | 23T14:51:00-0400         |         |
|                              | Phase C                               | 0.521      | 0.521   | 2024-04-2                | 23T14:47:00-0400         |         |
|                              | System                                | 1.561      | 1.561   | 2024-04-2                | 23T14:42:00-0400         |         |
|                              | Phase A                               | 0.600      | 0.735   | 2024-04-2                | 2024-04-22T15:49:00-0400 |         |
| Apparent Power kVA           | Phase B                               | 0.601      | 0.601   | 2024-04-2                | 2024-04-23T09:15:00-0400 |         |
|                              | Phase C                               | 0.601      | 0.601   | 2024-04-2                | 23T09:08:00-0400         |         |
|                              | System                                | 1.802      | 1.936   | 2024-04-2                | 22T15:49:00-0400         |         |
|                              | Phase A                               | 5.003      | 5.003   | 2024-04-2                | 23T14:41:00-0400         |         |
| Current A                    | Phase B                               | 5.003      | 5.003   | 2024-04-2                | 23T09:10:00-0400         |         |
|                              | Phase C                               | 5.006      | 5.006   | 2024-04-2                | 23T09:10:00-0400         |         |

#### Figure 4-9 Energy and Demand Readings Webpage

#### **Configuration Settings**

**Energy Data Type:** Select the dropdown list to display the energy type options. Choices include Import/Export and Quadrant.

**Unit:** Select the unit for energy and demand to display from the dropdown list. Options include Vah/varh/Wh, kVAh/kvarh/kWh, and MVAh/Mvarh/MWh.

Manual Edit: Enable or disable permission to edit energy readings manually.

Reset Demand: Clear all existing demand readings.

Reset Energy: Clear all existing energy readings.

A full summary of the energy parameters is listed in the following table.



| Parameter Type       | Energy Type 1 | Energy Type 2   | Unit   |
|----------------------|---------------|---|--|
|                      |               |   | Wh   |
|                      | Import        | Active Energy   | KWh  |
|                      | Export        |   | MWh  |
|                      | Total         |   | Varh   |
| Import/Export Energy | Net           | Reactive Energy   | Kvarh  |
|                      |               |   | Mvarh  |
|                      | Total         |   | Vah  |
|                      | Total         | Apparent Energy   | Kvah   |
|                      |               |   | Mvah   |
|                      |               | Reactive Energy   Apparent Energy   Active Energy   Reactive Energy | Wh   |
|                      |               |   | KWh  |
|                      |               |   | Active Energy<br>Reactive Energy<br>Apparent Energy<br>Active Energy<br>Reactive Energy<br>Apparent Energy |
|                      | Quad 1        |   | Varh   |
| Quadrant Energy      | Quad 2        | Reactive Energy   | Kvarh  |
|                      | Quad 3        | Reactive Energy   Apparent Energy   Active Energy   Reactive Energy | Mvarh  |
|                      | Quau 4        |   | Vah  |
|                      |               | Apparent Energy   | Kvah   |
|                      |               |   | Mvah   |

# Table 4-10 Acuvim 3 Energy Readings

# Table 4-11 Acuvim 3 Demand Readings

| Parameter                | Phase   | Data Type          | Max Demand Timestamp |  |  |  |
|--------------------------|---------|--------------------|----------------------|--|--|--|
|                          | Phase A |                    |                      |  |  |  |
| Active Dower (1/M)       | Phase B |                    |                      |  |  |  |
| Active Power (KW)        | Phase C |                    |                      |  |  |  |
|                          | System  |                    |                      |  |  |  |
|                          | Phase A |                    |                      |  |  |  |
| Depetive Devices (laver) | Phase B |                    |                      |  |  |  |
| Reactive Power (kvar)    | Phase C | Leste de la second |                      |  |  |  |
|                          | System  | Instantaneous      |                      |  |  |  |
|                          | Phase A | IVIAX              | •                    |  |  |  |
|                          | Phase B |                    |                      |  |  |  |
| Apparent Power (kvA)     | Phase C |                    |                      |  |  |  |
|                          | System  |                    |                      |  |  |  |
|                          | Phase A |                    |                      |  |  |  |
| Current (A)              | Phase B |                    |                      |  |  |  |
| Current (A)              | Phase C |                    |                      |  |  |  |
|                          | System  |                    |                      |  |  |  |



### 4.3.3.1 Active Energy

Energy represents the cumulative quantity of power consumed or produced over time. It is the integral of power with respect to time. In Acuvim 3, the relationship between active energy (EP), power (P), and time (t) is given by formula:

$$E_P = \int_{t1}^{t2} P(t) dt$$

### Import Active Energy

Under this category, only the active energy with positive power (consumed by the load) is accumulated. The formula for import active energy is:

$$E_{Pimp} = \int_{t1}^{t2} P_{imp}(t) dt$$

### **Export Active Energy**

Here, only the active energy with negative power (generated by the load) is accumulated. The formula for export active energy is:

$$E_{Pexp} = \int_{t1}^{t2} P_{exp}(t) dt$$

# **Total Active Energy**

Total active energy refers to the overall amount of active energy associated with the connected system. It is the sum of the import active energy and export active energy:

$$E_{Ptotal} = E_{Pimp} + E_{Pexp}$$

### **Net Active Energy**

Net active energy is the total electrical active energy remaining after accounting for losses and subtracting any exported active energy:

$$E_{Pnet} = E_{Pimp} - E_{Pexp}$$

### 4.3.3.2 Reactive Energy

Reactive energy is the energy consumed or generated by a reactive load such as inductor and capacitor in the Acuvim 3, the relationship between reactive energy (EQ), reactive power (Q), and time (t) is given by formula:

$$E_Q = \int_{t1}^{t2} Q(t) dt$$



### Import Reactive Energy

Under this category, only the reactive energy with positive reactive power (consumed by reactive load) is accumulated. The formula for import reactive energy is:

$$E_{Qimp} = \int_{t1}^{t2} Q_{imp}(t) dt$$

# **Export Reactive Energy**

Here, only the reactive energy with negative reactive power (generated by reactive load) is accumulated. The formula for export reactive energy is:

$$E_{Qexp} = \int_{t1}^{t2} Q_{exp}(t) dt$$

# **Total Reactive Energy**

Total reactive energy refers to the overall amount of reactive energy associated with the connected system. It is the sum of the import reactive energy and export reactive energy:

$$E_{Qtotal} = E_{Qimp} + E_{Qexp}$$

# Net Reactive Energy

Net reactive energy is the total electrical reactive energy remaining after accounting for losses and subtracting any exported reactive energy:

$$E_{Qnet} = E_{Qimp} - E_{Qexp}$$

# 4.3.3.3 Apparent Energy

Apparent power is the combination of active power and reactive power, it defines the amount of total power flowing within a system. Apparent energy is the integral of apparent power with respect to time. In the Acuvim 3, the relationship between apparent energy (ES), apparent power (S), and time (t) is given by formula:

$$E_S = \int_{t1}^{t2} S(t) dt$$

# Total Apparent Energy

Total apparent energy refers to the overall amount of apparent energy associated with the connected system. It is the sum of import apparent energy and export apparent energy:

$$E_{Stotal} = E_{Simp} + E_{Sexp}$$



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### 4.3.3.4 Four Quadrant Energy

For a power system, the relationship between apparent power, active power and reactive power is often defined as:

$$S = P + jQ$$

Where reactive power (Q, in Var units) is plotted on the ordinate axis, and active power (P, in Watts) is plotted on the abscissa. This coordinator has been defined as a four-quadrant system and indicates the power-flow concept of energy. The flow of power will result in the registration of energy in quadrants that correspond to the power vector location.



Figure 4-10 Four Quadrant PQS and Load Types

In the Acuvim 3 four-quadrant energy section, the meter will accumulate energy based on the apparent power vector's location. For example:

Quadrant I is defined as an area where both energies flow positively, so Eq\_Q1 will only accumulate energy when P and S are both positive. The formula is shown below:

$$Eq_{Q1} = \int_{t1}^{t2} Q(t)dt \text{ when } P \ge 0 \& Q \ge 0$$

## 4.3.4 Min/Max Webpage

To access the Min/Max section,

- 1. Click on **Acuvim 3** from the main menu.
- 2. Select **Metering** from the tab menu.



3. Click on the Min/Max menu option. This webpage displays the min/max readings for Acuvim 3.

|   |                     | E Logout | Wednesday, April 24, 2024 2:59 PM | O About | Settings Acuvim 3 ACCUENERGY |
|---|---------------------|----------|-----------------------------------|---------|------------------------------|
| Let Metering - 🗘 Power                    | r Quality and Alarm | - "Di    | ogs -                             |         |                              |
| Metering Min/Max                          |                     |          |                                   |         |                              |
| Min/Max                                   |                     |          |                                   |         |                              |
| Parameter                                 |                     | Min      | Min Timestamp                     | Max     | Max Timestamp                |
| Frequency Hz                              | Total               | 45.000   | 2024-04-23T16:50:58-0400          | 60.180  | 2024-04-22T16:30:08-0400     |
|   | Average             | 0.000    | 2024-04-22711:53:52-0400          | 163.336 | 2024-04-22715:48:45-0400     |
| and the second                            | Phase A             | 0.000    | 2024-04-22711:53:52-0400          | 249.950 | 2024-04-22T15:48:38-0400     |
| Line-to-Neutral Voltage V                 | Phase B             | 0.000    | 2024-04-22711:53:52-0400          | 128.627 | 2024-04-22T16:10:08-0400     |
|   | Phase C             | 0.000    | 2024-04-22T11:53:52-0400          | 133.045 | 2024-04-22T16:30:07-0400     |
|   | Average             | 0.000    | 2024-04-22T11:53:52-0400          | 287.252 | 2024-04-22715:48:45-0400     |
| Day to Day Webser W                       | Phase A             | 0.000    | 2024-04-22T11:53:52-0400          | 326.945 | 2024-04-22715:48:45-0400     |
| Line-to-Line Voltage V                    | Phase B             | 0.000    | 2024-04-22711:53:52-0400          | 217.394 | 2024-04-22716:30:07-0400     |
|   | Phase C             | 0.000    | 2024-04-22711:53:52-0400          | 327.182 | 2024-04-22T15:48:38-0400     |
|   | Average             | 0.000    | 2024-04-22711:53:53-0400          | 5.019   | 2024-04-22711:53:47-0400     |
| Connect 4                                 | Phase A             | 0.000    | 2024-04-22T11:53:53-0400          | 5.181   | 2024-04-22T16:13:37-0400     |
| Current A                                 | Phase B             | 0.000    | 2024-04-22T11:53:53-0400          | 5.011   | 2024-04-22T17:00:35-0400     |
|   | Phase C             | 0.000    | 2024-04-22T11:53:53-0400          | 5.082   | 2024-04-22T15:41:49-0400     |
|   | Total               | -0.899   | 2024-04-22711:53:50-0400          | 2.452   | 2024-04-22715:48:45-0400     |
| 4-10-10-10-10-10-10-10-10-10-10-10-10-10- | Phase A             | -0.300   | 2024-04-22711:53:47-0400          | 1.251   | 2024-04-22115:48:38-0400     |
| ACTIVE POWER KW                           | Phase B             | -0.300   | 2024-04-22711:53:50-0400          | 0.603   | 2024-04-22T17:00:35-0400     |
|   | Phase C             | -0.300   | 2024-04-22T11:53:55-0400          | 0.620   | 2024-04-22T15:41:49-0400     |
|   | Total               | -1.665   | 2024-04-22T11:54:46-0400          | 1.561   | 2024-04-23T14:40:18-0400     |
| Departure Departures                      | Phase A             | -0.558   | 2024-04-22711:54:46-0400          | 0.603   | 2024-04-22T11:53:47-0400     |
| Reactive Power Kvar                       | Phase B             | -0.551   | 2024-04-22T11:54:46-0400          | 0.520   | 2024-04-23T14:40:55-0400     |
|   | Phase C             | -0.556   | 2024-04-22711:54:46-0400          | 0.521   | 2024-04-23T14:40:33-0400     |
|   | Total               | 0.000    | 2024-04-22711:53:52-0400          | 2.452   | 2024-04-22T15:48:45-0400     |
| Annual Dever MA                           | Phase A             | 0.000    | 2024-04-22711:53:52-0400          | 1.251   | 2024-04-22T15:48:38-0400     |
| opposition round KTA                      | Phase B             | 0.000    | 2024-04-22711:53:52-0400          | 0.643   | 2024-04-22T16:10:08-0400     |
|   | Phase C             | 0.000    | 2024-04-22711:53:52-0400          | 0.620   | 2024-04-22715:41:49-0400     |

### Figure 4-11 Max/Min Readings Webpage

#### **Configuration Settings**

Reset Min/Max: Updating both minimum and maximum values with instantaneous readings.

Each parameter receives a new instantaneous reading that replaces the existing maximum value if it's greater, or the minimum value if it's smaller. A full summary of the min/max parameters is listed in the following table.

| Parameters               | Phase   | Min<br>Min Timestamp | Max<br>MaxTimestamp |
|--------------------------|---------|----------------------|---------------------|
| Frequency                | Total   | •                    | •                   |
|                          | Average |                      |                     |
| Line to Neutral Voltage  | PhaseA  |                      |                     |
| Line-to-iveutial voltage | PhaseB  | •                    | •                   |
|                          | PhaseC  |                      |                     |
|                          | Average |                      |                     |
|                          | PhaseA  |                      |                     |
| Line-to-Line voitage     | PhaseB  | •                    |                     |
|                          | PhaseC  |                      |                     |

#### Table 4-12 Acuvim 3 Min/Max Readings



| Parameters               | Phase                                 | Min<br>Min Timestamp | Max<br>MaxTimestamp |
|--------------------------|---------------------------------------|----------------------|---------------------|
| Current                  | Average<br>PhaseA<br>PhaseB<br>PhaseC | •                    | •                   |
| Active Power             | Total<br>PhaseA<br>PhaseB<br>PhaseC   | •                    | •                   |
| Reactive Power           | Total<br>PhaseA<br>PhaseB<br>PhaseC   | ٠                    | •                   |
| Apparent Power           | Total<br>PhaseA<br>PhaseB<br>PhaseC   | •                    | •                   |
| Leading Power Factor     | Total<br>PhaseA<br>PhaseB<br>PhaseC   | •                    | •                   |
| Lagging Power Factor     | Total<br>PhaseA<br>PhaseB<br>PhaseC   | •                    | •                   |
| Voltage Unbalance Factor | Total                                 | •                    | •                   |
| Current Unbalance Factor | Total                                 | •                    | •                   |

# 4.3.5 THD and Flicker Webpage

To access the THD and Flicker sections,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select **Metering** from the tab menu.
- 3. Click on the **THD and Flicker** menu option. This webpage displays the total harmonic distortion (THD) and flicker readings for Acuvim 3.



| Lat Metering - A Power Quality and a | Logout Wednesday, April 24, 2024 2:59 PM | About Settings | Acuvim 3 ALLU-IV-Har |
|--------------------------------------|--|----------------|----------------------|
| Metering THD and Flicker             |  |                |                      |
| Update Rate                          |  |                |                      |
| 3 s 🗢                                |  |                |                      |
| THD and Flicker                      |  |                |                      |
| Parameter                            | Phase A                                  | Phase B        | Phase C              |
| Voltage THD %                        | 0.000                                    | 0.000          | 0.000                |
| Voltage THD Odd %                    | 0.000                                    | 0.000          | 0.000                |
| Voltage THD Even %                   | 0.000                                    | 0.000          | 0.000                |
| Voltage Crest Factor                 | 1.415                                    | 1.415          | 1.415                |
| Current THD %                        | 0.000                                    | 0.000          | 0.000                |
| Current THD Odd %                    | 0.000                                    | 0.000          | 0.000                |
| Current THD Even %                   | 0.000                                    | 0.000          | 0.000                |
| Current TDD %                        | 0.000                                    | 0.000          | 0.000                |
| Current Crest-Factor                 | 1.414                                    | 1.414          | 1.414                |
| Current K-Factor                     | 1.000                                    | 1.000          | 1.000                |
| Manage Production and a local        | 0.000                                    | 0.000          | 0.000                |

#### Figure 4-12 THD and Flicker Readings Webpage

### **Configuration Settings**

**Update Rate:** Select how often parameters will refresh on the Acuvim 3 THD and Flicker webpage. Interval options are for every 3-second, 10-minute, or 2-hour.

A full summary of the THD and flicker parameters is listed in the following table.

| Daxamotors          | Dhaca  |           | Update Rate |         |
|---------------------|--------|-----------|-------------|---------|
| Parameters          | Pliase | 3 Seconds | 10 minutes  | 2 hours |
|                     | PhaseA |           |             |         |
| Voltage THD         | PhaseB | •         | •           | •       |
|                     | PhaseC |           |             |         |
|                     | PhaseA |           |             |         |
| Voltage THD Odd     | PhaseB | •         | •           | •       |
|                     | PhaseC |           |             |         |
|                     | PhaseA |           |             |         |
| Voltage THD<br>Even | PhaseB | •         | •           | •       |
| Even                | PhaseC |           |             |         |

Table 4-13 Acuvim 3 THD and Flicker Readings



| Davamatava                  | Dhasa  |           | Update Rate |         |
|-----------------------------|--------|-----------|-------------|---------|
| Parameters                  | Phase  | 3 Seconds | 10 minutes  | 2 hours |
|                             | PhaseA |           |             |         |
| Voltage Crest<br>Eactor     | PhaseB | •         | •           | •       |
| ractor                      | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| Current THD                 | PhaseB | •         | •           | •       |
|                             | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| Odd                         | PhaseB | •         | •           | •       |
| 000                         | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| Current IHD<br>Even         | PhaseB | •         | •           | •       |
| Even                        | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| Current TDD                 | PhaseB | •         | •           | •       |
|                             | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| Current Crest-              | PhaseB | •         | •           | •       |
| i detoi                     | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| Current K-Factor            | PhaseB | •         | •           | •       |
|                             | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| (10minutes)                 | PhaseB | •         | •           | N/A     |
| (Torninaces)                | PhaseC |           |             |         |
|                             | PhaseA |           |             |         |
| Voltage Flicker<br>(2hours) | PhaseB | N/A       | N/A         | •       |
| (2110013)                   | PhaseC |           |             |         |

**Total Harmonic Distortion (THD):** A ratio of the sum of powers in all harmonic components to the power of the fundamental frequency.

THD Odd: Total Harmonic Distortion of odd-order harmonics, such as the 3<sup>rd</sup>, 5<sup>th</sup>, 7<sup>th</sup>, etc.

THD Even: Total Harmonic Distortion of even-order harmonics, such as the 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>, etc.

**Total Demand Distortion (TDD):** A measure used in power systems to quantify the harmonic distortion of the electrical current relative to the total demand current or the maximum demand current at the fundamental frequency.



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Crest Factor: The ratio between either the peak current or voltage and the RMS value.

**K-Factor:** A measure of the heating effect caused by current harmonics, which helps determine the linearity of a load. A K-factor value of 1 indicates that the load is linear, and there are no harmonics present. However, a K-factor value greater than one means that the load is not linear, and there is a higher heating effect caused by the harmonics in the system.

## 4.3.6 Harmonics Webpage

To access the Harmonics section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Metering from the tab menu.
- 3. Click on the Harmonics menu option. This webpage displays the harmonic readings for Acuvim 3.

|                                     |                             | C Logout   | Wednesday, April 24, 2024 3:00 PM                  | About    | Settings    | Acuvim 3   | ACCUENERGY |  |
|-------------------------------------|-----------------------------|------------|--|----------|-------------|------------|------------|--|
| Lill Metering +                     | 🗘 Power Quality and Alarm 👻 | "D Logs -  |  |          |             |            |            |  |
| Metering Harma                      | nics                        |            |  |          |             |            |            |  |
| Update Rate<br>3 x<br>1 - 32 33 - 6 | •<br>4 65 - 96 97 - 127     |            |  |          |             |            |            |  |
| Voltage/Current                     |                             |            | Harmonic Type: Harm                                | nonic    |             |            |            |  |
| Voltage                             |                             |            | \$   |          |             |            |            |  |
| Harmonics<br>**                     |                             |            | A B C  |          |             |            |            |  |
| 0.8 -                               |                             |            |  |          |             |            |            |  |
| 0.6 -                               |                             |            |  |          |             |            |            |  |
| 0.4 -                               |                             |            |  |          |             |            |            |  |
| 02-                                 |                             |            |  |          |             |            |            |  |
| -1                                  | 2 3 4 5 6 7 8 9             | 10 11 12 1 | 3 14 15 16 17 18 19 20 21<br>Harmonic Order Number | 22 23 24 | 25 28 27 28 | 3 29 30 31 | 32         |  |



| Voltage        |                |                |                |
|----------------|----------------|----------------|----------------|
| Harmonic Order | Phase A        | Phase B        | Phase C        |
| 1              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∡0.000° |
| 2              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 3              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 4              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 5              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 6              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 7              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 8              | 0.000% ∠0.000° | 0.000% ∡0.000° | 0.000% ∠0.000° |
| 9              | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 10             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 11             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 12             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 13             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∡0.000° |
| 14             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 15             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 16             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 17             | 0.000% ∠0.000° | 0.000% ∡0.000° | 0.000% ∠0.000° |
| 18             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 19             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 20             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∡0.000° |
| 21             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 22             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |
| 23             | 0.000% ∠0.000° | 0.000% ∠0.000° | 0.000% ∠0.000° |

### Figure 4-13 Harmonics Readings Webpage

### **Configuration Setting**

**Update Rate:** Select how often parameters will refresh on the Acuvim 3 Harmonics webpage. Interval options are for every 3-second, 10-minute, or 2-hour.

**Harmonics:** Essentially high-frequency waveforms that are combined with or superimposed over the fundamental frequency.

**Fundamental Frequency:** Fundamental frequency is the circuit frequency which is 50 or 60Hz depending on the system that is being monitored.

**Inter-harmonics:** In addition to harmonics, the system also supports inter-harmonics. These are non-integer multiples of the fundamental frequency, representing harmonic-like components that fall between the integer harmonics.

**Order Ranges:** Harmonic component display ranges on the webpage are 2 to 32 , 33 to 64, 65 to 96, and 97 to 127. Inter-harmonic component display ranges on the webpage are 1 to 32, 33 to 64, 65 to 96, and 97 to 127.

Source Type: Acuvim 3 displays both voltage and current harmonic parameters.



## 4.3.7 Sequence Webpage

To access the Sequence section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Metering from the tab menu.
- 3. Click on the **Sequence** menu option. This webpage displays the sequence information for Acuvim 3.





**Update Rate:** Select how often parameters will refresh on the Acuvim 3 Sequence webpage. Interval options are for every 3-second, 10-minute, or 2-hour intervals.

A full summary of the sequence parameters is listed in the following table.



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|                   |          | Sequence Reading |           |             |         |
|-------------------|----------|------------------|-----------|-------------|---------|
| Daramator         | Convonco | Possiution       |           | Update Rate |         |
| Parameter         | Sequence | Resolution       | 3 Seconds | 10 minutes  | 2 hours |
| Voltage Magnitude |          | 0.001            | •         | •           | •       |
| Voltage Angle     |          | 0.001°           | •         | •           | •       |
| Current Magnitude | Positive | 0.001            | •         | •           | •       |
| Current Angle     |          | 0.001°           | •         | •           | •       |
| Real number       | 2010     | 0.001            | •         | •           | •       |
| Imaginary number  |          | 0.001            | •         | •           | •       |

## Table 4-14 Acuvim 3 Sequence Readings

## Table 4-15 Acuvim 3 Unbalance Readings

|                             | Unbalance Reading |           |             |         |
|-----------------------------|-------------------|-----------|-------------|---------|
| Devenseter                  | Desclution        |           | Update Rate |         |
| Parameter                   | Resolution        | 3 Seconds | 10 minutes  | 2 hours |
| Voltage Unbalance Factor    | 0.001%            | •         | •           | •       |
| Voltage Zero Sequence Ratio | 0.001%            | •         | •           | •       |
| Current Unbalance Factor    | 0.001%            | •         | •           | •       |
| Current Zero Sequence Ratio | 0.001%            | •         | •           | •       |

**Positive Sequence:** Three phasors of the positive sequence are equal in magnitude and are spaced 120 degrees apart.

$$I_{+} = \frac{1}{3} \times (I_{a} + aI_{b} + a^{2}I_{c})$$
$$V_{+} = \frac{1}{3} \times (V_{a} + aV_{b} + a^{2}V_{c})$$
$$a = 1 \angle 120^{\circ}$$
$$a^{2} = 1 \angle 240$$



Figure 4-15a Positive Sequence Diagram



**Negative Sequence:** Similar to the positive sequence, the negative phase-sequence phasors are equal in magnitude and spaced 120 degrees apart. The main difference between the positive and negative sequence is the phase rotation. In the negative sequence, phase B leads phase A, whereas in the positive sequence, phase B lags phase A.



Figure 4-15b Negative Sequence Diagram

**Zero Sequence:** Combines a set of three phasors that are equal in magnitude and in phase with each other. Unlike the positive and negative sequences, there is no rotation associated with the zero sequence.

$$I_0 = \frac{1}{3} \times (I_a + I_b + I_c)$$
$$V_0 = \frac{1}{3} \times (V_a + V_b + V_c)$$



#### Figure 4-15c Zero Sequence Diagram



**Unbalance Factor:** The unbalance factor allows users to understand the percentage in which the voltage and current are unbalanced. The factor is a percentage of the ratio of the negative/zero sequence component to the positive sequence component. It indicates that the magnitude and phase angles of the three-phase voltage/current are not equal.

Based on IEC 61000-4-30 and NEMA MG1-14.34, the voltage unbalance factor is calculated by the following equation.

$$V_U = \left(\frac{V_N}{V_P}\right) \times 100\%$$

 $V_U$  is the Percentage Voltage Unbalance,  $V_N$  is the Negative Voltage Sequence,  $V_P$  is the Positive Voltage Sequence.

Based on NEMA MG1-14.34, the current unbalance factor is calculated by the following equation.

$$I_{U} = 100\% \times \frac{\max(|I_{1} - I_{avg}|, |I_{2} - I_{avg}|, |I_{3} - I_{avg}|)}{I_{avg}}$$

 $I_U$  is the Current Unbalance Percentage,  $I_1, I_2, I_3$  are the current in three-phase.

$$I_{avg} = \frac{(I_1 + I_2 + I_3)}{3}$$

# 4.3.8 I/O Webpage

To access the I/O section,

1. Click on **Acuvim 3** from the main menu.

2. Select **Metering** from the tab menu.

3. Click on the I/O menu option. This webpage displays the I/O readings for Acuvim 3.

|                    |                                      | (+ Logout Thu | rsday, April 25, 2024 3:59 PM | About Settings Acusim 3 | ACCUENERGY    |
|--------------------|--------------------------------------|---------------|-------------------------------|-------------------------|---------------|
| Lat Metering +     | Department Power Quality and Alarm + | DLogs -       |                               |                         |               |
| Metering Io        |                                      |               |                               |                         |               |
| Meter Body - Onlin | e                                    |               |                               |                         |               |
| Digital Input      |                                      |               |                               |                         |               |
| Parameter          | Status                               |               | Counter                       | Reading                 | Action        |
| Dit - Dit          |                                      |               | 0                             | 0                       | Edit<br>Reset |
| 012 - 012          |                                      |               | 0                             | 0                       | Edit<br>Reset |
| DI3 - DI3          |                                      |               | 0                             | 0                       | Edit<br>Reset |

Figure 4-16 I/O Webpage

By default, when no additional I/O module is present, the webpage will only display the digital input readings from the Acuvim 3 meter base.



**DI:** These digital input (DI) readings come in two formats: Status or Counters. Counters can be personalized by applying specific ratios to them.

|                       | Et La                         | gout Thursday, April 25, 2024 | 4.01 PM @ About \$ Settings | Acution 3 ACCUENERGY |
|-----------------------|-------------------------------|-------------------------------|-----------------------------|----------------------|
| Lef Matering + APp    | rer Quality and Alarm - "D Lo |                               |                             |                      |
| Maturing or           |                               |                               |                             |                      |
| wetening to           |                               |                               |                             |                      |
| Meter Body - Online 👻 |                               |                               |                             |                      |
| Digital Input         |                               |                               |                             |                      |
| Parameter             | Status                        | Counter                       | Reading                     | Action               |
| 0m - 0m               |                               | 0                             | 0                           | Edt<br>Reset         |
| D12 - D12             |                               | 0                             | 0                           | Edit<br>Reset        |
| 013 - 013             |                               | 0                             | 0                           | Eds<br>Reset         |
| D14 - D14             |                               | 0                             | 0                           | Edit                 |
| AXM-I02-1 - Online v  |                               |                               |                             |                      |
| Digital Input         |                               |                               |                             |                      |
| Parameter             | Status                        | Counter                       | Reading                     | Action               |
| Ort Din               | OFF                           |                               |                             |                      |
| D12 D12               | OFF                           |                               |                             |                      |
| 0/3 0/3               | Ott                           |                               |                             |                      |
| D14 D14               | OFF                           |                               |                             |                      |
| Analog Output         |                               |                               |                             |                      |
| Parameter             |                               |                               | hetput                      |                      |
| A01                   |                               | 6                             | .000 V                      |                      |
| ADZ                   |                               | 2                             | 249 V                       |                      |

#### Figure 4-17 I/O Readings Webpage

When an extended I/O module is connected to the Acuvim 3 meter base, a subsection will become available for the I/O in the webpage interface. Along with digital input (DI) readings, extended I/O modules include I/O parameters for analog output (AO), analog input (AI), and relay output (RO) readings. For comprehensive information on I/O parameters, please refer to Chapter 5.

### **Configuration Settings**

DI Edit: Edit digital input counters.

DI Reset: Reset all digital input counters.

RO Toggle: Switch relay output in Relay Control to 'Latch' mode.

## 4.3.9 I/O Settings

To access the I/O settings section,

- 1. Click on **Settings** from the main menu.
- 2. Select Installation from the tab menu.
- 3. Click on the I/O menu option. This webpage displays the I/O settings for Acuvim 3.



| ation 10                  |                                   |                    |                                      |           |                          |   |                 |             |   |                |
|---------------------------|-----------------------------------|--------------------|--------------------------------------|-----------|--------------------------|---|-----------------|-------------|---|----------------|
| General                   | 10                                |                    |                                      |           |                          |   |                 |             |   |                |
| Pre-Cor                   | figuration                        |                    |                                      |           |                          |   |                 |             |   |                |
| Meter B                   | ndv - Onlin                       |                    |                                      |           |                          |   |                 |             |   |                |
| DI Cotti                  | inge                              | -                  |                                      |           |                          |   |                 |             |   |                |
| Disett                    | ings                              |                    |                                      |           | -                        |   |                 | -           |   |                |
| ID Ty                     | rpe                               | Labe               |                                      |           | On label                 | Off label   | Unit            | Ratio       |   |                |
| DI1                       | Counter 0                         | DI1                |                                      |           | ON                       | OFF   |                 | 1.000       |   |                |
|                           |                                   | Masore             | um 20 character                      |           | Maximum 20 characters    | Maximum 20 characters                                       |                 |             |   |                |
| DI2                       | Counter 0                         | DI2                |                                      |           | ON                       | OFF   |                 | 1.000       |   |                |
| 1                         |                                   | Maxim              | un zu character                      |           | Massmum 20 characters    | Materium 20 characters                                      |                 |             |   |                |
| DI3                       | Counter •                         | DIS                | um 20 character                      |           | ON Maximum 20 characters | OFF<br>Maximum 20 characters                                |                 | 1.000       |   |                |
| DIA                       |                                   | DIA                |                                      |           | ON                       | OFF   |                 | 1.000       |   |                |
| Dia 1                     | Commi •                           | Maxim              | um 20 character                      |           | Maximum 20 characters    | Maximum 20 characters                                       |                 | 1.000       |   |                |
| 0.1<br>Range: 0.0         | 00125 - 14.40                     | 0092               | RVI<br>DU                            | se/kWh    | Carculate Pulse Constant |   |                 |             |   |                |
|                           | T                                 |                    | Farmer Dadas                         | Label     |                          | Francis   |                 |             | Dules V                                   | (Links         |
| ID ID                     | Type                              |                    | Energy Pulse                         | Laber     |                          | energy  |                 |             | Puise w                                   | Jun            |
|                           | Alarm                             | •                  | Disable 0                            | DO        | m 20 characters          | Phase A Quadrant  | 1 Active Energy |             | 100<br>Rance: 20                          | - 1000         |
| DO                        |                                   |                    |                                      |           |                          |   |                 |             |   |                |
| DO                        |                                   |                    |                                      |           |                          |   |                 |             |   |                |
| DO<br>LED Se              | ttings                            |                    |                                      |           |                          |   |                 |             |   |                |
| DO<br>LED Se<br>ID        | ttings<br>Ener                    | gy Pulse           | Label                                |           |                          | Energy  |                 |             | Pulse Widt                                | h              |
| DO<br>LED Se<br>ID<br>LED | ttings<br>Ener<br>1 Ena           | gy Pulse           | Label                                |           |                          | Energy<br>System Net Apparent Er                            | iergy           | ß           | Pulse Widt                                | h<br>ms        |
| DO<br>LED Se<br>ID<br>LED | Ener                              | gy Pulse           | Label<br>VAR<br>Maximum 20 (         | haracters |                          | Energy<br>System Net Apparent Er                            | rergy           | œ           | Pulse Widt<br>200<br>lange: 20 - 1        | <b>h</b> ms    |
| DO<br>LED Se<br>ID<br>LED | ettings<br>Ener<br>1 Eno<br>2 Eno | gy Pulse<br>able 0 | Label<br>VAR<br>Maximum 20 0<br>WATT | haracters |                          | Energy<br>System Net Apparent Er<br>System Net Active Energ | iergy<br>Dy     | 8<br>8<br>1 | Pulse Widt<br>200<br>lange: 20 - 1<br>200 | h ms<br>100 ms |

### Figure 4-18 I/O Settings Webpage

## **Configuration Settings**

Pre-Configuration: Check the box to allow extended I/O modules to be set up before installation.

**Calculate Pulse Constant:** Clicking on this will allow the user to launch a calculator to set the energy pulse constant.



| alculate Pulse Cor  | nstant                     |                             |       |   |               |                        |                       |   |        |           |   |  |
|---|----------------------------|-----------------------------|-------|---|---------------|------------------------|-----------------------|---|--------|-----------|---|--|
| Primary Maximum Po  | wer                        |                             |       |   |               |                        |                       |   |        |           |   |  |
| 0.12  |                            |                             |       |   | kW            |                        |                       |   |        |           |   |  |
| Range: 0.001 - 0.12   |                            |                             |       |   |               |                        |                       |   |        |           |   |  |
| PT Input Rating   |                            | CT Inp                      | put R | Rating  |               | PT Outp                | ut Rating             |   | CT Out | put Ratin | g |  |
| 120   | V                          | 1                           |       |   | Α             | 120                    |                       | V | 1      |           | A |  |
| Output Energy Pulse   | Width                      |                             |       | Minimum   | Pulse Int     | erval                  |                       |   |        |           |   |  |
| 80  |                            | ms                          |       | 250   |               |                        | ms                    |   |        |           |   |  |
|   |                            |                             |       | Range: 250 - 1  | 86400000      |                        |                       |   |        |           |   |  |
| Secondary Maximum   | Power                      |                             |       | Secondary   | Energy        | Pulse Con              | stant                 |   |        |           |   |  |
| Secondary Maximum   | rower                      |                             |       | secondary   |               |                        |                       |   |        |           |   |  |
| 0.12<br>Primary Energy P  | ulse Co                    | kW<br>onsta                 | nts   | 0.4   | 'kWb          | pulse                  | /kWh                  |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/kWh<br>40000  | ulse Co                    | kW<br>onsta                 | nts   | 0.4<br>Min pulse/<br>0.347222   | kWh           | pulse                  | /kWh<br>/kWh          |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/kWh<br>40000<br>Max kWh/pulse   | ulse Co                    | kW<br>onsta<br>kWh          | nts   | 0.4<br>Min pulse/<br>0.347222<br>Min kWh/r                                      | 'kWh          | pulse                  | /kWh<br>/kWh          |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/kWh<br>40000<br>Max kWh/pulse<br>2.880002   | ulse Co<br>pulse/<br>kWh/p | kW<br>onsta<br>kWh          | nts   | 0.4<br>Min pulse/<br>0.347222<br>Min kWh/t                                      | kWh           | pulse<br>pulse<br>kWh/ | /kWh<br>/kWh<br>pulse |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/kWh<br>40000<br>Max kWh/pulse<br>2.880002<br>Primary pulse/kWh  | ulse Co<br>pulse/<br>kWh/p | kW<br>onsta<br>kWh<br>oulse | nts   | 0.4<br>Min pulse/<br>0.347222<br>Min kWh/t                                      | kWh           | pulse<br>pulse<br>kWh/ | /kWh<br>/kWh<br>pulse |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/KWh<br>40000<br>Max KWh/pulse<br>2.880002<br>Primary pulse/KWh<br>0.4   | pulse Co                   | kW<br>onsta<br>kWh<br>oulse | nts   | 0.4<br>Min pulse/<br>0.347222<br>Min kWh/f<br>0.000025<br>pulse/kWH             | 'kWh<br>oulse | pulse<br>pulse<br>kWh/ | /kWh<br>/kWh<br>pulse |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/kWh<br>40000<br>Max kWh/pulse<br>2.880002<br>Primary pulse/kWh<br>0.4<br>Range.0.347222 - 40000                             | pulse/                     | kW<br>onsta<br>kWh<br>oulse | nts   | 0.4<br>Min pulse/<br>0.347222<br>Min kWh/f<br>0.000025<br>pulse/kWl             | kWh           | pulse<br>pulse<br>kWh/ | /kWh<br>/kWh<br>pulse |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/kWh<br>40000<br>Max kWh/pulse<br>2.880002<br>Primary pulse/kWh<br>0.4<br>Range 0.347222 - 40000<br>Primary kWh/pulse        | pulse Co                   | kW<br>onstal<br>kWh         | nts   | 0.4<br>Min pulse/<br>0.347222<br>Min kWh/t<br>0.000025<br>pulse/kWl             | kWh<br>pulse  | pulse<br>pulse<br>kWh/ | /kWh<br>/kWh<br>pulse |   |        |           |   |  |
| 0.12<br>Primary Energy P<br>Max pulse/kWh<br>40000<br>Max kWh/pulse<br>2.880002<br>Primary pulse/kWh<br>0.4<br>Range 0.347222 - 40000<br>Primary KWh/pulse<br>2.5 | pulse Co                   | kW<br>Donstaa<br>kWh        | nts   | 0.4<br>Min pulse/<br>0.347222<br>Min kWh/j<br>0.000025<br>pulse/kWl<br>kWh/puls | kWh<br>pulse  | pulse<br>pulse<br>kWh/ | /kWh<br>/kWh<br>pulse |   |        |           |   |  |

### Figure 4-19 Pulse Constant Calculations

Set Pulse Constant: User can enter the calculated primary pulse constant value into the settings.

| AXM  | -IO2-1 - Online   | v                     |                              |      |       |
|------|-------------------|-----------------------|------------------------------|------|-------|
| Cha  | ange Logical Addi | ess                   | Change Logical Address       | ×    |       |
| DI S | ettings           |                       | Post Channel                 |      |       |
| ID   | Туре              | Label                 | 2 - 1                        | ÷    | Ratio |
| DI1  | Counter 🜩         | DI1                   | Select Post Channel<br>2 - 1 |      | 1.000 |
|      |                   | Maximum 20 characters | 2 - 2                        |      |       |
|      | Counter 🖨         | DI2                   |                              | Save | 1.000 |

#### Figure 4-20 Change Logical Address

Change Logical Address: User Can change the logical address for AXM-IO modules.



AXM-IO1 can switch logical address between AXM-IO1-1 and AXM-IO1-2, AXM-IO2 can switch logical address between AXM-IO2-1 and AXM-IO2-2, AXM-IO3 can switch logical address between AXM-IO3-1 and AXM-IO3-2.

### Figure 4-21 Change AO Type

| AI Set | AI Settings            |                              |        |      |       |  |  |  |  |
|--------|------------------------|------------------------------|--------|------|-------|--|--|--|--|
| ID     | Туре                   | Label                        | Offset | Unit | Ratio |  |  |  |  |
| AI1    | 1~5V \$                | Al1<br>Maximum 20 characters | 1.000  | A ¢  | 1.000 |  |  |  |  |
| AI2    | Select<br>0~5V<br>1~5V | AI2<br>Maximum 20 characters | 1.000  | A \$ | 1.000 |  |  |  |  |

### Figure 4-22 Change AI Type

A full summary of the I/O settings is listed in the following tables. For comprehensive information on I/O modules, please refer to Chapter 5.

| DI         |                          |          |       |          |           |      |       |  |  |
|------------|--------------------------|----------|-------|----------|-----------|------|-------|--|--|
| I/O Module | I/O ID                   | I/O Type | Label | On Label | Off Label | Unit | Ratio |  |  |
| Meter Base | DI1<br>DI2               | Counter  | •     | N/A      | N/A       | •    | •     |  |  |
|            | DI3<br>DI4               | Status   | •     | •        | •         | N/A  | N/A   |  |  |
|            | DI1<br>DI2               | Counter  | •     | N/A      | N/A       | •    | •     |  |  |
| AXM-IO1    | DI3<br>DI4<br>DI5<br>DI6 | Status   | •     | •        | •         | N/A  | N/A   |  |  |
| AXM-IO2    | DI1<br>DI2<br>DI3<br>DI4 | Counter  | •     | N/A      | N/A       | •    | •     |  |  |
|            |                          | Status   | •     | •        | •         | N/A  | N/A   |  |  |



| DI         |            |          |       |          |           |      |       |  |
|------------|------------|----------|-------|----------|-----------|------|-------|--|
| I/O Module | I/O ID     | I/O Type | Label | On Label | Off Label | Unit | Ratio |  |
|            | DI1<br>DI2 | Counter  | •     | N/A      | N/A       | •    | •     |  |
| AXIVI-IU3  | DI3<br>DI4 | Status   | •     | •        | •         | N/A  | N/A   |  |

## Table 4-17 Acuvim 3 DO Settings

| DO         |            |                 |       |  |   |  |         |  |  |  |
|------------|------------|-----------------|-------|--|---|--|---------|--|--|--|
| I/O Module | I/O ID     | I/О Туре        | Label |  | Pulse<br>Width  |  |         |  |  |  |
|            |            | Alarm           | •     | • N/A  |   |  |         |  |  |  |
| Meter Base | DO         | Energy<br>Pulse | •     | Channel A,<br>Channel B,<br>Channel C,<br>System | Active Energy<br>Reactive<br>Energy<br>Apparent<br>Energy | Quadrant 1<br>Quadrant 2<br>Quadrant 3<br>Quadrant 4<br>Import<br>Export<br>Net<br>Total | 20~1000 |  |  |  |
|            |            | Alarm           | •     |  | N/A   |  | (ms)    |  |  |  |
| AXM-IO2    | DO1<br>DO2 | Energy<br>Pulse | •     | Channel A,<br>Channel B,<br>Channel C,<br>System | Active Energy<br>Reactive<br>Energy<br>Apparent<br>Energy | Quadrant 1<br>Quadrant 2<br>Quadrant 3<br>Quadrant 4<br>Import<br>Export<br>Net<br>Total |         |  |  |  |



| RO         |            |                  |       |          |           |                |         |  |
|------------|------------|------------------|-------|----------|-----------|----------------|---------|--|
| I/O Module | I/O ID     | І/О Туре         | Label | On Label | Off Label | Output<br>Mode | Width   |  |
|            | RO1<br>RO2 | Relay<br>Control | •     | •        | •         | Latch          |         |  |
| AXIVI-IU I |            | Alarm            | •     | •        | •         | Momentary      | 20~1000 |  |
| AXM-IO3    | RO1<br>RO2 | Relay<br>Control | •     | •        | •         | Latch          | (ms)    |  |
|            |            | Alarm            | •     | •        | •         | Momentary      |         |  |

Table 4-18 Acuvim 3 RO settings

#### Table 4-19 Acuvim 3 AI settings

| I/O Module | I/O ID     | I/О Туре                         | Label | Offset | Unit                    | Ratio |
|------------|------------|----------------------------------|-------|--------|-------------------------|-------|
| AXM-IO3    | Al1<br>Al2 | 4~20mA<br>0~20mA<br>1~5V<br>0~5V | ·     | •      | V<br>A<br>₩<br>°C<br>°F | •     |

### Table 4-20 Acuvim 3 AO settings

| I/O Module | I/O ID     | I/О Туре                         | Label | Parameter ID  | Number of<br>Slopes |
|------------|------------|----------------------------------|-------|---|---------------------|
|            |            |                                  |       | Power Frequency 10/12(Hz)<br>VA RMS 10/12(V)<br>VB RMS 10/12(V)<br>VC RMS 10/12(V)  |                     |
| AXM-IO2    | AO1<br>AO2 | 4~20mA<br>0~20mA<br>1~5V<br>0~5V | •     | VLN AVG RMS 10/12(V)<br>VAB RMS 10/12(V)<br>VBC RMS 10/12(V)<br>VCA RMS 10/12(V)<br>VLL AVG RMS 10/12(V)<br>IA RMS 10/12(A)<br>IB RMS 10/12(A)<br>IC RMS 10/12(A) | 4                   |



| I/O Module | I/O ID | I/O Type  | Label | Parameter ID                           | Number of<br>Slopes |
|------------|--------|-----------|-------|--|---------------------|
|            |        |           |       | I AVG RMS 10/12(A)                     |                     |
|            |        |           |       | IN RMS 10/12(A)                        |                     |
|            |        |           |       | Phase A Active Power 10/12 (kW)        |                     |
|            |        |           |       | Phase B Active Power 10/12 (kW)        |                     |
|            |        |           |       | Phase C Active Power 10/12 (kW)        |                     |
|            |        |           |       | Total Active Power 10/12 (kW)          |                     |
|            |        |           |       | Phase A Reactive Power 10/12 (kvar)    |                     |
|            |        |           |       | Phase B Reactive Power 10/12 (kvar)    |                     |
|            |        |           |       | Phase C Reactive Power 10/12 (kvar)    |                     |
|            |        | A: 4~20mA |       | Total Reactive Power 10/12 (kvar)      |                     |
| AXM-IO2-1  | AO1    | B:0~20mA  |       | Phase A Apparent Power 10/12 (kVA)     | 4                   |
| AXM-102-2  | AO2    | C:1~5V    | •     | Phase B Apparent Power 10/12 (kVA)     | 4                   |
|            |        | D:0~5V    |       | Phase C Apparent Power 10/12 (kVA)     |                     |
|            |        |           |       | Total Apparent Power 10/12 (kVA)       |                     |
|            |        |           |       | Phase A Power Factor 10/12             |                     |
|            |        |           |       | Phase A Power Factor 10/12             |                     |
|            |        |           |       | Phase A Power Factor 10/12             |                     |
|            |        |           |       | Total Power Factor 10/12               |                     |
|            |        |           |       | Phase A Power Factor Angle 10/12 (deg) |                     |
|            |        |           |       | Phase B Power Factor Angle 10/12 (deg) |                     |
|            |        |           |       | Phase C Power Factor Angle 10/12 (deg) |                     |
|            |        |           |       | Total Power Factor Angle 10/12 (deg)   |                     |

Energy LED 1 is a visible orange light. Energy LED 2 aligns with ANSI type B, featuring an infrared sensor with an intensity of 900nm. For the selected energy type, both LEDs will blink synchronously with the generation of energy pulses. For comprehensive information on Energy LED settings, please refer to table 4-21.

|            |                            |   | Energy Parameter Set                                | ting   | Dulco Width |
|------------|----------------------------|---|---|--|-------------|
| 1/O Module | 1/010                      | Channel                                 | Energy PQS  | Energy Type  | Puise width |
| Meter Base | Energy LED1<br>Energy LED2 | Phase A<br>Phase B<br>Phase C<br>System | Active Energy<br>Reactive Energy<br>Apparent Energy | Quadrant 1<br>Quadrant 2<br>Quadrant 3<br>Quadrant 4<br>Import<br>Export<br>Net<br>Total | 20~1000ms   |

## Table 4-21 Acuvim 3 Energy LED Settings

## 4.3.10 TOU Energy Webpage

To access TOU Energy section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Metering from the tab menu.
- 3. Click on the **TOU Energy** menu option. This webpage displays the Time of Use (TOU) Energy information for Acuvim 3.

|                 |                           |           |                      |                       |        |                           |                |         | 🕒 Logout - Wednesday, August | 9, 2023 4:06 PM | About | Settings | Acuvim 3 | ACCUENERGY |
|-----------------|---------------------------|-----------|----------------------|-----------------------|--------|---------------------------|----------------|---------|------------------------------|-----------------|-------|----------|----------|------------|
| Let Metering +  | Dever Quality and Alarm - | "D Logs - |                      |                       |        |                           |                |         |                              |                 |       |          |          |            |
| Metering TOU EN | ergy                      |           |                      |                       |        |                           |                |         |                              |                 |       |          |          |            |
|                 |                           |           |                      | Previous              | Readir | ng Date: 2024-06-26 12:00 |                | 1       | Net                          |                 |       |          |          |            |
|                 |                           |           |                      |                       |        |                           |                |         | EVALUATION 0                 |                 |       |          |          |            |
|                 |                           |           | Tariff Rate          | Net Active Energy kWh | Net    | Reactive Energy kVARh     |                | Appar   | ent Energy kVAh              |                 |       |          |          |            |
|                 |                           |           | T1 - T1              | 121.920               | 115.3  | 331                       |                | 368.82  | 3                            |                 |       |          |          |            |
|                 |                           |           | T2 - T2              | 117.238               | 105.1  | 176                       |                | 342.48  | 2                            |                 |       |          |          |            |
|                 |                           |           | та - та              | 58.423                | 60.53  | 13                        |                | 175.72  | 9                            |                 |       |          |          |            |
|                 |                           |           | T4 - T4              | 123.441               | 107.1  | 154                       |                | 229,85  | 9                            |                 |       |          |          |            |
|                 |                           |           | T5 - T5              | 227.845               | 227.8  | 380                       |                | 715.90  | a                            |                 |       |          |          |            |
|                 |                           |           | T6 - T6              | 0.000                 | 0.000  | >                         |                | 0.000   |                              |                 |       |          |          |            |
|                 |                           |           | 17 - 17              | -5.268                | 0.001  | 1                         |                | 0.277   |                              |                 |       |          |          |            |
|                 |                           |           | та - та              | 0.000                 | 0.000  | 5                         |                | 0.000   |                              |                 |       |          |          |            |
|                 |                           |           | Total                | 643.599               | 624.0  | 076                       |                | 1833.1  | 10                           |                 |       |          |          |            |
|                 |                           |           |                      |                       |        |                           |                |         |                              |                 |       |          |          |            |
|                 |                           |           | Parameter            |                       |        | Value                     | Time           |         |                              |                 |       |          |          |            |
|                 |                           |           | Max Net Active Power | Demand                |        | 38.407 kW                 | 2023-07-27113: | 23:00-0 | 400                          |                 |       |          |          |            |
|                 |                           |           | Max Net Reactive Pow | er Demand             |        | 27.140 KWAR               | 2023-07-27110  | 48:00-0 | 400                          |                 |       |          |          |            |
|                 |                           |           | Max Apparent Power 0 | Demand                |        | 91.785 kWA                | 2023-07-27T06  | 48:00-0 | 400                          |                 |       |          |          |            |
|                 |                           |           |                      |                       |        |                           |                |         | Clear TOU Record             | 6               |       |          |          |            |

Figure 4-23 TOU Energy Readings Webpage

**Energy Readings:** Energy usage up to the current reading date. These energy readings are Net Active Energy, Net Reactive Energy, and Apparent Energy. For comprehensive information on Energy calculation, please refer to chapter 4.3.3.

