HPS Smart Transformers Technical Guide

The pictures used in this guide are only a representation and may vary from the actual product.

IIOTS
Oct 2024

SAFETY WARNINGS

All work on the power monitor needs to be done by a licensed electrician.
All local safety codes and standards need to be followed.

Key considerations:

1. **Power Off:** Ensure all power supplies to the device are turned off before working on it to prevent electrical shock or damage.
2. **Compliance With Standards:** Follow the safety standards IEC 61010-1 and UL 61010-1, which the meter complies with, to ensure safe installation and operation.
3. **Voltage Withstand:** Be aware that the meter has a high withstand voltage of 3250Vac for one minute. Ensure that the installation environment can handle this specification.
4. **Temperature Range:** Operate the meter within its specified temperature range of -25°C to 70°C to avoid malfunction or damage.
5. **Isolation Voltages:** Respect the isolation voltages for digital and analog outputs to prevent electrical hazards.
6. **Proper Wiring:** Follow the wiring diagrams provided in the data sheet for correct and safe connections.
7. **Environmental Conditions:** Ensure the installation environment is within the specified relative humidity range of 5% to 95% non-condensing to prevent moisture-related issues.

PRODUCT OVERVIEW

The power monitor comprises several components.

1. **Power Monitor:** The brain of the computer that receives current and voltage information from your transformer and provides all the relevant Energy, Power and Power Quality information.
2. **Web Module**: Enables the Power monitor to communicate with other systems through various industry communication protocols. The web module provides the power monitor with a software platform/web interface and an internal data storage of up to 8GB.
3. **I/O Modules**: Expand the functionality of the power monitors by allowing users to monitor external devices like through digital and analog inputs.
4. **NEMA 4X Enclosure**: The Power monitor and other components are secured inside a pre-wired, factory installed polycarbonate NEMA 4X enclosure.
5. **Current Transformers (CTs):** CTs are used to monitor the current for the power monitor. HPS provides Rogowski coil CTs with the transformer.

The panel comes pre-wired with all necessary connections for voltage and current. The customer needs to connect Ethernet cable to the Web module to set up a static IP address (recommended), which is explained in the sections below.

METER COMMUNICATION SETUP

This section allows you to configure communication for the meter using the LCD screen, which can then be used to log in to the web interface of the meter.

HPS recommends using static IP configuration via ethernet to allow multiple users to connect to the web interface of the power monitor. However, it is up to the customer to connect the meter in a way that suits their needs.

The Power Monitor, equipped with the **Web Module**, provides flexible network communication options. This feature enables real-time data collection and control over your network, allowing for remote access to metering parameters and diagnostics. The web module has two Ethernet ports, **Ethernet 1** is set to have the **static DHCP**, and **Ethernet 2** is set to have the **dynamic DHCP**. Both of the Ethernet ports have the same functionalities, you can use either of them according to the requirement.

You will require someone from your IT team to configure the network settings explained below.

The default settings of the power monitor are as follows:

- **Ethernet 1 (Static IP address)**
- IP Address (192.168.1.254);
- Subnet Mask (255.255.255.0);
- Gateway (192.168.1.1);
- DNS Server 1 (8.8.8.8);
- DNS Server 2 (8.8.4.4);
- Modbus Port 502

Step 1: Connecting The Power Monitor To Your Network or Computer

You can establish a connection between the Power Monitor and your network or computer using the Web Module, which supports dual Ethernet ports for stable data communication. Follow these steps for a successful setup:

1. **Connect the Web Module to Your Network (Ethernet 1 or Ethernet 2):**

- Insert an Ethernet cable into one of the two RJ45 ports on the Web Module.
- Connect the other end of the Ethernet cable to your router, switch, or directly to a computer using a standard Ethernet (RJ45) cable.
- For direct connection to a computer, ensure that the computer's IP address is within the same subnet as the Power Monitor's default IP address.

