Acuvim 3 Series
Power Quality Meter
Users Manual



ACCUENERGY

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

The information contained in this document is believed to be accurate at the time of publication, however, Accuenergy assumes no responsibility for any errors which may appear here and reserves the right to make changes without prior notice as part of continuing improvements. Please ask the local representative for the latest product specifications before ordering.

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.

Table of Contents

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

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%	0.001V	VLN:10V~400V VLL:17.3V~690V	½ Cycle 200ms (10/12 Cycle)
Current	0.1%	0.001A	1A:10mA~2A 5A:50mA~10A 333mV:3mV~400mV Rogowski Coil:3mV~400mV	½ Cycle 200ms (10/12 Cycle)
Power	0.1%	1W	-999999.999MW ~999999.999MW	½ Cycle 200ms (10/12 Cycle)

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

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

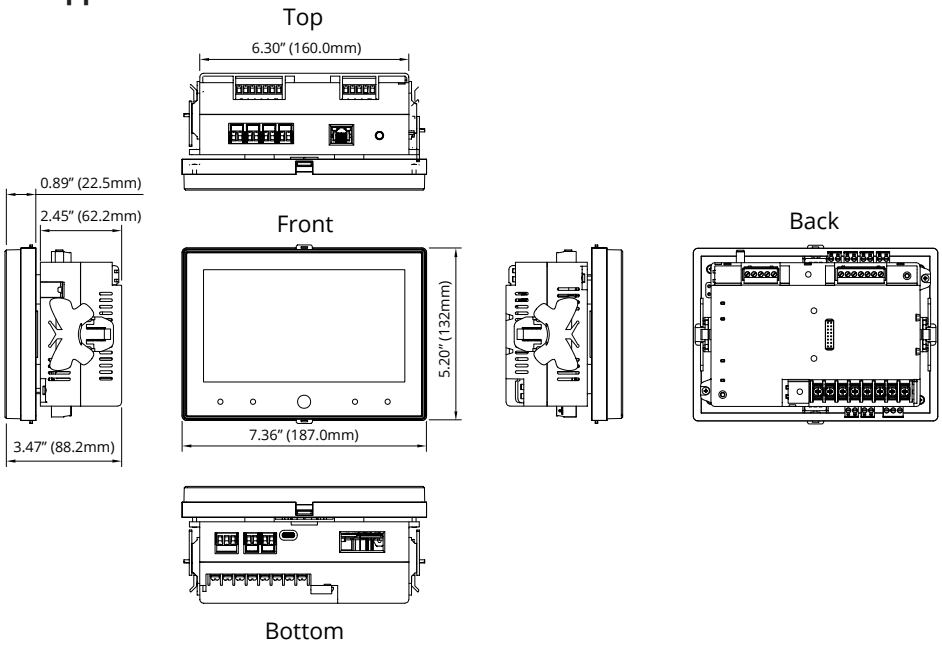


Figure 2-1a Acuvim 3 Panel Mount Appearance and Dimensions

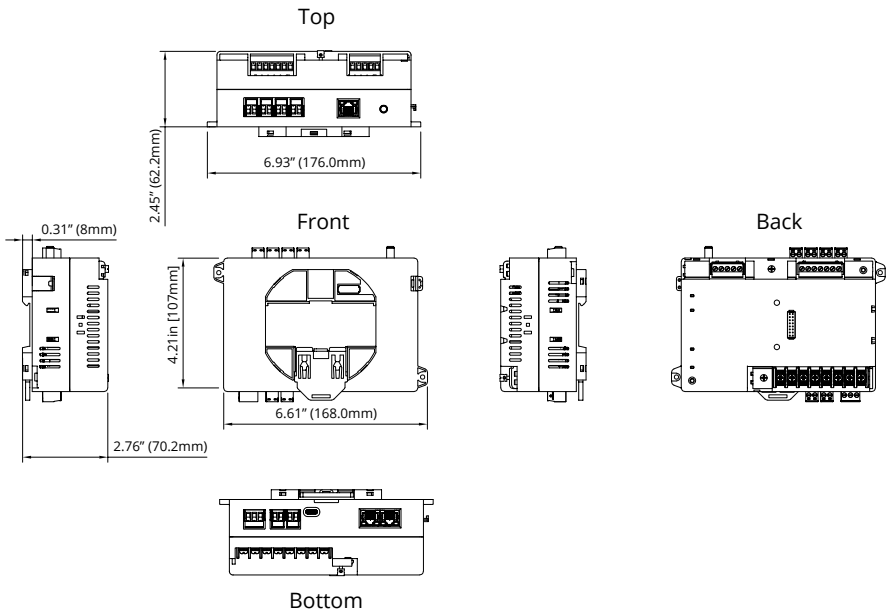


Figure 2-1b Acuvim 3 DIN Rail Mount Appearance and Dimensions

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.

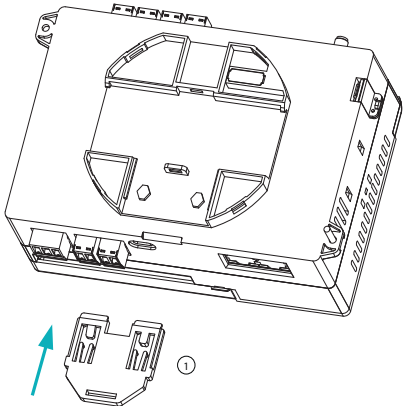


Figure 2-2a Acuvim 3 DIN Rail Clip Attachment

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.

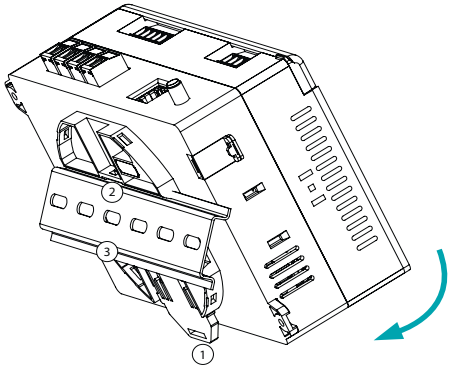


Figure 2-2b Acuvim 3 DIN Rail Mount Installation

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

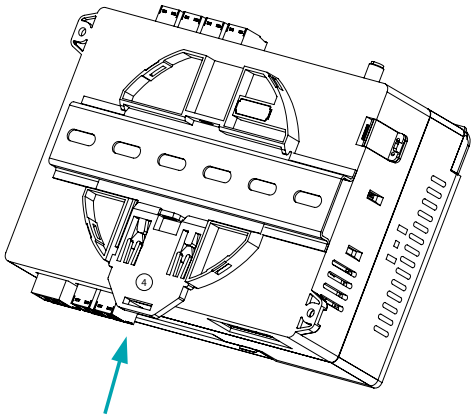


Figure 2-2c Acuvim 3 Lock Clip

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.

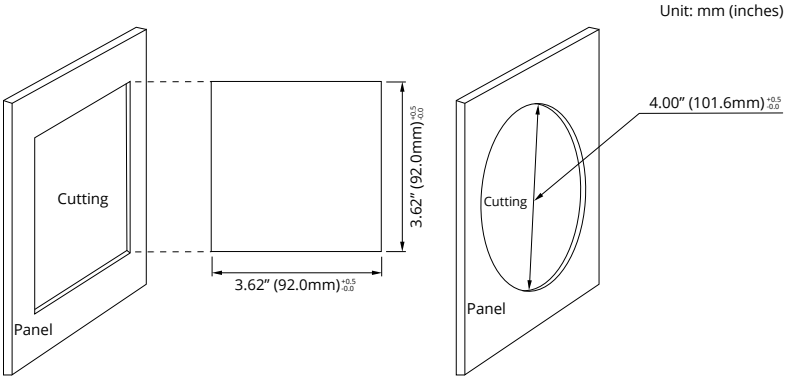


Figure 2-3a Acuvim 3 Panel Cutout

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.

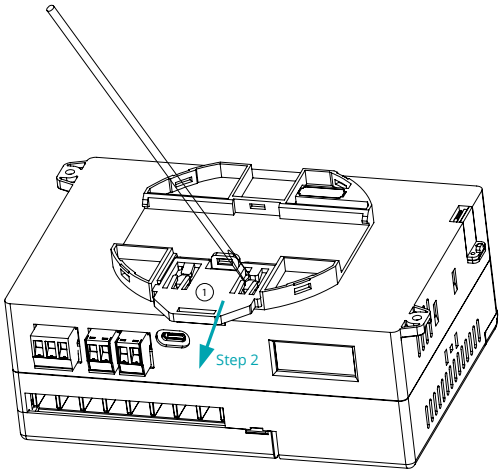


Figure 2-3b Acuvim 3 Lift Blockers

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

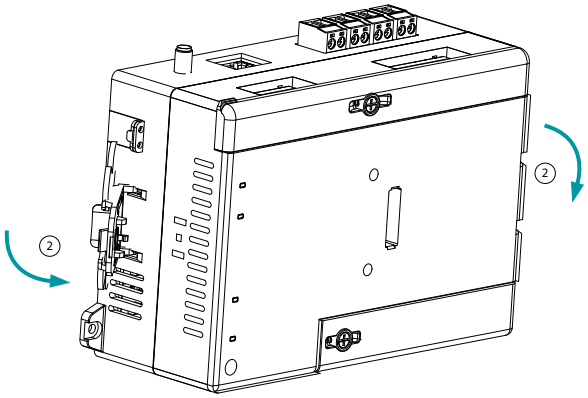


Figure 2-3c Acuvim 3 Butterfly Clips

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.

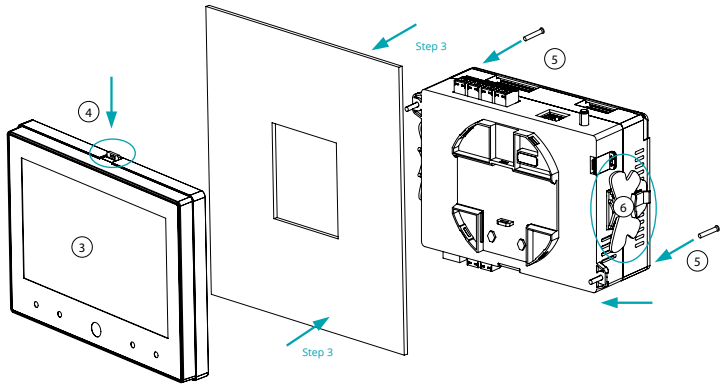


Figure 2-3d Acuvim 3 Panel Installation

2.3 Wiring

2.3.1 Terminals

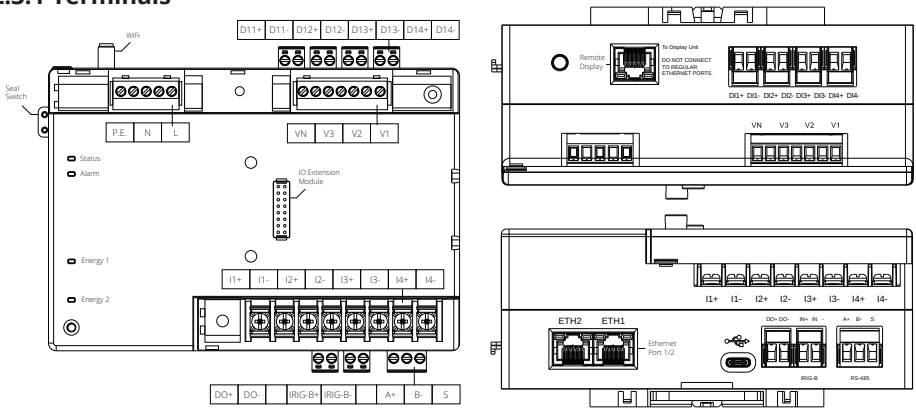


Figure 2-4 Acuvim 3 Terminals

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.

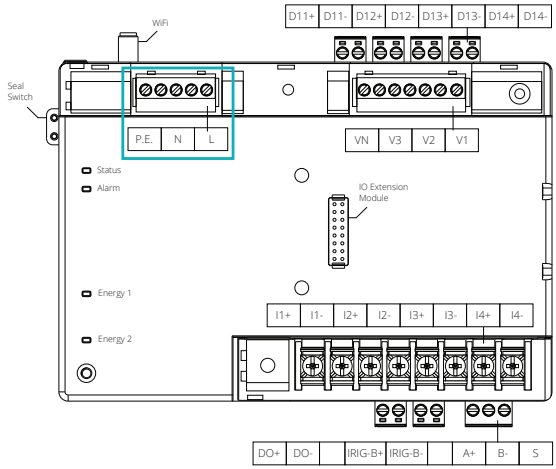


Figure 2-5 Acuvim 3 Power Supply

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.

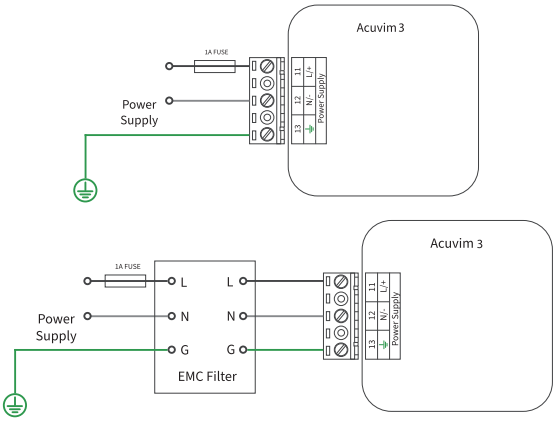


Figure 2-6 Acuvim 3 Power Supply with EMC Filter

2.3.4 Voltage Input Wiring

Voltage Input Terminal

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

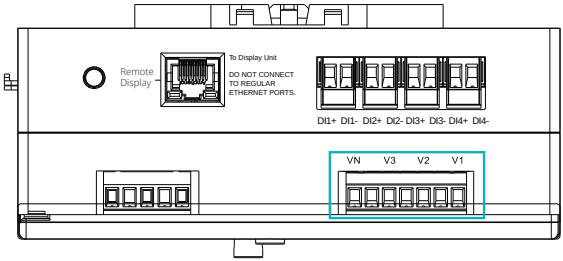


Figure 2-7 Acuvim 3 Voltage Input Terminals

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

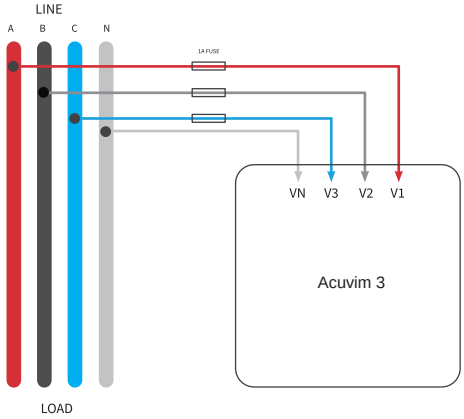
appropriate PT to maintain the measurement accuracy of the Acuvim 3. When connecting using the star configuration wiring method, the PT's primary side rated voltage should be equal to or close to the phase voltage of the system to utilize the full range of the PT. When connecting using the delta configuration 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 AWG28~12.

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)

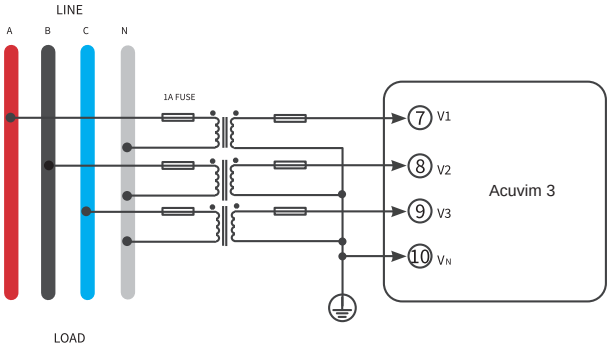
Three-element four-wire Wye mode is commonly used in low-voltage electric distribution systems. For voltages lower than 400LN/690LL, the voltage lines can be connected directly to the Acuvim 3's voltage input terminal as shown in the following figure.



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.

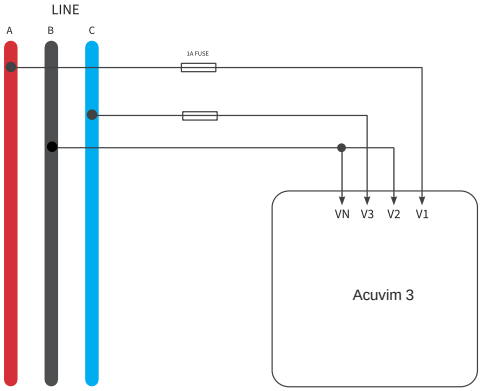


3 Element 4 Wire Y (3LN-PT Applied)

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

2 Element 3 Wire Delta Mode (3LL)

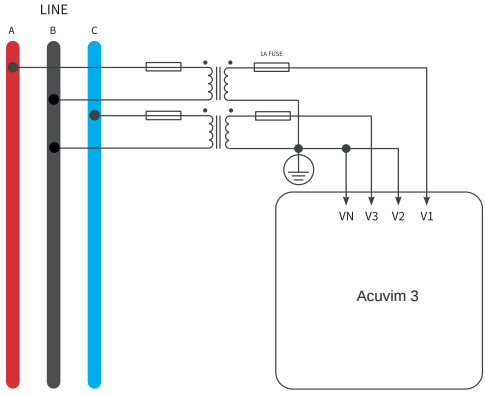
Two-element three-wire Delta mode is commonly used in low voltage electric distribution systems. For voltages lower than 400LN/690LL, the voltage lines can be connected directly to the Acuvim 3's voltage input terminal, as shown in the following figure.



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.

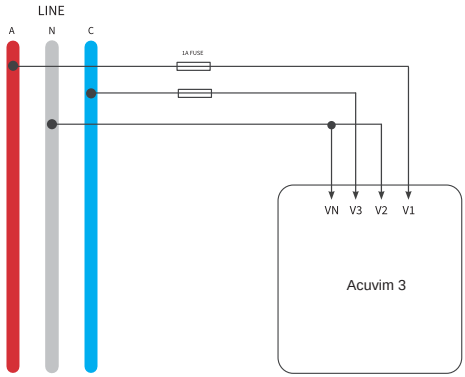


2 Element 3 Wire Delta (3LL-PT Applied)

Figure 2-9b 2 Element 3 Wire Delta Voltage Wiring Method

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.

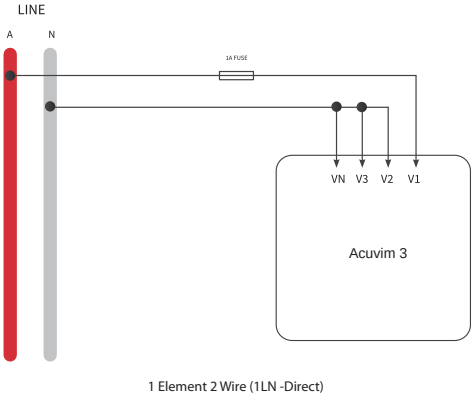


Figure 2-11a 1 Element 2 Wire Direct Voltage Wiring Method

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

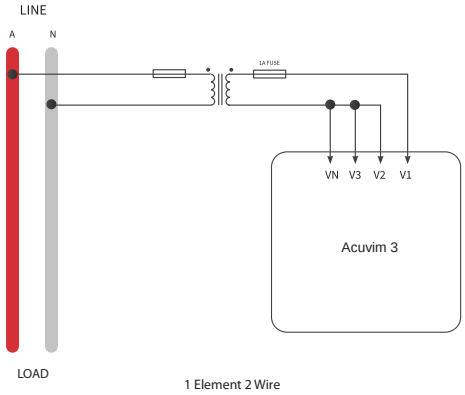


Figure 2-11b 1 Element 2 Wire Voltage Wiring Method

V_n Connection

V_n is the reference point of the Acuvim 3 voltage input. Low wire resistance helps improve the measurement accuracy. Different system wiring modes require different V_n 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 AWG22~12.

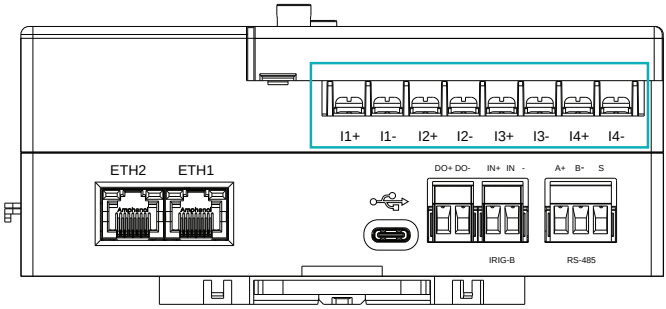


Figure 2-12 Current Input Terminal

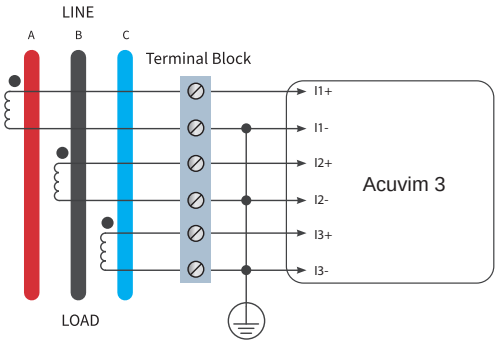
The Acuvim 3 has a current input terminal with eight current input channels available to include four current transformers.

- 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

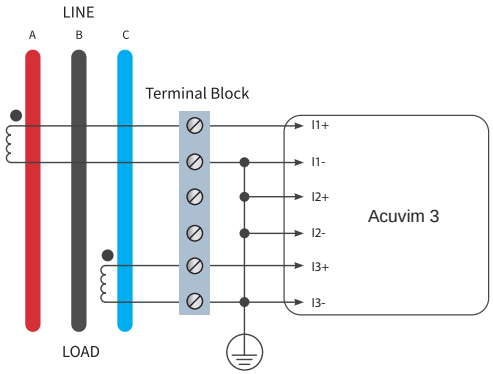
3CT



2 Elements 3 Wire Delta - 3CT

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

2CT



2 Elements 3 Wire Delta - 2CT

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

1CT

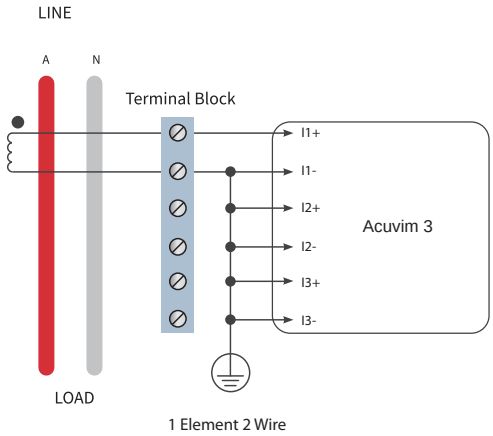


Figure 2-15 1 Element 2 Wire Current Wiring Method

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

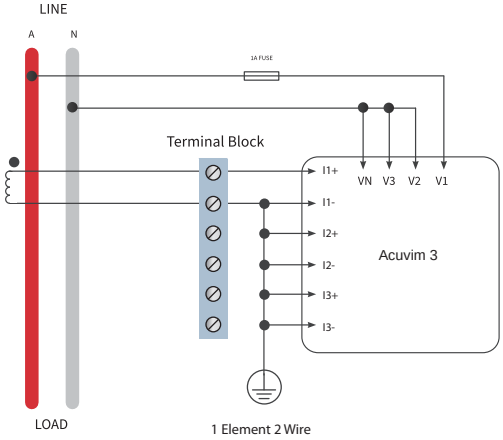


Figure 2-16 1 Element 2 Wire Wiring Method

2 Element 3 Wire 1 Phase

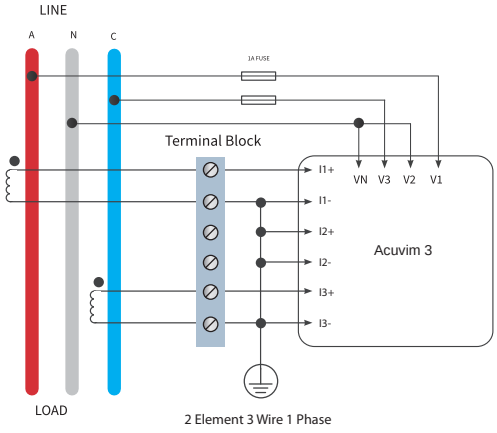


Figure 2-17 2 Element 3 Wire 1 Phase Wiring Method

2 Element 3 Wire Delta – 3CT

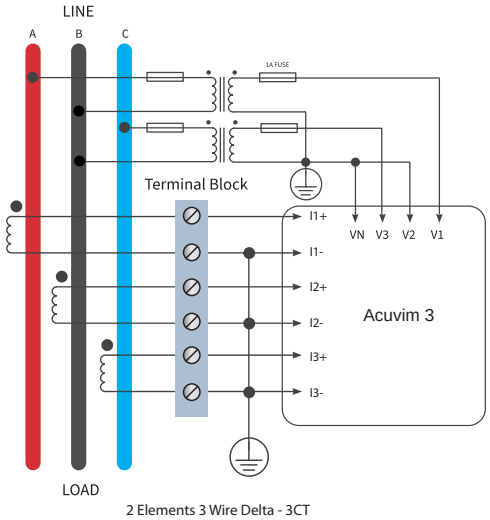


Figure 2-18 2 Element 3 Wire Delta 3 CT Wiring Method

2 Element 3 Wire Delta – 2CT

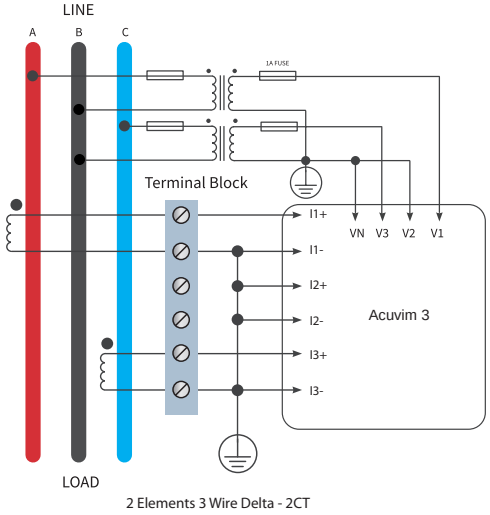


Figure 2-19 2 Element 3 Wire Delta 2 CT Wiring Method

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.

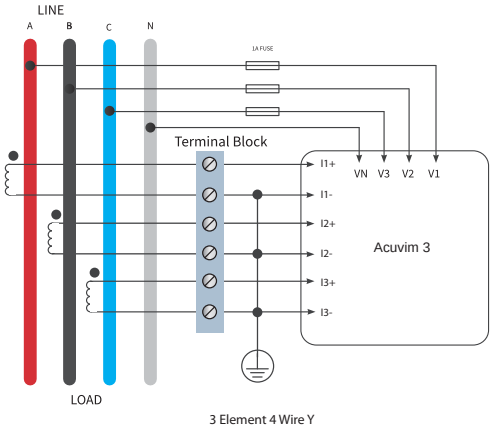


Figure 2-20 3 Element 4 Wire Wye Wiring Method

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

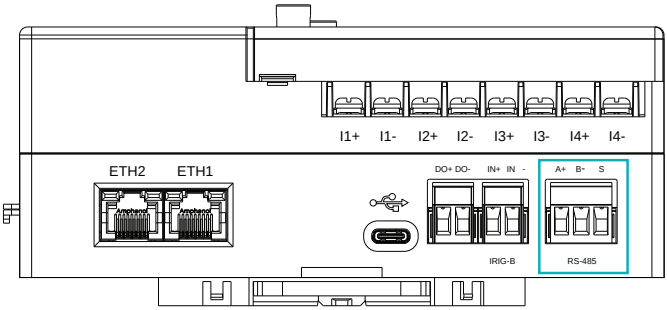


Figure 2-21 Acuvim 3 RS-485 Port

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 (0.32mm²) or higher. The overall length of the RS485 cable connecting all devices should not exceed 1200m (4000ft) for optimal performance.

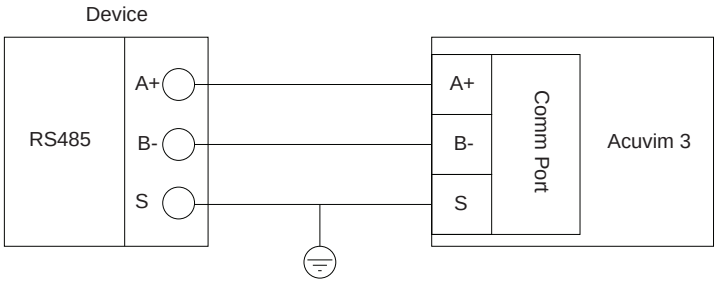


Figure 2-22 RS485 Connection to Acuvim 3

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 120Ω-300Ω/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.

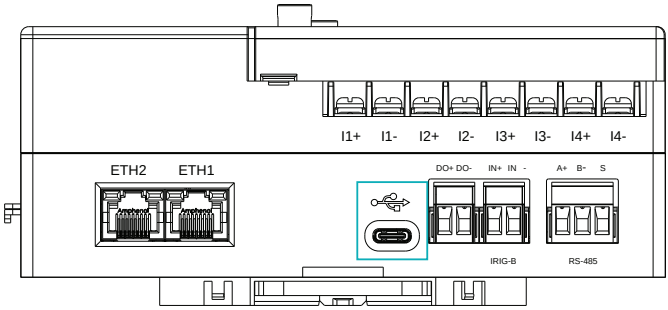


Figure 2-23 Acuvim 3 Type C USB Port

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.

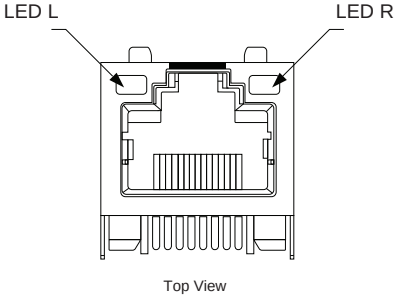


Figure 2-24 RJ45 Connector

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.

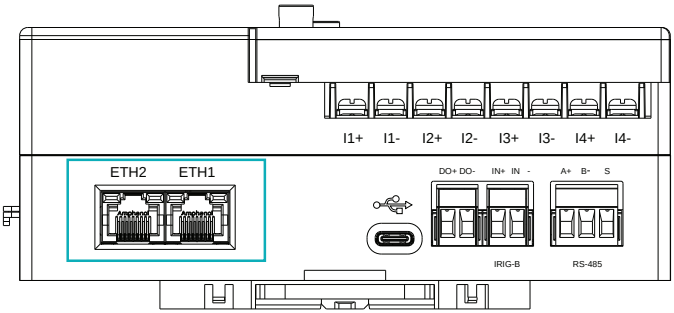


Figure 2-25 Acuvim 3 Ethernet Port

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.

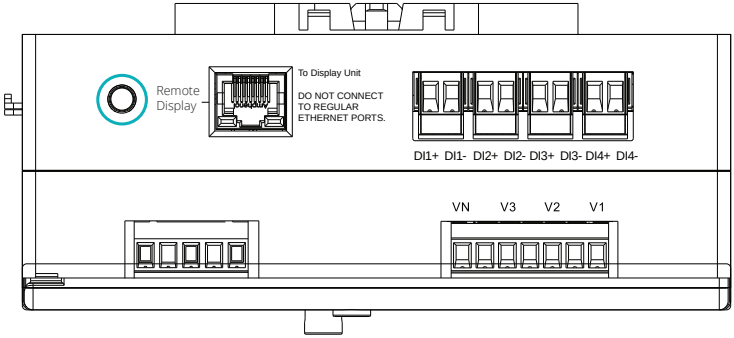


Figure 2-26 Acuvim 3 External Antenna Port

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.

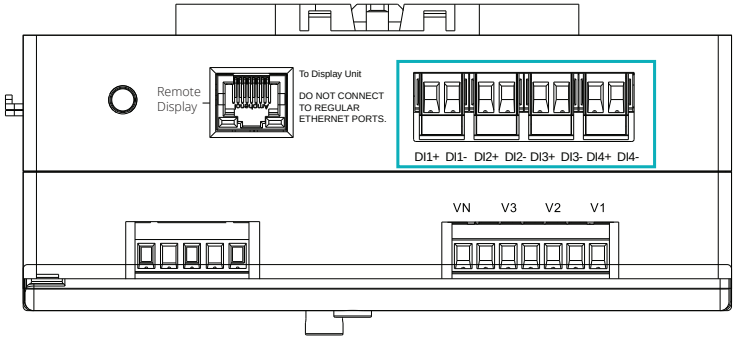


Figure 2-27 Acuvim 3 Onboard DI Port

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.

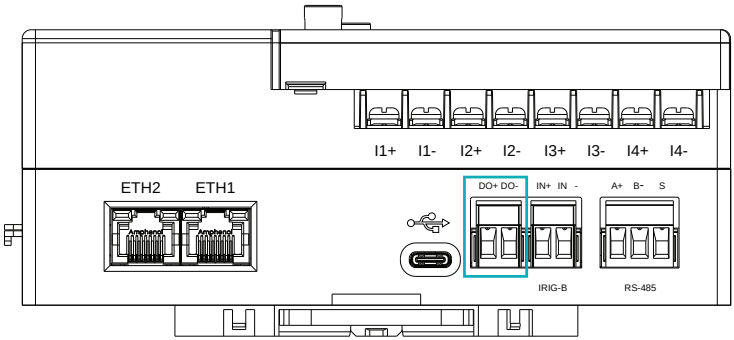


Figure 2-28 Acuvim 3 Onboard DO Port

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

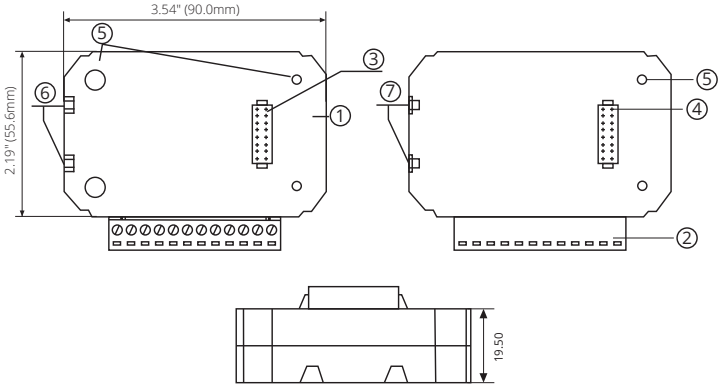


Figure 3-1 I/O Module Dimensions

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.

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.

- 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 **AI1+** to **AI2-** 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.

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.

NOTE: Use a small, flat screwdriver to remove the external port cover from the back of the Acuvim 3.

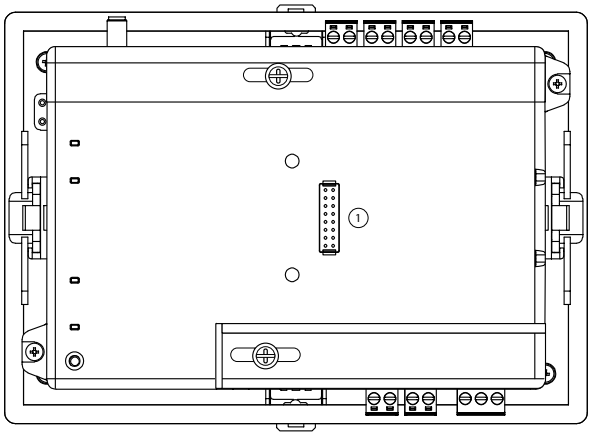


Figure 3-5 External Port Cover

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.

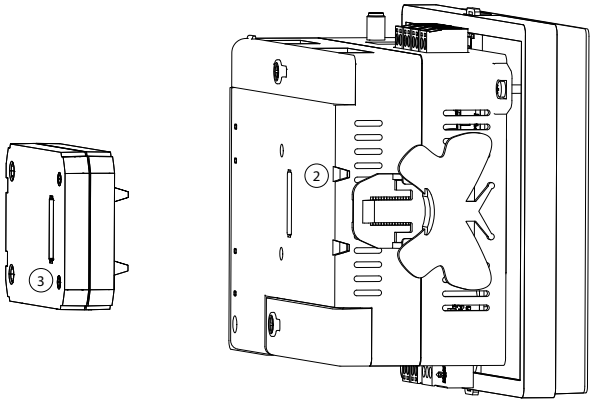


Figure 3-6 Installation of I/O Module to Acuvim 3 Meter

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.

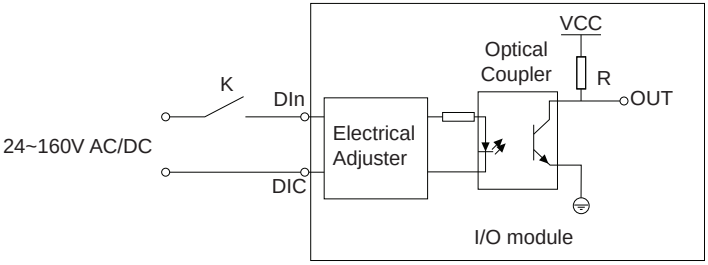


Figure 3-7 Digital Input Wiring Schematic

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

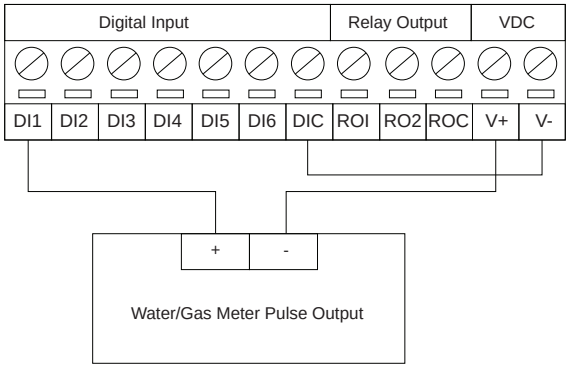


Figure 3-8 Digital Input Pulse Counter Wiring Using 24Vdc on AXM-IO1 Module

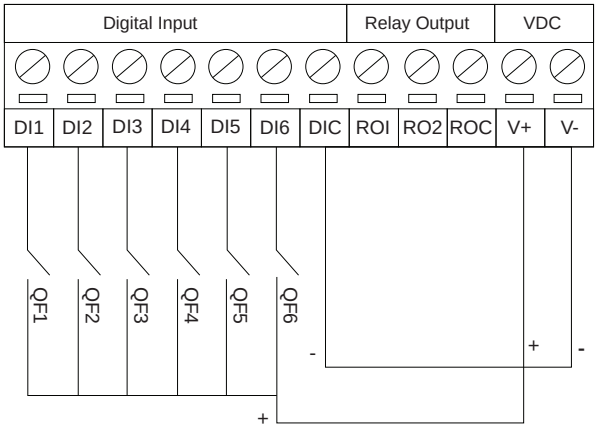


Figure 3-9 Multiple Channel Digital Input Wiring Using 24Vdc on AXM-IO1 Module

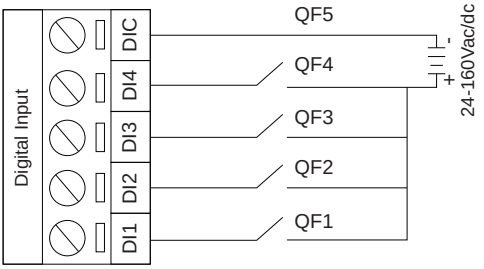


Figure 3-10 Digital Input Wiring Using AXM-IO2 and AXM-IO3 Modules

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

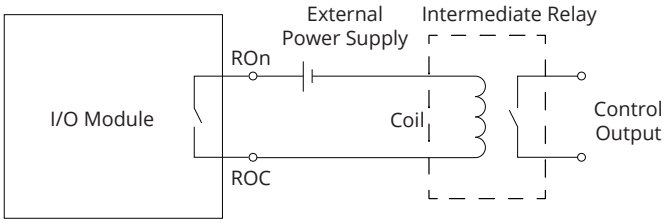


Figure 3-11 Relay Output Diagram

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.