**Maximum Readings:** Record the peak demand readings for net active power, net reactive power, and apparent power during the TOU period.

### **Configuration Settings**

**Unit Option:** Select preferred energy measurement unit, with choices including VAh/varh/Wh, kVAh/kvarh/kWh, and MVAh/Mvarh/MWh.

Clear TOU Records: Delete all existing TOU energy records.



## 4.3.11 Revenue and Energy TOU Setting

To access TOU setting section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Revenue and Energy** from the tab menu. This webpage displays the TOU configuration for Acuvim 3.

|              |                        |                         | C Logout We   | ednesday, April 2 | 4, 2024 3:04 PM | About Settings A   | cuvim 3 ACCUENERGY  |
|--------------|------------------------|-------------------------|---------------|-------------------|-----------------|--------------------|---------------------|
| Installation | Revenue and Energy     | Power Quality and Alarm | Communication | Data Log/Post     | User Management | Maintenance and Ma | anagement           |
| Revenue a    | and Energy TOU         |                         |               |                   |                 |                    |                     |
|              | Calendars              |                         |               |                   |                 |                    | Add New Calendar    |
|              | 5                      | itart                   | End           |                   |                 | Action             |                     |
|              |                        |                         |               | io Data           |                 |                    |                     |
|              | Reading Dates          |                         |               |                   |                 | 4                  | dd New Reading Date |
|              |                        | Date                    |               |                   | Ac              | tion               |                     |
|              |                        |                         | 5             | io Data           |                 |                    |                     |
|              | Tariff Rates<br>Tariff |                         |               |                   |                 |                    | Add New Tariff Rate |
|              | In                     | dex                     | Lat           | iel               |                 | Action             |                     |
|              |                        |                         | 5             | lo Data           |                 |                    |                     |
|              | Save                   |                         |               |                   |                 |                    |                     |

### Figure 4-24 Empty TOU Energy Settings Webpage

| Index TI 0 Tariff Rate Label Ti Tariff Tare Label Vanimum 22 Christmen |
|--|
| T1 e Tariff Rate Label T1 Tariff Mainum 32 characters                  |
| Tariff Rate Label T1 Tariff Maximum 32 characters                      |
| T1 Tariff<br>Maximum 32 characters                                     |
| Maximum 32 characters  |
|  |



### **Configuration Settings**

Creating a custom tariff rate.

Add New Tariff Rate: This brings up a dialog box to create new tariffs rate.

Index: Acuvim 3 supports up to eight different tariffs rates, ranging from T1 to T8.

Tariff Rate Label: Add a custom tariff name. Users may enter up to 32 characters.



|                             |                         |                         | -                     |                     |                   |
|-----------------------------|-------------------------|-------------------------|-----------------------|---------------------|-------------------|
|                             | 🕑 Logo                  | ut Wednesday, April 24, | 2024 3:26 PM ( About  | Settings Acuvim 3   | ALCUENERG         |
| Installation Revenue and En | Power Quality and Alarm | Communication Dat       | a Log/Post User Manag | ement Maintenance a | nd Management     |
| Revenue and Energy TOU      |                         |                         |                       |                     |                   |
| Enable TOU                  |                         |                         |                       | _                   |                   |
| Calendars                   |                         |                         |                       | A.                  | dd New Calendar   |
| Start                       |                         | End                     |                       | Action              |                   |
|                             |                         | No Data                 |                       |                     |                   |
| Reading Dates               |                         |                         |                       | Add N               | lew Reading Date  |
|                             | Date                    |                         | Action                | n                   |                   |
|                             |                         | No Data                 |                       |                     |                   |
| Tariff Rates                |                         |                         |                       | Adi                 | d New Tariff Rate |
| Tariff                      |                         |                         |                       |                     |                   |
| Index                       | Labo                    | ы                       |                       | Action              |                   |
| TI                          | T1 Tar                  | iff                     |                       | <b>a</b>            |                   |
| T2                          | T2 Tar                  | iff                     |                       | 2                   |                   |
| Т3                          | T3 Tai                  | iff                     |                       | 12                  |                   |
| Т4                          | T4 Tai                  | iff                     |                       | <b>a</b>            |                   |
| Save                        |                         |                         |                       |                     |                   |
|                             |                         |                         |                       |                     |                   |



### Creating a new tariff rate calendar.

Add New Calendar: This redirects the user to a new webpage to create a new calendar for tariff rate configuration.

| Go back to TOU settings       |                     |              |      |     |     |     |     |     |     |      |
|-------------------------------|---------------------|--------------|------|-----|-----|-----|-----|-----|-----|------|
| Use Calendar Forever          |                     | Schedule     |      |     |     |     |     |     | 82  | atch |
| Time Frame                    |                     |              |      | -   |     | -   |     |     |     |      |
| 2024-01-31 00:00 - 2024-02-01 | 00:00               |              | Mon  | Tue | Wed | The | Fri | Sat | Sun |      |
| Tariff                        |                     | 00:00 - 0:30 | TL   |     |     |     |     |     |     | Î    |
| Index                         | Label               | 00:30 - 1:00 | 71   |     |     |     |     |     |     | ш    |
| Т1                            | Tariff 1            | 01:00 - 1:30 | - 11 |     |     |     |     |     |     |      |
| T2                            | Tariff 2            | 01:30 - 2:00 | 71   |     |     |     |     |     |     | 11   |
| Т3                            | Tariff 3            | 02:00 - 2:00 |      |     |     |     |     |     |     | 11   |
| T4                            | Tariff 4            |              |      |     |     |     |     |     |     | 11   |
| Special Days                  | Add New Special Day | 02:30 - 3:00 | - 11 |     |     |     |     |     |     |      |
| * up to 100 special days      |                     | 03:00 - 3:30 | 71   |     |     |     |     |     |     |      |
| Name Date                     | Tariff Rate Action  | 03:30 - 4:00 | 71   |     |     |     |     |     |     |      |
| N                             | o Data              | 04:00 - 4:30 | TI   |     |     |     |     |     |     |      |
| Previous 1 Next 10/ps         | ige Ø               | 04:30 - 5:00 | TI   |     |     |     |     |     |     |      |
|                               |                     | 05:00 - 5:30 | 71   |     |     |     |     |     |     |      |
|                               |                     | 05:30 - 6:00 | - 71 |     |     |     |     |     |     |      |
|                               |                     | 06:00 - 6:30 | TI   |     |     |     |     |     |     |      |
|                               |                     | 06:30 - 7:00 | - 71 |     |     |     |     |     |     |      |
|                               |                     | 07:00 - 7:30 | 71   |     |     |     |     |     |     |      |

Figure 4-27 Default TOU Schedule Window

Time Frame: User can schedule a start and end date range for the measurements.

**Use Calendar Forever:** Check the box to overrides the timeframe from setting an end date allowing the TOU schedule to continue indefinitely.





### Figure 4-28 Time Frame Selection

**Start and End Dates:** Configure the TOU schedule by specifying a start and end date, with time resolution adjusted to the nearest minute.

| up to too special days | -           |          |          | 03.00 | - 3.30   | 100      | 10        | 10    | 100 | - 11 | 10 |  |
|------------------------|-------------|----------|----------|-------|----------|----------|-----------|-------|-----|------|----|--|
| Name Date              | Tariff Rate | Ac       | tion     | 03:30 | - 4:00   |          |           |       |     |      |    |  |
|                        | No Data     |          |          | 04:00 | 0 - 4:30 |          |           |       |     |      |    |  |
| Previous 1 Next        | 10/page 0   |          |          | 04:20 | 5:00     |          |           |       |     |      |    |  |
|                        |             |          |          | 04.00 |          |          |           |       |     |      |    |  |
|                        |             |          | al and a | 05:00 | - 5:30   |          |           |       |     |      |    |  |
|                        |             | Batch Se | chedule  |       |          |          |           | ×     |     |      |    |  |
|                        |             | 🕑 Mon    | 🖸 Tue    | 🕑 Wed | 🕑 Thu    | 🛛 Fri    | 🗆 Sat     | 🗆 Sun |     |      |    |  |
|                        |             | Start    |          | End   |          | Tariff L | abel      |       |     |      |    |  |
|                        |             | 9:00     | ٠        | 5:00  | ٥        | T1 - T   | 'l Tariff | ٠     |     |      |    |  |
|                        |             |          |          |       |          |          |           |       |     |      |    |  |
|                        |             |          |          |       | -        |          | Cancel    | Save  |     |      |    |  |
|                        |             |          |          | 08:30 | 9:00     |          |           |       |     |      |    |  |
|                        |             |          |          | 09:00 | 9:30     |          |           |       |     |      |    |  |
|                        |             |          |          | 09:30 | 0 - 10;  |          |           |       |     |      |    |  |
|                        |             |          |          | 10:00 | - 10:    |          |           |       |     |      |    |  |
|                        |             |          |          | 40.00 |          |          |           |       |     |      |    |  |

## Figure 4-29 Batch Editing Window

**Batch:** Clicking this button opens the batch scheduler. Users can assign predefined tariff rates to specific time periods on any days of the week.



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| Use Calendar Forever    |                     | Schedule     |              |     |     |     |     |      |     |
|-------------------------|---------------------|--------------|--------------|-----|-----|-----|-----|------|-----|
| Time Frame              |                     | 2            | Mon          | Tue | Wad | Thu | Eri | C.11 | Gun |
| 2024-04-01 00:00 - 2024 | -04-19 00:00        |              | mon          | 100 | mea |     |     |      |     |
| Tariff                  |                     | 00:00 - 0:30 | 71           |     |     |     |     |      |     |
| Index                   | Label               | 00:30 - 1:00 | 71           |     |     |     |     |      |     |
| τı                      | T1 Tariff           | 01:00 - 1:30 | 71           |     |     |     |     |      |     |
| T2                      | T2 Tariff           | 01:30 - 2:00 | 71           |     |     |     |     |      |     |
| T3                      | T3 Tariff           | 02:00 - 2:30 | TI.          |     |     |     |     |      |     |
| Special Days            | Add New Special Day | 02:30 - 3:00 | TI           |     |     |     |     |      |     |
| up to 100 special days  |                     | 03:00 - 3:30 | TI           |     |     |     |     |      |     |
| Name Date               | Tariff Rate Action  | 03:30 - 4:00 | 71           |     |     |     |     |      |     |
| _                       | No Data             | 04:00 - 4:30 | n.           |     |     |     |     |      |     |
| Previous 1 Next         | 10/page 6           | 04:30 - 5:00 | 71.          |     |     |     |     |      |     |
|                         |                     | 05:00 - 5:30 | TI           |     |     |     |     |      |     |
|                         |                     | 05:30 - 6:00 | (T1)         |     |     |     |     |      |     |
|                         |                     | 06:00 - 6:30 | TI.          |     |     |     |     |      |     |
|                         |                     | 06:30 - 7:00 | ( <b>n</b> ) |     |     |     |     |      |     |
|                         |                     | 07:00 - 7:30 | - TI-        |     |     |     |     |      |     |
|                         |                     | 07:30 - 8:00 | -m.          |     |     |     |     |      |     |
|                         |                     | 08:00 - 8:30 | - m          |     |     |     |     |      |     |
|                         |                     | 08:30 - 9:00 | 71           |     |     |     |     |      |     |

#### Figure 4-30 TOU Schedule Add New Special Day

Add New Special Day: Users can use this option to create exceptions on specific dates. Up to 100 special days can be created. A dialog box will appear to configure the tariff rate on a specific billing date, select a tariff rate, and enter a custom name for the special day.

| Special Dave             |                     | 02:30 - 3:00  | T1  | TI    | H       | -11 | n | T | 71 |
|--------------------------|---------------------|---------------|-----|-------|---------|-----|---|---|----|
| * up to 100 special days | 400 New Special Day | 03:00 - 3:30  |     |       |         |     |   |   |    |
| Name Date Tariff Rate    | Action              | 03:30 - 4:00  |     |       |         |     |   |   |    |
| No Data                  |                     | 04:00 - 4:30  |     |       |         |     |   |   |    |
| Previous 1 Next 10/page  | Add New Special     | Davs          |     |       | ×       | T   |   |   |    |
|                          | Date                |               |     |       |         | М   |   |   |    |
|                          | 2024-04-24          |               |     |       |         | (T) |   |   |    |
|                          | Tariff Rate Label   |               |     |       |         | ×n. |   |   |    |
|                          | T1 Tariff           |               |     |       | •       | m   |   |   |    |
|                          | Special Days Name   |               |     |       |         | -71 |   |   |    |
|                          | Enter Special Days  | Name          |     |       |         | 11  |   |   |    |
|                          | Name cannot be emp  | ty            |     |       |         | 31  |   |   |    |
|                          |                     |               | Car | cel C | onfirm  | 11  |   |   |    |
|                          |                     | 09:00 - 9:30  | - M | - 11  | <u></u> | TI. |   |   |    |
|                          |                     | 09:30 - 10:   |     |       |         |     |   |   |    |
|                          |                     | 10:00 - 10:   |     |       |         |     |   |   |    |
|                          |                     | 10:30 - 11:   |     |       |         |     |   |   |    |
|                          |                     | 11:00 - 11:30 |     |       |         |     |   |   |    |

Figure 4-31 Add New Special Day

Add New Reading Date: Brings up a dialog box to specify billing cycle dates and establish billing dates.



| • Leg 10: 00 periode ad dys       • Leg 10: 00 per                      |            |                 |             | aa man openia ooy |          |              | -    |        |         |    | 1.00 |  |
|---|------------|-----------------|-------------|-------------------|----------|--------------|------|--------|---------|----|------|--|
| Name         Date         Turiff Rate         Action         0030 - 400         17 <t< td=""><th>* up to 10</th><th>00 special days</th><td></td><td></td><td></td><td>03:00 - 3:3</td><td>0</td><td></td><td></td><td></td><td></td><td></td></t<>   | * up to 10 | 00 special days |             |                   |          | 03:00 - 3:3  | 0    |        |         |    |      |  |
| Next         2024-04-10         11 Jurif         IC         0         0.00 - 4:30         IT         IT <th< td=""><th>Name</th><th>Date</th><td>Tariff Rate</td><td>Action</td><td></td><td>03:30 - 4:0</td><td>0 Th</td><td></td><td></td><td></td><td></td><td></td></th<>   | Name       | Date            | Tariff Rate | Action            |          | 03:30 - 4:0  | 0 Th |        |         |    |      |  |
| Next         Name         Name <th< td=""><th>test</th><th>2024-04-10</th><td>T1 Tariff</td><td>CC 📅</td><td></td><td>04:00 - 4:3</td><td>0 11</td><td></td><td></td><td></td><td></td><td></td></th<>   | test       | 2024-04-10      | T1 Tariff   | CC 📅              |          | 04:00 - 4:3  | 0 11 |        |         |    |      |  |
| Add Kery Special Largin     Add Kery Special Largin     A     H1     H1 </td <th>Previou</th> <th>s 1 Next I</th> <td>0/page 🗢</td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td>m</td> <td></td> <td></td>   | Previou    | s 1 Next I      | 0/page 🗢    |                   | -        |              |      |        |         | m  |      |  |
| Date         A  |            |                 |             | Add New Spec      | cial Day | 15           |      |        | ^       | TI |      |  |
| 2022-0-01 <ul> <li>AP-2224</li> <li>AP-3224</li> <li>AP-3224</li></ul>   |            |                 |             | Date              |          |              |      |        |         | Th |      |  |
| <ul> <li>AP 2223</li> <li>AP 10</li> <li>AP 10</li></ul>   |            |                 |             | 2024-04-01        |          |              |      |        | -       | 71 |      |  |
| Su       Mo       Tu       Wo       Tu       Tu <td< td=""><th></th><th></th><td></td><td>&lt; A0</td><td>r 2024</td><td>&gt;</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>  |            |                 |             | < A0              | r 2024   | >            |      |        |         |    |      |  |
| 7       0       0       10       11       13   |            |                 |             | Su Mo Tu          | We Th    | Fr Sa        |      |        | ٠       |    |      |  |
| 14       16       17       16       19       20       24       26       26       26       27       28       26       27       28       20       1       2       3       4       17<   |            |                 |             | 7 8 9             | 10 11    | 12 13        |      |        |         | m  |      |  |
| 11     12     1     2     3     4       5     6     7     1     0     10     11       0000-830     70     71     71     71     71     71     71       0000-840     70     71     71     71     71     71     71     71       0000-840     71     71     71     71     71     71     71     71       0000-840     71     71     71     71     71     71     71     71  |            |                 |             | 14 15 16          | 17 18    | 19 20        |      |        |         | m  |      |  |
| 5         6         7         8         9         10         11         Cuent         -11         11 </td <th></th> <th></th> <td></td> <td>28 29 30</td> <td>1 2</td> <td>3 4</td> <td></td> <td></td> <td></td> <td>11</td> <td></td> <td></td>   |            |                 |             | 28 29 30          | 1 2      | 3 4          |      |        |         | 11 |      |  |
| 0000-930 43 41 11 11 11 11 11 11 11 11 11 11 11 11  |            |                 |             | 5 6 7             | 8 9      | 10 11        |      | Cancel | Confirm | 79 |      |  |
| 0930-10. 11 11 11 11 11 11 11 11 11 11 11 11 11   |            |                 |             |                   |          | 09:00 - 9:3  | 0 11 | TT     | (W)     | TI |      |  |
| 1000 - 10·  |            |                 |             |                   |          | 09:30 - 10:. |      |        |         |    |      |  |
|   |            |                 |             |                   |          | 10:00 - 10:  |      |        |         |    |      |  |
| 10:30 - 11: The state of the |            |                 |             |                   |          | 10:30 - 11:  | 1    |        |         |    |      |  |

Figure 4-32 Add New Reading Date

# 4.4 Logs

# 4.4.1 SOE Log

To access the SOE Log section,

- 1. Click on **Acuvim 3** from the main menu.
- 2. Select **Logs** from the tab menu.
- 3. Click on the **SOE Log** menu option. This webpage displays the Sequence of Events (SOE) log for Acuvim 3.

| Logs SOELog<br>SOElog                                 |  |
|---|--|
| SOE log   |  |
|   |  |
| AXM-JO2-1 - Online 4                                  |  |
| Timestamp DI1 Status DI2 Status DI3 Status DI4 Status |  |
| 2024-04-24 16:11:56.922 ON OFF OFF OFF                |  |

#### Figure 4-33 SOE Log Webpage

**DI Status Monitoring:** Monitor the digital input status change for Acuvim 3 meter base and extended I/O modules.



## 4.4.2 Trend Log

To access the Trend Log section,

- 1. Click on **Acuvim 3** from the main menu.
- 2. Select **Logs** from the tab menu.
- 3. Click on the **Trend Log** menu option. This webpage displays the trend logs for Acuvim 3 and includes **Realtime Log** and **Energy Log** subsections.

#### **Realtime Log** out Wednesday, April 24, 2024 3:39 PM 🚯 About 🌣 Settings Acuvim 3 ACCUENERGY III Metering + 🏠 Power Quality and Alarm + Logs Trend Log Realtime Log Energy Log Time Frame 2024/04/24 12:00 AM - 2024/04/24 03:38 PM Time Interval 1 hour ۰ Daramete • VLN O VLL O I O P O Q O S O PF O FREQ Realtime 140 V 120 V 100 V 80 V 60 V 40 V 20 V Apr 24th, 2am Apr 24th, 4am Apr 24th, 6am Apr 24th, 8am Apr 24th, 10am Apr 24th, 12pm Apr 24th, 2pm ۵.

Figure 4-34 Trend Log Realtime Log Webpage

A full summary of real-time trend log parameters is listed in the following table.



| Realtime Log             |                                |               |  |  |  |  |  |
|--------------------------|--------------------------------|---------------|--|--|--|--|--|
| Parameter                | Time Frame                     | Time Interval |  |  |  |  |  |
| VLNa, VLNb, VLNc, VLNavg | Last 10 Minutes<br>Last 1 Hour | 1 Minutes     |  |  |  |  |  |
| la,lb,lc,lavg            | Today                          | 15 Minutes    |  |  |  |  |  |
| Pa,Pb,Pc,Psys            | Yesterday                      | 1 Hour        |  |  |  |  |  |
| Qa,Qb,Qc,Qsys            |                                | 15 Minutes    |  |  |  |  |  |
| Sa,Sb,Sc,Ssys            | Last 7 Days                    | 1 Hour        |  |  |  |  |  |
| PFa,PFb,PFc,PFsys        |                                | 1 Day         |  |  |  |  |  |
| Fsys                     | Last 30 days                   | 1 Hour        |  |  |  |  |  |
|                          | This Month                     | 1 Day         |  |  |  |  |  |

### **Table 4-22 Trend Log Parameters**

## **Energy Log**

Acuvim 3 Trend log includes a section for Energy data.



Figure 4-35 Energy Log Webpage



### **Configuration Settings**

**Time Frame:** Users must select a valid date range to populate trend log diagrams with data. If the date range selection is invalid, an error message will appear to indicate that there is no data to generate the trend log.

Data Preview: Shows a preview of the trend log data in tabular format.

| Realtime Log       | Energy Log     |              |                |        |                     |                  |                  |                   |   |
|--------------------|----------------|--------------|----------------|--------|---------------------|------------------|------------------|-------------------|---|
| Time Frame         |                |              |                |        |                     |                  |                  |                   |   |
| 2024/04/11 12:0    | 0 AM - 2024/04 | /11 10:14 AM | v              |        |                     |                  |                  |                   |   |
| Time Interval      |                |              |                |        |                     |                  |                  |                   |   |
| 1 hour             |                | \$           |                |        |                     |                  |                  |                   |   |
| Parameter          |                |              |                |        |                     |                  |                  |                   |   |
| o ep-imp 🔾 ef      | P-EXP O EP-N   | ET 🔿 EP-1    | FOTAL O EQ-IMP | ⊖ EQ-E | EXP O EQ-NET O      | EQ-TO            | AL 🔾 ES          |                   |   |
| Energy<br>Analysis |                |              | EP_IMP_        | kWh 📒  | EP_IMPa_kWh 📕 EP_I  | IMPb_kV          | Vh 📒 EP_IMPc_kWh |                   |   |
| 0.25 kWh           |                |              |                |        |                     |                  |                  |                   |   |
|                    |                |              |                |        |                     |                  |                  |                   |   |
| 0.2 kWh            |                |              |                |        |                     |                  |                  |                   |   |
|                    |                |              |                |        |                     |                  |                  |                   |   |
| 0.15 kWh           |                |              |                |        |                     |                  |                  |                   |   |
|                    |                |              |                |        | Apr 11th 20         |                  |                  |                   |   |
| 0.1 kWh            |                |              |                |        | EP_IMP_kV           | Wh: 0            |                  |                   |   |
|                    |                |              |                |        | EP_IMPa_k EP_IMPb_k | cWh: 0<br>cWh: 0 |                  |                   |   |
| 0.05 kWh           |                |              |                |        | EP_IMPc_k           | Wh: 0            |                  |                   |   |
|                    |                |              |                |        |                     |                  |                  |                   |   |
| 0 kWh              | Apr 11th, 1am  |              | Apr 11th, 3am  |        | Apr 11th, 5am       |                  | Apr 11th, 7am    | <br>Apr 11th, 9am |   |
| Ģ                  | )              |              |                |        |                     |                  |                  |                   | = |

| Data Preview      |              |               |               |               |   |
|-------------------|--------------|---------------|---------------|---------------|---|
| Time              | EQ_EXP_kvarh | EQ_EXPa_kvarh | EQ_EXPb_kvarh | EQ_EXPc_kvarh | Í |
| Jan 25th, 03:57pm | 0.026        | 0.009         | 0.009         | 0.009         |   |
| Jan 25th, 03:58pm | 0.026        | 0.009         | 0.008         | 0.008         |   |
| Jan 25th, 03:59pm | 0.026        | 0.008         | 0.009         | 0.009         |   |
| Jan 25th, 04:00pm | 0.026        | 0.009         | 0.009         | 0.009         |   |
| Jan 25th, 04:01pm | 0.026        | 0.008         | 0.008         | 0.008         |   |
| Jan 25th, 04:02pm | 0.026        | 0.009         | 0.009         | 0.009         |   |
| Jan 25th, 04:03pm | 0.026        | 0.009         | 0.009         | 0.009         |   |
| Jan 25th, 04:04pm | 0.026        | 0.008         | 0.008         | 0.008         | _ |
| Jan 25th, 04:05pm | 0.026        | 0.009         | 0.009         | 0.009         |   |

#### Figure 4-36 Trend Log Data Preview Window



**Download:** Save trend log files as either a PNG image or CSV tabular file format onto a local computer.



Figure 4-37 Trend Log File Download Button

The update time interval varies with different time frames. A full summary of the trend log energy parameters is listed in the following table.

| Energy Log   |                                |                               |  |  |  |  |
|--|--------------------------------|-------------------------------|--|--|--|--|
| Parameter  | Time Frame                     | Time Interval                 |  |  |  |  |
| EP-IMPa, EP-IMPb, EP-IMPc, EP-IMPsys<br>EP-EXPa, EP-EXPb, EP-EXPc, EP-EXPsys   | Last 10 Minutes<br>Last 1 Hour | 1 Minute                      |  |  |  |  |
| EP-Neta, EP- Netb, EP- Netc, EP- Netsys<br>EP-Totala, EP- Totalb, EP- Totalc, EP- Totalsys   | Today<br>Yesterday             | 15 Minutes<br>1 Hour          |  |  |  |  |
| EQ-IMPa, EQ-IMPb, EQ-IMPc, EQ-IMPsys<br>EQ-EXPa, EQ-EXPb, EQ-EXPc, EQ-EXPsys<br>EQ-Neta, EQ- Netb, EQ- Netc, EQ- Netsys<br>EQ-Totala, EQ- Totalb, EQ- Totalc, EQ- Totalsys | Last 7 Days                    | 15 Minutes<br>1 Hour<br>1 Day |  |  |  |  |
|  | Last 30 days<br>This Month     | 1 Hour<br>1 Day               |  |  |  |  |
| ESa, ESb, ESc, Ssys  | Last Year                      | 1 Day<br>1 Month              |  |  |  |  |

### **Table 4-23 Energy Log Parameters**



## 4.4.3 Trend Log Management

To access the Trend Log Management section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select **Logs** from the tab menu.
- 3. Click on the **Trend Log Management** menu option. This webpage displays the trend log management information for Acuvim 3.

Acuvim 3 features a Trend Log Management webpage that enables users to select trend log parameters, log intervals, reading value types, start time, and end time.

| HM Metering - A Power Quality and Alarm - Class -  |
|--|
| Logs Trend Log Management  |
| Log Parameters 🗵   |
| Log Parameter Category   |
| RMS (2024-03-14 - 2024-04-24) C  |
| Not selected Selected  |
| Frequency<br>Line-to-Audral Voltage<br>Line-to-Audra Voltage<br>Current<br>4<br>Correct  |
| Log interval I minute  |
| Log Param Type Detail  tu datatateoro Value  Automum Value  Automum Value  Automum Value |
| Start Time End Time  |
| 2024/03/14   |
| Loo File v   |
|  |

#### Figure 4-38 Trend Log Management Webpage

#### **Configuration Settings**

This webpage provides options to download or clear the trend log. All valid settings, including trend log parameters, log intervals, and reading value types, are listed in the table below.

Generate File: Create a trend log file in 'csv.gz' format with selected parameters and time frame.

**Download:** Save the created trend log file onto a local computer.



Delete: Permanently remove the created trend log file.

Clear Log: Delete all trend log data on Acuvim 3.

A full summary of the Trend Log Management parameters is listed in the following table.

| Log Parameter<br>Category | Parameter   | Log Interval                                   | Log Parameter Type<br>Detail  |
|---------------------------|---|--|---|
| RMS                       | Frequency<br>Line-to-Neutral Voltage<br>Line-to-Line Voltage<br>Current   |  |   |
| Power                     | Active Power<br>Reactive Power<br>Apparent Power<br>Load Nature<br>Power Factor<br>Lead Power Factor<br>Lag Power Factor  | 1-minute<br>5-minute<br>10-minute<br>15-minute | Instantaneous Value   |
| Fundamental               | Fundamental Line-to-Neutral Voltage<br>Fundamental Line-to-Line Voltage<br>Fundamental Current<br>Fundamental Active Power<br>Fundamental Reactive Power<br>Fundamental Apparent Power<br>Displacement Power Factor | 1-hour<br>2-hour<br>6-hour<br>12-hour          | (default)<br>Minimum Value<br>(option)<br>Maximum Value<br>(option) |
| Phase Angle               | VLN Angle<br>VLL Angle<br>Line Current Angle  | 1-day<br>3-day                                 | Average value (option)  |
| THD                       | Voltage THD<br>Voltage THD ODD<br>Voltage THD Even<br>Voltage Crest Factor<br>Current THD<br>Current THD ODD<br>Current THD Even<br>Current Crest-Factor<br>Voltage Flicker   | 7-day<br>1-month                               |   |

### Table 4-24 Trend Log Management Parameters



| Log Parameter<br>Category | Parameter   | Log Interval  | Log Parameter Type<br>Detail                                    |
|---------------------------|---|---|---|
| Unbalance Magnitude       | Voltage Positive Sequence Magnitude<br>Voltage Zero Sequence Magnitude<br>Voltage Negative Sequence<br>Magnitude<br>Voltage Unbalanced Factor<br>Magnitude<br>Current Positive Sequence<br>Magnitude<br>Current Zero Sequence Magnitude<br>Current Negative Sequence<br>Magnitude<br>Current Zero Ratio Magnitude<br>Current Unbalanced Factor<br>Magnitude   | 1-minute<br>5-minute                                    |   |
| Unbalance Angle           | Voltage Positive Sequence Angle<br>Voltage Zero Sequence Angle<br>Voltage Negative Sequence Angle<br>Current Positive Sequence Angle<br>Current Zero Sequence Angle<br>Current Negative Sequence Angle  | 10-minute<br>15-minute<br>30-minute<br>1-hour           | Instantaneous Value<br>(default)                                |
| Energy                    | Active Energy – Quad 1<br>Reactive Energy –Quad 1<br>Apparent Energy – Quad 2<br>Reactive Energy – Quad 2<br>Reactive Energy – Quad 2<br>Apparent Energy – Quad 2<br>Active Energy – Quad 3<br>Reactive Energy – Quad 3<br>Apparent Energy – Quad 4<br>Reactive Energy – Quad 4<br>Reactive Energy – Quad 4<br>Apparent Energy – Quad 4<br>Apparent Energy – Quad 4<br>Active Energy – Net<br>Reactive Energy-Net<br>Reactive Energy-Net<br>Active Energy-Total<br>Reactive Energy-Total<br>Apparent Energy | 6-hour<br>12-hour<br>1-day<br>3-day<br>7-day<br>1-month | (option)<br>Maximum Value<br>(option)<br>Average Value (option) |





| Log Parameter<br>Category | Parameter   | Log Interval  | Log Parameter Type<br>Detail   |
|---------------------------|---|---|--|
| Demand                    | Current Demand<br>Active Power Demand-Quad1<br>Reactive Power Demand-Quad1<br>Apparent Power Demand-Quad2<br>Reactive Power Demand-Quad2<br>Apparent Power Demand-Quad2<br>Apparent Power Demand-Quad3<br>Reactive Power Demand-Quad3<br>Apparent Power Demand-Quad3<br>Apparent Power Demand-Quad4<br>Reactive Power Demand-Quad4<br>Reactive Power Demand-Quad4<br>Apparent Power Demand-Quad4<br>Apparent Power Demand-Import<br>Reactive Power Demand- Import<br>Reactive Power Demand- Import<br>Reactive Power Demand- Export<br>Reactive Power Demand- Export<br>Reactive Power Demand- Net<br>Reactive Power Demand- Net<br>Active Power Demand- Net<br>Active Power Demand- Net<br>Active Power Demand- Total<br>Reactive Power Demand- Total<br>Apparent Power Demand | 1-minute<br>5-minute<br>10-minute<br>30-minute<br>30-minute<br>1-hour<br>2-hour<br>6-hour<br>12-hour<br>12-hour<br>1-day<br>3-day<br>7-day<br>1-month | Instantaneous Value<br>(default)<br>Minimum Value<br>(option)<br>Maximum Value<br>(option)<br>Average Value (option) |

## 4.4.4 Data Log

To access the Data Log section,

- 1. Click on **Acuvim 3** from the main menu.
- 2. Select **Logs** from the tab menu.
- 3. Click on the **Data Log** menu option. This webpage displays the data logs for Acuvim 3.

Acuvim 3 allows users to add up to 15 data loggers for various parameters and requirements. The logged data can be downloaded as a CSV file from the Data Log webpage under the logs section or by using a HTTP/FTP client. For comprehensive information on data post, please refer to chapter 8.





# Site Map and Metering

|     |   |  | F Locout     | Wednesdav. April 24. 2024 4: | 35 PM 🚯 About | 🛱 Settings | Acuvim 3    | ACCUENERGY |
|-----|---|--|--------------|------------------------------|---------------|------------|-------------|------------|
|     | Lill Metering 👻                         | $\ensuremath{\bigcirc}$ Power Quality and Alarm $ \ensuremath{\checkmark}$ | 🕤 Logs       | •                            |               |            |             |            |
| Lo  | <b>998</b> Data Log                     |  |              |                              |               |            |             |            |
| Dat | <b>talog</b><br>Datalog 1 - Default Res | ltime 🗢  |              |                              |               |            |             |            |
|     | D File Update                           |  |              |                              |               |            |             | Size       |
|     | ASP22100025-                            | DefaultRealtime-2024-03-08T00  | -00-00-1day- | backup.csv.gz 🛓              |               | 2024-04-   | 24 15:55:05 | 10 кв      |
| P   | revious 1 Nex                           | t 25/page ÷  |              |                              |               |            |             |            |

#### Figure 4-39 Data Log Webpage

#### **Configuration Settings**

Delete Selected: Users can delete selected data log records.

Clear DataLog: Allow users to delete all data log data on the selected data logger.

## 4.4.5 Event Log

To access the Event Log section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Logs from the tab menu.
- 3. Click on the **Event Log** menu option. This webpage displays the event logs for users to monitor the activities of the Acuvim 3.



| HI Me    | stering 👻 🛕 Power Quality and A | Alarm - 🕤 Logs - |        |                                |
|----------|---------------------------------|------------------|--------|--------------------------------|
| Logs e   | vent Log                        |                  |        |                                |
| Event L  | .og                             |                  |        |                                |
| Time Fra | ame                             |                  | Level  |                                |
| Enter T  | îme Frame                       |                  | - Sele | t Level O                      |
| Search   | Reset                           |                  |        |                                |
| ID       | Timestamp                       | Source           | Level  | Message                        |
| 334      | 2024-04-24 14:47                | WebServer        | Info   | User admin login               |
| 333      | 2024-04-24 08:10                | System           | Info   | System booted up successfully. |
| 332      | 2024-04-24 08:03                | System           | Info   | System booted up successfully. |
| 331      | 2024-04-24 07:56                | System           | Info   | System booted up successfully. |
| 330      | 2024-04-24 07:49                | System           | Info   | System booted up successfully. |
| 329      | 2024-04-24 07:47                | System           | Info   | System restarts                |
| 328      | 2024-04-24 07:39                | System           | Info   | System booted up successfully. |
| 327      | 2024-04-24 07:32                | System           | Info   | System booted up successfully. |
| 326      | 2024-04-24 07:25                | System           | Info   | System booted up successfully. |
| 325      | 2024-04-24 07:18                | System           | Info   | System booted up successfully. |

#### Figure 4-40 Event Log Webpage

### **Configuration Settings**

Timeframe: Set a specific period to filter event logs.

Level: Designate the event's severity level, including options 'Critical', 'Error', and 'Info'.

Export Logs: User can click this button to download the event log as a CSV file.

Clear Logs: User can click this button to clear all the existing event logs.

# **4.5 General Settings**

## 4.5.1 General Configuration

To access the General Setting section,

- 1. Click on **Settings** from the main menu.
- 2. Select Installation from the tab menu.
- 3. Click on the General menu option. This webpage displays the general settings for Acuvim 3.

The General Settings webpage includes common measurement configurations for Acuvim 3 meter. Users should configure these settings right after installation and before commissioning.



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# Site Map and Metering

| Installation Revenue and Energy Power Q  | uality and Alarm Comm                         | unication Data Log/Po  | st User Management                               | Maintenance and Managem |
|--|---|--|--|-------------------------|
| Installation General   |   |  |  |                         |
|  |   |  |  |                         |
| General IO   |   |  |  |                         |
| Device Description   |   |  |  |                         |
| Acuvim 3   |   |  |  |                         |
| Aakmum 16 characters   |   |  |  |                         |
| Service Configuration -  |   |  |  |                         |
| 3 ELEMENT 4 WIRE Y   |   |  |  | ٠                       |
|  |   |  |  |                         |
| Nominal Settings   |   |  |  |                         |
| Nominal Voltage  | Nominal Current                               |  | Nominal Frequency                                |                         |
| 120 V<br>Received 50 - 500000  | 5   | A  | 50Hz   | •                       |
| Alige. 00 - 000000   |   |  |  |                         |
| PT and CT 👻  |   |  |  |                         |
| PT Input   |   | PT Output  |  |                         |
| 120  | v   | 120  |  | v                       |
| Range: 50 - 500000   |   | Range: 50 - 600  |  |                         |
| CT Input   |   | CT Output  |  |                         |
| 5  | A   | 5  |  | • A                     |
| Range: 1 - 50000   |   |  |  |                         |
|  |   |  |  |                         |
| Calculated   | •   |  |  |                         |
| Current Directions v   |   |  |  |                         |
| la   | lb  |  | lc   |                         |
| Positive   | Positive                                      | •  | Positive   | •                       |
|  |   |  |  |                         |
| Demand Settings +  |   |  |  |                         |
| Algorithm  | Demand Interval                               | Lange of the second sec |  |                         |
| Fixed Window 0   | 1<br>Rator 1-60                               | min  |  |                         |
|  |   |  |  |                         |
| Calculation Method 👻   |   |  |  |                         |
| PF Convention  | Reactive Power Calcula                        | tion Method  | Energy Calculation Me                            | thod                    |
| IEC<br>IEEE  | <ul> <li>Generalized</li> <li>True</li> </ul> |  | <ul> <li>Generic</li> <li>Fundamental</li> </ul> |                         |
| Harmonic Sattings =  |   |  |  |                         |
| the second secon |   |  |  |                         |
| Armonic type   | Group Group                                   |  |  |                         |
| Inter-harmonic   | Sub-group                                     |  |  |                         |
| Flicker Settings 👻   |   |  |  |                         |
| Dicible  |   |  |  |                         |
| Distric  |   |  |  |                         |
| Phase Order Settings 👻   |   |  |  |                         |
|  |   |  |  |                         |

## Figure 4-41 General Settings Webpage

#### **Device Description**

| Acuvim3_Demo          |  |
|-----------------------|--|
| Maximum 15 characters |  |

Figure 4-42 Device Description





**Device Description:** Description for the Acuvim 3 up to 15 characters. The device description will be displayed on the 'About Information' webpage.

#### **Service Configuration**

Acuvim 3 supports five service configurations, in addition to one Demo mode (3-Element 4-Wire Y). For comprehensive information on service configuration and wiring, please refer to chapter 2.

| Service Configuration 🔍                                      |  |    |
|--|--|----|
| 3 ELEMENT 4 WIRE Y   |  | \$ |
| Select<br>1 ELEMENT 2 WIRE                                   |  |    |
| 2 ELEMENT 3 WIRE 1 PHASE                                     |  |    |
| 2 ELEMENT 3 WIRE DELTA – 2CT<br>2 ELEMENT 3 WIRE DELTA – 3CT |  |    |
| 3 ELEMENT 4 WIRE Y<br>Demo(3 ELEMENT 4 WIRE Y)               |  |    |

#### Figure 4-43 Service Configuration Selection

**Service Configuration:** The wring configuration of the system. For comprehensive information on wiring configuration, please refer to Chapter 2.

**NOTE:** Demo mode is a configuration option for demonstration purposes, no physical wiring is required.

### **Nominal Settings**

| Nominal Settings 🐨 |   |                 |   |                   |    |  |  |  |
|--------------------|---|-----------------|---|-------------------|----|--|--|--|
| Nominal Voltage    |   | Nominal Current |   | Nominal Frequency |    |  |  |  |
| 240                | V | 10              | A | 60Hz              | \$ |  |  |  |
| Range: 50 - 500000 |   |                 |   |                   |    |  |  |  |

#### Figure 4-44 Nominal Settings Window

**Nominal Voltage:** The original voltage value measured across its primary winding. For example, if the potential transformer's (PT) ratio is 600V:120V, the nominal voltage should be set to 600V. The default nominal voltage is 120V.

**Nominal Current:** The original current value measured across its primary winding. For example, if the current transformer's (CT) ratio is 300A:5A, the nominal current should be set to 300A. The default nominal current is 5A.




**Nominal Frequency:** The standard frequency at which the monitored electrical system is designed to operate.

### PT and CT

| PT and CT 👻        |    |                 |   |
|--------------------|----|-----------------|---|
| PT Input           |    | PT Output       |   |
| 120                | v  | 120             | V |
| Range: 50 - 500000 |    | Range: 50 - 600 |   |
| CT Input           |    | CT Output       |   |
| 5                  | А  | 5               | А |
| Range: 1 - 50000   |    |                 |   |
| In Method          |    |                 |   |
| Calculated         | \$ |                 |   |
|                    |    |                 |   |

### Figure 4-45 PT/CT Ratios Settings Window

**PT Input:** If using potential transformers with the Acuvim 3 at the voltage input, this setting refers to the primary side rating of the transformer. The range is from 50-500000. If PTs are not being used with the Acuvim 3, this setting can be left as the default, which is 120. PT Input must be an integer.

**PT Output:** If using potential transformers with the Acuvim 3 at the voltage input, this setting refers to the secondary side rating of the transformer. The range is from 50-600. If PTs are not being used with the Acuvim 3, this setting can be left as the default, which is 120.0. PT Output must be an integer.

**CT Input:** The primary side rating of the current transformers being used with the Acuvim 3. For example, if the CTs being used have a ratio of 200:5A, the CT Input setting should be configured as 200. The allowable range for the CT Input setting is from 1 to 50000. The default CT Input value is 5. CT Input must be an integer.

**CT Output:** The secondary output of the current transformers. By default, the CT Output setting is already configured based on the current input type for the Acuvim 3 Acuvim 3. For example, the CT Output value will be configured to 5 for a 5A current input Acuvim 3, 333 for a 333mV current input Acuvim 3, and RCT for an RCT current input Acuvim 3.

**In Method:** Readings on Acuvim 3 can be set as either calculated or measured. When it is in measured mode, physical wiring needs to be applied. If it is in calculated mode, the calculation is based on KCL, the neutral current is the vector sum of the three individual live currents.





### **Current Directions**

| Current Directions 💌 |                |   |          |    |
|----------------------|----------------|---|----------|----|
| la                   | lb             |   | lc       |    |
| Positive             | \$<br>Positive | • | Positive | \$ |

### Figure 4-46 Current Direction Settings Window

The Acuvim 3 supports a setting that allows users to change the current direction in the Acuvim 3. This feature is beneficial if the CT has been installed in the reverse direction or if the leads have been terminated with reverse polarity at the Acuvim 3.

**La, lb, lc:** By default, the current direction is configured as positive for Ia, Ib and Ic. Changing the current direction to negative adjusts the phase angle of the current by 180 degrees, allowing for correct adjustment in an installation error.

### **Demand Settings**

| Demand Settings 🔻 |                 |     |
|-------------------|-----------------|-----|
| Algorithm         | Demand Interval |     |
| Fixed Window      | 5               | min |
|                   | Range: 1 - 60   |     |

### Figure 4-47a Demand Settings - Fixed Window

| Demand Settings 👻 |   |                 |     |   |
|-------------------|---|-----------------|-----|---|
| Algorithm         |   | Demand Interval |     | Update Interval   |
| Sliding Window 🗘  | ך | 5               | min | 1   |
|                   |   | Range: 1 - 60   |     | Must evenly divide 5<br>Must be less than or equal to 5 |

### Figure 4-47b Demand Settings - Sliding Window

Demand Algorithm Fixed Window: Calculated based on the demand interval.

**Demand Algorithm Sliding Window:** Calculated based on the demand interval and the update interval.

**Demand Interval:** The demand window length that is used in the demand calculation method. The default is 5-minutes, and the range is from 1 to 60 minutes.





**Update Interval:** The demand calculation intervals. The default is 1 minute, and range is from 1 to 15 minutes.

### **Calculation Method**

| Calculation Method 🐨 |                                   |                                 |
|----------------------|-----------------------------------|---------------------------------|
| PF Convention        | Reactive Power Calculation Method | Energy Calculation Method       |
| O IEC                | <ul> <li>General</li> </ul>       | <ul> <li>Generic</li> </ul>     |
| ○ IEEE               | ○ True                            | <ul> <li>Fundamental</li> </ul> |

### Figure 4-48 Calculation Method Settings Window

PF Convention IEC: Power factor is dependent on the direction of the real power flow.

**PF Convention IEEE:** Power factor is dependent on the nature of the load (i.e. capacitive, inductive).

Reactive Power Calculation Method: There are two ways to calculate reactive energy (power).

**True Method:** This method uses the Budeanu Concept to calculate the True reactive Power. This method generally uses the harmonic components to do the calculation instead of using the power vector triangle method. The most common definition of reactive power is Budeanu's definition, given by following expression for single phase circuit:

$$Q_b = \sum_{k=1}^{+\infty} I_{k,RMS} \cdot V_{k,RMS} \cdot \sin(\theta_k - \psi_k)$$

Where k represent the n<sup>th</sup> order harmonic and  $(\theta_k - \psi_k)$  represent the phase-shift.

Budeanu proposed that apparent power consists of two orthogonal components, active power and nonactive power, which are divided into reactive power and distortion power:

$$D_b = \sqrt{S^2 - P^2 - Q_b^2}$$

Where

$$P = UI\cos(\varphi), S = ||U|| \times ||I||$$





**Generalized Method:** The method uses Fryze's concept to calculate the Generalized reactive power. This method separates instantaneous current into two components, active and reactive currents. Active power and reactive power are calculated as:

$$P = V_{RMS} \times I_a$$
$$Q_f = V_{RMS} \times I_r$$

Where  $I_a$  and  $I_r$  represents RMS values of instantaneous active and reactive currents.

$$I_a(t) = \frac{P}{V_{RMS}^2} v(t)$$
$$I_r(t) = i(t) - i_a(t)$$

Active and reactive powers are as follows, where Ia and Ir represents RMS values of instantaneous active and reactive currents:

**Energy Calculation Method:** Users can configure the energy type as either fundamental or generic (fundamental + harmonics).

# **Harmonic Settings**

| Harmonic Settings 💌            |                        |
|--------------------------------|------------------------|
| Harmonic Type                  | Harmonic Group Type    |
| • Harmonic<br>O Inter-harmonic | ● Group<br>○ Sub-group |

### Figure 4-49 Harmonic Settings Window

Harmonic Type: Acuvim 3 supports harmonic and inter-harmonic fundamental frequencies.Harmonic Group Type: Acuvim 3 supports two harmonic group types: Group and Sub-group.

| Flicker Settings  |    |
|---|----|
| Flicker Settings 📼  |    |
| Disable   | \$ |
| Select Enable<br>Disable  |    |
| Automatic<br>120V-50Hz-60W Incandescent<br>230V-50Hz-60W Incandescent<br>120V-60Hz-60W Incandescent<br>230V-60Hz-60W Incandescent |    |

### Figure 4-50 Flicker Settings Window





For Flicker calculations, Acuvim 3 allows users to select from the dropdown list nominal values of voltage and frequency. If the user selects the 'Automatic' option, Acuvim 3 will check its nominal settings and automatically match one of the options from the dropdown menu.

### **Phase Order Settings**

| Order Settings 👻 |  |
|------------------|--|
|                  |  |
|                  |  |

#### Figure 4-51 Phase Order Settings Window

Phase order signifies the sequence in which the voltage waveforms of a multi-phase system reach their peak values. In Acuvim 3, users can choose from the dropdown list a phase order based on their specific conditions, opting for either ABC or ACB.



Figure 4-52 Phase Order ABC and ACB

The phase order configuration will only affect the evaluation of the symmetric sequence of the three-phase system. This change will only impact the sequence diagram and display of sequence parameters; it will not affect the phase angle readings.

### **Moving Average Frequency**

| Moving Average Frequency 💌  |       |  |       |  |
|---|-------|--|-------|--|
| Moving Average Window Length  |       | Moving Average Update Rate   |       |  |
| 5   | cycle | 0.5  | cycle |  |
| Must be multiple of 0.5<br>must be corrected to up to 3 decimal places<br>Range: 0.5 - 50 |       | Must be multiple of 0.5<br>must be corrected to up to 3 decimal places<br>Range: 0.5 - 5 |       |  |

### Figure 4-53 Moving Average Frequency Settings Window





In Acuvim 3, the frequency is determined using a specialized moving average algorithm. This algorithm, tailored for specific applications, contributes to smoothing frequency readings, mitigating noise, and improving the resolution for abnormal frequency detection.

**Moving Average Window Length:** Ranges from 0.5 to 50 cycles. The number must be a multiple of 0.5. Must be corrected to up to 3 decimal places.

**Moving Average Update Rate:** Ranges from 0.5 to 5 cycles. The number must be a multiple of 0.5. Must be corrected to up to 3 decimal places.

### 4.5.2 HMI

To access the HMI section,

- 1. Click on **Settings** from the main menu.
- 2. Select **HMI** from the tab menu. This webpage displays the HMI settings for Acuvim 3 and includes subsections **Module Information** and **Configuration**.

| Installation Revenue and Energy Power Quality and Alam | m Communication Data Log/Post User Management Maintenance and Management MMI |                            |
|--|--|----------------------------|
| HMI Module Information                                 |  |                            |
|  | Module Information Configuration   |                            |
|  | HMI Model  | Acuvim-3-HMI               |
|  | HMI Serial Number  | A\$A23040138               |
|  | Device Description   | HMI of Power Quality Meter |
|  | HMI Hardware Version   | 105                        |
|  | HMI Firmware Version   | v0.05                      |
|  |  |                            |

### Figure 4-54 HMI Information Webpage

| Module Information Configuration |                   |
|----------------------------------|-------------------|
| Screen-On time                   | Screen Brightness |
| 60                               | 10                |
| Range: 0 - 120                   | Range: 0 - 10     |
| Save                             |                   |

Figure 4-55 HMI Setting Webpage

### Configuration

**Screen-On Time:** Set the duration before the Acuvim 3 reverts to the dashboard screen. Default setting is 60 minutes, adjustable from 1 to 120 minutes.

**Screen Brightness:** Set the backlight brightness of the display. Default brightness is level 10, with an adjustable range from 0 to 10.





# Chapter 5: Acuvim 3 Display Screen

# 5.1 Acuvim 3 Screen Overview

The Acuvim 3 screen allows users to view real-time status updates, power quality, and metering data readings, along with management of core meter functions.