2. **Power on the Power Monitor:**

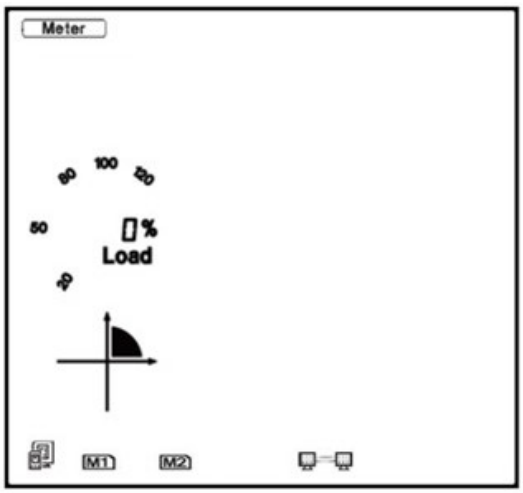
Ensure the Power Monitor is powered on. The Web Module will automatically detect the network and establish a connection using either a static or dynamic (DHCP) IP address.

Step 2: Configuring the IP Address via Modbus TCP/IP

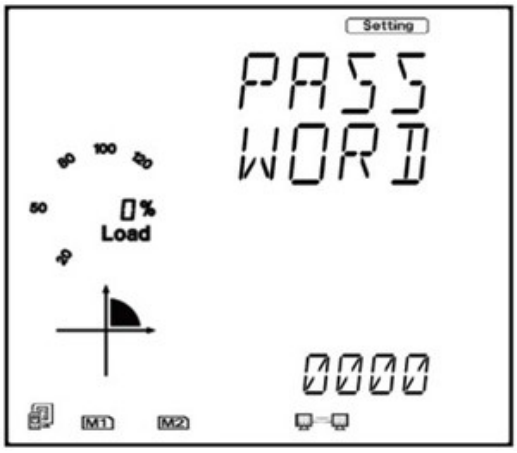
The Web Module supports Modbus TCP/IP, allowing users to configure and communicate with the Power Monitor over an Ethernet network. To configure the IP address, follow these steps:

1. **Access the Power Monitor's Network Settings:**

- Press the 'H' and 'V/A' buttons simultaneously on the Power Monitor to enter the settings menu. The display will show the "Meter" cursor flashing.



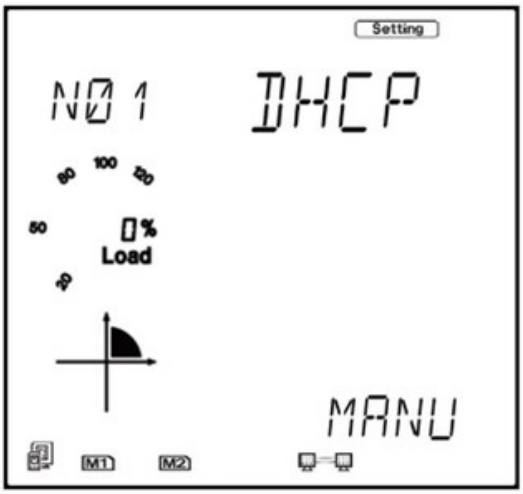
- Press the 'P' or 'E' button to move the cursor to 'Setting'. Press 'V/A' button to enter the parameter setting mode. The device address page is the first page of the 'Setting' mode. It will show the Modbus address of the meter for a second before prompting for the password of the device (default password '0000'). Press 'V/A' button to confirm password and enter the parameter setting page. Press the 'P' or 'E' button to move the cursor to 'NET' and press the 'V/A' button to enter the Ethernet module settings.



2. Set IP Address Parameters:

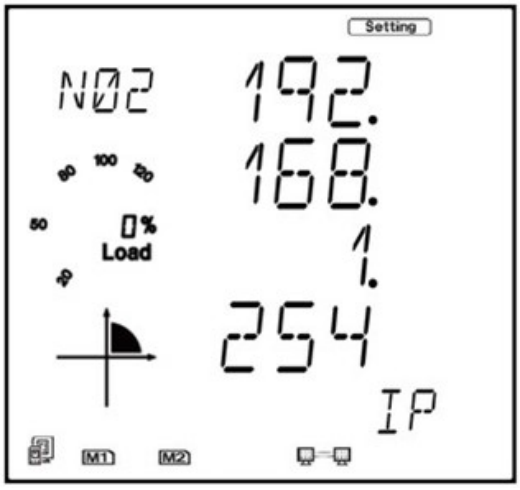
Once inside the network settings menu, configure the following parameters:

- **N01: DHCP Setting:** By default, the Power Monitor is set to **manual** for IP address configuration. You can switch this to **auto** if you want it to obtain an IP address dynamically from a DHCP server. Otherwise, continue with manual configuration.

