KW320 Series Power Meter

User's Manual

Automation Components, Inc.
[*Engineering a Better Sensor Solution*]

The information contained in this document is believed to be accurate at the time of publication, however, Automation Components, Inc (ACI) assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice. Please ask the local representative for latest product specifications before ordering.

Please read this manual carefully before installation, operation and maintenance of the KW320 series meter. The following symbols in this manual are used to provide warning of danger or risk during the installation and operation of the meters.

Electric Shock Symbol: Carries information about procedures which must be followed to reduce the risk of electric shock and danger to personal health.

Safety Alert Symbol: Carries information about circumstances which if not considered may result in injury or death.

Prior to maintenance and repair, the equipment must be de-energized and grounded. All maintenance work must be performed by qualified, competent accredited professionals who have received formal training and have experience with high voltage and current devices. ACI shall not be responsible or liable for any damages or injuries caused by improper meter installation and/or operation.

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Congratulations!

You have purchase an advanced, versatile, multifunction power meter. This meter can work as a remote terminal unit (RTU) that contributes to your system's stability and reliability by providing real-time power quality monitoring and analysis. When you open the package, you will find the following items:

1. KW320 Series Meter (1)
2. AXM-WEB2 Ethernet Module (1)
3. Terminal Blocks (3)
4. Installation clips (4)
5. Rubber Gasket (1)
6. Product Disk (Manual, Warranty, Software) (1)
7. Additional documentation (Quick Setup Guide, Calibration Certificate) (2)

To avoid complications, please read this manual carefully before installation and operation of the KW320 Series Meter.

Chapter 1: Introduction

Chapter 2: Installation and Wiring

Chapter 3: Meter Display and Parameter Settings

Chapter 4: Detailed Functions and Software

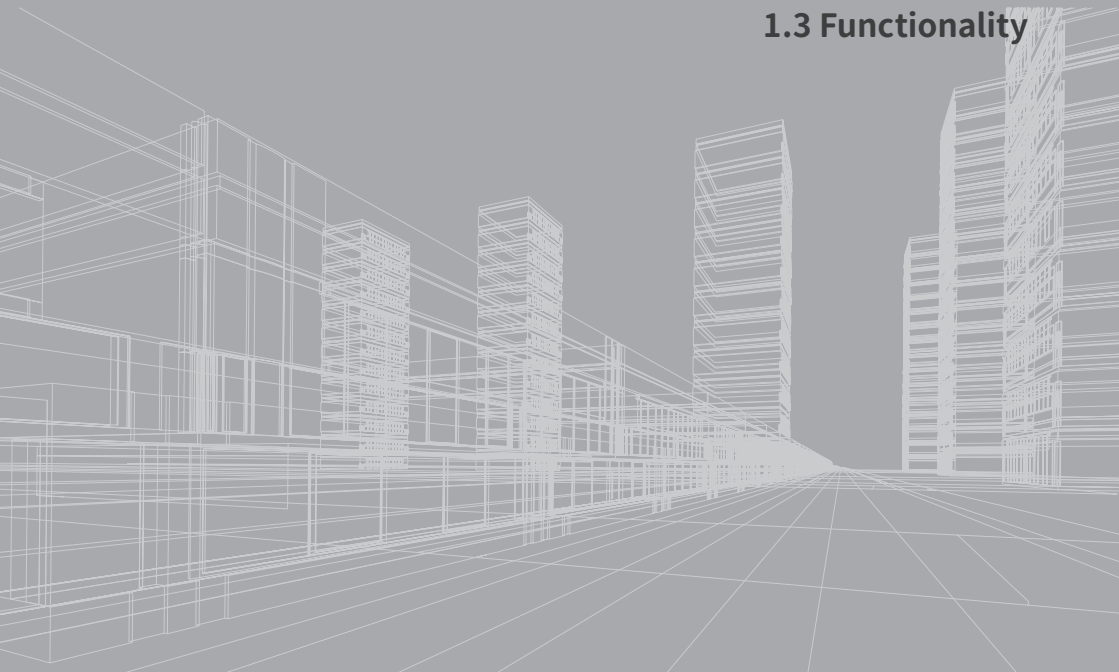
Chapter 5: Communication Ethernet Module