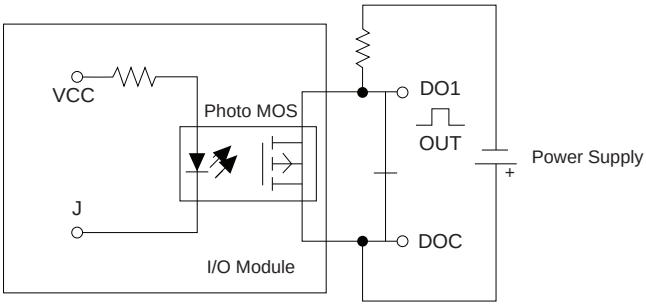


Figure 3-12 Digital Output Circuit

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.

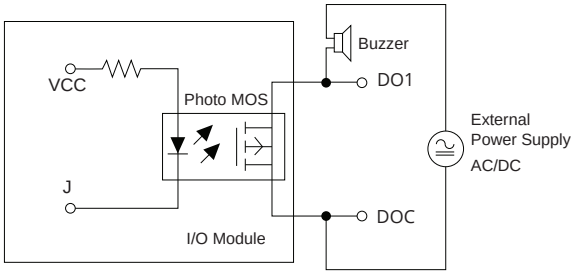


Figure 3-13 Digital Output as Alarm Mode

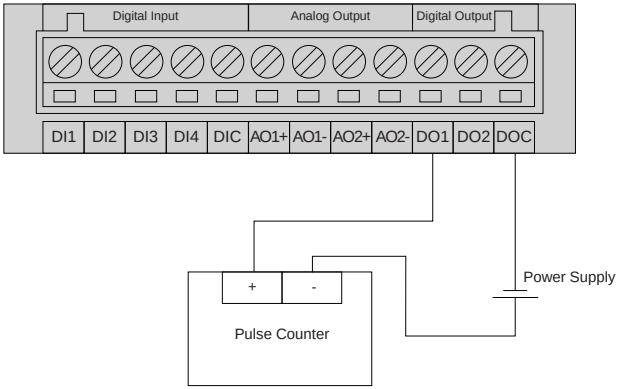


Figure 3-14 Digital Output to Pulse Counter

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

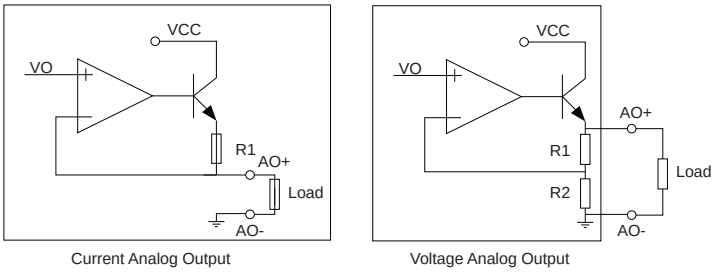


Figure 3-15 Analog Output Circuit for Voltage and Current on AXM-IO2 Module

Analog Output Ratings

- **For the current output (0-20mA/4-20mA):** The max load resistance is 500Ohms.
- **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.

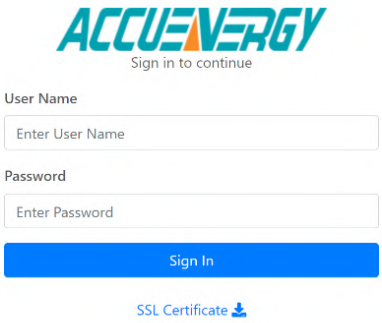


Figure 4-1 Sign In Webpage

Table 4-1 Default Webpage Login Username and Password

Default Login	Username	Password
For configuration/ management	admin	admin
For view	view	view

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

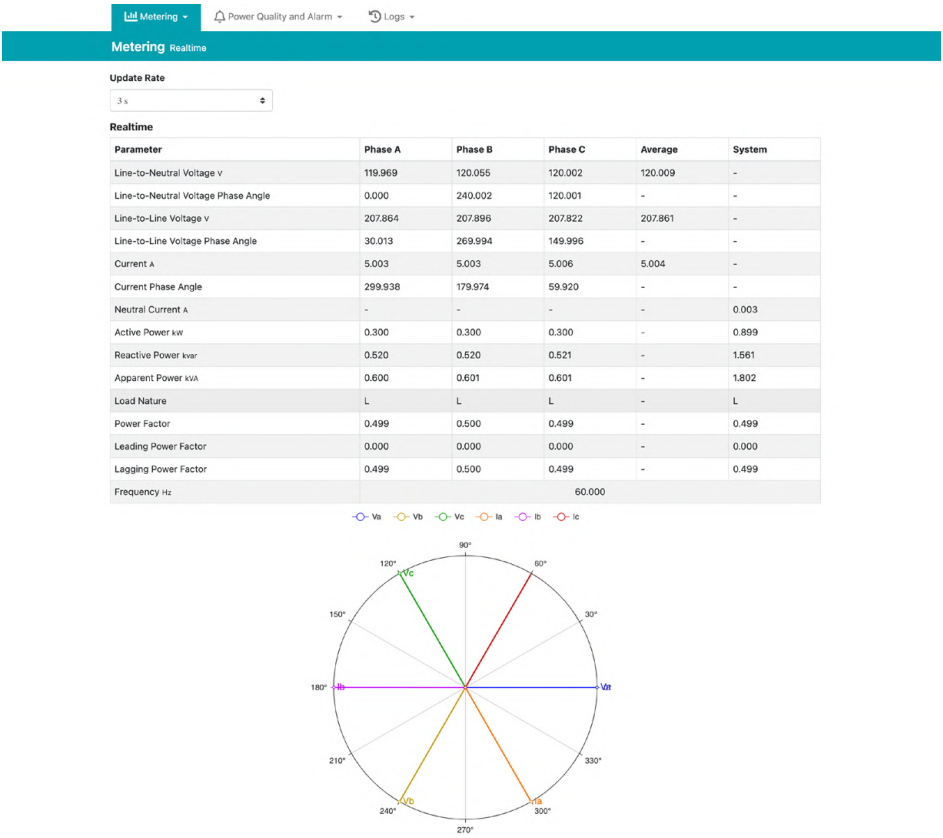


Figure 4-2 Default Metering Webpage

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.

Table 4-2 Acuvim 3 Webpages Hierarchical Structure

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

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

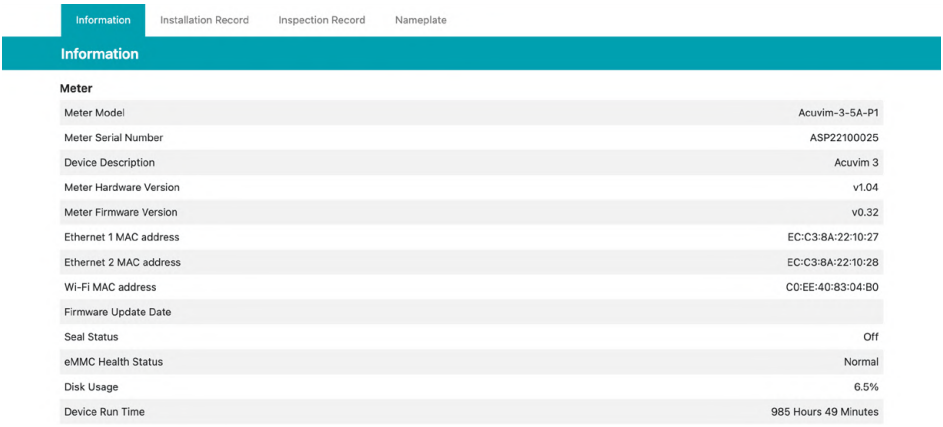


Figure 4-3 Information Webpage

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.

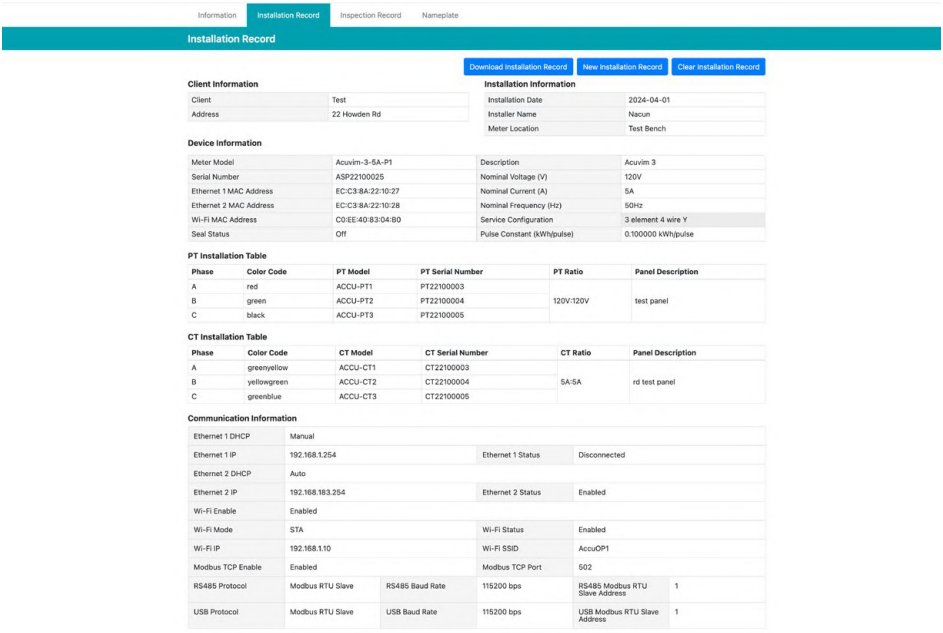


Figure 4-4 Installation Record Webpage

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.

Table 4-4 Acuvim 3 Installation Record Structure

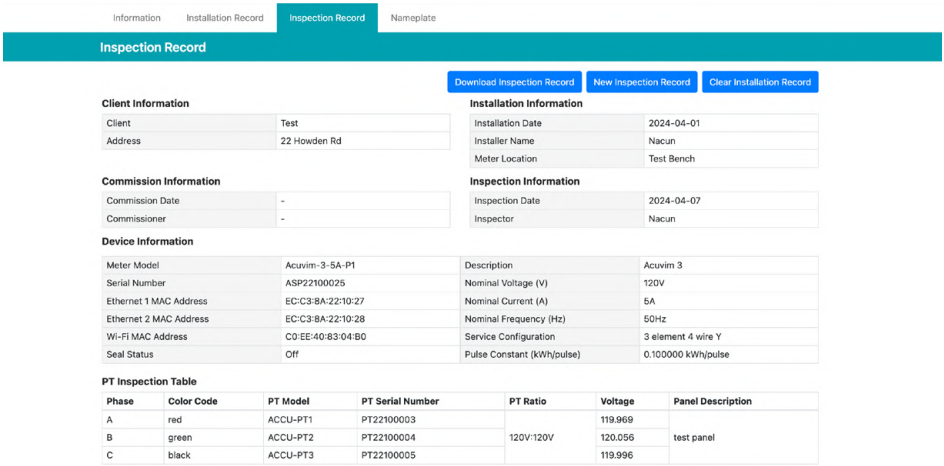
Information Type	Field	Input Source
Client Information	Client Address	Manual input
Installation Information	Installation Data Installer Name Meter Location	Manual input
Device Information	Meter Model Serial Number Ethernet1 MAC Address Ethernet2 MAC Address Wi-Fi MAC Address Seal Status Device Description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

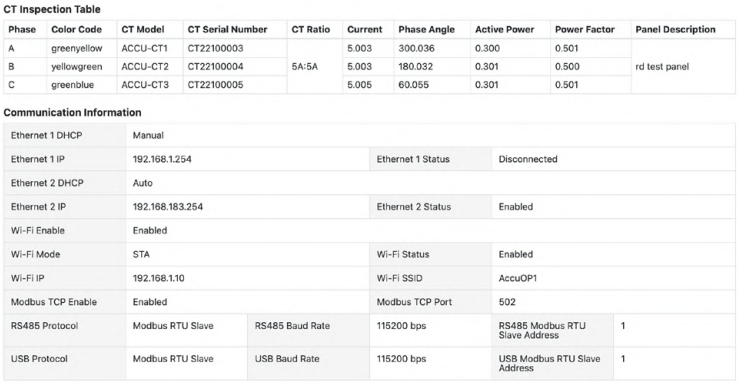
Information Type	Field	Input Source
Communication Information	Ethernet DHCP Type Ethernet Status Ethernet IP Wi-Fi Enable/Disable Wi-Fi Status Wi-Fi Mode Wi-Fi IP Modbus TCP Enable/Disable Modbus TCP Port RS485 Protocol RS485 Baud Rate RS485 Modbus RTU Slave Address USB Protocol USB Baud Rate USB Modbus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

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.





CT Inspection 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	
B	yellowgreen	ACCU-CT2	CT22100004	5A:5A	5.003	180.032	0.301	0.500	rd test panel
C	greenblue	ACCU-CT3	CT22100005		5.005	60.055	0.301	0.501	

Communication Information

Ethernet 1 DHCP	Manual				
Ethernet 1 IP	192.168.1.254		Ethernet 1 Status	Disconnected	
Ethernet 2 DHCP	Auto				
Ethernet 2 IP	192.168.183.254		Ethernet 2 Status	Enabled	
Wi-Fi Enable	Enabled				
Wi-Fi Mode	STA		Wi-Fi Status	Enabled	
Wi-Fi IP	192.168.1.10		Wi-Fi SSID	AccuOP1	
Modbus TCP Enable	Enabled		Modbus TCP Port	502	
RS485 Protocol	Modbus RTU Slave	RS485 Baud Rate	115200 bps	RS485 Modbus RTU Slave Address	1
USB Protocol	Modbus RTU Slave	USB Baud Rate	115200 bps	USB Modbus RTU Slave Address	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.

Table 4-5 Acuvim 3 Inspection Record Structure

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

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

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

4.2.4 Nameplate

To access the Nameplate section,

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

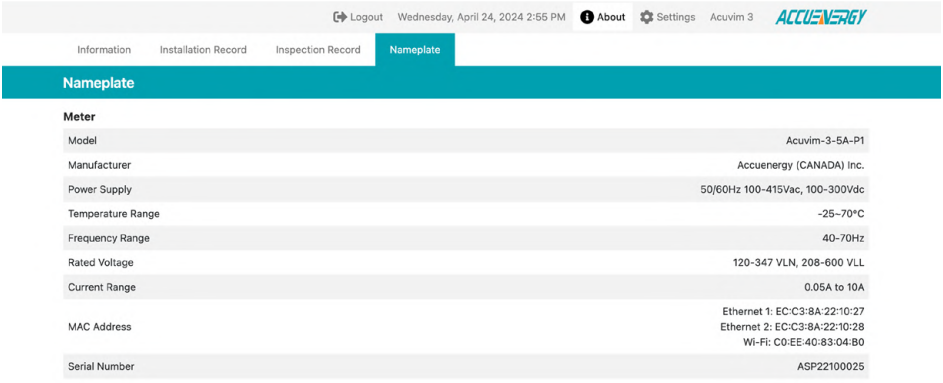


Figure 4-6 Nameplate Webpage

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.

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

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 Range	1A nominal: 0.01A to 2 A 5A nominal: 0.05A to 10A
MAC Address	Unique hardware number on Ethernet 1 adapter. Unique hardware number on Ethernet 2 adapter. Unique hardware number on Wi-Fi adapter.
Serial Number	Unique product serial number.

Table 4-7 Acuvim 3 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
Current Range	1A nominal: 0.01A to 2 A 5A nominal: 0.05A to 10A (only show the applied nominal setting)
Pulse Constant	Kwh/pulse Pulse/kwh (applied pulse constant settings)
MC Approval Number	AE-xxxx
MAC Address	Unique hardware number on Ethernet 1 adapter. Unique hardware number on Ethernet 2 adapter. Unique hardware number on Wi-Fi adapter.
Serial Number	Unique product serial number

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.

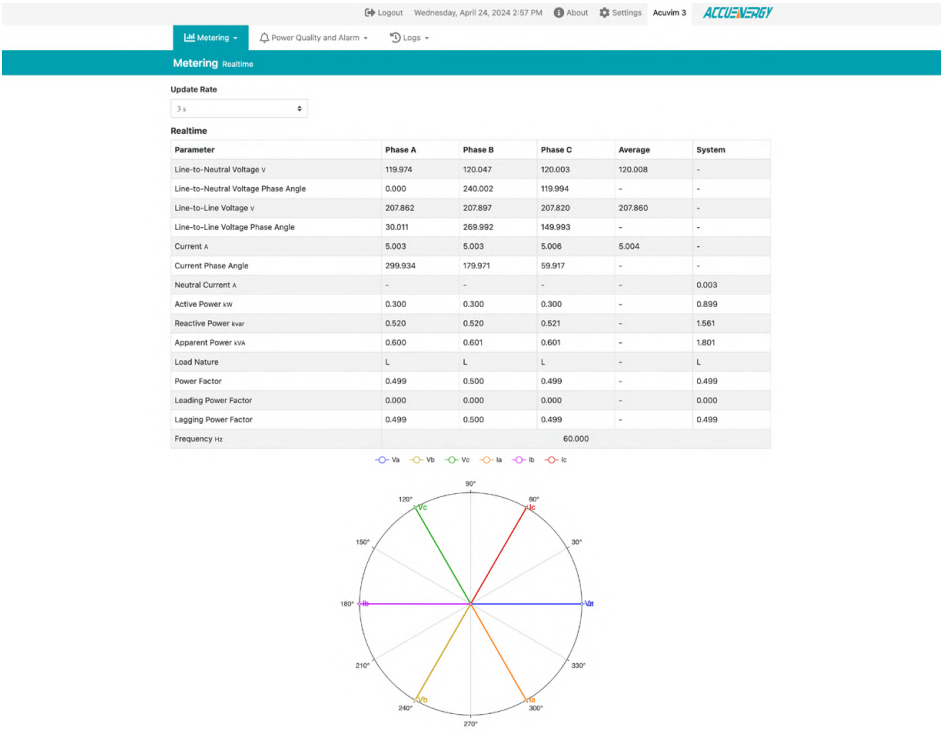


Figure 4-7 Realtime Readings Webpage

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.

Table 4-8 Acuvim 3 Realtime Parameters

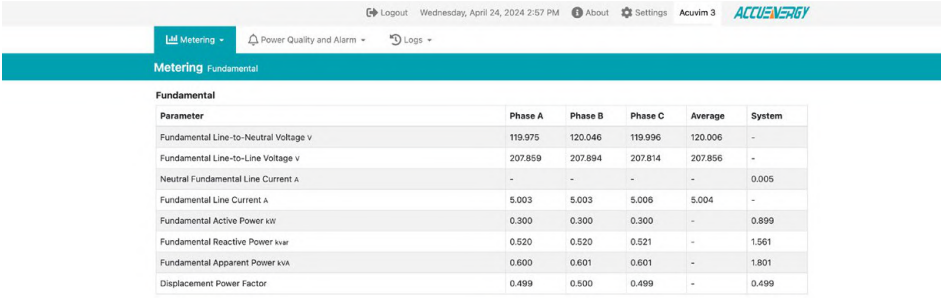
Parameters	Accuracy	Resolution	Range
Line-to-Neutra Voltage Magnitude	0.1%	0.001	10V~1000kV
Line-to-Neutra Voltage Angle	0.1%	0.001°	0.000°~359.999°
Line-to-Line Voltage Magnitude	0.1%	0.001	17.3V~1730kV

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 ~999999.999MW
Reactive Power	0.1%	1Var	-999999.999Mvar ~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.



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.

Table 4-9 Acuvim 3 Fundamental Parameters

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

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.

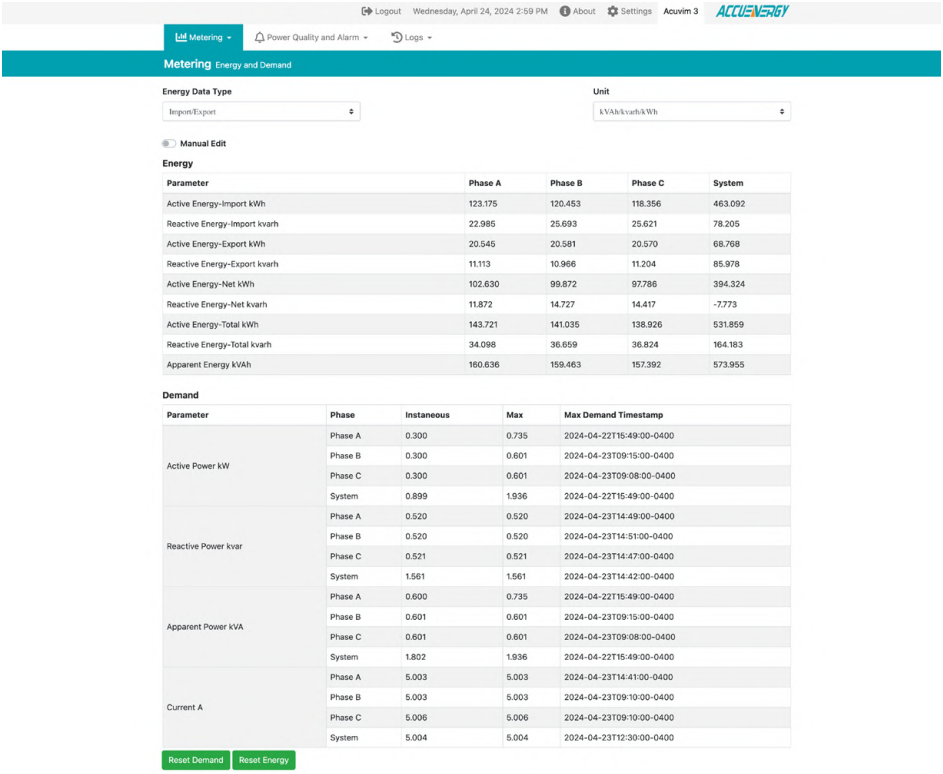


Figure 4-9 Energy and Demand Readings Webpage

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.

Table 4-10 Acuvim 3 Energy Readings

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

Table 4-11 Acuvim 3 Demand Readings

Parameter	Phase	Data Type	Max Demand Timestamp
Active Power (kW)	Phase A Phase B Phase C System	Instantaneous Max	•
Reactive Power (kvar)	Phase A Phase B Phase C System		
Apparent Power (kVA)	Phase A Phase B Phase C System		
Current (A)	Phase A Phase B 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:

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

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.

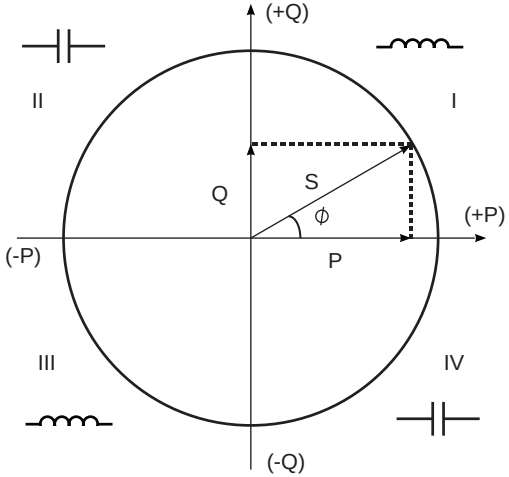


Figure 4-10 Four Quadrant PQS and Load Types

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:

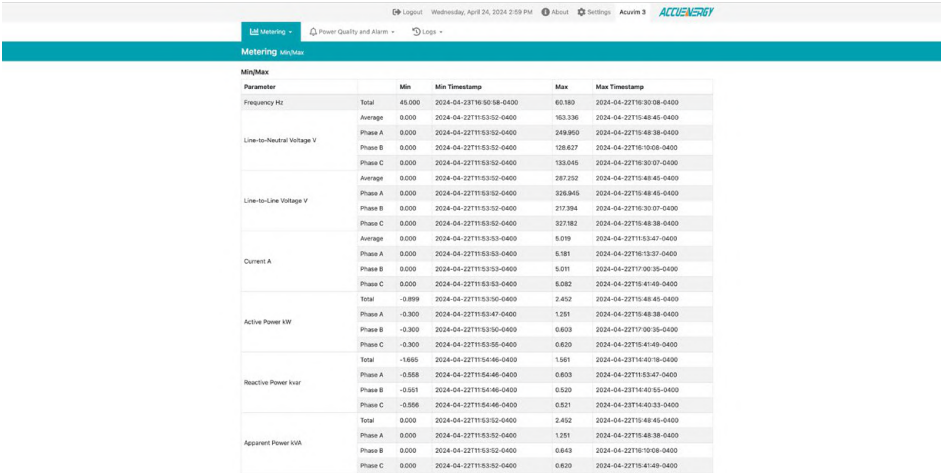
$$Eq_{Q1} = \int_{t1}^{t2} Q(t)dt \ \ when\, P \geq 0 \& Q \geq 0$$

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.



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
Line-to-Neutral Voltage V	Average	0.000	2024-04-22T11:53:52-0400	163.336	2024-04-22T15:48:45-0400
	Phase A	0.000	2024-04-22T11:53:52-0400	249.950	2024-04-22T15:48:38-0400
	Phase B	0.000	2024-04-22T11:53:52-0400	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
Line-to-Line Voltage V	Average	0.000	2024-04-22T11:53:52-0400	287.252	2024-04-22T15:48:45-0400
	Phase A	0.000	2024-04-22T11:53:52-0400	326.945	2024-04-22T15:48:45-0400
	Phase B	0.000	2024-04-22T11:53:52-0400	217.394	2024-04-22T16:30:07-0400
	Phase C	0.000	2024-04-22T11:53:52-0400	327.182	2024-04-22T15:48:38-0400
Current A	Average	0.000	2024-04-22T11:53:53-0400	5.019	2024-04-22T11:53:47-0400
	Phase A	0.000	2024-04-22T11:53:53-0400	5.181	2024-04-22T16:13:37-0400
	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
Active Power kW	Total	-0.899	2024-04-22T11:53:50-0400	2.452	2024-04-22T15:48:45-0400
	Phase A	-0.300	2024-04-22T11:53:47-0400	1.251	2024-04-22T15:48:38-0400
	Phase B	-0.300	2024-04-22T11:53:50-0400	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
Reactive Power kvar	Total	-1.665	2024-04-22T11:54:46-0400	1.561	2024-04-23T14:40:18-0400
	Phase A	-0.558	2024-04-22T11:54:46-0400	0.603	2024-04-22T11:53:47-0400
	Phase B	-0.561	2024-04-22T11:54:46-0400	0.520	2024-04-23T14:40:55-0400
	Phase C	-0.556	2024-04-22T11:54:46-0400	0.521	2024-04-23T14:40:33-0400
Apparent Power kVA	Total	0.000	2024-04-22T11:53:52-0400	2.452	2024-04-22T15:48:45-0400
	Phase A	0.000	2024-04-22T11:53:52-0400	1.251	2024-04-22T15:48:38-0400
	Phase B	0.000	2024-04-22T11:53:52-0400	0.643	2024-04-22T16:10:08-0400
	Phase C	0.000	2024-04-22T11:53:52-0400	0.620	2024-04-22T15:41:49-0400

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.

Table 4-12 Acuvim 3 Min/Max Readings

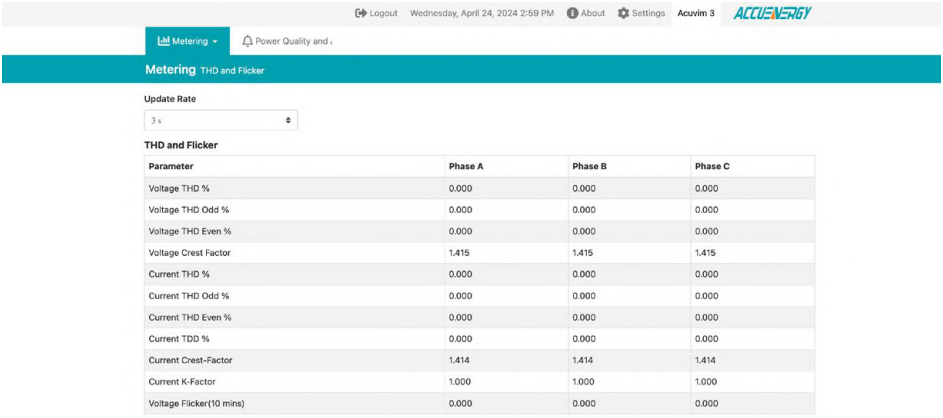
Parameters	Phase	Min Min Timestamp	Max MaxTimestamp
Frequency	Total	•	•
Line-to-Neutral Voltage	Average PhaseA PhaseB PhaseC	•	•
Line-to-Line Voltage	Average PhaseA PhaseB PhaseC	•	•

Parameters	Phase	Min Min Timestamp	Max MaxTimestamp
Current	Average PhaseA PhaseB PhaseC	•	•
Active Power	Total PhaseA PhaseB PhaseC	•	•
Reactive Power	Total PhaseA PhaseB PhaseC	•	•
Apparent Power	Total PhaseA PhaseB PhaseC	•	•
Leading Power Factor	Total PhaseA PhaseB PhaseC	•	•
Lagging Power Factor	Total PhaseA PhaseB 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.



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
Voltage Flicker(10 mins)	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.

Table 4-13 Acuvim 3 THD and Flicker Readings

Parameters	Phase	Update Rate		
		3 Seconds	10 minutes	2 hours
Voltage THD	PhaseA PhaseB PhaseC	•	•	•
Voltage THD Odd	PhaseA PhaseB PhaseC	•	•	•
Voltage THD Even	PhaseA PhaseB PhaseC	•	•	•

Parameters	Phase	Update Rate		
		3 Seconds	10 minutes	2 hours
Voltage Crest Factor	PhaseA PhaseB PhaseC	•	•	•
Current THD	PhaseA PhaseB PhaseC	•	•	•
Current THD Odd	PhaseA PhaseB PhaseC	•	•	•
Current THD Even	PhaseA PhaseB PhaseC	•	•	•
Current TDD	PhaseA PhaseB PhaseC	•	•	•
Current Crest-Factor	PhaseA PhaseB PhaseC	•	•	•
Current K-Factor	PhaseA PhaseB PhaseC	•	•	•
Voltage Flicker (10minutes)	PhaseA PhaseB PhaseC	•	•	N/A
Voltage Flicker (2hours)	PhaseA PhaseB PhaseC	N/A	N/A	•

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 3rd, 5th, 7th, etc.

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

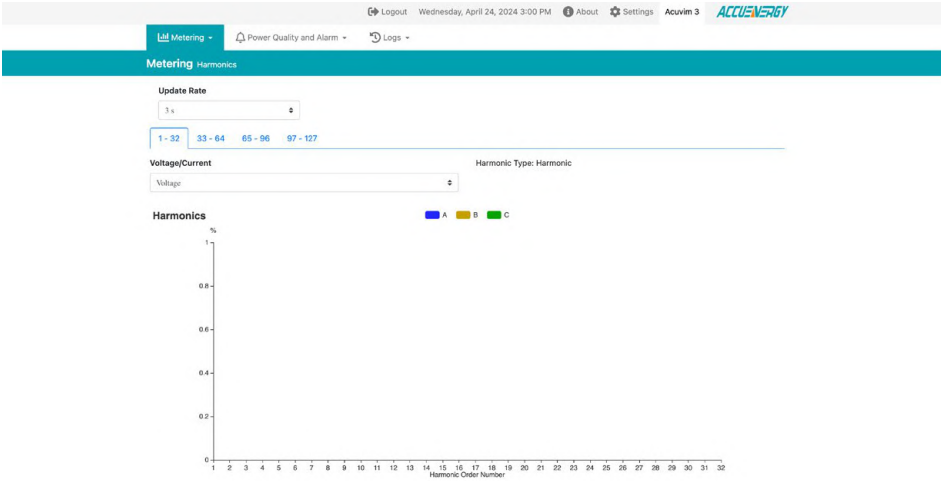
Crest Factor: The ratio between either the peak current or voltage and the RMS value.

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.



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.

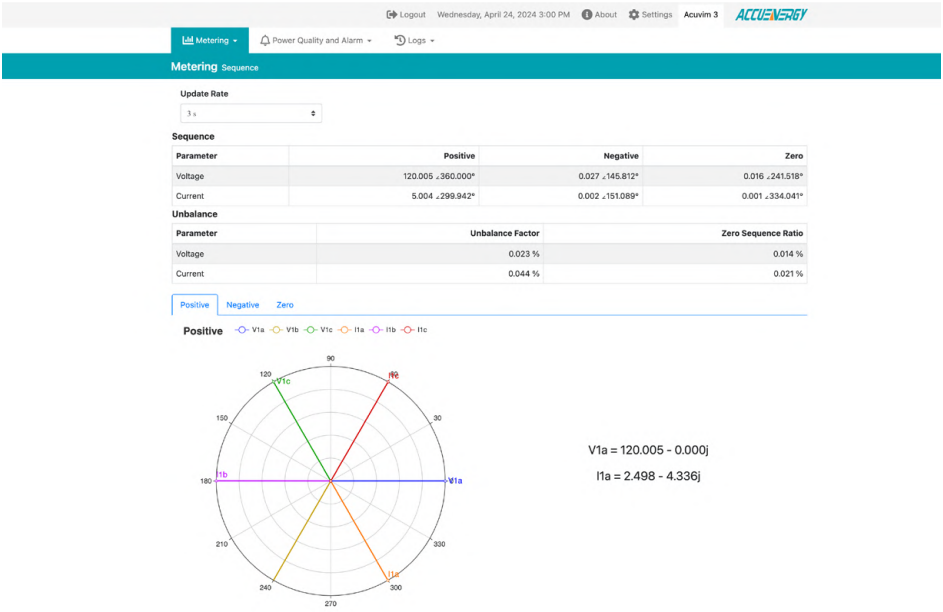


Figure 4-14 Sequence Readings Webpage

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.

Table 4-14 Acuvim 3 Sequence Readings

Sequence Reading					
Parameter	Sequence	Resolution	Update Rate		
			3 Seconds	10 minutes	2 hours
Voltage Magnitude	Positive Negative Zero	0.001	•	•	•
Voltage Angle		0.001°	•	•	•
Current Magnitude		0.001	•	•	•
Current Angle		0.001°	•	•	•
Real number		0.001	•	•	•
Imaginary number		0.001	•	•	•

Table 4-15 Acuvim 3 Unbalance Readings

Unbalance Reading				
Parameter	Resolution	Update Rate		
		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.

$$I_+ = \frac{1}{3} \times (I_a + aI_b + a^2 I_c)$$

$$V_+ = \frac{1}{3} \times (V_a + aV_b + a^2 V_c)$$

$$a = 1 \angle 120°$$

$$a^2 = 1 \angle 240$$

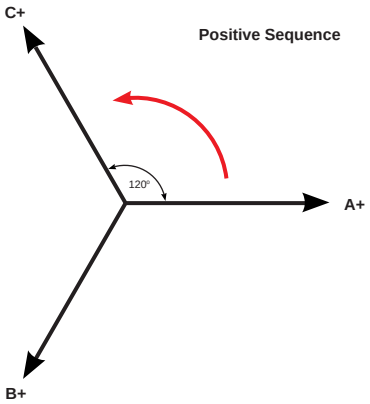


Figure 4-15a Positive Sequence Diagram

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.

$$I_{-} = \frac{1}{3} \times (I_a + a^2 I_b + a I_c)$$
$$V_{-} = \frac{1}{3} \times (V_a + a^2 V_b + a V_c)$$
$$a = 1 \angle 120°$$
$$a^2 = 1 \angle 240$$

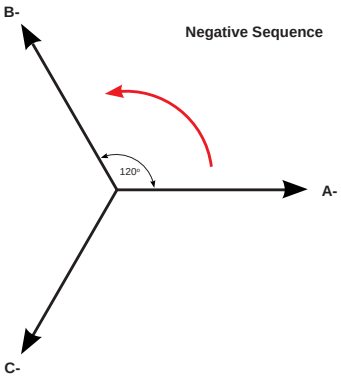


Figure 4-15b Negative Sequence Diagram

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.

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

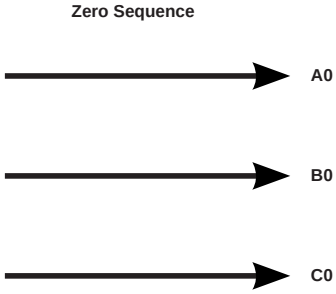


Figure 4-15c Zero Sequence Diagram

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.

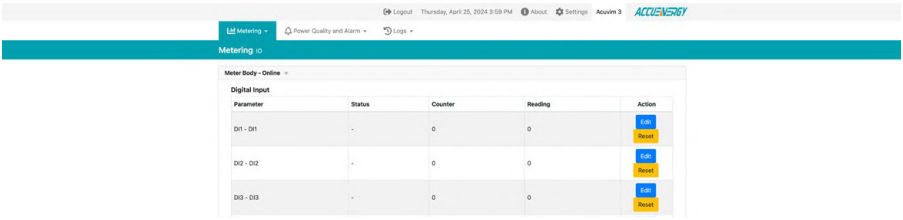


Figure 4-16 I/O Webpage

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.

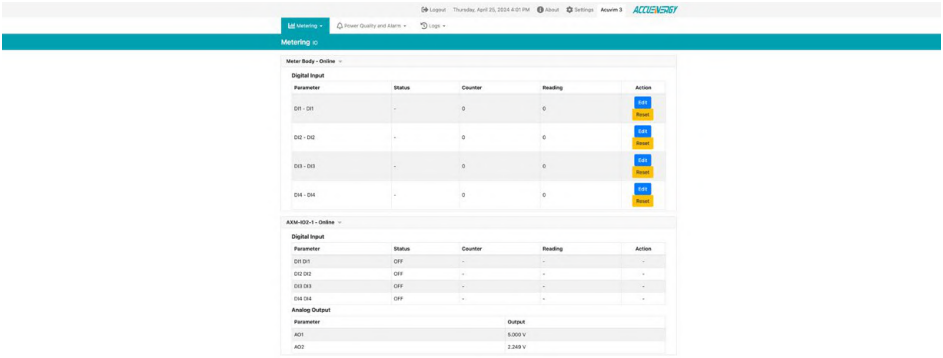


Figure 4-17 I/O Readings Webpage

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.

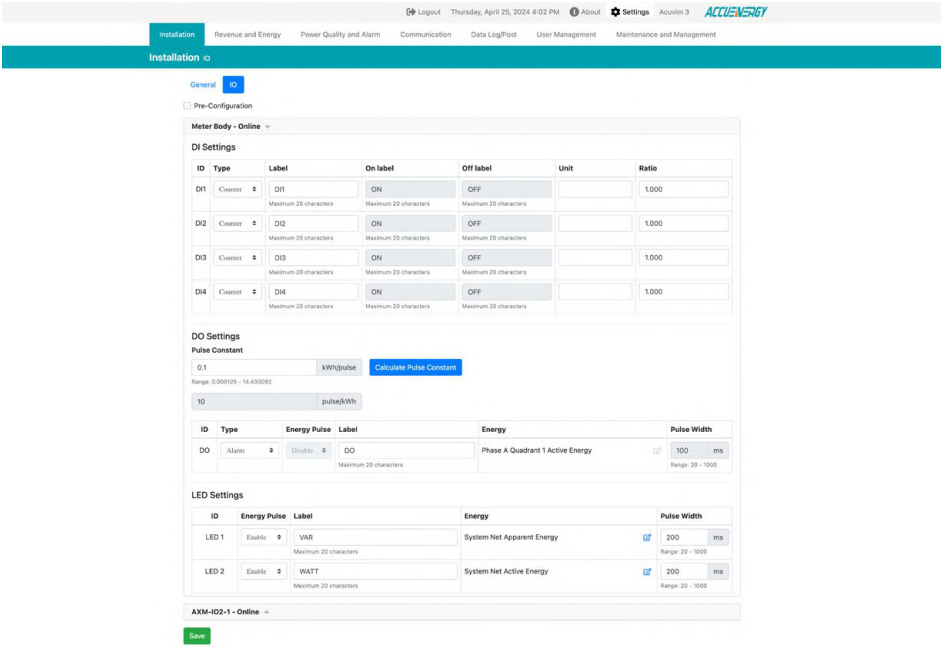


Figure 4-18 I/O Settings Webpage

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.