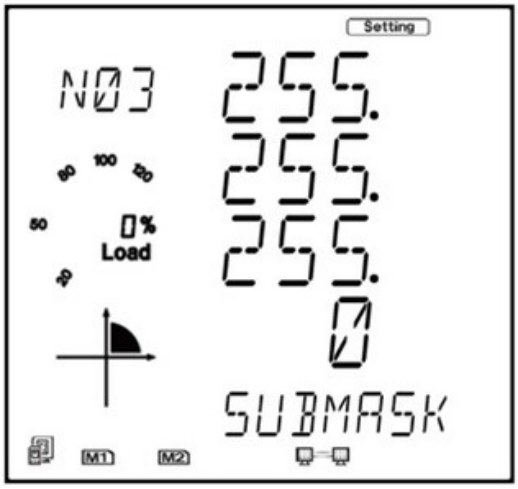


- **N02: IP Address:** This is the IP address of the meter and will be the IP address to access the web interface of the module. Users can configure the IP address if the DHCP is configured to Manual. Press 'V/A' to configure the IP address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm.

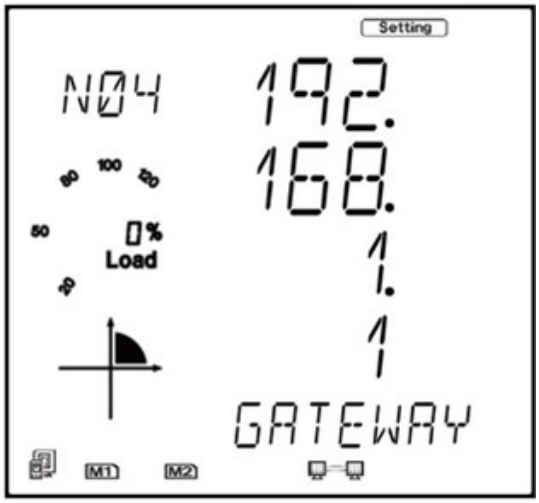
Ensure the address falls within the subnet range of your network (e.g., 192.168.1.xxx).



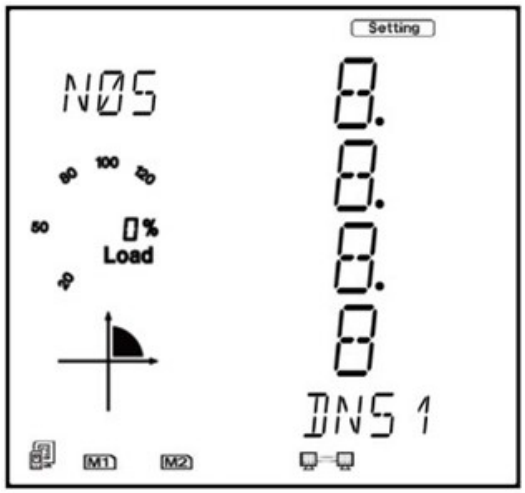
- **N03: Subnet Mask:** Press 'P' to get to "N03 Subnet Mask".Press 'V/A' to configure the subnet address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm. (usually 255.255.255.0 for most local networks).



- **N04: Gateway:** Press 'P' to get to "N04 Gateway". Press 'V/A' to configure the gateway IP address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm. (e.g., 192.168.1.1 for most routers).

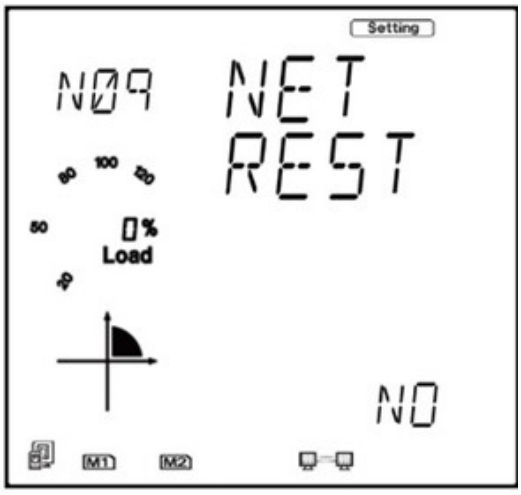


- **N05: DNS Server:** Press 'P' to get to "N05 DNS Primary Server".Press 'V/A' to configure the DNS address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm. The DNS parameters must be set correctly to use the SMTP and FTP/ HTTP Post functions.