Chapter 6: Commuication RS485 Serial

Appendix: Technical Data, Specifications and Ordering Information

KW320 Series Power Meter

Chapter 1: Introduction



1.1 Meter Overview

The KW320 series multifunction digital power meter is designed using modern MCU and DSP technology. It integrates three-phase energy measuring and displaying, energy accumulating, power quality analysis, malfunction alarming, data logging and network communication. A vivid LCD display with large characters and time of use programmable backlight provides a clear realtime data readout.

An Ideal for Electric Automation SCADA Systems:

The KW320 series meter is the ideal choice for replacing traditional, analog electric meters. In addition to providing clear real-time readings on the meter front, it can also be used as a remote terminal unit (RTU) for monitoring and controlling for a SCADA system. Users can access all measurement parameters via the standard RS485 communication port, or the dual Ethernet ports, with multiple communication protocols available.

Energy Management:

The KW320 series meter is able to measure bidirectional, four quadrants kWh and kvarh. It provides maximum/minimum records for power usage and power demand parameters. All power and energy parameters can be viewed remotely via software in order to easily monitor various parameters. In addition, measurement tables can be viewed from the free Acuview software.

Power Quality Analysis:

Utilizing digital signal processing (DSP) technology, the KW320 series meter provides high accuracy power quality analysis and supports remote monitoring via the RS485 communication ports or dual Ethernet ports. The meter continuously updates metering results and allows users to access the meter online to monitor parameters such as voltage and current THD, harmonics voltage crest factor, current K factor, and voltage and current unbalance factor etc.

Data Logging:

The KW320 and KW320Q meter contains 8 GB of onboard memory for data logging and historical trending. Since the meter contains a real-time clock, all events and logged data will be time stamped.

Power Quality Even Logging - KW320Q Only:

When a power quality event happens, such as voltage sag and swell, etc, KW320Q will record the timestamp and the triggering condition of the event. It can save up to 50,000 power quality events.

Waveform Capture - KW320Q Only:

KW320Q contains another 8 megabytes of on board memory for power quality event logging and waveform capture. KW320Q can record 100 groups of voltage and current waveforms. It logs at 64 points per cycle. It provides the waveform record of 10 cycles before and after the trigger

1.2 Areas of Application

- Power Distribution Automation
- Electric Switch Gear and Control Panels
- Industry Automation
- Building Automation
- Energy Management Systems
- Marine Applications
- Renewable Energy

1.3 Functionality

Multifunction:

KW320 meters provide powerful data collecting and processing functions. In addition to measuring various parameters, the meter is able to perform demand metering, harmonic analysis, max/min statistic recording, over/under limit alarming, energy accumulating and data logging.

High Accuracy:

Accuracy of Voltage and Current is 0.2%, True-RMS. Accuracy of Power and Energy is 0.2%, while monitoring all four quadrants.

Compact and Easy to Install:

This meter can be installed into a standard ANSI C39.1 (4" Round) or and IEC 92mm DIN (Square) cut out. With the 51mm depth after mounting, the KW320 series can be installed in a small cabinet. Mounting clips are used for easy installation and removal.

Multiple Wiring Modes:

The KW320 series meter can be used in high voltage, low voltage, three phase three wires, three phase four wires and single phase systems using different wiring mode settings.

High Safety, High Reliability:

KW320 series meter was designed according to industrial standards. It can run reliably under high power disturbance conditions. This meter has been fully tested for EMC and safety compliance in accordance with UL and IEC standards.