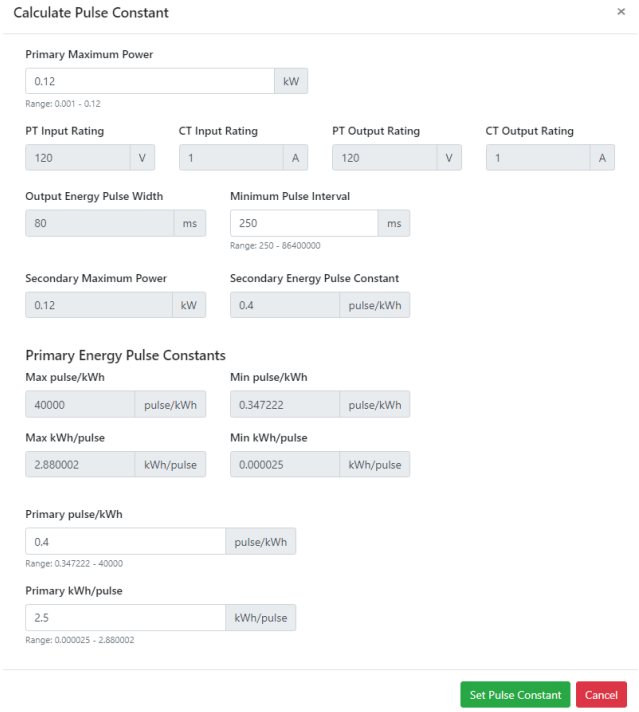


Figure 4-19 Pulse Constant Calculations

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

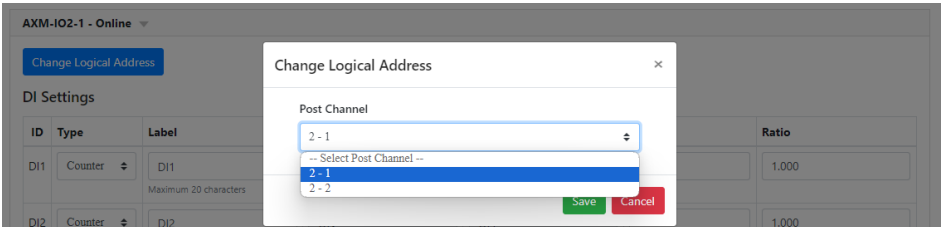


Figure 4-20 Change Logical Address

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.

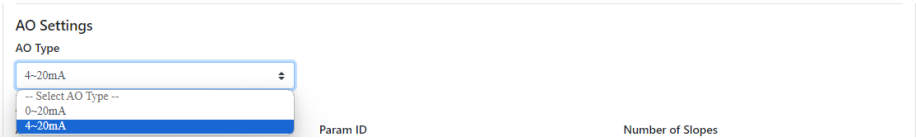


Figure 4-21 Change AO Type

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.

Table 4-16 Acuvim 3 DI Settings

DI							
I/O Module	**I/O ID**	**I/O Type**	**Label**	**On Label**	**Off Label**	**Unit**	**Ratio**
Meter Base	DI1 DI2 DI3 DI4	Counter	•	N/A	N/A	•	•
		Status	•	•	•	N/A	N/A
AXM-IO1	DI1 DI2 DI3 DI4 DI5 DI6	Counter	•	N/A	N/A	•	•
		Status	•	•	•	N/A	N/A
AXM-IO2	DI1 DI2 DI3 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**
AXM-IO3	DI1 DI2 DI3 DI4	Counter	•	N/A	N/A	•	•
		Status	•	•	•	N/A	N/A

Table 4-17 Acuvim 3 DO Settings

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

Table 4-18 Acuvim 3 RO settings

RO							
I/O Module	**I/O ID**	**I/O Type**	**Label**	**On Label**	**Off Label**	**Output Mode**	**Width**
AXM-IO1	RO1 RO2	Relay Control	•	•	•	Latch	20~1000 (ms)
		Alarm	•	•	•	Momentary	
AXM-IO3	RO1 RO2	Relay Control	•	•	•	Latch	
		Alarm	•	•	•	Momentary	

Table 4-19 Acuvim 3 AI settings

I/O Module	I/O ID	I/O Type	Label	Offset	Unit	Ratio
AXM-IO3	AI1 AI2	4~20mA 0~20mA 1~5V 0~5V	•	•	V A W °C °F	•

Table 4-20 Acuvim 3 AO settings

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

I/O Module	I/O ID	I/O Type	Label	Parameter ID	Number of Slopes
AXM-IO2-1 AXM-IO2-2	AO1 AO2	A: 4~20mA B:0~20mA C:1~5V D:0~5V	•	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) Total Reactive Power 10/12 (kvar) Phase A Apparent Power 10/12 (kVA) Phase B Apparent Power 10/12 (kVA) 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)	4

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.

Table 4-21 Acuvim 3 Energy LED Settings

I/O Module	I/O ID	Energy Parameter Setting			Pulse Width
		Channel	Energy PQS	Energy Type	
Meter Base	Energy LED1 Energy LED2	Phase A Phase B Phase C System	Active Energy Reactive Energy Apparent Energy	Quadrant 1 Quadrant 2 Quadrant 3 Quadrant 4 Import Export Net Total	20~1000ms

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.

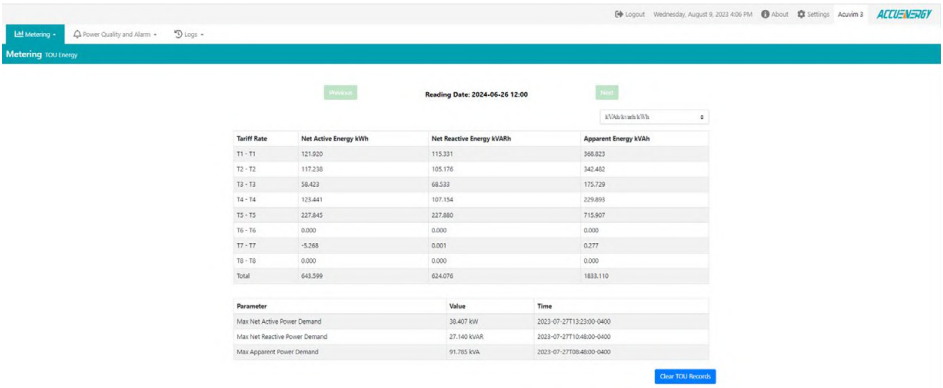


Figure 4-23 TOU Energy Readings Webpage

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.

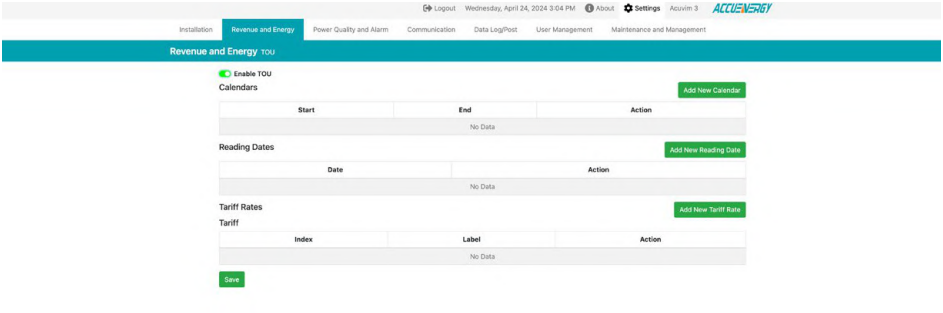


Figure 4-24 Empty TOU Energy Settings Webpage

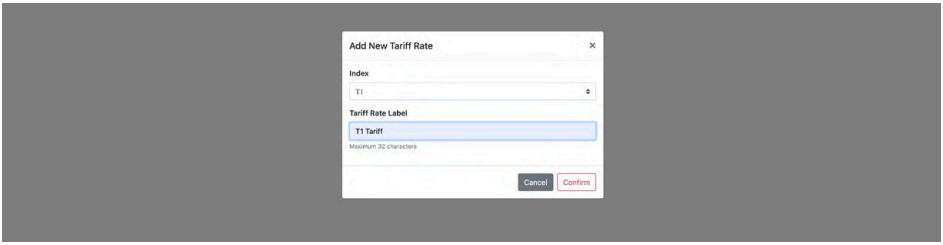


Figure 4-25 TOU Add New Tariff Rate Window

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.

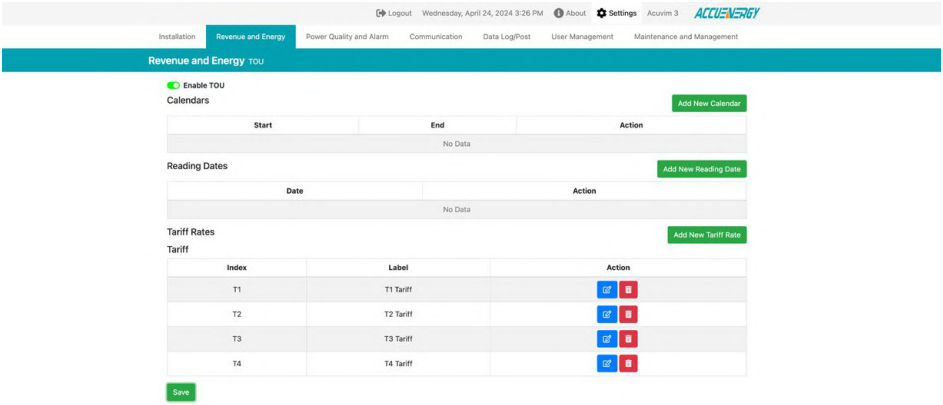


Figure 4-26 TOU Energy Settings Webpage with Tariffs

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.

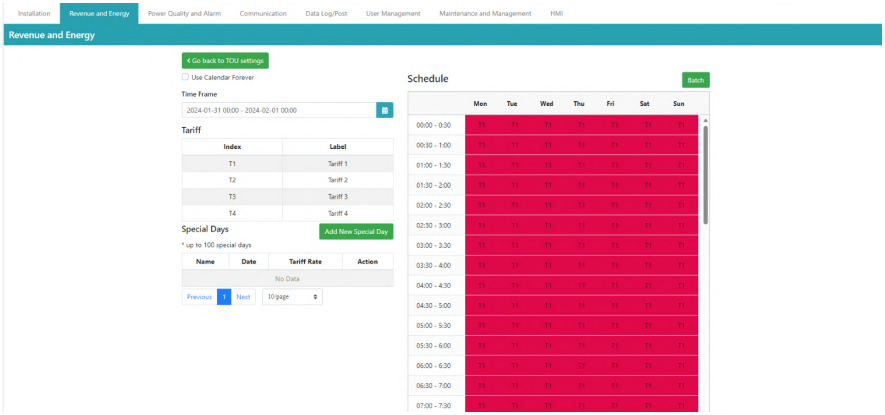


Figure 4-27 Default TOU Schedule Window

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.

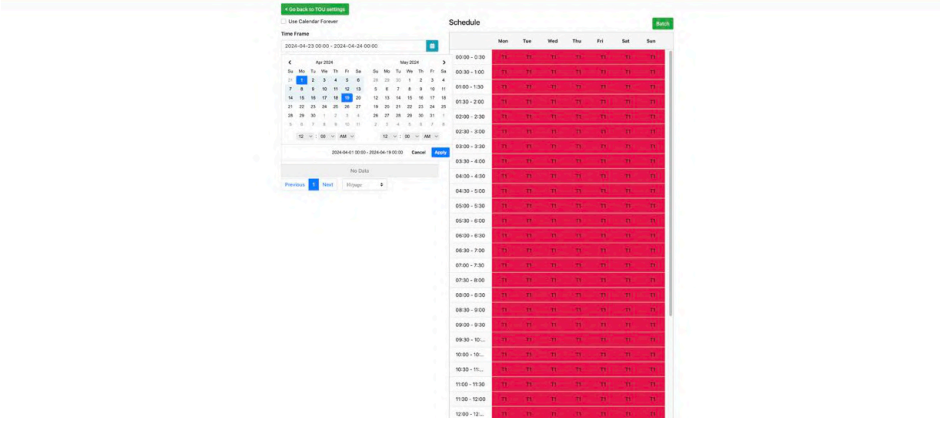


Figure 4-28 Time Frame Selection

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

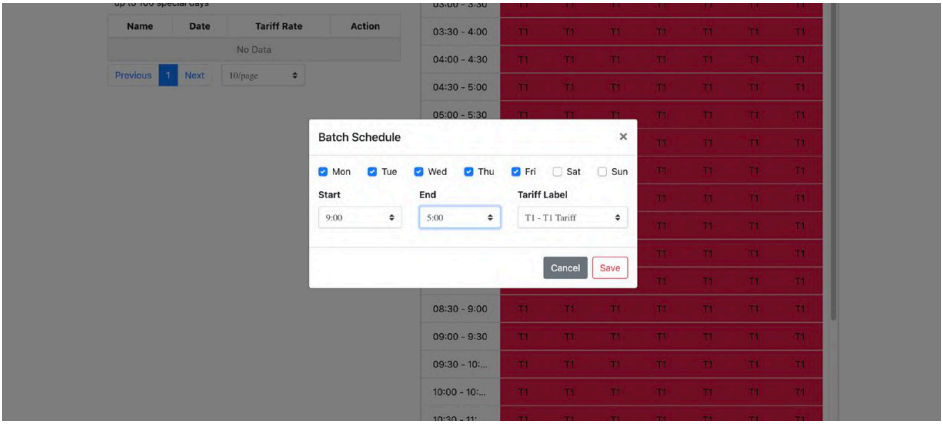


Figure 4-29 Batch Editing Window

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

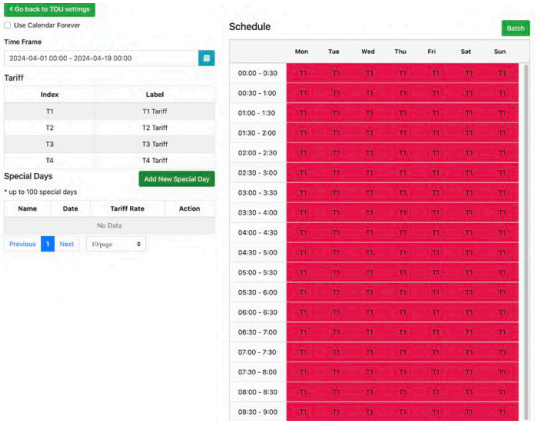


Figure 4-30 TOU Schedule Add New Special Day

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.

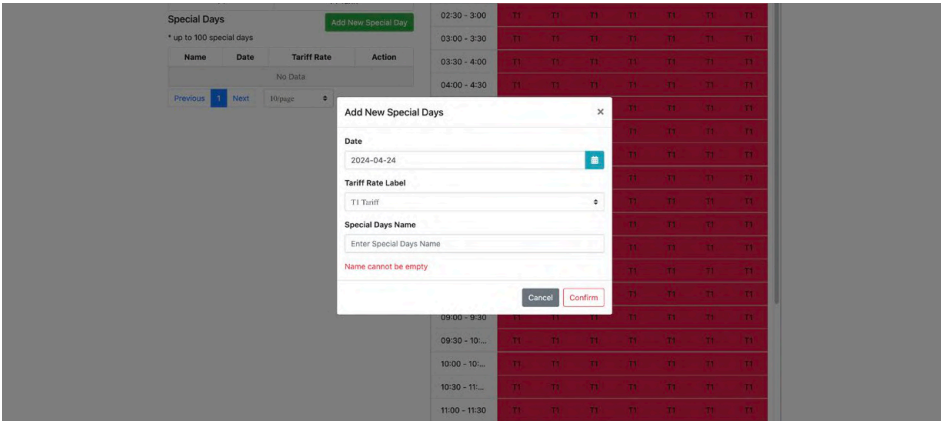


Figure 4-31 Add New Special Day

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

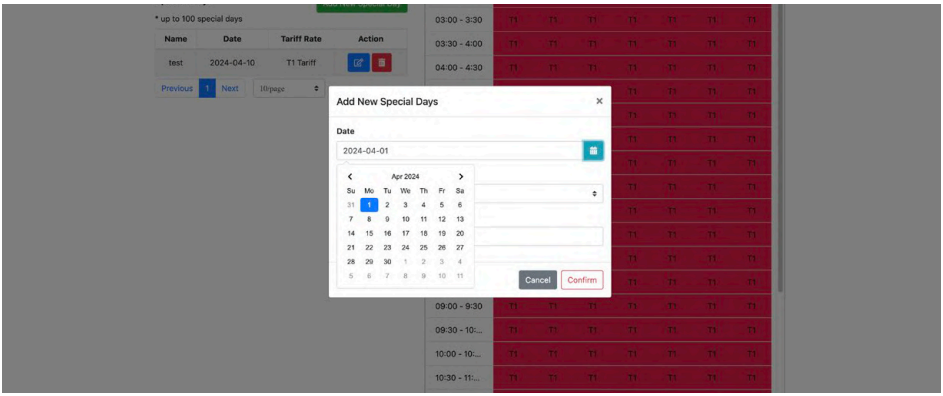


Figure 4-32 Add New Reading Date

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.

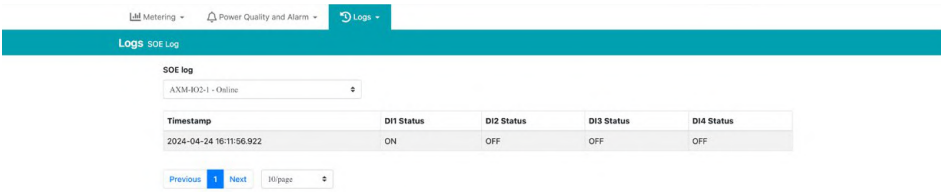


Figure 4-33 SOE Log Webpage

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

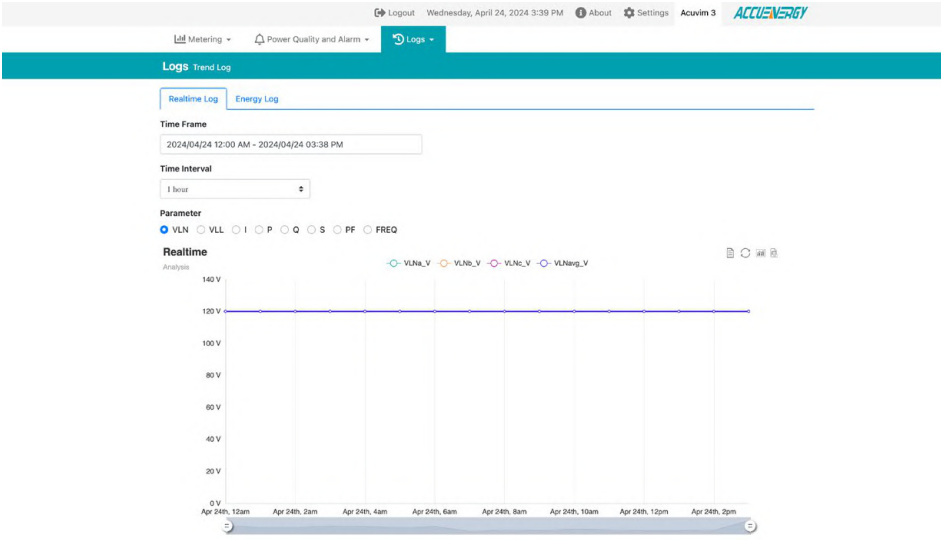


Figure 4-34 Trend Log Realtime Log Webpage

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

Table 4-22 Trend Log Parameters

Realtime Log		
Parameter	**Time Frame**	**Time Interval**
VLNa, VLNb, VLNc, VLNavg VLLab, VLLbc, VLLca, VLLavg Ia,Ib,Ic,Iavg Pa,Pb,Pc,Psys Qa,Qb,Qc,Qsys Sa,Sb,Sc,Ssys PFa,PFb,PFc,PFsys Fsys	Last 10 Minutes Last 1 Hour	1 Minutes
	Today Yesterday	15 Minutes 1 Hour
	Last 7 Days	15 Minutes 1 Hour 1 Day
	Last 30 days This Month	1 Hour 1 Day

Energy Log

Acuvim 3 Trend log includes a section for Energy data.

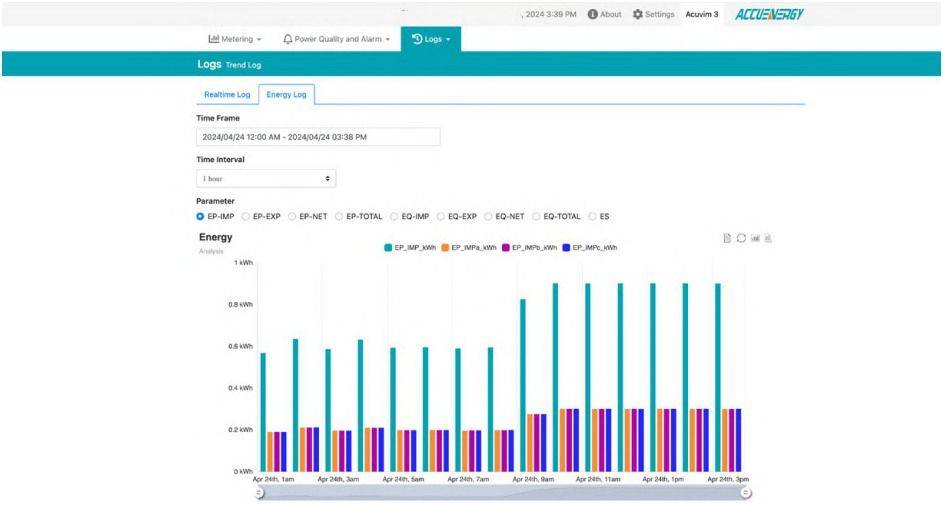


Figure 4-35 Energy Log Webpage

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.

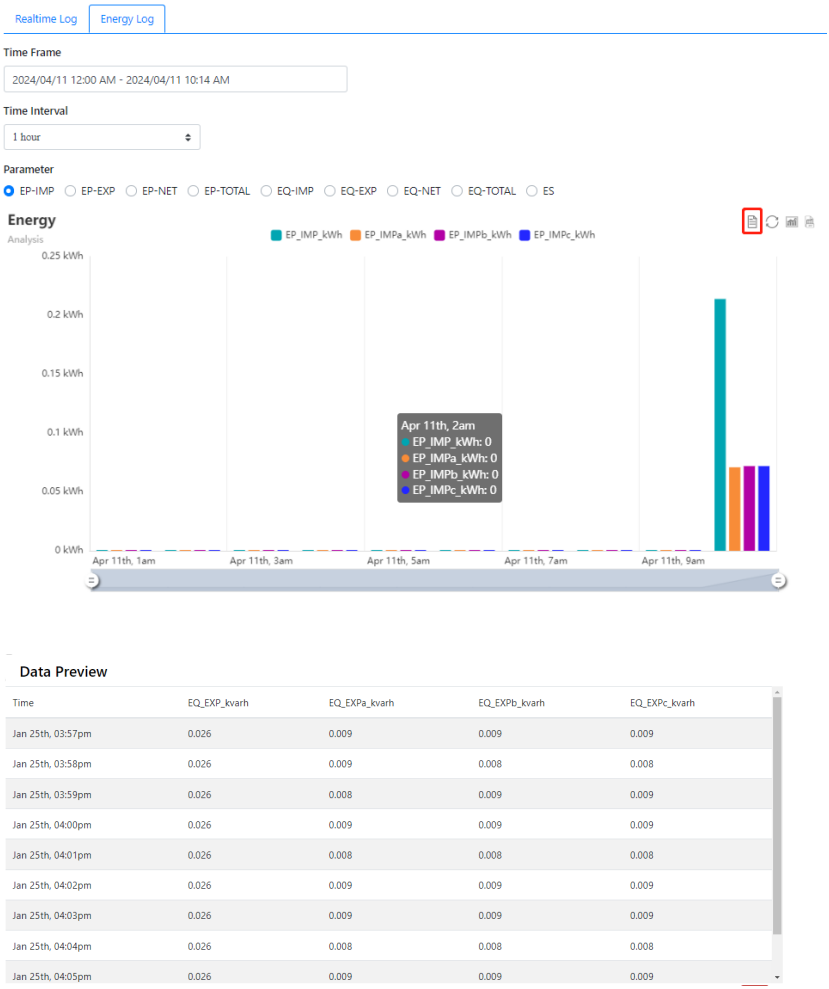


Figure 4-36 Trend Log Data Preview Window

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

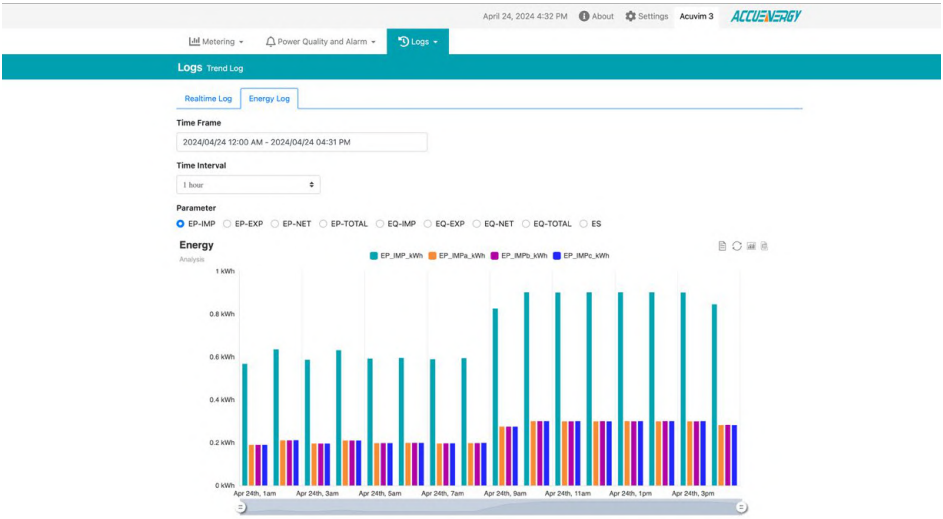


Figure 4-37 Trend Log File Download Button

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

Table 4-23 Energy Log Parameters

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

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.

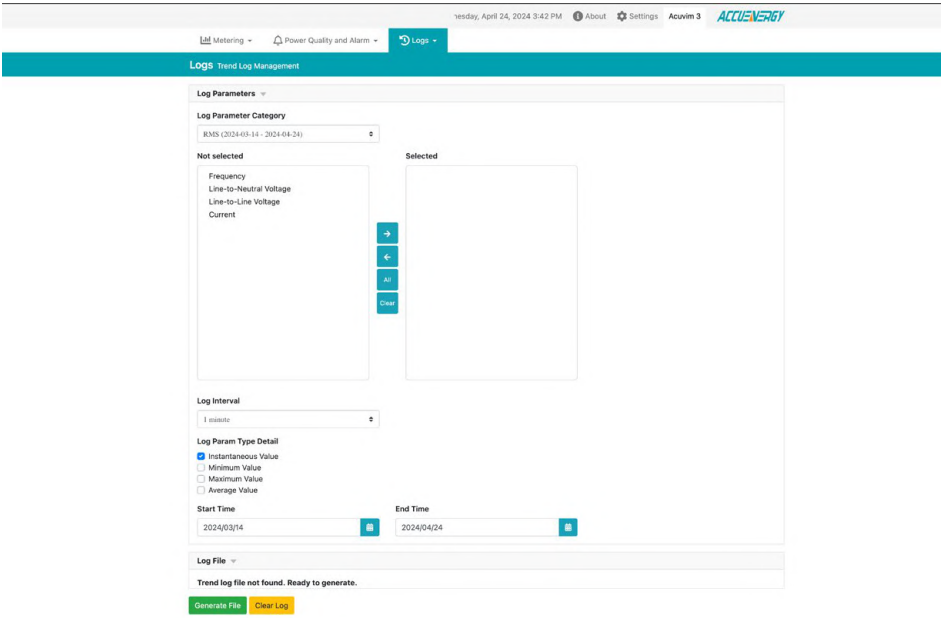


Figure 4-38 Trend Log Management Webpage

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.

Table 4-24 Trend Log Management Parameters

Log Parameter Category	Parameter	Log Interval	Log Parameter Type Detail
RMS	Frequency Line-to-Neutral Voltage Line-to-Line Voltage Current	1-minute 5-minute 10-minute 15-minute 30-minute 1-hour 2-hour 6-hour 12-hour 1-day 3-day 7-day 1-month	Instantaneous Value (default) Minimum Value (option) Maximum Value (option) Average Value (option)
Power	Active Power Reactive Power Apparent Power Load Nature Power Factor Lead Power Factor Lag Power Factor		
Fundamental	Fundamental Line-to-Neutral Voltage Fundamental Line-to-Line Voltage Fundamental Current Fundamental Active Power Fundamental Reactive Power Fundamental Apparent Power Displacement Power Factor		
Phase Angle	VLN Angle VLL Angle Line Current Angle		
THD	Voltage THD Voltage THD ODD Voltage THD Even Voltage Crest Factor Current THD Current THD ODD Current THD Even Current Crest-Factor Voltage Flicker		

Log Parameter Category	Parameter	Log Interval	Log Parameter Type Detail
Unbalance Magnitude	Voltage Positive Sequence Magnitude Voltage Zero Sequence Magnitude Voltage Negative Sequence Magnitude Voltage Zero Ratio Magnitude Voltage Unbalanced Factor Magnitude Current Positive Sequence Magnitude Current Zero Sequence Magnitude Current Negative Sequence Magnitude Current Zero Ratio Magnitude Current Unbalanced Factor Magnitude	1-minute 5-minute 10-minute 15-minute 30-minute 1-hour 2-hour 6-hour 12-hour 1-day 3-day 7-day 1-month	Instantaneous Value (default) Minimum Value (option) Maximum Value (option) Average Value (option)
Unbalance Angle	Voltage Positive Sequence Angle Voltage Zero Sequence Angle Voltage Negative Sequence Angle Current Positive Sequence Angle Current Zero Sequence Angle Current Negative Sequence Angle		
Energy	Active Energy – Quad 1 Reactive Energy –Quad 1 Apparent Energy – Quad1 Active Energy – Quad 2 Reactive Energy –Quad 2 Apparent Energy – Quad2 Active Energy – Quad 3 Reactive Energy –Quad 3 Apparent Energy – Quad3 Active Energy – Quad 4 Reactive Energy –Quad 4 Apparent Energy – Quad4 Active Energy- Import Reactive Energy-Import Active Energy-Export Reactive Energy-Export Active Energy- Net Reactive Energy-Net Active Energy- Total Reactive Energy-Total Apparent Energy		

Log Parameter Category	Parameter	Log Interval	Log Parameter Type Detail
Demand	Current Demand Active Power Demand-Quad1 Reactive Power Demand-Quad1 Apparent Power Demand-Quad1 Active Power Demand-Quad2 Reactive Power Demand-Quad2 Apparent Power Demand-Quad2 Active Power Demand-Quad3 Reactive Power Demand-Quad3 Apparent Power Demand-Quad3 Active Power Demand-Quad4 Reactive Power Demand-Quad4 Apparent Power Demand-Quad4 Active Power Demand- Import Reactive Power Demand- Import Active Power Demand- Export Reactive Power Demand- Export Active Power Demand- Net Reactive Power Demand- Net Active Power Demand- Total Reactive Power Demand- Total Apparent Power Demand	1-minute 5-minute 10-minute 15-minute 30-minute 1-hour 2-hour 6-hour 12-hour 1-day 3-day 7-day 1-month	Instantaneous Value (default) Minimum Value (option) Maximum Value (option) 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.

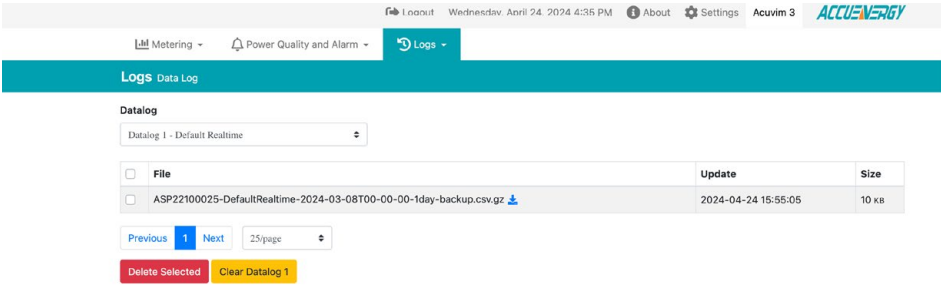


Figure 4-39 Data Log Webpage

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.

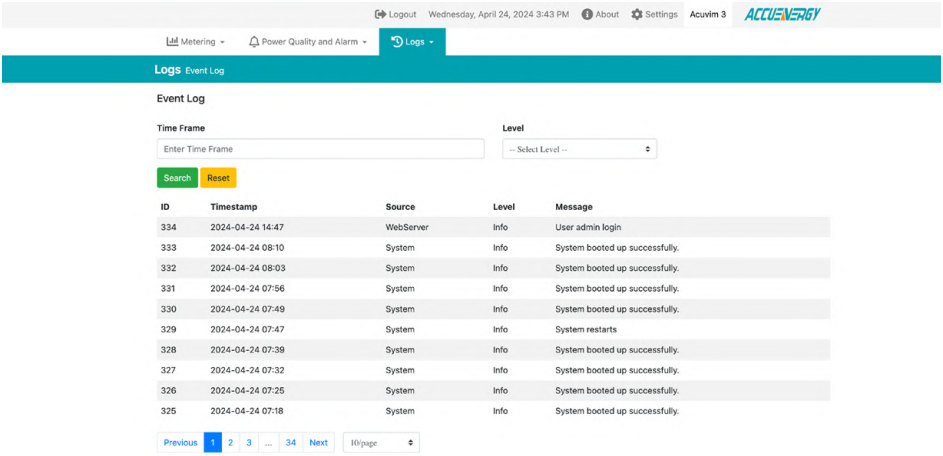


Figure 4-40 Event Log Webpage

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.

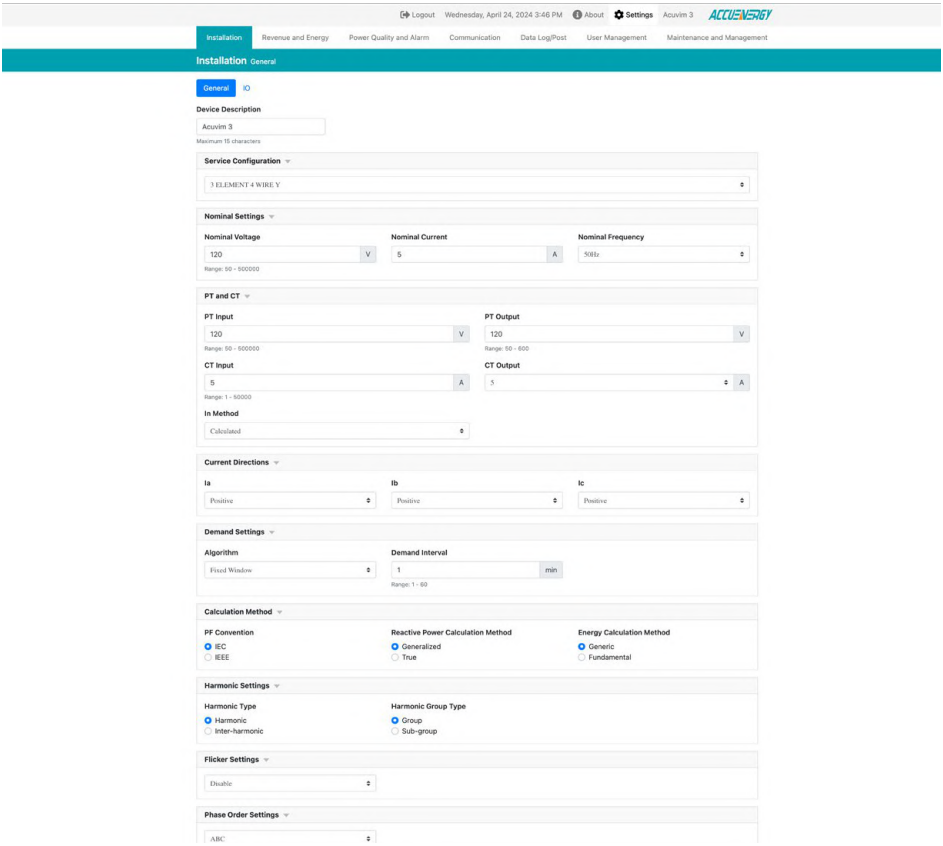


Figure 4-41 General Settings Webpage

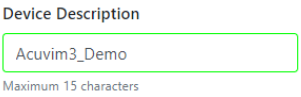


Figure 4-42 Device Description

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.