### Figure 5-1 Home Screen

# Table 5-1 Acuvim 3 Display Screen Information

| A | Status Icons             | See Table 5-2.   |
|---|--------------------------|--|
| В | Date and Time            | Shows current date and time of the meter.  |
| С | Navigation Menu<br>Tiles | The Acuvim 3 Home screen features a set of nine user-friendly menu tiles<br>categorized as Metering, Energy/Demand, Visualization, Trend, Waveform,<br>Power Quality, Input/Output, Dashboard, and User Center.                          |
| D | Status LED               | When this LED is not illuminated, it indicates the meter is either off with no<br>power or communication with the Acuvim 3 screen is lost.<br>A flashing green LED light indicates the meter is operational and functioning<br>normally. |
| E | Alarm LED                | When this LED is not illuminated, it indicates no alarm or power quality event<br>triggered.<br>A flashing red LED light indicates an alarm monitor, or a power quality event<br>is triggered.   |
| F | Home Button              | Takes user back to the Home menu screen, as shown in Figure 5-1.   |
| G | Energy1 LED              | Colour Orange.<br>Blinking orange LED light indicates it is synchronous with the generation of<br>energy pulses.   |
| н | Energy2 LED              | Colour Invisible (900nm infrared).<br>Synchronously blinks with the generation of energy pulses.   |





| Icon                                      |                                     | Description  |
|---|-------------------------------------|--|
| (((.                                      | Wi-Fi Enable Indicator              | When the icon is present, Wi-Fi is enabled.  |
|   | Ethernet Connection<br>Indicators   | lcon appears when Ethernet 1 and/or<br>Ethernet 2 ports are connected.   |
| IOI-1 IOI-2<br>IO2-1 IO2-2<br>IO3-1 IO3-2 | I/O Module Connection<br>Indicators | These icons will appear when<br>corresponding I/O modules are<br>connected.<br>Users can install up to three I/O<br>modules, each with a unique logic<br>number. |

**Table 5-2 Status Icon Description** 

### **Loading Screen**

When the Acuvim 3 is powered on a loading screen will appear until a connection is established. This may take several of minutes. The loading screen is shown below.



Figure 5-2 Loading Screen



# 5.2 Metering

# 5.2.1 Realtime Screen

To access the Realtime screen,

- 1. From the Home screen, select **Metering** menu tile.
- 2. Realtime screen will appear in the display and the menu tab will be highlighted to indicate which section the user is currently viewing.

| Realtime                 | Unbaland            | e THI    |         |         | Max/Min |        |
|--------------------------|---------------------|----------|---------|---------|---------|--------|
| Param                    | eter                | Phase A  | Phase B | Phase C | Average | System |
| Line-to-N<br>Voltage     | leutral<br>e (v)    | 120.1610 | 120.105 | 120.160 | 120.142 |        |
| Line-to-N<br>Voltage Pha | leutral<br>se Angle | 0.0000   | 239.994 | 120.009 |         |        |
| Line-to-Line             | Voltage (v)         | 208.0820 | 208.060 | 208.134 | 208.092 |        |
| Line-to-Line<br>Phase A  | e Voltage<br>.ngle  | 29.9900  | 270.009 | 150.005 |         |        |
| Curren                   | <b>t</b> (A)        | 1.0010   | 1.001   | 1.001   | 1.001   |        |
| Current Pha              | se Angle            | 0.0070   | 240.016 | 120.010 |         |        |

Figure 5-3 Realtime Screen

The Acuvim 3 screen features real-time readings of the system. Use the touch screen to scroll down to view different parameters; touch the edit icon 🖻 located in the top right corner of the screen to choose which parameters should be shown. A minimum of three parameters is required for selection. For comprehensive information on real-time parameters, refer to Chapter 4.3.1.

# 5.2.2 Unbalance Screen

To access the Unbalance screen,

- 1. From the Home screen, select Metering menu tile.
- 2. Select **Unbalance** from the menu tab.





Figure 5-4 Unbalance Screen

The Acuvim 3 screen features unbalance calculations of the system. For comprehensive information on unbalance parameters, refer to Chapter 4.3.7.

# 5.2.3 THD Screen

To access the THD screen,

- 1. From the Home screen, select Metering menu tile.
- 2. Select **THD** from the menu tab.

| Realtime    | Unbalance    | THD     | Harmonics | Max/Min | = |
|-------------|--------------|---------|-----------|---------|---|
| Parar       | meter        | Phase A | Phase B   | Phase C |   |
| Voltage     | THD %        | 2.739   | 3.448     | 4.241   |   |
| Voltage T   | HD Odd %     | 1.193   | 1.663     | 2.157   |   |
| Voltage Th  | HD Even %    | 2.465   | 3.021     | 3.651   |   |
| Voltage Cre | est Factor % | 0.696   | 0.701     | 0.697   |   |
| Current     | THD %        | 2.780   | 3.495     | 4.287   |   |
| Current T   | HD Odd %     | 1.240   | 1.712     | 2.204   |   |
|             |              |         |           |         |   |

### Figure 5-5 THD Screen

The Acuvim 3 screen features total harmonic distortion (THD) of the system. Use the touch screen to scroll down to view different parameters; touch the edit icon 🗎 located in the top right corner of the screen to choose which parameters should be shown. A minimum of three parameters is required for selection. For comprehensive information on THD parameters, refer to Chapter 4.3.5.





# 5.2.4 Harmonics Screen

To access the Harmonics screen,

- 1. From the Home screen, select Metering menu tile.
- 2. Select Harmonics from the menu tab.

|                   | Unbalance       | THD           | Harmonics   | Max/Min                |
|-------------------|-----------------|---------------|-------------|------------------------|
| Harmonic<br>Order | Phase A         | Phase B       | Phase       | C Voltage Current      |
|                   |                 |               | H           | armonic Type: Harmonic |
| 2                 | 0.000%∠0.000°   | 0.000%∠0.00   | 0.000%∠0    | 0.000°                 |
| 3                 | 0.000%∠0.000°   | 0.000%∠0.00   | 0.000%∠0    | ).000°                 |
| 4                 | 0.000%∠0.000°   | 0.000%∠0.00   | 0° 0.000%∠0 | ).000°                 |
| 5                 | 0.000%∠0.000°   | 0.000%∠0.00   | 0.000%∠0    | 0.000°                 |
| 6                 | 0.000%∠0.000°   | 0.000%∠0.00   | 0.000%∠0    | ).000°                 |
| 7                 | 0.000% ( 0.000% | 0.000% / 0.00 |             | 000°                   |

Figure 5-6 Harmonics Screen

The Acuvim 3 screen features a Harmonic diagram of the system. Use the touch screen to scroll down to view harmonic values of different orders. Users can choose to display the data as voltage harmonics or current harmonics by selecting the Voltage or Current toggle near the top right corner of the screen. For comprehensive information on harmonic parameters, refer to Chapter 4.3.6.

# 5.2.5 Max/Min Screen

To access the Max/Min screen,

- 1. From the Home screen, select Metering menu tile.
- 2. Select Max/Min from the menu tab.



| Realtime       | Unbalance | THD    | Harmonio                     | s Max/  | 'Min ⑦ ≔                     |
|----------------|-----------|--------|------------------------------|---------|------------------------------|
| Parameter      | Item      | Min    | Min Time                     | Max     | Max Time                     |
| Frequency (Hz) | Total     | 40.000 | 2024-01-10T<br>09:57:14-0500 | 150.115 | 2024-01-11T<br>10:12:00-0500 |
|                | Average   | 0.000  | 2023-10-26T<br>16:40:20-0400 | 300.329 | 2024-01-23T<br>09:45:18-0500 |
| Line-to-Neutra | Phase A   | 0.000  | 2023-10-26T<br>16:40:20-0400 | 301.094 | 2024-01-12T<br>15:23:15-0500 |
| Voltage (v)    | Phase B   | 0.000  | 2023-10-26T<br>16:40:20-0400 | 300.867 | 2024-01-12T<br>15:33:12-0500 |
|                | Phase C   | 0.000  | 2023-10-26T<br>16:40:20-0400 | 301.542 | 2024-01-12T<br>15:32:48-0500 |
|                | Average   | 0.000  | 2023-10-26T                  | 520.185 | 2024-01-23T                  |

Figure 5-7 Max/Min Screen

The Acuvim 3 screen features maximum and minimum values of the records in the system. Use the touch screen to scroll down to view different parameters; touch the edit icon 🗎 located in the top right corner of the screen to choose which parameters should be shown. A minimum of three parameters is required for selection. For comprehensive information on max/min, refer to Chapter 4.3.4.



Figure 5-8 Max/Min Parameters Selecting Screen

# 5.3 Energy/Demand

# 5.3.1 Import/Export Screen

To access the Import/Export screen,

- 1. From the Home screen, select Energy/Demand menu tile.
- 2. Select Import/Export from the menu tab.





| Import/Export      | Quadrai      | nt Tou E |         | Demand  | @ ≔    |
|--------------------|--------------|----------|---------|---------|--------|
| Paramete           | er           | Phase A  | Phase B | Phase C | System |
| Active Energy-Im   | port (kWh)   | 19.488   | 19.480  | 19.481  | 58.449 |
| Reactive Energy-Ir | nport (varh) | 0.000    | 0.000   | 1.510   | 1.540  |
| Active Energy-Ex   | (port (Wh)   | 0.000    | 0.870   | 0.870   | 1.750  |
| Reactive Energy-E  | xport (varh) | 2.020    | 3.360   | 2.410   | 7.840  |
| Active Energy-N    | let (kWh)    | 19.488   | 19.479  | 19.480  | 58.448 |
| Reactive Energy-   | Net (varh)   | -1.990   | -3.350  | -0.890  | -6.280 |
|                    |              |          |         |         |        |

Figure 5-9 Import/Export Screen

The Acuvim 3 screen features the import and export energy calculation of the system. Use the touch screen to scroll down to view different parameters; touch the edit icon 🖻 located in the top right corner of the screen to choose which parameters should be shown. A minimum of three parameters is required for selection. A dialog box will appear as shown in Figure 5-11. Select Save when complete.

Reset: Click on reset icon 🕑 allows users to reset digital input records.

For detailed annotations for each parameter, refer to Chapter 4.3.3, and for more information on quadrant energy, refer to Chapter 4.3.3.4.

# 5.3.2 Quadrant Screen

To access the Quadrant screen,

- 1. From the Home screen, select Energy/Demand menu tile.
- 2. Select **Quadrant** from the menu tab.

| Import/Export     | Quadrar      | nt   | Tou l |         |         | ٢      |   |
|-------------------|--------------|------|-------|---------|---------|--------|---|
| Paramete          | er           | Pha  | se A  | Phase B | Phase C | System | า |
| Active Energy-Qu  | ad 1 (Wh)    | 129. | 730   | 113.490 | 147.860 | 391.15 | 0 |
| Reactive Energy-Q | uad 1 (varh) | 0.0  | 00    | 0.000   | 0.000   | 0.020  |   |
| Apparent Energy-Q | uad 1 (VAh)  | 129. | 730   | 113.490 | 147.860 | 391.15 | 0 |
| Active Energy-Qu  | ad 2 (Wh)    | 0.0  | 00    | 0.000   | -0.870  | -0.870 | D |
| Reactive Energy-Q | uad 2 (varh) | 0.0  | 00    | 0.000   | 1.510   | 1.510  |   |
| Apparent Energy-Q | uad 2 (VAh)  | 0.0  | 00    | 0.000   | 1.740   | 1.740  |   |

Figure 5-10 Quadrant Screen





The Acuvim 3 screen features a quadrant energy calculation of the system. Use the touch screen to scroll down to view different parameters. Touch the edit icon 🖻 located in the top right corner of the screen to choose which parameters should be shown. A minimum of three parameters is required for selection. A dialog box will appear as shown in Figure 5-11. Select Save when complete.

Reset: Click on reset icon 🥑 allows users to reset digital input records.

For detailed annotations for each parameter, refer to Chapter 4.3.3, and for more information on quadrant energy, refer to Chapter 4.3.3.4.



Figure 5-11 Quadrant Parameter Selecting Screen

# 5.3.3 TOU Energy Screen

To access the TOU Energy screen,

- 1. From the Home screen, select Energy/Demand menu tile.
- 2. Select TOU Energy from the menu tab.

| Import/Export                  | Quadrant    | Tou Energy     | Demand |       |  |  |  |  |  |
|--------------------------------|-------------|----------------|--------|-------|--|--|--|--|--|
| Keading Date: 2024-05-16 13:00 |             |                |        |       |  |  |  |  |  |
| Max P import Dei               | mand 2023-0 | 05-26 09:15:31 | 0.000  | kW    |  |  |  |  |  |
| Max Q import Dei               | mand 2023-0 | 05-26 09:15:31 | 0.000  | kvar  |  |  |  |  |  |
| Max S Deman                    | nd 2023-0   | 05-26 09:15:31 | 1.000  | kVA   |  |  |  |  |  |
| Ep Total (Tota                 | al)         | NaN            |        | kWh   |  |  |  |  |  |
| Ep T1 (test)                   |             | NaN            |        | kWh   |  |  |  |  |  |
| Eq Total (Tota                 | al)         | NaN            |        | kvarh |  |  |  |  |  |

#### Figure 5-12 TOU Energy Screen



The Acuvim 3 screen features TOU energy accumulation of the system. Use the touch screen to scroll down to view more parameters; tap on the blue arrows to go through current TOU records and up to 12 previous billing periods. For comprehensive information on quadrant energy, refer to Chapters 4.3.10 and 4.3.11.

# 5.3.4 Demand Screen

To access the Demand screen,

- 1. From the Home screen, select **Energy/Demand** menu tile.
- 2. Select **Demand** from the menu tab.

| Import/Export    | Quadra  | ant Tou Ener  | gy   | Demand             | 9                      |
|------------------|---------|---------------|------|--------------------|------------------------|
| Parameter        | Phase   | Instantaneous | Ma   | x Max<br>Tin       | Demand<br>nestamp      |
|                  | Phase A | 0             | 0.60 | )1 2024<br>9:18    | 4-01-22T0<br>8:57-0500 |
| Activo Power and | Phase B | 0             | 0.60 | 01 2024<br>3:23    | 4-01-22T1<br>3:40-0500 |
|                  | Phase C | 0             | 0.60 | 01 2024<br>9:18    | 4-01-22T0<br>8:57-0500 |
|                  | System  | 0             | 1.80 | 04 2024<br>9:18    | 4-01-22T0<br>8:57-0500 |
|                  | Phase A | 0             | -0.2 | 99 2024<br>95 9:57 | 4-01-16T0<br>7:44-0500 |
| Reactive Power   | Phase B | 0             | -0.2 | 98 2024<br>9:5     | 4-01-16T0<br>7:44-0500 |

### Figure 5-13 Demand Screen

The Acuvim 3 screen features a demand calculation of the system. Use the touch screen to scroll down to view different parameters. For comprehensive information on demand, refer to Chapter 4.3.3.

# 5.4 Visualization

# 5.4.1 Realtime Diagrams

To access the Realtime diagram screens,

- 1. From the Home screen, select Visualization menu tile.
- 2. Select **Realtime** from the menu tab. The phase diagram will be the first diagram to appear on the screen.
- 3. To view the next diagram, use the touch screen to scroll down or up. The screen position is indicated by the dots to the right of the screen.





# 5.4.1.1 Phase Diagram



Figure 5-14 Phase Diagram

The Acuvim 3 screen features phase diagram of the system. For comprehensive information on the phase diagram, refer to Chapter 4.3.1.



### 5.4.1.2 Power Diagram

Figure 5-15 Power Diagram

The Acuvim 3 screen features power diagram of the system. For comprehensive information on the power diagram, refer to Chapter 4.3.3.





### 5.4.1.3 Positive Sequence



Figure 5-16 Positive Sequence Screen

The Acuvim 3 screen features positive sequence diagram of the system. For comprehensive information on the positive sequence, refer to Chapter 4.3.7.

### 5.4.1.4 Negative Sequence



Figure 5-17 Negative Sequence Screen

The Acuvim 3 screen features negative sequence diagram of the system. For comprehensive information on the negative sequence, refer to Chapter 4.3.7.



### 5.4.1.5 Zero Sequence



Figure 5-18 Zero Sequence Screen

The Acuvim 3 screen features zero sequence diagram of the system. For comprehensive information on the zero sequence, refer to Chapter 4.3.7.

# 5.4.2 Harmonic Histogram

To access the Harmonic Histogram screen,

- 1. From the Home screen, select Visualization menu tile.
- 2. Select Harmonic Histogram from the menu tab.



Figure 5-19 Harmonic Histogram Screen



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The Acuvim 3 screen features a harmonic histogram graph from the system. Use the touch screen to select each checkbox to show which voltage and current harmonic parameters will appear on the graph. Move the blue slider to choose the values corresponding with different harmonic order. For comprehensive information on the zero sequence, refer to Chapter 4.3.6.

# 5.5 Trend

To access the Trendlog screen,

- 1. From the Home screen, select **Trend** menu tile.
- 2. The Realtime Trendlog section will appear on the screen.

# 5.5.1 Realtime Trend log



Figure 5-20 Trend Log Screen

The Acuvim 3 screen features real-time trend log of the system. To update the graph, use the touch screen to change each dropdown list parameters for time frame, time interval and readings, respectively, as shown in Figure 5-20. Move the blue slider to update the corresponding Phase A, Phase B, Phase C, and System values along different timestamps. For comprehensive information on the trend log, refer to Chapter 4.4.2.





# 5.5.2 Energy Trend log



Figure 5-21 Energy Trend Log Screen

The Acuvim 3 screen features an energy trend log of the system. To update the graph, use the touch screen to change each dropdown list parameters for time frame, time interval, and readings. Move the blue cursor to choose the values corresponding with different timestamps. For comprehensive information on the trend log, refer to Chapter 4.4.2.

# 5.6 Waveform

To access the Waveform Capture screen,

- 1. From the Home screen, select **Waveform** menu tile.
- 2. The Waveform Capture screen will appear.

| Waveform Capture                    |                                | Capture                | : Trigge | r        |
|-------------------------------------|--------------------------------|------------------------|----------|----------|
| File N                              | lame                           | Time Stamp             | Size(KB) | Action   |
| iiprefix_2024-01-16T16-5<br>bc_VOLT | 56-11.159709-0500_Va<br>_INTRP | 2024-01-16<br>16:56:44 | 1093     | ~        |
| iiprefix_2024-01-16T16-3<br>VOLT_   | 3-58.997669-0500_Va_<br>SAG    | 2024-01-16<br>16:34:34 | 1153     | <u>~</u> |
| iiprefix_2024-01-16T16-3<br>VOLT_S  | 3-58.997669-0500_Vc_<br>WELL   | 2024-01-16<br>16:34:32 | 1153     | ~        |
| iiprefix_2024-01-16T15-5<br>VOLT_   | 9-27.540410-0500_Va_<br>SAG    | 2024-01-16<br>16:00:09 | 1153     | ~        |
| iiprefix_2024-01-16T15-5<br>VOLT_S  | 9-27.540410-0500_Vc_<br>WELL   | 2024-01-16<br>16:00:05 | 1153     | ~        |
| iiprefix_2024-01-16T15-3            | 4-13.890189-0500_Vc_           | 2024-01-16             | 1148     | ~        |
| 1 to 20 of 884 recoreds             |                                | 1 2                    |          | > >      |

Figure 5-22 Wave List Screen



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The Acuvim 3 screen features a waveform list of the system. Use the touch screen to scroll down to view more parameters. A limited number of records can be displayed per screen, more records can be viewed by using the pagination located at the bottom left corner of the screen. For comprehensive information on the waveform, refer to Chapter 6.2.

**Manual Capture:** Trigger a waveform capture manually. Typically used for trouble shooting. **Action:** Click the graph icon button under Action column to view a detailed waveform graph.



Figure 5-23 Waveform Image Screen

### Waveform Graph

The waveform graph offers interactive features such as zooming in and out. Users can use the touchscreen to shift the waveform to the left or right horizontally. Move the blue slider to retrieve waveform datapoints at different timestamps.

# 5.7 Power Quality

# 5.7.1 PQ Event

To access the PQ Event screen,

- 1. From the Home screen, select Power Quality menu tile.
- 2. Select **PQ Event** from the menu tab.





| PQ Event            | ITIC                           | Alarm Status  | Alarm Lo         |              |   |       |    |
|---------------------|--------------------------------|---------------|------------------|--------------|---|-------|----|
| Time Stamp          |                                | Reason        | Duration(second) |              |   | Detai | ls |
| 2024-01-16          | 16:33:58                       | Voltage Swell | 1332.153730      |              |   | ≣     |    |
| 2024-01-16          | 15:40:08                       | Voltage Sag   | 55.572400        |              |   | ≣     | I  |
| 2024-01-16          | 15:40:08                       | Voltage Swell | 55.57            |              | ≣ |       |    |
| 2024-01-16          | 4-01-16 15:34:37 Voltage Swell |               |                  | l 288.599030 |   |       |    |
| 2024-01-16          | 15:34:25                       | Voltage Swell | 0.033360         |              |   | ≣     |    |
| 1 to 20 of 962 reco | reds                           |               | 1 2              |              |   | >     | У  |

Figure 5-24 Power Quality Event Screen

The Acuvim 3 screen features recorded power quality events in the system. Use the touch screen to scroll down to view different PQ events. For comprehensive information on the PQ events, refer to Chapter 6.4.1.

| PQ Event | ITIC      | Alarm Statu | is Alarm L | og        |    |
|----------|-----------|-------------|------------|-----------|----|
|          |           |             |            |           |    |
| 2024-0   | Name      | Max         | Min        | Average   | ∷⊟ |
|          | Phase A   | 162.448 V   | 49.911 V   | 113.635 V |    |
|          | Phase B   | 162.161 V   | 49.898 V   | 113.606 V |    |
|          | Phase C   | 162.223 V   | 49.918 V   | 113.65 V  |    |
|          | unbalance | 12.689 %    | 0 %        | 0 %       |    |
|          |           |             |            |           |    |

Figure 5-25 Power Quality Event Details Screen

**Details:** Click the edit icon 🖽 button under Details column to view the detailed PQ event readings.

# 5.7.2 ITIC

To access the ITIC screen,

- 1. From the Home screen, select **Power Quality** menu tile.
- 2. Select **ITIC** from the menu tab.







Figure 5-26 ITIC Screen

The Acuvim 3 screen features an Information Technology Industry Council (ITIC) graph of the system between a time frame range. To change the period, select the box next to the Time Frame to access the calendar screen as shown in Figure 5-27. Choose the date range and select Save. For comprehensive information on the ITIC refer to Chapter 6.6.3.

| PQ Event | п   | TC                                     | Alarm | n Statu | s Ala | rm Log |     |  |  |  |
|----------|-----|--|-------|---------|-------|--------|-----|--|--|--|
| <        |     | Selected ITIC Time Range               |       |         |       |        |     |  |  |  |
|          | 202 | 2024-01-09 12:00 AM2024-01-17 11:59 PM |       |         |       |        |     |  |  |  |
|          | <   |  | >     |         |       |        |     |  |  |  |
|          | Sun | Mon                                    | Tue   | Wed     | Thu   | Fri    | Sat |  |  |  |
|          | 31  | 1                                      | 2     | 3       | 4     | 5      | 6   |  |  |  |
|          | 7   | 8                                      | 9     | 10      | 11    | 12     | 13  |  |  |  |
|          | 14  | 15                                     | 16    | 17      | 18    | 19     | 20  |  |  |  |
|          | 21  | 22                                     | 23    | 24      | 25    | 26     | 27  |  |  |  |
|          | 28  | 29                                     | 30    | 31      | 1     | 2      | 3   |  |  |  |
|          | 4   | 5                                      | 6     | 7       | 8     | 9      | 10  |  |  |  |

Figure 5-27 ITIC Time Frame Selection

# 5.7.3 Alarm Status

To access the Alarm Status screen,

- 1. From the Home screen, select Power Quality menu tile.
- 2. Select Alarm Status from the menu tab.



| PQ Event | ITIC | Alarm Status | Alarm Log |              |
|----------|------|--------------|-----------|--------------|
| Alarm ID |      | Alarm Label  |           | Alarm Status |
|          |      | NEW MONITOR  |           | OFF          |
|          |      | Alarm 2      |           | OFF          |
|          |      | NEW MONITOR  |           | OFF          |
|          |      |              |           |              |

Figure 5-28 Alarm Status Screen

The Acuvim 3 screen features an alarm status from the system. Use the touch screen to scroll down to view more alarm monitors. For comprehensive information on the alarm status, refer to Chapter 6.5.2.

# 5.7.4 Alarm Log

To access the Alarm Log screen,

- 1. From the Home screen, select Power Quality menu tile.
- 2. Select Alarm Log from the menu tab.

| PQ Event               | t ITIO      | 2  | Alarm Status |                   | Alarm                   | ۱ Lo | g   |       |       |       |     |
|------------------------|-------------|----|--------------|-------------------|-------------------------|------|-----|-------|-------|-------|-----|
| Timestamp              | Duration(s) | ID | Status       | Р                 | arametei                |      |     | E     | xtren | ne Va | lue |
|                        |             |    |              | Average           | e Line-to-<br>Voltage V | Neut | al  |       | 0.0   | 000   |     |
| 2024-01-15<br>22:32:01 | 0.000000    | 2  | ON           | Phas              | Phase A Current A       |      |     | 0.000 |       |       |     |
|                        |             |    |              | Syster            | System Frequency Hz     |      | z   |       | 0.0   | 000   |     |
|                        |             |    |              | Average           | e Line-to-<br>Voltage V | Neut | al  |       | 116   | .206  |     |
| 2024-01-15<br>22:27:30 | 0.010000    | 2  | OFF          | Phase A Current A |                         |      | 2.3 | 82    |       |       |     |
| 1 to 20 of 4244        | recoreds    |    |              |                   | 1                       |      |     |       |       | >     | УI  |

Figure 5-29 Alarm Log Screen

The Acuvim 3 screen features an alarm log of the system. Use the touch screen to scroll down to view more alarm records. For comprehensive information on the alarm log, refer to Chapter 6.5.3.



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# 5.8 Input Output

# 5.8.1 I/O Configuration

To access the I/O configuration screen,

- 1. From the Home screen, select **Input Output** menu tile.
- 2. Select **On-Board IO** or one of the **AXM-IO** options from the menu tab.

### **Onboard I/O Screen**

| On-Board IO   | AXM-IO11 | AXM-I   | 021 AX | M-1031 | AXM | -1012  | АХ |  |  |
|---------------|----------|---------|--------|--------|-----|--------|----|--|--|
| Digital Input |          |         |        |        |     |        |    |  |  |
| Parameter     | Status   | Counter | Ratio  | Readi  | ng  | Action |    |  |  |
| DI1           |          |         | 2.5    |        | ~   | Reset  |    |  |  |
| DI2           |          |         |        |        | ~   | Reset  |    |  |  |
| DI3           | OFF      |         |        |        |     |        |    |  |  |
| DI4           | OFF      |         |        |        |     |        |    |  |  |
|               |          |         |        |        |     |        |    |  |  |

Figure 5-30 I/O Screen

The Acuvim 3 screen features a configuration screen of the onboard I/O or external I/O modules. Use the touch screen to scroll down to view more I/O parameters. For comprehensive information on the Onboard I/O, refer to Chapter 4.3.9.

| On-Board IO   | AXM-I01 | -1 AXM-IC | 02-1 AXM | 1-103-   | 1 AX       | M-101-2 | AXI |  |  |
|---------------|---------|-----------|----------|----------|------------|---------|-----|--|--|
| Digital Input |         |           |          |          |            |         |     |  |  |
| Parameter     | Status  | Counter   | Ratio    | Rea      | ading      | Actior  | ı   |  |  |
| DI1           |         |           |          | 3        | ×          | Reset   |     |  |  |
| DI2           |         |           | 1        | 1 2      | 3 4        | Reset   |     |  |  |
| DI3           |         |           | 1 9      | 56<br>90 | 8 7<br>. ← | Reset   |     |  |  |
| DI4           |         |           | 1        | Conf     | firm       | Reset   |     |  |  |
|               |         |           |          |          |            |         |     |  |  |

Figure 5-31 Edit DI Readings





**Reading Edit:** Found under Reading column, users are able to edit digital input readings. **Reset:** Located under the Action column, the Reset button allows the user to reset digital input records.

### **AXM-IO Module Screens**

| 102-1 | AXM-IO3-1 | AXM-I01-2 | AXM-IO2-2 | AXM-103-2 | SOE |
|-------|-----------|-----------|-----------|-----------|-----|
|       | Parameter |           | Input     | Reading   |     |
|       | AI1 AI1   |           | 0 (V)     | 1 A       |     |
|       | AI2 AI2   |           | 0 (V)     | 1 A       |     |
|       |           | Rel       | ay Output |           |     |
|       | Parameter |           | Status    | Actio     | n   |
|       | R01-R01   |           | OFF       | Toggl     | e   |
|       | RO2-RO2   |           | OFF       | Тодди     | e   |

### Figure 5-32 Toggle RO Readings

Toggle: Toggle relay output within latch mode.

# 5.8.2 SOE Log

To access the SOE Log screen,

- 1. From the Home screen, select **Input Output** menu tile.
- 2. Select **SOE** from the menu tab.

| M-103-1 AXM-101-2           | AXM-102-2 | AXM-IO3 | 3-2 SOE |   |  |  |  |  |
|-----------------------------|-----------|---------|---------|---|--|--|--|--|
| IO Module Type: AXM-IO3-1 🗸 |           |         |         |   |  |  |  |  |
| Timestamp                   | DI1       | DI2 DI3 | 3 DI4   |   |  |  |  |  |
| 2024-03-25 15:42:26         | OFF       | OFF OFF | F OFF   |   |  |  |  |  |
| 2024-03-25 15:42:25         | ON        | OFF OFF | F OFF   |   |  |  |  |  |
| 2024-03-25 15:42:24         | OFF       | OFF OFF | F OFF   |   |  |  |  |  |
| 2024-03-25 15:42:23         | ON        | OFF OFF | F OFF   |   |  |  |  |  |
|                             |           |         |         |   |  |  |  |  |
|                             |           |         |         |   |  |  |  |  |
| 1 to 4 of 4 recoreds        |           |         |         | 1 |  |  |  |  |

Figure 5-33 SOE Log Screen



The Acuvim 3 screen features a sequence of events log (SOE) of the system. Use the touch screen to scroll down to view more DI status change. For comprehensive information on the SOE log, refer to Chapter 4.4.1.

# 5.9 Dashboard

To access the Dashboard screen,

1. From the Home screen, select **Dashboard** menu tile.

| D | ashboard                           |         |    |
|---|------------------------------------|---------|----|
|   | Frequency                          | 59.999  | Hz |
|   | Line-to-Neutral<br>Voltage Phase A | 120.006 | V  |
|   | Line-to-Neutral<br>Voltage Phase B | 120.006 | V  |
|   | Line-to-Neutral<br>Voltage Phase C | 120.006 | V  |
|   | Line-to-Neutral<br>Voltage Average | 120.006 | V  |
|   | Line-to-Line Voltage<br>Phase A-B  | 207.860 | V  |
|   | Line-to-Line Voltage<br>Phase B-C  | 207.848 | v  |

Figure 5-34 Dashboard Screen

The Acuvim 3 screen features a system dashboard. Use the touch screen to scroll down to view more parameters. Acuvim 3 screen will turn back to dashboard after backlight timeout.

# 5.10 User Center

# 5.10.1 Installation

### 5.10.1.1 General Setting

To access the General screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select Installation from the menu tab.
- 3. Select General from the submenu.





| Installation       | Comm              | About     | Operation | Event Log | <b>∂</b><br>Login |  |
|--------------------|-------------------|-----------|-----------|-----------|-------------------|--|
| General            | On-Board IO       | AXM-I01-1 | AXM-I02-1 | AXM-103-1 | AXM-IO            |  |
| Nominal Voltage(V) |                   |           |           | ~         |                   |  |
| Nominal Current(A) |                   |           |           | 5         | ~                 |  |
| Frequency          |                   |           | 60        | ~         |                   |  |
| Wiri               | ing Configuration |           | DEMO      | ~         |                   |  |
|                    | PT Input          |           |           | 20        | ~                 |  |
|                    | PT Output         |           |           | 120       |                   |  |
| CT Input           |                   |           |           | ~         |                   |  |
| General Par        | ameter Settin     | g         |           |           |                   |  |

| Figure 5-35 | General | Setting | Screen |
|-------------|---------|---------|--------|
|-------------|---------|---------|--------|

The Acuvim 3 screen features a general setting of the system. Users can configure various parameters including Nominal Voltage, Nominal Current, Frequency, Wiring Configuration, PT (Potential Transformer) Ratios, and CT (Current Transformer) Ratios. For comprehensive information on the general settings, refer to Chapter 4.5.

### 5.10.1.2 I/O Setting

To access the I/O setting screens,

- 1. From the Home screen, select **User Center** menu tile.
- 2. Select Installation from the menu tab.
- 3. Select **On-Board IO** from the submenu.

| Installation | Comm           | About      | Operation | Event Log | <b>→</b><br>Login |  |  |  |  |
|--------------|----------------|------------|-----------|-----------|-------------------|--|--|--|--|
| General      | On-Board IO    | AXM-I01-1  | AXM-I02-1 | AXM-103-1 | AXM-I01           |  |  |  |  |
| DI Settings  |                |            |           |           |                   |  |  |  |  |
| ID           | Туре           |            | Unit      | Rati      | o                 |  |  |  |  |
| DI1          | Counter Status |            |           | ✓ 1.0     | 000 🗸             |  |  |  |  |
| DI2          | Counter Status |            |           | ✓ 1.0     | 000 🗸             |  |  |  |  |
| DI3          | Counter Status |            |           | ✓ 1.0     | 000 🗸             |  |  |  |  |
| DI4          | Counter Status |            |           | ✓ 1.0     | 000 🗸             |  |  |  |  |
|              | DO Settings    |            |           |           |                   |  |  |  |  |
| ID 1         | Type En        | ergy Pulse | Energy    | Pulse \   | Width(ms)         |  |  |  |  |
| On-Board IC  | ) Parameter S  | etting     |           |           |                   |  |  |  |  |

Figure 5-36a On-Board I/O Screen



| Installa    | ition                         | Comm      | ۱     | About      | Operation                  | Ever        | nt Log |       | <b>→</b><br>Login |
|-------------|-------------------------------|-----------|-------|------------|----------------------------|-------------|--------|-------|-------------------|
| Gene        |                               | On-Board  | 01 b  | AXM-101-1  | AXM-102-1                  | AXM         | -103-1 | AX    | M-IC              |
| DI4         |                               | Counter S | tatus |            |                            | <u> </u>    | 1.     | 000   | ~                 |
| DO Settings |                               |           |       |            |                            |             |        |       |                   |
| ID          | ٦                             | уре       | Ene   | ergy Pulse | Energy                     |             | Pulse  | Width | (ms)              |
| DO          | Energy<br>Pulse               | Alarm     | Disa  | ble Enable | Phase A Active<br>Quadrant | Energy<br>1 |        |       |                   |
|             |                               |           |       | LED Sett   | ings                       |             |        |       |                   |
| ID          | Ene                           | rgy Pulse |       | Label      | Energy                     |             | Pulse  | Width | (ms)              |
| LED 1       | Disabl                        | e Enable  |       | VAR        | System Apparen<br>Net      | t Energy    | ~      | 200   | ~                 |
| LED 2       | Disabl                        | e Enable  |       | WATT       | System Active<br>Net       | Energy      | ~      | 200   | ~                 |
| On-Boa      | On-Board IO Parameter Setting |           |       |            |                            |             |        |       |                   |

Figure 5-36b On-Board I/O Screen

The Acuvim 3 screen features I/O settings for both Acuvim 3 and external I/O modules. For comprehensive information on the on-board I/O settings, refer to Chapter 4.3.9.

### 5.10.1.3 HMI Setting

To access the HMI Setting screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select Installation from the menu tab.
- 3. Select HMI Setting from the submenu.



Figure 5-37 HMI Setting Screen

The Acuvim 3 screen features an HMI setting to config the backlight time and brightness. For comprehensive information on the HMI settings, refer to Chapter 4.5.11.



### 5.10.1.4 Time/Date Setting

To access the Time/Date screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select Installation from the menu tab.
- 3. Select **Time/Date** from the submenu.

| Installation                    | Comm      | At     | oout   | Oper   | ation    | Event | Log    | <b>∂</b><br>Login |
|---------------------------------|-----------|--------|--------|--------|----------|-------|--------|-------------------|
| M-IO3-1 AX                      | M-101-2 A | XM-102 | 2-2 AX | (M-103 | -2 HM    |       | ng Tin | ne/Date           |
| Device                          | Date:     | <      |        | М      | arch 202 | 24    |        | >                 |
| 2024-03-25                      | 03:26 PM  | Sun    | Mon    | Tue    | Wed      | Thu   | Fri    | Sat               |
| Device                          | Time:     | 25     | 26     | 27     | 28       | 29    | 1      | 2                 |
| Device Time.                    |           | 3      | 4      | 5      | 6        | 7     | 8      | 9                 |
| 02 25 AM                        |           | 10     | 11     | 12     | 13       | 14    | 15     | 16                |
| 03 : 26                         | PM        | 17     | 18     | 19     | 20       | 21    | 22     | 23                |
| 04 27                           |           | 24     | 25     | 26     | 27       | 28    | 29     | 30                |
| Protocol: NTP<br>Sync Status: C |           | 31     | 1      | 2      | 3        | 4     | 5      | 6                 |
| Time/Date S                     | Setting   |        |        |        |          |       |        |                   |

#### Figure 5-38 Time/Date Setting Screen

The Acuvim 3 screen features a time/date setting screen. For comprehensive information on the time/date settings, refer to Chapter 7.6.

# 5.10.2 Communication

### 5.10.2.1 RS485 Setting

To access the RS485 screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **Comm** from the menu tab.
- 3. Select **RS485** from the submenu.



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| Installation | Comm          | About | Operation  | Event Log | <b>→</b><br>Login |
|--------------|---------------|-------|------------|-----------|-------------------|
| RS485        |               |       |            |           | Modb              |
| RS4          | 185 Enable    |       | Enable     | ~         |                   |
| RS4          | 85 Protocol   |       | MODBUS RTU | J 🗸       |                   |
| Bi           | aud Rate      |       | 115200     | ~         |                   |
| [            | Data Bit      |       |            | ~         |                   |
| 5            |               |       |            | ~         |                   |
|              |               |       |            | ~         |                   |
|              |               |       |            |           |                   |
| RS485 Para   | meter Setting | J     |            |           |                   |

Figure 5-39 RS485 Setting Screen

The Acuvim 3 screen features an RS485 setting screen. For comprehensive information on the RS485 settings, refer to Chapter 7.1.

### 5.10.2.2 Ethernet Port Settings

To access the Ethernet port screens,

- 1. From the Home screen, select **User Center** menu tile.
- 2. Select **Comm** from the menu tab.
- 3. Select Ether1 or Ether2 from the submenu.

| Install | lation  | Comm             | About  | Operation | Event Log  |       |
|---------|---------|------------------|--------|-----------|------------|-------|
| RS4     | 185     | Ether1           | Ether2 |           |            | Modbu |
|         | R       | STP Disable RSTP | Enable | Static IP | Dynamic IP |       |
|         |         |                  |        |           |            |       |
| IP      |         |                  |        |           | 192.168.1. | .254  |
| Subi    | net mas | k                |        |           | 255.255.2  | 55.0  |
| Gate    | eway    |                  |        |           | 192.168    | 3.1.1 |
|         |         |                  |        |           |            |       |
|         |         |                  |        |           |            |       |
| Etherr  | net1 Pa | arameter Set     | ting   |           |            |       |

Figure 5-40a Ethernet 1 Setting Screen





| Installation | Comm         | About     | Operation  | Event Log |  |
|--------------|--------------|-----------|------------|-----------|--|
| RS485        |              | Ether2    |            |           |  |
|              |              | Static IP | Dynamic IP |           |  |
|              |              |           |            |           |  |
| IP           |              |           |            |           |  |
| Subnet mas   | sk           |           |            |           |  |
| Gateway      |              |           |            |           |  |
|              |              |           |            |           |  |
|              |              |           |            |           |  |
|              |              |           |            |           |  |
| Ethernet2 Pa | arameter Set | ting      |            |           |  |

Figure 5-40b Ethernet 2 Setting Screen

The Acuvim 3 screen features two Ethernet port setting screens. For comprehensive information on the ethernet settings, refer to Chapter 7.2.2.

### 5.10.2.3 Wi-Fi Setting

To access the Wi-Fi screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **Comm** from the menu tab.
- 3. Select **Wi-Fi** from the submenu.

| Installation | Comn      | n Ab     | out | Operation    | Event Log    |       |
|--------------|-----------|----------|-----|--------------|--------------|-------|
| RS485        |           |          | er2 | Wi-Fi        |              |       |
|              | Wi-Fi OFF | Wi-Fi ON |     | Access Point | Station Mode |       |
|              |           |          |     |              |              |       |
| IP           |           |          |     |              | 192.168.1    | 00.1  |
| Network Ke   | y         |          |     |              | accuer       | nergy |
| SSID(AP Mo   | ode)      |          |     | Acuvim-3-V   | WIFI-ASP6666 | 6666  |
|              |           |          |     |              |              |       |
|              |           |          |     |              |              |       |
| Wi-Fi Param  | eter Sett | ing      |     |              |              |       |

Figure 5-41a Wi-Fi Access Point Setting Screen



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| Installation | n Com     | m    | About  | Operation    | Event Log    | Ð      |
|--------------|-----------|------|--------|--------------|--------------|--------|
| RS485        | Ethe      | r1   | Ether2 | Wi-Fi        |              | Modb   |
|              | Wi-Fi OFF | Wi   | FiON   | Access Point | Station Mode |        |
|              | Maunal    | Auto | DHCP   |              |              |        |
| IP           |           |      |        |              | 192.168      | .1.10  |
| Subnet m     | ask       |      |        |              | 255.255.2    | 255.0  |
| Gateway      |           |      |        |              | 192.16       | 8.1.1  |
| SSID(Stat    | ion Mode) |      |        |              | SSI          | O Scan |
| Key          |           |      |        |              | S            | how    |
| Wi-Fi Para   | meter Set | ting |        |              |              |        |

Figure 5-41b Wi-Fi Station Mode Setting Screen

The Acuvim 3 screen features a Wi-Fi setting screen. For comprehensive information on the Wi-Fi settings, refer to Chapter 7.2.3.

# 5.10.2.4 USB Setting

To access the USB screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **Comm** from the menu tab.
- 3. Select **USB** from the submenu.

| Installation | Comm         | About | Operation  | Event Log |  |
|--------------|--------------|-------|------------|-----------|--|
| RS485        |              |       | Wi-Fi      | USB       |  |
| US           | B Enable     |       | Enable     | ~         |  |
| USI          | B Protocol   |       | MODBUS RTI | J 🗸       |  |
| Ва           | aud Rate     |       | 115200     | ~         |  |
| [            |              |       |            | ~         |  |
| Ş            |              |       |            | ~         |  |
|              |              |       |            | ~         |  |
|              |              |       |            |           |  |
| USB Parame   | eter Setting |       |            |           |  |

Figure 5-42 USB Setting Screen



The Acuvim 3 screen features a USB setting screen. For comprehensive information on the USB settings, refer to Chapter 7.1.

### 5.10.2.5 Modbus Setting

To access the Modbus screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **Comm** from the menu tab.
- 3. Select **Modbus** from the submenu.

| Installation                   | Comm          | About | Operation | Event Log |       |
|--------------------------------|---------------|-------|-----------|-----------|-------|
| RS485                          |               |       |           |           | Modbu |
| Modbu                          | is TCP Enable |       | Enable    | ~         |       |
| Modb                           | ous TCP Port  |       | 502       | ~         |       |
| Modbus TCP Slave Address       |               |       |           | ~         |       |
| Modbus RTU RS485 Enable        |               |       | Enable    | ~         |       |
| Modbus RTU RS485 Slave Address |               |       |           | ~         |       |
| Modbus RTU USB Enable          |               |       | Enable    | ~         |       |
| Modbus RTU                     | USB Slave Add | ress  |           | ~         |       |
| Modbus Par                     | ameter Settir | ng    |           |           |       |

Figure 5-43 Modbus Setting Screen

The Acuvim 3 screen features a Modbus setting screen. For comprehensive information on the Modbus settings, refer to Chapter 7.8.

# 5.10.3 About

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### 5.10.3.1 Device Information

To access the Device Info screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **About** from the menu tab.
- 3. Select **Device Info** from the submenu.



| Installation | Comm         | About | Operation | Event Log       |   |
|--------------|--------------|-------|-----------|-----------------|---|
| Device Info  | HMI Info     |       |           | Record Insp     |   |
| Me           | eter Model   |       | A         | cuvim 3-5A-P1   |   |
| Meter        | Serial Numbe | er    | ,         | ASP22080011     |   |
| De           | escription   |       |           | CLASS A         |   |
| Hard         | ware Version |       |           | 1.04            |   |
| Firm         | ware Version |       |           | 0.33            |   |
| Ethernet     | 1 MAC addre  | ess   | EC        | :C3:8A:22:19:0  | I |
| Ethernet     | 2 MAC addre  | ess   | EC        | :C3:8A:22:19:02 | 2 |
|              |              |       |           |                 |   |

Figure 5-44 Device Information Screen

The Acuvim 3 screen features a device information screen. For comprehensive information on the device information, refer to Chapter 4.2.1.

### 5.10.3.2 HMI Information

To access the HMI Info screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **About** from the menu tab.
- 3. Select HMI Info from the submenu.

| Device Info     HMI Info     Nameplate     Install Record     Inspec Record       HMI Model     Acuvim-3-HMI       Serial Number     ASA22070001       Hardware Version     v1.00       Firmware Version     v1.04 | Installation Comm    | About  | Operation | Event Log      |     |
|--|----------------------|--------|-----------|----------------|-----|
| HMI Model     Acuvim-3-HMI       Serial Number     ASA22070001       Hardware Version     v1.00       Firmware Version     v1.04   | Device Info HMI Info | Namepl |           |                |     |
| Serial Number     ASA22070001       Hardware Version     v1.00       Firmware Version     v1.04  | HMI Model            |        | A         | cuvim-3-HMI    |     |
| Hardware Version     v1.00       Firmware Version     v1.04  | Serial Number        |        | A         | SA22070001     |     |
| Firmware Version v1.04   | Hardware Version     |        |           | v1.00          |     |
|  | Firmware Version     |        | v1.04     |                |     |
| Firmware Update Date 07/29/2022  | Firmware Update Da   | ate    | (         | 07/29/2022     |     |
| Description Customized description   | Description          |        | Custo     | mized descript | ion |
|  |                      |        |           |                |     |

Figure 5-45 HMI Information Screen

The Acuvim 3 screen features an HMI information screen. For comprehensive information on the HMI information, refer to Chapter 4.5.11.



#### 5.10.3.3 Nameplate

To access the Nameplate screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **About** from the menu tab.
- 3. Select Nameplate from the submenu.

| Installation | Comm              | About | Operation   | Event Log    |  |  |  |
|--------------|-------------------|-------|---|--------------|--|--|--|
| Device Info  | HMI Info          | Namep | late Instal   | Record Inspe |  |  |  |
|              | Model             |       | Acuvi   | m 3-5A-P1    |  |  |  |
| Ма           | nufacturer        |       | Accuenergy (CANADA) Inc.                            |              |  |  |  |
| Pov          | wer Supply        | 50    | 50/60Hz 100-415Vac , 100-300Vdc                     |              |  |  |  |
| Tempe        | erature Range     | 2     | -25~70 C  |              |  |  |  |
| Frequ        | uency Range       |       | 40  | )-70Hz       |  |  |  |
| Rat          | Rated Voltage 10- |       | 10-400 VLN, 690 VLL                                 |              |  |  |  |
| Cur          | rent Range        |       | 1A nominal: 0.01A to 2A<br>5A nominal: 0.05A to 10A |              |  |  |  |
|              |                   |       | =   |              |  |  |  |

#### Figure 5-46 Nameplate Screen

The Acuvim 3 screen features a Nameplate screen. For comprehensive information on the nameplate, refer to Chapter 4.2.4.

### 5.10.3.4 Install Record

To access the Install Record screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **About** from the menu tab.
- 3. Select Install Record from the submenu.




| Installation | Comm          | About | Ор | eration | Event  | Log | Eogout |
|--------------|---------------|-------|----|---------|--------|-----|--------|
| Device Info  | HMI Info      |       |    | Install | Record |     |        |
| CT Phase     | eA Serial Num | ber   |    |         |        |     |        |
| CT P         | haseA Ratio   |       |    | 54      | A:5A   |     |        |
| CT P         | haseB Color   |       |    |         |        |     |        |
| CT P         | haseB Model   |       |    |         |        |     |        |
| CT Phase     | eB Serial Num | ıber  |    |         |        |     |        |
| CT F         | PhaseB Ratio  |       |    | 54      | A:5A   |     |        |
| CT P         | haseC Color   |       |    |         |        |     |        |
| CT P         | haseC Model   |       |    |         |        |     |        |

Figure 5-47 Installation Record Screen

The Acuvim 3 screen features an installation record screen. For comprehensive information on the installation record, refer to Chapter 4.2.2.

#### 5.10.3.5 Inspection Record

To access the Inspection Record screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **About** from the menu tab.
- 3. Select Inspec Record from the submenu.

| Installation | Comm         | About | Operation | Event    | Log $\bigotimes_{\text{Logout}}$ |
|--------------|--------------|-------|-----------|----------|----------------------------------|
| Device Info  | HMI Info     |       |           | l Record | Inspec Record                    |
| Comn         | nission Date |       |           |          |                                  |
| Con          | nmissioner   |       |           |          |                                  |
| Insp         | ection Date  |       |           |          |                                  |
| Ir           | nspector     |       |           |          |                                  |
| Inspe        | ction Status |       |           |          |                                  |
| Inspe        | ection Notes |       |           |          |                                  |
| CT Pł        | nase A Color |       |           |          |                                  |
| CT Ph        | ase A Model  |       |           |          |                                  |

#### Figure 5-48 Inspection Record Screen

The Acuvim 3 screen features an inspection record screen. For comprehensive information on the inspection record, refer to Chapter 4.2.3.





# 5.10.4 Operation

To access the Operation screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select **Operation** from the menu tab.

| Installation | Comm                  | About  | Operation | E١ | vent Log |  |  |  |  |  |  |
|--------------|-----------------------|--------|-----------|----|----------|--|--|--|--|--|--|
| Reset        | Reset Device Run Time |        |           |    |          |  |  |  |  |  |  |
| R            | Reboot Meter          |        |           |    |          |  |  |  |  |  |  |
| Rese         | et Meter Conf         | figs   |           |    | Reset    |  |  |  |  |  |  |
| Reset        | Reset Common Configs  |        |           |    |          |  |  |  |  |  |  |
| Reset t      | o Factory de          | faults |           |    | Reset    |  |  |  |  |  |  |
|              |                       |        |           |    |          |  |  |  |  |  |  |
|              |                       |        |           |    |          |  |  |  |  |  |  |
|              |                       |        |           |    |          |  |  |  |  |  |  |
|              |                       |        |           |    |          |  |  |  |  |  |  |

Figure 5-49 Operation Screen

The Acuvim 3 screen features an operation screen. For comprehensive information on the operations, refer to Chapter 10.1.

# 5.10.5 Event Log

To access the Event Log screen,

- 1. From the Home screen, select User Center menu tile.
- 2. Select Event Log from the menu tab.

| Installa  | ation Cor                | nm      | About     | Operation       | Event Log                             | €<br>Logout      |
|-----------|--------------------------|---------|-----------|-----------------|---------------------------------------|------------------|
| No.       | Timestamp                | Level   | Source    |                 | Message                               |                  |
| 24556     | <b>5</b> 2024-01-24 23:5 | 7 Info  | НМІ       | Updated         | USB configuratior                     | ı                |
| 24558     | <b>5</b> 2024-01-24 23:5 | 57 Info | НМІ       | Updated e       | thernet configurati                   | on               |
| 24554     | 2024-01-24 23:5          | 5 Info  | НМІ       | Updated         | l wifi configuration                  |                  |
| 24553     | <b>3</b> 2024-01-24 23:5 | 5 Info  | WebServer | Us              | er admin login                        |                  |
| 24552     | <b>2</b> 2024-01-24 23:5 | 5 Error | НМІ       | Invalid L<br>mo | lser tried to access<br>dule from HMI | ;                |
| 1 to 20 o | f 4555 recoreds          |         |           | 1 2             |                                       | <b>&gt; &gt;</b> |

Figure 5-50 Event Log Screen



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The Acuvim 3 screen features an event log screen. For comprehensive information on the event log, refer to Chapter 4.4.5.