Function Comparison of KW320 series Meters:

Category		Item	Parameters	KW320	KW320Q
Metering	Real Time Metering	Phase Voltage	V1, V2, V3, VInavg	•	•
		Line Voltage	V12, V23, V31, VIIavg	•	•
		Current	I1, I2, I3, In, Iavg	•	•
		Power	P1, P2, P3, Psum	•	•
		Reactive Power	Q1, Q2, Q3, Qsum	•	•
		Apparent Power	S1, S2, S3, Ssum	•	•
		Power	Factor PF1, PF2, PF3, PF	•	•
		Frequency	F	•	•
		Load Features		•	•
		Four Quadrant Powers		•	•
	Energy & Demand	Energy	Ep_imp, Ep_exp, Ep_total, Ep_net, Epa_imp, Epa_exp, Epb_imp, Epb_exp, Epc_imp, Epc_exp	•	•
		Reactive Energy	Eq_imp, Eq_exp, Eq_total, Eq_net, Eqa_imp, Eqa_exp, Eqb_imp, Eqb_exp, Eqc_imp, Eqc_exp	•	•
		Apparent Energy	Es; Esa; Esb; Esc	•	•
		Demand	Dmd_P, Dmd_Q, Dmd_S, Dmd_I1, Dmd_I2, Dmd_I3	•	•

Category		Item	Parameters	KW320	KW320Q
Monitoring	Waveform Capture if 400Hz type, there is no this function	Voltage and Current Waveform	Trigger, Manual, DI Change, Sag/Dips, Swell, Over Current		•
	Power Quality	Voltage Unbalance Factor	U_unbl	•	•
		Current Unbalance Factor	I_unbl	•	•
		Voltage THD	THD_V1, THD_V2, THD_V3, THD_Iavg	•	•
		Current THD	THD_I1, THD_I2, THD_I, THD_Iavg	•	•
		Individual Harmonics	Harmonics 2nd to 63st If 400Hz Harmonics 2nd to 15st	•	•
		Voltage Crest Factor	Crest Factor	•	•
		TIF	THFF	•	•
		Current K Factor	K Factor	•	•
	Statics	Max with Time Stamp Min with Time Stamp	Each phase of V & I; Total of P, Q, S, PF & F; Demand of P, Q & S; Each phase THD of V & I; Unbalance factor of V & I	•	•
Others	Alarm	Over/Under Limit Alarm	V, I, P, Q, S, PF, V_THD & I_THD each phase and total or average; Unbalance factor of V & I; load type; Analog Input of each channel	•	•
	Power Quality Event Logging if 400Hz type, there is no this function	SAG/DIPS, SWELL	Voltage		•

Category		Item	Parameters	KW320	KW320Q
Others	Data Logging	Data Logging 1 Data Logging 2 Data Logging 3	F, V1/2/3/lnavg, V12/23/13 lavg, I1/2/3/n/avg, P1/2/3/sum, Q1/2/3/sum, S1/2/3/sum, PF1/2/3, PF, U_unbl, I_unbl, Load Type, Ep_imp, Ep_exp, Ep_total, Ep_net, Eq_imp, Eq_exp, Eq_total, Eq_net, Es, THD_V1/2/3/avg, THD_I1/2/3/avg, Harmonics 2nd to 63rd, Crest Factor, THFF, K Factor, sequence and phase angles, DI counter, AI, AO, Dmd P/Q/S, Dmd I1/2/3Epa_imp; Epa_exp; Epb_imp; Epb_exp; Epc_imp; Epc_exp;Eqa_imp; Eqa_exp; Eqb_imp; Eqb_exp; Eqc_imp; Eqc_exp; Esa; Esb; Esc	•	•
	Onboard Memory Size	Memory	Bytes	8GB	8GB
	Communication	RS485 Port, Half Duplex, Optical Isolated Dual Ethernet Ports Wifi Enabled	Modbus RTU, DNP3.0, BACnet MS/TP Modbus-TCP/IP, BACnet-IP, SNMP V3, DNP 3.0 V2, IEC 61850 2nd Edition, SMTP, NTP, HTTP post, HTTPs post, FTP post, sFTP server, HTTPs webserver	•	•
	Time	Real Time Clock	Year, Month, Date, Hour, Minute, Second	•	•
	400Hz Type		Only support full-wave energy, support 2nd ~15th individual harmonics	•	