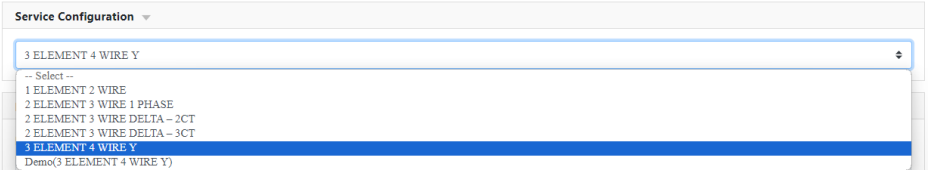


Figure 4-43 Service Configuration Selection

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

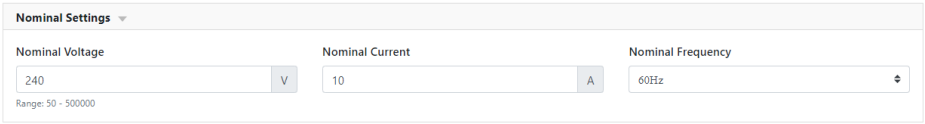


Figure 4-44 Nominal Settings Window

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

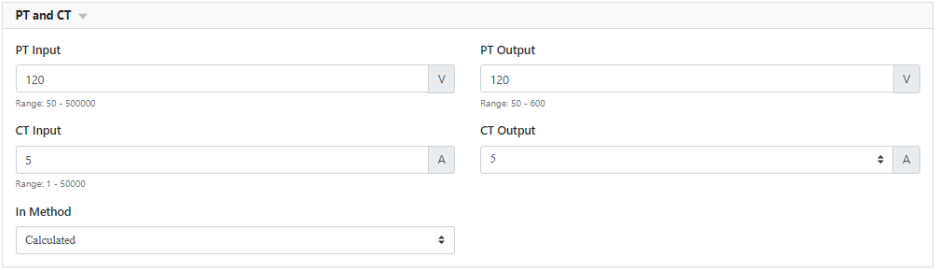


Figure 4-45 PT/CT Ratios Settings Window

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

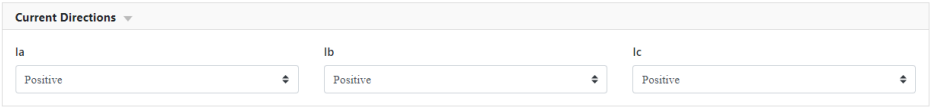


Figure 4-46 Current Direction Settings Window

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

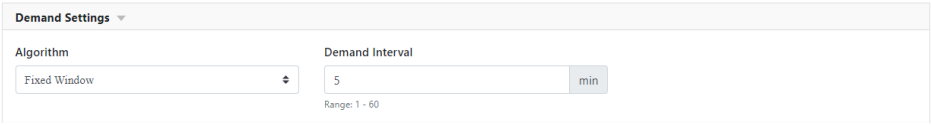


Figure 4-47a Demand Settings - Fixed Window

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

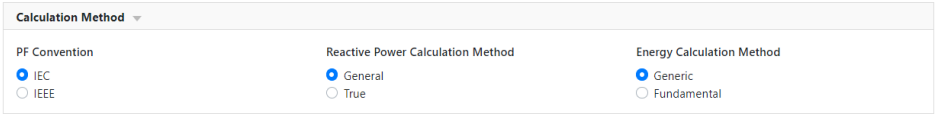


Figure 4-48 Calculation Method Settings Window

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 nth 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

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

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

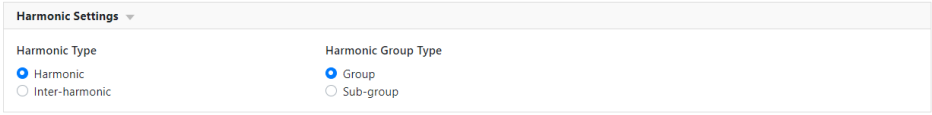


Figure 4-49 Harmonic Settings Window

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

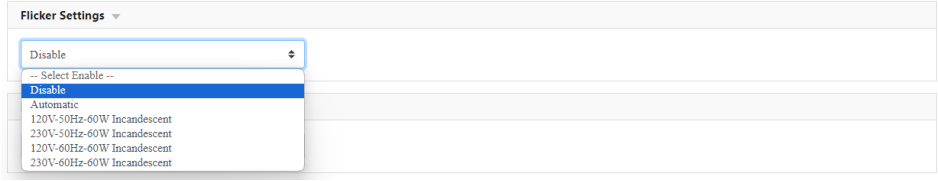


Figure 4-50 Flicker Settings Window

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

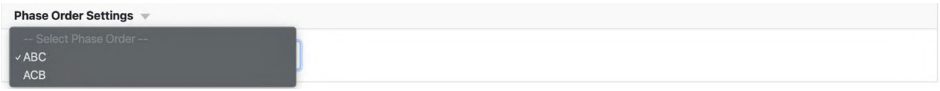


Figure 4-51 Phase Order Settings Window

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.

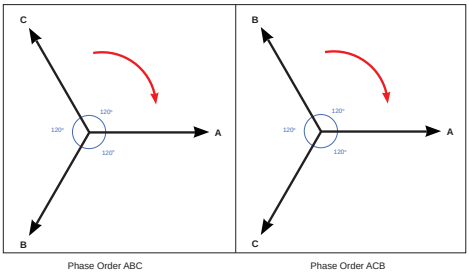


Figure 4-52 Phase Order ABC and ACB

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

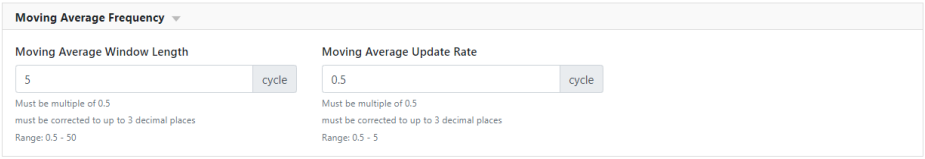


Figure 4-53 Moving Average Frequency Settings Window

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.

Current Phase Selection

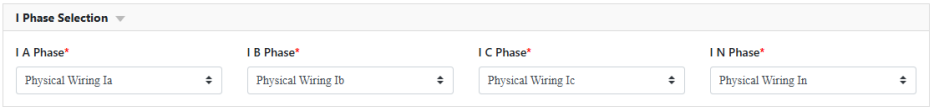


Figure 4-54 Current Phase Selection

The Current Phase Selection feature allows the user to correct CT wiring errors without physically rewiring the meter. If the current transformers (CTs) for different phases are incorrectly connected. For example, if the CT for Phase A is physically wired to the Phase B input, the user can resolve the issue by reassigning the physical wiring through the phase selection menu. Each phase input (Ia, Ib, Ic, In) can be individually mapped to the correct logical phase, ensuring accurate measurement and reporting even when the initial wiring is not correct. This function helps to save installation time and eliminates the need for on-site rewiring in case of phase misconnection.

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**.

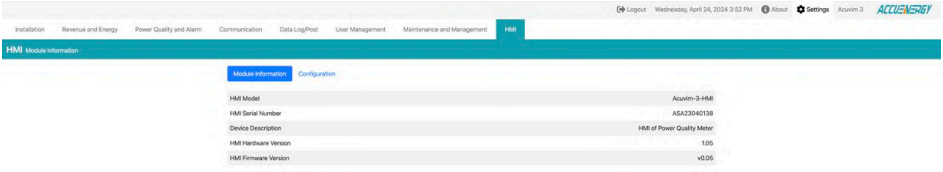


Figure 4-55 HMI Information Webpage

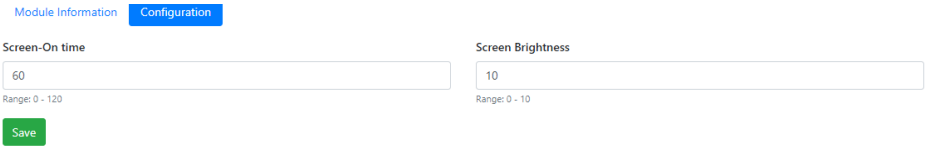


Figure 4-56 HMI Setting Webpage

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.
B	Date and Time	Shows current date and time of the meter.
C	Navigation Menu Tiles	The Acuvim 3 Home screen features a set of nine user-friendly menu tiles categorized as Metering, Energy/Demand, Visualization, Trend, Waveform, 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 power or communication with the Acuvim 3 screen is lost. A flashing green LED light indicates the meter is operational and functioning normally.
E	Alarm LED	When this LED is not illuminated, it indicates no alarm or power quality event triggered. A flashing red LED light indicates an alarm monitor, or a power quality event is triggered.
F	Home Button	Takes user back to the Home menu screen, as shown in Figure 5-1.
G	Energy1 LED	Colour Orange. Blinking orange LED light indicates it is synchronous with the generation of energy pulses.
H	Energy2 LED	Colour Invisible (900nm infrared). Synchronously blinks with the generation of energy pulses.

Table 5-2 Status Icon Description

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

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.

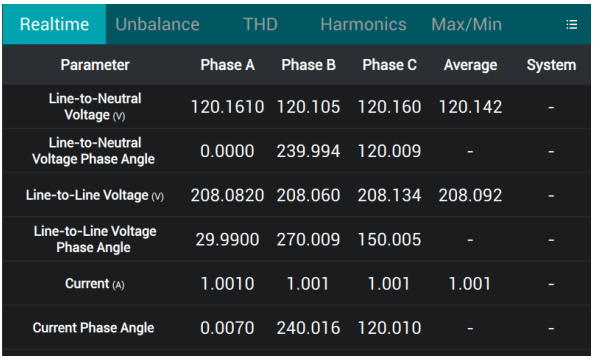
Figure 5-2 Loading Screen

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.



Parameter	Phase A	Phase B	Phase C	Average	System
Line-to-Neutral Voltage (V)	120.1610	120.105	120.160	120.142	-
Line-to-Neutral Voltage Phase Angle	0.0000	239.994	120.009	-	-
Line-to-Line Voltage (V)	208.0820	208.060	208.134	208.092	-
Line-to-Line Voltage Phase Angle	29.9900	270.009	150.005	-	-
Current (A)	1.0010	1.001	1.001	1.001	-
Current Phase 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.

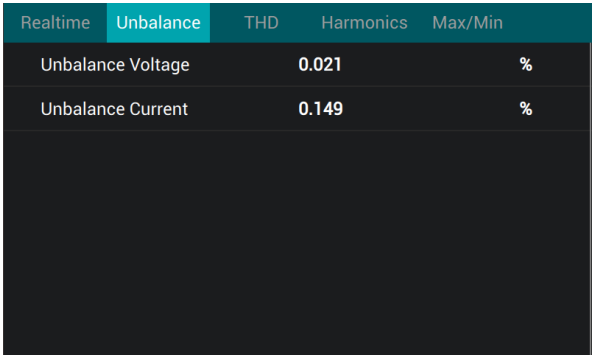


Figure 5-4 Unbalance Screen

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.

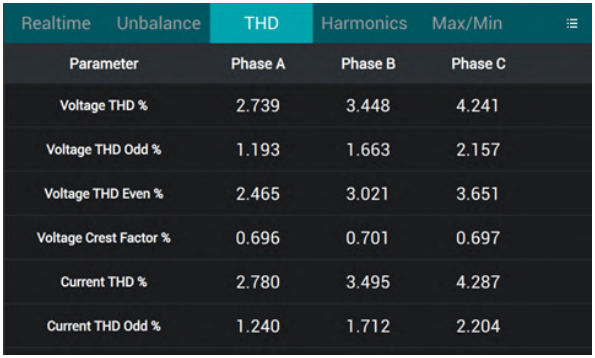


Figure 5-5 THD Screen

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.

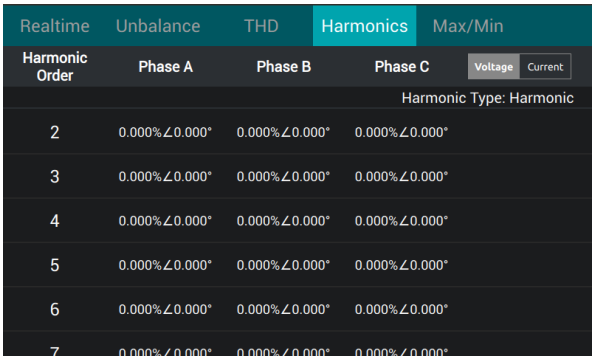


Figure 5-6 Harmonics Screen

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.

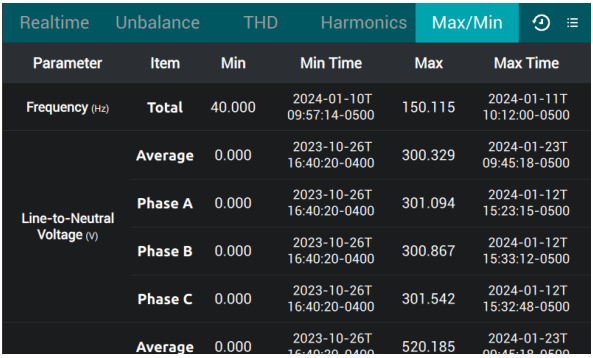


Figure 5-7 Max/Min Screen

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.

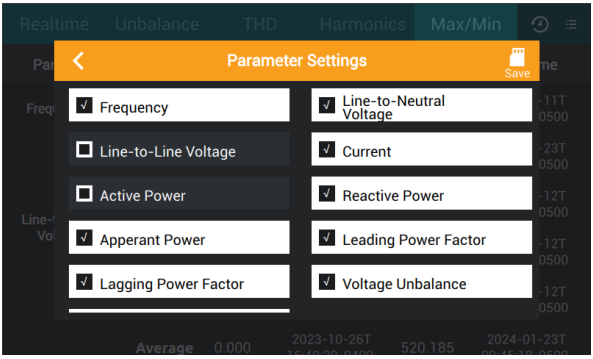


Figure 5-8 Max/Min Parameters Selecting Screen

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 | Quadrant | Tou Energy | Demand

Parameter	Phase A	Phase B	Phase C	System
Active Energy-Import (kWh)	19.488	19.480	19.481	58.449
Reactive Energy-Import (varh)	0.000	0.000	1.510	1.540
Active Energy-Export (Wh)	0.000	0.870	0.870	1.750
Reactive Energy-Export (varh)	2.020	3.360	2.410	7.840
Active Energy-Net (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 | Quadrant | Tou Energy | Demand

Parameter	Phase A	Phase B	Phase C	System
Active Energy-Quad 1 (Wh)	129.730	113.490	147.860	391.150
Reactive Energy-Quad 1 (varh)	0.000	0.000	0.000	0.020
Apparent Energy-Quad 1 (VAh)	129.730	113.490	147.860	391.150
Active Energy-Quad 2 (Wh)	0.000	0.000	-0.870	-0.870
Reactive Energy-Quad 2 (varh)	0.000	0.000	1.510	1.510
Apparent Energy-Quad 2 (VAh)	0.000	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.

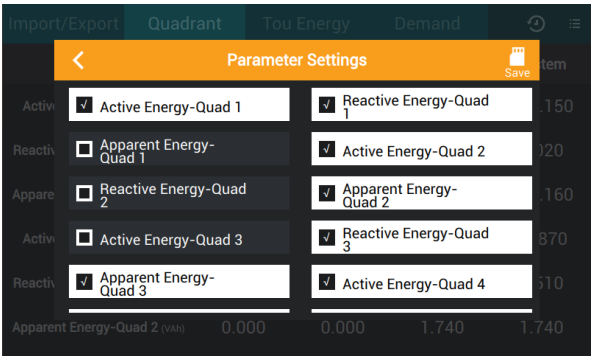


Figure 5-11 Quadrant Parameter Selecting Screen

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.

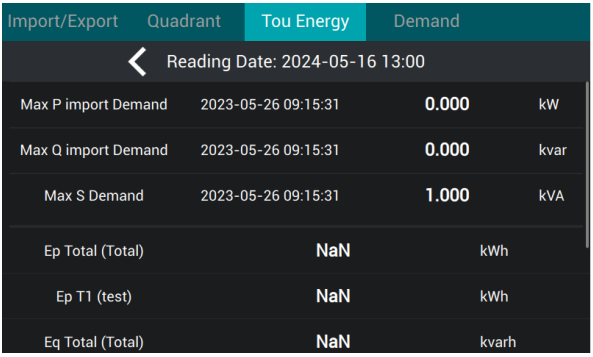


Figure 5-12 TOU Energy Screen

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.

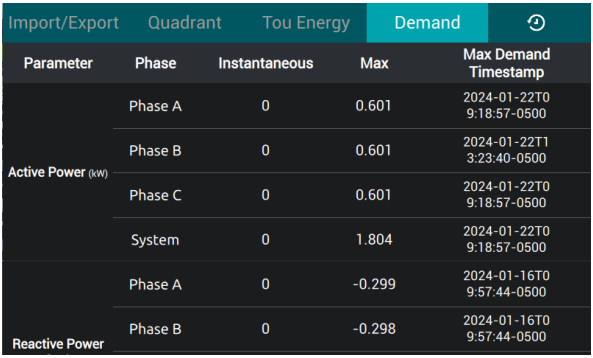


Figure 5-13 Demand Screen

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

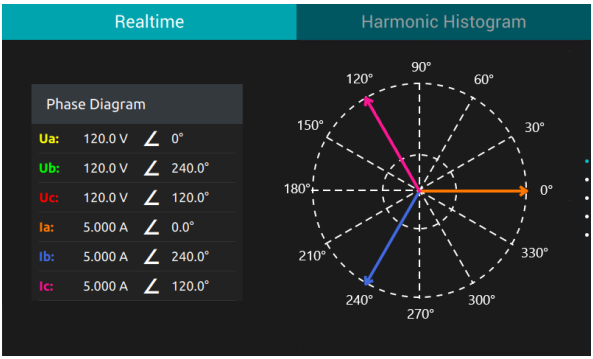


Figure 5-14 Phase Diagram

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

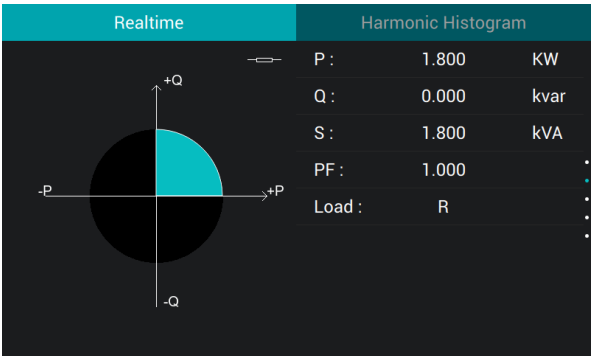


Figure 5-15 Power Diagram

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

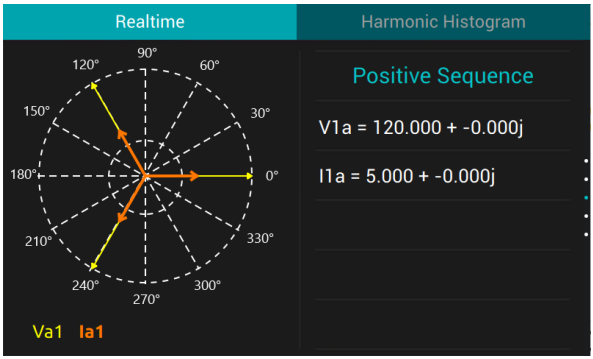


Figure 5-16 Positive Sequence Screen

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

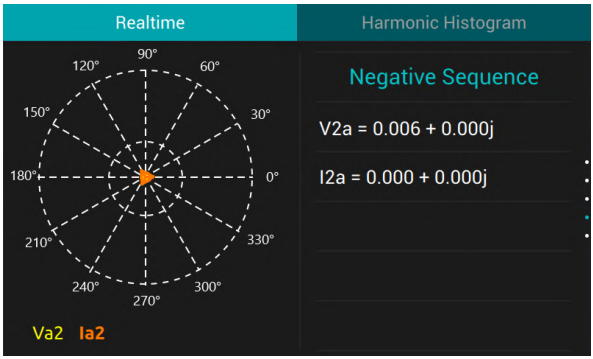


Figure 5-17 Negative Sequence Screen

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

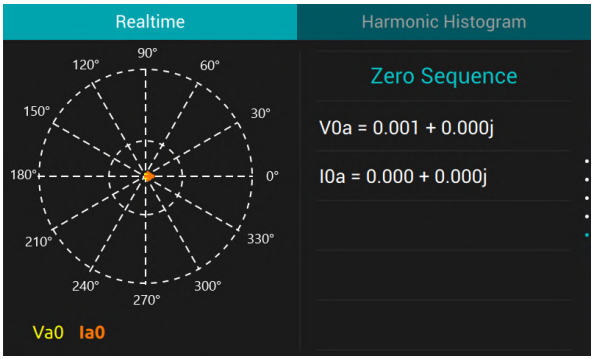


Figure 5-18 Zero Sequence Screen

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.

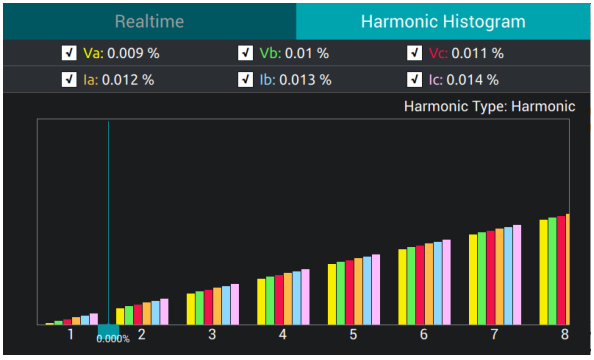


Figure 5-19 Harmonic Histogram Screen

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

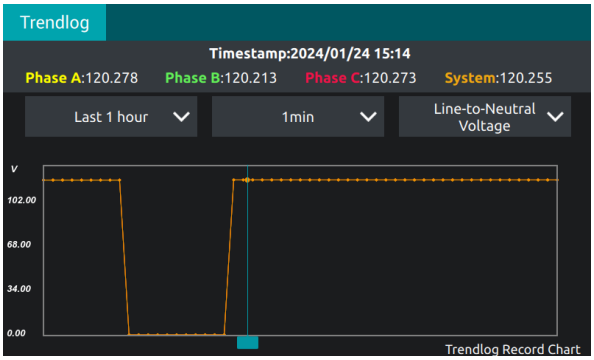


Figure 5-20 Trend Log Screen

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

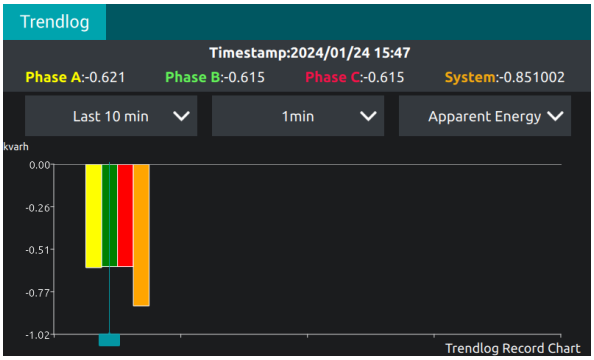


Figure 5-21 Energy Trend Log Screen

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.

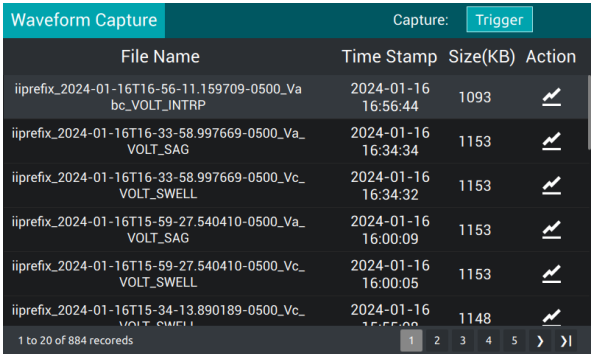


Figure 5-22 Wave List Screen

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.

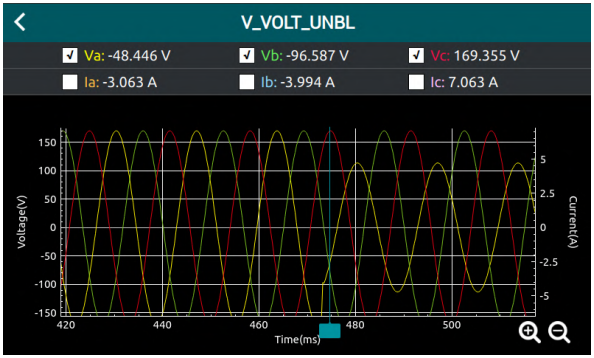


Figure 5-23 Waveform Image Screen

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.

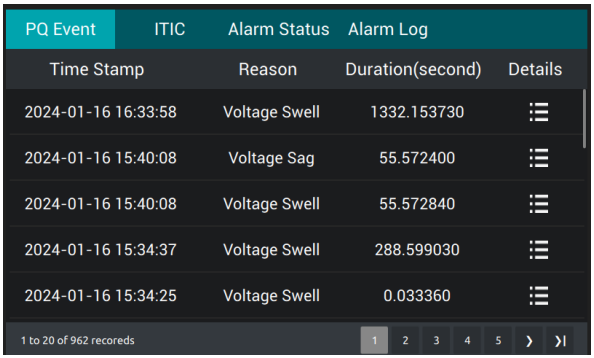


Figure 5-24 Power Quality Event Screen

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.

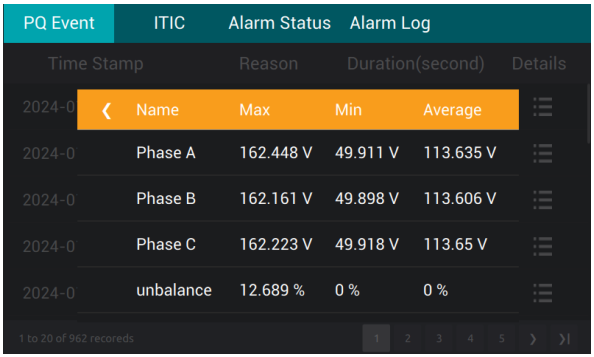


Figure 5-25 Power Quality Event Details Screen

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.

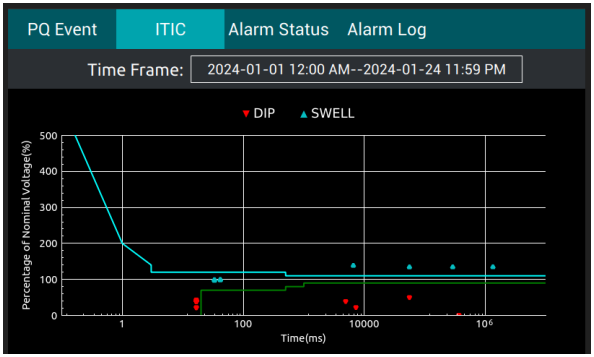


Figure 5-26 ITIC Screen

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.

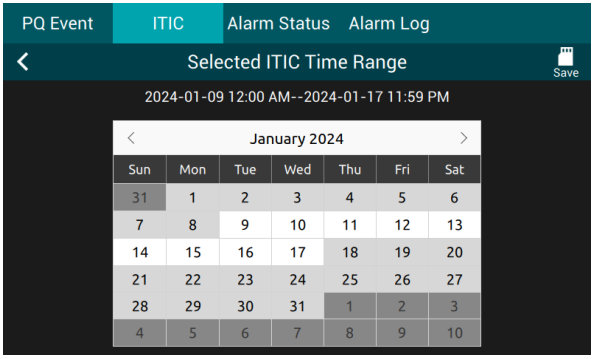


Figure 5-27 ITIC Time Frame Selection

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.

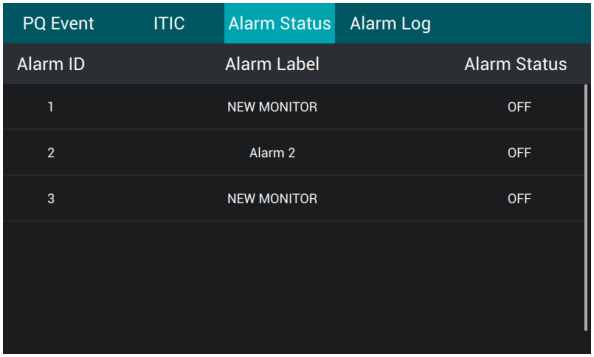


Figure 5-28 Alarm Status Screen

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.

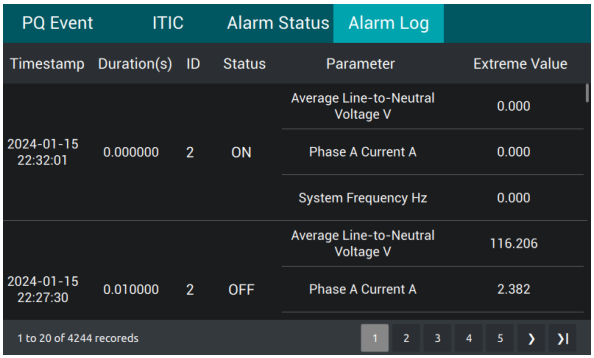


Figure 5-29 Alarm Log Screen

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.

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

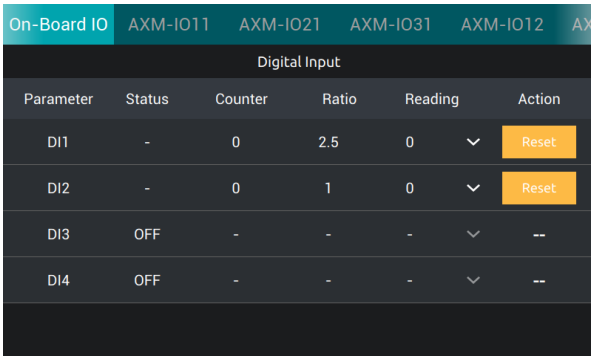


Figure 5-30 I/O Screen

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.

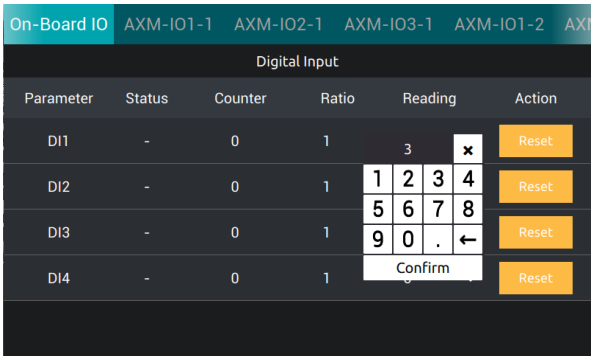


Figure 5-31 Edit DI Readings

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

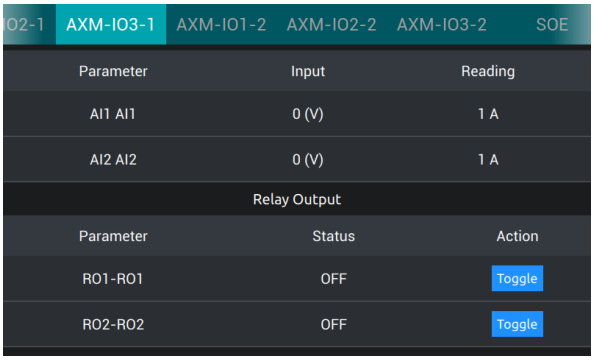


Figure 5-32 Toggle RO Readings

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.

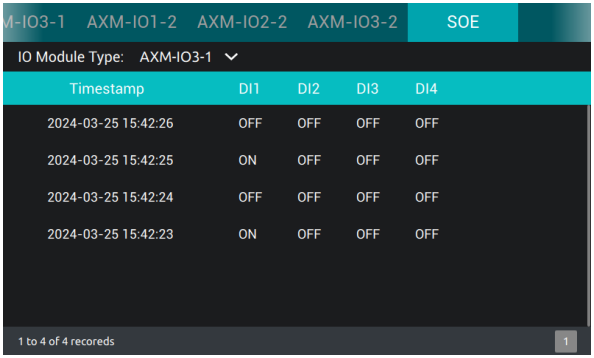


Figure 5-33 SOE Log Screen

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.

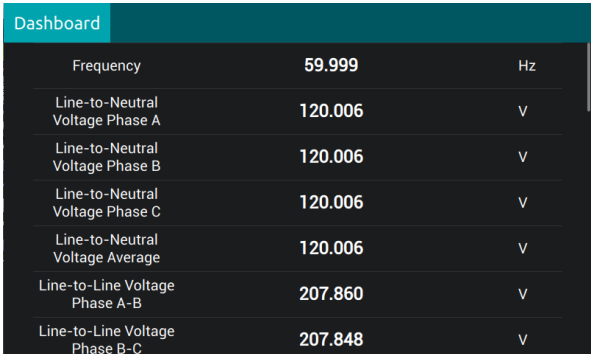


Figure 5-34 Dashboard Screen

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.

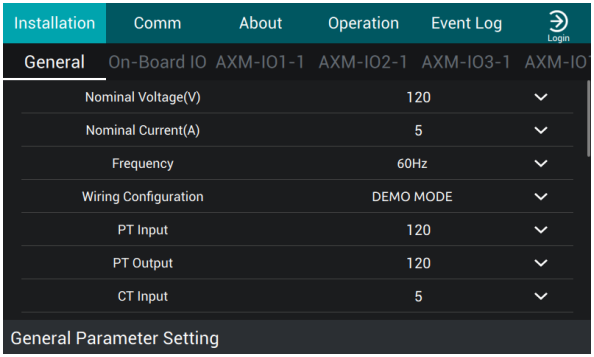


Figure 5-35 General Setting Screen

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.

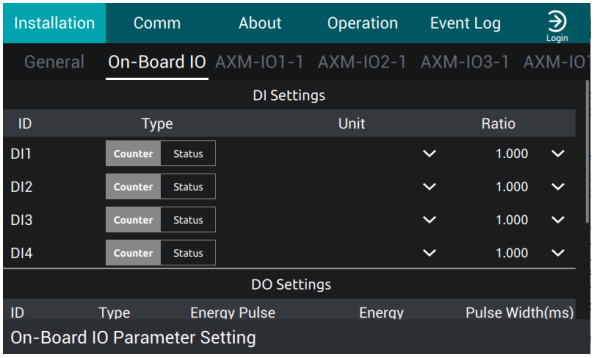


Figure 5-36a On-Board I/O Screen

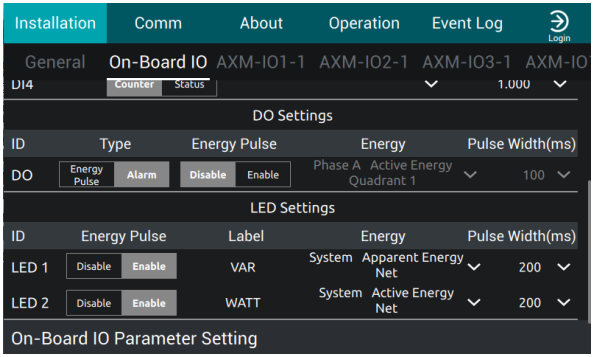


Figure 5-36b On-Board I/O Screen

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.

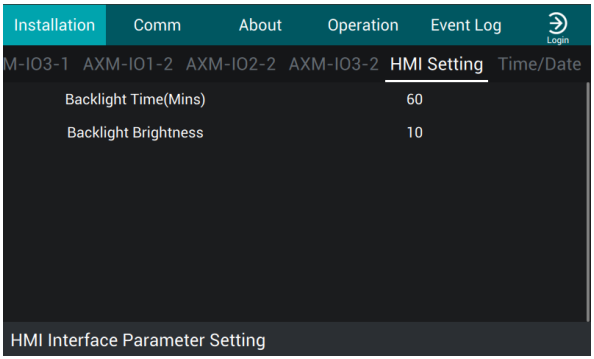


Figure 5-37 HMI Setting Screen

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.

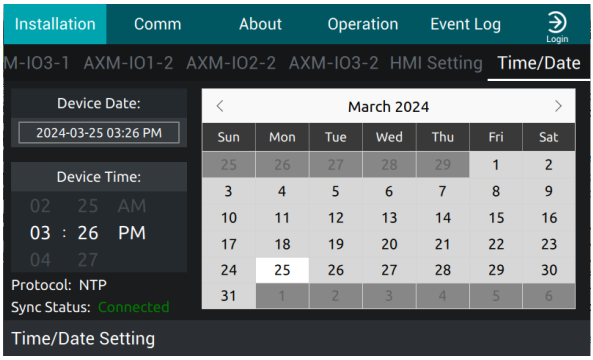


Figure 5-38 Time/Date Setting Screen

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.

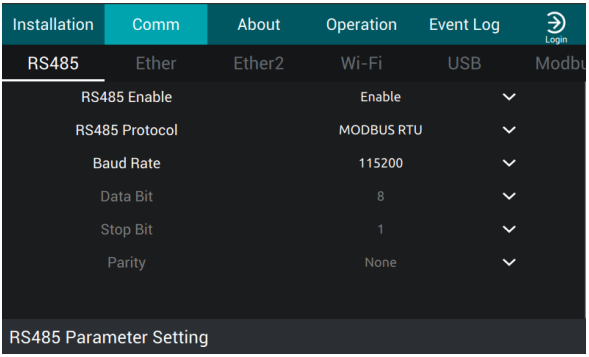


Figure 5-39 RS485 Setting Screen

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.

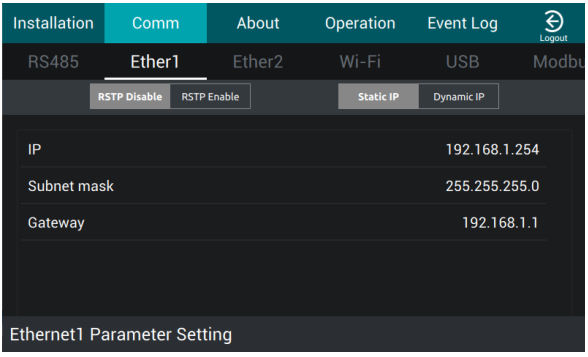


Figure 5-40a Ethernet 1 Setting Screen

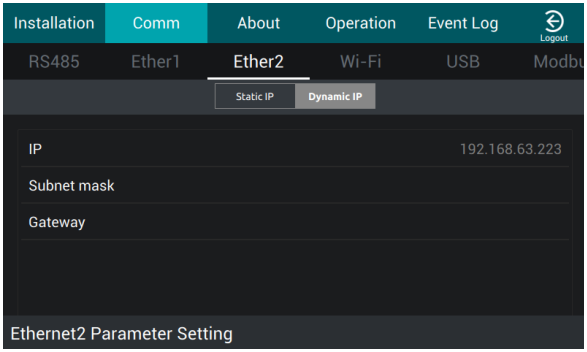


Figure 5-40b Ethernet 2 Setting Screen

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.

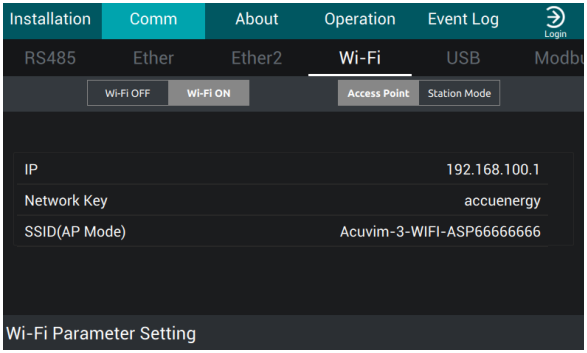


Figure 5-41a Wi-Fi Access Point Setting Screen

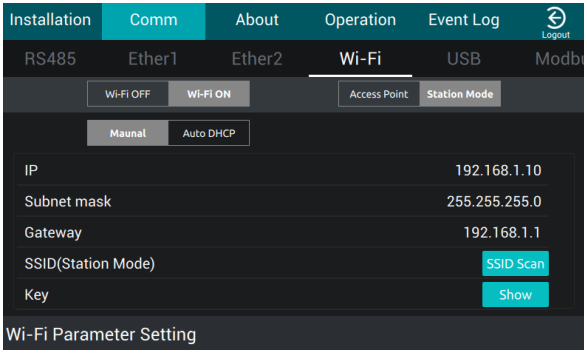


Figure 5-41b Wi-Fi Station Mode Setting Screen

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.

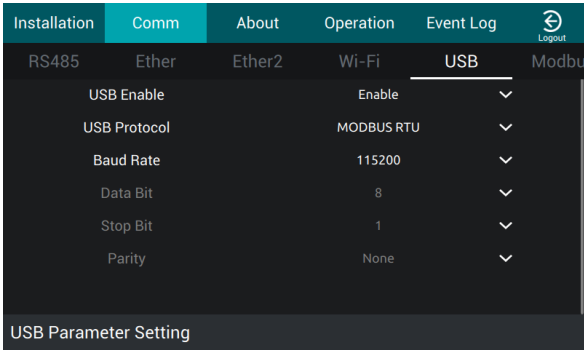


Figure 5-42 USB Setting Screen

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.

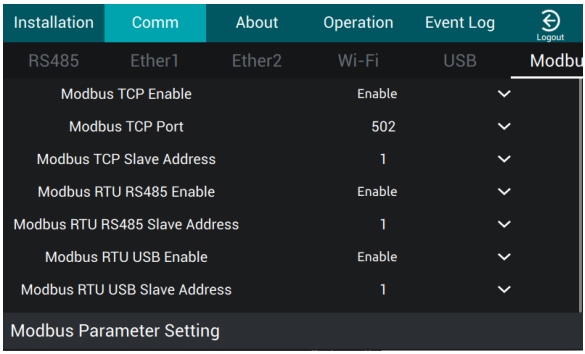


Figure 5-43 Modbus Setting Screen

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

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.