3. Save and Reboot:

- Press 'P' to get to **"N09 NET REST"**. After making any changes to the NET settings, users must reboot the Ethernet module from this page for the settings to take effect. Press 'V/A' to reboot the module, the cursor will begin to flash. Once rebooted, the Power Monitor will use the new IP address, and you can access it through a software platform through a web browser using the newly assigned IP.



Step 3: Connecting the Power Monitor to a Computer Using Ethernet (Not required if step 2 is used)

To connect the Power Monitor directly to a computer via Ethernet for configuration or monitoring, follow these steps:

1. Manually Set The Computer's IP Address:

- On a Windows PC, navigate to **Network and Sharing Center > Change Adapter Settings > Ethernet Properties.**

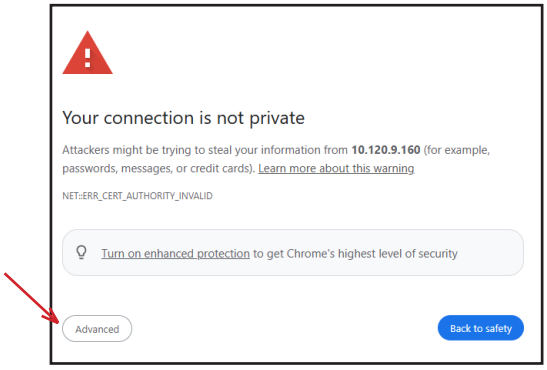
- Select **Internet Protocol Version 4 (TCP/IPv4)** and manually assign an IP address in the same subnet as the Power Monitor's default IP (e.g., if the Power Monitor's IP is 192.168.1.254, assign your computer an IP of 192.168.1.xxx).
- Set the subnet mask to 255.255.255.0, and the gateway can be left blank if directly connecting to the Power Monitor.

2. Access The Web Interface:

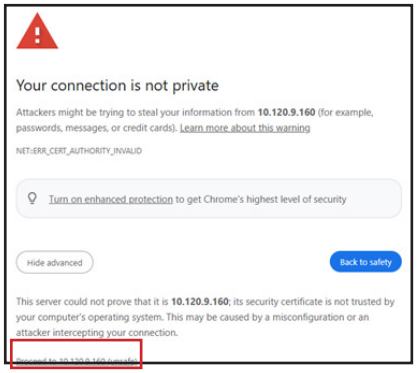
- Once connected, open a web browser and enter the IP address of the Power Monitor (e.g., 192.168.1.254).
- The Web Module interface will prompt you to log in. The default username and password are both **admin.**
- From the web interface, you can access real-time data, configure settings, and monitor the performance of the Power Monitor.

SOFTWARE PLATFORM/WEB INTERFACE LOGIN

Enter the IP address assigned by your IT to the power monitor into a browser and click on 'Advanced'.

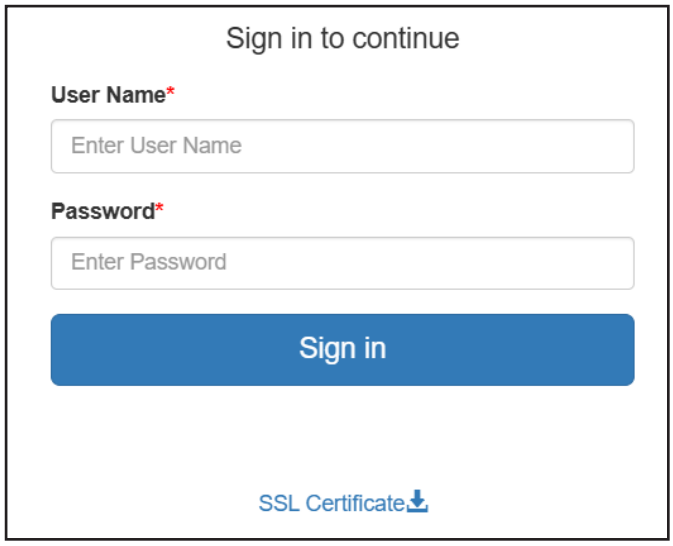


This will open another dialog below which will prompt you to proceed to the assigned IP address, click on 'Proceed to "your IP address" (unsafe)' to go to the login page.