# 5.11 User Management

Access to the Acuvim 3 screens generally does not require any login credentials. However, certain screen modifications or event log browsing require appropriate permission levels. User credentials for the Acuvim 3 display screen are the same for webpage interface. For comprehensive information on the permissions, refer to Chapter 9.2.1.

|          | JOZI T   | 74-2 |      |     |     |     | January 25,202 |     |      |       |   |   |    | 2024 | ļ | €     |       |
|----------|----------|------|------|-----|-----|-----|----------------|-----|------|-------|---|---|----|------|---|-------|-------|
| <u> </u> | <b>\</b> |      |      |     |     |     |                | Lo  | g In |       |   |   |    |      |   | €     | _ogin |
|          |          |      |      |     |     |     |                |     |      |       |   |   |    |      |   | Login |       |
|          |          | ι    | Jser | nan | ne: | а   | admin          |     |      |       |   |   |    |      |   |       |       |
|          |          | F    | ass  | swo | rd: |     |                |     |      |       |   |   |    |      |   |       |       |
|          |          |      |      |     |     |     |                |     |      |       |   |   |    |      |   |       |       |
|          |          | 1    | 2    | 3   | 4   | 5   | 6              | 7   | 8    | 9     | 0 | - | =  | ÷    | - |       |       |
|          |          | `    | q    | w   | е   | r   | t              | У   | u    | i     | 0 | р | [  | ]    | \ |       |       |
|          |          | Û    | 1    | a   | 5 0 | i T | f              | g I | n j  | j   I | < | T | Ϋ́ | Ę    |   |       |       |
|          |          |      | ;    | z   | Х   | С   |                |     | ۷    | b     | n | m | ,  |      | / |       |       |
|          |          |      |      |     |     |     |                |     |      |       |   |   |    |      |   |       |       |
|          |          | U    |      |     |     |     |                |     |      |       |   |   |    |      |   |       |       |
|          |          |      |      |     |     | _   |                |     | _    |       | _ | _ | _  | _    |   |       |       |

Figure 5-51 User Login Screen

|            | Configuration will take<br>effect after power cycle | 2. |
|------------|---|----|
| Reboot now | Reboot later  |    |

Figure 5-52 Reboot Action Notification

Configurations typically require a reboot to become active. Users will receive an Action Required notification to reboot immediately or at a later time.

Reboot now: Click this button to reboot Acuvim 3 meter immediately.

Wait 10 minutes: This option will reboot Acuvim 3 meter after 10 minutes.

Reboot later: Allows the user to pause the reboot process at an unspecified time.







Figure 5-53 Logout Warning

To log the user out of the meter or clear the current user role information on the screen, click the Solution button at the top right corner of the Home screen.



# **Chapter 6: Power Quality Measurements**

Acuvim 3 measures various power quality-related parameters in accordance with standards such as IEC 61000-4-30 Class-A, IEC 61000-4-15, and IEC 61000-4-7. These measurements are accessible from the Acuvim 3 webpage interface, supported communication protocols, or be logged or posted using Acuvim 3 data log/post functions. Table 6-1 lists all the supported parameters and calculations related to power quality monitoring.

| Parameter          | Details  |  |  |  |  |  |  |  |
|--------------------|--|--|--|--|--|--|--|--|
|                    | Half cycle highspeed reading                               |  |  |  |  |  |  |  |
|                    | • 10 seconds reading                                       |  |  |  |  |  |  |  |
|                    | • 10/12 cycle (200ms) reading                              |  |  |  |  |  |  |  |
| Dowor Fraguency    | Aggregation (3 seconds)                                    |  |  |  |  |  |  |  |
| Power Frequency    | <ul> <li>Aggregation (10 minutes)</li> </ul>               |  |  |  |  |  |  |  |
|                    | Aggregation (2 hours)                                      |  |  |  |  |  |  |  |
|                    | • PMU (Phasor Measurement Unit) (Class P/M)                |  |  |  |  |  |  |  |
|                    | Moving average calculation (customized)                    |  |  |  |  |  |  |  |
|                    | Half cycle highspeed reading (used for PQ event detection) |  |  |  |  |  |  |  |
|                    | • 10/12 cycle (200ms) reading                              |  |  |  |  |  |  |  |
| Voltage RMS        | Aggregation (3 seconds)                                    |  |  |  |  |  |  |  |
| Current RMS        | Aggregation (10 minutes)                                   |  |  |  |  |  |  |  |
|                    | Aggregation (2 hours)                                      |  |  |  |  |  |  |  |
|                    | • Up to 127 <sup>th</sup> order Harmonic reading           |  |  |  |  |  |  |  |
|                    | • THD calculation  |  |  |  |  |  |  |  |
|                    | OTHD calculation   |  |  |  |  |  |  |  |
| Voltage Harmonics/ | • ETHD calculation   |  |  |  |  |  |  |  |
| Interharmonics     | • Crest-Factor calculation                                 |  |  |  |  |  |  |  |
| Current Harmonics/ | • K-Factor calculation (Current only)                      |  |  |  |  |  |  |  |
| Interharmonics     | • 10/12 cycle (200ms) reading                              |  |  |  |  |  |  |  |
|                    | Aggregation (3 seconds)                                    |  |  |  |  |  |  |  |
|                    | Aggregation (10 minutes)                                   |  |  |  |  |  |  |  |
|                    | Aggregation (2 hours)                                      |  |  |  |  |  |  |  |

#### **Table 6-1 Power Quality - Related Parameters**



| Parameter         | Details                                     |
|-------------------|---|
|                   | Positive Sequence calculation               |
|                   | Negative Sequence calculation               |
|                   | • Zero Sequence calculation                 |
| Voltage Unbalance | Unbalance factor calculation                |
| Current Unbalance | • 10/12 cycle (200ms) reading               |
|                   | <ul> <li>Aggregation (3 seconds)</li> </ul> |
|                   | Aggregation (10 minutes)                    |
|                   | • Aggregation (2 hours)                     |
| Veltere Elister   | • Short term (10 minutes)                   |
| voitage Flicker   | • Long term (2 hours)                       |

# **6.1 Power Quality Event**

To access the Power Quality Event section,

- 1. Click on **Settings** from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the **Power Quality Event** menu option. This webpage displays the power quality event settings for Acuvim 3.

Acuvim 3 supports the monitoring of eight power quality events, which include voltage sag, voltage swell, voltage interruption, unbalanced voltage, transient voltage, current sag, current swell, and unbalanced events.

|  |   |  |   |  |  |   |  |                                   |   |                            | Dogout   | Friday, Septemb | er 13, 2024 3 29 PM | O About | Settings | Acustin 3 | ACCUENER |
|--|---|--|---|--|--|---|--|-----------------------------------|---|----------------------------|----------|-----------------|---------------------|---------|----------|-----------|----------|
| Installation Revenue and Energy Power Quality and Alarm Communication Data 1 | ogPest  | User Management  | Maintenance and Mar   | agement HMI  |  |   |  |                                   |   |                            |          |                 |                     |         |          |           |          |
| Porter Quality and Marine Pole Gality Cher.                                  |   |  |   |  |  |   |  |                                   |   |                            |          |                 |                     |         |          |           |          |
|  | Power   | Quality Event Alerm  | Di Trigger Hav  | eform and Fastlog Ma   | ins Signaling                                  | Voltage Pow   | er Quality Repo  | rting Ersal                       | Netficatio                              | m                          |          |                 |                     |         |          |           |          |
|  | Nomina  | / Voltage  |   | Nominal Current  |  |   |  |                                   |   |                            |          |                 |                     |         |          |           |          |
|  | 120<br>Earlos M   | - 800000   | V   | 6  |  |   | A  |                                   |   |                            |          |                 |                     |         |          |           |          |
|  | * Email e<br>Alarm -3<br>* Email e<br>* Waveh<br>Quelky a | notification for power qu<br>> Enail Notification.<br>notification for power qu<br>orm and fastlog for powe<br>and Alarm -> Wavefrom | ality events is currently<br>ality events is currently<br>in quality events is carr<br>and Fastleg. | unavailable since email r<br>unavailable since SMTP<br>ently unavailable since w | otification fe<br>s disabled. 1<br>sveform and | ature is globally o<br>ou can enable it<br>lastlog feature is | lisebled. You co<br>on Settings -> 0<br>globally disable | an enable it on<br>od. You can en | Settings -<br>-> Email.<br>able it on 1 | > Power Qu<br>lettings → P | sity and |                 |                     |         |          |           |          |
|  | Enable  | Power Quality Event  | Threshold   | Hysteresis   | Email  | Waveform  | Fast Log   | 80                                |   | RC                         |          |                 |                     |         |          |           |          |
|  | •   | Voltage Sag  | 90 % / 64V<br>One decimal place at more<br>Banger 10 - 90   | 2 % (1.2V<br>One decimal place at most<br>Range: 1 × 10                          | 60   | •   | 10   | New                               |   | New                        |          |                 |                     |         |          |           |          |
|  | •   | Voltage Swell  | 110 16 / 66V<br>One decimal place at more<br>Bange: 110 - 150                                       | 2 56 J 1.2V<br>One decimal place at most<br>Range 1 - 10                         | ۲  | •   | 0  | New                               | ٠                                       | Nyme                       | ٠        |                 |                     |         |          |           |          |
|  | 60  | Voltage Interruption   | 20 % / 12V<br>One decimal place at more   | 2 % / 1.2V<br>One decimal place at most  | #0   | •   | 10   | New                               |   | Nine                       | •        |                 |                     |         |          |           |          |
|  | (E)   | Unbalance Voltage  | 6 %<br>One decimal place at woo   | 1 %<br>One decimal place at most   | 60   | 0   | - 60   | Note                              | +                                       | None                       | +        |                 |                     |         |          |           |          |
|  | 10  | Transient Voltage  | 300 %<br>One decimal place at more  |  | -  | ۲   |  |                                   |   |                            |          |                 |                     |         |          |           |          |
|  | (B)   | Current Sag  | 00 % / 4.5A<br>One decimal place at mos   | 1 % / 0.05A<br>One decimal place at most   | 10   | •   | 10   | Now                               |   | None                       |          |                 |                     |         |          |           |          |
|  | 10  | Current Swell  | 110 % / 5.5A<br>One decimal place at more   | 2 % / 0.1A<br>One decimal place at most  | ø  | ۲   | •0   | New                               | 4                                       | None .                     |          |                 |                     |         |          |           |          |
|  | 10  | Unbalance Current  | 5 %<br>One decimal place at more  | 3 %<br>One decimal place at most   | 60   | •   | 60   | New                               |   | None                       |          |                 |                     |         |          |           |          |

Figure 6-1 Power Quality Event Setting Webpage



Table 6-2 provides the threshold values, hysteresis, and various monitoring options for different power quality events available on Acuvim 3.

| Power Quality Event  | Threshold | Hysteresis | Email | Waveform | Fast Log | Trigger DO<br>Trigger RO |
|----------------------|-----------|------------|-------|----------|----------|--------------------------|
| Voltage Sag          | 10%-90%   | 1%-10%     | •     | •        | •        | •                        |
| Voltage Swell        | 110%-150% | 1%-10%     | •     | •        | •        | •                        |
| Voltage Interruption | 5%-20%    | 1%-10%     | •     | •        | •        | •                        |
| Unbalance Voltage    | 5%-50%    | 1%-10%     | •     | •        | •        | •                        |
| Transient Voltage    | 150-400%  | N/A        | •     | •        | N/A      | N/A                      |
| Current Sag          | 10%-90%   | 1%-10%     | •     | •        | •        | •                        |
| Current Swell        | 110%-150% | 1%-10%     | •     | •        | •        | •                        |
| Unbalance Current    | 5%-50%    | 1%-10%     | •     | •        | •        | •                        |

Table 6-2 Power Quality Event Monitoring Configuration

**Nominal Voltage:** The original voltage value measured across its primary winding. For example, all power quality event thresholds and hysteresis related to voltage are calculated based on the customized nominal current.

**Nominal Current:** The original current value measured across its primary winding. For example, all power quality event thresholds and hysteresis related to current are calculated based on the customized nominal current.

# 6.1.1 Voltage Sag Detection

**Voltage Sag:** Acuvim 3 detects voltage sag by assessing the half-cycle voltage RMS. A voltage sag event starts when the voltage RMS of any channel falls below the defined threshold and ends when the voltage RMS of all measured channels is equal to or above the threshold plus the specified hysteresis voltage.

**Threshold and Hysteresis:** Users can configure the threshold percentage within the range of 10% to 90% and the hysteresis percentage within the range of 1% to 10% to precisely define the conditions for detecting voltage sag events.

**Example:** When a user defines a nominal voltage of 120V and configures the voltage sag threshold to 50% with a hysteresis of 1%, a voltage sag event record will commence if any one of the half-cycle voltage RMS values drops below 60V. The voltage sag event record will conclude when all the half-cycle voltage RMS values have increased to equal or exceed 61.2V.



# 6.1.2 Voltage Swell Detection

**Voltage Swell:** Acuvim 3 detects voltage swell by examining the half-cycle voltage RMS. A voltage swell event initiates when the half-cycle voltage RMS of any channel exceeds the specified threshold and concludes when the half-cycle voltage RMS on all measured channels equals or falls below the threshold minus the set hysteresis voltage.

**Threshold and Hysteresis:** Users can customize the threshold percentage within the range of 110% to 150% and set the hysteresis percentage within the range of 1% to 10% to precisely define the criteria for detecting voltage swell events.

**Example:** When a user defines a nominal voltage of 120V and configures the voltage swell threshold to 150% with a hysteresis of 1%, a voltage swell event record will begin if any one of the half-cycle voltage RMS values surpasses 180V. The voltage swell event record will end when all the half-cycle voltage RMS values have dropped to equal or fall below 178.8V.

# 6.1.3 Voltage Interruption Detection

**Voltage Interruption:** Acuvim 3 detects voltage interruption by examining the half-cycle voltage RMS. A voltage interruption event begins when the half-cycle voltage RMS of all channels falls below the defined threshold and concludes when the half-cycle voltage RMS on any of the measured channels reaches or exceeds the threshold plus the specified hysteresis voltage.

**Threshold and Hysteresis:** Users can customize the threshold percentage within the range of 5% to 20% and set the hysteresis percentage within the range of 1% to 10% to precisely define the criteria for detecting voltage interruption events.

**Example:** When a user defines a nominal voltage of 120V and configures the voltage interruption threshold to 5% with a hysteresis of 10%, a voltage interruption event record will initiate if all the half-cycle voltage RMS values drop below 6V. The voltage interruption event record will conclude when any one of the half-cycle voltage RMS values increases to equal or surpass 18V.

In Acuvim 3, when both a voltage interruption and voltage sag meet their respective thresholds, only the voltage interruption event will be recorded.

# 6.1.4 Unbalanced Voltage Detection

**Unbalance Voltage:** Acuvim 3 detects unbalanced voltage by monitoring the voltage unbalance factor, which is updated at a rate of 200ms. An unbalanced voltage event starts when the unbalance factor exceeds the defined threshold and concludes when it falls below the threshold minus the specified hysteresis.

Threshold and Hysteresis: Users can customize the threshold percentage within the range of





5% to 50% and set the hysteresis percentage within the range of 1% to 10% to precisely define the criteria for detecting unbalance voltage events.

**Example:** When a user configures the unbalanced voltage threshold to 5% with a hysteresis of 1%, an unbalanced voltage event record will initiate if the voltage unbalance factor exceeds 5%. And the unbalanced voltage event record will conclude when the voltage unbalance factor is equal to or below 4%.

# 6.1.5 Transient Voltage Detection

**Transient Voltage:** Acuvim 3 detects transient voltage by analyzing the voltage sampling values at a rate of 32,000 samples per second (ksps). A transient voltage event is triggered when the sampling peak value of any channel exceeds the defined threshold. It's important to note that transient voltage events do not trigger waveform or fast log capture. Instead, they capture a transient log at 32 ksps for the 40ms duration. This mechanism allows for the precise detection and logging of transient voltage events in the electrical system.

Threshold: Transient voltage threshold ranges from 150% to 400%.

**Example:** If the nominal voltage of the system is 120V, and the Acuvim 3 detects a peak voltage of 360V (RMS voltage of 254V), a duration of 40ms transient voltage event will be recorded.

# 6.1.6 Current Sag Detection

**Current Sag:** Acuvim 3 detects current sag by analyzing the half-cycle current RMS. A current sag event begins when the half-cycle current RMS of any channel falls below the specified threshold and concludes when the half-cycle current RMS on all measured channels is equal to or exceeds the threshold plus the specified hysteresis current.

**Threshold and Hysteresis:** Users can configure the threshold percentage within the range of 10% to 90% and the hysteresis percentage within the range of 1% to 10% to precisely define the conditions for detecting current sag events.

**Example:** When a user defines a nominal current of 5A and configures the current sag threshold to 50% with a hysteresis of 1%, a current sag event record will commence if any one of the half-cycle current RMS values drops below 2.5A. The current sag event record will conclude when all the half-cycle current RMS values have increased to equal or exceed 2.55A.

# **6.1.7 Current Swell Detection**

**Current Swell:** Acuvim 3 detects current swell by analyzing the half-cycle current RMS. A current swell event begins when the half-cycle current RMS of any channel exceeds the defined threshold



and concludes when the half-cycle current RMS on all measured channels falls to equal or below the threshold minus the specified hysteresis current.

**Threshold and Hysteresis:** Users can customize the threshold percentage within the range of 110% to 150% and set the hysteresis percentage within the range of 1% to 10% to precisely define the criteria for detecting current swell events.

**Example:** When a user defines a nominal current of 5A and configures the current swell threshold to 150% with a hysteresis of 1%, a current swell event record will begin if any one of the half-cycle current RMS values surpasses 7.5A. The current swell event record will end when all the half-cycle current RMS values have dropped to equal or below 7.45A.

# 6.1.8 Unbalanced Current Detection

**Unbalance Current:** Acuvim 3 detects unbalanced current by monitoring the current unbalance factor, which is updated at a rate of 200ms. An unbalanced current event starts when the unbalance factor exceeds the defined threshold and concludes when it falls below the threshold minus the specified hysteresis.

**Threshold and Hysteresis:** Users can customize the threshold percentage within the range of 5% to 50% and set the hysteresis percentage within the range of 1% to 10% to precisely define the criteria for detecting unbalanced current events.

**Example:** when a user configures the unbalanced current threshold to 5% with a hysteresis of 1%, an unbalanced current event record will initiate if the current Unbalance factor exceeds 5%. And the unbalanced current event record will conclude when the current unbalance factor equal to or below 4%.

# 6.1.9 Power Quality Event General Configuration

| Enable | Power Quality Event | Threshold                  |  | Hysteresis                |                                       | Email | Waveform | Fast Log | DO   |    | RO   | )  |
|--------|---------------------|----------------------------|--|---------------------------|---------------------------------------|-------|----------|----------|------|----|------|----|
|        | Voltage Sag         | 90<br>One decimal<br>Range | % / 108V<br>place at most<br>: 10 - 90 | 2<br>One decimal<br>Range | % / 2.4V<br>place at most<br>: 1 - 10 |       |          |          | None | \$ | None | \$ |

Figure 6-2a Voltage Sag Enable

Power Quality Event Enable: Toggle to enable or disable a power quality event detection.

| Enable | Power Quality Event | Thre                 | Threshold                  |                      | Hysteresis                   |  | Waveform Fast Log |  | DO   |  | RO   |   |
|--------|---------------------|----------------------|----------------------------|----------------------|------------------------------|--|-------------------|--|------|--|------|---|
|        | Voltage Sag         | 90 %                 | % / 108V                   | 2                    | % / 2.4V                     |  |                   |  | None |  | None | ÷ |
|        | voltage sag         | One decimal<br>Range | place at most<br>: 10 - 90 | One decimal<br>Range | l place at most<br>e: 1 - 10 |  |                   |  |      |  |      |   |

### Figure 6-2b Voltage Sag Email Enable





**Power Quality Event Email Enable:** To receive an email alert when a power quality event has occurred, users will need to enable and configure email SMTP settings and email notification settings.

| Enable | Power Quality Event |             | Thre                  | shold                                    | Hyst                    | teresis                                  | Email | Waveform | Fast Log | DO   |   | RO   |    |
|--------|---------------------|-------------|-----------------------|--|-------------------------|--|-------|----------|----------|------|---|------|----|
|        | Voltage Sag         | 90<br>One o | ¢<br>decimal<br>Range | % / 108V<br>I place at most<br>: 10 - 90 | 2<br>One decima<br>Rang | % / 2.4V<br>I place at most<br>e: 1 - 10 |       |          |          | None | ¢ | None | \$ |

Figure 6-2c Voltage Sag Waveform Enable

**Power Quality Event Waveform Enable:** Toggling this setting enables waveform for power quality events. Users will still need to enable and configure settings in 'Waveform and Fastlog' section to ensure waveform functions effectively.

| _ |             | 90                   | % / 108V                 | 2                       | % / 2.4V                | _ | _ | _ |      |   |      |   |
|---|-------------|----------------------|--------------------------|-------------------------|-------------------------|---|---|---|------|---|------|---|
|   | Voltage Sag | One decimal<br>Range | place at most<br>10 - 90 | One decimal p<br>Range: | place at most<br>1 - 10 |   |   |   | None | ÷ | None | ¢ |

#### Figure 6-2d Voltage Sag Fastlog Enable

**Power Quality Event Fast Log Enable:** Toggling this setting enables fast logging for power quality events. Users will still need to enable and configure settings in 'Waveform and Fastlog' section to ensure fastlog functions effectively.

| Enable | Power Quality Event | Thre                       | shold                                | Hyste                      | eresis                                | Email | Waveform | Fast Log | DO          | RO           |
|--------|---------------------|----------------------------|--------------------------------------|----------------------------|---------------------------------------|-------|----------|----------|-------------|--------------|
|        | Voltage Sag         | 90<br>One decimal<br>Range | % / 108V<br>place at most<br>10 - 90 | 2<br>One decimal<br>Ranges | % / 2.4V<br>place at most<br>: 1 - 10 |       |          | ۲        | Meter Bod 🖨 | AXM IO1 - \$ |

Figure 6-2e Voltage Sag DO Enable

Power Quality Event DO Enable: Selected DO will latch to 'High' after event occurs.

Power Quality Event RO Enable: Based on the selected configuration for a relay output (RO):

- When configured in **Latch Mode**, the relay will remain in the 'High' state after an event occurs. It will latch to the 'High' state until there is a manual reset or until a specific reset condition is met.
- When configured in **Momentary Mode**, the relay will generate a pulse or momentary switch to the 'High' state after an event occurs. This pulse is typically of short duration and is used to trigger external I/O or processes.





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| Enable | Power Quality Event | Thre                       | shold                                  | Hyste                      | eresis                              | Email | Waveform | Fast Log | DO           | RO          |
|--------|---------------------|----------------------------|--|----------------------------|-------------------------------------|-------|----------|----------|--------------|-------------|
|        | Voltage Sag         | 90<br>One decimal<br>Range | % / 108V<br>place at most<br>: 10 - 90 | 2<br>One decimal<br>Ranges | % / 2.4V<br>place at most<br>1 - 10 |       |          | ۲        | Meter Bod \$ | AXM IO1  \$ |

Figure 6-2f Voltage Sag RO Enable

# 6.2 Waveform and Fastlog

**Waveform Capture:** Acuvim 3 captures waveforms for both voltage and current channels. These waveforms are saved as COMTRADE files within Acuvim 3 and it can also be posted to remote servers via HTTP/FTP for further analysis and storage.

**Fastlog Capture:** Acuvim 3 captures fast logs for all half-cycle voltage and current RMS values. These fast logs are stored as CSV files within the Acuvim 3, and they can also be posted to remote servers using HTTP/FTP.

# 6.2.1 Waveform and Fastlog Settings

**Sample Rate:** The sample rate defines the frequency at which the Acuvim 3 captures waveform data, directly affecting the granularity and precision of waveform analysis. Available options include 64, 128, 256, and 512 samples per cycle.

**Pre-Trigger Cycles:** The number of cycles recorded before a power quality event is triggered. Ranges from 0 to 60.

**Post Trigger Cycles:** The number of cycles recorded after a power quality event is triggered. Ranges from 0 to 300.

| Waveform an                                 | d Fastlog Se                | ettings 👻                   |                           |        |                           |        |
|---|-----------------------------|-----------------------------|---------------------------|--------|---------------------------|--------|
| <ul><li>Waveform</li><li>Enable e</li></ul> | m and Fastlo<br>xtended way | eg Enable<br>veform capture |                           |        |                           |        |
| Sample Rate                                 |                             |                             | Pre-trigger Cycles        |        | Post Trigger Cycles       |        |
| 64  | \$                          | sample/cycle                | 30                        | cycles | 60                        | cycles |
|   |                             |                             | Default: 0, Range: 0 - 60 |        | Default: 0, Range: 0 - 30 | 0      |

Figure 6-3a Waveform and Fastlog Settings

**Extended Waveform Capture:** If the extended waveform function is enabled, the waveform duration will be fixed at 10 seconds, and sample rate will be fixed at 12k samples/second. There will be no pre-triggering, and it can only be triggered manually.





Enabling the Extended Waveform Capture function will disable several key features, including Power Quality Event, Alarm, and Mains Signaling Voltage. Additionally, only manual triggering will be available. Please proceed only if you do not require these functions during waveform capture.

| Waveform and Fa | astlog Se | ettings 👻     |                          |        |                          |        |
|-----------------|-----------|---------------|--------------------------|--------|--------------------------|--------|
| 💽 Waveform a    | nd Fastlo | g Enable      |                          |        |                          |        |
| Enable exter    | nded way  | eform capture |                          |        |                          |        |
| Sample Rate     |           |               | Pre-trigger Cycles       |        | Post Trigger Cycles      |        |
| 64              | \$        | sample/cycle  | 30                       | cycles | 60                       | cycles |
|                 |           |               | Default: 0 Range: 0 - 60 |        | Default: 0 Range: 0 - 30 | 0      |

Figure 6-3b Waveform and Fastlog Settings (Extended Waveform)

### 6.2.2 Waveform and Fastlog Data Post Settings

| Data Post Settings 🐨 |                   |              |
|----------------------|-------------------|--------------|
| Filename Prefix      | Receive Device ID | Station Name |
| Test1                | Device1           | Station1     |
| Data Post Enable     |                   |              |

Figure 6-4 Data Post Settings

Filename Prefix: Prefixed name of the waveform and the fast log file.

**Receive Device ID:** ID to indicate which Acuvim 3 was used for waveform and fast log data acquisition.

Station Name: Provide a Station name to indicate where Acuvim 3 was located.

| Files to Post:<br>Waveform Transient Fastlog |   |                              |                       |  |
|--|---|------------------------------|-----------------------|--|
| Methods                                      |   |                              |                       |  |
| HTTP/HTTPs                                   | ٥ |                              |                       |  |
| Fix Filename                                 |   |                              |                       |  |
| Authentication                               |   |                              |                       |  |
| HTTP/HTTPs URL                               |   | HTTP/HTTPs Port              | Meter ID              |  |
| Enter HTTP/HTTPs URL                         |   | 0                            | Enter Meter ID        |  |
| Maximum 40 characters                        |   | Default: 1, Range: 1 - 65535 | Maximum 40 characters |  |
| Test Data Post                               |   |                              |                       |  |

#### Figure 6-5 Data Post Settings

Files to Post: Users can specify data for posting, including waveform, transient, and Fastlog data.

**Data Post Methods:** Users can specify data posting methods, including HTTP/HTTPs, FTP, and SFTP.

Test Data Post: Confirms server connectivity after saving settings.



### 6.2.3 Waveform and Fastlog HTTP/HTTPs Settings

| Methods               |   |                              |                       |
|-----------------------|---|------------------------------|-----------------------|
| HTTP/HTTPs            | ٥ |                              |                       |
| Fix Filename          |   |                              |                       |
| Authentication        |   |                              |                       |
| HTTP/HTTPs URL        |   | HTTP/HTTPs Port              | Meter ID              |
| Enter HTTP/HTTPs URL  |   | 0                            | Enter Meter ID        |
| Maximum 40 characters |   | Default: 1, Range: 1 - 65535 | Maximum 40 characters |

Figure 6-6 Data Post HTTP/HTTPs Settings

URL: The URL supports a maximum of 40 characters.

**Port:** The default port number is 1, and can range from 1 to 65535.

MeterID: Add custom Acuvim 3's ID with a maximum of 40 characters.

**Fix Filename:** Overrides the waveform and fast log filename prefix setting in the waveform and Fastlog Configuration webpage.

Authentication: Two authentication methods available:

- Token: Input the unique access token provided. Max character limit is 40.
- Username: Input the corresponding username and password. Max character limit is 40.

# 6.2.4 Waveform and Fastlog FTP/SFTP Settings

| Methods               |   |                               |          |
|-----------------------|---|-------------------------------|----------|
| FTP                   | ¢ |                               |          |
| FTP URL               |   | FTP Port                      |          |
| Enter FTP URL         |   | 0                             |          |
| Maximum 40 characters |   | Default: 21, Range: 1 - 65535 |          |
| FTP Username          |   | FTP Password                  |          |
| Enter FTP Username    |   | Enter FTP Password            | <i>S</i> |
| Maximum 40 characters |   | Maximum 40 characters         |          |

Figure 6-7 Data Post FTP Settings

**Username:** The username supports a maximum of 40 characters.

**Password:** The password supports a maximum of 40 characters.

# 6.3 Email Notification

To access the Email section,

1. Click on **Settings** from the main menu.





- 2. Select **Power Quality and Alarm** from the tab menu.
- 3. Click on the **Email** menu option. This webpage displays the Email settings for Acuvim 3.

|              |                    |                              |                     |                 |                      | 🕞 Logout      | Thursday, January 26 | i, 2023 8:50 AM | About | Settings | Acuvim 3 | ACCUENERGY |
|--------------|--------------------|------------------------------|---------------------|-----------------|----------------------|---------------|----------------------|-----------------|-------|----------|----------|------------|
| Installation | Revenue and Energy | Power Quality and Alarm      | Communication       | Data Log/Post   | User Management      | Maintenance a | and Management       | HMI             |       |          |          |            |
| Power Qualit | ty and Alarm Email | Notification                 |                     |                 |                      |               |                      |                 |       |          |          |            |
|              |                    | Power Quality Event Alarm    | Waveform and Fastle | og Power Quali  | ty Reporting Email N | lotification  |                      |                 |       |          |          |            |
|              |                    | C Enable Email Notifications |                     |                 |                      |               |                      |                 |       |          |          |            |
|              |                    | Subject Prefix               |                     |                 |                      |               |                      |                 |       |          |          |            |
|              |                    | Enter Subject Prefix         |                     |                 |                      |               |                      |                 |       |          |          |            |
|              |                    | Maximum 256 characters       |                     |                 |                      |               |                      |                 |       |          |          |            |
|              |                    | Recipient 1                  |                     | Recipient 2     |                      |               | Recipient 3          |                 |       |          |          |            |
|              |                    | Enter Recipient 1            |                     | Enter Recipie   | nt 2                 |               | Enter Recipient      | 3               |       |          |          |            |
|              |                    | Maximum 256 characters       |                     | Maximum 256 cha | racters              |               | Maximum 256 charac   | tters           |       |          |          |            |
|              |                    | Save                         |                     |                 |                      |               |                      |                 |       |          |          |            |

Figure 6-8 Email Notification Settings

**Subject Prefix:** The subject line for the email. For example, voltage sags will trigger a notification email with the subject as 'subject prefix - Voltage Sag.'

Recipient: Allows the configuration of up to three recipients to receive the email.

# 6.4 Power Quality Event Analysis

### 6.4.1 Power Quality Event

To access the power quality event section,

- 1. Click on **Acuvim 3** from the main menu.
- 2. Select **Power Quality and Alarm** from the tab menu.
- 3. Click on the **Power Quality Event** menu option. This webpage displays the power quality event for Acuvim 3.

Power Quality Event webpage displays the following information for each event: timestamp, event type, duration, waveform file, fast log file, and additional event details.



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| Metering + 🗘 Po     | wer Quality and Alarm 👻 🔊 Logs 👻    |                      |                  |          |         |         |  |
|---------------------|-------------------------------------|----------------------|------------------|----------|---------|---------|--|
| ower Quality and Al | arm Power Quality Event             |                      |                  |          |         |         |  |
|                     | Power Quality Event                 |                      |                  |          |         |         |  |
|                     | Time Frame                          |                      |                  |          |         |         |  |
|                     | 2023/01/26 12:00 AM - 2023/01/26 11 | 59 PM                |                  |          |         |         |  |
|                     | Search Reset                        |                      |                  |          |         |         |  |
|                     | Timestamp                           | Event                | Duration(second) | Waveform | FastLog | Details |  |
|                     | 2023-01-25 16:01:21.783             | Current Sag          | 0.016650         | 4        | 4       | ٥       |  |
|                     | 2023-01-25 16:01:21.600             | Current Sag          | 0.066700         | *        | *       | 0       |  |
|                     | 2023-01-25 13:50:22.008             | Unbalance Voltage    | 0.117300         | 4        | *       | 0       |  |
|                     | 2023-01-25 13:50:22.008             | Unbalance Current    | 7859.691880      | 4        | *       | 0       |  |
|                     | 2023-01-25 13:50:02.386             | Voltage Sag          | 19.621580        | 4        | 4       | ٥       |  |
|                     | 2023-01-25 13:50:02:386             | Voltage Interruption | 19.604820        | 4        | *       | 0       |  |
|                     | 2023-01-25 13:50:02.386             | Unbalance Voltage    | 0.040840         | 4        | 4       | ٥       |  |
|                     | 2023-01-25 11:01:00.601             | Unbalance Voltage    | 0.222440         | *        | *       | 0       |  |
|                     | 2023-01-25 11:01:00.601             | Unbalance Current    | 10141.826310     | 4        | 4       | 0       |  |
|                     | 2023-01-25 11:00:56.022             | Voltage Interruption | 4.562300         | 4        | ۵.      | 0       |  |
|                     | Previous 1 2 Next 10/page           | •                    |                  |          |         |         |  |
|                     | attend on the second                |                      |                  |          |         |         |  |

**Timestamp:** The timestamp follows the format: 'year-month-date hours: minute: seconds: milliseconds'.

**Event Type:** The available event types include voltage sag, voltage swell, voltage interruption, voltage, transient voltage unbalance, current sag, current swell, and unbalance current parameters.

Duration: The duration is measured in seconds and can be displayed up to six decimal places.

Waveform File Download: Allow users to download a waveform COMTRADE file.

Fastlog File Download: Allow users to download a Fastlog CSV file.

**Details:** Displays maximum, minimum, and average values for each channel associated with the power quality event.



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| D | ata       |         |           |           | ×  |
|---|-----------|---------|-----------|-----------|----|
|   | Name      | Min     | Max       | Average   |    |
|   | Phase A   | 5.817 V | 152.866 V | 146.882 V |    |
|   | Phase B   | 4.010 V | 88.440 V  | 85.366 V  |    |
|   | Phase C   | 5.726 V | 151.216 V | 146.594 V |    |
|   | unbalance | 0.000 % | 16.999 %  | 0.918 %   |    |
|   |           |         |           | Clos      | se |

#### Figure 6-10 Waveform Detail Data webpage

### 6.4.2 Waveform Capture

To access the Waveform Capture section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the **Waveform Capture** menu option. This webpage displays the waveform capture information for Acuvim 3.

|              |                            |  |                     | Cogran 100 |        |   | our 🛶 seriests |
|--------------|----------------------------|--|---------------------|------------|--------|---|----------------|
| Metering +   | A Power Quality and Narm 👻 | D Logs -   |                     |            |        |   |                |
| er Quality a | and Alarm Waveform Capture |  |                     |            |        |   |                |
|              |                            |  |                     |            |        | _ |                |
|              |                            | Filename   | Time -              | Size -     | Action |   |                |
|              |                            | prefix_2023-01-31T14-43-53.559619-0500_Vabc_VOLT_INTRP | 2023-01-31 14:44:06 | 1070       | 📥 🗅 🧰  |   |                |
|              |                            | prefix_2023-01-31T14-43-53.519140-0500_L_CUR_UNBL      | 2023-01-31 14:44:05 | 1074       | 📥 D 💼  |   |                |
|              |                            | prefix_2023-01-31T14-43-53.519140-0500_V_VOLT_UNBL     | 2023-01-31 14:44:04 | 1074       | 🔺 🗅 💼  |   |                |
|              |                            | prefix_2023-01-31T14-43-53.519140-0500_labc_CUR_SAG    | 2023-01-31 14:44:02 | 1074       | 📥 D 🛅  |   |                |
|              |                            | prefix_2023-01-31T14-43-53.519140-0500_Vabc_VOLT_SAG   | 2023-01-31 14:44:01 | 1074       | 📥 D 🔟  |   |                |
|              |                            | prefx_2023-01-31T14-43-15.165910-0500_J_CUR_UNBL       | 2023-01-31 14:44:00 | 1111       | 📥 D 💼  |   |                |
|              |                            | prefix_2023-01-31T14-43-15.165910-0500_V_VOLT_UNBL     | 2023-01-31 14:43:58 | 1111       | 📥 D 💼  |   |                |
|              |                            | prefix_2023-01-31T14-43-10.218559-0500_Vabc_VOLT_INTRP | 2023-01-31 14:43:57 | 1090       | 📥 D 💼  |   |                |
|              |                            | prefix_2023-01-31T14-43-10.201849-0500_I_CUR_UNBL      | 2023-01-31 14:43:55 | 1091       | 🔺 🗅 💼  |   |                |
|              |                            | prefix_2023-01-31T14-43-10.201849-0500_V_VOLT_UNBL     | 2023-01-31 14:43:55 | 1091       | 🔺 D 💼  |   |                |
|              |                            | Previous 1 2 3 5 Next 10/page •                        |                     |            |        |   |                |
|              |                            | Trigger Waveform Capture Clear Waveform Capture        |                     |            |        |   |                |

Figure 6-11 Power Quality and Alarm Waveform Capture Webpage



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**Filename:** The waveform file name follows the pattern of Prefix + Timestamp + Event Type. **Time:** The timestamp at which waveform capture is triggered.

Size: The size of the waveform capture file saved on the disk is measured in kilobytes (KB).

**Download:** Download COMTRADE file of the selected waveform record.

**View Button:** Enables detailed analysis of waveforms, with customizable window size and channels.



#### Figure 6-12 Power Quality and Alarm Waveform Capture Webpage

Delete: Permanently delete the selected waveform record.

**Trigger waveform Capture:** Manually trigger a waveform with the current waveform configuration. A manual waveform trigger will be recorded in Power Quality Event log.

**Clear Waveform Capture:** Delete all the waveform capture records stored on the disk. This action cannot be reversed.

# 6.4.3 Fast Log

To access the Fast Log section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select **Power Quality and Alarm** from the tab menu.
- 3. Click on the Fast Log menu option. This webpage displays the fast logs for Acuvim 3.



| Filename   | Time                | Size | Action |
|--|---------------------|------|--------|
| prefix_2023-01-31T14-44-57.712680-0500_V_VOLT_UNBL.csv     | 2023-01-31 14:45:03 | 25   | 1      |
| prefix_2023-01-31T14-43-53.519140-0500_L_CUR_UNBL.csv      | 2023-01-31 14:43:59 | 24   | ± 0    |
| prefix_2023-01-31T14-43-53.559619-0500_Vabc_VOLT_INTRP.csv | 2023-01-31 14:43:59 | 24   | ۵ ک    |
| prefix_2023-01-31T14-43-53.519140-0500_Vabc_VOLT_SAG.csv   | 2023-01-31 14:43:59 | 24   | ۵ 🕹    |
| prefix_2023-01-31T14-43-53.519140-0500_V_VOLT_UNBL.csv     | 2023-01-31 14:43:59 | 24   | ۵ 🛓    |
| prefix_2023-01-31T14-43-53.519140-0500_Jabc_CUR_SAG.csv    | 2023-01-31 14:43:59 | 24   | ۵      |
| prefix_2023-01-31T14-43-15.165910-0500_L_CUR_UNBL.csv      | 2023-01-31 14:43:20 | 25   | 1      |
| prefix_2023-01-31T14-43-15.165910-0500_V_VOLT_UNBLcsv      | 2023-01-31 14;43:20 | 25   | ۵ 🕹    |
| prefix_2023-01-31T14-43-10.201849-0500_V_VOLT_UNBL.csv     | 2023-01-31 14:43:15 | 24   | ۵ ک    |
| prefix_2023-01-31T14-43-10.201849-0500_Jbc_CUR_SAG.csv     | 2023-01-31 14:43:15 | 24   | ± 0    |
| Previous 1 2 3 5 Next 10 page +                            |                     |      |        |
| Trigger Fast Log   |                     |      |        |

#### Figure 6-13 Power Quality and Alarm Fast Log Webpage

**Filename:** The fast log file name follows the pattern of Prefix + Timestamp + Event Type **Time:** The timestamp at which fast log is triggered.

Size: The size of the fast log file saved on the disk is measured in kilobytes (KB).

Download: Download CSV file of the selected fast log.

**Delete:** Delete the selected fast log record.

Trigger Fast Log: Manually trigger a fast log event with the current fast log configuration.

Clear Fast Log: Delete all the fast logs stored on the disk. This action cannot be undone.

#### 6.4.4 Transient Voltage Log

To access the Transient Voltage Log section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select **Power Quality and Alarm** from the tab menu.
- 3. Click on the **Transient Voltage Log** menu option. This webpage displays the transient voltage logs for Acuvim 3.

| Ltd Metering +  | 🗘 Power Quality and Alarm 👻 | D Logs +  |                     |      |        |  |  |  |
|-----------------|-----------------------------|---|---------------------|------|--------|--|--|--|
| Power Quality a | and Alarm Transient Log     |   |                     |      |        |  |  |  |
|                 |                             | Filename  | Time                | Size | Action |  |  |  |
|                 |                             | prefix_2023-01-31T14-48-29.335180-0500_V_TRAN     | 2023-01-31 14:48:35 | 47   | 🛓 D 💼  |  |  |  |
|                 |                             | prefx_2023-01-31T14-48-27.335160-0500_V_TRAN      | 2023-01-31 14:48:33 | 48   | 📩 D 💼  |  |  |  |
|                 |                             | prefix_2023-01-31T14-43-08.372720-0500_V_TRAN     | 2023-01-31 14:43:14 | 48   | 🛓 D 💼  |  |  |  |
|                 |                             | prefix_2023-01-31T14-43-06.372699-0500_V_TRAN     | 2023-01-31 14:43:12 | 48   | 🛓 D 💼  |  |  |  |
|                 |                             | prefix_2023-01-31T14-43-00.872839-0500_V_TRAN     | 2023-01-31 14:43:06 | 48   | 🛓 D 💼  |  |  |  |
|                 |                             | prefix_2023-01-31T14-42-58.872740-0500_V_TRAN     | 2023-01-31 14:43:04 | 48   | 📩 0 💼  |  |  |  |
|                 |                             | Previous 1 Next 10/page                           |                     |      |        |  |  |  |
|                 |                             | Trigger Transient Capture Clear Transient Capture |                     |      |        |  |  |  |

Figure 6-14 Power Quality and Alarm Transient Voltage Log Webpage





Download: Allow users to download COMTRADE file of the selected transient log.

Delete: Permanently delete the selected transient voltage log record.

View Transient Voltage Log File: Access the voltage transient waveform for advanced analysis.



Figure 6-15 Transient Voltage View Webpage

# 6.4.5 Mains Signaling Voltage Log

To access the Mains Signaling Voltage section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the **Mains Signaling Voltage** menu option. This webpage displays the mains signaling voltage logs for Acuvim 3.

| 📶 Metering 👻    | 🗘 Power Quality and Alarm 📼   | "D Logs -                  |               |                     |          |                |  |
|-----------------|-------------------------------|----------------------------|---------------|---------------------|----------|----------------|--|
| Power Quality a | and Alarm Mains Signaling Log |                            |               |                     |          |                |  |
|                 |                               | Mains Signaling Log        |               |                     |          |                |  |
|                 |                               | Time Frame                 |               | Trigger Phase       |          |                |  |
|                 |                               | Enter Time Frame           |               | Select Trigger Phas | se       | •              |  |
|                 |                               | Search Reset               |               |                     |          |                |  |
|                 |                               | Timestamp                  | Trigger Phase | Period(second)      | Log File | Max Voltage(V) |  |
|                 |                               | 2023-08-01 14:46:06.916    | Phase B       | 60                  | ۵        | 120.549        |  |
|                 |                               | 2023-08-01 14:46:06:708    | Phase A       | 60                  | *        | 57.653         |  |
|                 |                               | 2023-08-01 14:46:06:708    | Phase B       | 60                  | *        | 58.673         |  |
|                 |                               | 2023-08-01 14:46:06:708    | Phase C       | 60                  | ۵.       | 58.197         |  |
|                 |                               | 2023-08-01 14:46:06:490    | Phase B       | 60                  | ٤.       | 0.000          |  |
|                 |                               | 2023-08-01 14:46:06:272    | Phase B       | 60                  | ۵.       | 0.000          |  |
|                 |                               | 2023-08-01 14:46:06:272    | Phase C       | 60                  | ۵.       | 0.000          |  |
|                 |                               | 2023-08-01 14:46:06:054    | Phase C       | 60                  | ▲        | 0.000          |  |
|                 |                               | 2023-08-01 14:46:05:836    | Phase A       | 60                  | 4        | 0.000          |  |
|                 |                               | 2023-08-01 14:46:05:836    | Phase C       | 60                  | ۵.       | 0.000          |  |
|                 |                               | Previous 1 2 3 497 Next    | 10 page Ø     |                     |          |                |  |
|                 |                               | Clear Mains Signaling Logs |               |                     |          |                |  |

Figure 6-16 Mains Signaling Log Webpage



**Trigger Phase**: Users can specify the phase in which mains signaling voltage (MSV) occurs, and can also apply filters to monitor the selected phase.

Period: The time duration in which the MSV occurred, with the unit being seconds.

# 6.4.6 Mains Signaling Voltage Record

To access the Mains Signaling Voltage Record section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select **Power Quality** and Alarm from the tab menu.
- 3. Click on the **Mains Signaling Voltage Record** menu option. This webpage displays the mains signaling voltage records for Acuvim 3.

| All Metering * | $\bigtriangleup$ Power Quality and Alarm $\star$ | D Logs v                                       |                     |      |        |
|----------------|--|--|---------------------|------|--------|
| ower Quality a | nd Alarm Mains Signaling Recor                   | d  |                     |      |        |
|                |  | Filename                                       | Time                | Size | Action |
|                |  | MSV-PhaseC-2023-08-01T14-46-06.708430-0400.csv | 2023-08-01 14:46:07 | 9    | ۵      |
|                |  | MSV-PhaseC-2023-08-01T14-46-06.53590-0400.csv  | 2023-08-01 14:46:07 | 9    | ۵ 🕹    |
|                |  | MSV-Phase8-2023-08-01T14-46-06.915679-0400.csv | 2023-08-01 14:46:07 | 10   | ۵ 🕹    |
|                |  | MSV-PhaseA-2023-08-01T14-46-06.708430-0400.csv | 2023-08-01 14:46:07 | 10   | 🛓 🗉    |
|                |  | MSV-PhaseB-2023-08-01T14-46-06.271879-0400.csv | 2023-08-01 14:46:07 | 10   | 🛃 🗉    |
|                |  | MSV-PhaseB-2023-08-01T14-46-06.708430-0400.csv | 2023-08-01 14:46:07 | 10   | ۵      |
|                |  | MSV-PhaseB-2023-08-01T14-46-06.490139-0400.csv | 2023-08-01 14:46:07 | 10   | ۵      |
|                |  | MSV-PhaseC-2023-08-01T14-46-06.271879-0400.csv | 2023-08-01 14:46:07 | 9    | ± 0    |
|                |  | MSV-PhaseC-2023-08-01T14-46-05.835750-0400.csv | 2023-08-01 14:46:07 | 9    | ۵      |
|                |  | MSV-PhaseC-2023-08-01T14-46-05.180910-0400.csv | 2023-08-01 14:46:06 | 9    | ۵      |
|                |  | Previous 1 2 3 5264 Next 10/page +             |                     |      |        |
|                |  | Clear Mains Signaling Records                  |                     |      |        |

#### Figure 6-17 Mains Signaling Log Webpage

Filename: The fast log file name follows the pattern of MSV + Phase Type + Timestamp.

Size: The size of the MSV log file saved on the disk is measured in kilobytes (KB).

Download: Download CSV file of the selected MSV log.

Delete: Delete the selected MSV log.

Clear Fast Log: Delete all the MSV logs stored on the disk. This action cannot be undone.

# 6.5 Alarm

### 6.5.1 Alarm Configuration

To access the Alarm section,

1. Click on **Settings** from the main menu.





2. Select **Power Quality Event** from the tab menu.

3. Click on the Alarm menu option. This webpage displays the alarm monitors for Acuvim 3.

Acuvim 3 can support up to 16 setpoint alarm monitors, with each alarm monitor capable of monitoring up to three trigger conditions.

For each alarm monitor, users can easily identify its ID, whether the alarm is enabled or disabled, the label name, the enabled or disabled status of email notifications, and the configuration for digital outputs (DO) and relay outputs (RO).

| Installation                  | Revenue and Energy | Power Quality and Alarm   | Communicatio | in Data Log/Post      | User Management       | Maintenano | e and Management | HMI                   |  |  |
|-------------------------------|--------------------|---------------------------|--------------|-----------------------|-----------------------|------------|------------------|-----------------------|--|--|
| Power Quality and Alarm Alarm |                    |                           |              |                       |                       |            |                  |                       |  |  |
|                               |                    | Power Quality Event Alarm | Waveform an  | d Fastlog Power Quali | ty Reporting Email No | tification |                  |                       |  |  |
|                               | 2                  | Alarm Monitors            |              |                       |                       |            |                  | Add New Alarm Monitor |  |  |
|                               |                    | ID                        | Enable       | Label                 | Fmail                 | DO         | RO               | Action                |  |  |
|                               |                    | Alarm Monitor 1           | Disable      | Alarm 1               | Disable               | None       | None             | View Edit Delete      |  |  |
|                               |                    | Alarm Monitor 2           | Disable      | NEW MONITOR           | Disable               | None       | None             | View Edit Delete      |  |  |
|                               |                    | Alarm Monitor 3           | Enable       | Voltage Monitor       | Disable               | None       | None             | View Edit Delete      |  |  |

#### Figure 6-18 Alarm Monitors Operation Webpage

Add New Alarm Monitor: Create a new alarm monitor with default setting.

View Alarm Monitor: View the configuration of the selected alarm monitor.

Edit Alarm Monitor: Edit the selected alarm monitor with custom settings.

Delete Alarm Monitor: Removes the selected alarm monitor.

Enable: Activate or deactivate an alarm monitor.

Label: Custom label with a maximum of 20 characters for each alarm monitor.

**DO:** When an alarm is triggered, the selected digital output will be activated, and when the alarm recovers, the DO status is cleared.