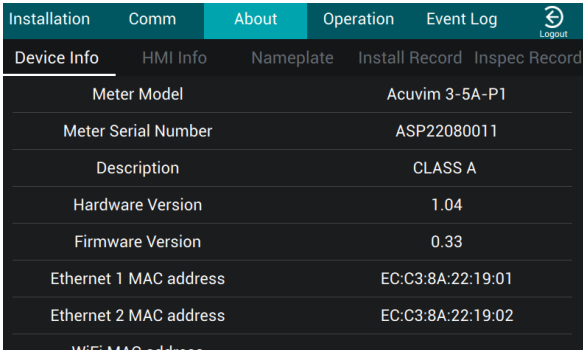


Figure 5-44 Device Information Screen

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.

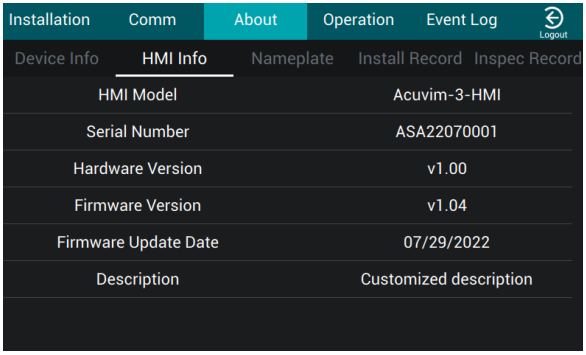


Figure 5-45 HMI Information Screen

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.

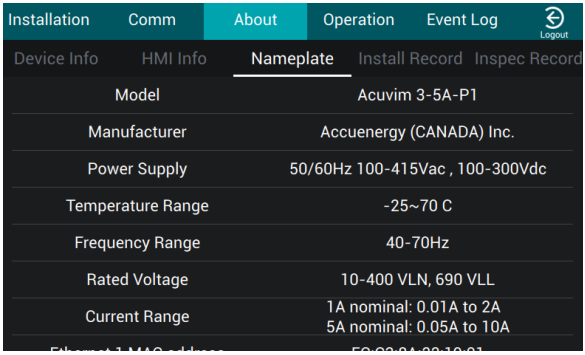


Figure 5-46 Nameplate Screen

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.

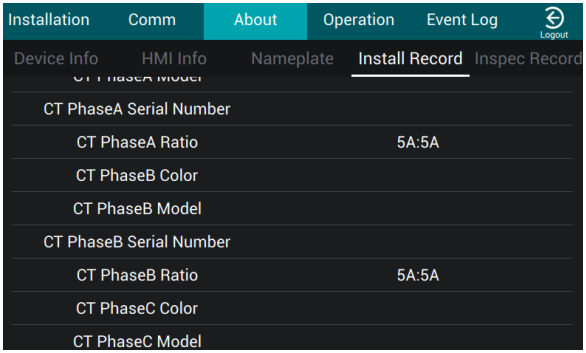


Figure 5-47 Installation Record Screen

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.

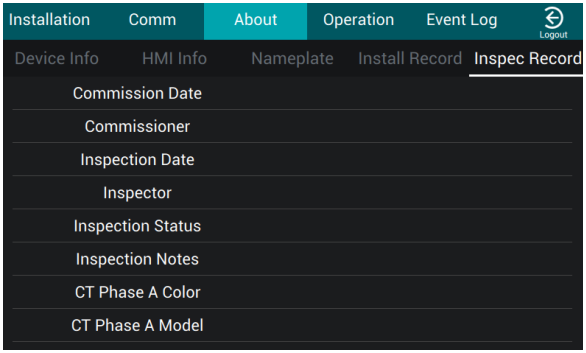


Figure 5-48 Inspection Record Screen

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.

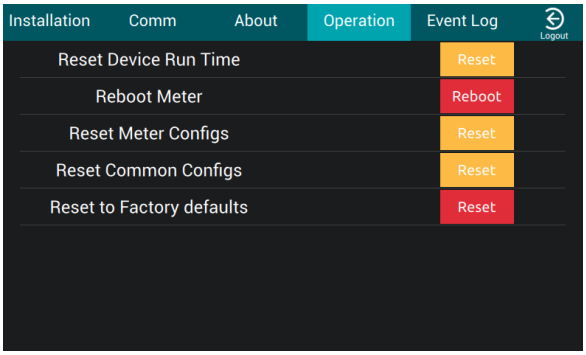


Figure 5-49 Operation Screen

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.

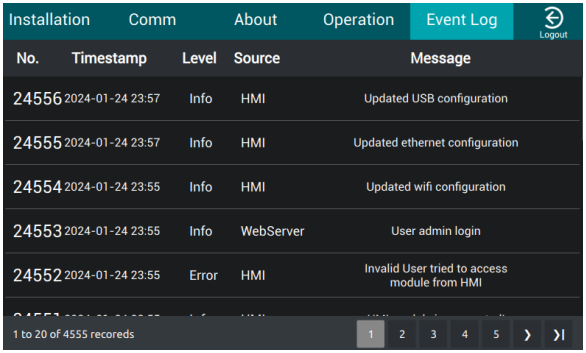


Figure 5-50 Event Log Screen

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.

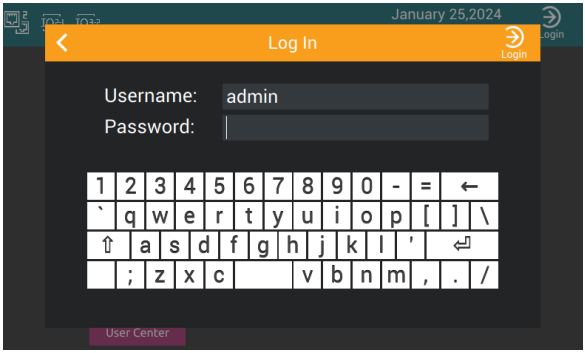


Figure 5-51 User Login Screen

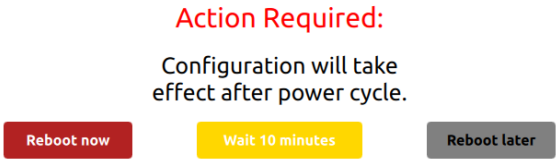


Figure 5-52 Reboot Action Notification

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.

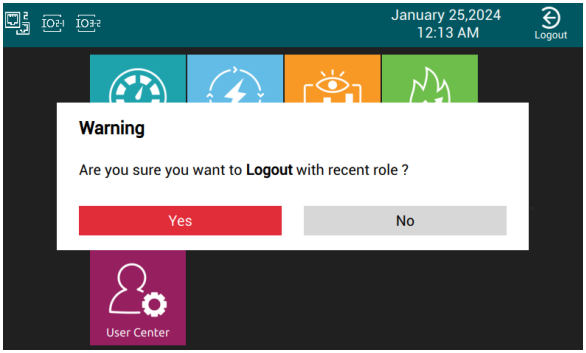


Figure 5-53 Logout Warning

To log the user out of the meter or clear the current user role information on the screen, click the Logout 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.

Table 6-1 Power Quality - Related Parameters

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

Parameter	Details
Voltage Unbalance Current Unbalance	• Positive Sequence calculation • Negative Sequence calculation • Zero Sequence calculation • Unbalance factor calculation • 10/12 cycle (200ms) reading • Aggregation (3 seconds) • Aggregation (10 minutes) • Aggregation (2 hours)
Voltage Flicker	• Short term (10 minutes) • 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.

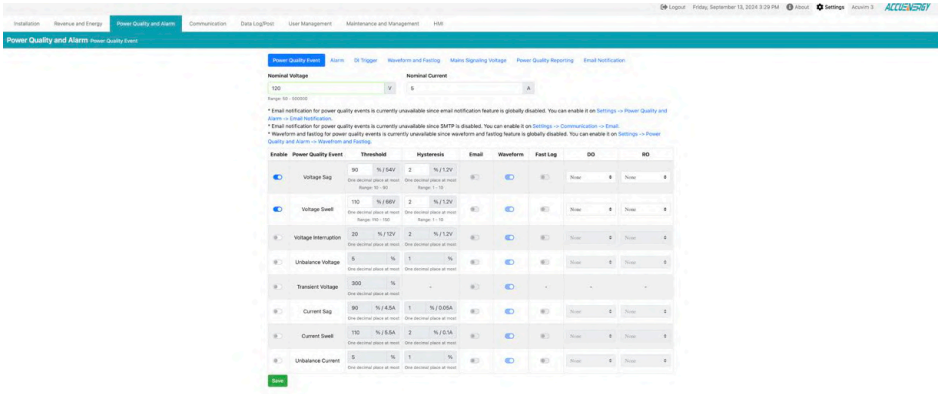


Figure 6-1 Power Quality Event Setting Webpage

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

Table 6-2 Power Quality Event Monitoring Configuration

Power Quality Event	Threshold	Hysteresis	Email	Waveform	Fast Log	Trigger DO 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%	•	•	•	•

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

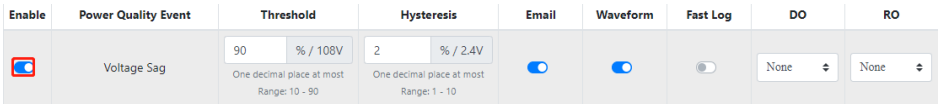


Figure 6-2a Voltage Sag Enable

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

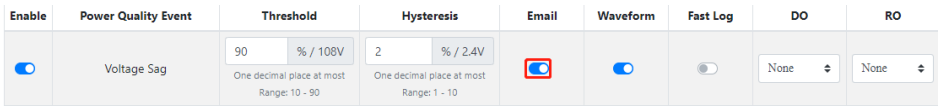


Figure 6-2b Voltage Sag Email Enable

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.

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.

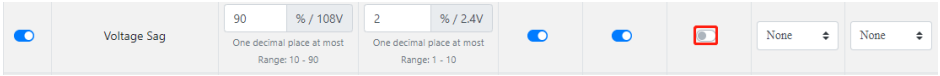


Figure 6-2d Voltage Sag Fastlog Enable

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.

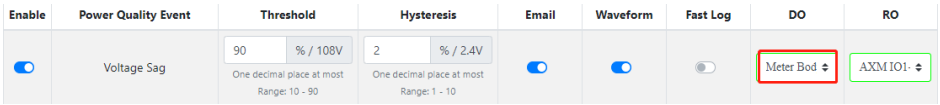


Figure 6-2e Voltage Sag DO Enable

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.

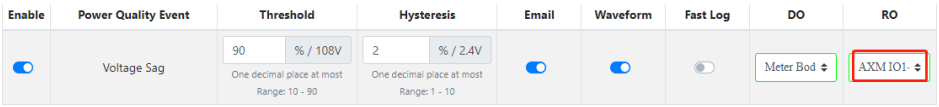


Figure 6-2f Voltage Sag RO Enable

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.

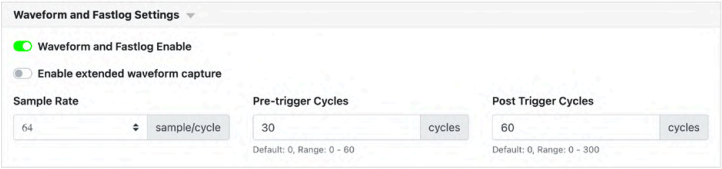


Figure 6-3a Waveform and Fastlog Settings

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.

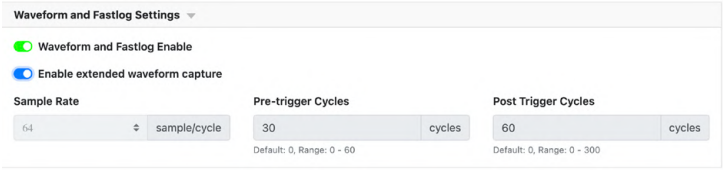


Figure 6-3b Waveform and Fastlog Settings (Extended Waveform)

6.2.2 Waveform and Fastlog Data Post Settings

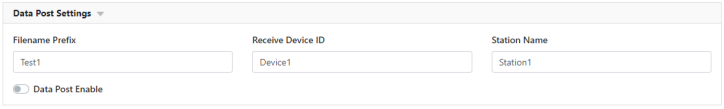


Figure 6-4 Data Post Settings

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.

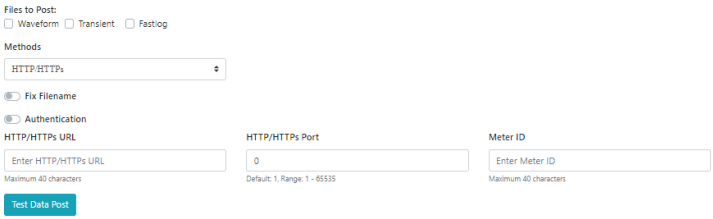


Figure 6-5 Data Post Settings

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

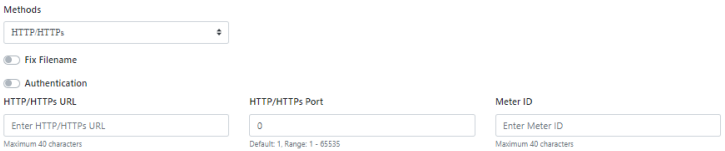


Figure 6-6 Data Post HTTP/HTTPs Settings

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

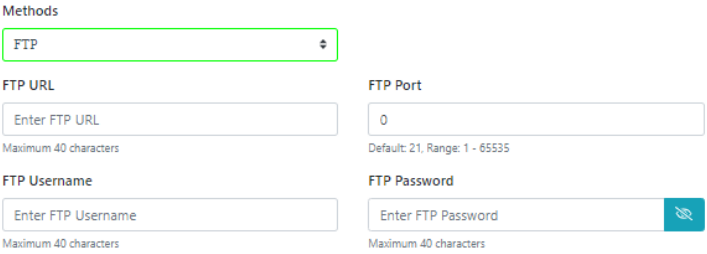


Figure 6-7 Data Post FTP Settings

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.

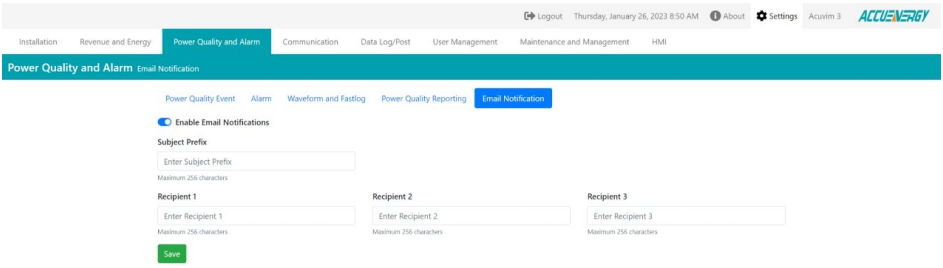


Figure 6-8 Email Notification Settings

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.

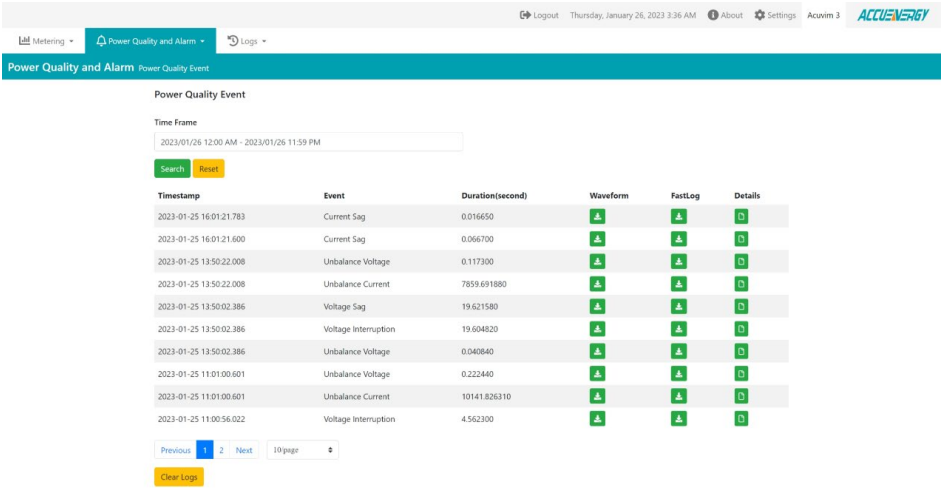


Figure 6-9 Power Quality Event Webpage

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.

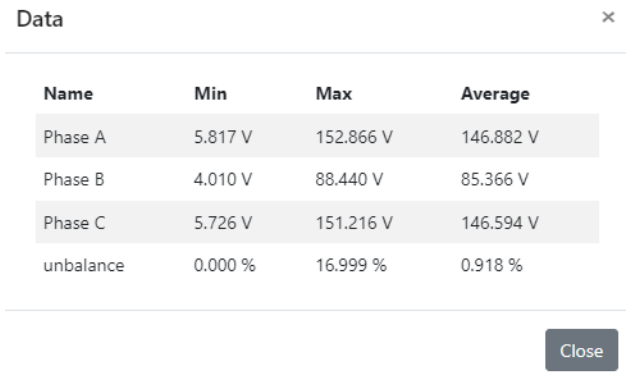


Figure 6-10 Waveform Detail Data webpage

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.

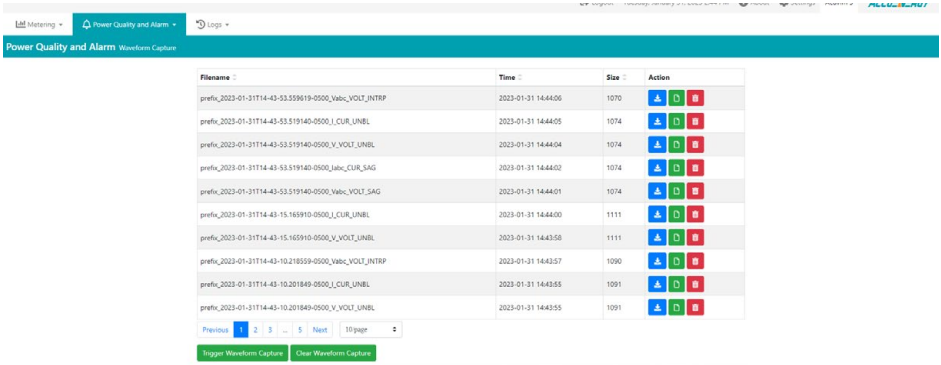


Figure 6-11 Power Quality and Alarm Waveform Capture Webpage

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.

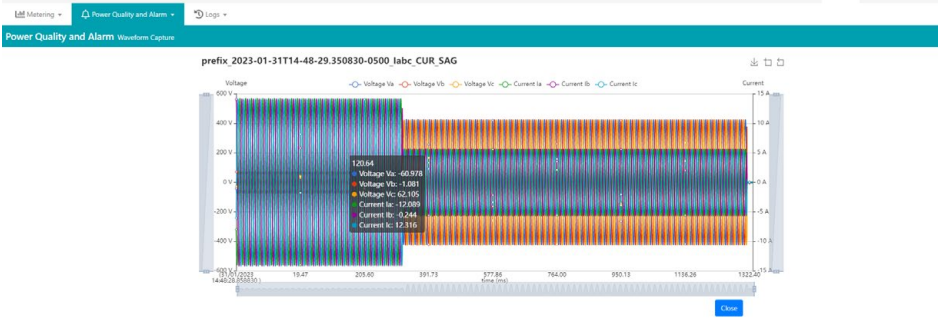


Figure 6-12 Power Quality and Alarm Waveform Capture Webpage

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.

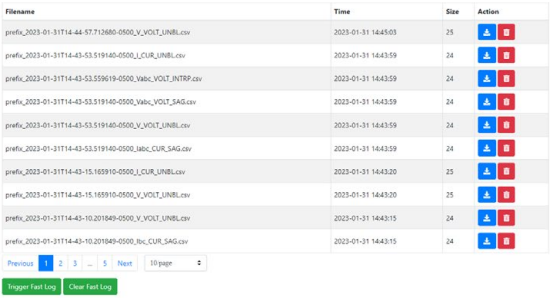


Figure 6-13 Power Quality and Alarm Fast Log Webpage

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.

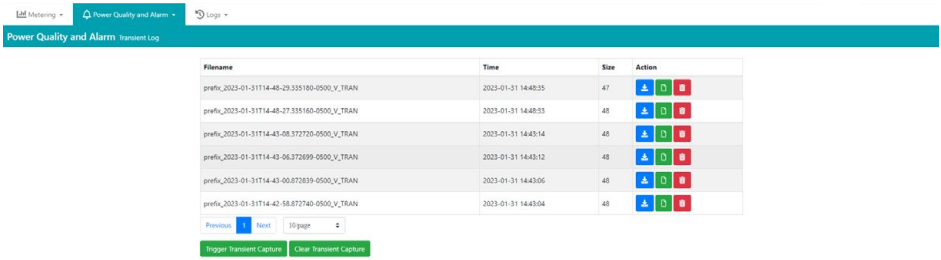


Figure 6-14 Power Quality and Alarm Transient Voltage Log Webpage

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.

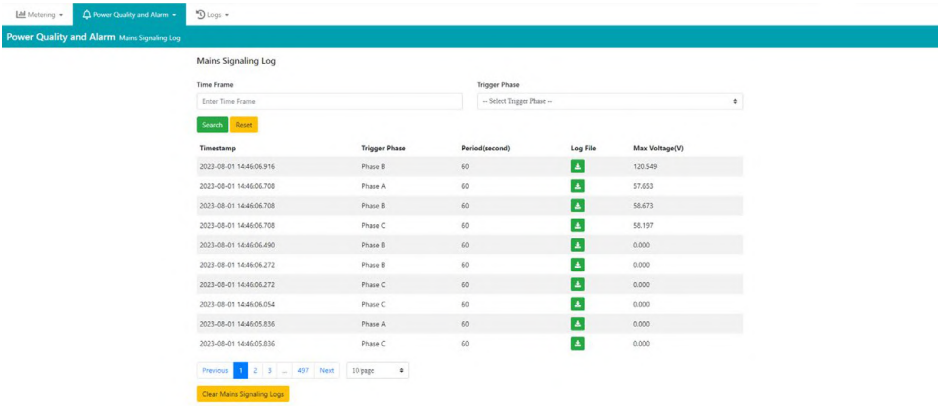


Figure 6-16 Mains Signaling Log Webpage

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.

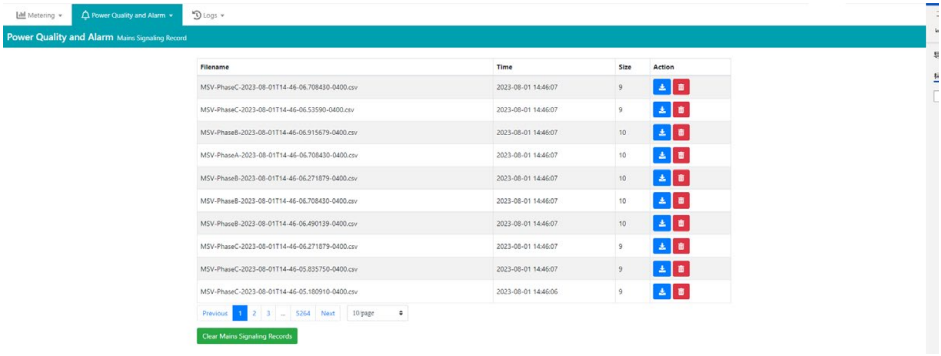


Figure 6-17 Mains Signaling Log Webpage

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.

6.4.7 Disturbance Direction Detection

The Disturbance Direction Detection function identifies whether a detected power quality disturbance originates upstream (towards the utility supply) or downstream (towards the load).

When enabled, the meter analyzes voltage, current, and power signal changes before and after a disturbance to determine its direction.

This feature supports single-phase and combined-phase analysis and can log direction data for events such as voltage sag/swell, current sag/swell, and other PQ events. The detection method uses a pre-triggered average compared to an after-triggered average to determine whether the disturbance magnitude increased (downstream event), decreased (upstream event), or remained stable.

Disturbance Direction Detection Settings

To enable Disturbance Direction Detection feature,

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.

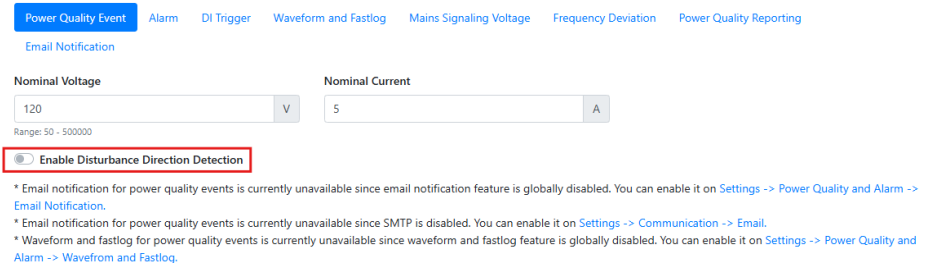


Figure 6-18 Disturbance Direction Detection Enable

The Disturbance Direction Detection setting page contains a single toggle option that allows the user to enable or disable the feature. When the toggle is switched on, the meter will actively monitor and record the direction of power quality disturbances, indicating whether they originate from the upstream supply or the downstream load. If the feature is disabled, disturbance direction data will not be captured in the logs. For accurate operation, related power quality event detection should also be enabled in the Power Quality Event configuration.

Disturbance Direction Detection Log

To access the Disturbance Direction Detection logs,

1. Click on **Acuvim 3** from the main menu.
2. Select **Power Quality and Alarm** from the tab menu.
3. Click on the **Disturbance Direction Detection** menu option.

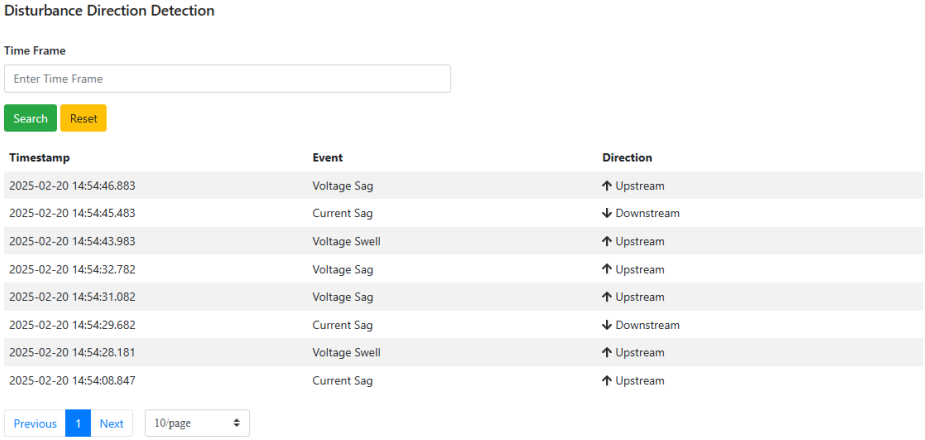


Figure 6-19 Disturbance Direction Detection Log

The Disturbance Direction Detection log page provides a chronological record of detected events with their corresponding disturbance direction. Each entry displays the timestamp of the event, the type of disturbance detected, such as voltage sag, voltage swell, current sag, etc., and the determined direction, shown as either “Upstream” or “Downstream.” The page includes a time frame search function to filter results for a specific period, along with a reset option to return to the full list. Pagination controls allow adjustment of the number of records displayed per page, making it easier to navigate large volumes of logged data.

6.4.8 Frequency Deviation

The Frequency Deviation feature continuously monitors the fundamental system frequency (50 Hz / 60 Hz) at a 10-second aggregation rate. When the measured value drifts outside the user-defined upper or lower thresholds, the meter flags a Frequency Deviation Event, writes a time-stamped entry to the Frequency Deviation Log, and saves a CSV file under the Frequency Deviation Record list for download or remote posting.

Frequency measurement resolution: 1 mHz resolution on frequency measurement ensures precise detection of minor excursions.

Compliance: Thresholds can be aligned with EN 50160 limits (Zone 1: ±1 % for ≥ 99 % of the week; Zone 2: -6 % / +4 % for the entire week @ 50 Hz) or NERC Eastern Connection limits (±0.42 Hz @60 Hz).

Frequency Deviation Settings

To enable Frequency Deviation Detection feature,

1. Click on **Settings** from the main menu.
2. Select **Power Quality and Alarm** from the tab menu.
3. Click on the **Frequency Deviation** menu option.

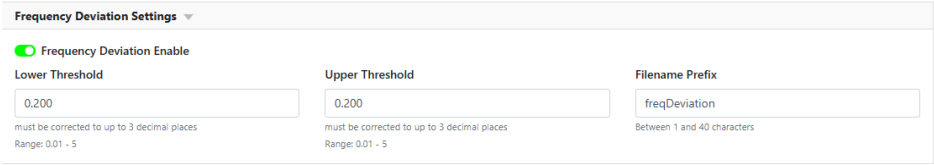


Figure 6-20 Frequency Deviation Enable

Frequency Deviation Enable:

Toggling this setting enables frequency deviation monitoring. When enabled, the meter will continuously monitor the fundamental frequency and log any deviations that exceed the configured thresholds.

Lower Threshold:

This setting defines the allowable deviation below the nominal system frequency before a Frequency Deviation Event is triggered. The threshold value is entered in hertz (Hz) and represents the amount by which the measured frequency may fall below the nominal frequency. The configured value must be within the range of 0.01 Hz to 5.000 Hz and may be entered with up to three decimal places of precision.

For example, in a 60 Hz system, if the Lower Threshold is set to 0.200 Hz, an event will be triggered when the measured frequency drops below 59.800 Hz. When this condition is met, the meter records a Frequency Deviation Event and logs the corresponding data.

Upper Threshold:

This setting defines the allowable deviation above the nominal system frequency before a Frequency Deviation Event is triggered. The threshold value is entered in hertz (Hz) and represents the amount by which the measured frequency may increase above the nominal frequency. The configured value must be within the range of 0.01 Hz to 5.000 Hz and may be entered with up to three decimal places of precision.

For example, in a 60 Hz system, if the Upper Threshold is set to 0.200 Hz, an event will be triggered when the measured frequency exceeds 60.200 Hz.

Filename Prefix:

Specifies the filename prefix used when storing frequency deviation log files. The prefix must be between 1 and 40 characters.

Frequency Deviation Log

To access the Frequency Deviation 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 **Frequency Deviation Log** menu option. This webpage displays the frequency deviation logs for Acuvim 3.

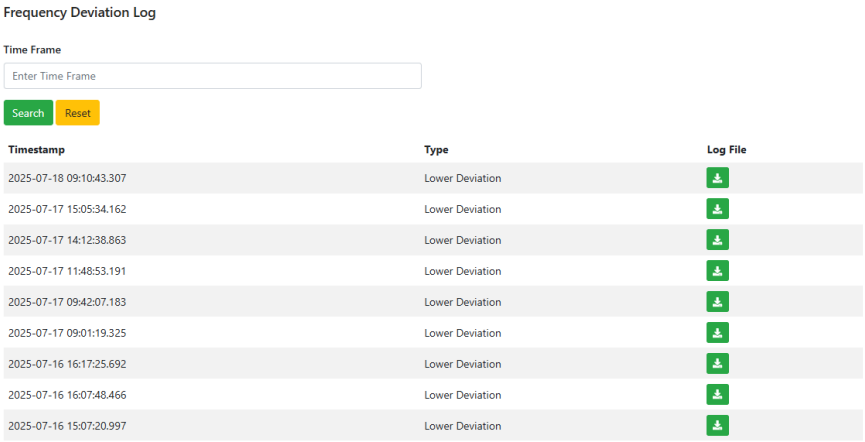


Figure 6-21 Frequency Deviation Log

The Frequency Deviation Log records every deviation event with:

- Timestamp of occurrence
- Type (Upper Deviation or Lower Deviation)
- Log File (download link for detailed CSV record)

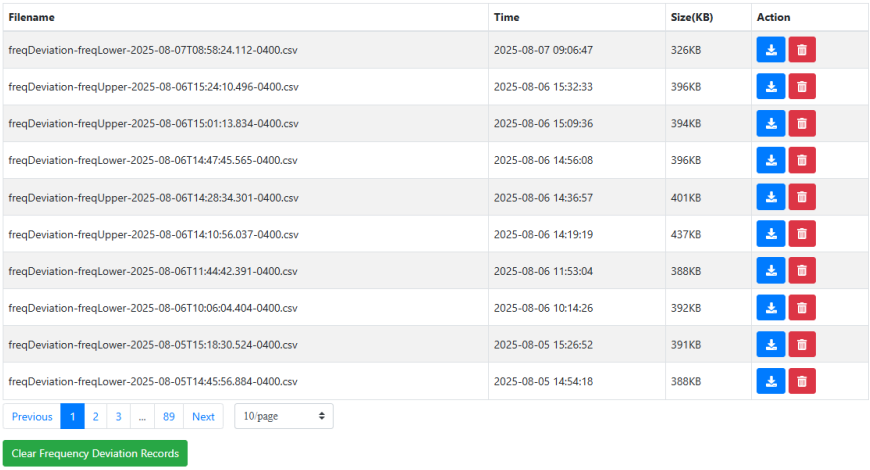
Users can:

- Search by date/time range
- Download event logs
- Clear the log history manually

6.4.9 Frequency Deviation Record

To access the Frequency Deviation 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 **Frequency Deviation Record** menu option. This webpage displays the frequency deviation records for Acuvim 3.



Filename	Time	Size(KB)	Action
freqDeviation-freqLower-2025-08-07T08:58:24.112-0400.csv	2025-08-07 09:06:47	326KB	
freqDeviation-freqUpper-2025-08-06T15:24:10.496-0400.csv	2025-08-06 15:32:33	396KB	
freqDeviation-freqUpper-2025-08-06T15:01:13.834-0400.csv	2025-08-06 15:09:36	394KB	
freqDeviation-freqLower-2025-08-06T14:47:45.565-0400.csv	2025-08-06 14:56:08	396KB	
freqDeviation-freqUpper-2025-08-06T14:28:34.301-0400.csv	2025-08-06 14:36:57	401KB	
freqDeviation-freqUpper-2025-08-06T14:10:56.037-0400.csv	2025-08-06 14:19:19	437KB	
freqDeviation-freqLower-2025-08-06T11:44:42.391-0400.csv	2025-08-06 11:53:04	388KB	
freqDeviation-freqLower-2025-08-06T10:06:04.404-0400.csv	2025-08-06 10:14:26	392KB	
freqDeviation-freqLower-2025-08-05T15:18:30.524-0400.csv	2025-08-05 15:26:52	391KB	
freqDeviation-freqLower-2025-08-05T14:45:56.884-0400.csv	2025-08-05 14:54:18	388KB	

Figure 6-22 Frequency Deviation Record

The Frequency Deviation Record list contains all stored CSV files generated during frequency deviation events. Each entry includes:

- Filename (with event type and timestamp)
- Time of record creation
- File Size
- Action (Download / Delete)

Users can download individual files for offline analysis or clear the entire record list.

6.4.10 Open Circuit Detection

The Open Circuit Detection function monitors the continuity and integrity of current transformers (CT) and voltage transformers (PT) circuits in real time. When a monitored circuit is disconnected

(open circuit) or exhibits abnormal continuity during operation, the meter will trigger an Open Circuit Event.

Detected events are stored in the CT Open/Short Detection Log, and event details can be downloaded or posted remotely in CSV format.

Nominal accuracy ensures that abnormal CT/PT wiring conditions are captured promptly without false triggering during normal operation.

The feature can be configured to monitor specific phases and to use user-defined thresholds for both CT and PT channels.

Open Circuit Detection Settings

To enable Open Circuit Detection feature,

1. Click on **Settings** from the main menu.
2. Select **Installation** from the tab menu.
3. Click on the **General** menu option.

Open Circuit Enable:

Toggles the monitoring function ON or OFF. When enabled, the meter continuously checks each configured CT/PT channel.

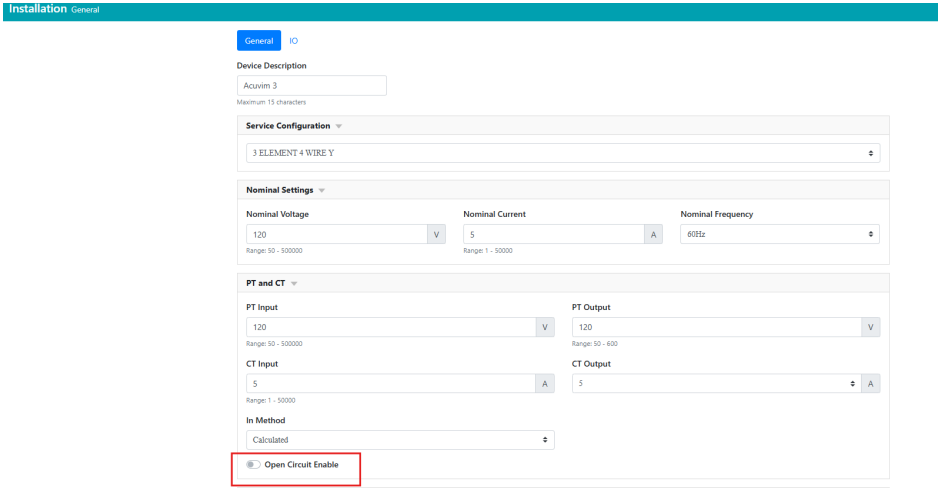


Figure 6-23 Open Circuit Detection Enable

Open Circuit Detection Log

To access the Open Circuit Detection logs,

1. Click on **Acuvim 3** from the main menu.
2. Select **Power Quality** and **Alarm** from the tab menu.
3. Click on the **CT Open/Short Detection** menu option.

The Open Circuit Detection Log records all detected events with:

- Timestamp of the event
- Type (Open Circuit)
- Affected Phase Channel
- Status (ON = fault active, OFF = fault cleared)

The log can be accessed from the meter's web interface to:

- Search by time range
- Export as CSV
- Clear logs manually
- Enable automatic posting to remote servers or SCADA systems

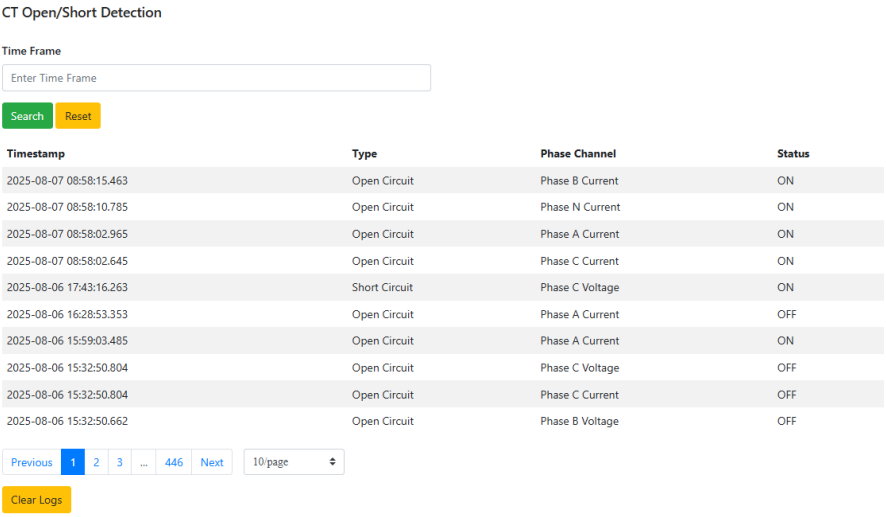


Figure 6-24 Open Circuit Detection Log

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).