• Function | Blank NA

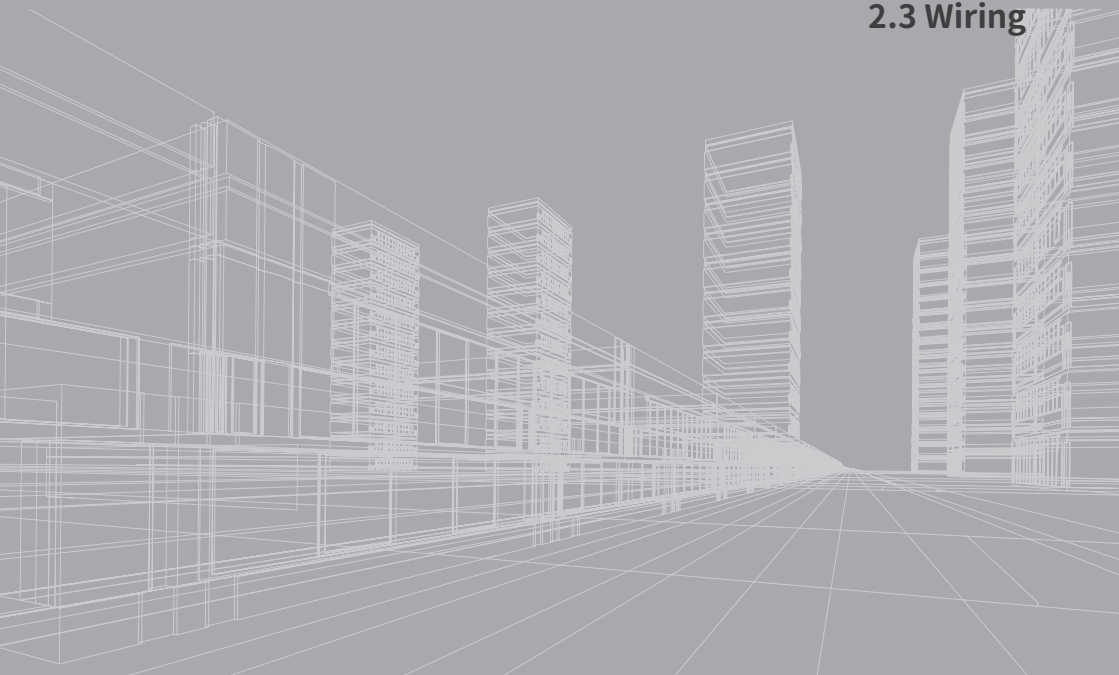
KW320 Series Power Meter

Chapter 2: Installation

2.1 Appearance and Dimensions

2.2 Installation Methods

2.3 Wiring



Before Installation

Installation of the meter must be performed by qualified personnel only, who follow standard safety precautions through the installation procedures. Those personnel should have appropriate training and experience with high voltage devices. Appropriate safety gloves, safety glasses and protective clothing are recommended.

During normal operation, dangerous voltage may flow through many parts of the meter, including terminals, and any connected CTs (Current Transformers) and PTs (Potential Transformers) and their circuits. All primary and secondary circuits can, at times, produce lethal voltages and currents. AVOID contact with any current-carrying surfaces.

The meter 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 meter and its I/O output channels can only be used as secondary protection. AVOID using the meter under situations where failure of the meter may cause injury or death. AVOID using the meter for any application where risk of fire may occur.

All meter terminals should be inaccessible after installation.

Do NOT perform Dielectric (HIPOT) test to any inputs, outputs or communication terminals. High voltage testing may damage electronic components of the meter.

Applying more than the maximum voltage the meter and/or its modules can withstand will permanently damage the meter and/or its modules. Please refer to the specifications for all devices before applying voltages.

When removing meter for service, use fuses for voltage leads and power supply to prevent hazardous voltage conditions or damage to CTs.