**RO:** When an alarm is triggered, the selected relay output will be activated, and when the alarm recovers, the RO status is cleared.



|           |                         |     |       | g Toner quanty hepotan                   | g Email Notification               |  |                                    |
|-----------|-------------------------|-----|-------|--|------------------------------------|--|------------------------------------|
| Alarm     | Monitor 3               |     |       |  |                                    |  | < Back to Alarm List               |
| Enable    |                         |     |       |  |                                    |  |                                    |
| O Disable | Enable                  |     |       |  |                                    |  |                                    |
| Label     |                         |     |       |  |                                    |  |                                    |
| Voltage   | Monitor                 |     |       |  |                                    |  |                                    |
| Logic     |                         |     |       |  |                                    |  |                                    |
| AND       |                         |     | ٥     |  |                                    |  |                                    |
| DO        |                         |     |       | RO                                       |                                    |  |                                    |
| None      |                         |     | ٥     | None                                     |                                    |  |                                    |
|           |                         |     |       | 1022 12                                  | 1.028 - 2                          |  |                                    |
| Enable    | Parameter               |     | Logic | Pickup Value                             | Pickup Delay (ms)                  | Dropout Value                            | Dropout Delay (ms)                 |
| ۵         | Phase A Line to Neutral |     | > 0   | 110.000                                  | 100                                | 105.000                                  | 100                                |
|           | Voltage                 | ß   |       | must be corrected to 3 decimal<br>places | Default: 0, must be multiple of 10 | must be corrected to 3 decimal<br>places | Default: 0, must be multiple of 10 |
|           |                         | _   | > 0   | 0.000                                    | 0                                  | 0.000                                    | 0                                  |
|           | requency                | LØ. |       | must be corrected to 3 decimal<br>places | Default: 0, must be multiple of 10 | must be corrected to 3 decimal<br>places | Default: 0, must be multiple of 10 |
|           |                         |     |       | 0.000                                    | 0                                  | 0.000                                    | 0                                  |
|           | Frequency               | ß   |       | must be corrected to 3 decimal           |                                    | must be corrected to 3 decimal           | Date th 0 much be weather at 10    |

Figure 6-19 Alarm Setting Webpage

**Logic:** Defines the operational relationship between the enabled parameters within the same alarm monitor. Users can choose between 'OR' or 'AND' logic.

- **OR Logic:** Alarm is triggered when any one of the set parameters meets the predefined condition.
- **AND Logic:** Alarm is triggered only when all specified parameters simultaneously meet the predefined condition.

Parameter Enable: Enable/disable the individual alarm parameter.

**Parameter Logic:** The relational relationship between the enabled parameters and pickup value. Users can choose between > or < logical expressions.

**Parameter Pickup Value:** The alarm trigger point. The pickup value data type is floating-point number up to three decimal places. If the parameter is set to DI Status, the pickup value choices will be ON and OFF.

**Parameter Pickup Delay:** Time delay before the alarm is triggered. If an alarm ends while the pickup delay time is still active, the alarm will not be triggered. If the input for the pickup delay is set to 0, the delay mechanism will be deactivated. The default pickup delay range is from 100 milliseconds to 30 seconds.



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**Parameter Dropout Value:** The alarm dropout point. The dropout value data type is floatingpoint number up to three decimal places. The dropout value should be smaller than the pickup value when using the > greater than expression and the dropout value should be larger than the pickup value when using the < less than expression.

**Parameter Dropout Delay:** Time delay before the alarm is dropped out. If an alarm ends while the dropout delay time is still active, the alarm will not be deactivated. If the input for the dropout delay is set to 0, the delay mechanism will be deactivated. The default dropout delay range is from 100 milliseconds to 30 seconds.

**Email Enable:** Enable/disable email notifications when an alarm status changes to ON or OFF. Users need to enable SMTP settings before this option is available. For SMTP configuration, please refer to chapter 7.7.

**Parameter:** Acuvim 3 supports the monitoring of up to three parameters in a single alarm monitor. The available parameters are listed in Table 6-3, Table 6-4, Table 6-5, and Table 6-6.

| Category    | Туре                                | Scope               |
|-------------|-------------------------------------|---------------------|
|             | Frequency                           | System              |
| D 1 T       | Line to Neutral Voltage             | Average/A/B/C       |
| Real Time   | Line to Line Voltage                | Average/A-B/B-C/C-A |
|             | Current                             | Average/A/B/C/N     |
|             | Active Power                        |                     |
| Dowor       | Reactive Power                      | Sustem (A/P/C       |
| Fower       | Apparent Power                      | System/Avb/C        |
|             | Power Factor                        |                     |
|             | Fundamental VLN                     | Average/A/B/C       |
|             | Fundamental VLL                     | Average/A-B/B-C/C-A |
|             | Fundamental Current                 | Average/A/B/C/N     |
| Fundamental | Fundamental Active Power            |                     |
|             | Fundamental Reactive Power          | Sustem (A/D/C       |
|             | Fundamental Apparent Power          | System/Avd/C        |
|             | Fundamental Power Factor            |                     |
|             | Line to Neutral Voltage Phase Angle | B/C                 |
| Phase Angle | Line to Line Voltage Phase Angle    | A-B/B-C/C-A         |
|             | Current Phase Angle                 | A/B/C               |

### Table 6-3 Basic Metering Parameters for Alarm Monitoring



| Category            | Туре                                | Scope  |
|---------------------|-------------------------------------|--------|
|                     | Voltage Positive Sequence Magnitude |        |
|                     | Voltage Zero Sequence Magnitude     |        |
|                     | Voltage Negative Sequence Magnitude |        |
|                     | Voltage Zero Sequence Ratio         |        |
|                     | Voltage Unbalance Factor            |        |
| Unbalance Magnitude | Current Positive Sequence Magnitude |        |
|                     | Current Zero Sequence Magnitude     |        |
|                     | Current Negative Sequence Magnitude | Guntan |
|                     | Current Zero Sequence Ratio         | System |
|                     | Current Unbalance Factor            |        |
|                     | Voltage Positive Sequence Angle     |        |
|                     | Voltage Zero Sequence Angle         |        |
|                     | Voltage Negative Sequence Angle     |        |
| Unbalance Angle     | Current Positive Sequence Angle     |        |
|                     | Current Zero Sequence Angle         |        |
|                     | Current Negative Sequence Angle     |        |

### Table 6-4 Unbalance Parameters for Alarm Monitoring

### Table 6-5 Harmonics Parameters for Alarm Monitoring

| Category | Туре                 | Scope                |
|----------|----------------------|----------------------|
|          | Voltage THD          |                      |
|          | Voltage Odd THD      |                      |
|          | Voltage Even THD     |                      |
|          | Voltage Crest Factor |                      |
| TUD      | Current THD          | A. 19 19 29 (A /D /C |
| IND      | Current Odd THD      | Average/A/B/C        |
|          | Current Even THD     |                      |
|          | Current TDD          |                      |
|          | Current Crest Factor |                      |
|          | Current K Factor     |                      |



# Acuvim 3 Series Power Meter

| Category             | Scope                       |                             |  |
|----------------------|-----------------------------|-----------------------------|--|
| Llarmanice Magnitude | Voltage Harmonics Magnitude |                             |  |
| Harmonics Magnitude  | Current Harmonics Magnitude | A/D/C (order number 2, 127) |  |
| Harmonics Angle      | Voltage Harmonics Angle     | AVB/C (order humber:2-127)  |  |
|                      | Current Harmonics Angle     |                             |  |

#### **Table 6-6 IO Parameters for Alarm Monitoring**

| Category                  | Туре       | Scope                 |
|---------------------------|------------|-----------------------|
|                           | Meter Body | DI1/DI2/DI3/DI4       |
|                           | AXM-IO1-1  |                       |
| Digital Input (DI) Status | AXM-IO1-2  | 01012/013/014/013/010 |
|                           | AXM-IO2-1  |                       |
|                           | AXM-IO2-2  | אוס/ כוס/ כוס/ נוס    |
|                           | AXM-IO3-1  | 011/012/015/014       |
|                           | AXM-IO3-2  |                       |
|                           | AXM-IO3-1  | A11/A12               |
| Analog Input (Al)         | AXM-IO3-2  | AIT/AIZ               |

# 6.5.2 Alarm Status

To access the Alarm Status section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select **Power Quality and Alarm** from the tab menu.
- 3. Click on the **Alarm Status** menu option. This webpage displays the alarm status for Acuvim 3.

From the Alarm Status webpage, users are presented with the status of alarms, indicating whether they are active (ON) or inactive (OFF).

| Latel Metering +    | swer Quality and Alarm 👻 📆 Logs | •               |              |  |
|---------------------|---------------------------------|-----------------|--------------|--|
| wer Quality and Ala | arm Alarm Status                |                 |              |  |
|                     | Alarm ID                        | Alarm Label     | Alarm Status |  |
|                     | 1                               | Alarm 1         | OFF          |  |
|                     | 2                               | NEW MONITOR     | OFF          |  |
|                     | 3                               | Voltage Monitor | ON           |  |

Figure 6-20 Alarm Status Webpage

Alarm ID: Alarm monitor unique ID number.

Alarm Label: Customized label name for alarm monitor.



V: 1.0.6 Revised: January 2025

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### 6.5.3 Alarm Log

To access the Alarm Log section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the Alarm Log menu option. This webpage displays the alarm logs for Acuvim 3.

| un meloning • La Powel Ocally and Alarm • 3 | Logs +                     |                |              |                                      |                 |                                      |                 |             |                 |
|---|----------------------------|----------------|--------------|--------------------------------------|-----------------|--------------------------------------|-----------------|-------------|-----------------|
| ower Quality and Alarm Aarm tog             |                            |                |              |                                      |                 |                                      |                 |             |                 |
|   | Alarm Log                  |                |              |                                      |                 |                                      |                 |             |                 |
|   | Timestamp                  | Alarm Label    | Duration (s) | Parameter 1                          | Extreme Value 1 | Parameter 2                          | Extreme Value 2 | Peremeter 3 | Extreme Value 3 |
|   | 2023-08-02<br>11:33:50.056 | New_Alarm_1    | 38.00230     | Phase A Line-to-Neutral<br>Voltage V | 160,204         | N/A                                  | 0.000           | N/A         | 0.000           |
|   | 2022-08-02<br>11:33:48.056 | New_Alarm_2    | 40.000300    | Phase A Line-to-Neutral<br>Voltage V | 160.209         | N/A                                  | 0.000           | N/A         | 0.000           |
|   | 2023-08-02<br>11/26/04/924 | New_Alarre_1   | 38.00250     | Phase A Line to Neutral<br>Voltage V | 160.207         | N/A                                  | 0.000           | N/A         | 0.000           |
|   | 2023-08-02<br>11:20:02.984 | New_Alarri_2   | 39.593280    | Phase A Line-to-Neutral<br>Voltage V | 160.223         | N/A                                  | 0.000           | N/A         | 0.000           |
|   | 2023-08-02<br>10:50:18:414 | New_Alarm_1    | 38.010300    | Phase A Line-to-Neutral<br>Voltage V | 160,210         | N/A.                                 | 0.000           | N/A         | 0.000           |
|   | 2023-08-02<br>10:50:16:434 | New, Alarra, 2 | 89.000880    | Phase A Line-to-Neutral<br>Voltage V | 160.227         | Phase 8 Line-to-Neutral<br>Voltage V | 160.257         | N/A         | 0.000           |
|   | 2028-08-02<br>09:25:35:295 | New_Alarru1    | 37.999950    | Phase A Line-to-Neutral<br>Voltage V | 160.210         | N/A                                  | 0.000           | N/A         | 0.000           |
|   | 2023-08-02<br>09:02:34.297 | New_Alarm_1    | 38.003309    | Phase A Line-to-Neutral<br>Voltage V | 160,212         | N/A                                  | 6.000           | N/A         | 0.000           |

#### Figure 6-21 Alarm Log Webpage

**Timestamp:** Timestamp has the format of year-month-day hour: minute: second: millisecond.

Durations: Duration is the time between the alarm pickup and drop off.

**Extreme Value:** In the alarm duration, the maximum or minimum values will be recorded. Depending on the logic, if it is set to a > greater than expression, the extreme value will show the maximum value, and if it is set to a < lesser than expression, the extreme value will show the minimum value.

**Clear Logs:** Delete all the alarm logs. Acuvim 3 maintains up to 5,000 alarm logs in non-volatile memory in a first in, first out sequence. When the limit is reached, the system automatically deletes the oldest logs to make room for new ones.

# 6.6 Power Quality Report

Based on the IEC 61000-4-30 compliant measurements and logging standard, Acuvim 3 provides EN50160 compliant reports, IEEE519 compliant reports, ITIC/CBEMA curves, and SEMI curves.



### 6.6.1 EN50160 Compliant Report

Acuvim 3 generates EN50160-compliant reports based on statistics obtained through metering. For the supported parameters, please refer to Table 6-7.

| Туре                 | Details  |  |  |
|----------------------|--|--|--|
| Frequency            | System   |  |  |
| Voltage RMS          | Phase A/B/C  |  |  |
| Voltage Unbalance    | System   |  |  |
| Voltage Harmonics    | System (up to 25 <sup>th</sup> )                       |  |  |
| Flicker              | System   |  |  |
| Voltage Dip          | System (Need enable the voltage dip PQ event)          |  |  |
| Voltage Swell        | System (Need enable the voltage swell PQ event)        |  |  |
| Voltage Interruption | System (Need enable the voltage interruption PQ event) |  |  |

### Table 6-7 EN50160 Compliant Reports Parameters

### 6.6.1.1 General Settings

To access the EN50160 Compliant Report setting section,

- 1. Click on **Settings** from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the **Power Quality Reporting** menu option.
- Click on the EN50160 tab. This webpage displays the EN50160 compliant report settings for Acuvim 3.

| Installation Revenue and Energy Power Power Quality and Alarm Power Quality Rep | uality and Alarm Communication Data Log/F | Pot User Miningement, Maintenance and Miningement, 1986  |
|---|---|--|
|   |   | Prever Carely Inter:         Water:         Diffuge:         Water Signafung Younge:         Prever Carely Recording         Ended Natification           Prevent Sections |
|   |   |  |

#### Figure 6-22 EN50160 Compliant Report Setting Webpage

Enable EN50160 Power Quality Report: Enable/disable EN50160 report function.







Figure 6-23 EN50160 Power Quality Report General Settings

**First Day of Week:** It is the day that Acuvim 3 starts new statistics records for EN50160 report. It could be set to start on either Monday or Sunday, depending on the user's preference or system setup.

**Normal Operation Condition Voltage Variance (%):** The system is in normal operational condition if the voltage variance is less than the configured threshold. Statistics are only taken during normal operational condition.

Reset All: Clear all EN50160 records and EN50160 buffer.

Reset Current: Clear the current EN50160 buffer and the records for this week.

#### 6.6.1.2 EN50160 Frequency Setting

Under normal operating conditions, the statistical mean values of the fundamental frequency measured over a 10-second interval are used to generate the EN50160 Frequency Report.

Parameter Zone Limits: Lower limits and upper limits to categorize parameter statistics bins.

**Parameter Trigger Enable:** Activates the feature that assesses whether parameter statistics meet the criteria for a Pass or Fail determination.

Parameter Trigger Limits: Threshold to determine if parameter statistics Pass or Fail evaluation.

**Zone 1:** Frequency within a range of -1% to +1% deviation from the nominal frequency, maintained for at least 99% of the recording period (one week).

**Zone 2:** Frequency within a range of -6% to +4% deviation from the nominal frequency, maintained for the entire recording period (one week).





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| Frequency 🔻   |                              |   |                                |   |
|---|------------------------------|---|--------------------------------|---|
| Frequency Trigger Enable Frequency Zone 1 Lower Limit | Frequency Zone 1 Upper Limit |   | Frequency Zone 1 Trigger Limit |   |
| -1.000 %  | 1.000                        | % | 99.000                         | % |
| Frequency Zone 2 Lower Limit                          | Frequency Zone 2 Upper Limit |   | Frequency Zone 2 Trigger Limit |   |
| -6.000 \$ %   | 4 000                        | % | 100.000                        | 9 |

Figure 6-24 Frequency Settings

#### 6.6.1.3 EN50160 Voltage RMS Setting

Under normal operating conditions, the statistical mean values of the voltage RMS measured over a 10-second interval are used to generate the EN50160 Voltage RMS report.

**Zone 1:** Voltage RMS within -%10 to +10% deviation from nominal voltage for at least 99% of the record period (one week).

**Zone 2:** Voltage RMS within -%15 to +10% deviation from nominal voltage for at least 100% of the record period (one week).

|   | voltage RMS Zone T Opper Limit |  | Voltage RMS Zone 1 Trigger Lin  | nit   |
|---|--------------------------------|--|---|---|
| % | 10.000                         | %  | 0.000   | %   |
|   | Voltage RMS Zone 2 Upper Limit |  | Voltage RMS Zone 2 Trigger Lir  | nit   |
| % | 10.000                         | %  | 100.000   | %   |
|   | %                              | Voltage RMS Zone 1 Upper Limit<br>5% 10.000<br>Voltage RMS Zone 2 Upper Limit<br>5% 10.000 | Voltage RMS Zone 1 Upper Limit           %         10.000         %           Voltage RMS Zone 2 Upper Limit         %         10.000         % | Voltage RMS Zone 1 Upper Limit         Voltage RMS Zone 1 Trigger Limit           %         10.000         %         0.000           Voltage RMS Zone 2 Upper Limit         Voltage RMS Zone 2 Trigger Limit           %         10.000         %         100.000 |

Figure 6-25 EN50160 RMS Settings

#### 6.6.1.4 Voltage Unbalance Setting

Under normal operating conditions, the statistical mean values of the voltage unbalance calculated over a 10-second interval are used to generate the EN50160 Voltage Unbalance report.

**Zone 1:** Voltage unbalance factor within 0% to 30%, for at least 95% of the record period (one week).

| Voltage Unbalance 👻                  |   |                                      |   |                              |            |
|--------------------------------------|---|--------------------------------------|---|------------------------------|------------|
| Voltage Unbalance Trigger Enable     |   |                                      |   |                              |            |
| Voltage Unbalance Zone 1 Lower Limit |   | Voltage Unbalance Zone 1 Upper Limit |   | Voltage Unbalance Zone 1 Tri | gger Limit |
| 0.000                                | % | 200.000                              | % | 95.000                       | %          |

Figure 6-26 EN50160 Unbalance Settings





### 6.6.1.5 Voltage Harmonics Setting

Under normal operating conditions, the statistical mean values of the voltage harmonics calculated over a 10-minute interval is used to generate the EN50160 Voltage Harmonic report.

Users can configure criteria for voltage total harmonic distortion (THD) and individual harmonics up to the 25<sup>th</sup> harmonic. For example, with the configuration provided in Table 6-8, voltage harmonics should meet the requirements outlined.

| Parameter     | Pass Criteria   |
|---------------|---|
| THD           | < 8% for 100% of the record period (1 week)             |
| 2nd Harmonic  | < 2.0% for at least 95.0% of the record period (1 week) |
| 3rd Harmonic  | < 5.0% for at least 95.0% of the record period (1 week) |
| 4th Harmonic  | < 1.0% for at least 95.0% of the record period (1 week) |
| 5th Harmonic  | < 6.0% for at least 95.0% of the record period (1 week) |
| 6th Harmonic  | < 0.5% for at least 95.0% of the record period (1 week) |
| 7th Harmonic  | < 5.0% for at least 95.0% of the record period (1 week) |
| 8th Harmonic  | < 0.5% for at least 95.0% of the record period (1 week) |
| 9th Harmonic  | < 1.5% for at least 95.0% of the record period (1 week) |
| 10th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 11th Harmonic | < 3.5% for at least 95.0% of the record period (1 week) |
| 12th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 13th Harmonic | < 3.0% for at least 95.0% of the record period (1 week) |
| 14th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 15th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 16th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 17th Harmonic | < 2.0% for at least 95.0% of the record period (1 week) |
| 18th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 19th Harmonic | < 2.0% for at least 95.0% of the record period (1 week) |
| 20th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 21st Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 22nd Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 23rd Harmonic | < 2.0% for at least 95.0% of the record period (1 week) |
| 24th Harmonic | < 0.5% for at least 95.0% of the record period (1 week) |
| 25th Harmonic | < 2.0% for at least 95.0% of the record period (1 week) |

### Table 6-8 Voltage Harmonics Pass Criteria





| Voltage THD Lower Limit  |                        | Voltage THD Trigger       | Limit           |                        |                     |                    |
|--|------------------------|---------------------------|-----------------|------------------------|---------------------|--------------------|
| 8.000  | %                      | 100.000                   |                 | %                      |                     |                    |
| Voltage Harmonics 👻  |                        |                           |                 |                        |                     |                    |
| Voltage Harmonics Trigger<br>Upper Limits<br>Voltage Harmonics 2 Upper Lim | Enable<br>it Voltage H | larmonics 3 Upper Limit   | Voltage Harn    | nonics 4 Upper Limit   | Voltage Harmonio    | cs 5 Upper Limit   |
| 2.000  | % 5.000                | q                         | 6 1.000         | 3                      | 6.000               | %                  |
| Voltage Harmonics 6 Upper Lim  | it Voltage H           | larmonics 7 Upper Limit   | Voltage Harn    | nonics 8 Upper Limit   | Voltage Harmonie    | cs 9 Upper Limit   |
| 0.500  | % 5.000                | 9                         | 6 0.500         | 9                      | 6 1.500             | %                  |
| Voltage Harmonics 10 Upper Lir   | nit Voltage H          | larmonics 11 Upper Limit  | Voltage Harn    | nonics 12 Upper Limit  | Voltage Harmonie    | s 13 Upper Limit   |
| 0.500  | % 3.500                | 9                         | 6 0.500         | 9                      | 6 3.000             | %                  |
| Voltage Harmonics 14 Upper Lir   | nit Voltage H          | armonics 15 Upper Limit   | Voltage Harn    | nonics 16 Upper Limit  | Voltage Harmonie    | s 17 Upper Limit   |
| 0.500  | % 0.500                |                           | 6 0.500         | 3                      | 6 2.000             | %                  |
| Voltage Harmonics 18 Upper Lir   | nit Voltage H          | larmonics 19 Upper Limit  | Voltage Harn    | nonics 20 Upper Limit  | Voltage Harmonie    | s 21 Upper Limit   |
| 0.500  | % 1.500                | 9                         | 6 0.500         | 9                      | 6 0.500             | %                  |
| Voltage Harmonics 22 Upper Lir   | mit Voltage H          | larmonics 23 Upper Limi   | Voltage Harn    | nonics 24 Upper Limit  | Voltage Harmonie    | s 25 Upper Limit   |
| 0.500  | % 1.500                | 9                         | 6 0.500         | 9                      | 6 1.500             | %                  |
| Trigger Limits<br>Voltage Harmonics 2 Trigger Lir                          | nit Voltage H          | larmonics 3 Trigger Limit | Voltage Harn    | nonics 4 Trigger Limit | Voltage Harmonie    | cs 5 Trigger Limit |
| 95.000   | % 95.000               |                           | 6 95.000        | 9                      | 95.000              | %                  |
| Voltage Harmonics 6 Trigger Lir  | nit Voltage H          | larmonics 7 Trigger Limit | Voltage Harn    | nonics 8 Trigger Limit | Voltage Harmonie    | s 9 Trigger Limit  |
| 95.000   | % 95.000               | 9                         | 6 95.000        | 9                      | 95.000              | %                  |
| Voltage Harmonics 10 Trigger Li  | imit Voltage H         | larmonics 11 Trigger Limi | t Voltage Harn  | nonics 12 Trigger Limi | t Voltage Harmonie  | s 13 Trigger Limit |
| 95.000   | % 95.000               | 9                         | 6 95.000        | 3                      | 95.000              | %                  |
| Voltage Harmonics 14 Trigger Li  | imit Voltage H         | larmonics 15 Trigger Lim  | it Voltage Harn | nonics 16 Trigger Limi | t Voltage Harmonie  | s 17 Trigger Limit |
| 95.000   | % 95.000               | q                         | 6 95.000        | 9                      | 95.000              | \$ %               |
| Voltage Harmonics 18 Trigger Li  | imit Voltage H         | larmonics 19 Trigger Lim  | it Voltage Harn | nonics 20 Trigger Lim  | it Voltage Harmonie | s 21 Trigger Limit |
| 95.000   | % 95.000               |                           | 6 95.000        | 3                      | 6 95.000            | %                  |
| Voltage Harmonics 22 Trigger L   | imit Voltage H         | larmonics 23 Trigger Lim  | it Voltage Harn | nonics 24 Trigger Lim  | it Voltage Harmonie | s 25 Trigger Limit |
|  |                        |                           | 6 0E 000        | 0                      | 05.000              |                    |

Figure 6-27 EN50160 Voltage Harmonics Settings

### 6.6.1.6 Voltage Interruptions Setting

Users can configure the duration to categorize voltage interruptions into different bins and set criteria for each bin. In Table 6-9, with the listed configuration, voltage interruptions should meet the specified requirements.



| Name              | Categorization                             | Max Number of Events Allowed |
|-------------------|--|------------------------------|
| bin1              | Event Duration <= 0.1 second               | 100                          |
| bin2              | 0.1 second < event duration <= 180 seconds | 3                            |
| bin3              | 180 seconds < event duration               | 1                            |
| Voltage Interrupt |  |                              |

#### Table 6-9 EN50160 Voltage Interruptions Categorization and Requirements

| Very Short Interruption Name           |        | Short Interruption Name                | Long Interruption Name                 |
|--|--------|--|--|
| bin1                                   |        | bin2                                   | bin3                                   |
| Voltage Interrupt Duration Limit 1     |        | Voltage Interrupt Duration Limit 2     |  |
| 0.001                                  | second | 180.000 second                         |  |
| Bin 1 Voltage Interrupt Number Allowed |        | Bin 2 Voltage Interrupt Number Allowed | Bin 3 Voltage Interrupt Number Allowed |
| 100                                    |        | 3                                      | 1                                      |

#### Figure 6-28 EN50160 Voltage Interruption Settings

#### 6.6.1.7 Voltage Dip Setting

Users can configure the event duration and residual voltage to categorize voltage dip events into different cells and set criteria for each cell. In Table 6-10, with the listed configuration, voltage dips should meet the specified requirements.

| Residual<br>Voltage u (%) | Duration t (ms)                             |   |   |   |   |  |  |  |  |
|---------------------------|---|---|---|---|---|--|--|--|--|
|                           | 10ms<=t<br><=200ms                          | 200ms <t<br>&lt;=500ms</t<br>               | 500ms <t<br>&lt;=1000ms</t<br>                    | 1000ms <t<br>&lt;=5000ms</t<br>             | 5000ms <t< th=""></t<>                      |  |  |  |  |
| 00% > !! > -              | • Cell name: A1                             | • Cell name: A2                             | • Cell name: A3                                   | • Cell name: A4                             | • Cell name: A5                             |  |  |  |  |
| 90% > u > =<br>80%        | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul>       | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul> |  |  |  |  |
| 80% > u >=<br>70%         | • Cell name: B1                             | • Cell name: B2 • Cell name: B3 • Cel       |   | • Cell name: B4                             | • Cell name: B5                             |  |  |  |  |
|                           | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul> | • Allowed<br>events: 100 • Allowed<br>events: 100 |   | <ul> <li>Allowed<br/>events: 100</li> </ul> |  |  |  |  |
| 70% > > -                 | • Cell name: C1                             | • Cell name: C2                             | Cell name: C3     Cell name: C4                   |   | • Cell name: C5                             |  |  |  |  |
| 40%                       | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul>       | <ul> <li>Allowed<br/>events: 100</li> </ul> | • Allowed events: 100                       |  |  |  |  |
| 40% > u >= 5%             | • Cell name: D1                             | • Cell name: D2                             | • Cell name: D3                                   | • Cell name: D4                             | • Cell name: D5                             |  |  |  |  |
|                           | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul>       | <ul> <li>Allowed<br/>events: 100</li> </ul> | <ul> <li>Allowed<br/>events: 100</li> </ul> |  |  |  |  |

#### Table 6-10 EN50160 Voltage Dip Categorization and Requirements





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| Residual<br>Voltage u (%) |   |   | Duration t (ms)                                   |   |   |  |  |
|---------------------------|---|---|---|---|---|--|--|
| 5% > u                    | <ul> <li>Cell name: X1</li> <li>Allowed</li></ul> | <ul> <li>Cell name: X2</li> <li>Allowed</li></ul> | <ul> <li>Cell name: X3</li> <li>Allowed</li></ul> | <ul> <li>Cell name: X4</li> <li>Allowed</li></ul> | <ul><li>Cell name: X5</li><li>Allowed</li></ul> |  |  |
|                           | events: 100                                       | events: 100                                       | events: 100                                       | events: 100                                       | events: 100                                     |  |  |

| Voltage Dips 👻  |   |                 |   |   |     |   |       |
|---|---|-----------------|---|---|-----|---|-------|
| Voltage Limits<br>Cell A Upper Limit  |   |                 | Cell A Lower Limit/Cell   | B Upper Limit   |     | Cell B Lower Limit/Cell C Upper                                     | Limit |
| 90.000  |   | %               | 80.000  |   | %   | 70.000  | %     |
| Cell C Lower Limit/Cell   | D Upper Limit   |                 | Cell D Lower Limit/Cell   | X Upper Limit   |     |   |       |
| 40.000  |   | %               | 5.000   |   | %   |   |       |
| Durations<br>Cell 1 Lower Limit   |   |                 | Cell 1 Upper Limit/Cell :   | 2 Lower Limit   |     | Cell 2 Upper Limit/Cell 3 Lower                                     | Limit |
| 10.000  |   | ms              | 200.000   |   | ms  | 500.000   | ms    |
| Cell 3 Upper Limit/Cell   | 4 Lower Limit   |                 | Cell 4 Upper Limit/Cell   | 5 Lower Limit   |     | Cell 5 Upper Limit  |       |
| 1000.000  | •   | ms              | 5000.000  | 5000.000 ms   |     | 60000.000   | ms    |
| Cell Voltage Dip Numbe<br>Cell A1 Voltage Dip<br>Number Allowed<br>100<br>Cell B1 Voltage Dip | r Limits<br>Cell A2 Voltage I<br>Number Allowed<br>100<br>Cell B2 Voltage I | Dip<br>I<br>Dip | Cell A3 Voltage Dip<br>Number Allowed<br>100<br>Cell B3 Voltage Dip | Cell A4 Voltage I<br>Number Allowed<br>100<br>Cell B4 Voltage I | Dip | Cell A5 Voltage Dip<br>Number Allowed<br>100<br>Cell B5 Voltage Dip |       |
| Number Allowed  | Number Allowed  |                 | Number Allowed  | Number Allowed Number Allowed                                   |     | Number Allowed  |       |
| 100   | 100   |                 | 100   | 100   |     | 100   |       |
| Cell C1 Voltage Dip<br>Number Allowed   | Cell C2 Voltage Dip<br>Number Allowed                                       |                 | Cell C3 Voltage Dip<br>Number Allowed                               | Cell C4 Voltage Dip<br>Number Allowed                           |     | Cell C5 Voltage Dip<br>Number Allowed                               |       |
| 100   | 100   |                 | 100   | 100   |     | 100   |       |
| Cell D1 Voltage Dip<br>Number Allowed   | Cell D2 Voltage I<br>Number Allowed   | Dip<br>I        | Cell D3 Voltage Dip<br>Number Allowed                               | Cell D4 Voltage I<br>Number Allowed                             | Dip | Cell D5 Voltage Dip<br>Number Allowed                               |       |
| 100   | 100   |                 | 100   | 100   |     | 100   |       |
| Cell X1 Voltage Dip<br>Number Allowed   | Oltage Dip Cell X2 Voltage Dip<br>Allowed Number Allowed                    |                 | Cell X3 Voltage Dip<br>Number Allowed                               | Cell X4 Voltage Dip<br>Number Allowed                           |     | Cell X5 Voltage Dip<br>Number Allowed                               |       |
| 100   | 100   |                 | 100   | 100   |     | 100   |       |

Figure 6-29 EN50160 Voltage Dips Settings

### 6.6.1.8 Voltage Swell Setting

Users can configure the event duration and swell voltage to categorize voltage swell events into different cells and set criteria for each cell. In Table 6-11, with the listed configuration, voltage swells should meet the specified requirements.



| Residual<br>Voltage u (%) | Duration t (ms)                         |   |  |  |  |  |  |  |
|---------------------------|---|---|--|--|--|--|--|--|
|                           | 10ms<=t<=500ms                          | 500ms <t<=5000ms< th=""><th>5000ms<t<=60000ms< th=""></t<=60000ms<></th></t<=5000ms<> | 5000ms <t<=60000ms< th=""></t<=60000ms<> |  |  |  |  |  |
| u >= 120%                 | • Cell name: S1                         | • Cell name: S2   | • Cell name: S3                          |  |  |  |  |  |
|                           | <ul> <li>Allowed events: 100</li> </ul> | <ul> <li>Allowed events: 100</li> </ul>   | Allowed events: 100                      |  |  |  |  |  |
| 120% > u >=               | • Cell name: T1                         | • Cell name: T2   | • Cell name: T3                          |  |  |  |  |  |
| 110%                      | <ul> <li>Allowed events: 100</li> </ul> | <ul> <li>Allowed events: 100</li> </ul>   | Allowed events: 100                      |  |  |  |  |  |

### Table 6-11 EN50160 Voltage Swell Categorization and Requirements

| Voltage Swell 🔍                       |                                      |                                       |                                      |                                       |    |  |
|---------------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|---------------------------------------|----|--|
| Voltage Limits                        |                                      |                                       |                                      |                                       |    |  |
| Cell S Lower Limit/Cell T Upper Limit |                                      | Cell T Lower Limit                    |                                      |                                       |    |  |
| 120.0                                 | %                                    | 110.0                                 | 96                                   |                                       |    |  |
| Min Value: 0                          |                                      | Min Value: 0                          |                                      |                                       |    |  |
| Durations                             |                                      |                                       |                                      |                                       |    |  |
| Cell 1 Lower Limit                    |                                      | Cell 1 Upper Limit/Cell 2 Lower Limit |                                      | Cell 2 Upper Limit/Cell 3 Lower Limit |    |  |
| 10                                    | ms                                   | 500                                   | ms                                   | 5000                                  | ms |  |
| Min Value: 0                          |                                      | Min Value: 0                          |                                      | Min Value: 0                          |    |  |
| Cell 3 Upper Limit                    |                                      |                                       |                                      |                                       |    |  |
| 60000                                 | ms                                   |                                       |                                      |                                       |    |  |
| Min Value: 0                          |                                      |                                       |                                      |                                       |    |  |
| Cell Voltage Swell Number Limits      |                                      |                                       |                                      |                                       |    |  |
| Cell S1 Voltage Swell Number Allowed  |                                      | Cell S2 Voltage Swell Number Allowed  |                                      | Cell S3 Voltage Swell Number Allowed  |    |  |
| 100                                   |                                      | 100                                   |                                      | 100                                   |    |  |
| Min Value: 0                          |                                      | Min Value: 0                          |                                      | Min Value: 0                          |    |  |
| Cell T1 Voltage Swell Number Allowed  | Cell T2 Voltage Swell Number Allowed |                                       | Cell T3 Voltage Swell Number Allowed |                                       |    |  |
| 100                                   |                                      | 100                                   |                                      | 120                                   |    |  |
| Min Value: 0                          |                                      | Min Value: 0                          |                                      | Min Value: 0                          |    |  |

#### Figure 6-30 EN50160 Voltage Settings

#### 6.6.1.9 Flicker Severity Setting

Under normal operating conditions, excluding periods with interruptions, the report uses statistics derived from short-term flicker severity (PST) and long-term flicker severity (PLT). Users have the option to configure one zone for PST and one zone for PLT.

Default PST Zone: PST <= 1, for 95% of the record period (one week).

**Default PLT Zone:** PLT <=1, for 95% of the record period (one week).





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| Short-Term Flicker Severity(PST) 👻            |                             |                      |  |
|---|-----------------------------|----------------------|--|
| Short-Term Flicker Severity(PST) Trigger Enal | ble                         |                      |  |
| Short-Term Flicker Severity (PST) Upper Limit | Short-Term Flicker Severity | r(PST) Trigger Limit |  |
| 1.000   | 95.000                      | %                    |  |
|   |                             |                      |  |
| Long-Term Flicker Severity(PLT) 👻             |                             |                      |  |
| Long-Term Flicker Severity(PLT) Trigger Enab  | le                          |                      |  |
| Long-Term Flicker Severity(PLT) Upper Limit   | Long-Term Flicker Severity  | (PLT) Trigger Limit  |  |
| 1.000   | 95.000                      | %                    |  |

#### Figure 6-31 EN50160 Flicker Settings

#### 6.6.1.10 EN50160 Frequency Report

To access the EN50160 compliance report section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- Click on the Power Quality Reports option and select EN50160 Compliance Report menu option. This webpage displays the EN50160 compliance Reports for Acuvim 3.

|                 |                                 |                            |                         |   | C+ Logout | Thursday, March 21, 2024 10:37 AM | B About | Settings | Acusim 3 | ACCUENERGY |
|-----------------|---------------------------------|----------------------------|-------------------------|---|-----------|-----------------------------------|---------|----------|----------|------------|
| Metering •      | A Power Quality and Alarm +     | Dlogs -                    |                         |   |           |                                   |         |          |          |            |
| Power Quality a | and Alarm Power Quality Reports |                            |                         |   |           |                                   |         |          |          |            |
|                 |                                 | EN 50160 compliance report | IEEE 519 compliance rep | ort ITTC Curve SEMI Curve                 |           |                                   |         |          |          |            |
|                 |                                 | Parameter                  |                         | Time Frame                                |           |                                   |         |          |          |            |
|                 |                                 | Frequency                  |                         | 2023+05+21 00:00:00 + 2023+05+27 23:59:59 |           | Generate                          |         |          |          |            |

Figure 6-32 EN50160 Compliance Report Webpage



Figure 6-33 EN50160 Frequency Trend


**Frequency Trends:** The data used to create frequency trends is sourced from the trend log, which records instantaneous frequency values every 15-minute.



Figure 6-34 EN50160 Frequency Bin

**Frequency Bin:** The section displays the statistical distribution of frequency throughout the reporting period.

| Results Summary |              |            |        |  |  |  |  |  |  |  |
|-----------------|--------------|------------|--------|--|--|--|--|--|--|--|
| Zone            | Required (%) | Actual (%) | Result |  |  |  |  |  |  |  |
| -1%/1%          | 99           | 100.000    | Pass   |  |  |  |  |  |  |  |
| -6%/4%          | 100          | 100.000    | Pass   |  |  |  |  |  |  |  |

| Min | Max, | Avg |
|-----|------|-----|
| _   |      | _   |

| Min(Hz) | Max(Hz) | Avg(Hz) |  |
|---------|---------|---------|--|
| 59.998  | 60.001  | 60.000  |  |

#### Figure 6-35 EN50160 Frequency Report Results Summary

**Results Summary:** Based on the zone settings configured on the EN50160 configuration webpage, Acuvim 3 evaluates the quality of frequency throughout the reporting period and determines whether it passes or fails. Additionally, it displays the minimum, maximum, and average frequency in Hertz (Hz).





#### 6.6.1.11 EN50160 Voltage RMS Report



**Voltage RMS Trend:** The data used to create Voltage RMS trends is sourced from the trend log, which records instantaneous Voltage RMS values for each phase every 15-minute.





**Voltage Variations Bins:** The Voltage Variation Bins section displays the statistical distribution of voltage RMS throughout the reporting period.



#### Results Summary

| Zone     | Required (%) | Volts A (%) | Volts B (%) | Volts C (%) |
|----------|--------------|-------------|-------------|-------------|
| -10%/10% | 0            | 100.000     | 100.000     | 100.000     |
| -15%/10% | 100          | 100.000     | 100.000     | 100.000     |

#### Min/Max/Avg

| Phase | Min(V) | Max(V) | Avg(V) |
|-------|--------|--------|--------|
| A     | 60.003 | 60.004 | 60.004 |
| В     | 60.003 | 60.004 | 60.004 |
| С     | 60.003 | 60.004 | 60.004 |

#### Figure 6-38 EN50160 Voltage Results Report Summary

**Result Summary:** Based on the zone settings configured on the EN50160 configuration webpage, Acuvim 3 evaluates the quality of voltage RMS throughout the reporting period and determines whether it passes or fails. Additionally, it displays the minimum, maximum, and average voltage RMS for each channel in Volts (V).

#### 6.6.1.12 EN50160 Voltage Unbalance Report



Figure 6-39 EN50160 Voltage Unbalance Factor Trend

**Voltage Unbalance Factor Trend:** The data used to create voltage unbalance factor trends is sourced from the trend log, which records instantaneous voltage unbalance factor values every 15 minutes.



#### **Results Summary**

| Zone    | Required (%) | Actual (%) | Result |
|---------|--------------|------------|--------|
| 0%/200% | 95           | 100.000    | Pass   |

### Min/Max/Avg

| Min(%) | Max(%) | Avg(%) |  |  |  |  |
|--------|--------|--------|--|--|--|--|
| 0.000  | 0.006  | 0.006  |  |  |  |  |

Figure 6-40 EN50160 Voltage Unbalance Factor Report Results Summary

**Results Summary:** Based on the zone settings configured on the EN50160 configuration webpage, Acuvim 3 evaluates the quality of voltage unbalance factor throughout the reporting period and determines whether it passes or fails. Additionally, it displays the minimum, maximum, and average voltage RMS for each channel.



### 6.6.1.13 EN50160 Voltage Harmonics Report

#### Figure 6-41 EN50160 Voltage Harmonics Trend

**Voltage Harmonic Trend:** The data used to generate voltage harmonic trends is collected from the trend log, which records instantaneous voltage total harmonic distortion (THD) values for each phase every 15 minutes. Each phase has its own trend plot, and users can choose which phase to include in the report.



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| Results Sun | nmary           |                               |                   |            |            |         |         |             |
|-------------|-----------------|-------------------------------|-------------------|------------|------------|---------|---------|-------------|
| Parameter   | Upper Limit (%) | Enable Zone Trigger Pass/Fail | Trigger limit (%) | Actual (%) | Result (%) | Max (%) | Min (%) | Average (%) |
| THD         | 8.000           | Yes                           | 100.000           | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 2           | 2.000           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 3           | 5.000           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 4           | 1.000           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 5           | 6.000           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 6           | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 7           | 5.000           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 8           | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 9           | 1.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 10          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 11          | 3.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 12          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 13          | 3.000           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 14          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 15          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 16          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 17          | 2.000           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 18          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 19          | 1.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 20          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 21          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 22          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 23          | 1.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 24          | 0.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |
| 25          | 1.500           | Yes                           | 95.000            | 100.000    | Pass       | 0.000   | 0.000   | 0.000       |

#### Min/Max/Avg

| Name | Min(%) | Max(%) | Avg(%) |
|------|--------|--------|--------|
| THD  | 0.000  | 0.000  | 0.000  |
| TOHD | 0.000  | 0.000  | 0.000  |
| TEHD | 0.000  | 0.000  | 0.000  |

#### Figure 6-42 EN50160 Voltage Harmonics Report Results Summary

**Results Summary:** Based on the zone settings configured on the EN50160 configuration webpage, Acuvim 3 evaluates the quality of voltage harmonic throughout the reporting period and determines whether it passes or fails. Additionally, it displays the minimum, maximum, and average voltage THDs for the selected channel.



#### 6.6.1.14 EN50160 Voltage Interruption Report

|   |                      |                        |                             |         |          | Ge Logout | Wednesday, February 1, 2023 10:58 AM | () About | Settings | Acuvim 3 | ACCUENERGY |
|---|----------------------|------------------------|-----------------------------|---------|----------|-----------|--------------------------------------|----------|----------|----------|------------|
| Hereing - A Power Quality and Alarm - D Logs -                              |                      |                        |                             |         |          |           |                                      |          |          |          |            |
| Power Quality and Alarm Power Quality Reports                               |                      |                        |                             |         |          |           |                                      |          |          |          |            |
| EN 50160 compliance report #EE SI9 compliance report /// CC Curve SEM Curve |                      |                        |                             |         |          |           |                                      |          |          |          |            |
|   | Parameter            | Time Frame             |                             |         |          |           | _                                    |          |          |          |            |
|   | Voltage Interruption | • 2023/01/22 12        | :00 AM - 2023/01/29 11:59 I | M       |          |           | Generate                             |          |          |          |            |
|   |                      | 50160 Volta            | ige Interruptio             | on Re   | port     |           |                                      |          |          |          |            |
|   |                      | Results Summary        | -                           |         |          |           |                                      |          |          |          |            |
|   |                      | Interruption Type Name | Duration                    | Allowed | Occurred |           |                                      |          |          |          |            |
| bint < tms 100 0  |                      |                        |                             |         |          |           |                                      |          |          |          |            |
|   |                      | bin2                   | 1ms <= duration <= 3min     | 3       | 7693     |           |                                      |          |          |          |            |
|   |                      | bin3                   | 3min <= duration            | 1       | 0        |           |                                      |          |          |          |            |

Figure 6-43 EN50160 Voltage Interruption Report Results Summary

**Results Summary:** Based on the settings of the bins, the EN50160 voltage interruption report displays the number of times voltage interruptions occurred in each bin and their related duration ranges.

#### 6.6.1.15 EN50160 Voltage Dips Report

|                          |                                 |           |                            |                        |                         |                          | e                         | <ul> <li>Logout Wednesday, Febru</li> </ul> | ary 1, 2023 10.27 AM | O HOLDE A Serie | go Acomina | ALLUSINSKUT |
|--------------------------|---------------------------------|-----------|----------------------------|------------------------|-------------------------|--------------------------|---------------------------|---|----------------------|-----------------|------------|-------------|
| Lill Metering -          | A Power Quality and Alarm +     | "D Logs - |                            |                        |                         |                          |                           |   |                      |                 |            |             |
| Power Quality            | and Alarm Power Quality Reports |           |                            |                        |                         |                          |                           |   |                      |                 |            |             |
|                          |                                 |           | EN 50160 compliance report | IEEE 519 compliance    | report ITIC Curve S     | EMI Curve                |                           |   |                      |                 |            |             |
|                          |                                 |           | Parameter                  |                        | Time Frame              |                          |                           |   |                      |                 |            |             |
|                          |                                 |           | Voltage Dip                | 0                      | 2023/01/22 12:00 Af     | M - 2023/01/29 11:59 PM  |                           | Ge  | erate                |                 |            |             |
| 50160 Voltage Dip Report |                                 |           |                            |                        |                         |                          |                           |   |                      |                 |            |             |
|                          |                                 |           | Results Summary            |                        |                         |                          |                           |   |                      |                 |            |             |
|                          |                                 |           | Residual Voltage u (%)     |                        |                         | Duration t (ms)          |                           |   |                      |                 |            |             |
|                          |                                 |           |                            |                        |                         | Allowed / Occurred       |                           |   |                      |                 |            |             |
|                          |                                 |           |                            | 10.000 <= t <= 200.000 | 200.000 <= t <= 500.000 | 500.000 <= t <= 1000.000 | 1000.000 <= t <= 5000.000 | 5000.000 <= t <= 60000.000                  |                      |                 |            |             |
|                          |                                 |           | 90.000 > u >= 80.000       | 100 / 0                | 100 / 0                 | 100 / 0                  | 100 / 0                   | 100/0                                       |                      |                 |            |             |
|                          |                                 |           | 80.000 > u >= 70.000       | 100 / 0                | 100 / 0                 | 100 / 0                  | 100 / 0                   | 100/0                                       |                      |                 |            |             |
|                          |                                 |           | 70.000 > u >= 40.000       | 100 / 0                | 100 / 0                 | 100 / 0                  | 100 / 0                   | 100/0                                       |                      |                 |            |             |
|                          |                                 |           | 40.000 > u > = 5.000       | 100 / 0                | 100 / 0                 | 100 / 0                  | 100 / 0                   | 100/0                                       |                      |                 |            |             |
|                          |                                 |           | 5.000 × u                  | 100 / 0                | 100 / 0                 | 100 / 0                  | 100/0                     | 100/0                                       |                      |                 |            |             |

Figure 6-44 EN50160 Voltage Dips Report Results Summary

**Results Summary:** Based on the settings of the Cells, the EN50160 voltage dip report displays the number of times voltage dips occurred in each cell.

#### 6.6.1.16 EN50160 Voltage Swell Report

|   |                            |                          |   |                          | €∳ u                       | gout Wednesday, February 1, 2023 10:57 AM | O About 🌣 S | ttings Acuvim 3 | ACCUENERGY |
|---|----------------------------|--------------------------|---|--------------------------|----------------------------|---|-------------|-----------------|------------|
| Left Metering - A Power Quality and Alarm - "D Lo | ogs •                      |                          |   |                          |                            |   |             |                 |            |
| Power Quality and Alarm Power Quality Reports     |                            |                          |   |                          |                            |   |             |                 |            |
|   | EN 50160 compliance report | IEEE 519 compliance repo | ort ITIC Curve SEP                        | 41 Curve                 |                            |   |             |                 |            |
|   | Parameter                  |                          | Time Frame                                |                          |                            |   |             |                 |            |
|   | Voltage Swell              | ۰                        | 2023/01/22 12:00 AM - 2023/01/29 11:59 PM |                          |                            |   |             |                 |            |
|   |                            |                          | 50160 Volta                               | ge Swell Repo            | rt                         |   |             |                 |            |
|   |                            | Results Summary          |   |                          |                            |   |             |                 |            |
|   |                            | Swell Voltage u (%)      |   | Duration t (ms)          |                            |   |             |                 |            |
|   |                            |                          |   | Allowed / Occurred       |                            |   |             |                 |            |
|   |                            |                          | 10.000 <= t <= 500.000                    | 500.000 <= t <= 5000.000 | 5000.000 <= t <= 60000.000 |   |             |                 |            |
|   |                            | 120.000 > u >= 110.000   | 100 / 0                                   | 100 / 0                  | 100 / 0                    |   |             |                 |            |
|   |                            | 110.000 > u              | 100 / 0                                   | 100 / 0                  | 120 / 0                    |   |             |                 |            |

Figure 6-45 EN50160 Voltage Swell Report Results Summary



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**Results Summary:** Based on the settings of the cells, the EN50160 voltage swell report displays the number of times voltage swell occurred in each cell.

#### 6.6.1.17 EN50160 Flicker Report

|   |  |          |                   |              |                |              |              | the cogool - wearebady, redrady 1, 2023 1457 AM | O ADODE OF SEE | ingo Accomina | ALLUSASHUT |
|---|--|----------|-------------------|--------------|----------------|--------------|--------------|---|----------------|---------------|------------|
| Metering - Dever Quality and Alarm - Dicos -  |  |          |                   |              |                |              |              |   |                |               |            |
| Power Quality and Alarm Power Quality Reports |  |          |                   |              |                |              |              |   |                |               |            |
|   | EN 50160 compliance report IEEE 519 compli | ince rep | ort ITIC Curve    | SEMI Curv    | •              |              |              |   |                |               |            |
|   | Parameter                                  |          | Time Frame        |              |                |              |              |   |                |               |            |
|   | Flicker                                    | 0        | 2023/01/22 120    | 0 AM - 2023/ | 01/29 11:59 P1 |              |              | Generate  |                |               |            |
|   |  |          | 5016              | 0 Flicke     | r Repo         | rt           |              |   |                |               |            |
|   |  |          | Results Summary   |              |                |              |              |   |                |               |            |
|   |  |          | PST (10 min)      | 100          | 100 100        | 100          |              |   |                |               |            |
|   |  |          | PLT (2 hour)      | 100          | 100 100        | 100          |              |   |                |               |            |
|   | Min/Ma                                     | x/Avg    |                   |              | _              |              |              |   |                |               |            |
|   | Phase                                      | PST MIN  | (96) PST MAX (96) | PST AVG (%)  | PLT MIN (%)    | PLT MAX (96) | PLT AVG (98) |   |                |               |            |
|   | A  | 0        | 0.83602           | 0            | 0.003207       | 0.006012     | 0            |   |                |               |            |
|   | 8  | 0        | 0.833928          | 0            | 0.003208       | 0.005975     | 0            |   |                |               |            |
|   | c  | 0        | 0.824178          | •            | 0.003233       | 0.005974     | •            |   |                |               |            |

Figure 6-46 EN50160 Flicker Report Result Summary

**Results Summary:** Based on the settings of the zones, the EN50160 flicker report presents the percentage values of the maximum, minimum, and average PST and PLT values for all voltage channels.

### 6.6.2 IEEE519 Compliant Report

Acuvim 3 generates IEEE519 compliant reports based on statistics obtained through metering. For the supported parameters, please refer to Table 6-12.

| Туре              | Details  | Update Interval         |
|-------------------|--|-------------------------|
| Voltage Harmonics | Voltage THD and individual<br>harmonics (up to 50 <sup>th</sup> ) for each<br>phase A/B/C. | Daily (3s reading)      |
| Current Harmonics | Current THD and individual<br>harmonics (up to 50 <sup>th</sup> ) for each<br>phase A/B/C. | Weekly (10 min reading) |

#### 6.6.2.1 General Settings

To access the IEEE519 Compliant Report setting section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Power Quality and Alarm** from the tab menu.