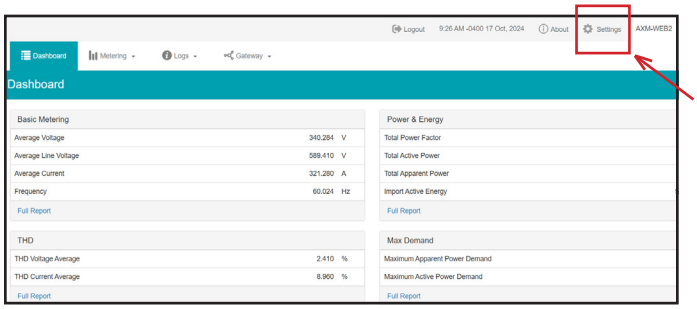
Once on the login page, login using the default credentials as below. 'admin' will have an admin level access, 'view' will have basic access to view the data but won't be able to modify any settings. HPS recommends to personalize default password.

Admin		View	
Username	Password	Username	Password
Admin	Admin	View	View

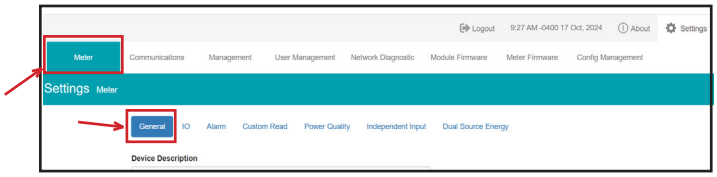


SETTINGS CONFIGURATION

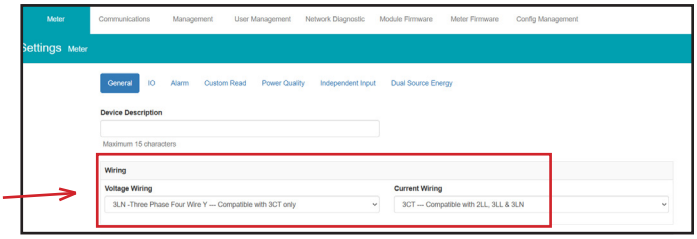
1. Once you login, you will be able to see the screen below. Navigate to **Settings** on the top right corner.



2. Once you select **Settings**, the window below will open. Go to the meter tab on it and select **General**.



3. Under the **General Tab**, under the section **Wiring**, navigate to **Voltage Wiring** and **Current Wiring** and select the option relevant to your system requirement. A list of vailable options shown below.



Voltage Wiring Options

a. 3LN - Three Phase Four Wire Y -- Compatible with 3CT only.

b. 1LN - Single Phase Two Wire -- Compatible with 1CT only.

c. 2LL - Three Phase Three Wire Open Delta -- Compatible with 2CT & 3CT.

d. 3LL - Three Phase Three Wire Delta - Compatible with 3CT only.

e. 1LL - Single Phase Three Wire - Compatible with 2CT only.

f. 3LN-2.5 -Three Phase Four Wire Y -- Compatible with 3CT only.

Current Wiring Options

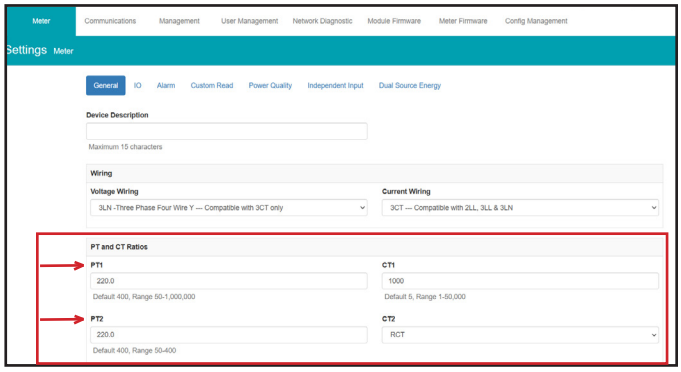
g. 3CT --- Compatible with 2LL, 3LL & 3LN.