ACI recommends using a dry cloth to wipe the meter.

> **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.

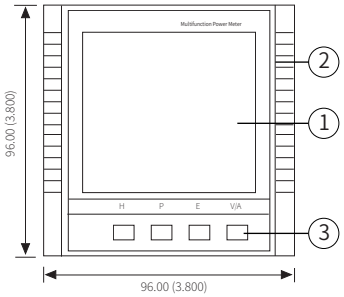
DISCONNECT DEVICE: The following part is considered the equipment disconnect device.

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.

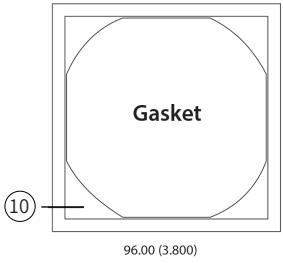
The installation method is introduced in this chapter. Please read this chapter carefully before beginning installation.

2.1 Appearance and Dimensions

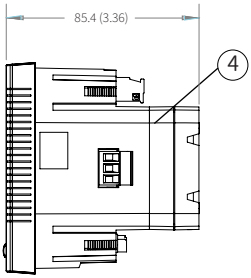
KW320 Dimensions



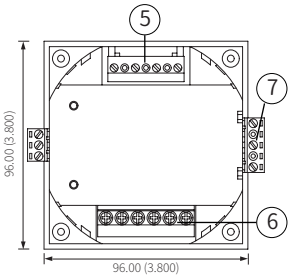
Front View



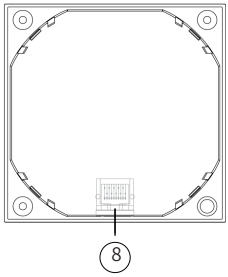
Gasket



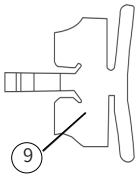
Side View (Display Meter)



Rear View



Rear View (Remote Display)



Installation Clip

Fig 2-1 Appearance and dimensions of KW320 series meter.

Part Name	Description
1. LCD Display	Large bright white backlight LCD display
2. Front Casing	Visible portion (for display and control) after mounting onto a panel
3. Key	Four keys are used to select display and set
4. Enclosure	The KW320 series meter enclosure is made of high strength anti-combustible engineering plastic
5. Voltage Input Terminals	Used for voltage input
6. Current Input Terminals	Used for current input
7. Power Supply Terminals	Used for control power input
8. Communication Terminals	Communication output
9. Installation Clip	Used for fixing the meter to the panel
10. Gasket	Insert the gasket in between the meter and the cutout to cover up gaps from the round hole

Table 2-1 Part name of KW320 series meter

2.2 Installation Methods

Environmental:

Before installation, please check the environment, temperature and humidity to ensure the KW320 series meter is being placed where optimum performance will occur.

Temperature:

Operation: -25 to 70°C (-13 to 158°F)

Storage: -40 to 85°C (-40 to 185°F)

Humidity:

5% to 95% non-condensing.

Location:

KW320 series meter should be installed in a dry and dust free environment. Avoid exposing the meter to excessive heat, radiation and high electrical noise sources.

Installation Steps:

The KW320 series meter can be installed into a standard ANSI C39.1 (4" Round) or an IEC 92mm DIN (Square) form.