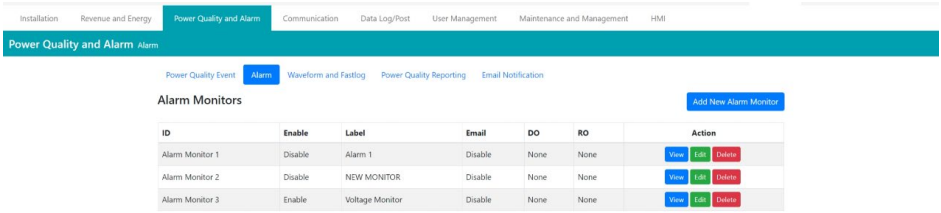


Figure 6-24 Alarm Monitors Operation Webpage

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.

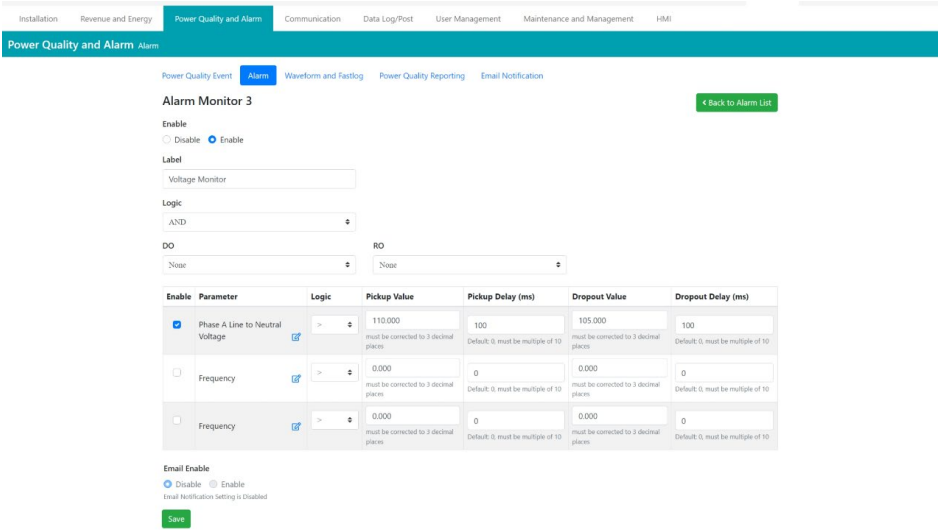


Figure 6-25 Alarm Setting Webpage

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.

Parameter Dropout Value: The alarm dropout point. The dropout value data type is floating-

point 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.

Table 6-3 Basic Metering Parameters for Alarm Monitoring

Category	Type	Scope
Real Time	Frequency	System
	Line to Neutral Voltage	Average/A/B/C
	Line to Line Voltage	Average/A-B/B-C/C-A
	Current	Average/A/B/C/N
Power	Active Power	System/A/B/C
	Reactive Power	
	Apparent Power	
	Power Factor	
Fundamental	Fundamental VLN	Average/A/B/C
	Fundamental VLL	Average/A-B/B-C/C-A
	Fundamental Current	Average/A/B/C/N
	Fundamental Active Power	System/A/B/C
	Fundamental Reactive Power	
	Fundamental Apparent Power	
	Fundamental Power Factor	
Phase Angle	Line to Neutral Voltage Phase Angle	B/C
	Line to Line Voltage Phase Angle	A-B/B-C/C-A
	Current Phase Angle	A/B/C

Table 6-4 Unbalance Parameters for Alarm Monitoring

Category	Type	Scope
Unbalance Magnitude	Voltage Positive Sequence Magnitude	System
	Voltage Zero Sequence Magnitude	
	Voltage Negative Sequence Magnitude	
	Voltage Zero Sequence Ratio	
	Voltage Unbalance Factor	
	Current Positive Sequence Magnitude	
	Current Zero Sequence Magnitude	
	Current Negative Sequence Magnitude	
	Current Zero Sequence Ratio	
	Current Unbalance Factor	
Unbalance Angle	Voltage Positive Sequence Angle	
	Voltage Zero Sequence Angle	
	Voltage Negative Sequence Angle	
	Current Positive Sequence Angle	
	Current Zero Sequence Angle	
	Current Negative Sequence Angle	

Table 6-5 Harmonics Parameters for Alarm Monitoring

Category	Type	Scope
THD	Voltage THD	Average/A/B/C
	Voltage Odd THD	
	Voltage Even THD	
	Voltage Crest Factor	
	Current THD	
	Current Odd THD	
	Current Even THD	
	Current TDD	
	Current Crest Factor	
	Current K Factor	

Category	Type	Scope
Harmonics Magnitude	Voltage Harmonics Magnitude	A/B/C (order number:2–127)
	Current Harmonics Magnitude	
Harmonics Angle	Voltage Harmonics Angle	
	Current Harmonics Angle	

Table 6-6 IO Parameters for Alarm Monitoring

Category	Type	Scope
Digital Input (DI) Status	Meter Body	DI1/DI2/DI3/DI4
	AXM-IO1-1	DI1/DI2/DI3/DI4/DI5/DI6
	AXM-IO1-2	
	AXM-IO2-1	DI1/DI2/DI3/DI4
	AXM-IO2-2	
	AXM-IO3-1	
	AXM-IO3-2	
Analog Input (AI)	AXM-IO3-1	AI1/AI2
	AXM-IO3-2	

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).

Figure 6-26 Alarm Status Webpage

Alarm ID: Alarm monitor unique ID number.

Alarm Label: Customized label name for alarm monitor.

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.

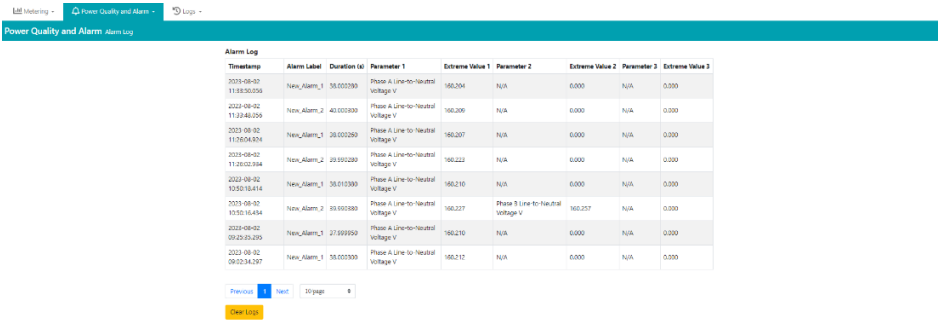


Figure 6-27 Alarm Log Webpage

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.

Table 6-7 EN50160 Compliant Reports Parameters

Type	Details
Frequency	System
Voltage RMS	Phase A/B/C
Voltage Unbalance	System
Voltage Harmonics	System (up to 25th)
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)

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.
4. Click on the **EN50160** tab. This webpage displays the EN50160 compliant report settings for Acuvim 3.

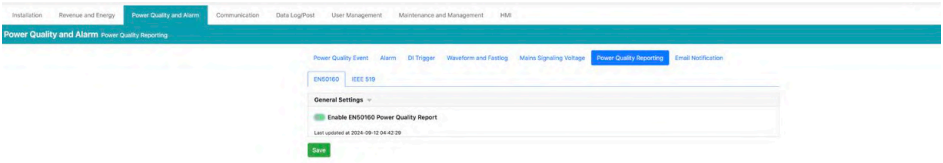


Figure 6-28 EN50160 Compliant Report Setting Webpage

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

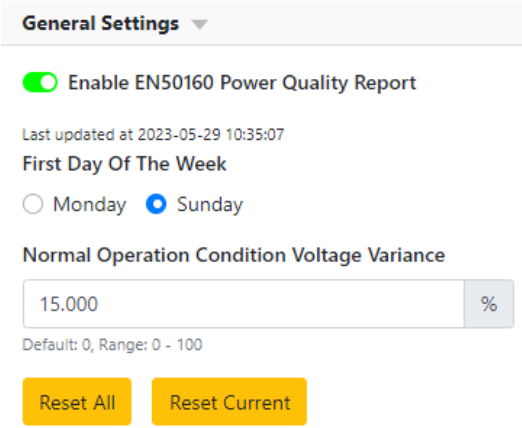


Figure 6-29 EN50160 Power Quality Report General Settings

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).

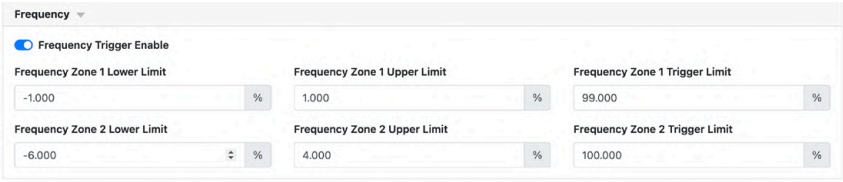


Figure 6-30 Frequency Settings

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).

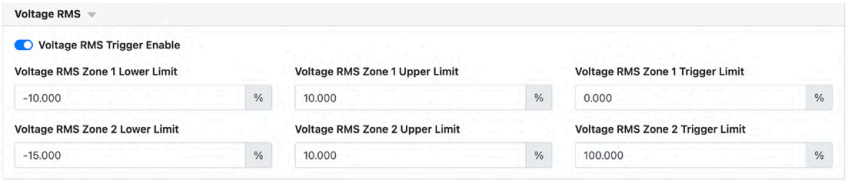


Figure 6-31 EN50160 RMS Settings

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).

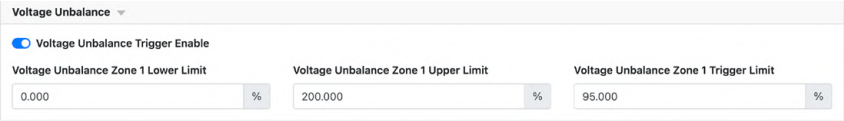


Figure 6-32 EN50160 Unbalance Settings

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 25th harmonic. For example, with the configuration provided in Table 6-8, voltage harmonics should meet the requirements outlined.

Table 6-8 Voltage Harmonics Pass Criteria

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)

Parameter	Pass Criteria
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)

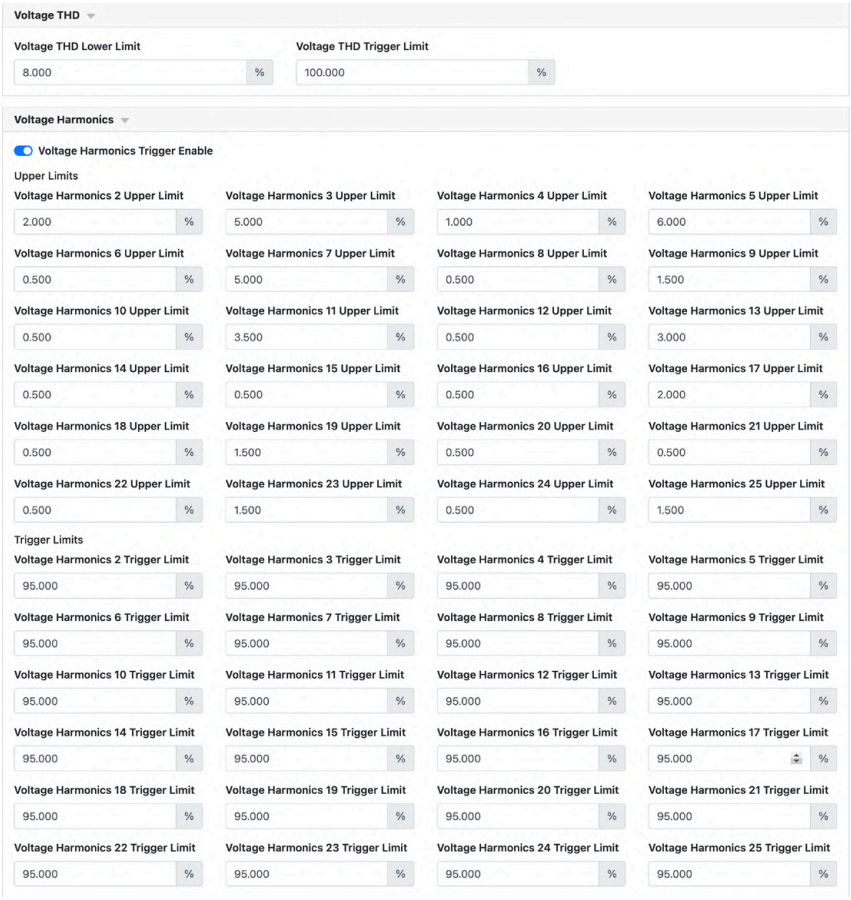


Figure 6-33 EN50160 Voltage Harmonics Settings

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.

Table 6-9 EN50160 Voltage Interruptions Categorization and 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

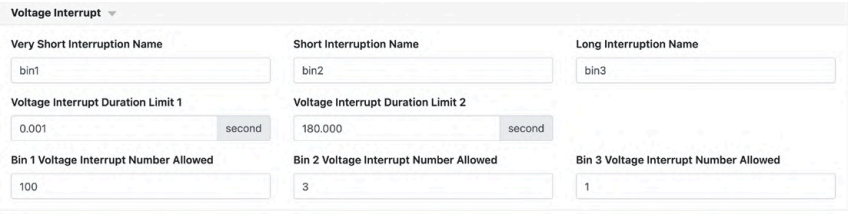


Figure 6-34 EN50160 Voltage Interruption Settings

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.

Table 6-10 EN50160 Voltage Dip Categorization and Requirements

Residual Voltage u (%)	Duration t (ms)				
	10ms<=t <=200ms	200ms<t <=500ms	500ms<t <=1000ms	1000ms<t <=5000ms	5000ms<t
90% > u > = 80%	• Cell name: A1 • Allowed events: 100	• Cell name: A2 • Allowed events: 100	• Cell name: A3 • Allowed events: 100	• Cell name: A4 • Allowed events: 100	• Cell name: A5 • Allowed events: 100
80% > u >= 70%	• Cell name: B1 • Allowed events: 100	• Cell name: B2 • Allowed events: 100	• Cell name: B3 • Allowed events: 100	• Cell name: B4 • Allowed events: 100	• Cell name: B5 • Allowed events: 100

Residual Voltage u (%)	Duration t (ms)				
70% > u > = 40%	• Cell name: C1 • Allowed events: 100	• Cell name: C2 • Allowed events: 100	• Cell name: C3 • Allowed events: 100	• Cell name: C4 • Allowed events: 100	• Cell name: C5 • Allowed events: 100
40% > u >= 5%	• Cell name: D1 • Allowed events: 100	• Cell name: D2 • Allowed events: 100	• Cell name: D3 • Allowed events: 100	• Cell name: D4 • Allowed events: 100	• Cell name: D5 • Allowed events: 100
5% > u	• Cell name: X1 • Allowed events: 100	• Cell name: X2 • Allowed events: 100	• Cell name: X3 • Allowed events: 100	• Cell name: X4 • Allowed events: 100	• Cell name: X5 • Allowed events: 100

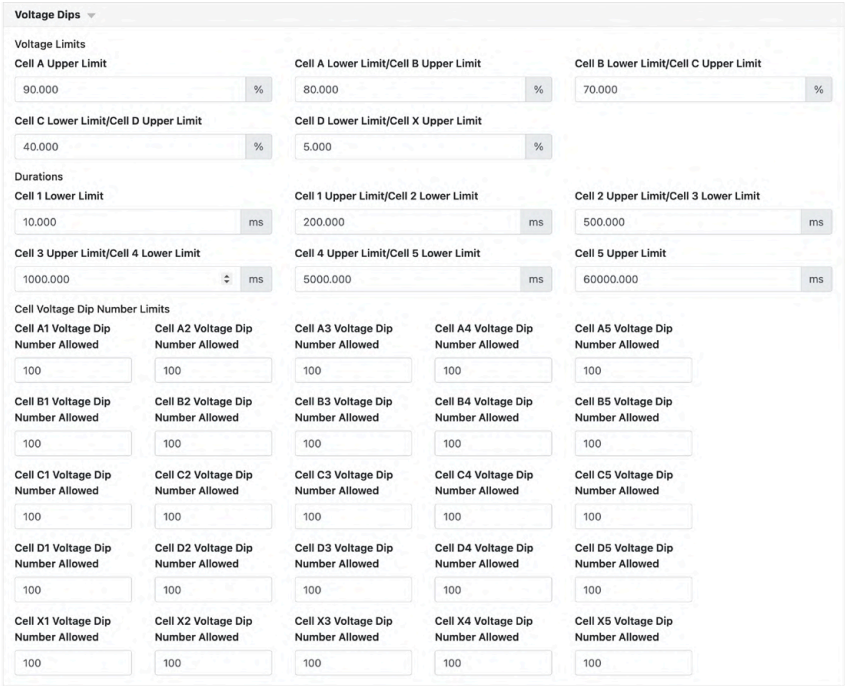


Figure 6-35 EN50160 Voltage Dips Settings

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.

Table 6-11 EN50160 Voltage Swell Categorization and Requirements

Residual Voltage u (%)	Duration t (ms)		
	10ms<=t<=500ms	500ms<t<=5000ms	5000ms<t<=60000ms
u >= 120%	• Cell name: S1 • Allowed events: 100	• Cell name: S2 • Allowed events: 100	• Cell name: S3 • Allowed events: 100
120% > u >= 110%	• Cell name: T1 • Allowed events: 100	• Cell name: T2 • Allowed events: 100	• Cell name: T3 • Allowed events: 100

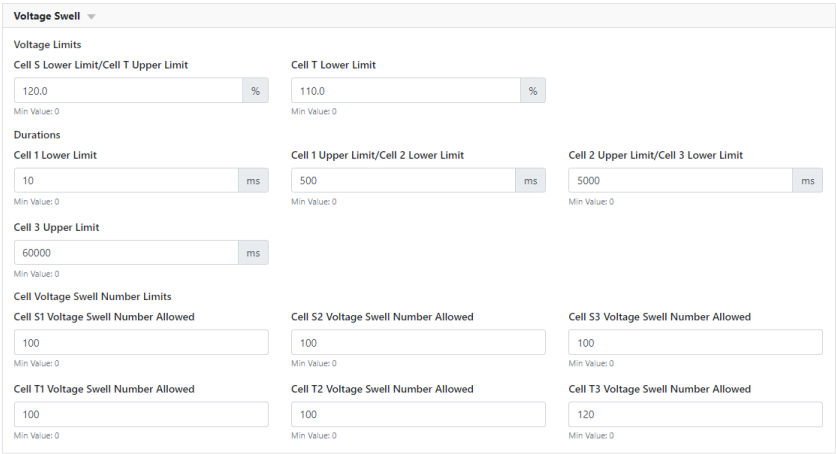


Figure 6-36 EN50160 Voltage Settings

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).

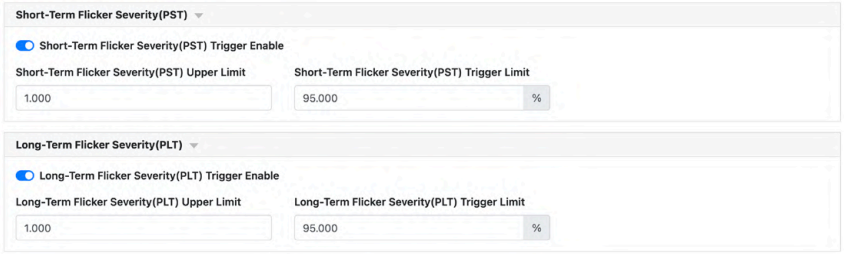


Figure 6-37 EN50160 Flicker Settings

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.
3. Click on the **Power Quality Reports** option and select **EN50160 Compliance Report** menu option. This webpage displays the EN50160 compliance Reports for Acuvim 3.

Figure 6-38 EN50160 Compliance Report Webpage

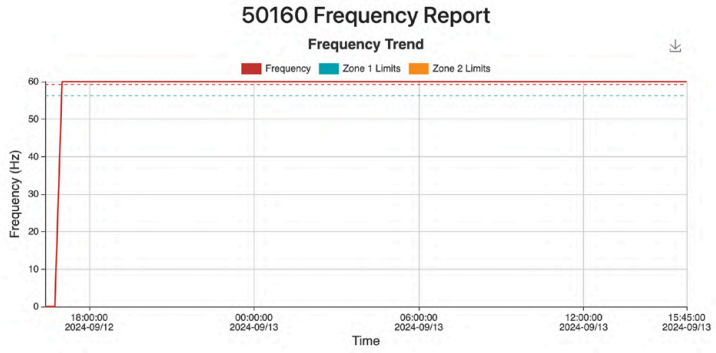


Figure 6-39 EN50160 Frequency Trend

Frequency Trends: The data used to create frequency trends is sourced from the trend log, which records instantaneous frequency values every 15-minute.

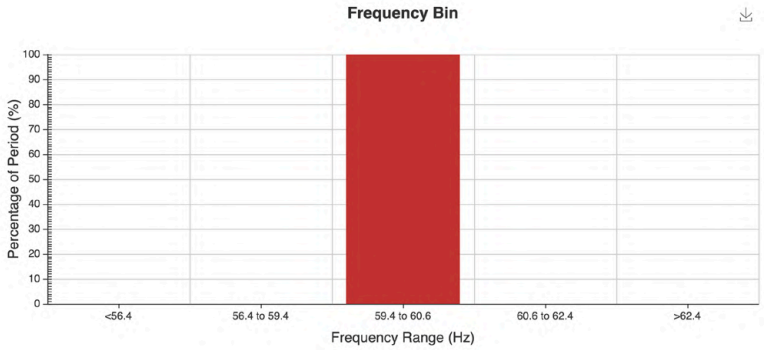


Figure 6-40 EN50160 Frequency Bin

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 6-41 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

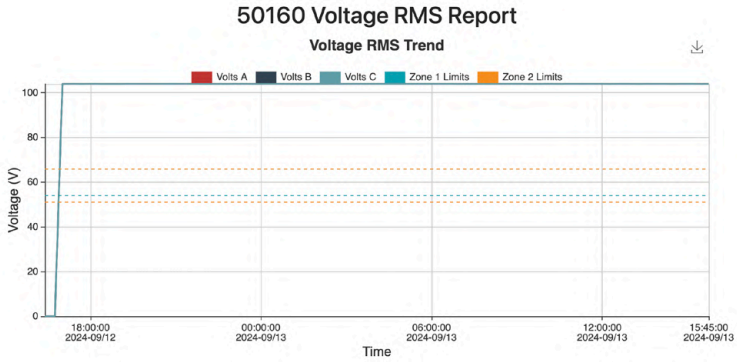


Figure 6-42 EN50160 Voltage RMS Trend

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.

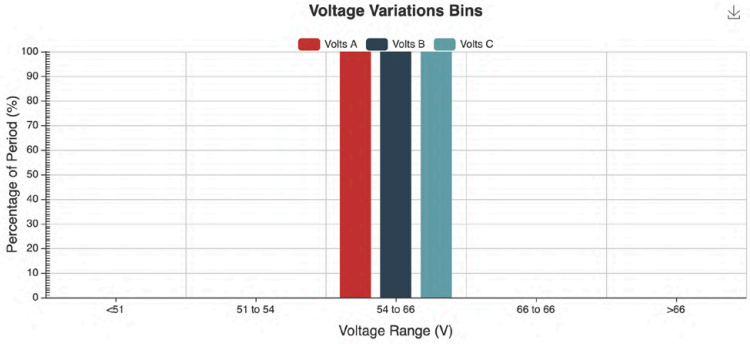


Figure 6-43 EN50160 Voltage Variations Bins

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
B	60.003	60.004	60.004
C	60.003	60.004	60.004

Figure 6-44 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

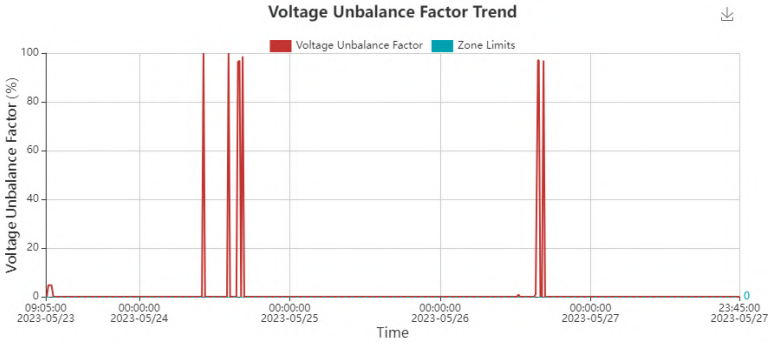


Figure 6-45 EN50160 Voltage Unbalance Factor Trend

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 6-46 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

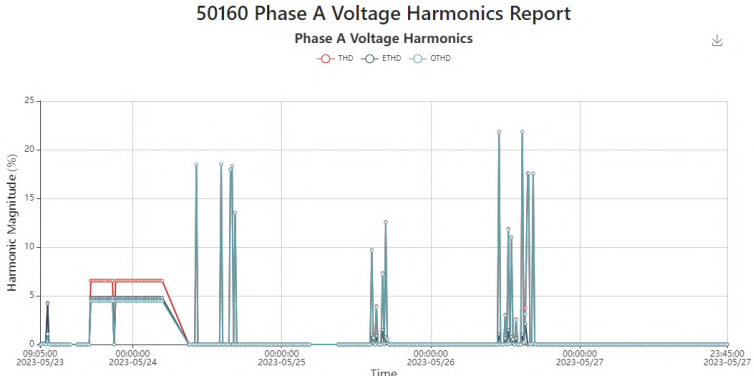


Figure 6-47 EN50160 Voltage Harmonics Trend

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.

Results Summary

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 6-48 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

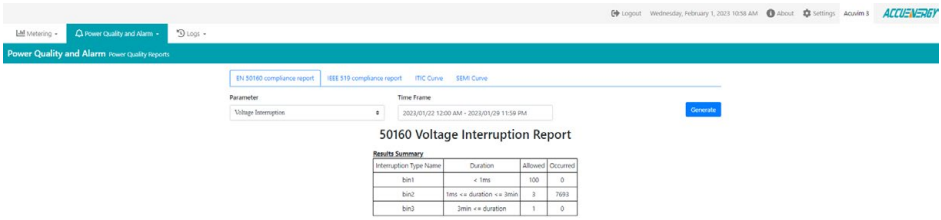


Figure 6-49 EN50160 Voltage Interruption Report Results Summary

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

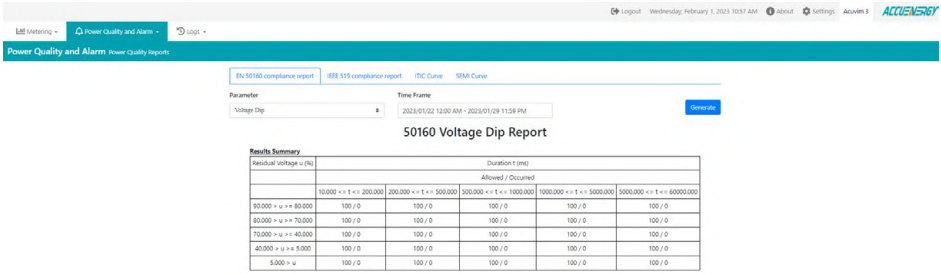


Figure 6-50 EN50160 Voltage Dips Report Results Summary

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

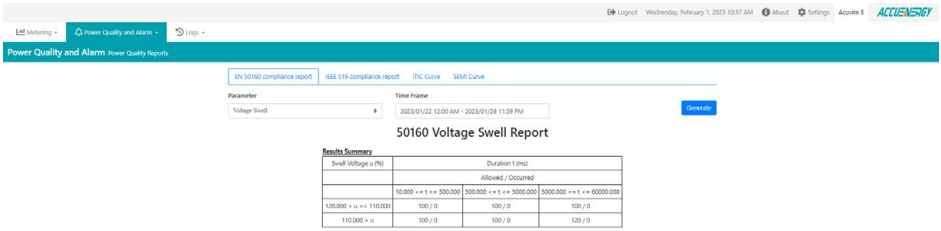


Figure 6-51 EN50160 Voltage Swell Report Results Summary

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

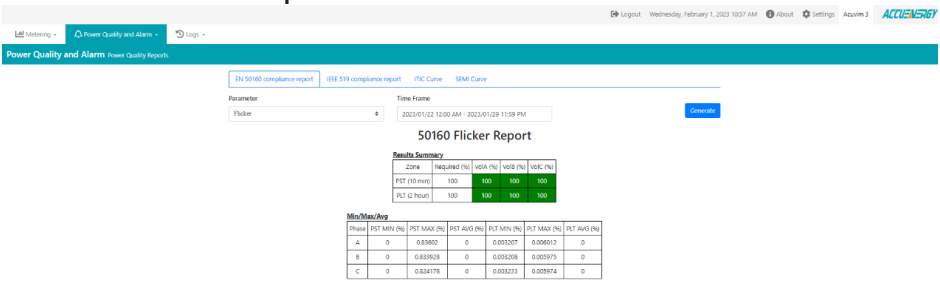


Figure 6-52 EN50160 Flicker Report Result Summary

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.

Table 6-12 IEEE519 Compliant Reports Parameters

Type	Details	Update Interval
Voltage Harmonics	Voltage THD and individual harmonics (up to 50th) for each phase A/B/C.	Daily (3s reading) Weekly (10 min reading)
Current Harmonics	Current THD and individual harmonics (up to 50th) for each phase A/B/C.	

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.

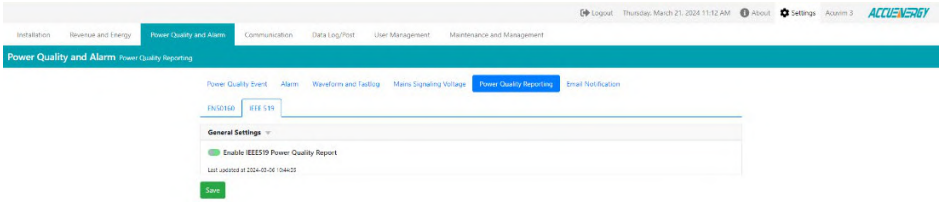


Figure 6-53 IEEE519 Report Setting Webpage

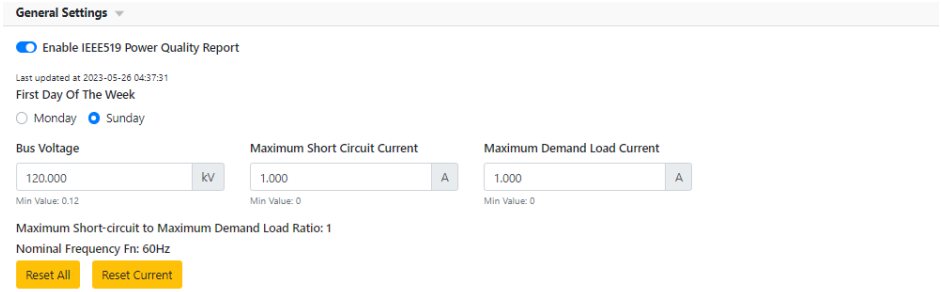


Figure 6-54 IEEE519 Report General Setting

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 50th harmonic).

To meet the IEEE519 standard for voltage harmonics, the daily 99th percentile of very short-time (3 seconds) values should be less than 1.5 times the configured trigger limits. Additionally, the weekly 95th 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.

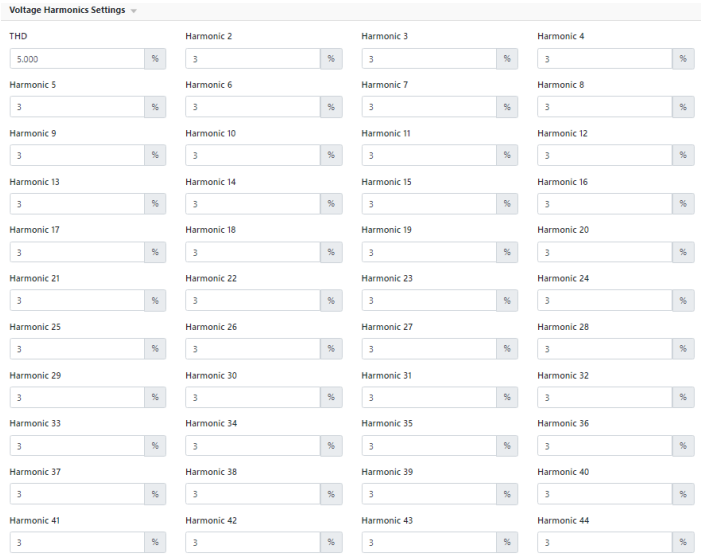


Figure 6-55 IEEE519 Voltage Harmonic Settings

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 50th harmonic).

To meet the IEEE519 standard for current harmonics, the daily 99th percentile of very short-time (3 seconds) values should be less than twice the configured trigger limits. Additionally, the weekly 99th percentile of short-time (10 minutes) values should be less than 1.5 times the configured trigger limits. Furthermore, weekly 95th percentile short-time (10 minutes) values should also be less than the configured trigger limits.

Cell TDD: The TDD upper limit.

Cell Harmonics (1~50): The current harmonics upper limit.

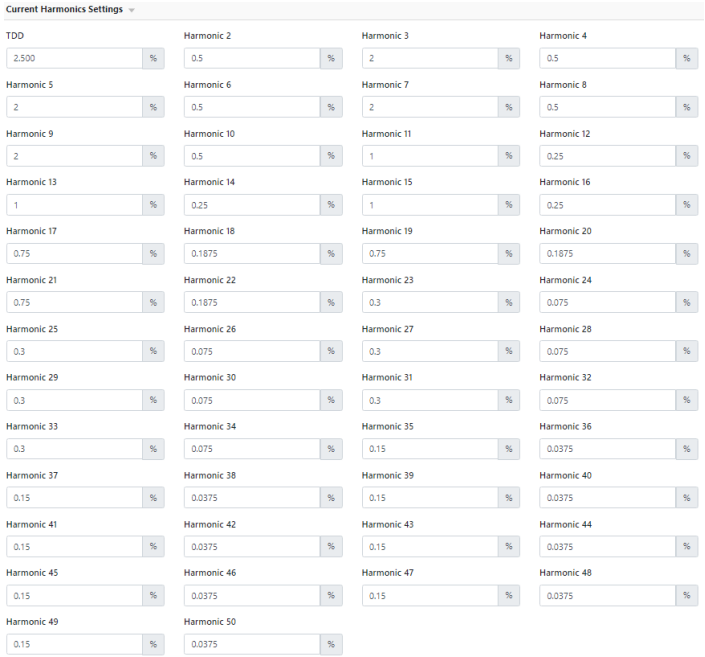


Figure 6-56 IEEE519 Current Harmonic Settings

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.

4. Click on the **IEEE519 Compliant Report** menu option. This webpage displays the IEEE519 Compliant reports for Acuvim 3.

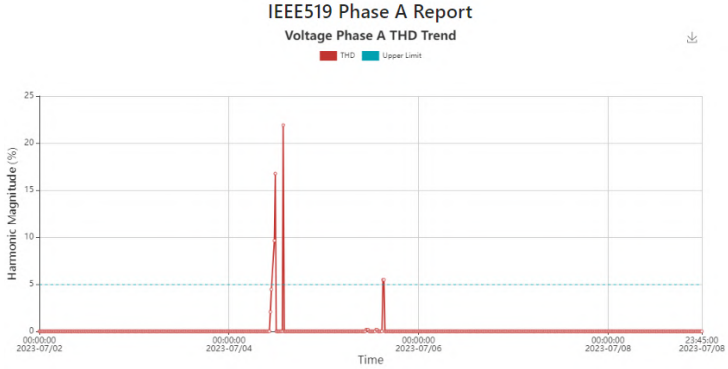


Figure 6-57 IEEE519 Voltage Phase A THD Trend

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.

Results Summary

Parameter	Upper Limit %	Trigger limit %	Actual Pass Rate %	Result	Max	Min	Average
THD	5%	99%	92.868%	Fail	54.987%	0.000%	1.110%
Harmonic 2	3%	99%	98.098%	Fail	6.064%	0.000%	0.101%
Harmonic 3	3%	99%	93.544%	Fail	9.998%	0.000%	0.262%
Harmonic 4	3%	99%	94.295%	Fail	3.001%	0.000%	0.150%
Harmonic 5	3%	99%	93.978%	Fail	7.992%	0.000%	0.298%
Harmonic 6	3%	99%	95.721%	Fail	4.996%	0.000%	0.219%
Harmonic 7	3%	99%	93.502%	Fail	9.999%	0.000%	0.423%
Harmonic 8	3%	99%	95.880%	Fail	4.988%	0.000%	0.218%
Harmonic 9	3%	99%	94.136%	Fail	3.993%	0.000%	0.207%
Harmonic 10	3%	99%	96.038%	Fail	2.997%	0.000%	0.140%
Harmonic 11	3%	99%	97.623%	Fail	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%	Fail	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%	Fail	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%	Fail	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%	Fail	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%	Fail	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%	Fail	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%	Fail	2.595%	0.000%	0.045%
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%	Fail	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%	Pass	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 6-58 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

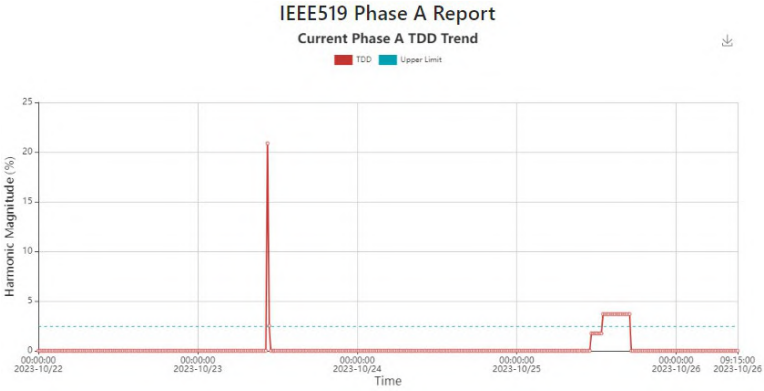


Figure 6-59 IEEE519 Current Phase A THD Trend

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.

Results Summary

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	1.499%	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	0.241%	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	0.187%	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	0.103%	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	0.0375%	99%	100.000%	Pass	0.000%	0.000%	0.000%

Figure 6-60 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.
4. 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.

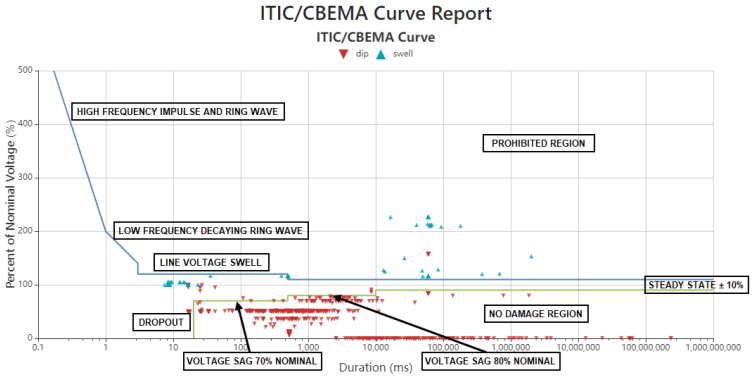


Figure 6-61 ITIC/CBEMA Curve Report

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.

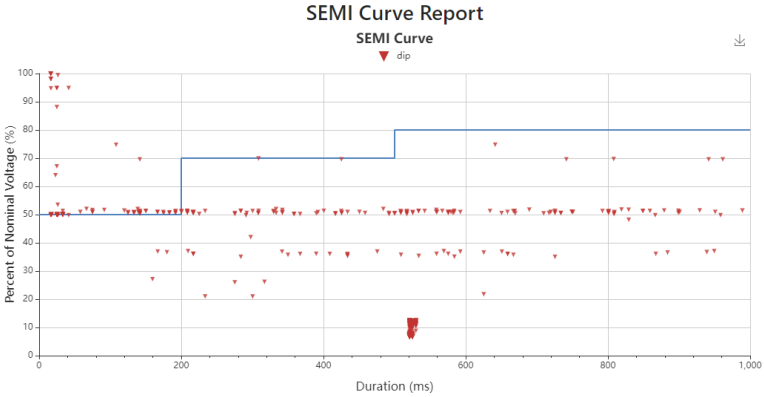


Figure 6-62 SEMI Curve Report

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.