4. PT and CT Ration Selection

a. Keep the PT1 and PT2 values to default as per system.

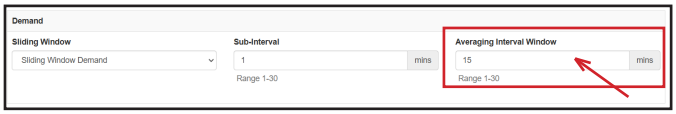
b. Enter the CT1 ratio as the secondary side current of the transformer.

c. For CT2, select RCT for CTs provided by HPS. Please note that the meter can support a 333mV output CT as well, if used.



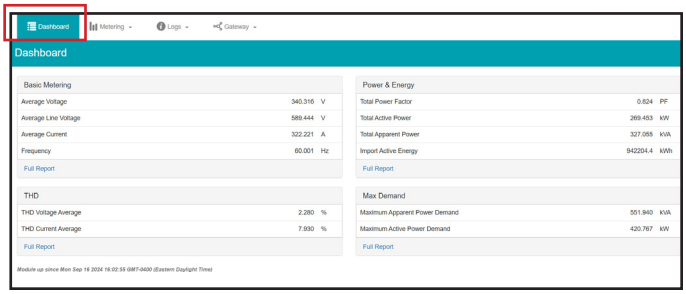
5. Demand Settings – Averaging Interval Window

a. Select the averaging interval window between 1-30 Mins according to required. Typical average interval window to be set at 15 minutes.



COMMISSIONING

Once the communication is set up and the power monitor settings have been set, you want to ensure that the readings that appear on the web interface are accurate.



There could be several reasons why the readings on the dashboard are incorrect, some of these are:

- Incorrect CT polarization
- Incorrect CT ratio entered in the web interface
- Incorrect CT type selected
- Phase sequence is different from what is wired

Most of these can be fixed from the web interface. Please look at FAQs for more details.

To proceed with commissioning, you will require:

- A hand-held meter
- Login to the web interface

Follow the steps shown below:

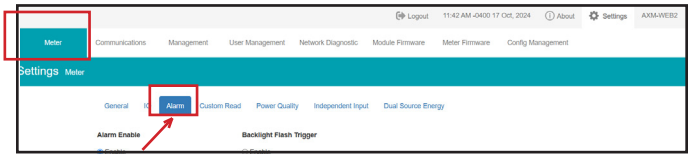
a. Use handheld meter on the secondary cables where the CTs are installed.

b. Read the data on handheld meter and read the data at the same time on a Meter to compare the results of Voltage, Current. Additionally ensure that the Power factor values are not significantly low (typically over 0.8 or 0.9).

c.	Below is an example of handheld meter and digital meter readings.

ALARM

a. Go to Alarm tab under Meter Settings

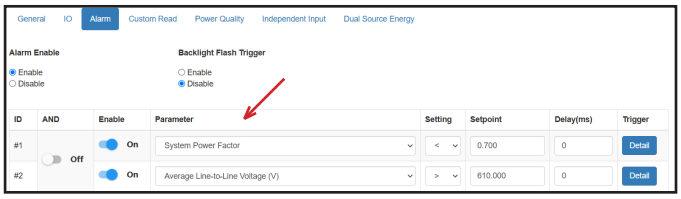


b. You can choose up to 16 points for alarm settings.

c. Select the parameter you want to set up alarm for.

d. Under the setting selection, you can choose any option you need for values to be like (<,>,=).

e. Define a setpoint value for that parameter.



g. Under the Trigger option, select the Output module as per the system.