1. Cut a square hole or round hole on the panel of the switch gear. The cutting size is show in fig 2-2.

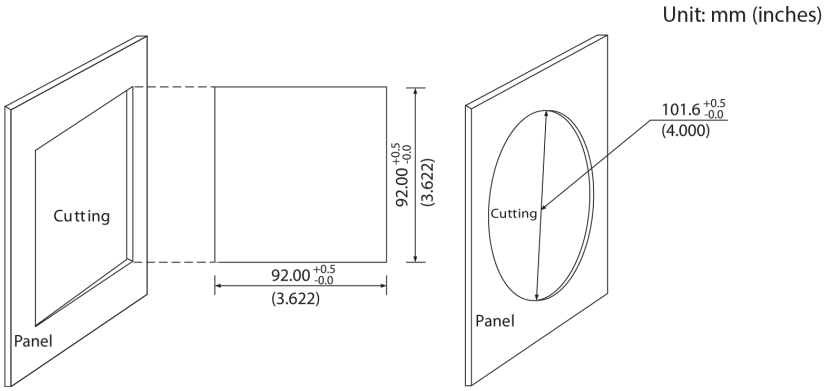


Figure 2-2 Panel Cutout

2. Remove the clips from the meter and insert the meter into the square hole from the front side. Please note: optional rubber gasket must be installed on the meter before inserting the meter into the cut out.

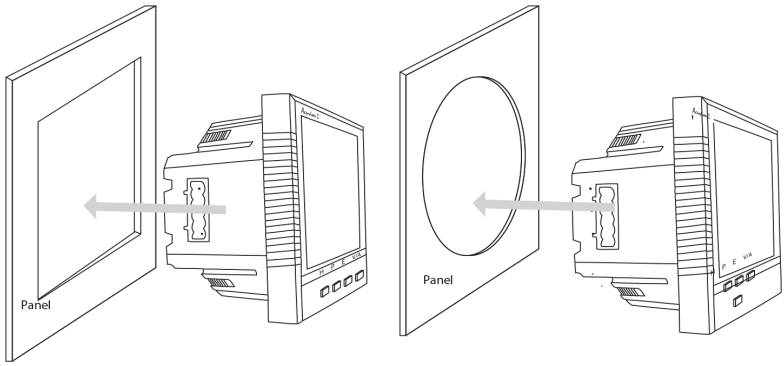


Figure 2-3 Put the meter into the opening

3. Install clips on the back side of the meter and secure tightly to ensure the meter is affixed to the panel.

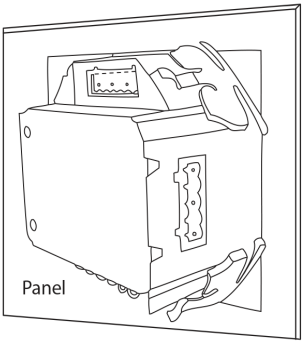


Fig 2-4 Use the clips to fix the meter on the panel

Note: The display meter and the remote display unit have the same installation method. The DIN rail meter is simply installed on a 35mm DIN rail.

2.3 Wiring

2.3.1 Terminal Strips

There are four terminal strips at the back of the KW320 series meter. The three-phase voltage and current are represented by using 1, 2 and 3 respectively. These numbers have the same meaning as A, B and C or R, S and T used in other literature.

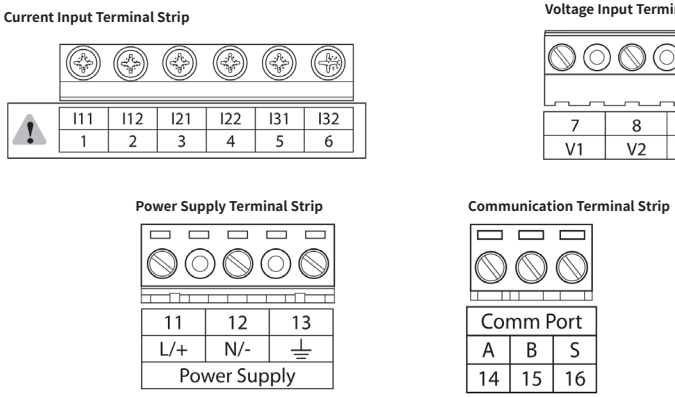


Figure 2-5 Terminal Strips of KW320 series meter

DANGER

Only the qualified personnel does do the wire connection work. Make sure the power supply is cut off and all the wires are powerless. Failure to observe it may result in severe injury or death.

NOTE

Make sure the control power terminal of the meter ground is connected to the safety Earth of switchgear.

NOTE

Make sure the voltage of power supply is the same as what the meter needed for its control power.