- 3. Click on the **Power Quality Reporting** menu option.
- 4. Click on the **IEEE519** menu option. This webpage displays the IEEE519 compliant report settings for Acuvim 3.

|  |                    |                         |                          |                |                       |                                 | C+ Logout         | Thursday, March 21, 2024 11:12 AM | O About | Settings | Acumim 3 | ACCUENERGY |
|--|--------------------|-------------------------|--------------------------|----------------|-----------------------|---------------------------------|-------------------|-----------------------------------|---------|----------|----------|------------|
| Installation                               | Revenue and Energy | Power Quality and Alarm | Communication            | Data Log/Post  | User Management       | Maintenance and Management      |                   |                                   |         |          |          |            |
| Power Qualit                               | ty and Alarm Power | Quality Reporting       |                          |                |                       |                                 |                   |                                   |         |          |          |            |
|  |                    | Power Q                 | ality Event Alarm        | Waveform and F | astlog Mains Signalin | Woltage Power Quality Reporting | Email Notificatio |                                   |         |          |          |            |
|  |                    | EN5016                  | IEFE S19                 |                |                       |                                 |                   |                                   |         |          |          |            |
|  |                    | General                 | Settings +               |                |                       |                                 |                   |                                   |         |          |          |            |
| Calify Enable IEEE519 Power Quality Report |                    |                         |                          |                |                       |                                 |                   |                                   |         |          |          |            |
|  |                    | Last updat              | id at 2024-03-06 1044-35 |                |                       |                                 |                   |                                   |         |          |          |            |
|  |                    | Save                    |                          |                |                       |                                 |                   |                                   |         |          |          |            |

#### Figure 6-46 IEEE519 Report Setting Webpage

| General Settings 👻  |          |                     |            |                |              |
|---|----------|---------------------|------------|----------------|--------------|
| Enable IEEE519 Power Qual   | ty Repor | t                   |            |                |              |
| Last updated at 2023-05-26 04:37:31<br>First Day Of The Week                            |          |                     |            |                |              |
| 🔾 Monday 🧿 Sunday   |          |                     |            |                |              |
| Bus Voltage   |          | Maximum Short Circu | it Current | Maximum Demand | Load Current |
| 120.000   | kV       | 1.000               | А          | 1.000          | А            |
| Min Value: 0.12   |          | Min Value: 0        |            | Min Value: 0   |              |
| Maximum Short-circuit to Maxin<br>Nominal Frequency Fn: 60Hz<br>Reset All Reset Current | num Der  | nand Load Ratio: 1  |            |                |              |

Figure 6-47 IEEE519 Report General Setting

Enable IEEE519 Power Quality Report: Enables or disables EN50160 report function.

**First Day OF The Week:** It is the day that Acuvim 3 starts new statistics records for IEEE519 report. It could be set to start on either Monday or Sunday, depending on the preference or system setup.

Bus Voltage: Primary voltage.

**Maximum Short Circuit Current:** The highest current of an electrical component can safely endure without posing a shock or fire hazard.

Maximum Demand Load Current: The highest load current that is allowed in the system.

Reset All: Clear all IEEE519 record and IEEE519 buffer.

Reset Current: Clear the current IEEE519 buffer and the records for this week.





#### 6.6.2.2 Voltage Harmonics Setting

Under normal operating conditions, excluding periods with interruptions, the report is generated using the 10-minute mean voltage harmonics. Users can configure trigger limits for voltage total harmonic distortion (THD) and individual harmonics (up to the 50<sup>th</sup> harmonic).

To meet the IEEE519 standard for voltage harmonics, the daily 99<sup>th</sup> percentile of very short-time (3 seconds) values should be less than 1.5 times the configured trigger limits. Additionally, the weekly 95<sup>th</sup> percentile of short-time (10 minutes) values should also be less than the configured trigger limits.

#### **Cell THD:** The THD upper limit.

Cell Harmonics (1~50): The voltage harmonics upper limit.

| Voltage Harmonics Settings |   |             |    |             |    |             |    |  |
|----------------------------|---|-------------|----|-------------|----|-------------|----|--|
| THD                        |   | Harmonic 2  |    | Harmonic 3  |    | Harmonic 4  |    |  |
| 5.000                      | % | 3           | %  | 3           | %  | 3           | %  |  |
| Harmonic 5                 |   | Harmonic 6  |    | Harmonic 7  |    | Harmonic 8  |    |  |
| 3                          | % | 3           | 96 | 3           | 96 | 3           | 96 |  |
| Harmonic 9                 |   | Harmonic 10 |    | Harmonic 11 |    | Harmonic 12 |    |  |
| 3                          | % | 3           | %  | 3           | 96 | 3           | %  |  |
| Harmonic 13                |   | Harmonic 14 |    | Harmonic 15 |    | Harmonic 16 |    |  |
| 3                          | % | 3           | %  | 3           | %  | 3           | %  |  |
| Harmonic 17                |   | Harmonic 18 |    | Harmonic 19 |    | Harmonic 20 |    |  |
| 3                          | % | 3           | 96 | 3           | 96 | 3           | %  |  |
| Harmonic 21                |   | Harmonic 22 |    | Harmonic 23 |    | Harmonic 24 |    |  |
| 3                          | % | 3           | %  | 3           | %  | 3           | %  |  |
| Harmonic 25                |   | Harmonic 26 |    | Harmonic 27 |    | Harmonic 28 |    |  |
| 3                          | % | 3           | %  | 3           | %  | 3           | %  |  |
| Harmonic 29                |   | Harmonic 30 |    | Harmonic 31 |    | Harmonic 32 |    |  |
| 3                          | % | 3           | 96 | 3           | 96 | 3           | %  |  |
| Harmonic 33                |   | Harmonic 34 |    | Harmonic 35 |    | Harmonic 36 |    |  |
| 3                          | % | 3           | %  | 3           | %  | 3           | %  |  |
| Harmonic 37                |   | Harmonic 38 |    | Harmonic 39 |    | Harmonic 40 |    |  |
| 3                          | % | 3           | %  | 3           | 96 | 3           | %  |  |
| Harmonic 41                |   | Harmonic 42 |    | Harmonic 43 |    | Harmonic 44 |    |  |
| 3                          | % | 3           | 96 | 3           | 96 | 3           | %  |  |

Figure 6-48 IEEE519 Voltage Harmonic Settings

#### 6.6.2.3 Current Harmonics Setting

Under normal operating conditions, excluding periods with interruptions, the report is generated using the 10-minute mean current harmonics. Users have the option to configure trigger limits for current total demand distortion (TDD) and individual harmonics (up to the 50<sup>th</sup> harmonic).



To meet the IEEE519 standard for current harmonics, the daily 99<sup>th</sup> percentile of very short-time (3 seconds) values should be less than twice the configured trigger limits. Additionally, the weekly 99<sup>th</sup> percentile of short-time (10 minutes) values should be less than 1.5 times the configured trigger limits. Furthermore, weekly 95<sup>th</sup> percentile short-time (10 minutes) values should also be less than the configured trigger limits.

#### Cell TDD: The TDD upper limit.

| Current Harmonics Settings 👻 |    |             |    |             |    |             |    |
|------------------------------|----|-------------|----|-------------|----|-------------|----|
| TDD                          |    | Harmonic 2  |    | Harmonic 3  |    | Harmonic 4  |    |
| 2.500                        | %  | 0.5         | 96 | 2           | 96 | 0.5         | %  |
| Harmonic 5                   |    | Harmonic 6  |    | Harmonic 7  |    | Harmonic 8  |    |
| 2                            | %  | 0.5         | %  | 2           | 96 | 0.5         | %  |
| Harmonic 9                   |    | Harmonic 10 |    | Harmonic 11 |    | Harmonic 12 |    |
| 2                            | %  | 0.5         | 96 | 1           | %  | 0.25        | 96 |
| Harmonic 13                  |    | Harmonic 14 |    | Harmonic 15 |    | Harmonic 16 |    |
| 1                            | %  | 0.25        | %  | 1           | %  | 0.25        | %  |
| Harmonic 17                  |    | Harmonic 18 |    | Harmonic 19 |    | Harmonic 20 |    |
| 0.75                         | %  | 0.1875      | %  | 0.75        | %  | 0.1875      | %  |
| Harmonic 21                  |    | Harmonic 22 |    | Harmonic 23 |    | Harmonic 24 |    |
| 0.75                         | %  | 0.1875      | %  | 0.3         | %  | 0.075       | %  |
| Harmonic 25                  |    | Harmonic 26 |    | Harmonic 27 |    | Harmonic 28 |    |
| 0.3                          | %  | 0.075       | %  | 0.3         | %  | 0.075       | %  |
| Harmonic 29                  |    | Harmonic 30 |    | Harmonic 31 |    | Harmonic 32 |    |
| 0.3                          | %  | 0.075       | %  | 0.3         | %  | 0.075       | %  |
| Harmonic 33                  |    | Harmonic 34 |    | Harmonic 35 |    | Harmonic 36 |    |
| 0.3                          | %  | 0.075       | 96 | 0.15        | %  | 0.0375      | %  |
| Harmonic 37                  |    | Harmonic 38 |    | Harmonic 39 |    | Harmonic 40 |    |
| 0.15                         | %  | 0.0375      | 96 | 0.15        | %  | 0.0375      | %  |
| Harmonic 41                  |    | Harmonic 42 |    | Harmonic 43 |    | Harmonic 44 |    |
| 0.15                         | %  | 0.0375      | 96 | 0.15        | 96 | 0.0375      | %  |
| Harmonic 45                  |    | Harmonic 46 |    | Harmonic 47 |    | Harmonic 48 |    |
| 0.15                         | %  | 0.0375      | %  | 0.15        | 96 | 0.0375      | %  |
| Harmonic 49                  |    | Harmonic 50 |    |             |    |             |    |
| 0.15                         | 96 | 0.0375      | 96 |             |    |             |    |

**Cell Harmonics (1~50):** The current harmonics upper limit.

#### Figure 6-49 IEEE519 Current Harmonic Settings

#### 6.6.2.4 IEEE519 Voltage Harmonics Report

To access the IEEE519 Compliant Report section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the Power Quality Reports menu option.



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23:45:00 2023-07/08

00:00:00 2023-07/08



4. Click on the **IEEE519 Compliant Report** menu option. This webpage displays the IEEE519 Compliant reports for Acuvim 3.

**Voltage THD Trends:** The data used to create voltage THD trends is sourced from the trend log, which records instantaneous voltage THD values for the selected voltage phase every 15-minute.

Figure 6-50 IEEE519 Voltage Phase A THD Trend

00:00:00 2023-07/06

00:00:00 2023-07/04

| Results Summ | ary           |                 |                    |        |         |        |         |
|--------------|---------------|-----------------|--------------------|--------|---------|--------|---------|
| Parameter    | Upper Limit % | Trigger limit % | Actual Pass Rate % | Result | Max     | Min    | Average |
| THD          | 5%            | 99%             | 92.868%            | Fall   | 54.987% | 0.000% | 1.110%  |
| Harmonic 2   | 3%            | 99%             | 98.098%            |        | 6.064%  | 0.000% | 0.101%  |
| Harmonic 3   | 3%            | 99%             | 93.344%            |        | 9.998%  | 0.000% | 0.262%  |
| Harmonic 4   | 3%            | 99%             | 94.295%            |        | 3.001%  | 0.000% | 0.150%  |
| Harmonic 5   | 3%            | 99%             | 93.978%            | Fall   | 7.992%  | 0.000% | 0.298%  |
| Harmonic 6   | 3%            | 99%             | 95.721%            |        | 4.996%  | 0.000% | 0.219%  |
| Harmonic 7   | 3%            | 99%             | 93.502%            | Fall   | 9.999%  | 0.000% | 0.423%  |
| Harmonic 8   | 3%            | 99%             | 95.880%            |        | 4.988%  | 0.000% | 0.218%  |
| Harmonic 9   | 3%            | 99%             | 94.136%            | Fall   | 3.993%  | 0.000% | 0.207%  |
| Harmonic 10  | 3%            | 99%             | 96.038%            |        | 2.997%  | 0.000% | 0.140%  |
| Harmonic 11  | 3%            | 99%             | 97.623%            |        | 9.975%  | 0.000% | 0.149%  |
| Harmonic 12  | 3%            | 99%             | 100.000%           | Pass   | 0.997%  | 0.000% | 0.018%  |
| Harmonic 13  | 3%            | 99%             | 98.257%            | Fall   | 4,494%  | 0.000% | 0.077%  |
| Harmonic 14  | 3%            | 99%             | 100.000%           | Pass   | 0.996%  | 0.000% | 0.019%  |
| Harmonic 15  | 3%            | 99%             | 97.623%            |        | 6.099%  | 0.000% | 0.069%  |
| Harmonic 16  | 3%            | 99%             | 99.842%            | Pass   | 10.077% | 0.000% | 0.034%  |
| Harmonic 17  | 3%            | 99%             | 98.257%            |        | 3.981%  | 0.000% | 0.069%  |
| Harmonic 18  | 3%            | 99%             | 100.000%           | Pass   | 0.999%  | 0.000% | 0.018%  |
| Harmonic 19  | 3%            | 99%             | 97.623%            |        | 4.999%  | 0.000% | 0.092%  |
| Harmonic 20  | 3%            | 99%             | 100.000%           | Pass   | 0.994%  | 0.000% | 0.019%  |
| Harmonic 21  | 3%            | 99%             | 98.257%            | Fall   | 32.796% | 0.000% | 0.084%  |
| Harmonic 22  | 3%            | 99%             | 100.000%           | Pass   | 0.999%  | 0.000% | 0.018%  |
| Harmonic 23  | 3%            | 99%             | 97.623%            | Fall   | 4.973%  | 0.000% | 0.079%  |
| Harmonic 24  | 3%            | 99%             | 100.000%           | Pass   | 0.995%  | 0.000% | 0.018%  |
| Harmonic 25  | 3%            | 99%             | 98.257%            | Fall   | 2.595%  | 0.000% | 0.045%  |

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| Harmonic 26 | 3% | 99% | 99.842%  | Pass | 6.460% | 0.000% | 0.027% |
|-------------|----|-----|----------|------|--------|--------|--------|
| Harmonic 27 | 3% | 99% | 99.842%  | Pass | 4.045% | 0.000% | 0.023% |
| Harmonic 28 | 3% | 99% | 100.000% | Pass | 0.995% | 0.000% | 0.018% |
| Harmonic 29 | 3% | 99% | 98.415%  | Fall | 2.072% | 0.000% | 0.035% |
| Harmonic 30 | 3% | 99% | 100.000% | Pass | 0.990% | 0.000% | 0.017% |
| Harmonic 31 | 3% | 99% | 98.415%  | Fail | 1.986% | 0.000% | 0.034% |
| Harmonic 32 | 3% | 99% | 100.000% | Pass | 0.986% | 0.000% | 0.017% |
| Harmonic 33 | 3% | 99% | 100.000% | Pass | 0.987% | 0.000% | 0.017% |
| Harmonic 34 | 3% | 99% | 100.000% | Pass | 0.993% | 0.000% | 0.017% |
| Harmonic 35 | 3% | 99% | 100.000% | Pass | 0.983% | 0.000% | 0.017% |
| Harmonic 36 | 3% | 99% | 100.000% | Pass | 0.986% | 0.000% | 0.017% |
| Harmonic 37 | 3% | 99% | 98.415%  | Fail | 1.589% | 0.000% | 0.027% |
| Harmonic 38 | 3% | 99% | 100.000% | Pass | 0.981% | 0.000% | 0.017% |
| Harmonic 39 | 3% | 99% | 100.000% | Pass | 0.986% | 0.000% | 0.017% |
| Harmonic 40 | 3% | 99% | 100.000% | Pass | 0.994% | 0.000% | 0.017% |
| Harmonic 41 | 3% | 99% | 100.000% | Pass | 1.335% | 0.000% | 0.023% |
| Harmonic 42 | 3% | 99% | 100.000% | Pass | 0.986% | 0.000% | 0.017% |
| Harmonic 43 | 3% | 99% | 100.000% | Pass | 1.269% | 0.000% | 0.022% |
| Harmonic 44 | 3% | 99% | 100.000% | Pass | 0.979% | 0.000% | 0.017% |
| Harmonic 45 | 3% | 99% | 100.000% | Pass | 0.982% | 0.000% | 0.017% |
| Harmonic 46 | 3% | 99% | 100.000% |      | 0.988% | 0.000% | 0.017% |
| Harmonic 47 | 3% | 99% | 100.000% | Pass | 1.099% | 0.000% | 0.019% |
| Harmonic 48 | 3% | 99% | 100.000% | Pass | 0.978% | 0.000% | 0.017% |
| Harmonic 49 | 3% | 99% | 100.000% | Pass | 0.985% | 0.000% | 0.017% |
| Harmonic 50 | 3% | 99% | 100.000% | Pass | 0.972% | 0.000% | 0.016% |

#### Figure 6-51 IEEE519 Voltage Phase A THD Report Results Summary

**Results Summary:** Based on the settings of the cells, the IEEE519 voltage report presents THD and harmonic percentage throughout the reporting period and determines whether it passes or fails. Additionally, it displays the minimum, maximum, and average THD and harmonics percentage.





#### 6.6.2.5 IEEE519 Current Harmonics Report



**Current TDD Trends:** The data used to create voltage THD trends is sourced from the trend log, which records instantaneous voltage THD values for the selected voltage phase every 15-minute.

| Parameter   | Upper Limit % | Trigger limit % | Actual Pass Rate % | Result | Max    | Min    | Average |
|-------------|---------------|-----------------|--------------------|--------|--------|--------|---------|
| TDD         | 2.5%          | 99%             | 99.183%            | Pass   | 3.000% | 0.000% | 0.025%  |
| Harmonic 2  | 0.5%          | 99%             | 99.992%            | Pass   | 1.459% | 0.000% | 0.000%  |
| Harmonic 3  | 2%            | 99%             | 100.000%           | Pass   | 0.685% | 0.000% | 0.000%  |
| Harmonic 4  | 0.5%          | 99%             | 100.000%           | Pass   | 0.440% | 0.000% | 0.000%  |
| Harmonic 5  | 2%            | 99%             | 100.000%           | Pass   | 0.305% | 0.000% | 0.000%  |
| Harmonic 6  | 0.5%          | 99%             | 99.175%            | Pass   | 5.048% | 0.000% | 0.041%  |
| Harmonic 7  | 2%            | 99%             | 100.000%           | Pass   | 0.312% | 0.000% | 0.000%  |
| Harmonic 8  | 0.5%          | 99%             | 100.000%           | Pass   | 0.243% | 0.000% | 0.000%  |
| Harmonic 9  | 2%            | 99%             | 100.000%           | Pass   | 0.205% | 0.000% | 0.000%  |
| Harmonic 10 | 0.5%          | 99%             | 100.000%           | Pass   | 0.180% | 0.000% | 0.000%  |
| Harmonic 11 | 1%            | 99%             | 100.000%           | Pass   | 0.164% | 0.000% | 0.000%  |
| Harmonic 12 | 0.25%         | 99%             | 100.000%           | Pass   | 0.151% | 0.000% | 0.000%  |
| Harmonic 13 | 1%            | 99%             | 100.000%           | Pass   | 0.137% | 0.000% | 0.000%  |
| Harmonic 14 | 0.25%         | 99%             | 100.000%           | Pass   | 0.126% | 0.000% | 0.000%  |
| Harmonic 15 | 1%            | 99%             | 100.000%           | Pass   | 0.117% | 0.000% | 0.000%  |
| Harmonic 16 | 0.25%         | 99%             | 100.000%           | Pass   | 0.111% | 0.000% | 0.000%  |
| Harmonic 17 | 0.75%         | 99%             | 100.000%           | Pass   | 0.108% | 0.000% | 0.000%  |
| Harmonic 18 | 0.1875%       | 99%             | 100.000%           | Pass   | 0.097% | 0.000% | 0.000%  |
| Harmonic 19 | 0.75%         | 99%             | 100.000%           | Pass   | 0.092% | 0.000% | 0.000%  |
| Harmonic 20 | 0.1875%       | 99%             | 100.000%           | Pass   | 0.087% | 0.000% | 0.000%  |
| Harmonic 21 | 0.75%         | 99%             | 100.000%           | Pass   | 0.083% | 0.000% | 0.000%  |
| Harmonic 22 | 0.1875%       | 99%             | 100.000%           | Pass   | 0.079% | 0.000% | 0.000%  |
| Harmonic 23 | 0.3%          | 99%             | 100.000%           | Pass   | 0.075% | 0.000% | 0.000%  |
| Harmonic 24 | 0.075%        | 99%             | 100.000%           | Pass   | 0.072% | 0.000% | 0.000%  |
| Harmonic 25 | 0.3%          | 99%             | 100.000%           | Pass   | 0.070% | 0.000% | 0.000%  |

| Harmonic 26 | 0.075%  | 99%  | 100.000% | Pass | 0.067%  | 0.000%  | 0.000% |
|-------------|---------|------|----------|------|---------|---------|--------|
| Harmonic 27 | 0.3%    | 99%  | 100.000% | Pass | 0.064%  | 0.000%  | 0.000% |
| Harmonic 28 | 0.075%  | 99%  | 100.000% | Pass | 0.061%  | 0.000%  | 0.000% |
| Harmonic 29 | 0.3%    | 99%  | 100.000% | Pass | 0.060%  | 0.000%  | 0.000% |
| Harmonic 30 | 0.075%  | 99%  | 100.000% | Pass | 0.057%  | 0.000%  | 0.000% |
| Harmonic 31 | 0.3%    | 99%  | 100.000% | Pass | 0.056%  | 0.000%  | 0.000% |
| Harmonic 32 | 0.075%  | 99%  | 100.000% | Pass | 0.050%  | 0.000%  | 0.000% |
| Harmonic 33 | 0.3%    | 99%  | 100.000% | Pass | 0.038%  | 0.000%  | 0.000% |
| Harmonic 34 | 0.075%  | 99%  | 100.000% | Pass | 0.017%  | 0.000%  | 0.000% |
| Harmonic 35 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 36 | 0.0375% | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 37 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 38 | 0.0375% | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 39 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 40 | 0.0375% | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 41 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 42 | 0.0375% | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 43 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 44 | 0.0375% | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 45 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 46 | 0.0375% | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 47 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 48 | 0.0375% | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 49 | 0.15%   | 99%  | 100.000% | Pass | 0.000%  | 0.000%  | 0.000% |
| Harmonic 50 | 0.0275% | 9995 | 100.000% | Pass | 0.00035 | 0.00056 | 0.000% |

#### Figure 6-53 IEEE519 Current Phase A THD Report Results Summary

**Results Summary:** Based on the settings of the cells, the IEEE519 Current report presents TDD and harmonic percentage throughout the reporting period and determines whether it passes or fails. Additionally, it displays the minimum, maximum, and average TDD and harmonics percentage.





### 6.6.3 ITIC/CBEMA Curve Report

To access the ITIC/CBEMA Curve Report section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the Power Quality Reports menu option.
- Click on the ITIC/CBEMA Curve Report menu option. This webpage displays the ITIC/CBEMA curve reports for Acuvim 3.

Acuvim 3 provides the Information Technology Industry Council (ITIC) and Computer Business Equipment Manufacturers Association (CBEMA) curve report to visually represent voltage events.



#### Figure 6-54 ITIC/CBEMA Curve Report

#### 6.6.4 SEMI Curve Report

To access the SEMI Curve Report section,

- 1. Click on Acuvim 3 from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the Power Quality Reports menu option.
- 4. Click on the **SEMI Curve** menu option. Click on **Generate button** to display the SEMI curve reports for Acuvim 3.

Acuvim 3 provides the Semiconductors Manufacturers' Institute (SEMI) curve report to illustrate the minimum voltage levels over time that equipment is expected to withstand during a power



outage. For stable equipment operation, the percent of nominal voltage of voltage sag should not exceed the SEMI curve.



Figure 6-55 SEMI Curve Report

# 6.7 Power Quality Logging

Acuvim 3 supports power quality logging with user-configurable parameters and log file length. Logs are saved as CSV files in the Acuvim 3 for users to download and can also be configured for HTTP/FTP post to remote servers. The logging includes IEC 61010-4-30 compliant aggregation, EN50160 report, and IEEE519 report. For detailed information on data log settings, refer to chapter 8.

### 6.7.1 IEC 61010-4-30 Compliant Aggregation Logging

Acuvim 3 offers IEC 61010-4-30 Compliant Aggregation logging. Table 6-13 listed four types of aggregation loggers.





| Logger Type   | Parameters   | Log Interval        |
|---|--|---------------------|
| 3s Aggregation Logger   | <ul> <li>Timestamp</li> <li>3s Aggregation Values:</li> <li>RMS</li> <li>Power</li> <li>Fundamental</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> </ul>                                   | Fixed at 3 Seconds  |
| 10s Aggregation Logger  | Timestamp     Frequency  | Fixed at 10 Seconds |
| 10 Min Aggregation Logger   | <ul> <li>Timestamp</li> <li>10 Min Aggregation Values:</li> <li>RMS</li> <li>Power</li> <li>Fundamental</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> <li>Individual Harmonics</li> </ul> | Fixed at 10 Minutes |
| <ul> <li>Timestamp</li> <li>2hour Aggregation Values:</li> <li>RMS</li> <li>Power</li> <li>Fundamental</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> <li>Individual Harmonics</li> </ul> |  | Fixed at 2 Hours    |

Table 6-13 IEC 61010-4-30 Compliant Aggregation Loggers





### 6.7.2 EN50160 Report Logging

Acuvim 3 supports EN50160 report logging with weekly updated EN50160 record data. This includes counters for each bin and cell, pass/fail results, and statistics for maximum, minimum, and average values. The log interval is set to weekly, and you can refer to Table 6-14 for detailed parameters.

| Category             | Parameters   |
|----------------------|--|
| Normal Operation     | Counter for valid  |
| Normal Operation     | Counter for invalid  |
|                      | Counters for Frequency of each zone  |
| Frequency            | • Flag for pass/fail   |
|                      | Max/min/average values of 3-second frequency in the week                     |
|                      | Counters for Voltage RMS of each zone  |
| Voltage RMS          | • Flag for pass/fail   |
|                      | Max/min/average values of 10-minute voltage RMS in the week                  |
|                      | Counters for in range PST  |
| PST                  | • Flag for pass/fail   |
|                      | Max/min/average values of 10-minute PST in the week                          |
|                      | Counters for in range PLT  |
| PLT                  | • Flag for pass/fail   |
|                      | Max/min/average values of 2-hour PLT in the week                             |
|                      | Counters for in range voltage unbalance                                      |
| Voltage Unbalance    | • Flag for pass/fail   |
|                      | Max/min/average values of 10-minute voltage unbalance in the week            |
|                      | Counters for in range voltage THD  |
|                      | • Flag for pass/fail   |
| Voltage THD          | Max/min/average values of 10-minute voltage THD in the week                  |
|                      | Max/min/average values of 10-minute voltage odd THD in the week              |
|                      | Max/min/average values of 10-minute voltage even THD in the week             |
|                      | <ul> <li>Counters for in range individual voltage harmonics</li> </ul>       |
| Voltage Harmonics    | • Flag for pass/fail   |
|                      | Max/min/average values of 10-minute individual Voltage harmonics in the week |
| Voltage Interruption | Counters for voltage interruptions of each cell                              |
| Voltage Dip          | Counters for voltage dips of each cell                                       |
| Voltage Swell        | Counters for voltage swells of each cell                                     |

### Table 6-14 EN50160 Compliant Aggregation Loggers



### 6.7.3 IEEE519 Report Logging

Acuvim 3 supports EN50160 report logging with IEEE159 record data, including counters for each bin and cell, pass/fail results, and statistics for maximum, minimum, and average values. The log interval is either daily for very short (3 seconds) data or weekly for short (10 minutes) data. Detailed parameters for very short (3 seconds) data (logged daily) can be found in Table 6-15, and detailed parameters for short (10 minutes) data (logged weekly) are listed in Table 6-16.

| Category          | Parameters   |
|-------------------|--|
|                   | Counters for in range voltage THD  |
| Voltage THD       | • Flag for pass/fail   |
|                   | Max/min/average values of 3-second voltage THD in the day                  |
|                   | Counters for in range individual voltage harmonics                         |
| Voltage Harmonics | • Flag for pass/fail   |
|                   | Max/min/average values of 3-second individual voltage harmonics in the day |
|                   | Counters for in range voltage THD  |
| Current THD       | • Flag for pass/fail   |
|                   | Max/min/average values of 3-second min current THD in the day              |
|                   | Counters for in range voltage THD  |
| Current Harmonics | • Flag for pass/fail   |
|                   | Max/min/average values of 3-second individual current harmonics in the day |

#### Table 6-15 IEEE519 Daily Logger Parameters

#### Table 6-16 IEEE519 Weekly Logger Parameters

| Category          | Parameters   |
|-------------------|--|
|                   | Counters for in range voltage THD  |
| Voltage THD       | • Flag for pass/fail   |
|                   | Max/min/average values of 10-minute voltage THD in the week                  |
|                   | Counters for in range individual voltage harmonics                           |
| Voltage Harmonics | • Flag for pass/fail   |
|                   | Max/min/average values of 10-minute individual voltage harmonics in the week |
|                   | Counters for in range voltage THD  |
| Current THD       | • Flag for pass/fail   |
|                   | Max/min/average values of 10-minute current THD in the week                  |
|                   | Counters for in range voltage THD  |
| Current Harmonics | • Flag for pass/fail   |
|                   | Max/min/average values of 10-minute individual current harmonics in the week |



# 6.8 DI Trigger

To access the DI Trigger section,

- 1. Click on Settings from the main menu.
- 2. Select Power Quality and Alarm from the tab menu.
- 3. Click on the **DI Trigger** menu option. This webpage displays the DI trigger settings for Acuvim3.

| Installation Revenue and Ensure Revenue And Auron Communication Parts Londonst Linux Management Maintenances and Management  |  |                    | <br>4 beings Accents | ALLUSINSHUT |
|--|--|--------------------|----------------------|-------------|
| second se |  |                    |                      |             |
| Power Quality and Alarm to trager  |  |                    |                      |             |
| Power Quality Event Marm Dt Trigger Waveform and Far   | tog Mains Signaling Voltage Power Quality Reporting        | Email Netification |                      |             |
| "Please ensure DI type is set to "Status" to enable DI Trigger feature.  | fou can modify settings on Settings -> installation -> 10. |                    |                      |             |
| Enable 04  | Condition  | Waveform           |                      |             |
| CH Roing Edge  |  | ۲                  |                      |             |
| Di Di2 Faling Edge   | •  | •                  |                      |             |
| DIS Both Edges   |  | (m)                |                      |             |
| 0 DH4 Roing Edge   |  |                    |                      |             |
| Save   |  |                    |                      |             |
|  |  |                    |                      |             |

#### Figure 6-56 Acuvim3 DI trigger waveform

There are 4 I/O IDs on the meter body, from DI 1 to DI 4. When DI is set to "Status" type, users can decide to trigger waveform capture on the "Rising edge", "Failing edge" or "Both edges" of DI changing status. Where "Rising edge" is defined as DI turning from OFF to ON.



# **Chapter 7: Communications**

This chapter describes how the different applicable communications protocols can be established from the webpage interface.

# 7.1 RS485 and USB Settings

To access the RS485 and USB section,

- 1. Click on **Settings** from the main menu.
- 2. Select Communication from the tab menu.
- 3. Click on the **RS485 and USB** menu options. The webpage will display the options to enable RS485 and USB settings for the Acuvim 3.



**WARNING:** The RS485 terminal with label S must be grounded, otherwise it will affect the network or may damage the communication interface.

|   | 🕒 Logout Thursday, April 25, 202    | 2:57 PM  About  Settings Acus   | im 3 ACCUENERGY            |
|---|-------------------------------------|---------------------------------|----------------------------|
| Installation Revenue and Energy Power ( | Quality and Alarm Communication     | Data Log/Post User Management N | faintenance and Management |
| Communication RS485 and USB             |                                     |                                 |                            |
| RS485 and USB Network Webpage Time      | e)Date Access Control Remote Access | Email Modbus BACnet SNMP        | DNP IEC61850               |
| EtherNet/IP PMU                         |                                     |                                 |                            |
| R\$485 v                                |                                     |                                 |                            |
| RS485 Enable                            |                                     |                                 |                            |
| Protocol                                | Baud Rate                           |                                 |                            |
| Modbus RTU Slave                        | 115200 bps                          | ٠                               |                            |
| Parity                                  | Data Bit                            | Stop Bit                        |                            |
| None                                    | 8                                   | ¢ 1                             | ٥                          |
| USB 🔻                                   |                                     |                                 |                            |
| USB Enable                              |                                     |                                 |                            |
| Protocol                                | Baud Rate                           |                                 |                            |
| Modbus RTU Slave                        | 115200 bps                          | ٥                               |                            |
| Parity                                  | Data Bit                            | Stop Bit                        |                            |
| Nonir                                   | 8                                   | 0 1                             | 0                          |

Figure 7-1 Communication RS485 and USB Setting Webpage

Protocol: Option to select Modbus RTU Slave or BACnet MS/TP.

**Baud Rate:** The rate at which information is transmitted. Select a rate speed from the options of 9600 bits/s, 19200 bits/s, 38400 bits/s, 57600 bits/s, and 115200 bits/s. The default baud rate is 115200 bits/s.

Parity: Parameter is set to 'None' by default and cannot be changed.

Data Bit: Parameter is set to '8' by default and cannot be changed.

Stop Bit: Parameter is set to '1' by default and cannot be changed.





# 7.2 Network

Acuvim 3 supports wireless network communication. Wi-Fi can be configured in both access point and station modes, and also accommodates both IPv4 and IPv6 Ethernet modes.

To access the Network section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.

Click on the **Network** menu option. This webpage displays the network settings for Acuvim 3.

### 7.2.1 RSTP

Acuvim 3 has two Ethernet interfaces able to communicate on different networks, for webpage interface access and Ethernet-based protocols like data post, email, Modbus TCP, PMU, and more.

| General 🔻  |
|--|
| C RSTP Enable  |
| Note: Two RJ45 ports are working in daisy-chain mode |
| Default Interface (Outbound Traffic)                 |
| O Bridge   |
|  |
|  |

Figure 7-2 Enable RSTP

**RSTP Enable:** When RSTP is enabled, Ethernet 1 and Ethernet 2 will not be configurable. There is only one IP per meter using the RSTP protocol.

**Daisy Chain:** Users can daisy chain up to 32 devices when the RSTP protocol is enabled. Each device can be accessed by configuring a unique IP address or having the IP addresses assigned automatically by the network.

#### Figure 7-3 Default Interface Selection

**Default Interface (Outbound Traffic):** Users can choose the default interface from either Ethernet 1 or Ethernet 2 only when RSTP is disabled. The selection sets a default Ethernet interface to determine which port to use as the primary routing to external networks. The other interface can be used for local routing.



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### 7.2.2 IPv4 Ethernet

Users can configure the IPv4 addresses for the Acuvim 3's two Ethernet interfaces manually or by setting DHCP to auto.

| Ethernet1 DHCP                 |                    |                    |
|--------------------------------|--------------------|--------------------|
| Manual                         |                    |                    |
| Auto                           |                    |                    |
| Ethernet1 IP Address           | Ethernet1 Subnet   | Ethernet1 Gateway  |
| 192.168.1.254                  | 255.255.255.0      | 192.168.1.1        |
| 192.168.1.254                  | 255.255.255.0      | 192.168.1.1        |
| Must be ip address             | Must be ip address | Must be ip address |
| Ethernet1 Status: Disconnected |                    |                    |
| Ethernet2 DHCP                 |                    |                    |
| 🔿 Manual                       |                    |                    |
| O Auto                         |                    |                    |
| Ethernet2 IP Address           |                    |                    |
| 100 100 00 100                 |                    |                    |

Figure 7-4 Ethernet Setting Section

**Ethernet1 DHCP:** Ethernet 1 port has the option to allow users to choose between manually configuring an IP address or automatically assigning one by DHCP.

| Default Ethernet 1 Port Setting:   |
|------------------------------------|
| DHCP: Manual                       |
| Ethernet IP Address: 192.168.1.254 |
| Subnet: 255.255.255.0              |
| Gateway: 192.168.1.1               |

**Ethernet2 DHCP:** Ethernet 2 port has the option to allow users to choose between manually configuring an IP address or automatically assigning one by DHCP. By default, Ethernet 2 is set to automatically acquire dynamic IP assignment from router.

**NOTE:** Ethernet 2 does not support the EtherNet/IP protocol. Connect to Ethernet 1 if the EtherNet/IP protocol is needed.





### 7.2.3 IPv4 Wi-Fi

Acuvim 3 is equipped with a Wi-Fi interface that supports 2.4GHz/5GHz frequencies and can be configurable as an access point (AP) or in station mode.

#### **Access Point Mode**

| IPv4 WiFi 👻               |                             |                        |  |
|---------------------------|-----------------------------|------------------------|--|
| O WiFi Enable             |                             |                        |  |
| WiFi Mode                 |                             |                        |  |
| Access Point              | \$                          |                        |  |
| SSID                      | Network Key                 | IP                     |  |
| Acuvim-3-WIFI-ASP21100007 |                             | <b>X</b> 192.168.100.1 |  |
| Maximum 32 characters     | Between 8 and 63 characters | Must be ip address     |  |
| Wifi Status: Disconnected |                             |                        |  |

Figure 7-5 Access Point Setting Section

Access Point Mode: Enabling other wireless devices to connect and communicate with Acuvim 3. Users can configure the SSID, network key, and IP address of the Acuvim 3. 5GHz is not supported in AP mode.

**SSID:** Service set identifier allows an AP to identify itself on a network and can be configured with a maximum of 32 characters. By default, the Acuvim 3 in AP mode SSID format will appear as Acuvim-3-WIFI-(serial number of Acuvim 3 meter) for example, 'Acuvim-3-WIFI-ASP21100007'.

**Network Key:** The default network security key is 'accuenergy' (case sensitive all lowercase). It is recommended to update the network key by configuring it through the webpage interface. The network key must be between 9 and 63 characters in length.

IP: The default IP address is '192.168.100.1' with the option to configure the address.

### **Station Mode**

| IPv4 WiFi 📼           |           |                             |     |                |  |
|-----------------------|-----------|-----------------------------|-----|----------------|--|
| 💽 WiFi Enable         |           |                             |     |                |  |
| WiFi Mode             |           |                             |     |                |  |
| Station Mode          | ¢         |                             |     |                |  |
| C Enterprise Mode     |           |                             |     |                |  |
| Connect to SSID       |           | Network Key                 |     | Username       |  |
| Enter Connect to SSID | SSID List | Enter Network Key           | SR. | Enter Username |  |
| Maximum 32 characters |           | Between 8 and 63 characters |     |                |  |
| WiFi DHCP             |           |                             |     |                |  |
| ● Manual<br>○ Auto    |           |                             |     |                |  |





Station Mode: Allow Acuvim 3 to connect to an existing wireless network.

**SSID:** Network name of the existing network. Users can search available networks by clicking the SSID List button.

**Network Key:** The password to connect to an external network. If connecting to an open wireless network that is not password protected, the password field can be left blank.

**Enterprise Mode:** If WPA/WPA2-Enterprise is enabled on the network, Enterprise mode users can configure the usernames to connect to the network.

**Wi-Fi DHCP:** This option allows users to choose between manually configuring the Wi-Fi IP address or automatically assigning one by DHCP. By default, Wi-Fi is set to manual mode when station mode is enabled with the following configurations.

| Default Wi-Fi Station Mode Setting |
|------------------------------------|
| DHCP: Manual                       |
| Static IP Address: 192.168.1.10    |
| Subnet: 255.255.255.0              |
| Gateway: 192.168.1.1               |

**IPv4 DNS:** Users can configure up to two IPv4 DNS servers. Acuvim 3 requires DNS server configuration to connect to remote servers with domain names, such as the AcuCloud servers, NTP servers, and remote HTTP/FTP servers.

| IPv4 DNS 👻        |                   |  |
|-------------------|-------------------|--|
| IPv4 DNS Server 1 | IPv4 DNS Server 2 |  |
| 8.8.8             | 8.8.4.4           |  |

Figure 7-7 IPv4 DNS Setting

### 7.2.4 IPv6 Ethernet

Enabling IPv6 allows users to manually or set DHCP to automatically configure the IPv6 addresses for the Acuvim 3's two Ethernet interfaces. It's important to note that only the web server and SNMP server support IPv6.



| IPv6 👻   |                                   |                              |
|--|-----------------------------------|------------------------------|
| IPv6 Enable Note: Crity web server & SNMP server support IPv6 IPv6 Ethermet1     Manual     Auto Ethermet1 IPv6 Link-local Address fe80::eec38afffe90:1234 |                                   |                              |
| Ethernet1 IPv6 Address   | Ethernet1 IPv6 PrefixLength       | Ethernet1 IPv6 Gateway       |
| Enter Ethernet1 IPv6 Address   | Enter Ethernet1 IPv6 PrefixLength | Enter Ethernet1 IPv6 Gateway |
| Ethernet1 Status: Disconnected<br>IPv6 Ethernet2<br>Manual<br>Auto<br>Ethernet2 IPv6 Link-local Address  |                                   |                              |
| fe80::eec3:8aff:fe90:1235  |                                   |                              |
| Ethernet2 IPv6 Address   |                                   |                              |
| Ethernet2 Status: Disconnected   | IPv6 DNS Server 2                 |                              |
| Enter IPv6 DNS Server 1  | Enter IPV6 DNS Serve              | r 2                          |

Figure 7-8 IPV6 Network Setting Section

**Ethernet1 IPv6 DHCP:** Allows users a choice between manual configuration of an IP address or automatic IP assignment with DHCP for Ethernet 1. By default, Ethernet 1 is set to 'Auto' mode to acquire dynamic IP assignment from a router.

**Ethernet2 IPv6 DHCP:** Allows users to choose between manually configuring an IP address or automatically assigning one by DHCP for Ethernet 2. By default, Ethernet 2 is set to 'Auto' mode to acquire dynamic IP assignment from a router.

**Ethernet IPv6 Manual:** If the user wants to manually configure each Ethernet interface with an IPv6 address, the following parameters are needed: IPv6 address, IPv6 prefix length, and IPv6 gateway.

**IPv6 DNS:** Users can configure up to two IPv6 DNS servers. Acuvim 3 requires DNS server configuration to connect to remote servers with domain names, such as the AcuCloud servers, NTP servers, and remote HTTP/FTP servers.

| IPv6 DNS Server 1       | IPv6 DNS Server 2       |  |
|-------------------------|-------------------------|--|
| Enter IPv6 DNS Server 1 | Enter IPv6 DNS Server 2 |  |

Figure 7-9 IPv6 DNS Setting



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### 7.2.5 HTTP proxy

Acuvim 3 supports HTTP proxy. If the user has a proxy in the network to filter outgoing traffic, the Acuvim 3 can be configured to use that proxy for outgoing traffic (e.g. data post, NTP server).

HTTP Proxy Server Port: The default port number is 80, with a range from 1 to 65535.

| HTTP Proxy 🐨                |                               |  |
|-----------------------------|-------------------------------|--|
| HTTP Proxy Enable           |                               |  |
| HTTP Proxy Server URL       | HTTP Proxy Server Port        |  |
| Enter HTTP Proxy Server URL | 8080                          |  |
|                             | Default: 80, Range: 0 - 65535 |  |

#### Figure 7-10 HTTP Proxy Setting

# 7.3 Access Control

To access the Access Control section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the **Access Control** menu option. This webpage displays the access control information for Acuvim 3.

| Installation Revenue and Energy                | Power Quality and Alarm Communicat | Data Lan Dest. Lines Management |                             |
|--|------------------------------------|---------------------------------|-----------------------------|
|  |                                    | on Data Loginost Oser Manageria | ent Maintenance and Managem |
| Communication Access Control                   |                                    |                                 |                             |
| R5485 and USB Network Webpa<br>EtherNet/IP PMU | ge Time)Date Access Control Remo   | te Access Email Modibus BACnet  | SNMP DNP IEC61850           |
| Whitelist Cashie                               |                                    |                                 |                             |
| IPv4 Address                                   | IPv6 Address                       | Description                     |                             |
| Enter IPv4 Address                             | Enter IPv6 Address                 | Enter Descripti                 | ion                         |
| Most be ip address                             | Must be love address               | Maximum 20 charae               | ners                        |
| Add  |                                    |                                 |                             |
| IP Whitelist                                   |                                    |                                 |                             |
| IPv4 Address                                   | IPv6 Address                       | Description                     | Action                      |
|  | No Da                              | 2                               |                             |
| Import Whitelist                               |                                    |                                 |                             |
| Choose file                                    | Browse Import Export               |                                 |                             |

#### Figure 7-11 Access Control Setting

The Acuvim 3 access control function allows for trusted IP addresses to be added to the whitelist.

Whitelist Enable: Users can enter an IPv4 or IPv6 address along with a description for each address.





**IP Whitelist:** The IP whitelist can accommodate a maximum of twenty IP addresses. Additionally, an option exist to import or export the IP whitelist as a CSV file.

# 7.4 Remote Access

To access the Remote Access section,

- 1. Click on **Settings** from the main menu.
- 2. Select Communication from the tab menu.
- 3. Click on the **Remote Access** menu option. This webpage displays remote access information for Acuvim 3.





The Acuvim 3 has a remote access function. When enabled, the Acuvim 3 can bypass the local router to connect directly to the internet. This enables users to access the Acuvim 3 from a remote location using a static URL in the format of (serial number of Acuvim 3 meter).accuenergy. io (e.g., 'asp21100007.accuenergy.io').

**Ping Interval:** The length of time the system waits between ping packets for remote access is known as the ping interval. The default interval is set to 60 seconds, but users can also opt for a 600-second interval.

**Registration Status:** Depends on the remote access status. If no remote URL is registered, the status will display as 'Unregistered'. If a remote URL is available, the status will show 'Registered'.

Manual Register: Create remote access URL for remote access.

Refresh Status: Check the availability of the remote access URL.

Deregister: Delete the registered remote access URL.



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# 7.5 Webpage Interface

To access the Webpage section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the Webpage menu option. This webpage displays webpage settings for Acuvim 3.

### 7.5.1 HTTP/HTTPS

| HTTP 👻                           |
|----------------------------------|
| HTTPS Port                       |
| 443                              |
| Default: 443, Range: 6000 - 9999 |
| HTTP Enable                      |
| HTTP Port                        |
| 80                               |
| Sefault: 80. Ranner 6000 - 9999  |

#### Figure 7-13 HTTP Enable Setting

**HTTPS Port:** By default, port 443 is enabled for HTTPS webpage access with available port numbers ranging from 6001 to 9999, excluding 6566, 6665, 6666, 6667, 6668, 6669, and 6697.

**HTTP Port:** If HTTP port is enabled. Port number 80 is the default configuration. The port number can range from 6001 to 9999, excluding 6566, 6665, 6666, 6667, 6668, 6669, and 6697.

### 7.5.2 Certificate Management

Acuvim 3 allows users to import and export the HTTPS certificate to align with an organization's security policy. Users can generate a certificate signing request (CSR) and a new self-signed certificate for testing and security purposes.





| Import Generate New Self-Signed Certi | Generate CSR Export    |
|---------------------------------------|------------------------|
|                                       |                        |
| Certificate Issuer                    |                        |
| Common Name                           | ASP22100               |
| Company Name                          | Accuenergy (CANADA)    |
| Division Name                         |                        |
| City                                  | Toro                   |
| State                                 |                        |
| Country Code                          |                        |
| Certificate Subject                   |                        |
| Common Name                           | ASP22100               |
| Company Name                          | Accuenergy (CANADA)    |
| Division Name                         |                        |
| City                                  | Terr                   |
| State                                 |                        |
| Country Code                          |                        |
| Certificate Validity                  |                        |
| Validate From                         | Mar 14 13:49:27 2024 0 |
| Expiration                            | Mar 14 13:49:27 2054 0 |
| Details                               |                        |
| PublicKey Size                        | 2                      |
| PublicKey Type                        | rsaEncryp              |
| Certificate Version                   |                        |
| Signature Algorithm                   | sha256WithRSAEncryp    |
| Sarial Number                         | 00/73/24-6/25/8        |

#### Figure 7-14 Certificate Management

# 7.6 Time/Date

To access the Time/Date section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the Time/Date menu option. This webpage displays the time/date settings for Acuvim 3.

Acuvim 3 supports five protocols for time synchronization: Network Time Protocol (NTP), Simple Network Time Protocol (SNTP), Precision Time Protocol (PTP), Inter-Range Instrumentation Group Time Code (IRIG-B) (unmodulated IRIG-B002, 5V levels), and allows for manual configuration of the time and date.

### 7.6.1 NTP & SNTP

The NTP and SNTP are a time synchronization feature to ensure the Acuvim 3 is using the same clock time as on the network.



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|    | NTP Server 2          | NTP Server 3  |
|----|-----------------------|---|
|    | Enter NTP Server 2    | Enter NTP Server 3  |
|    | Maximum 40 characters | Maximum 40 characters                                       |
| ed |                       |   |
|    |                       |   |
|    |                       |   |
|    | ed .                  | NTP Server 2<br>Enter NTP Server 2<br>Maximum 40 characters |

Figure 7-15 NTP Setting

**NTP Server 1, 2, & 3:** NTP enables Acuvim 3 to synchronize time with up to three servers. If an NTP time server is down, Acuvim 3 will attempt to synchronize with another configured time server. The server name can be up to 40 characters in length.

Recommended NTP servers include: 0.us.pool.ntp.org, 1.us.pool.ntp.org, 2.us.pool.ntp.org, and 3.us.pool.ntp.org. Additional NTP servers can be found at: http://www.pool.ntp.org/en/.

**Connection Status:** Displays the current connection status between Acuvim 3 and a NTP server. This status will be updated every five minutes.



Figure 7-16 Device Clock Sync

**Device Clock:** Allow users to configure the time and date manually by clicking on the calendar icon. Note when the Acuvim 3 is connected to an NTP server, dependent on the network status and NTP server status, the clock will be automatically updated. Users can also manually synchronize to the NTP time by clicking the 'Sync' button.



Figure 7-17 Time Zone Setting





**Timezone:** Acuvim 3 supports daylight saving time (DST) configuration. Users can select the synchronized time zone based on the Acuvim 3's location or another time zone. This can be achieved from the dropdown list or by directly clicking a region on the map.

**SNTP Interval:** SNTP Interval specifies the amount of time between updates of the system clock using SNTP. The default interval is set to 720-second, and the interval ranges from 5 to 85,400 seconds.

### 7.6.2 PTP

| Protocol             |   |                |                     |   |
|----------------------|---|----------------|---------------------|---|
| PTP                  | ¢ |                |                     |   |
| PTP Interface        |   | PTP Domain     | PTP Delay Mechanism |   |
| Ethernet 0 - 0.0.0.0 | ¢ | 0              | Auto                | ÷ |
|                      |   | Range: 0 - 127 |                     |   |
| Master Identity      |   | Offset         |                     |   |
|                      |   |                |                     |   |

Figure 7-18 PTP Setting

**PTP Interface:** Displays information about the interface to domain association. Acuvim 3 supports PTP interface Ethernet 1 and Ethernet 2.

**PTP Domain:** PTP domain refers to a network with PTP enabled. The default number is 0, and with a range from 0 to 127.

**PTP Delay Mechanism:** Acuvim 3 supports three PTP delay mechanisms: Auto, Peer to Peer, and End to End.

**Master Identity:** The clock identity of the grandmaster is a 64-bit global identifier (EUI-64) as defined by the IEEE 1588 standard.