Table 6-13 IEC 61010-4-30 Compliant Aggregation Loggers

Logger Type	Parameters	Log Interval
3s Aggregation Logger	• Timestamp • 3s Aggregation Values: • RMS • Power • Fundamental • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle	Fixed at 3 Seconds
10s Aggregation Logger	• Timestamp • Frequency	Fixed at 10 Seconds
10 Min Aggregation Logger	• Timestamp • 10 Min Aggregation Values: • RMS • Power • Fundamental • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle • Individual Harmonics	Fixed at 10 Minutes
2 Hour Aggregation Logger	• Timestamp • 2hour Aggregation Values: • RMS • Power • Fundamental • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle • Individual Harmonics	Fixed at 2 Hours

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.

Table 6-14 EN50160 Compliant Aggregation Loggers

Category	Parameters
Normal Operation	• Counter for valid • Counter for invalid
Frequency	• Counters for Frequency of each zone • Flag for pass/fail • Max/min/average values of 3-second frequency in the week
Voltage RMS	• Counters for Voltage RMS of each zone • Flag for pass/fail • Max/min/average values of 10-minute voltage RMS in the week
PST	• Counters for in range PST • Flag for pass/fail • Max/min/average values of 10-minute PST in the week
PLT	• Counters for in range PLT • Flag for pass/fail • Max/min/average values of 2-hour PLT in the week
Voltage Unbalance	• Counters for in range voltage unbalance • Flag for pass/fail • Max/min/average values of 10-minute voltage unbalance in the week
Voltage THD	• Counters for in range voltage THD • Flag for pass/fail • 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
Voltage Harmonics	• Counters for in range individual 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

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.

Table 6-15 IEEE519 Daily Logger Parameters

Category	Parameters
Voltage THD	• Counters for in range voltage THD • Flag for pass/fail • Max/min/average values of 3-second voltage THD in the day
Voltage Harmonics	• Counters for in range individual voltage harmonics • Flag for pass/fail • Max/min/average values of 3-second individual voltage harmonics in the day
Current THD	• Counters for in range voltage THD • Flag for pass/fail • Max/min/average values of 3-second min current THD in the day
Current Harmonics	• Counters for in range voltage THD • Flag for pass/fail • Max/min/average values of 3-second individual current harmonics in the day

Table 6-16 IEEE519 Weekly Logger Parameters

Category	Parameters
Voltage THD	• Counters for in range voltage THD • Flag for pass/fail • Max/min/average values of 10-minute voltage THD in the week
Voltage Harmonics	• Counters for in range individual voltage harmonics • Flag for pass/fail • Max/min/average values of 10-minute individual voltage harmonics in the week
Current THD	• Counters for in range voltage THD • Flag for pass/fail • Max/min/average values of 10-minute current THD in the week

Category	Parameters
Current Harmonics	• Counters for in range voltage THD • 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.

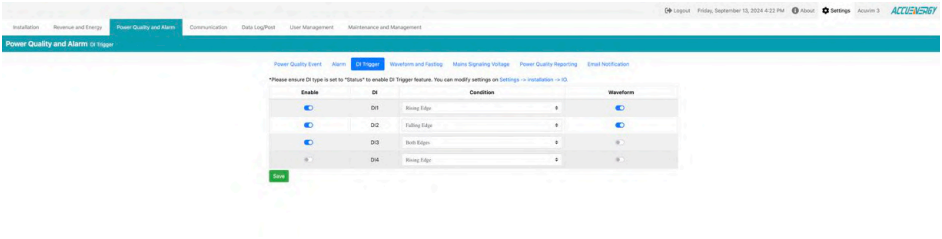


Figure 6-63 Acuvim3 DI trigger waveform

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.

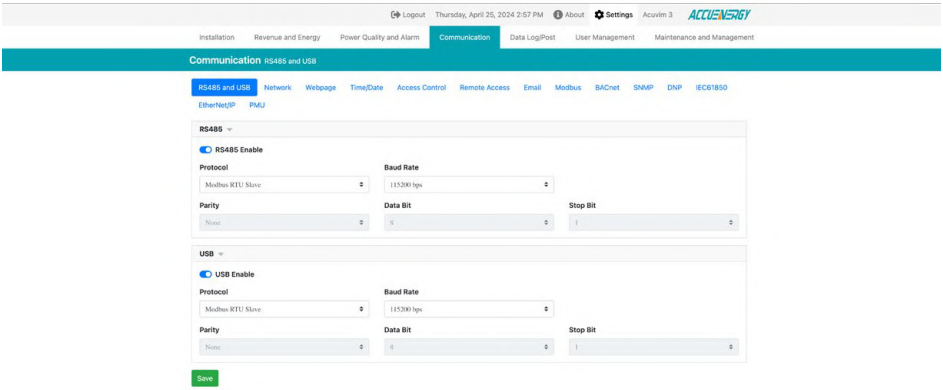


Figure 7-1 Communication RS485 and USB Setting Webpage

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.

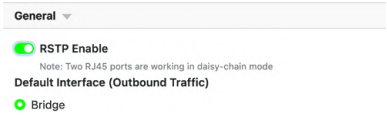


Figure 7-2 Enable RSTP

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.

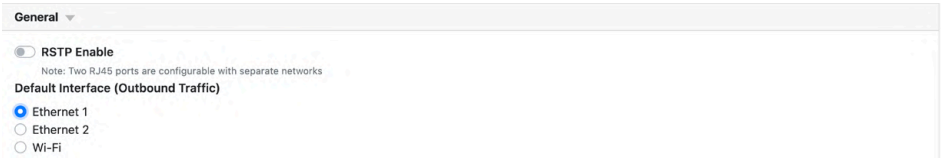


Figure 7-3 Default Interface Selection

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.

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.

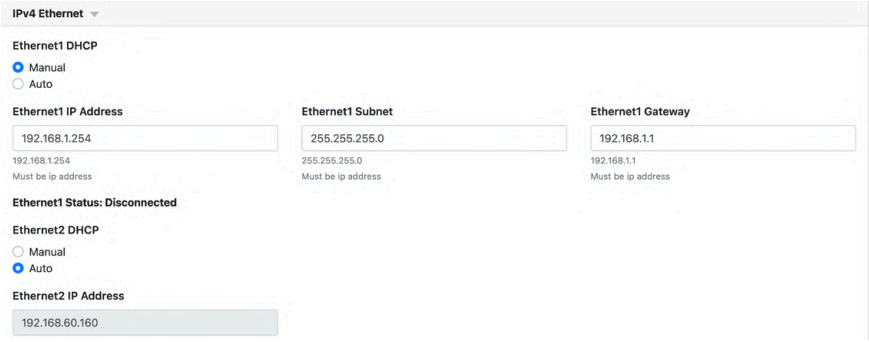


Figure 7-4 Ethernet Setting Section

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

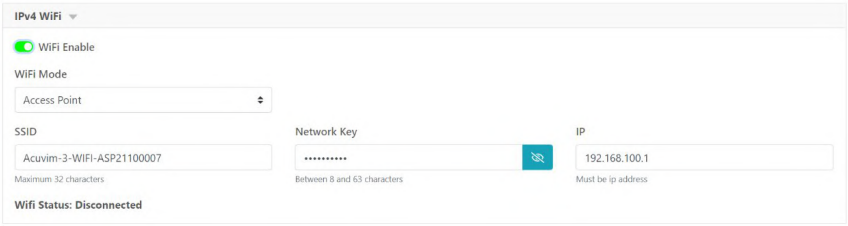


Figure 7-5 Access Point Setting Section

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

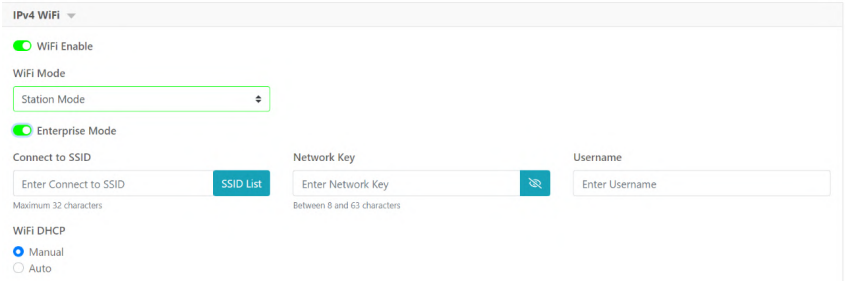


Figure 7-6 Access Point Setting Section

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.

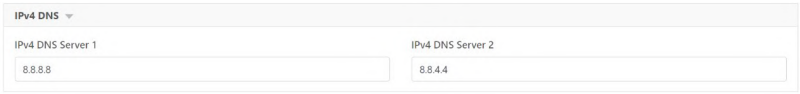


Figure 7-7 IPv4 DNS Setting

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.

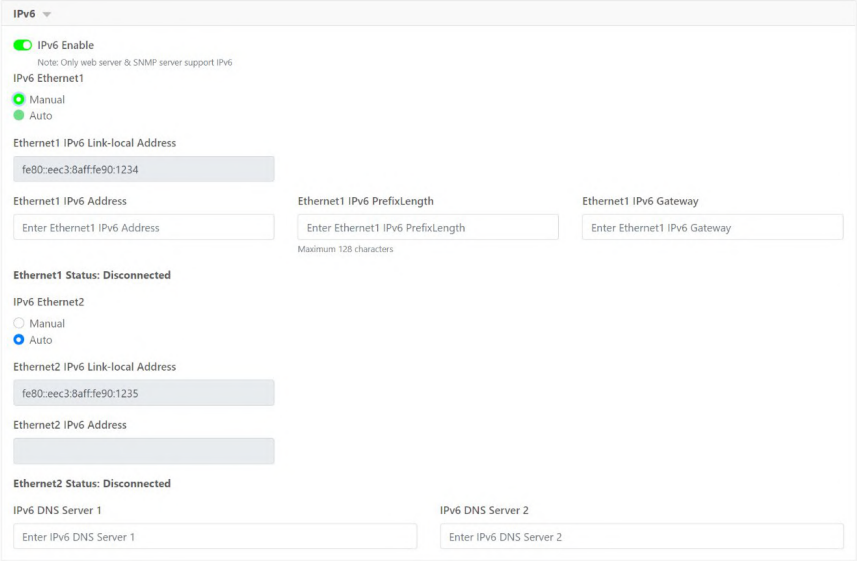


Figure 7-8 IPV6 Network Setting Section

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.

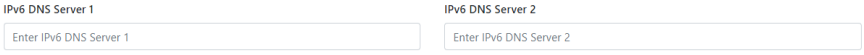


Figure 7-9 IPv6 DNS Setting

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.

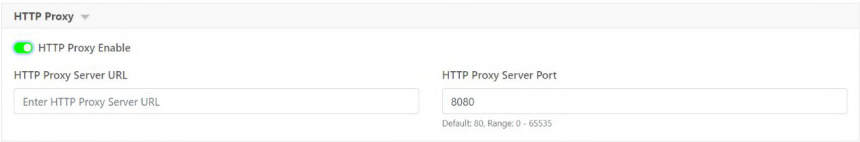


Figure 7-10 HTTP Proxy Setting

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.

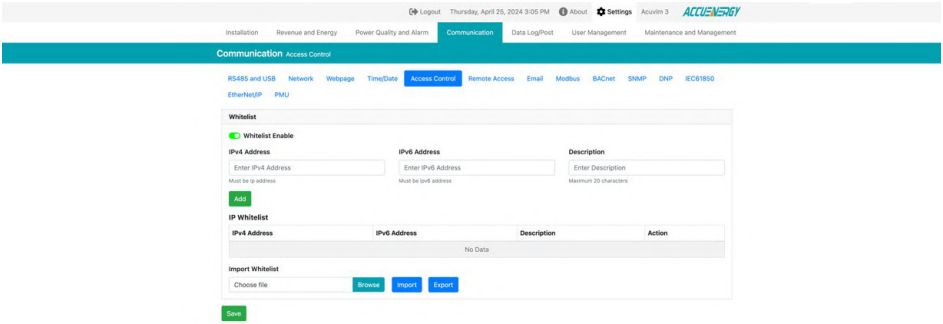


Figure 7-11 Access Control Setting

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.

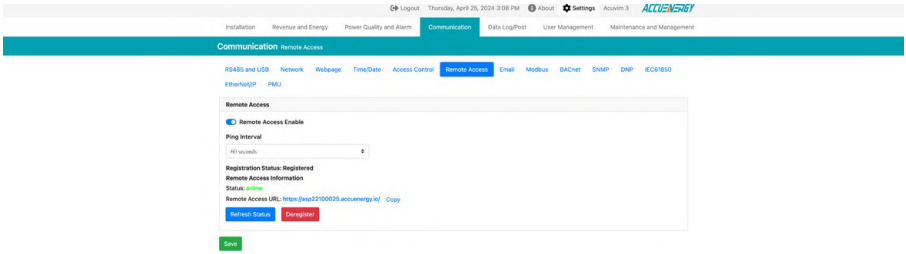


Figure 7-12 Remote Access Setting

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.

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

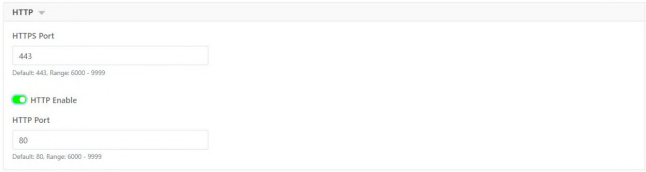


Figure 7-13 HTTP Enable Setting

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.

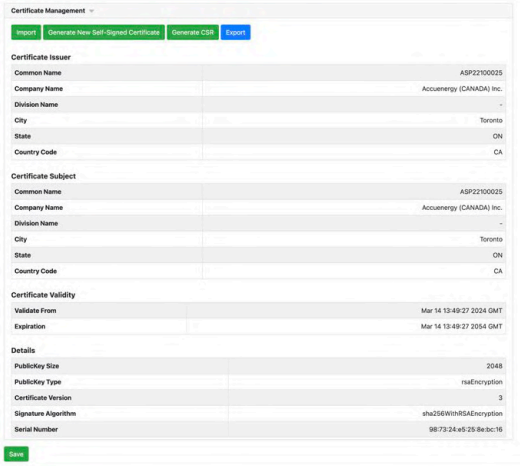


Figure 7-14 Certificate Management

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.

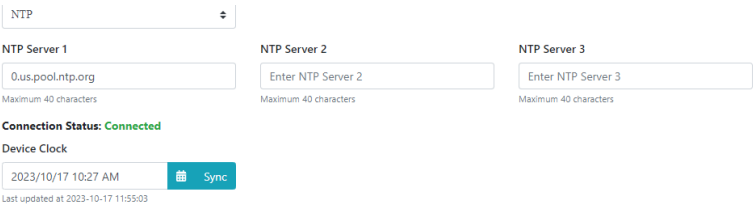


Figure 7-15 NTP Setting

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.

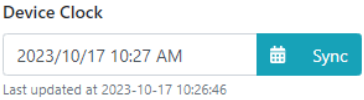


Figure 7-16 Device Clock Sync

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.

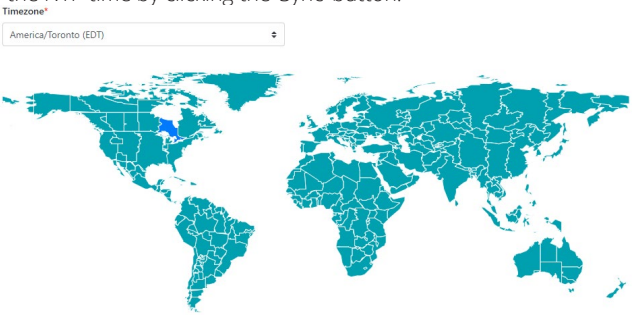


Figure 7-17 Time Zone Setting

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

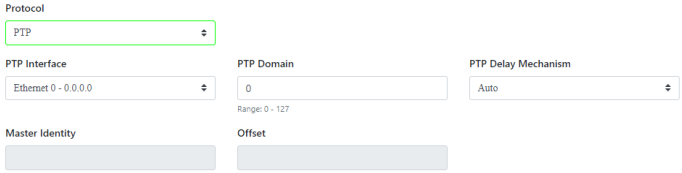


Figure 7-18 PTP Setting

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.

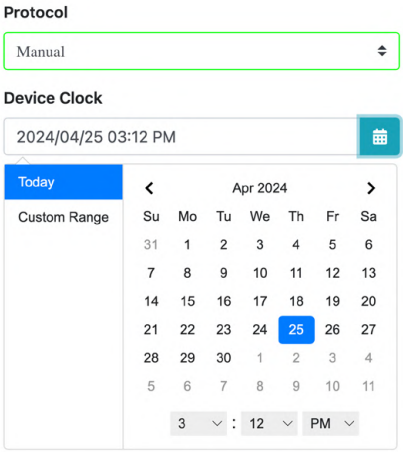


Figure 7-19 Manual Device Clock Configuration

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).

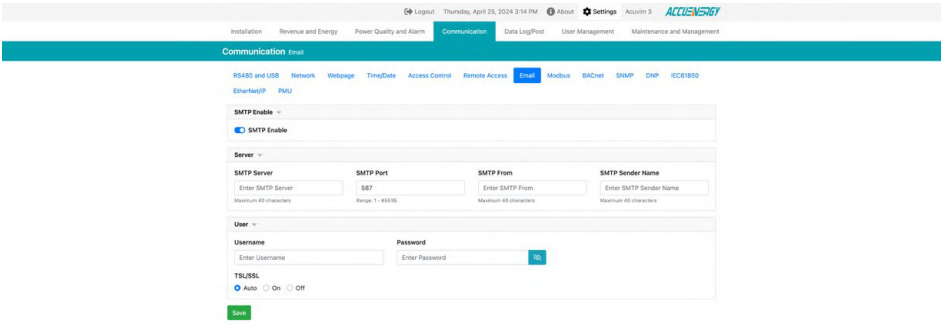


Figure 7-20 Email Setting Webpage

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.

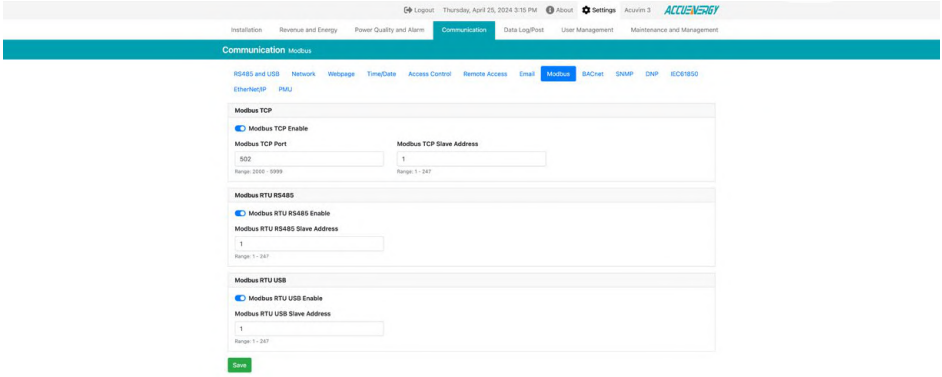


Figure 7-21 Modbus Setting Webpage

Ethernet Modbus Configuration

Acuvim 3 supports Modbus TCP over Ethernet, where it functions as a Modbus TCP server and responds to Modbus client requests.

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.

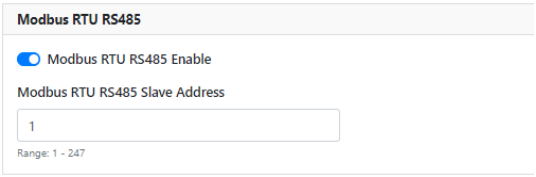


Figure 7-23 Modbus RTU RS485 Setting

Modbus RTU RS485 Slave Address: The default address is set to 1, and the address number can range from 1 to 247.

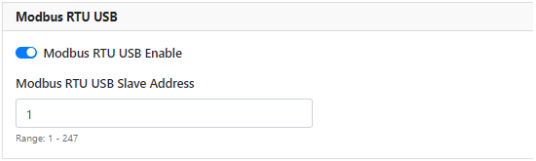


Figure 7-24 Modbus RTU USB Setting

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.

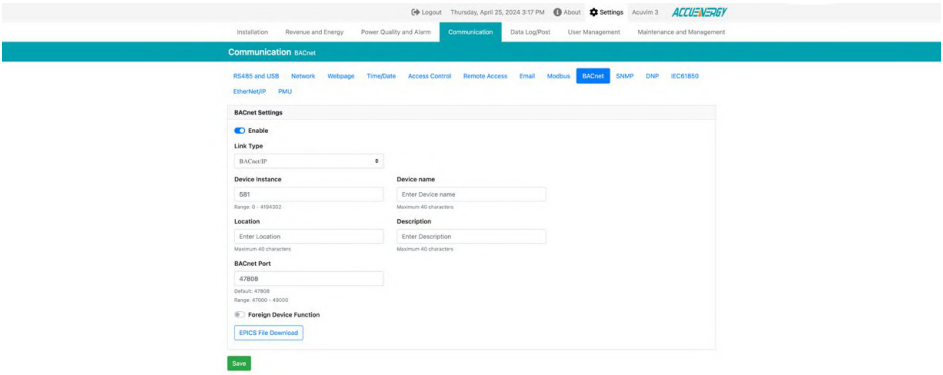


Figure 7-25 BACnet/IP Setting Webpage

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.

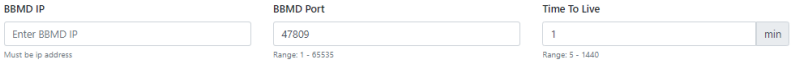


Figure 7-26 BACnet Foreign Device Function Setting

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.

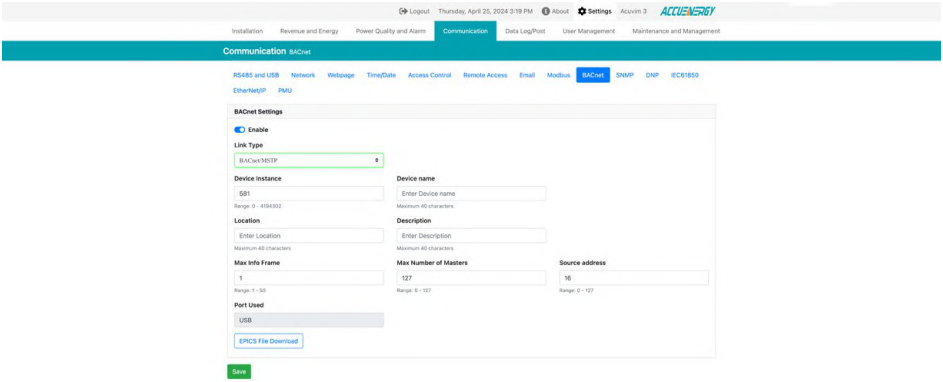


Figure 7-27 BACnet/MSTP Setting Webpage

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

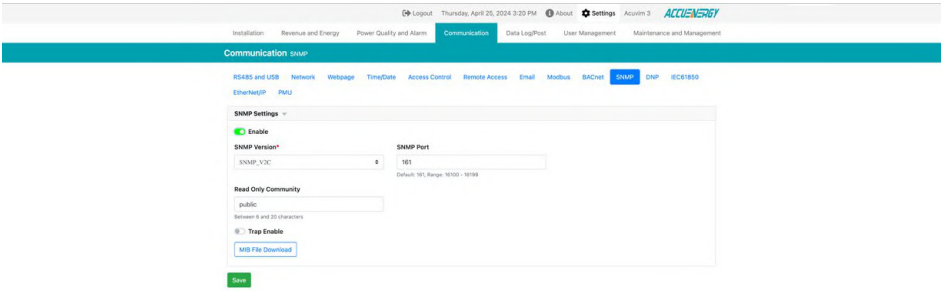


Figure 7-28 SNMP V2C Setting Webpage

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

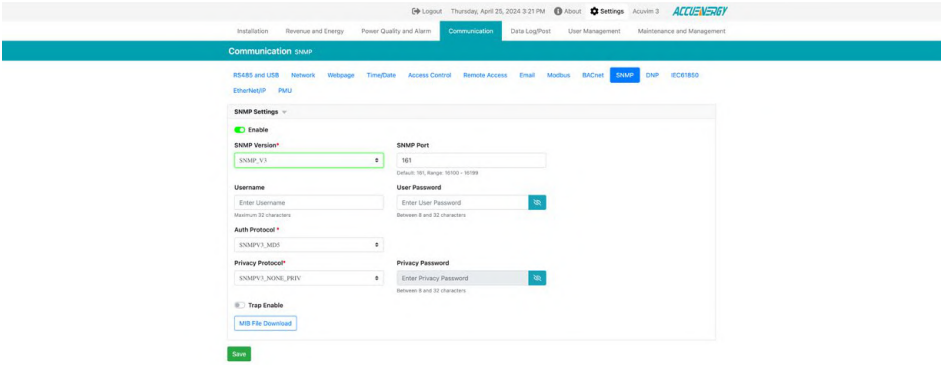


Figure 7-29 SNMP V3 Setting Webpage

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.

Table 7-1 PQ Event Status Trap for Acuvim 3

Node Name 1	ID 1	Node Name 2	ID 2
PQ Event Status Trap	1	phaseAPQEventStatusVoltageSagTra	1
		phaseBPQEventStatusVoltageSagTra	2
		phaseCPQEventStatusVoltageSagTra	3
		phaseAPQEventStatusVoltageSwellTrap	4
		phaseBPQEventStatusVoltageSwellTrap	5
		phaseCPQEventStatusVoltageSwellTrap	6
		phaseAPQEventStatusVoltageInterruptionTrap	7
		phaseBPQEventStatusVoltageInterruptionTrap	8
		phaseCPQEventStatusVoltageInterruptionTrap	9
		systemPQEventStatusVoltageUnbalanceTrap	10
		phaseAPQEventStatusVoltageTransientTrap	11
		phaseBPQEventStatusVoltageTransientTrap	12
		phaseCPQEventStatusVoltageTransientTrap	13
		phaseAPQEventStatusCurrentSagTrap	14
		phaseBPQEventStatusCurrentSagTrap	15
		phaseCPQEventStatusCurrentSagTrap	16
		phaseAPQEventStatusCurrentSwellTrap	17
		phaseBPQEventStatusCurrentSwellTrap	18
		phaseCPQEventStatusCurrentSwellTrap	19
		systemPQEventStatusCurrentUnbalanceTrap	20

Table 7-2 Alarm Trap for Acuvim 3

Node Name 1	ID 1	Node Name 2	ID 2
Alarm Trap	2	alarmMonitorStatus1Trap - alarmMonitorStatus64Trap	1-64

Table 7-3 DI Status Trap for Acuvim 3

Node Name 1	ID 1	Node Name 2	ID 2
DI Status Trap	1	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
		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

Node Name 1	ID 1	Node Name 2	ID 2
DI Status Trap	1	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
		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.

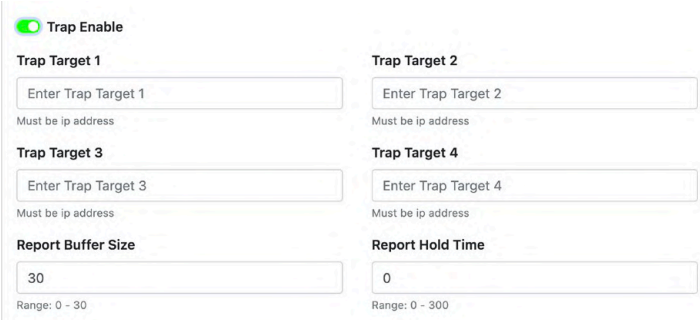


Figure 7-30 SNMP Trap Setting

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.

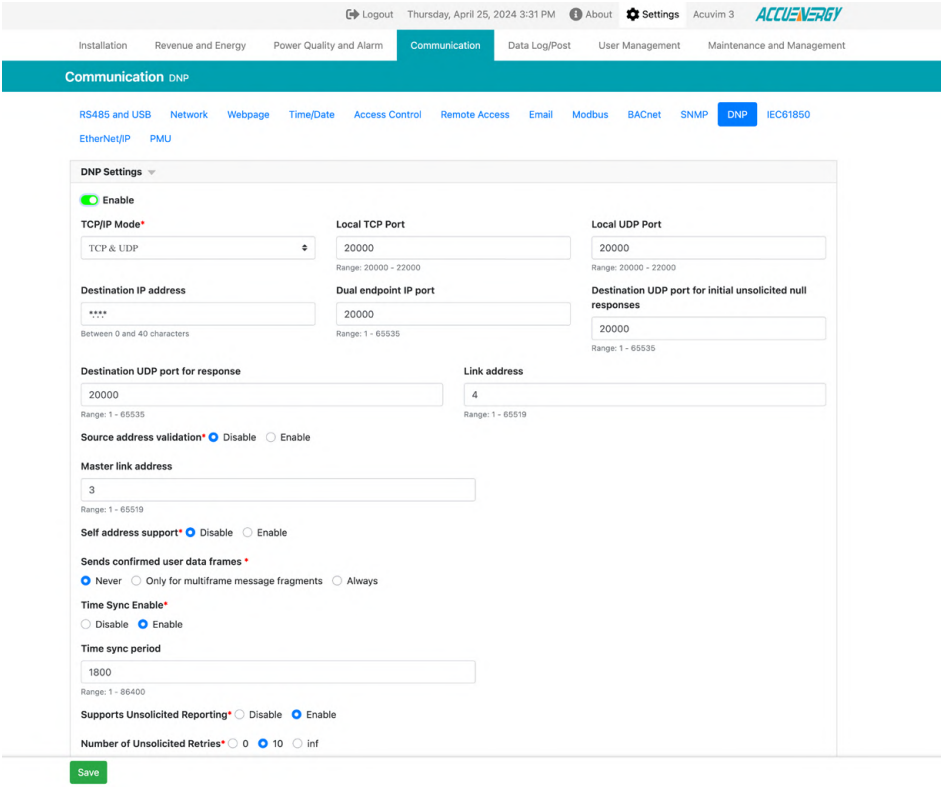


Figure 7-31 DNP Setting Webpage

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.

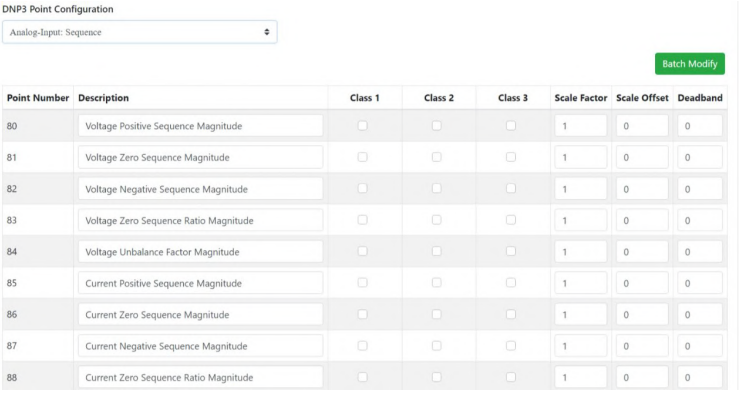


Figure 7-32 DNP3 Point Configuration

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.

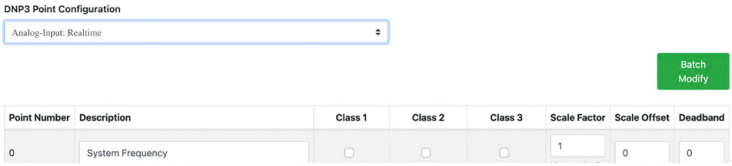


Figure 7-33 DNP3 Point Configuration- Batch Modify

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.

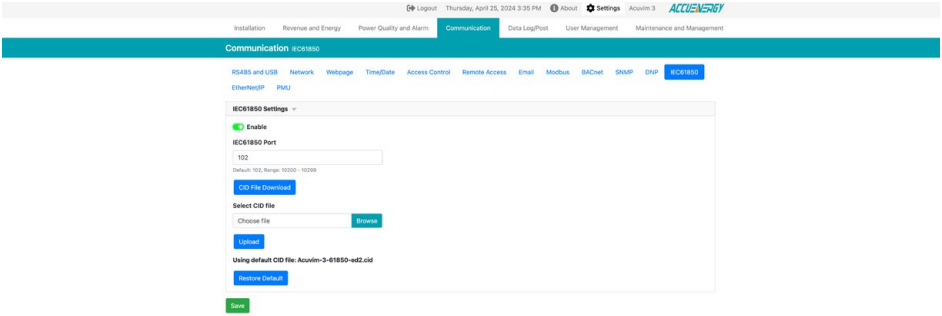


Figure 7-34 IEC 61850 Setting Webpage

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.

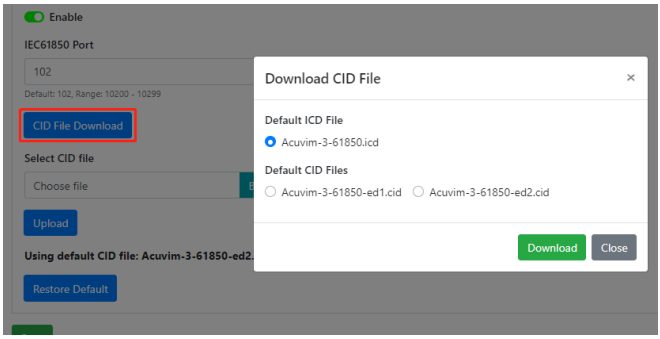


Figure 7-35 CID File Download Webpage

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.

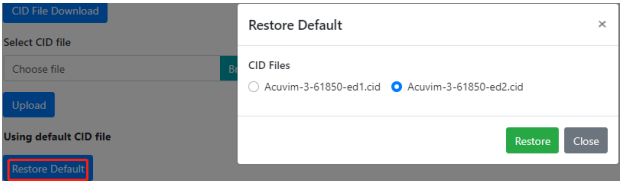


Figure 7-37 Restore CID File

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.
3. 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.

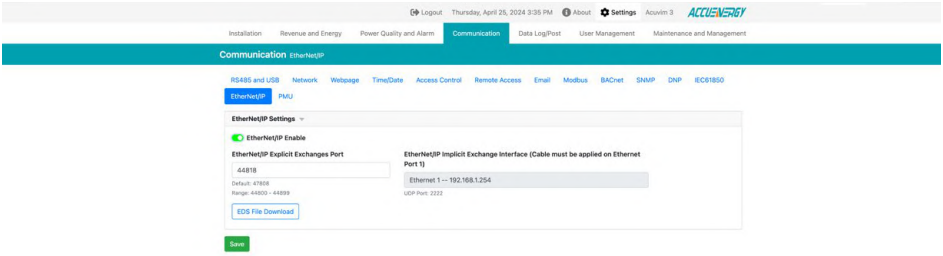


Figure 7-38 Ethernet/IP Webpage

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.

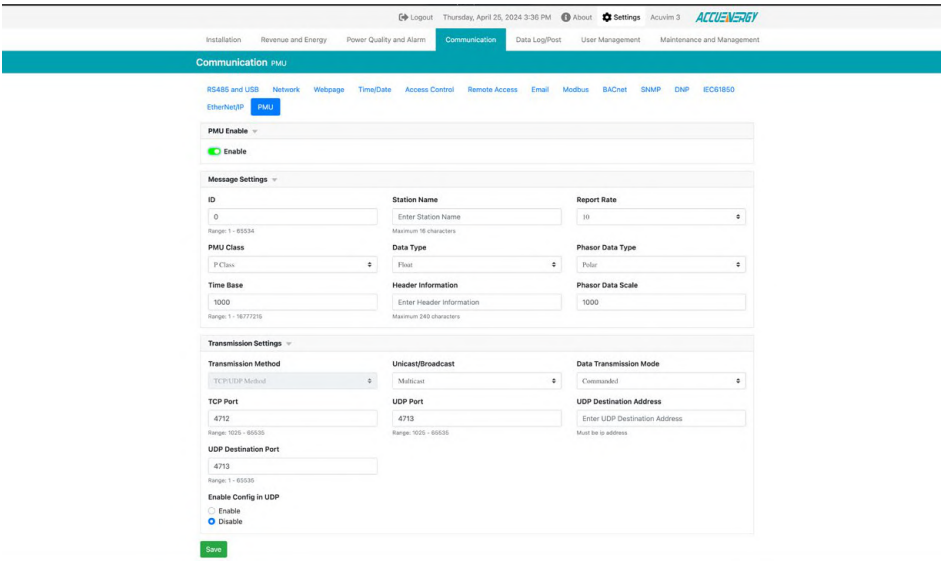


Figure 7-39 PMU Configuration Webpage

7.14.1 Message Settings

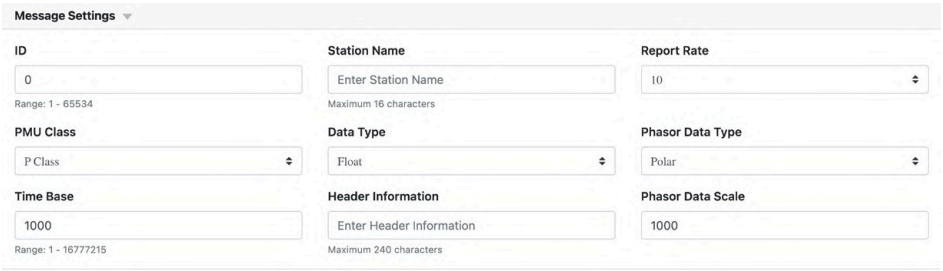


Figure 7-40 PMU Message Settings

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.

Table 7- 4 PMU Frequency and Reporting Rates

System frequency	50Hz			60Hz					
Reporting rates (Fs-frames per second)	10	25	50	10	12	15	20	30	60

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.

Table 7- 5 PMU Data Type and Formats

Data & Phasor Data Types	Phasor Data Type	Details
16-Bit Integer Values	Rectangular Format	real and imaginary, real value first. 16-bit signed integers, range –32 767 to +32 767
	Polar Format	magnitude and angle, magnitude first magnitude 16-bit unsigned integer, range 0 to 65535 angle 16-bit signed integer, in radians × 104, range –31 416 to +31 416
32-Bit Values IEEE Floating-Point Format	Rectangular Format	real and imaginary, in engineering units, real value first
	Polar Format	magnitude and angle, magnitude first, in engineering units angle in radians range –π to + π

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

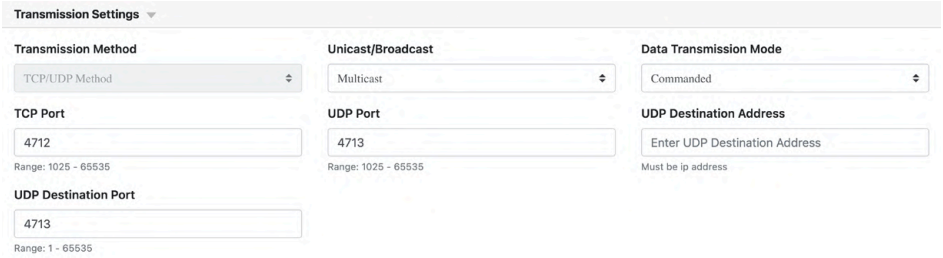


Figure 7-41 PMU Transmission Settings

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.