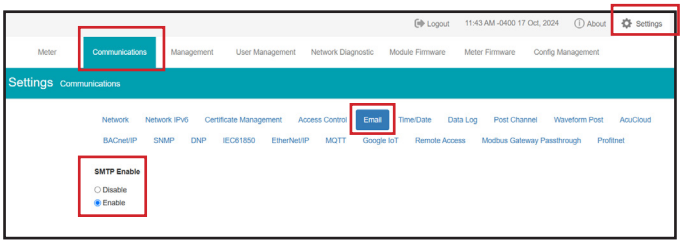
Set Email Alerts for Alarms:

The Web module on your power monitor supports the SMTP protocol to set up the email function to enable the meter to send emails based at specific time intervals or whenever there is an alarm.

There are three modes available for sending emails that the user can enable.

- **Triggered Sending:** Emails are sent immediately when there is a new alarm. Please note, you will need to have selected and set alarm parameters before you select this option.
- **Timed Sending:** Emails are sent at regular time periods based on the time interval configured. The email will include the data that is selected to be sent.
- **Triggered Sending and Timed Sending:** This mode is when both of the above modes are enabled.

a. On your software platform, navigate to **Settings> Communications> Email.**



b. **SMTP Enabled:** Select **Enable** to allow SMTP functionality and to further configure the settings. Start Time to Send Email: Select the date and time for when the emails should begin to send.
   - Click on the calendar icon to configure the time and date.
   - Click on the trash icon in the bottom right to clear the time and date.

c. **SMTP Server:** Enter the URL of a valid SMTP server. I.e. mail.accuenergy.com or smtp.gmail.com.

d. **SMTP Port:** Enter the port number associated with the SMTP server.

e. **SMTP From:** Enter a name or phrase which will appear to let you know who the mail is from. I.e. 'Technical Support'.

f. **SMTP Subject:** Enter a subject line for the email

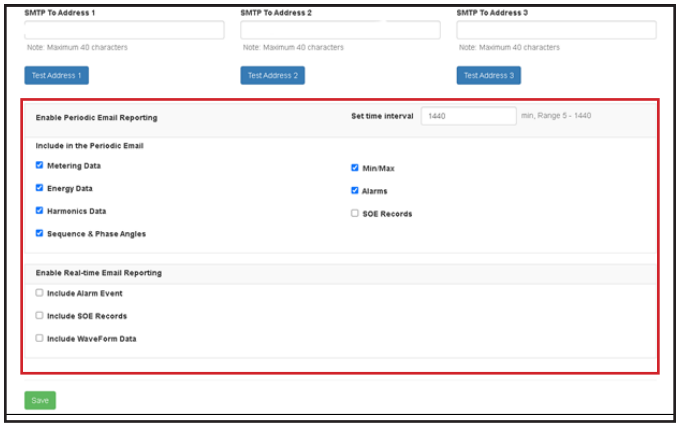
g. **Authentication:** Users can have email authentication set to On or Off. If authentication is set to On users will need to provide the SMTP username and password.

h. **SMTP Username:** Enter the SMTP username for the SMTP server set above.

i. **SMTP Password:** Enter the SMTP user password for the username set above.

j. **SMTP to Address 1, 2, 3:** Enter up to three recipients that you wish to have the email sent to in 'SMTP To Address 1', 'SMTP To Address 2' and 'SMTP To Address 3'.

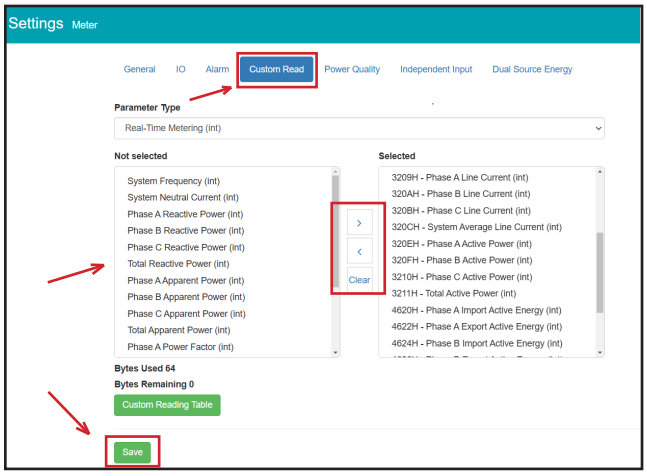
k. Once the settings are configured, you need to select content for the email. In addition to the data, you will need to enter the time interval (in minutes) if you choose to get periodic emails (Enter a number between the range 5-1440 mins).