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

Figure 2-6 Safety Earth Symbol

2.3.2 Power Requirement

Control Power:

There are 2 options for the Control Power of the KW320 series meter:

Standard: 100~415 VAC (50/60Hz) or 100-300VDC

The meter's typical power consumption is very low 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 11, 12 and 13 (L, N and Ground). A switch or circuit-breaker shall be in close proximity to the equipment, within easy reach of the operator and shall be marked as the disconnecting device for the equipment.

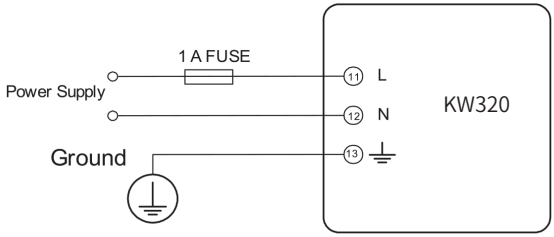


Figure 2-7 Power Supply

A fuse (typical 1A/250VAC) should be used in the auxiliary power supply loop. No. 13 terminal must be connected to the ground terminal of the switchgear. 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.

NOTE

A filter should be used if there is an EMI problem.

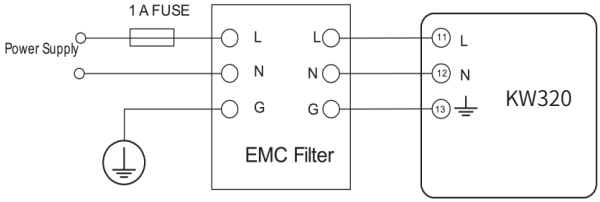


Figure 2-8 Power Supply With EMC Filter

Choice of wire of power supply is AWG 22-16 or 0.6-1.5 mm².

Voltage Input:

Maximum input voltage for the KW320 series meter 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 PT's shall be 100V or 120V. Please make sure to select an appropriate PT to maintain the measurement accuracy of the meter. When connecting using the star 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 AWG16-12 pr 1.3-2.0 mm².

Note: In no circumstance should the secondary of the PT be shorted. The secondary of the PT should be grounded at one end. Please refer to the wiring diagram section for further details.

Current Input:

Current Transformers (CTs) are required in most applications. The KW320 series meter supports two CT input types: 333mV (SC) or Rogowski coil (RCT). Meter model selection is determined by which style of current transformer input being used. The CT should be selected to maintain revenue grade accuracy of the system. The distance between CT and the meter should be as short as possible as the length of the CT leads will have an effect on the accuracy.

The meter requires AWG22-14 as the wire size to the current input terminals.

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 in the CT loop.

When using mV and RCT CT's the secondary leads must not be grounded

VN Connection:

VN is the reference point of the KW320 series meter voltage input. Low wire resistance helps improve the measurement accuracy. Different system wiring 20 modes require different VN connection methods. Please refer to the wiring diagram section for more details.

Three Phase Wiring Diagram:

This meter can satisfy almost any kind of three phase wiring diagrams. Please read this section carefully before choosing the suitable wiring method for your power system.

Voltage and current input wiring mode can be set separately in the meter parameter setting process. The voltage wiring mode can be set as 3-phase 4-line Wye (3LN), 3-phase 3-line direct connection (3LL), 3-phase 3-line open delta (2LL), single phase 2-line (1LN) and single phase 3-line (1LL). The current input wiring mode can be set as 3CT, 2CT and 1CT.

2.3.3 Voltage Input Wiring

3-Phase 4-Line Wye Mode (3LN):

The 3-Phase 4-Line Wye mode is commonly used in low voltage electric distribution power systems. For voltage lower than 400LN/690LL VAC, power line can be connected directly to the meter's voltage input terminal as shown in Fig 2-9a. For high voltage systems (over 400LN/690LL VAC), PT's are required as shown in Fig 2-9b. The meter should be set to 3LN for both voltage levels.