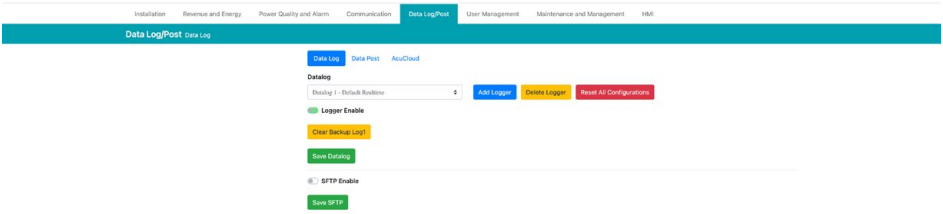


Figure 8-1 Data Log Settings

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.

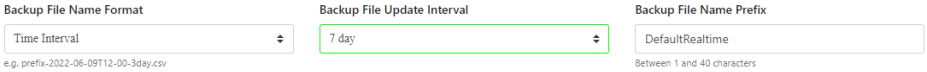


Figure 8-2 Backup File Settings

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.

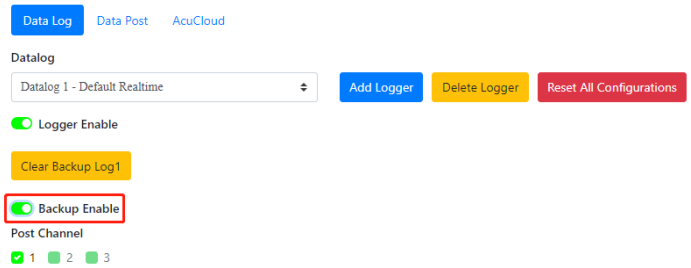


Figure 8-3 Backup Enable

Clear Back Up Log: Deletes all the backup data log files listed on the **Logs** webpage.

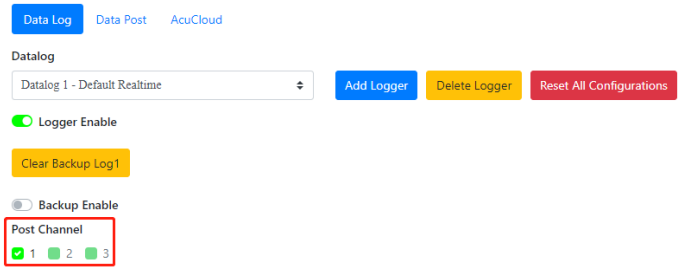


Figure 8-4 Post Channel Selection

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

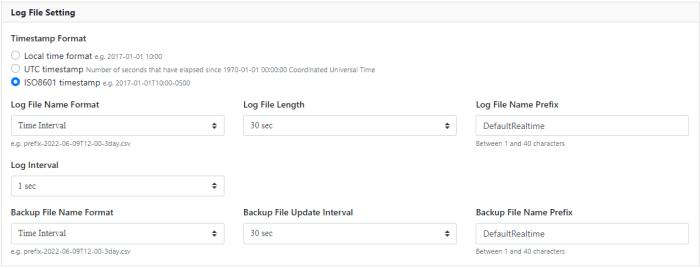


Figure 8-5 Log File Setting

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.

Table 8-1 Data Logger Parameter and Details

Data Logger Type	Parameter Category/Types	Log File Length	Interval Range
Instant Logger	• RMS • Power • Fundamental • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle	• 1 Second • 3 Seconds • 15 Seconds • 30 Seconds	• 200ms • 1 Second • 3 Seconds • 15 Seconds • 30 Seconds

Data Logger Type	Parameter Category/Types	Log File Length	Interval Range
Trend Logger	• RMS • Power • Fundamental • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle • Energy • Demand	• 1 Minute • 5 Minutes • 10 Minutes • 15 Minutes • 30 Minutes • 1 Hour • 2 Hours • 6 Hours • 12 Hours • 1 Day • 7 Days • 1 Month	• 1 Minute • 5 Minutes • 10 Minutes • 15 Minutes • 30 Minutes • 1 Hour • 2 Hours • 6 Hours • 12 Hours • 1 Day • 7 Days
Aggregation 3s	• RMS • Power • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle	• 3 Seconds	• 3 Seconds
Aggregation 10s	• Frequency	• 10 Seconds	• 10 Seconds
Aggregation 10 min	• RMS • Power • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle • Voltage Magnitude Harmonics • Voltage Angle Harmonics • Current Magnitude Harmonics • Current Angle Harmonics	• 10 Minutes	• 10 Minutes
Aggregation 2 hour	• RMS • Power • Phase Angle • THD • Unbalance Magnitude • Unbalance Angle • Voltage Magnitude Harmonics • Voltage Angle Harmonics • Current Magnitude Harmonics • Current Angle Harmonics	• 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

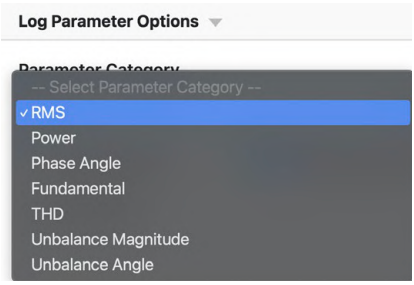


Figure 8-6 Data Log Parameters Category

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.

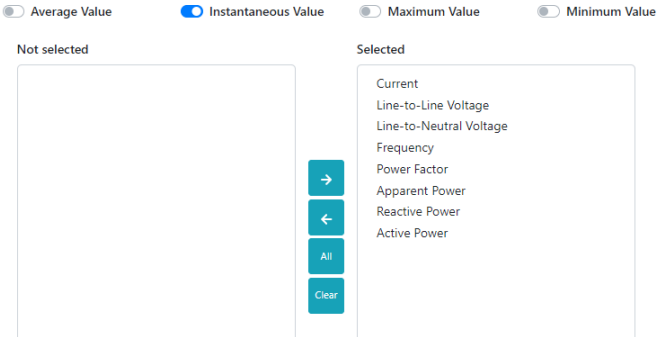


Figure 8-7 Data Log Parameter Details

8.1.3 SFTP Backup

Acuvim 3 allow users to backup data log files using Acuvim 3's SFTP server.

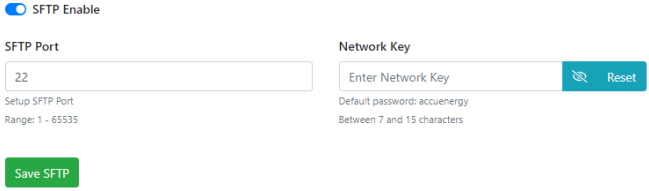


Figure 8-8 SFTP Settings

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.

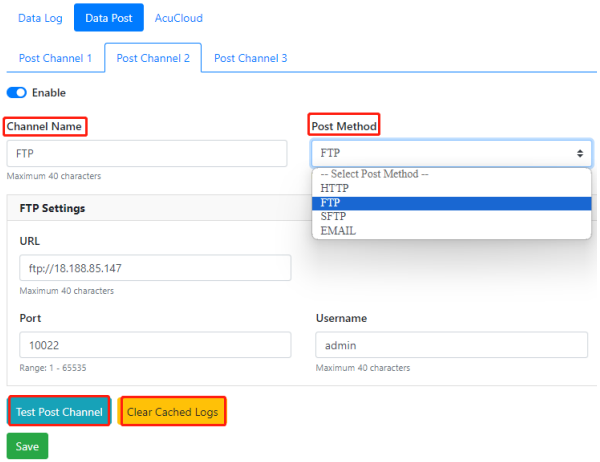


Figure 8-9 Data Post Settings

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

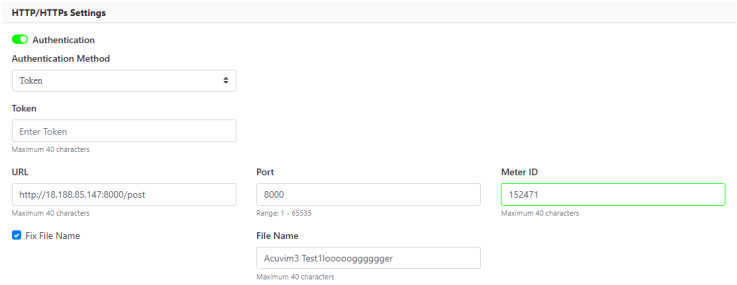


Figure 8-10 Data Post HTTP/HTTPS Settings

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

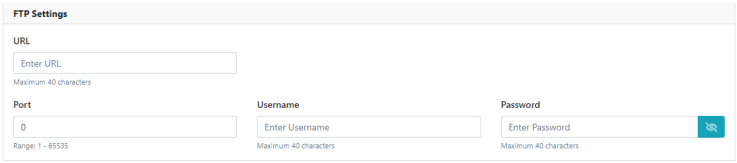


Figure 8-11 Data Post FTP Settings

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

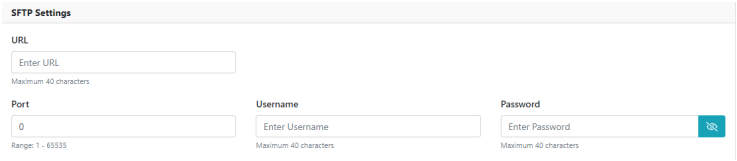


Figure 8-12 Data Post SFTP Settings

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

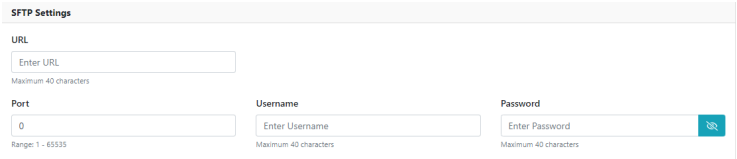


Figure 8-13 Data Post Email Notification Settings

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.

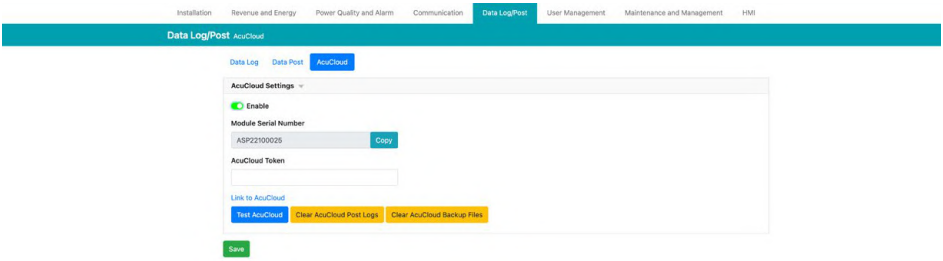


Figure 8-14 AcuCloud Settings

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 (https://acucloud.accuenergy.com/). 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.

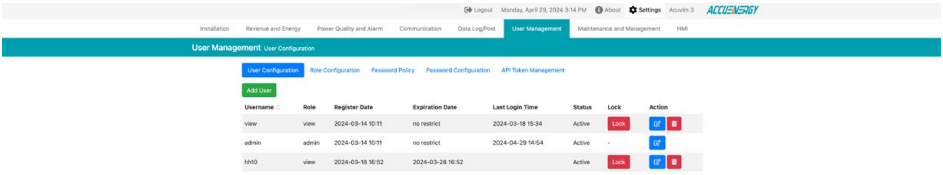


Figure 9-1 User Configuration Webpage

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.

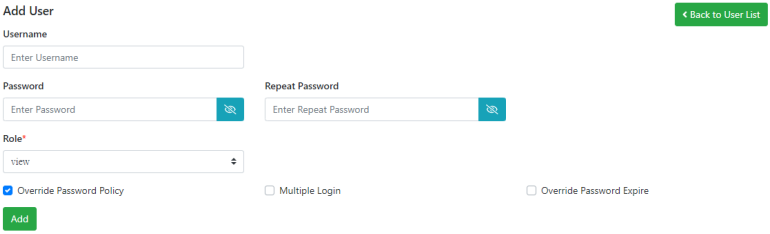


Figure 9-2 Add User Account

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 allows the selected user to change its setting details, with the exception of the username which cannot be modified.

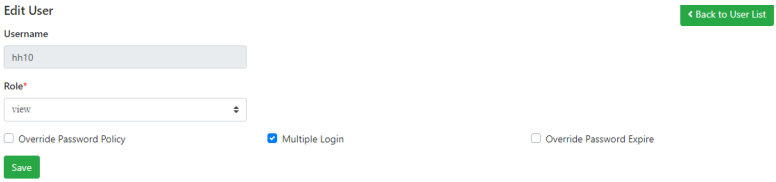


Figure 9-3 Edit User Account

Delete User: Clicking on the trash icon 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.

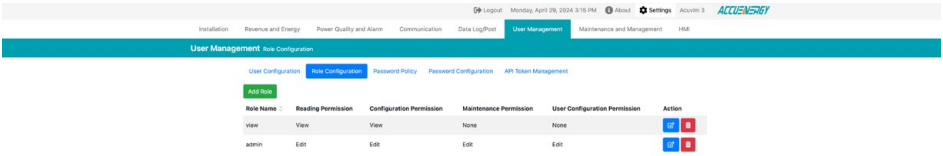


Figure 9-4 Role Configuration Webpage

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 category.

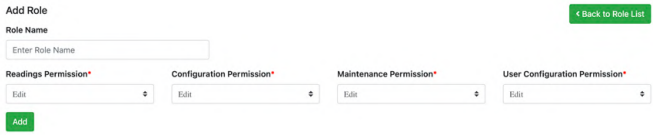


Figure 9-5 Add Role

Edit Role: The edit icon allows the role's permission levels for each permission category to be updated.

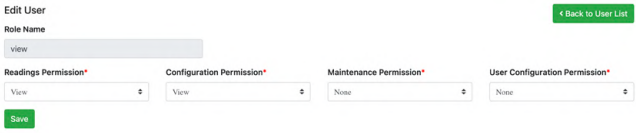


Figure 9-6 Edit Role

Delete Role: Clicking on the trash icon permits the permanent deletion of select roles. This action cannot be undone.

9.2.1 Reading Permissions

Table 9-1 Reading Permissions

Permission Category	Permission Level	View Operations		Edit Operations	
Reading Permission	View	'Metering' Webpage	View Real-Time View Fundamental View Energy View Demand View Min/Max View THD View Flicker View Harmonic View Sequencing View I/O View TOU Energy	N/A	
		'Power Quality and Alarm' Webpage	View Alarm Status View Alarm Log View Power Quality Event View Power Quality Reports View Mains Signaling View Voltage Log View Mains Signaling Record View Fast Log View Waveform Capture		
		'Logs' Webpage	View SOE Log View Trend Log View Trend Log Management View Data Log View Event Log		
	Edit	Include all 'View' operations		'Metering' Webpage	Reset Max/Min Record Reset Demand Reset Energy Edit Energy Clear TOU Records Reset DI Constants Edit DI Counters Toggle RO Status

Permission Category	Permission Level	View Operations	Edit Operations	
Reading Permission		Include all 'View' operations	'Power Quality and Alarm' Webpage	Clear Alarm Log Clear Power Quality Event Logs Clear Mains Signaling Logs Clear Mains Signaling Records Clear Fast Log Trigger Fast Log Trigger Waveform Captures Clear Waveform Captures Trigger Transient Captures Clear Transient Captures
			'Logs' Webpage	Clear Trend Logs Clear Data Logs Clear Event Log
	None	N/A	N/A	

9.2.2 Configuration Permission

Table 9-2 Configuration Permissions

Permission Category	Permission Level	View Operations		Edit Operations
Configuration Permission	View	'Installation' Webpage	View General Settings View I/O Settings	N/A
		'Revenue and Energy' Webpage	View TOU Settings	
		'Power Quality and Alarm' Webpage	View Power Quality Event Settings View Alarm Settings View Waveform and Fastlog Settings View Mains Signaling Voltage Settings View Power Quality Reporting Settings View Email Notification Settings	

<table>
<tr><th>Permission Category</th><th>Permission Level</th><th colspan="2">View Operations</th><th colspan="2">Edit Operations</th></tr>
<tr><td rowspan="3">Configuration Permission</td><td rowspan="2">View</td><td rowspan="2">'Communication' Webpage</td><td>View RS485and USB Settings
View Network Settings
View Webpage Settings
View Time/Date Settings
View Access Control Settings
View Remote Access Settings
View Email Settings
View Modbus Settings
View BACnet Settings
View SNMP Settings
View DNP Settings
View IEC61850 Settings
View Ethernet/IP Settings
View PMU Settings</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>'Datalog/Post' Webpage</td><td>View Data Log Settings
View Data Post Settings
View AcuCloud Settings</td></tr>
<tr><td>Edit</td><td colspan="2">Include all 'View' Operations</td><td>Installation</td><td>Edit General Settings
Edit I/O Settings</td></tr>
<tr><td colspan="3"></td><td>Revenue And Energy</td><td>Edit TOU Settings</td></tr>
<tr><td colspan="3"></td><td>Power Quality and Alarm</td><td>Edit Power Quality Event Settings
Edit Alarm Settings
Edit Waveform and Fastlog Settings
Edit Mains Signaling Voltage Settings
Edit Power Quality Reporting Settings
Edit Email Notification Settings</td></tr>
</table>

Permission Category	Permission Level	View Operations	Edit Operations	
Configuration Permission	Edit	Include all 'View' Operations	Communication	Edit RS485and USB Settings Edit Network Settings Edit Webpage Settings Edit Time/Date Settings Edit Access Control Settings Edit Remote Access Settings Edit Email Settings Edit Modbus Settings Edit BACnet Settings Edit SNMP Settings Edit DNP Settings Edit IEC61850 Settings Edit Ethernet/IP Settings Edit PMU Settings
			Datalog/Post	Edit Data Log Settings Edit Data Post Settings Edit AcuCloud Settings
	None	N/A	N/A	

9.2.3 Maintenance Permission

Table 9-3 Maintenance Permissions

Permission Category	Permission Level	Edit Operations	
Maintenance Permission	Edit	'About' Webpage	Clear Installation Records Generate Installation Records Clear Inspection Records Generate Inspection Records
		'Operation' Webpage	Reset Device Runtime Reboot Acuvim 3 Reset Meter Configurations Reset Common Configurations Reset To Factory Defaults Enable SSH Access Active Debug Diagnostics
		'Configuration Management' Webpage	Import Common Configuration File Import Meter Configuration File Export Common Configuration File Export Meter Configuration File
		'Network Diagnostic' Webpage	View Network Status Test Host Lookup Test Connection
		'Firmware' Webpage	Edit Firmware Settings
	None	N/A	

9.2.4 User Configuration Permission

Table 9-4 User Configuration Permissions

Permission Category	Permission Level	Edit Operations	
User Configuration Permission	Edit	'User Configuration' Webpage	Add User Edit User Delete User
		'Role Configuration' Webpage	Add Role Edit Role 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.

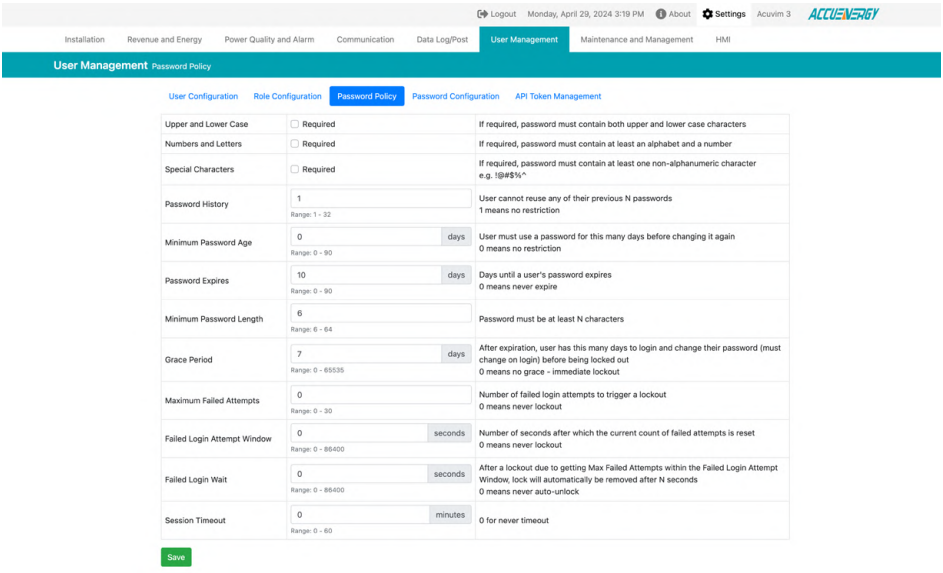


Figure 9-7 Password Policy Webpage

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  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.

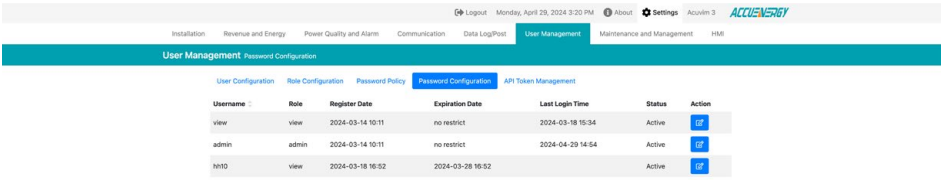


Figure 9-8 Password Configuration Edit Button Webpage

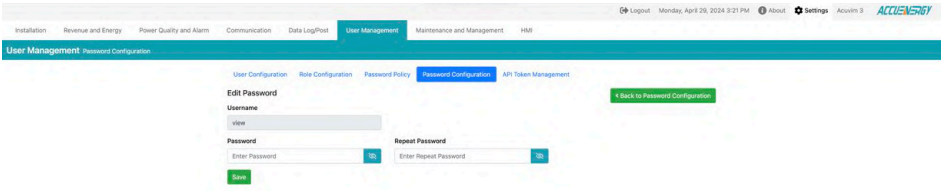


Figure 9-9 Create New Password Webpage

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.

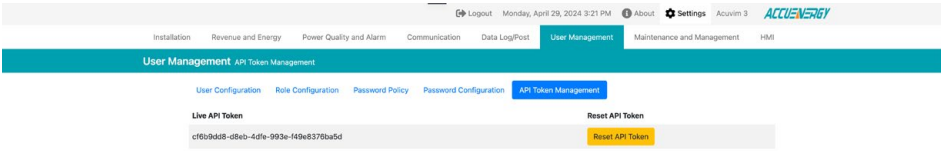


Figure 9-10 API Token Management

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.

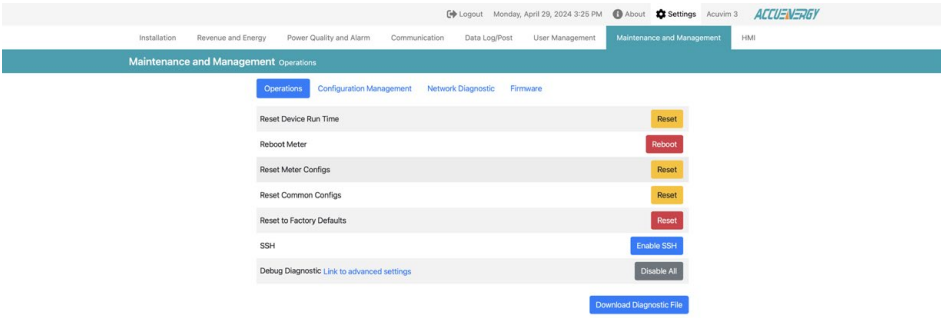


Figure 10-1 Maintenance and Management Operations Webpage

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.

Table 10-1 Factory Default Settings

Parameter	Default Value

Webpage Login	• For configuration/management
	  • Username: admin
	  • Password: admin
	• For view only
	  • Username: view
	  • Password: view

Ethernet 1	• IP: 192.168.1.254 • Subnet: 255.255.255.0 • Gateway: 192.168.1.1
Ethernet 2	• DHCP enabled
Wi-Fi SSID (AP mode)	• SSID: in the format Acuvim-3-WIFI-SerialNumber • 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

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.

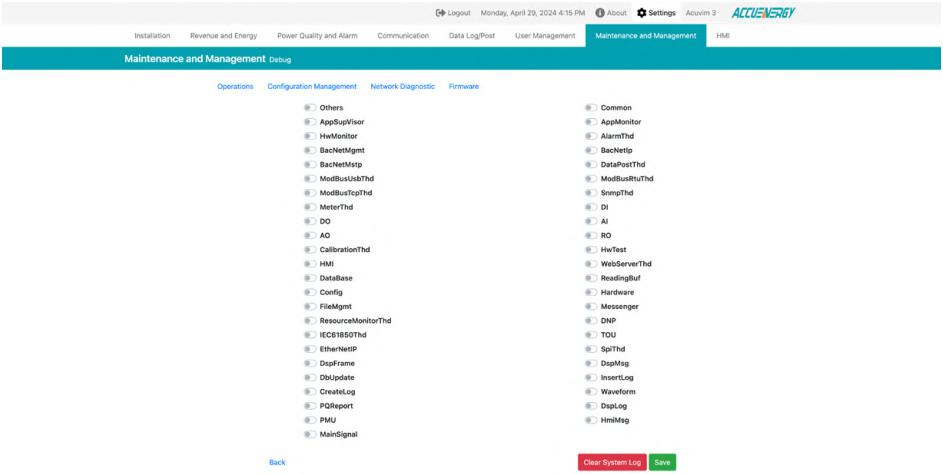


Figure 10-2 Maintenance and Management Debug Webpage

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.'

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 support@accuenergy.com. 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.

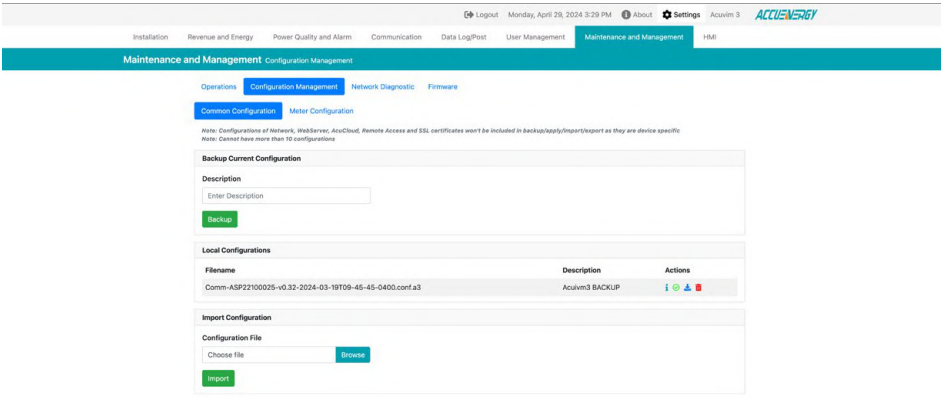


Figure 10-3 Configuration Management Webpage

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.

Table 10-2 Supported Configuration Settings

Configuration Type	Section	Setting
Meter Configuration	Installation	General
		I/O
Common Configuration	Revenue and Energy	TOU
	Power Quality and Alarm	Power Quality Event Alarm Waveform and Fast log Mains Signaling Voltage Power Quality Reporting Email Notification
	Communication	RS485 and USB Email Modbus BACnet SNMP DNP IEC61850 EtherNet/IP PMU
	Datalog/Post	Datalog Data Post
	User Management (Optional)	User Roles Password policy

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.

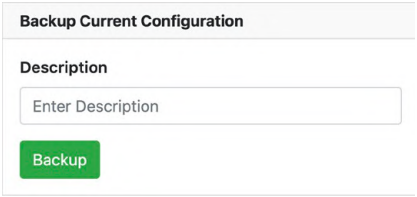


Figure 10-4 Backup Current Configuration

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.

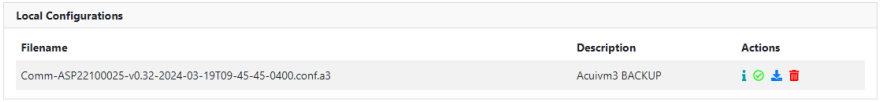


Figure 10-5 Local Configurations

Details: The details icon ℹ 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.

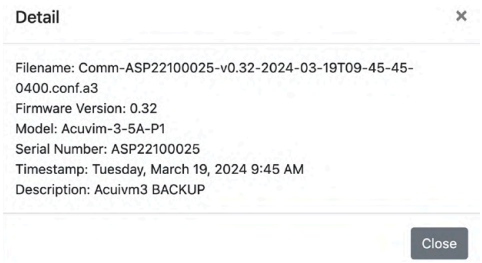


Figure 10-6 Configuration File Details

Apply Configuration: The apply icon ✓ 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.

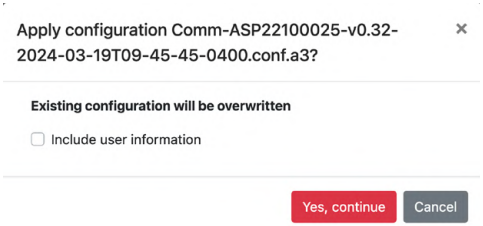


Figure 10-7 Apply Configuration File

Download Configuration: Users can export a configuration file for backup purposes. The Download icon 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.

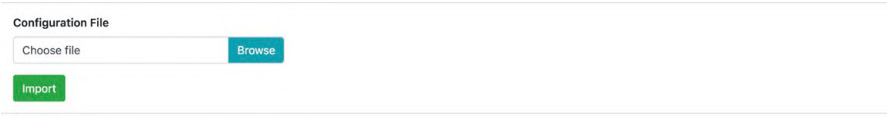


Figure 10-8 Import Configuration File

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.

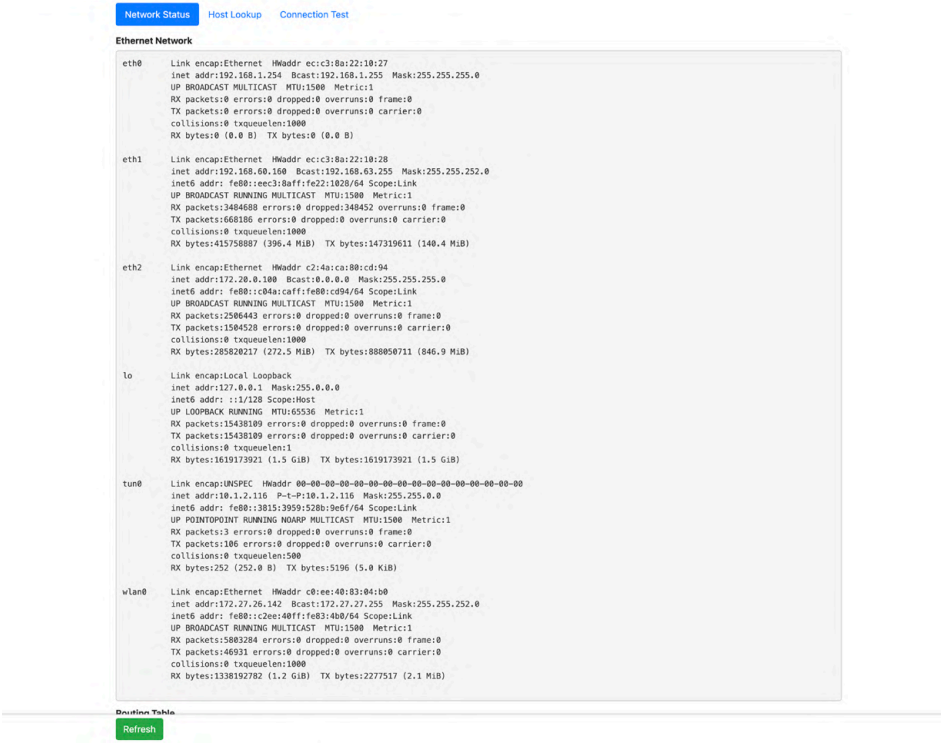


Figure 10-9 Ethernet Network Status

Routing Table

Users can access the routing table, which outlines how network traffic is directed and managed.

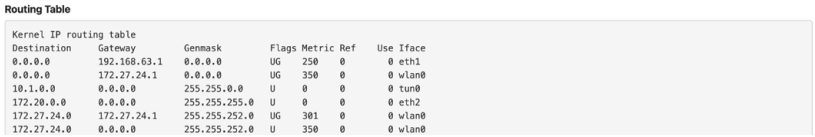


Figure 10-10 Routing Table

DNS Server Setting

Information regarding the DNS server settings is available, which is crucial for translating domain names into IP addresses.

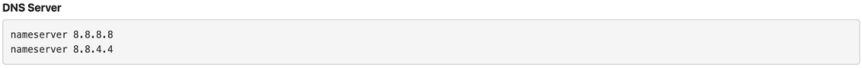


Figure 10-11 DNS Server

Network Status

Users can ascertain the status of the network, including connectivity details and relevant statistics.

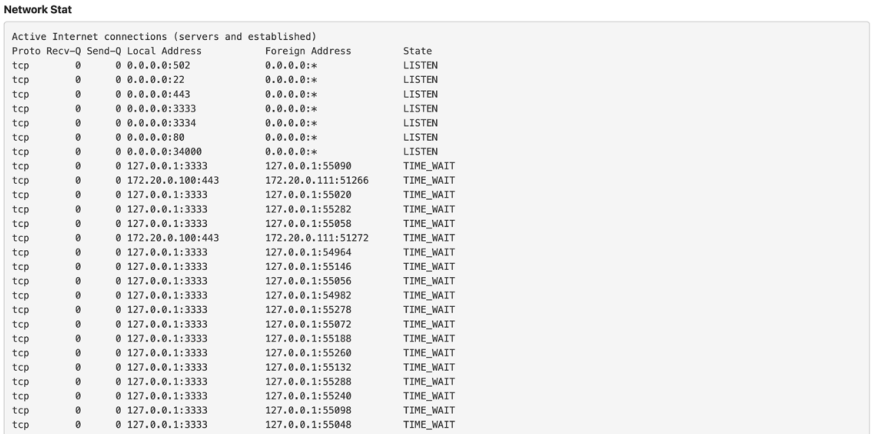


Figure 10-12 Network Stat

SSID Information

The window offers information about the available SSIDs (Service Set Identifiers) for wireless networks.

SSID

```
BSS 18:e8:29:94:92:a7(on wlan0)
        last seen: 526.014s [boottime]
        TSF: 0 usec (0d, 00:00:00)
        freq: 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:
        RSN:     * Version: 1
                 * Group cipher: CCMP
                 * Pairwise ciphers: CCMP
                 * 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.

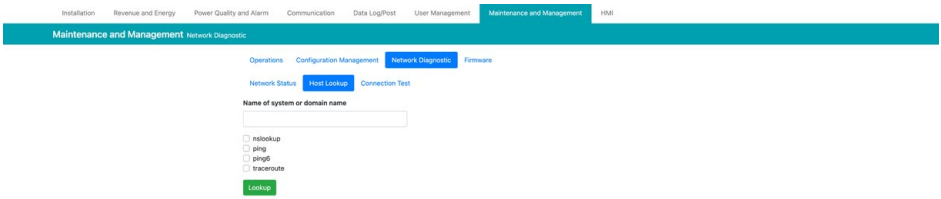


Figure 10-14 Host Lookup Webpage

nslookup: Query the nameserver for the IP address of the given host optionally using a specified DNS server.

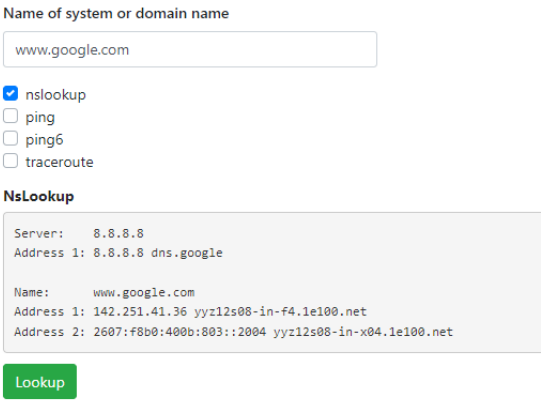


Figure 10-15 nslookup Test

Ping: Test the reachability to other networks through IPv4.

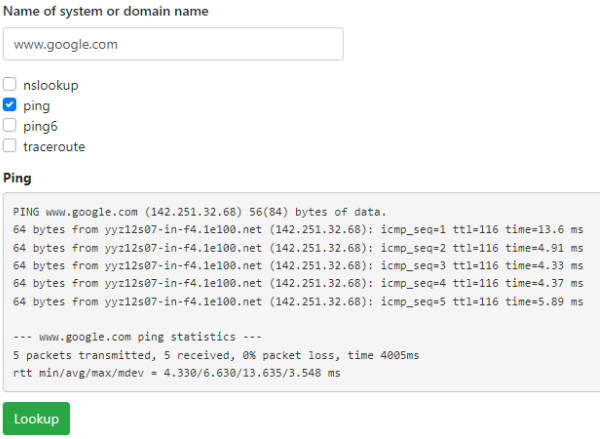


Figure 10-16 Ping Lookup Test

Ping6: Test the reachability to other networks through IPv6.

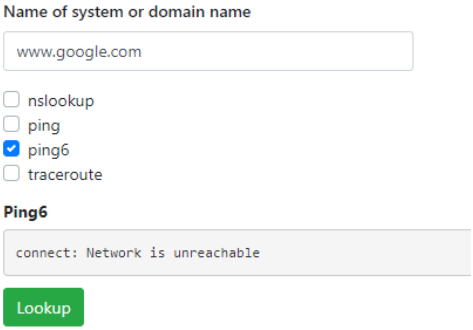


Figure 10-17 Ping6 Lookup Test

Traceroute: Track the path of an IP packet as it traverses routers locally or globally.

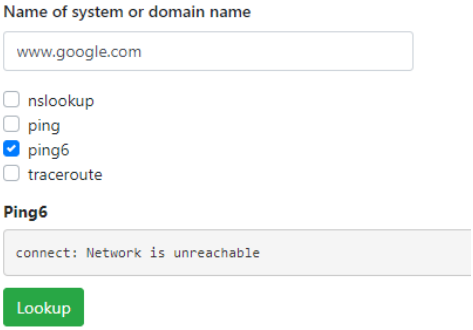


Figure 10-18 Traceroute Lookup Test

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.

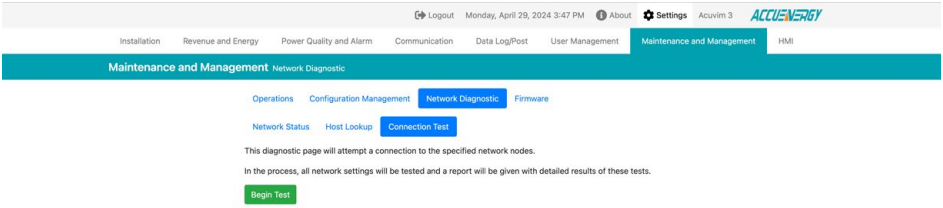


Figure 10-19 Connection Test Webpage

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.

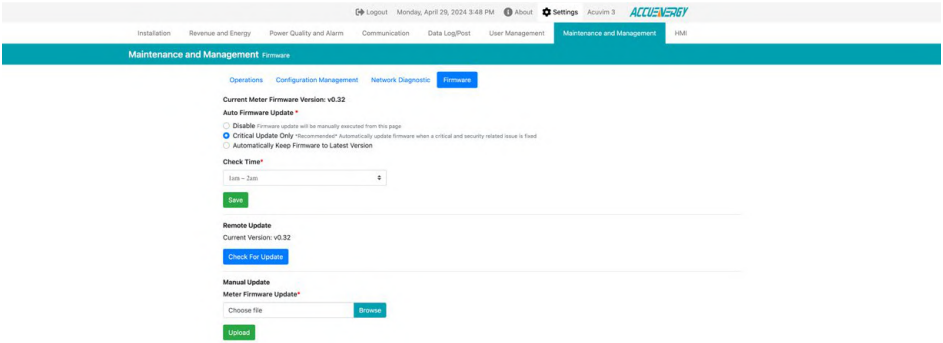


Figure 10-20 Firmware Update Webpage

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.

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MAKE ENERGY USAGE SMARTER

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