DATA LOGGING - CUSTOM READ

a. Select **Custom Read** option under **Meter** setting, where you can add/remove the parameters which readings you want to capture.
Use the > button in the center of the two columns to add the datapoints available on the left.
Use **<** to remove the selected datapoints on the right.
Select **Clear** to remove all selected datapoints on the right.

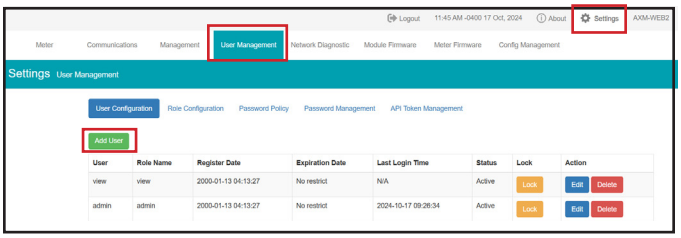
b. Click on **Save** to save the selected datapoints before closing.



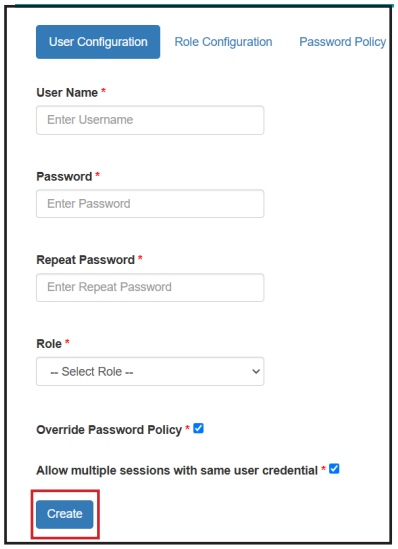
USER MANAGEMENT

a. Navigate to **Settings > User Management > Add > User.**

b. By default, the system has 2 users created that can be used to login.
   i. Admin
   ii. View



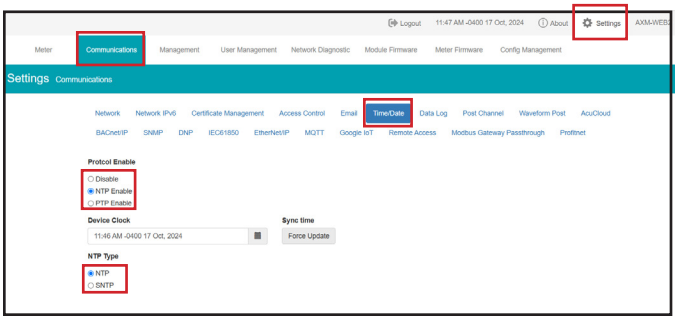
c. To create a new user, click on **Add User**, assign a Username, password and the role (Admin or View) and click **Create.**



TIME AND DATE

The clock for the power monitor can be set through the software platform/ web interface. The power monitor supports NTP (Network Time Protocol) and PTP so that the clock can be updated by synchronizing with a time server.

a. Navigate to **Settings > Communications > Time/ Date.**



Under the NTP mode, the module can sync with up to three time servers. If a time server is down, the module will attempt to synchronize with the second or third time server if they are configured. The following must be configured to set the time/date and NTP settings:

b. **NTP Enabled:** Select enable to further configure the settings related to the NTP (Network Time Protocol) function.

c. **Device Clock:** Configure the date and time on the meter.
   - Click on the calendar icon to configure the time and date.
   - Click on the trash icon in the bottom right to clear the time and date.

d. **Sync Time:** Click on Force Update to have the AXM-WEB2 series module sync its time with the NTP server.

e. **NTP Type:** Select the NTP type from NTP or SNTP. SNTP should be selected when using the IEC 61850 protocol.

f. **NTP Servers:** Enter up to 3 NTP servers in the “NTP Server 1”, “NTP Server 2” and “NTP Server 3”.
   - 0.us.pool.ntp.org
   - 1.us.pool.ntp.org
   - 2.us.pool.ntp.org
   - 3.us.pool.ntp.org

   For more NTP servers based on region, visit **http://www.pool.ntp.org/en/**

g. Click **Save** at the bottom left corner of the screen to save the changes.