Offset: Time difference between the master clock and the Acuvim 3 measured in nanoseconds.

### 7.6.3 IRIG-B

Acuvim 3 supports the IRIG-B protocol. With the correct wiring connection, users do not require any additional configuration on the settings webpage.

### 7.6.4 Manual

**Device Clock:** Users have the option to configure the time and date manually by clicking the calendar icon button.





¢

### Protocol Manual

| 2024/04/25 03 | :12 PM | N  |    |        |    |    | Ē  |
|---------------|--------|----|----|--------|----|----|----|
| Today         | <      |    | А  | pr 202 | 24 |    | >  |
| Custom Range  | Su     | Мо | Tu | We     | Th | Fr | Sa |
|               | 31     | 1  | 2  | 3      | 4  | 5  | 6  |
|               | 7      | 8  | 9  | 10     | 11 | 12 | 13 |
|               | 14     | 15 | 16 | 17     | 18 | 19 | 20 |
|               | 21     | 22 | 23 | 24     | 25 | 26 | 27 |
|               | 28     | 29 | 30 | 1      | 2  | 3  | 4  |
|               | 5      | 6  | 7  | 8      | 9  | 10 | 11 |

Figure 7-19 Manual Device Clock Configuration

# 7.7 SMTP Email

To access the SMTP Email section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the **Email** menu option. This webpage displays the email configuration for Acuvim 3.

Acuvim 3 supports configuration of an SMTP email client to connect to SMTP server to send data log files (as configured in Data Post section), or send notifications when a power quality event occurs (configured in Power Quality Event or Alarm section).

| instancion neteno eno en                 | ergy Power Quarty and A | m communication bala cogressi oser     | wanagemeni. Wantenance allo wanagen |
|--|-------------------------|--|-------------------------------------|
| Communication Email                      |                         |  |                                     |
| RS485 and US8 Network<br>EtherNet/IP PMU | Webpage Time/Date Ad    | ess Control Remote Access Email Modbus | BACnet SNMP DNP IEC61850            |
| SMTP Enable -                            |                         |  |                                     |
| SMTP Enable                              |                         |  |                                     |
| Server -                                 |                         |  |                                     |
| SMTP Server                              | SMTP Port               | SMTP From                              | SMTP Sender Name                    |
| Enter SMTP Server                        | 587                     | Enter SMTP From                        | Enter SMTP Sender Name              |
| Maximum 40 characters                    | Range: 1 - 65535        | Maximum 00 characters                  | Maximum 40 characters               |
| User v                                   |                         |  |                                     |
| Username                                 | Passw                   | rd                                     |                                     |
| Enter Username                           | Ente                    | Password                               |                                     |
| TSL/SSL<br>Auto On Off                   |                         |  |                                     |



#### Figure 7-20 Email Setting Webpage



**SMTP Server:** Enter the URL of a valid SMTP server. I.e. mail.accuenergy.com or smtp.gmail.com. Maximum 40 characters.

**SMTP Port:** Enter the port number associated with the SMTP server. The port number ranges from 1 to 65535.

**SMTP From:** Input a name or phrase that identifies the origin of the email, such as 'Accuenergy'. Maximum 40 characters.

**SMTP Sender Name:** Input a name or phrase that identifies the sender of the email, such as 'Alex'. Maximum 40 characters.

Username: SMTP username for the SMTP server.

Password: SMTP user password for the username set above.

**TSL/SSL:** Users have the option to send secure emails using the TLS/SSL protocol. It has three options: 'Auto', 'On', and 'Off'.

### 7.8 Modbus

To access the Modbus section,

- 1. Click on Settings from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the **Modbus** menu option. This webpage displays the Modbus configuration for Acuvim 3.

Acuvim 3 supports general meter setting configurations, parameter monitoring, and I/O signal reading and control. For more details, refer to the Acuvim 3 Modbus register map document.

| RS485 and US8 Network Webpage Time/Date | Access Control Remote Access Email | Modbus BACnet | SNMP DNP IEC61850 |
|---|------------------------------------|---------------|-------------------|
| EtherNeyIP PMU                          |                                    |               |                   |
| Modbus TCP                              |                                    |               |                   |
| Modbus TCP Enable                       |                                    |               |                   |
| Modbus TCP Port                         | Modbus TCP Slave Address           |               |                   |
| 502                                     | 1                                  |               |                   |
| Range: 2000 - 6999                      | Range: 1 - 247                     |               |                   |
| Modbus RTU RS485                        |                                    |               |                   |
| Modbus RTU RS485 Enable                 |                                    |               |                   |
| Modbus RTU RS485 Slave Address          |                                    |               |                   |
| 1                                       |                                    |               |                   |
| Range: 1 - 247                          |                                    |               |                   |
| Modbus RTU USB                          |                                    |               |                   |
| Modbus RTU USB Enable                   |                                    |               |                   |
| Modbus RTU USB Slave Address            |                                    |               |                   |
| 1                                       |                                    |               |                   |
|   |                                    |               |                   |





#### **Ethernet Modbus Configuration**

Acuvim 3 supports Modbus TCP over Ethernet, where it functions as a Modbus TCP server and responds to Modbus client requests.

| Modbus TCP         |                          |
|--------------------|--------------------------|
| Modbus TCP Enable  |                          |
| Modbus TCP Port    | Modbus TCP Slave Address |
| 502                | 1                        |
| Range: 2000 - 5999 | Range: 1 - 247           |

#### Figure 7-22 Modbus TCP Setting

Modbus TCP Port: The default port number is 502, and the port number ranges from 1 to 65535.

**Modbus TCP Slave Address:** The default address is 1, and the address number can range from 1 to 247.

#### **Serial Modbus Configuration**

Acuvim 3 supports Modbus RTU using RS485 and USB interfaces. When Modbus RTU RS485 or Modbus RTU USB is enabled, the Acuvim 3 acts as a Modbus server by responding to Modbus client requests.

| Modbus RTU RS485               |
|--------------------------------|
| Modbus RTU RS485 Enable        |
| Modbus RTU RS485 Slave Address |
| 1                              |
| Range: 1 - 247                 |

#### Figure 7-23 Modbus RTU RS485 Setting

**Modbus RTU RS485 Slave Address:** The default address is set to 1, and the address number can range from 1 to 247.

| Modbus RTU USB               |
|------------------------------|
| Modbus RTU USB Enable        |
| Modbus RTU USB Slave Address |
| 1                            |
| Range: 1 - 247               |

Figure 7-24 Modbus RTU USB Setting

**Modbus RTU USB Slave Address:** The default address is set to 1, and the address number can range from 1 to 247.





# 7.9 BACnet

### 7.9.1 BACnet/IP

To access the BACnet section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the **BACnet** menu option. This webpage displays the BACnet settings for Acuvim 3.

Acuvim 3 will act as BACnet/IP server and respond to client requests. Acuvim 3 supports various functions in BACnet/IP, including device information reading, parameter reading, RO control, change-of-value (COV) handling, and interaction with foreign devices.

|    |  | E Logout Thursday, April 25, 2024 3:17 PM | About Settings Ac   | uvim 3 ACCUEVER          | 77 |
|----|--|---|---------------------|--------------------------|----|
| ir | stallation Revenue and Energy Power Qual               | ty and Alarm Communication Data Log/Pos   | t User Management M | Asintenance and Manageme | nt |
| Co | mmunication BACORE                                     |   |                     |                          |    |
| RS | 485 and USB Network Webpage Time/Date<br>serNet/IP PMU | Access Control Remote Access Email        | Modbus BAGnet SNMP  | DNP IEC61850             |    |
| 8/ | Cnet Settings  |   |                     |                          |    |
|    | ) Enable<br>sk Type                                    |   |                     |                          |    |
|    | IACocuIP 0   |   |                     |                          |    |
| De | vice Instance  | Device name                               |                     |                          |    |
|    | 581  | Enter Device name                         |                     |                          |    |
| 24 | nge: 0 - 4194302                                       | Maximum 40 characters                     |                     |                          |    |
| Lo | cation   | Description                               |                     |                          |    |
|    | Inter Location   | Enter Description                         |                     |                          |    |
| Ma | ximum 40 characters                                    | Maximum 40 characters                     |                     |                          |    |
| 84 | Cnet Port  |   |                     |                          |    |
|    | 17808  |   |                     |                          |    |
| De | tault: 47008   |   |                     |                          |    |
|    | Foreign Device Function                                |   |                     |                          |    |
|    | PICS File Download                                     |   |                     |                          |    |
|    |  |   |                     |                          |    |
| Se | re l   |   |                     |                          |    |

#### Figure 7-25 BACnet/IP Setting Webpage

Device Instance: This number must be unique within the system ranging from 0 to 4194302.

Device Name: The name must be unique within the system with a maximum of 40 characters.

Location: The geographical location can be entered up to a maximum of 40 characters.

Description: The description can be entered up to a maximum of 40 characters.

**BACnet Port:** The default port is 47808, with available port numbers ranging from 47000 to 49000.

| BBMD IP            | BBMD Port        | Time To Live    |     |
|--------------------|------------------|-----------------|-----|
| Enter BBMD IP      | 47809            | 1               | min |
| Must be ip address | Range: 1 - 65535 | Range: 5 - 1440 |     |

Figure 7-26 BACnet Foreign Device Function Setting





**BBMD IP:** The IP of the BACnet Broadcast Management Device (BBMD) receives broadcast messages on one subnet and will forwards them to another subnet.

**BBMD Port:** The port number can range from 1 to 65,535.

**Time to Live:** Indicates how soon the foreign device will need to re-register with the BBMD's foreign device table. The time ranges from 5 to 1440 minutes.

**EPICS File Download:** An Experimental Physics and Industrial Control System (EPICS) file specifies how to communicate with BACnet devices within an EPICS control system, map BACnet objects to EPICS variables, or define rules and logic for controlling and monitoring BACnet devices within an EPICS-based environment.

### 7.9.2 BACnet MS/TP

Acuvim 3 supports BACnet MS/TP using RS485 and USB interfaces. Users can read device information and parameter readings. See 'Acuvim 3 BACnet MSTP Protocol Implementation Conformance Statement' document for more details.

|                             |                                    | Ge Logout Thursday, April 25, 2024 3:19 PM | About Settings Acuvim 3 ACCU-V-DGY        |   |
|-----------------------------|------------------------------------|--|---|---|
|                             |                                    |  |   |   |
| Installation                | Revenue and Energy Power Quality   | y and Alarm Communication Data Log/Post    | User Management Maintenance and Managemen | 5 |
| Communica                   | tion BACnet                        |  |   |   |
| R\$485 and U<br>EtherNet(IP | 58 Network Webpage Time(Dat<br>PMU | e Access Control Remote Access Email 7     | todbus BACnet SNMP DNP IEC61850           |   |
| BACnet Setti                | ngs                                |  |   |   |
| C Enable                    |                                    |  |   |   |
| Link Type                   |                                    |  |   |   |
| BACoctMS                    | P 0                                |  |   |   |
| Device Insta                | nce                                | Device name                                |   |   |
| 581                         |                                    | Enter Device name                          |   |   |
| Range: 0 - 4104             | 302                                | Maximum 40 characters                      |   |   |
| Location                    |                                    | Description                                |   |   |
| Enter Locat                 | ion                                | Enter Description                          |   |   |
| Maximum 40 ch               | aracters                           | Maximum 40 characters                      |   |   |
| Max Info Fra                | ne                                 | Max Number of Masters                      | Source address                            |   |
| 1                           |                                    | 127  | 16  |   |
| Range: 1 - 50               |                                    | Range: 0 - 127                             | Range: 0 - 127                            |   |
| Port Used                   |                                    |  |   |   |
| USB                         |                                    |  |   |   |
| EPICS File 1                | Download                           |  |   |   |
| Save                        |                                    |  |   |   |

Figure 7-27 BACnet/MSTP Setting Webpage

**Max Info Frame:** Specifies how many messages the controller can transmit to other controllers when it possesses the token on the network.

**Max Number of Masters:** Set a maximum number of MSTP devices on the network. The number ranges from 0 to 127.

Source Address: Master device address. The address number ranges from 0 to 127.

Port Used: By default, USB is selected and cannot be changed.





# 7.10 SNMP

To access the SNMP section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the **SNMP** menu option. This webpage displays the SNMP settings for Acuvim 3.

Acuvim 3 supports the Simple Network Management Protocol (SNMP) protocol to report metering data to the management station. The Acuvim 3 uses a public community string for read-only access.

**SNMP Version:** Users can select the SNMP version, the Acuvim 3 supports SNMPv2c and SNMPv3.

**SNMP Port:** The default port for the SNMP is set to 161. It can be configured to any value within the range of 16100 to 16199.

### 7.10.1 SNMP V2C

| Installation Revenue and Energy Preme Quality and Name Communication Data LagPlet, User Management Maintenance and Management<br>Communication soure<br>SSASS will USE Network Websing: TransDate Access Control Revues Access Enail Mattews BACKI SWM (DAT 2011)  |
|--|
| Communication sour   |
| R5485 and USB Methods Webpage Time(Date Access Control Remote Access Email Modeus BACnet SNUD DNP IEC61950   |
|  |
| SNMP Settings v  |
| SNMP Version* SNMP Port  |
| SNMP_V2C 0 101   |
| Default 1911, Kargan 19150 - 30199 Read Only Community   |
| public   |
| There is a particular and a second and |



**Read Only Community:** The default community string is set to 'public'. This configuration functions similar to a password, permitting only authorized users to access data from the Acuvim 3.


### 7.10.2 SNMP V3

|   | C Logout Thursday, April 26, 2024 3:21 PM   | About Settings Acuvim 3       | ALLU=N=H6.    |
|---|---|-------------------------------|---------------|
| Installation Revenue and Energy Power Qua                 | lity and Alarm Communication Data Log/Post  | User Management Maintenance a | and Managemen |
| Communication SNMP  |   |                               |               |
| RS485 and USB Network Webpage Time(Dat<br>EtherNet)IP PMU | te Access Control Remote Access Email Modbu | IS BACnet SNMP DNP IER        | 1061850       |
| SNMP Settings v   |   |                               |               |
| Enable  |   |                               |               |
| SNMP Version*   | SNMP Port                                   |                               |               |
| SNMP_V3 0   | 161   |                               |               |
|   | Default: 161, Range: 16100 - 16199          |                               |               |
| Username  | User Password                               |                               |               |
| Enter Username  | Enter User Password                         |                               |               |
| Maximum 32 characters                                     | Between 8 and 32 characters                 |                               |               |
| Auth Protocol *   |   |                               |               |
| \$NMPV3_MD5 0   |   |                               |               |
| Privacy Protocol*   | Privacy Password                            |                               |               |
| SNMPV3_NONE_PRIV 0  | Enter Privacy Password                      |                               |               |
| Trap Enable   | Berween 6 and 32 characters                 |                               |               |

Figure 7-29 SNMP V3 Setting Webpage

**Username:** The SNMP username supports up to 32 characters, allowing a mix of alphanumeric characters (uppercase and lowercase letters, and numbers) without spaces.

**User Password:** The user's password must be exactly eight characters long and can include any combination of mixed case alphanumeric characters without spaces.

Auth Protocol: This property can be set to MD5 or SHA.

Privacy Protocol: This property can be set as NONE\_PRIV, DES, and AES.

**Privacy Password:** When the privacy protocol is set to DES or AES, a privacy password is required. It must be exactly eight characters in length and can include any combination of mixed case alphanumeric characters without spaces.

### 7.10.3 Email Traps

The Acuvim 3 supports email spam traps to send unsolicited messages to up to four management stations. Acuvim 3 supports PQ Event Status Trap, Alarm Trap, and DI Status Trap. Please check the following table for more details.





| Node Name 1          | ID 1 | Node Name 2                                | ID 2 |
|----------------------|------|--|------|
|                      |      | phaseAPQEventStatusVoltageSagTra           | 1    |
|                      |      | phaseBPQEventStatusVoltageSagTra           | 2    |
|                      |      | phaseCPQEventStatusVoltageSagTra           | 3    |
|                      |      | phaseAPQEventStatusVoltageSwellTrap        | 4    |
|                      |      | phaseBPQEventStatusVoltageSwellTrap        | 5    |
|                      |      | phaseCPQEventStatusVoltageSwellTrap        | 6    |
|                      |      | phaseAPQEventStatusVoltageInterruptionTrap | 7    |
|                      |      | phaseBPQEventStatusVoltageInterruptionTrap | 8    |
|                      |      | phaseCPQEventStatusVoltageInterruptionTrap | 9    |
|                      | 1    | systemPQEventStatusVoltageUnbalanceTrap    | 10   |
| PQ EVENT Status ITap |      | phaseAPQEventStatusVoltageTransientTrap    | 11   |
|                      |      | phaseBPQEventStatusVoltageTransientTrap    | 12   |
|                      |      | phaseCPQEventStatusVoltageTransientTrap    | 13   |
|                      |      | phaseAPQEventStatusCurrentSagTrap          | 14   |
|                      |      | phaseBPQEventStatusCurrentSagTrap          | 15   |
|                      |      | phaseCPQEventStatusCurrentSagTrap          | 16   |
|                      |      | phaseAPQEventStatusCurrentSwellTrap        | 17   |
|                      |      | phaseBPQEventStatusCurrentSwellTrap        | 18   |
|                      |      | phaseCPQEventStatusCurrentSwellTrap        | 19   |
|                      |      | systemPQEventStatusCurrentUnbalanceTrap    | 20   |

### Table 7-1 PQ Event Status Trap for Acuvim 3

### Table 7-2 Alarm Trap for Acuvim 3

| Node Name 1 | ID 1 | Node Name 2   | ID 2 |
|-------------|------|---|------|
| Alarm Trap  | 2    | alarmMonitorStatus1Trap -<br>alarmMonitorStatus64Trap | 1-64 |



| Node Name 1    | ID 1 | Node Name 2                  | ID 2 |
|----------------|------|------------------------------|------|
|                |      | iO01DISTATUS1Trap            | 1    |
|                |      | iO01DISTATUS2Trap            | 2    |
|                |      | iO01DISTATUS3Trap            | 3    |
|                |      | iO01DISTATUS4Trap            | 4    |
|                |      | iO11DISTATUS1Trap            | 5    |
|                |      | iO11DISTATUS2Trap            | 6    |
|                |      | iO11DISTATUS3Trap            | 7    |
|                |      | iO11DISTATUS4Trap            | 8    |
|                |      | iO11DISTATUS5Trap            | 9    |
|                |      | iO11DISTATUS6Trap            | 10   |
|                |      | iO12DISTATUS1Trap            | 11   |
|                |      | iO12DISTATUS2Trap            | 12   |
|                |      | iO12DISTATUS3Trap            | 13   |
|                |      | iO12DISTATUS4Trap            | 14   |
|                |      | iO12DISTATUS5Trap            | 15   |
|                |      | iO12DISTATUS6Trap            | 16   |
| DI Status Trap | 1    | iO13DISTATUS1Trap (reserved) | 17   |
|                |      | iO13DISTATUS2Trap (reserved) | 18   |
|                |      | iO13DISTATUS3Trap (reserved) | 19   |
|                |      | iO13DISTATUS4Trap (reserved) | 20   |
|                |      | iO13DISTATUS5Trap (reserved) | 21   |
|                |      | iO13DISTATUS6Trap (reserved) | 22   |
|                |      | iO14DISTATUS1Trap (reserved) | 23   |
|                |      | iO14DISTATUS2Trap (reserved) | 24   |
|                |      | iO14DISTATUS3Trap (reserved) | 25   |
|                |      | iO14DISTATUS4Trap (reserved) | 26   |
|                |      | iO14DISTATUS5Trap (reserved) | 27   |
|                |      | iO14DISTATUS6Trap (reserved) | 28   |
|                |      | iO21DISTATUS1Trap            | 29   |
|                |      | iO21DISTATUS2Trap            | 30   |
|                |      | iO21DISTATUS3Trap            | 31   |
|                |      | iO21DISTATUS4Trap            | 32   |
|                |      | iO22DISTATUS1Trap            | 33   |

### Table 7-3 DI Status Trap for Acuvim 3



| Node Name 1    | ID 1 | Node Name 2                  | ID 2 |
|----------------|------|------------------------------|------|
|                |      | iO22DISTATUS2Trap            | 34   |
|                |      | iO22DISTATUS3Trap            | 35   |
|                |      | iO22DISTATUS4Trap            | 36   |
|                |      | iO23DISTATUS1Trap (reserved) | 37   |
|                |      | iO23DISTATUS2Trap (reserved) | 38   |
|                |      | iO23DISTATUS3Trap (reserved) | 39   |
|                |      | iO23DISTATUS4Trap (reserved) | 40   |
|                |      | iO24DISTATUS1Trap (reserved) | 41   |
|                |      | iO24DISTATUS2Trap (reserved) | 42   |
|                |      | iO24DISTATUS3Trap (reserved) | 43   |
|                |      | IO24DISTATUS4Trap (reserved) | 44   |
|                |      | iO31DISTATUS1Trap            | 45   |
|                |      | iO31DISTATUS2Trap            | 46   |
| DI Status Trap | 1    | iO31DISTATUS3Trap            | 47   |
|                |      | iO31DISTATUS4Trap            | 48   |
|                |      | iO32DISTATUS1Trap            | 49   |
|                |      | iO32DISTATUS2Trap            | 50   |
|                |      | iO32DISTATUS3Trap            | 51   |
|                |      | iO32DISTATUS4Trap            | 52   |
|                |      | iO33DISTATUS1Trap (reserved) | 53   |
|                |      | iO33DISTATUS2Trap (reserved) | 54   |
|                |      | iO33DISTATUS3Trap (reserved) | 55   |
|                |      | iO33DISTATUS4Trap (reserved) | 56   |
|                |      | iO34DISTATUS1Trap (reserved) | 57   |
|                |      | iO34DISTATUS2Trap (reserved) | 58   |
|                |      | iO34DISTATUS3Trap (reserved) | 59   |
|                |      | IO34DISTATUS4Trap (reserved) | 60   |

Four management stations can be configured to receive spam traps. Power Quality events, alarm status changes, and DI status changes can be set to trigger traps.



| Trap Target 1       | Trap Target 2       |  |
|---------------------|---------------------|--|
| Enter Trap Target 1 | Enter Trap Target 2 |  |
| Must be ip address  | Must be ip address  |  |
| Trap Target 3       | Trap Target 4       |  |
| Enter Trap Target 3 | Enter Trap Target 4 |  |
| Must be ip address  | Must be ip address  |  |
| Report Buffer Size  | Report Hold Time    |  |
| 30                  | 0                   |  |
| Range: 0 - 30       | Range: 0 - 300      |  |

Figure 7-30 SNMP Trap Setting

**Trap Target 1:** Enter the IP address and port number of management station number 1 to be notified in the event of an occurrence.

**Trap Target 2:** Enter the IP address and port number of management station number 2 to be notified in the event of an occurrence.

**Trap Target 3:** Enter the IP address and port number of management station number 3 to be notified in the event of an occurrence.

**Trap Target 4:** Enter the IP address and port number of management station number 4 to be notified in the event of an occurrence.

**Report Buffer Size:** The size of the buffer for the number of notifications that will be stored before being sent to the management station. A maximum of 30 notifications can be stored.

**Report Hold Time:** Specify the duration in seconds for which a notification will remain queued before being dispatched to the management station. The default configuration is set to 0 for notifications to be sent immediately following an event. This setting can be adjusted from 0 to 30 seconds.

# 7.11 DNP

To access the DNP section,

- 1. Click on **Settings** from the main menu.
- 2. Select Communication from the tab menu.
- 3. Click on the **DNP** menu option. This webpage displays the DNP settings for Acuvim 3.



The Distributed Network Protocol (DNP) is an open protocol used in the electric utility industry for communication and interoperability among substation computers, remote terminal units (RTUs), intelligent electronic devices (e.g. Acuvim 3), and master stations.

| ommunication DNP   |                       |                     |   |  |
|--|-----------------------|---------------------|---|--|
| RS485 and USB Network Webpage Time/  | Date Access Control   | Remote Access Email | Modbus BACnet SNMP DNP IEC61850                   |  |
| EtherNet/IP PMU  |                       |                     |   |  |
| DNP Settings 👻   |                       |                     |   |  |
| Enable   |                       |                     |   |  |
| TCD/ID Mode  | Local TCP Port        |                     | Local LIDP Port                                   |  |
|  |                       |                     | 20000   |  |
| TCF & ODF  | Range: 20000 - 22000  |                     | Range: 20000 - 22000                              |  |
| Destination IP address   | Dual endpoint IP port |                     | Destination UDP port for initial unsolicited null |  |
| ****   | 20000                 |                     | responses   |  |
| Between 0 and 40 characters  | Range: 1 - 65535      |                     | 20000   |  |
|  |                       |                     | Range: 1 - 65535                                  |  |
| Destination UDP port for response  |                       | Link address        |   |  |
| 20000  |                       | 4                   |   |  |
| Range: 1 - 65535   |                       | Range: 1 - 65519    |   |  |
| Source address validation* O Disable O Enable  |                       |                     |   |  |
| Master link address  |                       |                     |   |  |
| 3  |                       |                     |   |  |
|  |                       |                     |   |  |
| Range: 1 - 65519   |                       |                     |   |  |
| Range: 1 - 65519 Self address support* O Disable O Enable  |                       |                     |   |  |
| Range: 1 - 65519<br>Self address support* O Disable C Enable<br>Sends confirmed user data frames *   |                       |                     |   |  |
| Range: 1 - 05519         Self address support* O Disable       Enable         Sends confirmed user data frames *         O Never       Only for multiframe message fragmen   | ts 🔿 Always           |                     |   |  |
| Range: 1 - 68510         Self address support* O Disable O Enable         Sends confirmed user data frames *         O Never O Only for multiframe message fragmen         Time Sync Enable*   | ts 🔿 Always           |                     |   |  |
| Range 1 - 65510<br>Self address support * O Disable C Enable<br>Sends confirmed user data frames *<br>O Never Only for multiframe message fragmen<br>Time Sync Enable*<br>O Disable © Enable   | ts 🔿 Always           |                     |   |  |
| Range: 1 - 65/19         Self address support* O Disable C Enable         Sends confirmed user data frames *         O Never       Only for multiframe message fragmen         Time Sync Enable*       Disable C Enable         Disable       Enable | ts 🔿 Always           |                     |   |  |
| Range: 1 - 65519       Self address support* O Disable C Enable       Sends confirmed user data frames*       O Never Only for multiframe message fragmen       Time Sync Enable*       Disable O Enable       Time sync period       1800           | ts 🔿 Always           |                     |   |  |

#### Figure 7-31 DNP Setting Webpage

**TCP/IP Mode:** By default, the TCP/IP is set as TCP & UDP. It can be updated to TCP dual endpoint mode or UDP only.

Local TCP Port: The port number ranges from 20000 to 22000.

**Local UDP Port:** The port number ranges from 20000 to 22000.

Destination IP Address: The default IP address is set as \*.\*.\* to allow all incoming requests.

Dual Endpoint IP Port: The port number ranges from 1 to 65535.





**Destination UDP Port for Initial Unsolicited Null Responses:** The port number ranges from 1 to 65535.

Destination UDP Port for Response: The port number ranges from 1 to 65535.

Link Address: The link address ranges from 1 to 65519.

**Source Address Validation:** Indicates whether the outstation will filter out requests not from a specific source address.

Master Link Address: The master link address ranges from 1 to 65519.

**Time Sync Period:** Time update request rate parameter in a DNP outstation. The default period is 1800 and the period can range from 1 to 86400.

**Supports Unsolicited Reporting:** When the unsolicited response mode is configured to 'Disable', the Acuvim 3 behaves exactly like an equivalent device that has no support for unsolicited responses. If set to 'Enable', the outstation will send a null unsolicited response after it restarts, then wait for an enable unsolicited response command from the master before sending additional unsolicited responses containing event data.

Number of Unsolicited Retries: Number of retries can be selected as '0', '10' and 'infinite'.

**Unsolicited Response Trigger Condition (Num of Class # Events):** The number of events for each class to set up the trigger point. The unsolicited response will be triggered once the number of class events reaches the configured triggering number. The range is from 0-255.

**Unsolicited Response Trigger Condition (Hold Time After Class # Events):** The threshold holding time for each class, the unsolicited response will be triggered once the event holding time is longer or equal to the threshold time. The range is from 0 to 86400000 milliseconds.

**Support For Broadcast Functionality:** DNP supports three broadcasting addresses. When enabled, it will allow Acuvim 3 to respond to requests from a client by sending them to the broadcasting addresses.

**File Transfer:** The DNP function within Acuvim 3 facilitates file transfers, enabling users to send and receive data. This process necessitates a username and password, both of which are configurable. The default credentials are set to 'accuenergy' for both username and password.

#### **DNP3 Point Configuration**

Users can assign certain parameters to either class 1, class 2, or class 3. The scale factor is a multiplier that can be applied to a certain parameter when viewing the readings. An offset can be applied to the reading. The dead band can be set for each parameter, where if the value of the parameter exceeds the dead band value a DNP event will occur.





| DNP3 Point Con  | figuration                            |         |         |         |              |              |            |
|-----------------|---------------------------------------|---------|---------|---------|--------------|--------------|------------|
| Analog-Input: S | equence •                             |         |         |         |              |              |            |
|                 |                                       |         |         |         |              | Ba           | tch Modify |
| Point Number    | Description                           | Class 1 | Class 2 | Class 3 | Scale Factor | Scale Offset | Deadband   |
| 80              | Voltage Positive Sequence Magnitude   |         |         |         | 1            | 0            | 0          |
| 81              | Voltage Zero Sequence Magnitude       |         |         |         | 1            | 0            | 0          |
| 82              | Voltage Negative Sequence Magnitude   |         |         |         | 1            | 0            | 0          |
| 83              | Voltage Zero Sequence Ratio Magnitude |         |         |         | 1            | 0            | 0          |
| 84              | Voltage Unbalance Factor Magnitude    |         |         |         | 1            | 0            | 0          |
| 85              | Current Positive Sequence Magnitude   |         |         |         | 1            | 0            | 0          |
| 86              | Current Zero Sequence Magnitude       |         |         |         | 1            | 0            | 0          |
| 87              | Current Negative Sequence Magnitude   |         |         |         | 1            | 0            | 0          |
| 88              | Current Zero Sequence Ratio Magnitude |         |         |         | 1            | 0            | 0          |

Figure 7-32 DNP3 Point Configuration

Users can use the **Batch Modify** button to apply certain settings to all parameters instead of individually configuring each point. Once the configuration in the batch modify is complete click on the 'Save Changes' button.

| Analog-Input: F | ealtime     | •       |         |         |              |              |                 |
|-----------------|-------------|---------|---------|---------|--------------|--------------|-----------------|
|                 |             |         |         |         |              |              | Batch<br>Modify |
|                 |             |         |         |         |              |              |                 |
| Point Number    | Description | Class 1 | Class 2 | Class 3 | Scale Factor | Scale Offset | Deadband        |

Figure 7-33 DNP3 Point Configuration- Batch Modify

# 7.12 IEC 61850

To access the IEC 61850 section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the IEC 61850 menu option. This webpage displays the IEC 61850 settings for Acuvim 3.

IEC 61850 communication protocol is a standard for Ethernet communication among IEDs (intelligent electronic devices) used in substations.





| € Logout Thursday, April 20, 2024 3:35 PM ④ About \$ Settings Acavim 3   |
|--|
| Installation Revenue and Energy Power Quality and Alarm Communication Data Log/Post User Management Maintenance and Management |
| Communication #ECENERG   |
| READS and USB Network Welpage TempDate Access Control Remote Access (mail Moduus BAChet SNAM) DNP (ECO1855)<br>EthomNet(P PAU  |
| IEC61850 Settings 👻  |
| C fuble  |
| 102  |
| Diffuelt 102, Rever 1020 - 10299   |
| Select CD File Choose file Broose  |
| (b)eed   |
| Using default CID file: Acv/m-3-61850-e82.cid<br>Fortore Dofut1  |
| See  |

Figure 7-34 IEC 61850 Setting Webpage

**IEC61850 Port:** The default setting for the IEC 61850 Port is 102. It can be configured to any value within the range of 10200 to 10299.

**CID File:** This is the configuration file that contains settings related to the IEC 61850 standard for Acuvim 3. Users have the option to download the default IED Capability Description (ICD) file or choose between the 1st and 2nd edition CID files. The CID file can be modified using third-party editors and then uploaded to the Acuvim 3 to implement the changes. See 'Acuvim 3 IEC61850 Data Objects List' document for more details.



Figure 7-35 CID File Download Webpage

**Select CID File:** Users can upload their own CID configuration file by selecting 'Browse' and then selecting 'Upload' once the correct file is chosen.







Figure 7-36 Browse CID File

**Restore to Default:** At any point the Acuvim 3 can revert back to the original CID file by selecting this button.

| CID File Download      | Restore Default                                 | × |
|------------------------|---|---|
| Select CID file        |   |   |
| Choose file Br         | CID Files                                       |   |
|                        | Acuvim-3-61850-ed1.cid O Acuvim-3-61850-ed2.cid |   |
| Upload                 |   |   |
| Using default CID file | Restore   | e |
| Restore Default        |   |   |

Figure 7-37 Restore CID File

# 7.13 EtherNet/IP

To access the EtherNet/IP section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- Click on the EtherNet/IP menu option. This webpage displays the EtherNet/IP settings for Acuvim 3.

EtherNet/IP protocol is an industrial based network protocol that uses standard Ethernet and TCP/IP technology.

The Acuvim 3's EtherNet/IP protocol supports unicast, multicast, and broadcast, and it also provides support for both implicit and explicit messaging. Implicit messaging involves the transfer of basic I/O data via UDP, while explicit messaging pertains to the uploading and downloading of parameters, setpoints, programs, and recipes via TCP Additionally, it facilitates poll, cyclic, and change-of-state monitoring via UDP.



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|   | Ge Logout Thursday, April 26, 2024 3:35 PM () About Settings Acuvim 3 ACCUENERGY           |
|---|--|
| Installation Revenue and Energy Power                 | r Quality and Alarm Communication Data Log/Post User Management Maintenance and Management |
| Communication EtherNet/IP                             |  |
| R5485 and US8 Network Webpage Til<br>EtherNet(P) PM(J | ImpDate Access Control Remote Access Email Modeus BACres SHMP DNP IECE1850                 |
| EtherNet/IP Settings +                                |  |
| C EtherNet/IP Enable                                  |  |
| EtherNet/IP Explicit Exchanges Port                   | EtherNet/IP Implicit Exchange Interface (Cable must be applied on Ethernet                 |
| 44818   | Ethernet 1 102 168 1 254   |
| Default 47909<br>Range: 44800 - 44699                 | LOP Port: 2222   |
| EDS File Download                                     |  |
| Sdve  |  |

#### Figure 7-38 Ethernet/IP Webpage

**EtherNet/IP Explicit Exchanges Port:** The default port is 44818 and the port number ranges from 44800 to 44899.

**EtherNet/IP Implicit Exchange Interface:** EtherNet/IP is supported by Ethernet 1 port and will be the default selection. This cannot be changed.

# 7.14 PMU

To access the PMU section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Communication** from the tab menu.
- 3. Click on the **PMU** menu option. This webpage displays the PUM settings for Acuvim 3.

Acuvim 3 provides IEEE C37.118 compliant phasor measurement unit (PMU) functions. Acuvim 3 measures the frequency, rate of change of frequency, three-phase voltage magnitude, and angles, and it can respond to remote PDC commands.

Enabling PMU will disable all data log recordings, data log will still be provided for downloading but no data will be recorded in downloaded files.





| Installation Revenue and Energy | Power Qua | lity and Alarm Communication Data Log/Post | User Management Maintenance and Manage |
|---------------------------------|-----------|--|--|
| COMMUNICATION PMU               |           |  |  |
| RS485 and USB Network Webpa     | ge Time/D | ate Access Control Remote Access Email     | Modbus BACnet SNMP DNP IEC61850        |
| EtherNet/IP PMU                 |           |  |  |
| PMU Enable v                    |           |  |  |
| C Enable                        |           |  |  |
| Message Settings v              |           |  |  |
| ID                              |           | Station Name                               | Report Rate                            |
| 0                               |           | Enter Station Name                         | 10 •                                   |
| Range: 1 - 65534                |           | Maximum 16 characters                      |  |
| PMU Class                       |           | Data Type                                  | Phasor Data Type                       |
| P Class                         | ٠         | Float                                      | Polar                                  |
| Time Base                       |           | Header Information                         | Phasor Data Scale                      |
| 1000                            |           | Enter Header Information                   | 1000                                   |
| Range: 1 - 16777216             |           | Maximum 240 characters                     |  |
| Transmission Settings 👻         |           |  |  |
| Transmission Method             |           | Unicast/Broadcast                          | Data Transmission Mode                 |
| TCP/UDP Method                  | ٥         | Multicast 0                                | Commanded                              |
| TCP Port                        |           | UDP Port                                   | UDP Destination Address                |
| 4712                            |           | 4713                                       | Enter UDP Destination Address          |
| Range: 1025 - 65535             |           | Range: 1025 - 65535                        | Must be ip address                     |
| UDP Destination Port            |           |  |  |
| 4713                            |           |  |  |
| Range: 1 - 65535                |           |  |  |
| Enable Config in UDP            |           |  |  |
| Enable                          |           |  |  |



### 7.14.1 Message Settings

| Message Settings 🔻  |   |                          |                   |    |
|---------------------|---|--------------------------|-------------------|----|
| ID                  |   | Station Name             | Report Rate       |    |
| 0                   |   | Enter Station Name       | 10                | \$ |
| Range: 1 - 65534    |   | Maximum 16 characters    |                   |    |
| PMU Class           |   | Data Type                | Phasor Data Type  |    |
| P Class             | + | Float                    | \$<br>Polar       | \$ |
| Time Base           |   | Header Information       | Phasor Data Scale |    |
| 1000                |   | Enter Header Information | 1000              |    |
| Range: 1 - 16777215 |   | Maximum 240 characters   |                   |    |

Figure 7-40 PMU Message Settings

ID: PMU/PDC data stream ID number ranging from 1 to 65534.

Station Name: The station name for the Acuvim 3 up to a maximum 16 characters.

**Report Rate:** The Acuvim 3 PMU function can support data reporting (by recording or output) at sub-multiples of the nominal powerline (system) frequency. Users can select different reporting rates for 50 Hz and 60 Hz systems. The selectable rates for each frequency are listed in the following table.



| System frequency 50Hz                  |    | 60Hz |    |    |    |    |    |    |    |
|--|----|------|----|----|----|----|----|----|----|
| Reporting rates (Fs-frames per second) | 10 | 25   | 50 | 10 | 12 | 15 | 20 | 30 | 60 |

Table 7- 4 PMU Frequency and Reporting Rates

**PMU P Class:** Designed for applications that demand quick response times and do not require explicit filtering.

**PMU M Class:** Designed for applications that might be negatively impacted by aliased signals and that do not necessitate the highest speed in reporting.

| Data & Phasor Data Types                    | Phasor Data Type   | Details  |  |
|---|--------------------|--|--|
|   | Rectangular Format | real and imaginary, real value first.<br>16-bit signed integers,<br>range –32 767 to +32 767   |  |
| 16-Bit Integer Values                       | Polar Format       | magnitude and angle,<br>magnitude first<br>magnitude 16-bit unsigned integer,<br>range 0 to 65535<br>angle 16-bit signed integer,<br>in radians × 104,<br>range –31 416 to +31 416 |  |
|   | Rectangular Format | real and imaginary,<br>in engineering units,<br>real value first   |  |
| 32-Bit Values IEEE Floating-Point<br>Format | Polar Format       | magnitude and angle,<br>magnitude first,<br>in engineering units<br>angle in radians<br>range –π to + π  |  |

Table 7- 5 PMU Data Type and Formats

**Time Base:** The time base specifies the resolution of the fractional second timestamp (FRACSEC) in all frames. The actual fractional second of the data frame is calculated as FRACSEC divided by TIME\_BASE.

**Phasor Data Scale:** The default scaling factor is set to 1000. For phasors in polar form, this value scales the magnitude. In rectangular form, it scales the real and imaginary components.





## 7.14.2 Transmission Settings

| Transmission Settings 👻 |                     |    |                               |   |
|-------------------------|---------------------|----|-------------------------------|---|
| Transmission Method     | Unicast/Broadcast   |    | Data Transmission Mode        |   |
| TCP/UDP Method          | \$<br>Multicast     | \$ | Commanded                     | ¢ |
| TCP Port                | UDP Port            |    | UDP Destination Address       |   |
| 4712                    | 4713                |    | Enter UDP Destination Address |   |
| Range: 1025 - 65535     | Range: 1025 - 65535 |    | Must be ip address            |   |
| UDP Destination Port    |                     |    |                               |   |
| 4713                    |                     |    |                               |   |
| Range: 1 - 65535        |                     |    |                               |   |

Figure 7-41 PMU Transmission Settings

**Transmission Method:** Acuvim 3 adopts a TCP/UDP hybrid transmission method in alignment with IEEE Std C37.118.2-2011 recommendations. TCP facilitates the exchange of commands, headers, and configuration details, while UDP is employed for data transmission.

**Unicast/Broadcast:** This configuration allows users to specify whether the UDP data frame is dispatched via unicast, multicast, or broadcast.

**Data Transmission Mode:** Acuvim 3 offers two modes of data transmission, command-triggered and spontaneous. In spontaneous mode, Acuvim 3 automatically forwards data to the pre-configured destination upon completing system initialization.

**TCP Port:** Specified for the exchange of commands, headers, and configuration information within the Acuvim 3.

**UDP Port:** Designated for the transmission of data from Acuvim 3, ranges from 1025 to 65535.

**UDP Destination Port:** Specifies the port on the receiving device that is designated for data reception, facilitating accurate data routing, ranges from 1 to 65535.

**UDP Destination Address:** The assigned IP address of the receiving device, directing the data to the correct endpoint.



# **Chapter 8: Data Log and Post**

# 8.1 Data Log

To access the Data Log setting section,

- 1. Click on **Settings** from the main menu.
- 2. Select **Data Log/Post** from the tab menu.
- 3. Click on the **Data Log** menu option. This webpage displays the data log settings for Acuvim 3.

Acuvim 3 supports data log configuration, allowing users to add up to 15 data loggers for various parameters and requirements. The logged data can be downloaded as a CSV file from the data log webpage in the logs section or by using an HTTP/FTP client.

| Installation | Revenue and Energy Power Quality and Ala | m Communication          | Data Log/Post | User Management | Maintenance and Ma | lanagement )         | HMI |  |
|--------------|--|--------------------------|---------------|-----------------|--------------------|----------------------|-----|--|
| Data Log/Po  | St Data Log                              |                          |               |                 |                    |                      |     |  |
|              | Da                                       | Log Data Post AcuC       | loud          |                 |                    |                      |     |  |
|              | Data                                     | 9                        |               |                 |                    |                      |     |  |
|              | Dat                                      | log 1 - Default Realtime | 0             | Add Logger      | Delete Logger Rese | et All Configuration | ns  |  |
|              | -  | ogger Enable             |               |                 |                    |                      |     |  |
|              | Cie                                      | r Backup Log1            |               |                 |                    |                      |     |  |
|              | Sav                                      | Datalog                  |               |                 |                    |                      |     |  |
|              | ۵)                                       | FTP Enable               |               |                 |                    |                      |     |  |
|              | Sav                                      | SFTP                     |               |                 |                    |                      |     |  |
|              |  |                          |               |                 |                    |                      |     |  |

Figure 8-1 Data Log Settings

Datalog: Dropdown menu to select a default data log or customized data log for modification.

**Reset All Configurations:** Deletes all the existing data loggers and restores the corresponding settings to default.

Logger Enable: Enable to view and configure the applicable data logger settings.

**Logger Type:** Acuvim 3 supports nine different types of data loggers for users to choose, please check Table 8-1 for more details.

**Logger Label:** The selected data logger allows users to customize its label with character limits of up to 40.

**Save Datalog:** Saves the current data log configuration. Users will be prompted to reboot the Acuvim 3 for the settings to take effect.

**Backup Enable:** Users can back up the data log file on Acuvim 3. To access the backup logs, users need to click on the **Acuvim 3** main menu tab and select **Logs** from the submenu tab. Select **Data Log** tab, and the available data log backup files will be listed on the webpage.





| Backup File Name Format               | Backup File Update Interval |   | Backup File Name Prefix     |
|---------------------------------------|-----------------------------|---|-----------------------------|
| Time Interval                         | \$<br>7 day                 | ÷ | DefaultRealtime             |
| e.g. prefix-2022-06-09T12-00-3day.csv |                             |   | Between 1 and 40 characters |

Figure 8-2 Backup File Settings

**Backup File Name Format:** The format name for the backup file can be based on the UTC timestamp or time interval format.

**Backup File Update Interval:** The backup file update interval indicates how often Acuvim 3 updates the backup file internally.

**Backup File Name Prefix:** This backup file name will be appended to the beginning of the log file if 'Time Interval Format' is selected as the post file name format. By default, Acuvim 3's serial number will be appended to the beginning of the log file.

| Data Log Data Post AcuCloud     |                  |               |                          |
|---------------------------------|------------------|---------------|--------------------------|
| Datalog                         |                  |               |                          |
| Datalog 1 - Default Realtime    | \$<br>Add Logger | Delete Logger | Reset All Configurations |
| C Logger Enable                 |                  |               |                          |
| Clear Backup Log1               |                  |               |                          |
| C Backup Enable<br>Post Channel |                  |               |                          |
| 1 2 3                           |                  |               |                          |

Figure 8-3 Backup Enable

Clear Back Up Log: Deletes all the backup data log files listed on the Logs webpage.

| Data Log Data Post AcuCloud  |                  |               |                          |
|------------------------------|------------------|---------------|--------------------------|
| Datalog                      |                  |               |                          |
| Datalog 1 - Default Realtime | \$<br>Add Logger | Delete Logger | Reset All Configurations |
| C Logger Enable              |                  |               |                          |
| Clear Backup Log1            |                  |               |                          |
| Backup Enable                |                  |               |                          |
| Post Channel                 |                  |               |                          |
| 🖬 1 🔳 2 📕 3                  |                  |               |                          |

#### Figure 8-4 Post Channel Selection

**Post Channel Selection:** Select an enabled channel to upload the data log file. Refer to Chapter 8.2 for detailed instructions on data post channels.



### 8.1.1 Log File Setting

| Log File Setting   |                                |  |   |                             |  |
|--|--------------------------------|--|---|-----------------------------|--|
| Timestamp Format   |                                |  |   |                             |  |
| Local time format e.g. 2017-01-01 10:00     UTC timestamp Number of seconds that hi     ISO8601 timestamp e.g. 2017-01-01T10:0 | ave elapsed since 19<br>0-0500 | 70-01-01 00:00:00 Coordinated Universal Time |   |                             |  |
| Log File Name Format   |                                | Log File Length                              |   | Log File Name Prefix        |  |
| Time Interval  | ¢                              | 30 sec                                       | ¢ | DefaultRealtime             |  |
| e.g. prefix-2022-06-09T12-00-3day.csv  |                                |  |   | Between 1 and 40 characters |  |
| Log Interval   |                                |  |   |                             |  |
| 1 sec  | \$                             |  |   |                             |  |
| Backup File Name Format  |                                | Backup File Update Interval                  |   | Backup File Name Prefix     |  |
| Time Interval  | ¢                              | 30 sec                                       | ÷ | DefaultRealtime             |  |
| e.g. prefix-2022-06-09T12-00-3day.csv  |                                |  |   | Between 1 and 40 characters |  |

Figure 8-5 Log File Setting

**Timestamp Format:** The timestamp format can be based on local time (not available for JSON format), UTC seconds, or ISO8601 format.

**Log File Name Format:** The log file name format can be based on the UTC timestamp or time interval format.

**Log File Length:** The log file length can range from 1 second to 1 month. Please check Table 8-1 for more details.

**Log File Name Prefix:** Provides a name for the log file posted to the post channel. This name will be appended to the beginning of the log file if 'Time Interval Format' is selected as the post file name format. By default, Acuvim 3's serial number will be appended to the beginning of the log file.

**Log Interval:** The logging interval in Acuvim 3 ranges from 200ms to 7 days. Only the first three loggers support 200ms instant logger. Please check Table 8-1 for more details.

| Data Logger Type | Parameter Category/Types  | Log File Length   | Interval Range   |
|------------------|---|---|--|
| Instant Logger   | <ul> <li>RMS</li> <li>Power</li> <li>Fundamental</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> </ul> | <ul> <li>1 Second</li> <li>3 Seconds</li> <li>15 Seconds</li> <li>30 Seconds</li> </ul> | <ul> <li>200ms</li> <li>1 Second</li> <li>3 Seconds</li> <li>15 Seconds</li> <li>30 Seconds</li> </ul> |

**Table 8-1 Data Logger Parameter and Details** 





| Data Logger Type   | Parameter Category/Types   | Log File Length   | Interval Range   |
|--------------------|--|---|--|
| Trend Logger       | <ul> <li>RMS</li> <li>Power</li> <li>Fundamental</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> <li>Energy</li> <li>Demand</li> </ul>  | <ul> <li>1 Minute</li> <li>5 Minutes</li> <li>10 Minutes</li> <li>15 Minutes</li> <li>30 Minutes</li> <li>30 Minutes</li> <li>1 Hour</li> <li>2 Hours</li> <li>6 Hours</li> <li>12 Hours</li> <li>1 Day</li> <li>7 Days</li> <li>1 Month</li> </ul> | <ul> <li>1 Minute</li> <li>5 Minutes</li> <li>10 Minutes</li> <li>15 Minutes</li> <li>30 Minutes</li> <li>30 Minutes</li> <li>1 Hour</li> <li>2 Hours</li> <li>6 Hours</li> <li>12 Hours</li> <li>1 Day</li> <li>7 Days</li> </ul> |
| Aggregation 3s     | <ul> <li>RMS</li> <li>Power</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> </ul>   | • 3 Seconds   | • 3 Seconds  |
| Aggregation 10s    | • Frequency  | • 10 Seconds  | • 10 Seconds   |
| Aggregation 10 min | <ul> <li>RMS</li> <li>Power</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> <li>Voltage Magnitude Harmonics</li> <li>Voltage Angle Harmonics</li> <li>Current Magnitude Harmonics</li> <li>Current Angle Harmonics</li> </ul> | • 10 Minutes  | • 10 Minutes   |
| Aggregation 2 hour | <ul> <li>RMS</li> <li>Power</li> <li>Phase Angle</li> <li>THD</li> <li>Unbalance Magnitude</li> <li>Unbalance Angle</li> <li>Voltage Magnitude Harmonics</li> <li>Voltage Angle Harmonics</li> <li>Current Magnitude Harmonics</li> <li>Current Angle Harmonics</li> </ul> | • 2 Hours   | • 2 Hours  |



| Data Logger Type      | Parameter Category/Types   | Log File Length | Interval Range |
|-----------------------|----------------------------|-----------------|----------------|
| EN50160 Report        | EN50160 report data        | • 7 Days        | • 7 Days       |
| IEEE519 Daily Report  | IEEE519 daily report data  | • 1 Day         | • 1 Day        |
| IEEE519 Weekly Report | IEEE519 weekly report data | • 7 Days        | • 7 Days       |

### 8.1.2 Log Parameter Options

| Log Parameter Options 👻   |  |  |  |
|---------------------------|--|--|--|
| Baramatar Catagory        |  |  |  |
| Select Parameter Category |  |  |  |
| ✓ RMS                     |  |  |  |
| Power                     |  |  |  |
| Phase Angle               |  |  |  |
| Fundamental               |  |  |  |
| THD                       |  |  |  |
| Unbalance Magnitude       |  |  |  |
| Unbalance Angle           |  |  |  |

Figure 8-6 Data Log Parameters Category

**Parameter Detail:** For data logging parameters, users can select among maximum, minimum, average, and instantaneous value types. Parameters like Energy and Power Quality only support instantaneous value logging.

**Parameter Selection:** By choosing a specific parameter category, the available parameters will be displayed in the parameter selection window.

| Average Value | Instantaneous Value | Maximum Value   | Minimum Value |
|---------------|---------------------|---|---------------|
| Not selected  |                     | Selected  |               |
|               | ÷<br>¢              | Current<br>Line-to-Line Voltage<br>Line-to-Neutral Voltage<br>Frequency<br>Power Factor<br>Apparent Power<br>Reactive Power<br>Active Power |               |
|               | Clear               |   |               |

Figure 8-7 Data Log Parameter Details





### 8.1.3 SFTP Backup

Acuvim 3 allow users to backup data log files using Acuvim 3's SFTP server.

| SFTP Port        | Network Key                  |       |
|------------------|------------------------------|-------|
| 22               | Enter Network Key 🗞          | Reset |
| Setup SFTP Port  | Default password: accuenergy |       |
| Range: 1 - 65535 | Between 7 and 15 characters  |       |
|                  |                              |       |
| Save SETP        |                              |       |

SFTP Enable: Enable SFTP settings to configure SFTP Datapost parameters on Acuvim 3.

**SFTP Port:** The default port for the SFTP server is 22, with allowable port numbers ranging from 1 to 65535.

**Network Key:** The network security key serves as the password for accessing the SFTP server and must consist of 7 to 15 characters. The default network key is set to 'accuenergy'.

# 8.2 Data Post

To access the Data Post Setting section,

- 1. Click on **Settings** from the main menu.
- 2. Select Data Log/Post from the tab menu.
- 3. Click on the Data Post menu option. This webpage displays the data post settings for Acuvim 3.

| Post Channel 1 Post Channel 2 Post Char | inel 3                     |
|---|----------------------------|
| C Enable                                |                            |
| Channel Name                            | Post Method                |
| FTP                                     | FTP                        |
| Maximum 40 characters                   | Select Post Method<br>HTTP |
| FTP Settings                            | FTP                        |
| URL                                     | EMAIL                      |
| ftp://18.188.85.147                     |                            |
| Maximum 40 characters                   |                            |
| Port                                    | Username                   |
| 10022                                   | admin                      |
| Range: 1 - 65535                        | Maximum 40 characters      |

Figure 8-9 Data Post Settings



Channel Name: Customize data post channel names with a maximum of 40 characters.

**Post Method:** Acuvim 3 supports the HTTP, FTP, SFTP, and Email post functions to transmit data log files from the Acuvim 3 to a remote server or email recipients.

**Test Post Channel:** The test post button can be used to verify the connection to the server after clicking the Save button.

**Clear Cached Logs:** Clear the Acuvim 3 cached logs from memory. It removes all the buffered data log records from the current POST channel. Acuvim 3 will start overwriting the oldest backup or post-cached files first once the disk usage exceeds 80%.

### 8.2.1 HTTP/HTTPs Settings

| HTTP/HTTPs Settings            |                              |                       |
|--------------------------------|------------------------------|-----------------------|
| Authentication                 |                              |                       |
| Authentication Method          |                              |                       |
| Token                          | \$                           |                       |
| Token                          |                              |                       |
| Enter Token                    |                              |                       |
| Maximum 40 characters          |                              |                       |
| URL                            | Port                         | Meter ID              |
| http://18.188.85.147:8000/post | 8000                         | 152471                |
| Maximum 40 characters          | Range: 1 - 65535             | Maximum 40 characters |
| Fix File Name                  | File Name                    |                       |
|                                | Acuvim3 Test1loooooggggggger |                       |
|                                | Maximum 40 characters        |                       |

Figure 8-10 Data Post HTTP/HTTPS Settings

**Authentication:** Users can enable the authentication method in HTTP/HTTPS data posts for the Acuvim 3.

**Authentication Method:** There are two authentication methods from the drop-down menu available: Token or Username. If the authentication method is set as Token, the user needs to enter a unique token up to 40 characters. When the authentication method is set as Username, the user needs to enter a valid username and password combination. Note that each field has a maximum character limit of 40.

URL: The HTTP URL supports a maximum of 40 characters.

**Port:** The HTTP port number with a range from 1 to 65535.

Meter ID: Users can customize Acuvim 3's ID with a maximum of 40 characters.

**Fix File Name:** If the fixed file name is enabled, users can customize the file name on the Post Channel webpage, and this setting will override the Log File Name Prefix setting in the Data Log configuration webpage.

Backup Mechanics: In the case when there is no connection to the server, the Acuvim 3 will store





the posts and send them out when the connection is restored. The Acuvim 3 can store up to 1GB (or 3000 files) of cache post files.

### 8.2.2 FTP Settings

| FTP Settings          |                       |                       |    |
|-----------------------|-----------------------|-----------------------|----|
| URL                   |                       |                       |    |
| Enter URL             |                       |                       |    |
| Maximum 40 characters |                       |                       |    |
| Port                  | Username              | Password              |    |
| 0                     | Enter Username        | Enter Password        | 80 |
| Range: 1 - 65535      | Maximum 40 characters | Maximum 40 characters |    |

Figure 8-11 Data Post FTP Settings

**URL:** FTP URL supports a maximum of 40 characters.

Port: FTP port number ranges from 1 to 65535.

**Username:** FTP username supports a maximum of 40 characters.

**Password:** FTP password supports a maximum of 40 characters.

## 8.2.3 SFTP Settings

| SFTP Settings         |                       |                       |
|-----------------------|-----------------------|-----------------------|
| URL                   |                       |                       |
| Enter URL             |                       |                       |
| Maximum 40 characters |                       |                       |
| Port                  | Username              | Password              |
| 0                     | Enter Username        | Enter Password 🔌      |
| Range: 1 - 65535      | Maximum 40 characters | Maximum 40 characters |

Figure 8-12 Data Post SFTP Settings

URL: SFTP URL supports a maximum of 40 characters.

Port: SFTP port number ranges from 1 to 65535.

Username: SFTP username supports a maximum of 40 characters.

**Password:** SFTP password supports a maximum of 40 characters.

### 8.2.4 Email Settings

| SFTP Settings         |                       |                       |          |
|-----------------------|-----------------------|-----------------------|----------|
| URL                   |                       |                       |          |
| Enter URL             |                       |                       |          |
| Maximum 40 characters |                       |                       |          |
| Port                  | Username              | Password              |          |
| 0                     | Enter Username        | Enter Password        | <u>8</u> |
| Range: 1 - 65535      | Maximum 40 characters | Maximum 40 characters |          |

Figure 8-13 Data Post Email Notification Settings



Subject: The subject line for the email.

Recipient: Acuvim 3 supports users to set up to three recipients to receive the email.

**NOTE:** If Email SMTP is disabled, the option to send data via email will not be available.

# 8.3 AcuCloud

To access the AcuCloud section,

- 1. Click on Settings from the main menu.
- 2. Select Communication from the tab menu.
- 3. Click on the AcuCloud menu option. This webpage displays the AcuCloud settings for Acuvim 3.

| Installation | Revenue and Energy   | Power Quality and Alarm     | Communication        | Data Log/Post | User Management | Maintenance and Management | HMI |  |
|--------------|----------------------|-----------------------------|----------------------|---------------|-----------------|----------------------------|-----|--|
| Data Log/F   | ost AcuCloud         |                             |                      |               |                 |                            |     |  |
|              | Data Log Data Post   | AcuCloud                    |                      |               |                 |                            |     |  |
|              | AcuCloud Settings 👻  |                             |                      |               |                 |                            |     |  |
|              | C Enable             |                             |                      |               |                 |                            |     |  |
|              | Module Serial Number |                             |                      |               |                 |                            |     |  |
|              | ASP22100025          | Copy                        |                      |               |                 |                            |     |  |
|              | AcuCloud Token       |                             |                      |               |                 |                            |     |  |
|              |                      |                             |                      |               |                 |                            |     |  |
|              | Link to AcuCloud     |                             |                      |               |                 |                            |     |  |
|              | Test AcuCloud CH     | ear AcuCloud Post Logs Clev | ar AcuCloud Backup R | Files         |                 |                            |     |  |
|              | _                    |                             |                      |               |                 |                            |     |  |
|              | Save                 |                             |                      |               |                 |                            |     |  |
|              |                      |                             |                      |               |                 |                            |     |  |

#### Figure 8-14 AcuCloud Settings

**Meter Serial Number:** AcuCloud requires users to register the Acuvim 3's serial number. Users can click the AcuCloud hyperlink to access the AcuCloud webpage (<u>https://acucloud.accuenergy.com/</u>). For assistance with setting up your AcuCloud account, please reach out to Accuenergy Technical Support.

**AcuCloud Token:** AcuCloud will generate a token for the specified Acuvim 3, which users must then enter into the designated field.

**Test AcuCloud:** Test the ability of the Acuvim 3 to transmit data to the AcuCloud server after clicking the Save button.

Clear AcuCloud Post Logs: Deletes all the cached AcuCloud files.

Clear AcuCloud Backup Files: Delete all the backup AcuCloud files.



# **Chapter 9: User Management**

# 9.1 User Configuration

To access the User Configuration section,

- 1. Click on **Settings** from the main menu.
- 2. Select User Management from the tab menu.
- 3. Click on the **User Configuration** menu option. This webpage displays the user configuration information for Acuvim 3.

In Acuvim 3 user accounts can be created and managed for specific purposes in an organization. The administrator role has full permissions to control user access and delegate privileges to other people.



### Figure 9-1 User Configuration Webpage

**Username:** This is the user account name to sign into the webpage interface or Acuvim 3 display screen. Acuvim 3 has two default user accounts: 'view' and 'admin'.

**Role:** Roles can be customized based on permission types and levels. Please check chapter 9.2 for more details.

Registration Date: The date when the user account was created.

**Expiration Date:** The user login password will expire on a specific date and a new password will need to be created.

**Last Login Time:** Indicates the most recent instance the user logged in through the webpage or display screen.

**Status:** This indicates the user account status. Administrators can set user status to Active or Locked.





#### **Configuration Settings**

**Lock User:** Allows a user to be locked, preventing the user from logging into the system from the webpage interface or display screen. Users cannot lock an account they are currently logged into.

**Add User:** Allows for the creation of a new user with a custom username, password policy privileges, multi-login availability, and password expiration settings.

| Add User                 |                       | < Back to User List      |
|--------------------------|-----------------------|--------------------------|
| Username                 |                       |                          |
| Enter Username           |                       |                          |
| Password                 | Repeat Password       |                          |
| Enter Password           | Enter Repeat Password | <i>B</i>                 |
| Role*                    |                       |                          |
| view 🗢                   |                       |                          |
| Override Password Policy | Multiple Login        | Override Password Expire |
| Add                      |                       |                          |

Figure 9-2 Add User Account

When creating a new user, the 'Override Password' Policy' checkbox is checked by default, which prevents the new user from following the password policy.

**Edit User:** The edit icon is allows the selected user to change its setting details, with the exception of the username which cannot be modified.

| Edit User                |                                    | Sack to User List        |
|--------------------------|------------------------------------|--------------------------|
| Username                 |                                    |                          |
| hh10                     |                                    |                          |
| Role*                    |                                    |                          |
| view                     | \$                                 |                          |
| Override Password Policy | <ul> <li>Multiple Login</li> </ul> | Override Password Expire |
| Save                     |                                    |                          |

#### Figure 9-3 Edit User Account

**Delete User:** Clicking on the trash icon memory permits the permanent deletion of select users. Users cannot delete an account they are currently logged into. This action cannot be undone.

# 9.2 Role Configuration

To access the Role Configuration section,

- 1. Click on **Settings** from the main menu.
- 2. Select User Management from the tab menu.
- 3. Click on the **Role Configuration** menu option. This webpage displays the role configuration information for Acuvim 3.





Role configuration allows users to establish custom roles for different levels of users. A role encompasses permission levels that are assigned to user accounts as mentioned in Chapter 9.1.

|              |                                       |                                 | Cogout Monday, Apr          | 1 29, 2024 3:15 PM   About    \$ Set | ings Acuvim 3 ACCU | ENERGY |
|--------------|---------------------------------------|---------------------------------|-----------------------------|--------------------------------------|--------------------|--------|
| Installation | Revenue and Energy Power Quality a    | nd Alarm Communication          | Data Log/Post User Manag    | ment Maintenance and Managemen       | e HMI              |        |
| User Manager | ment Role Configuration               |                                 |                             |                                      |                    |        |
|              | User Configuration Role Configuration | Password Policy Password        | Configuration API Token Man | igement.                             |                    |        |
|              | Add Role                              |                                 |                             |                                      |                    |        |
|              | Role Name : Reading Permission        | <b>Configuration Permission</b> | Maintenance Permission      | User Configuration Permission        | Action             |        |
|              | view View                             | View                            | None                        | None                                 | G2 🔳               |        |
|              | admin Edit                            | Edit                            | Edit                        | Edit                                 | 67 8               |        |

#### Figure 9-4 Role Configuration Webpage

**Role Name:** A name must be unique and must not already exist. The default meter configuration includes two roles: 'admin' and 'view'.

**Permission Category:** Acuvim 3 grants four permission categories: Reading, Configuration, Maintenance, and User Configuration. Each category refers to specific sections and functions granted to a user assigned to the role.

Permission level: In Acuvim 3, there are three permission levels:

- **Read:** Users can only view the specified category.
- Edit: Users can view and make modifications to the specific category.
- None: Permission level does not allow the user to access the specific category.

#### **Configuration Settings**

Add Role: Allows for the creation of a new role with custom permission levels for each permission

| calegory. | Add Role<br>Role Name |   |                      |        |                         |   |                    | Back to Role List |
|-----------|-----------------------|---|----------------------|--------|-------------------------|---|--------------------|-------------------|
|           | Enter Role Name       |   |                      |        |                         |   |                    |                   |
|           | Readings Permission*  |   | Configuration Permis | ision* | Maintenance Permission* |   | User Configuration | Permission*       |
|           | Edit                  | • | Edit                 | •      | Edit                    | ۰ | Edit               | •                 |
|           | Edit                  | ٠ | Edit                 | •      | Edit                    | ۰ | Edit               |                   |

Figure 9-5 Add Role

Edit Role: The edit icon 🗹 allows the role's permission levels for each permission category to be

updated.

| to User List | < Back                  |      |                       |      |                         |   | dit User<br>tole Name        |
|--------------|-------------------------|------|-----------------------|------|-------------------------|---|------------------------------|
| ission*      | User Configuration Perm | ion• | Maintenance Permissio | ion• | Configuration Permissio |   | view<br>teadings Permission* |
| ٠            | None                    | •    | None                  | •    | View                    | ٠ | View                         |
|              | None                    | ٥    | None                  | •    | View                    | • | View                         |

Figure 9-6 Edit Role





**Delete Role:** Clicking on the trash icon the permits the permanent deletion of select roles. This action cannot be undone.

# 9.2.1 Reading Permissions

| Permission<br>Category             | Permission<br>Level |  | View Operations  | Edi   | t Operations |  |
|------------------------------------|---------------------|--|--|---|--------------|--|
| Reading<br>Permission              |                     | 'Metering'<br>Webpage                      | View Real-Time<br>View Fundamental<br>View Energy<br>View Demand<br>View Min/Max<br>View THD<br>View THD<br>View Flicker<br>View Harmonic<br>View Sequencing<br>View I/O<br>View TOU Energy                        |   |              |  |
|                                    | View                | 'Power<br>Quality<br>and Alarm'<br>Webpage | View Alarm Status<br>View Alarm Log<br>View Power Quality Event<br>View Power Quality Reports<br>View Mains Signaling<br>View Voltage Log<br>View Mains Signaling Record<br>View Fast Log<br>View Waveform Capture | N/A   |              |  |
|                                    | w                   | 'Logs'<br>Webpage                          | View SOE Log<br>View Trend Log<br>View Trend Log Management<br>View Data Log<br>View Event Log   |   |              |  |
| Edit Include all 'View' operations |                     | ude all 'View' operations                  | 'Metering'<br>Webpage  | Reset Max/Min<br>Record<br>Reset Demand<br>Reset Energy<br>Edit Energy<br>Clear TOU Records<br>Reset DI Constants<br>Edit DI Counters<br>Toggle RO Status |              |  |

### **Table 9-1 Reading Permissions**





| Permission<br>Category | Permission<br>Level | View Operations               | Edi   | t Operations   |
|------------------------|---------------------|-------------------------------|---|--|
| Reading<br>Permission  |                     | Include all 'View' operations | 'Power<br>Quality<br>and Alarm'<br>Webpage<br>'Logs'<br>Webpage | Clear Alarm Log<br>Clear Power Quality<br>Event Logs<br>Clear Mains<br>Signaling Logs<br>Clear Mains<br>Signaling Records<br>Clear Fast Log<br>Trigger Fast Log<br>Trigger Waveform<br>Captures<br>Clear Waveform<br>Captures<br>Trigger Transient<br>Captures<br>Clear Transient<br>Captures<br>Clear Transient<br>Captures<br>Clear Transient<br>Captures<br>Clear Transient<br>Captures |
|                        | None                | N/A                           |   | Clear Event Log<br>N/A   |

# 9.2.2 Configuration Permission

| <b>Table 9-2 Configuration</b> | Permissions |
|--------------------------------|-------------|
|--------------------------------|-------------|

| Permission<br>Category           | Permission<br>Level | View                               | Operations  | Edit Operations |
|----------------------------------|---------------------|------------------------------------|---|-----------------|
|                                  |                     | 'Installation'<br>Webpage          | View General Settings<br>View I/O Settings  |                 |
|                                  |                     | 'Revenue<br>and Energy'<br>Webpage | View TOU Settings   |                 |
| Configuration View<br>Permission | View                | View<br>'Power Quality             | View Power Quality<br>Event Settings<br>View Alarm Settings<br>View Waveform and<br>Fastlog Settings                        | N/A             |
|                                  |                     | Webpage                            | View Mains Signaling<br>Voltage Settings<br>View Power Quality<br>Reporting Settings<br>View Email Notification<br>Settings |                 |





| Permission<br>Category      | Permission<br>Level | View                        | Operations   | Edit Operations            |   |  |
|-----------------------------|---------------------|-----------------------------|--|----------------------------|---|--|
| category                    | View                | 'Communication'<br>Webpage  | View RS485and USB<br>Settings<br>View Network Settings<br>View Webpage Settings<br>View Time/Date<br>Settings<br>View Access Control<br>Settings<br>View Remote Access<br>Settings<br>View Email Settings<br>View Modbus Settings<br>View Modbus Settings<br>View BACnet Settings<br>View SNMP Settings<br>View IEC61850 Settings<br>View Ethernet/IP<br>Settings<br>View PMU Settings | N/A                        |   |  |
| Configuration<br>Permission |                     | 'Datalog/Post'<br>Webpage   | View Data Log Settings<br>View Data Post Settings<br>View AcuCloud Settings  |                            |   |  |
|                             |                     |                             |  |                            | Edit General<br>Settings<br>Edit I/O Settings   |  |
|                             |                     |                             |  | Revenue And<br>Energy      | Edit TOU Settings   |  |
|                             | Edit                | Include all View Operations |  | Power Quality<br>and Alarm | Edit Power Quality<br>Event Settings<br>Edit Alarm Settings<br>Edit Waveform and<br>Fastlog Settings<br>Edit Mains<br>Signaling Voltage<br>Settings<br>Edit Power Quality<br>Reporting Settings<br>Edit Email<br>Notification<br>Settings |  |





| Permission<br>Category      | Permission<br>Level | View Operations             | Edit O        | perations  |
|-----------------------------|---------------------|-----------------------------|---------------|--|
| Category                    | Level               |                             |               | Edit RS485and<br>USB Settings<br>Edit Network<br>Settings<br>Edit Webpage<br>Settings<br>Edit Time/Date<br>Settings<br>Edit Access Control   |
| Configuration<br>Permission | Edit                | Include all View Operations | Communication | Settings<br>Edit Remote<br>Access Settings<br>Edit Email Settings<br>Edit Modbus<br>Settings<br>Edit BACnet<br>Settings<br>Edit SNMP Settings<br>Edit DNP Settings<br>Edit IEC61850<br>Settings<br>Edit Ethernet/IP<br>Settings<br>Edit PMU Settings |
|                             |                     |                             | Datalog/Post  | Edit Data Log<br>Settings<br>Edit Data Post<br>Settings<br>Edit AcuCloud<br>Settings   |
|                             | None                | N/A                         | I             | N/A  |



# 9.2.3 Maintenance Permission

| Permission<br>Category    | Permission Level | Edit C                                | Edit Operations  |  |  |
|---------------------------|------------------|---------------------------------------|--|--|--|
|                           |                  | 'About' Webpage                       | Clear Installation Records<br>Generate Installation Records<br>Clear Inspection Records<br>Generate Inspection Records   |  |  |
| Maintenance<br>Permission | Edit             | 'Operation' Webpage                   | Reset Device Runtime<br>Reboot Acuvim 3<br>Reset Meter Configurations<br>Reset Common Configurations<br>Reset To Factory Defaults<br>Enable SSH Access<br>Active Debug Diagnostics |  |  |
| Permission                |                  | 'Configuration Management'<br>Webpage | Import Common Configuration File<br>Import Meter Configuration File<br>Export Common Configuration File<br>Export Meter Configuration File   |  |  |
|                           |                  | 'Network Diagnostic' Webpage          | View Network Status<br>Test Host Lookup<br>Test Connection   |  |  |
|                           |                  | 'Firmware' Webpage                    | Edit Firmware Settings   |  |  |
|                           | None             |                                       | N/A  |  |  |

### **Table 9-3 Maintenance Permissions**

# 9.2.4 User Configuration Permission

### **Table 9-4 User Configuration Permissions**

| Permission<br>Category Permission Level |      | Edit Operations              |                                      |  |
|---|------|------------------------------|--------------------------------------|--|
|   |      | 'User Configuration' Webpage | Add User<br>Edit User<br>Delete User |  |
| User Configuration<br>Permission        | Edit | 'Role Configuration' Webpage | Add Role<br>Edit Role<br>Delete Role |  |
|   |      | Password Policy              | Edit Password Policy                 |  |
|   |      | Password Configuration       | Edit Password Configuration          |  |
|   |      | API Token Management         | Reset API Token                      |  |
|   | None |                              | N/A                                  |  |





# 9.3 Password Policy

To access the Password Policy section,

- 1. Click on Settings from the main menu.
- 2. Select User Management from the tab menu.
- 3. Click on the **Password Policy** menu option. This webpage displays the password policy settings for Acuvim 3.

The password policy offers users a mechanism to enforce specific criteria and rules when creating passwords. This policy puts into place requirements a password must adhere to enhance overall organization or system security.

The default administrator user account has the username and password set to 'admin', which bypasses the usual password policy. Administrators will also have the option to grant user privileges that ignore the password policy to better reflect an organization's security requirements.

|              | Power Quarty a              |  | ogi. oat  | montering of the sign of the s |
|--------------|-----------------------------|--|-----------|--|
| lser Managem | ent Password Policy         |  |           |  |
|              | User Configuration Role Co  | nfiguration Password Policy Passwo   | rd Config | iguration API Token Management   |
|              | Upper and Lower Case        | Required   |           | If required, password must contain both upper and lower case characters  |
|              | Numbers and Letters         | Required   |           | If required, password must contain at least an alphabet and a number   |
|              | Special Characters          | Required   |           | If required, password must contain at least one non-alphanumeric character e.g. 1@#\$%^  |
|              | Password History            | 1  |           | User cannot reuse any of their previous N passwords  |
|              |                             | Range: 1 - 32  |           |  |
|              | Minimum Password Age        | 0 days User must use a password for this many days before changing it again<br>Riange: 0 - 90 0 means no restriction |           | User must use a password for this many days before changing it again<br>0 means no restriction   |
|              |                             |  |           |  |
|              | Password Expires            | 10   | days      | Days until a user's password expires   |
|              |                             | Range: 0 - 90  |           | o means never expire   |
|              | Minimum Password Length     | 6<br>Range: 6 - 64<br>7 days<br>Range: 0 - 65535   |           | Password must be at least N characters   |
|              |                             |  |           |  |
|              | Cares Davied                |  |           | After expiration, user has this many days to login and change their password (must   |
|              | Grace Period                |  |           | 0 means no grace - immediate lockout   |
|              |                             | 0  |           | Number of failed login attempts to trigger a lockout   |
|              | Maximum Failed Attempts     | Range: 0 - 30  |           | 0 means never lockout  |
|              |                             | 0 51   | econds    | Number of seconds after which the current count of failed attempts is reset  |
|              | Failed Login Attempt Window | Range: 0 - 86400   |           | 0 means never lockout  |
|              |                             | 0 51   | econds    | After a lockout due to getting Max Failed Attempts within the Failed Login Attempt   |
|              | Palled Login Walt           | Range: 0 - 86400   |           | 0 means never auto-unlock  |
|              |                             | 0  | ninutes   |  |
|              | Session Timeout             | Range: 0 - 60  |           | 0 for never timeout  |





# 9.4 Password Configuration

To access the Password Configuration section,

- 1. Click on **Settings** from the main menu.
- 2. Select User Management from the tab menu.
- 3. Click on the **Password Configuration** menu option. This webpage displays the password configuration information for Acuvim 3.

Administrators can manage passwords, including resetting passwords as needed.

To update the password, users can follow these steps:

- 1. Locate and click on the Edit button in under the Action column which is associated with the user's password to be changed.
- 2. In the provided fields, enter the new password and repeat entry again to confirm the passwords are identical.
- 3. Once the new password is entered, click the Save button to save the changes.

**NOTE:** The Acuvim 3 does not need to perform a power cycle for the password update to take effect.



#### Figure 9-8 Password Configuration Edit Button Webpage

|                                      |                    |                         |                   |                |                    |                             |                      | (+ Logout    | t Monday, April 29, 2024 3:21 PM | About | Settings | Acuvim 3 | ACCUENERGY |
|--------------------------------------|--------------------|-------------------------|-------------------|----------------|--------------------|-----------------------------|----------------------|--------------|----------------------------------|-------|----------|----------|------------|
| Installation                         | Revenue and Energy | Power Quality and Alarm | Communication     | Data Log/Post  |                    | Maintenance and Manageme    | nt HMI               |              |                                  |       |          |          |            |
| User Management Paumed Configuration |                    |                         |                   |                |                    |                             |                      |              |                                  |       |          |          |            |
|                                      |                    |                         | User Configuratio | n Role Configu | ation Password Pol | licy Password Configuration | API Token Management |              |                                  |       |          |          |            |
|                                      |                    |                         | Edit Password     |                |                    |                             |                      | K Back to Pa | assword Configuration            |       |          |          |            |
|                                      |                    |                         | Username          |                |                    |                             |                      |              |                                  |       |          |          |            |
|                                      |                    |                         | view              |                |                    |                             |                      |              |                                  |       |          |          |            |
|                                      |                    |                         | Password          |                | Re                 | epeat Password              |                      |              |                                  |       |          |          |            |
|                                      |                    |                         | Enter Password    |                | 38                 | Enter Repeat Password       | 382                  |              |                                  |       |          |          |            |
|                                      |                    |                         | Save              |                |                    |                             |                      |              |                                  |       |          |          |            |







# 9.5 API Token Management

To access the API Token Management section,

- 1. Click on **Settings** from the main menu.
- 2. Select User Management from the tab menu.
- 3. Click on the **API Token Management** menu option. This webpage displays the API token management information for Acuvim 3.

API token management allow users with the right permission level to generate a new API token used for accessing the webpage interface's functionalities. This token serves as a secure form of authentication. Administrators can reset the token to generate a new token to ensure continued security compliance is maintained while accessing the web interface.

|                                     |                                       | C+ Log                          | out Monday, April 29, 2024 3:21 PM | About Settings Acuvim :    | 3 ACCUENERGY |  |  |
|-------------------------------------|---------------------------------------|---------------------------------|------------------------------------|----------------------------|--------------|--|--|
| Installation                        | Revenue and Energy Power Quality      | and Alarm Communication         | Data Log/Post User Management      | Maintenance and Management | HMI          |  |  |
| User Management AN Token Management |                                       |                                 |                                    |                            |              |  |  |
|                                     | User Configuration Role Configuration | Password Policy Password Config | uration API Token Management       |                            |              |  |  |
| L                                   | Live API Token                        |                                 | Reset AP                           |                            |              |  |  |
| c                                   | cf6b9dd8+d8eb-4dfe-993e-f49e8376ba5d  |                                 |                                    |                            |              |  |  |
|                                     |                                       |                                 |                                    |                            |              |  |  |

Figure 9-10 API Token Management



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# **Chapter 10: Maintenance and Management**

# **10.1 Operation**

- 1. To access the Operation section,
- 2. Click on Settings from the main menu.
- 3. Select Maintenance and Management from the tab menu.
- 4. Click on the **Operation** menu option. This webpage displays the operation options for Acuvim 3.





From the Operations webpage, the user can perform several important actions.

**Reset Device Run Time:** Users can initiate the Acuvim 3 run time reset by clicking the Reset button. This does not necessitate the meter to reboot for the reset to take effect. The Acuvim 3 run time information is accessible within the About section from the information interface.

**Reboot Meter:** Users can perform a manual reboot of the Acuvim 3 to apply a configuration update.

**NOTE:** Some modifications to the settings will not take effect unless an Acuvim 3 reboot is performed. In such cases, initiating a reboot is required to ensure the configuration updates are applied.

**Reset Meter Configs:** Refers to a compilation of configurations originating from both the General and I/O settings under the Installation section located the webpage interface and meter display screen. Resetting the meter's configurations will result in a complete restoration of all these settings to their default values.



**Reset Common Configs:** Refers to a compilation of configurations originating from various webpage interfaces, including Revenue and Energy, Power Quality and Alarm, Communication, Data Log/Post, User Management, Maintenance and Management. When a user resets common configuration, it will trigger a complete restoration of all these settings to their original default values.

**Reset to Factory Defaults:** This operation encompasses a wide range of restore actions. Resets the original values for common configuration and meter configuration, it also resets the following:

- 1. Clears the database and data log.
- 2. Reset network settings.
- 3. Clears uploaded IEC 61850 CID files.
- 4. Reset the web server.
- 5. Reset AcuCloud and Remote Access configurations.

| Parameter            | Default Value                                    |  |  |  |  |  |
|----------------------|--|--|--|--|--|--|
|                      | For configuration/management                     |  |  |  |  |  |
|                      | • Username: admin                                |  |  |  |  |  |
| Webpage Login        | Password: admin                                  |  |  |  |  |  |
| Webpage Login        | • For view only                                  |  |  |  |  |  |
|                      | • Username: view                                 |  |  |  |  |  |
|                      | • Password: view                                 |  |  |  |  |  |
|                      | • IP: 192.168.1.254                              |  |  |  |  |  |
| Ethernet 1           | • Subnet: 255.255.255.0                          |  |  |  |  |  |
|                      | • Gateway: 192.168.1.1                           |  |  |  |  |  |
| Ethernet 2           | • DHCP enabled                                   |  |  |  |  |  |
|                      |  |  |  |  |  |  |
|                      | • SSID: in the format Acuvim-3-WIFI-SerialNumber |  |  |  |  |  |
| Wi-Fi SSID (AP mode) | • Key: Accuenergy                                |  |  |  |  |  |
|                      | • IP: 192.168.100.1                              |  |  |  |  |  |
| RS485 Protocol       | Modbus RTU, Slave ID 1                           |  |  |  |  |  |
|                      |  |  |  |  |  |  |
| RS485 Settings       | 115200 bps, 8N1                                  |  |  |  |  |  |
| USB Protocol         | Modbus RTU. Slave ID 1                           |  |  |  |  |  |
|                      |  |  |  |  |  |  |
| USB Settings         | 115200 bps, 8N1                                  |  |  |  |  |  |

### **Table 10-1 Factory Default Settings**



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**NOTE:** that all reset operations are permanent and irreversible. To mitigate potential risks, it is strongly advised to first export the configuration files before proceeding with a reset action. Export a backup file with the meter's current configurations for recovery or reference as a precaution in case of unintended consequences resulting from the reset operations.

**SSH:** The Acuvim 3 offers support for SSH (Secure Shell), a secure communication protocol over a network. SSH can be enabled to permit users to login remotely into the Acuvim 3 using a secure encrypted communication method.

# 10.1.1 Debug Diagnostic

To access the Debug Diagnostic section,

1. From the **Operations** webpage, click on the **Link to advanced settings** hyperlink. This webpage displays the debug diagnostic options for Acuvim 3.

| 0   | Logout Monday, April 29, 2024 4:15 PM () About Settings Acuvim 3 ACCUENERSY |
|---|---|
| Installation Revenue and Energy Power Quality and Alarm Communication | Data Log/Post User Management Maintenance and Management HMI                |
| Maintenance and Management Debug                                      |   |
| Operations Configuration Management Network Disposition               | Firmare   |
|   |   |
| Others  | Common  |
| AppSupVisor   | AppMonitor  |
| WWMonitor   | AlarmThd  |
| BacNetMgmt  | BacNetip  |
| BacNetMstp  | DataPostThd   |
| ModBusUsbThd  | ModBusRtuThd  |
| ModBusTcpThd  | SnmpThd   |
| MeterThd  | DI  |
| D0  | AI (I)  |
| ۵۵ (Television)   | NO RO   |
| CalibrationThd  | HwTest  |
| HMI   | WebServerThd  |
| DataBase  | ReadingBuf  |
| Config  | Hardware  |
| FileMgmt  | Messenger   |
| ResourceMonitorThd  | DNP   |
| IEC61850Thd   | TOU   |
| EtherNetlP  | SpiThd  |
| DspFrame  | DspMsg  |
| DbUpdate  | InsertLog   |
| CreateLog   | Waveform  |
| PQReport  | DspLog  |
| PMU   | HmiMsg  |
| MainSignal  |   |
|   |   |
| Back  | Clear System Log Save   |

Figure 10-2 Maintenance and Management Debug Webpage

### **Debug Diagnostic**

The debug diagnostic webpage provides users with the ability to activate or deactivate debug logs within the system. Users can enable or disable individual or multiple debug logs. When specific debug logs are enabled, the system's status will show 'Partial On.'





# Acuvim 3 Series Power Meter

**NOTE:** Enabling debug logs can impact the overall system performance. As a precaution, it is recommended to only enable debug logs as needed. If further details are required, please reach out to technical support for more comprehensive information and guidance.

**Download Diagnostic File:** Within the Acuvim 3 Operations webpage, users can download the diagnostic file. This file contains detailed diagnostic information that can be utilized for analyzing the Acuvim 3's performance and functionality.

It is important to keep in mind that for a thorough analysis of the diagnostic file, it's recommended to send the file to Accuenergy Technical Support at <a href="mailto:support@accuenergy.com">support@accuenergy.com</a>. Our experts better assist the issue by assessing the data derived from the diagnostic file.

# **10.2 Configuration Management**

To access the Configuration Management section,

- 1. Click on **Settings** from the main menu.
- 2. Select Maintenance and Management from the tab menu.
- 3. Click on the **Configuration Management** menu option. This webpage displays the configuration management information for Acuvim 3.

|              |   | 🕪 Logout Monday, April 29, 2024 3:29 PM                         | About Settings Acuvim 3 | CEUEN |
|--------------|---|---|-------------------------|-------|
| Installation | Revenue and Energy Power Quality and Alarm Communication                    | Data Log/Post User Management Maintena                          | nce and Management HMI  |       |
| Maintenanc   | ce and Management Configuration Management                                  |   |                         |       |
|              | Operations Configuration Management Network Disgnostic F                    | Firmware  |                         |       |
|              | Common Configuration Mater Configuration                                    |   |                         |       |
|              | Note: Configurations of Materials WebServer Aru/David Remote Access and 991 | cartificates must be included in backundensity/mart/synart as a | hav are davine mentile  |       |
|              | Note: Connot have more than 10 configurations                               |   |                         |       |
|              | Backup Current Configuration  |   |                         |       |
|              | Description   |   |                         |       |
|              | Enter Description   |   |                         |       |
|              | Backup  |   |                         |       |
|              | Local Configurations  |   |                         |       |
|              | Filename  | Description   | Actions                 |       |
|              | Comm-ASP22100025-v0.32-2024-03-19T09-45-45-0400.conf.a3                     | Acuivm3 BACKU   | P i 🛛 🛦 📋               |       |
|              |   |   |                         |       |
|              | Import Configuration  |   |                         |       |
|              | Configuration File  |   |                         |       |
|              | Choose file Browse  |   |                         |       |
|              | Import  |   |                         |       |

### Figure 10-3 Configuration Management Webpage



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This webpage offers support for various backup configuration options such as export and import functionalities. The available configuration settings are listed in the following table.

| Configuration Type   | Section                       | Setting   |  |  |
|----------------------|-------------------------------|---|--|--|
| Meter Configuration  | Installation                  | General   |  |  |
|                      | Installation                  | I/O   |  |  |
|                      | Revenue and Energy            | TOU   |  |  |
| Common Configuration | Power Quality and Alarm       | Power Quality Event<br>Alarm<br>Waveform and Fast log<br>Mains Signaling Voltage<br>Power Quality Reporting<br>Email Notification |  |  |
|                      | Communication                 | RS485 and USB<br>Email<br>Modbus<br>BACnet<br>SNMP<br>DNP<br>IEC61850<br>EtherNet/IP<br>PMU                                       |  |  |
|                      | Datalog/Post                  | Datalog<br>Data Post  |  |  |
|                      | User Management<br>(Optional) | User<br>Roles<br>Password policy  |  |  |

# Table 10-2 Supported Configuration Settings

# **Configuration Settings**

## **Backup Current Configuration**

Initiate the process to create a full backup of the meter's current settings by generating a local configuration file.





| ter Description |  |
|-----------------|--|

Figure 10-4 Backup Current Configuration

## **Local Configurations**

A list of backup and imported configuration files will be displayed under local configurations section. The files follow a specific naming convention, which includes specific details such as file type, serial number, firmware version, and a timestamp when a file was created. The Acuvim 3 has enough storage capacity to store up to ten configuration files.

| Local Configurations                                    |                |         |  |  |  |  |
|---|----------------|---------|--|--|--|--|
| Filename  | Description    | Actions |  |  |  |  |
| Comm-ASP22100025-v0.32-2024-03-19T09-45-45-0400.conf.a3 | Acuivm3 BACKUP | i 🛛 🛓 💼 |  |  |  |  |

### Figure 10-5 Local Configurations

**Details:** The details icon **1** under the Actions column contains additional important information about the meter's configuration file. The details include various attributes, associated to the Acuvim3 such as name, serial number, timestamp of creation, firmware version, and a description at the time a backup was generated.



Figure 10-6 Configuration File Details

**Apply Configuration:** The apply icon  $\bigcirc$  enables users to implement local configurations to a specific file on the Acuvim 3. The option determines whether the overwritten configuration should include user information. This process is not reversible.



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| 024-03-19109-43-43-0400             |          |
|-------------------------------------|----------|
| Existing configuration will be over | rwritten |
| Include user information            |          |
|                                     |          |

Figure 10-7 Apply Configuration File

**Download Configuration:** Users can export a configuration file for backup purposes. The Download icon  $\checkmark$  initiates the download process, and the file will be saved with a '.conf.a3' file extension.

**Delete Configuration:** The Delete icon allows users to remove specific local configurations files. This process is irreversible.

**Import Configuration:** Users can import a configuration file to Acuvim 3. Importing a file that already exists in the local configurations list is not permitted when ten configuration files already exist. Importing a configuration file from another Acuvim 3 meter with a higher firmware version is not permitted.

| Configuration File |        |
|--------------------|--------|
| Choose file        | Browse |
| Import             |        |

### Figure 10-8 Import Configuration File

# **10.3 Network Diagnostic**

# 10.3.1 Network Status

To access the Network Status section,

- 1. Click on **Settings** from the main menu.
- 2. Select Maintenance and Management from the tab menu.
- 3. Click on the **Network Diagnostic** menu option, then click on the **Network Status** option. This webpage displays the network status for Acuvim 3.

In the Network Status section, users can review several aspects of the Acuvim 3's network setups.





### **Ethernet Network Information**

This section provides details about the current configuration of the Acuvim 3's Ethernet network.



#### Figure 10-9 Ethernet Network Status

### **Routing Table**

Users can access the routing table, which outlines how network traffic is directed and managed.

Routing Table

| Kernel IP routing table |              |               |       |        |     |     |       |  |
|-------------------------|--------------|---------------|-------|--------|-----|-----|-------|--|
| Destination             | Gateway      | Genmask       | Flags | Metric | Ref | Use | Iface |  |
| 0.0.0.0                 | 192.168.63.1 | 0.0.0.0       | UG    | 250    | 0   | 0   | eth1  |  |
| 0.0.0.0                 | 172.27.24.1  | 0.0.0.0       | UG    | 350    | 0   | 0   | wlan0 |  |
| 10.1.0.0                | 0.0.0.0      | 255.255.0.0   | U     | 0      | 0   | 0   | tunØ  |  |
| 172.20.0.0              | 0.0.0.0      | 255.255.255.0 | U     | 0      | 0   | 0   | eth2  |  |
| 172.27.24.0             | 172.27.24.1  | 255.255.252.0 | UG    | 301    | 0   | 0   | wlan0 |  |
| 172.27.24.0             | 0.0.0.0      | 255.255.252.0 | U     | 350    | 0   | 0   | wlan0 |  |

### Figure 10-10 Routing Table



### **DNS Server Setting**

Information regarding the DNS server settings is available, which is crucial for translating domain names into IP addresses.

DNS Server

nameserver 8.8.8.8 nameserver 8.8.4.4

### Figure 10-11 DNS Server

### **Network Status**

Users can ascertain the status of the network, including connectivity details and relevant statistics.

#### Network Stat

| Active Int | ernet c | oni | nections (servers and es | tablished)         |           |
|------------|---------|-----|--------------------------|--------------------|-----------|
| Proto Recv | -Q Send | -Q  | Local Address            | Foreign Address    | State     |
| tcp        | 0       | 0   | 0.0.0.0:502              | 0.0.0.0:*          | LISTEN    |
| tcp        | 0       | 0   | 0.0.0.0:22               | 0.0.0.0:*          | LISTEN    |
| tcp        | 0       | 0   | 0.0.0.0:443              | 0.0.0.0:*          | LISTEN    |
| tcp        | 0       | 0   | 0.0.0.0:3333             | 0.0.0.0:*          | LISTEN    |
| tcp        | 0       | 0   | 0.0.0.0:3334             | 0.0.0.0:*          | LISTEN    |
| tcp        | 0       | 0   | 0.0.0.0:80               | 0.0.0.0:*          | LISTEN    |
| tcp        | 0       | 0   | 0.0.0.0:34000            | 0.0.0.0:*          | LISTEN    |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55090    | TIME_WAIT |
| tcp        | 0       | 0   | 172.20.0.100:443         | 172.20.0.111:51266 | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55020    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55282    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55058    | TIME_WAIT |
| tcp        | 0       | 0   | 172.20.0.100:443         | 172.20.0.111:51272 | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:54964    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55146    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55056    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:54982    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55278    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55072    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55188    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55260    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55132    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55288    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55240    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55098    | TIME_WAIT |
| tcp        | 0       | 0   | 127.0.0.1:3333           | 127.0.0.1:55048    | TIME_WAIT |

### Figure 10-12 Network Stat

# SSID Information

The window offers information about the available SSIDs (Service Set Identifiers) for wireless networks.





# Acuvim 3 Series Power Meter

SSID

BSS 18:e8:29:94:92:a7(on wlan0) last seen: 526.014s [boottime] TSF: 0 usec (0d, 00:00:00) freg: 2437 beacon interval: 100 TUs capability: ESS Privacy ShortPreamble ShortSlotTime RadioMeasure (0x1431) signal: -67.00 dBm last seen: 1 ms ago SSID: AccuOP1 Supported rates: 1.0\* 2.0\* 5.5\* 11.0\* 6.0 9.0 12.0 18.0 DS Parameter set: channel 6 Country: US Environment: Indoor/Outdoor Channels [1 - 11] @ 30 dBm ERP: \* Version: 1 RSN-\* Group cipher: CCMP \* Pairwise ciphers: CCMF \* Authentication suites: PSK \* Capabilities: 1-PTKSA-RC 1-GTKSA-RC (0x0000) Extended supported rates: 24.0 36.0 48.0 54.0 BSS Load: \* station count: 7 \* channel utilisation: 105/255 \* available admission capacity: 31250 [\*32us]

#### Figure 10-13 SSID Information

# 10.3.2 Host Lookup

To access the Host Lookup section, click on the 'Network Diagnostic' menu option, then click on the 'Host Lookup' option. This webpage displays the Host Lookup test result for Acuvim 3.

The Host Lookup tests enable users to verify the connectivity to other networks and diagnose potential network issues.

| Installation Revenue and Energy Power Quality | r and Alerm Communication Data Log/Post User Management Maintenance and Management HMI   |
|---|--|
| Maintenance and Management Network Diagno     | usic   |
|   | Operations Configuration Management Network Disproptic Firmware  |
|   | Network Status Host Lookup Connection Test   |
|   | Name of system or domain name  |
|   | indicotup iping program progra |
|   | Lookup   |

#### Figure 10-14 Host Lookup Webpage

**nslookup:** Query the nameserver for the IP address of the given host optionally using a specified DNS server.





| Name of syst | tem or domain name                                 |
|--------------|--|
| www.goog     | e.com  |
| 🗹 nslookup   |  |
| ping         |  |
| ping6        |  |
| tracerout    | 2  |
| NsLookup     |  |
| Server:      | 8.8.8.8  |
| Address 1:   | 8.8.8.8 dns.google                                 |
| Name:        | www.google.com                                     |
| Address 1:   | 142.251.41.36 yyz12s08-in-f4.1e100.net             |
| Address 2:   | 2607:f8b0:400b:803::2004 yyz12s08-in-x04.1e100.net |
| Lookup       |  |
|              |  |

Figure 10-15 nslookup Test

Ping: Test the reachability to other networks through IPv4.

| Name of system or domain name                           |                               |                |
|---|-------------------------------|----------------|
| www.google.com  |                               |                |
| nslookup  |                               |                |
| ping  |                               |                |
| ping6   |                               |                |
| traceroute  |                               |                |
| Ping  |                               |                |
| PING www.google.com (142.251.32.68) 56(84) bytes of dat | a.                            |                |
| 64 bytes from yyz12s07-in-f4.1e100.net (142.251.32.68): | <pre>icmp_seq=1 ttl=110</pre> | 5 time=13.6 ms |
| 64 bytes from yyz12s07-in-f4.1e100.net (142.251.32.68): | <pre>icmp_seq=2 ttl=110</pre> | 5 time=4.91 ms |
| 64 bytes from yyz12s07-in-f4.1e100.net (142.251.32.68): | <pre>icmp_seq=3 ttl=110</pre> | 5 time=4.33 ms |
| 64 bytes from yyz12s07-in-f4.1e100.net (142.251.32.68): | <pre>icmp_seq=4 ttl=110</pre> | 5 time=4.37 ms |
| 64 bytes from yyz12s07-in-f4.1e100.net (142.251.32.68): | <pre>icmp_seq=5 ttl=110</pre> | 5 time=5.89 ms |
| www.google.com ping statistics                          |                               |                |
| 5 packets transmitted, 5 received, 0% packet loss, time | 4005ms                        |                |
| rtt min/avg/max/mdev = 4.330/6.630/13.635/3.548 ms      |                               |                |
|   |                               |                |
| Lookup  |                               |                |

Figure 10-16 Ping Lookup Test

Ping6: Test the reachability to other networks through IPv6.



| Name of system or domain name   |  |  |  |  |  |
|---|--|--|--|--|--|
| www.google.com  |  |  |  |  |  |
| <ul> <li>nslookup</li> <li>ping</li> <li>ping6</li> <li>traceroute</li> </ul> |  |  |  |  |  |
| Ping6   |  |  |  |  |  |
| connect: Network is unreachable   |  |  |  |  |  |
| Lookup  |  |  |  |  |  |

Figure 10-17 Ping6 Lookup Test

Traceroute: Track the path of an IP packet as it traverses routers locally or globally.

| Name of system or domain name   |  |  |  |  |  |
|---|--|--|--|--|--|
| www.google.com  |  |  |  |  |  |
| <ul> <li>nslookup</li> <li>ping</li> <li>ping6</li> <li>traceroute</li> </ul> |  |  |  |  |  |
| Ping6   |  |  |  |  |  |
| connect: Network is unreachable   |  |  |  |  |  |
| Lookup  |  |  |  |  |  |



# 10.3.3 Connection Test

To access the Connection Test section, click on the 'Network Diagnostic' menu option, then click on the 'Connection Test' option. This webpage displays the Connection Test result for Acuvim 3.

A user can utilize the 'Connection' Test function for examining the local network to which the Acuvim 3 is connected. If no issues are detected, the outcome of the test will be displayed as 'SUCCESS' and 'PASS.' This function serves as a valuable tool to assess and confirm the proper functionality of the network connection within the local environment.



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# Maintenance and Management

|              |                    |                                | 🕞 Logout                | Monday, April 29, 20     | 24 3:47 PM 🚯 About          | Settings Acuvim 3 | ACCUENERGY |
|--------------|--------------------|--------------------------------|-------------------------|--------------------------|-----------------------------|-------------------|------------|
| Installation | Revenue and Energy | Power Quality and Alarm        | Communication           | Data Log/Post            | User Management             |                   | ment HMI   |
| Maintenanc   | e and Management   |                                |                         |                          |                             |                   |            |
|              | Oper               | ations Configuration Mana      | gement Network          | Diagnostic Firmwa        | re                          |                   |            |
|              | Netw               | ork Status Host Lookup         | Connection Test         |                          |                             |                   |            |
|              | This di            | gnostic page will attempt a c  | onnection to the speci  | ified network nodes.     |                             |                   |            |
|              | In the p           | rocess, all network settings w | ill be tested and a rep | ort will be given with a | detailed results of these t | tests.            |            |
|              | Begin              | Test                           |                         |                          |                             |                   |            |

#### Figure 10-19 Connection Test Webpage

# 10.4 Firmware

To access the Firmware section,

- 1. Click on **Settings** from the main menu.
- 2. Select Maintenance and Management from the tab menu.
- 3. Click on the **Firmware** menu option. This webpage displays the firmware information for Acuvim 3.

The Acuvim 3 webpage interface supports various features to allow the user to update and maintain the meter's firmware more efficiently.

|                      | G♦ Logout Monday, April 29, 2024 3-48 PM 🚯 About 🏚 Settings Acur/m 3 🛛 🕂 🖉   |
|----------------------|--|
| Installation Revenue | e and Energy Power Quality and Alarm Communication Data Log.Post User Management Maintenance and Management HMI  |
| Maintenance and M    | anagement Firmware   |
|                      | Operations         Configuration Management         Network         Ferrow           Current Mater Firmware Variable: 40.2         The Firmware Variable: 40.2         The Firmware Variable: 40.2           Dealbail: minute quadra firm and a second water that and a second water of the se |
|                      | Sense Uptate<br>Current Version: vo.32   |
|                      | Cook for topologie<br>Marcul Opdate<br>Marcel Trimmer Opdate*  |
|                      | Librar   |

#### Figure 10-20 Firmware Update Webpage





# Acuvim 3 Series Power Meter

**Auto Firmware Update:** Acuvim 3 can automatically update the firmware version without a manual connection to the web server to perform the update.

**Disable:** Disables the auto firmware update function.

Critical Update Only: Updates the Acuvim 3 to the latest critical firmware.

Automatically Keep Firmware to Latest: Updates the Acuvim 3 to the latest firmware.

**Check Time:** This feature is enabled only when Critical Update Only or Automatically Keep Firmware to Latest Firmware Version auto update options are selected. The time firmware will update based on the next configured time.

**Remote Update:** Allows the Acuvim 3 to fetch if the latest firmware file exists from the Accuenergy server and perform an update on itself.

Manual Update: Users can manually upload an Acuvim 3 firmware file to update it.







# MAKE ENERGY USAGE SMARTER

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