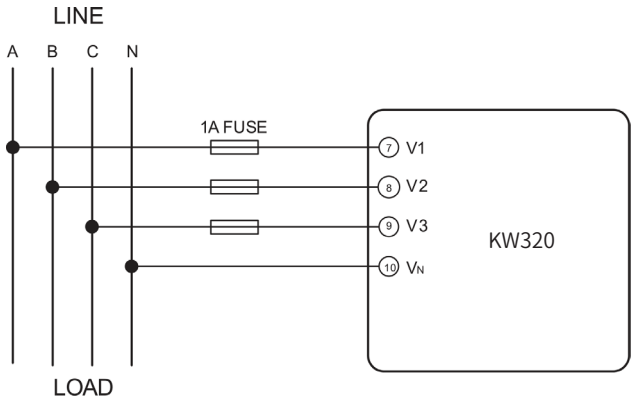


Figure 2-9a 3LN Direct Connection

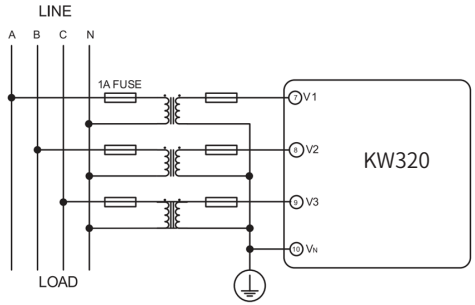


Figure 2-9b 3LN With 3PT

3-Phase 3-Line Direct Connection Mode (3LL):

In a 3-Phase 3-Line system, power line A, B and C are connected to V1, V2 and V3 directly. VN is floated. The voltage input mode of the meter should be set to 3LL.

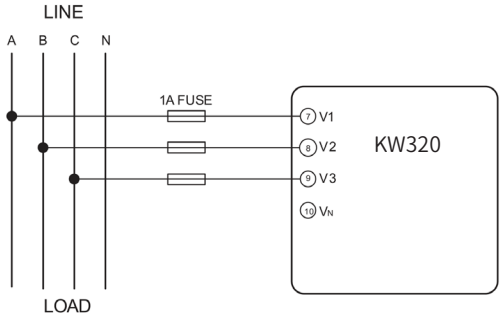


Figure 2-10 3LL 3-Phase 3-Line Direct Connection

3-Phase 3-Line Open Delta Mode (2LL):

Open Delta Wiring Mode is often used in high voltage systems. V2 and VN are connected together in this mode. The voltage input mode of the meter should be set to 2LL for this voltage input wiring mode.

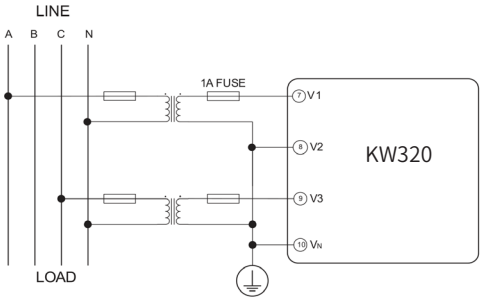


Figure 2-11 2LL With 2PT's

2.3.4 Current Input Wiring

3CT:

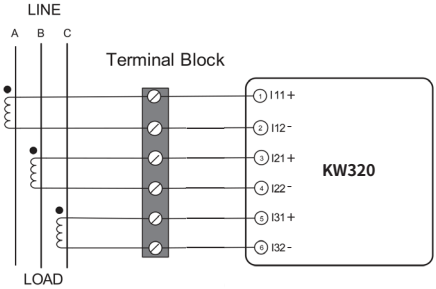


Figure 2-12 3CT's

2CT:

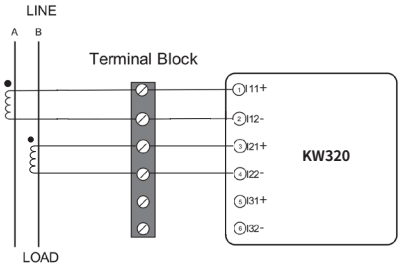


Figure 2-13 2CT's

1CT:

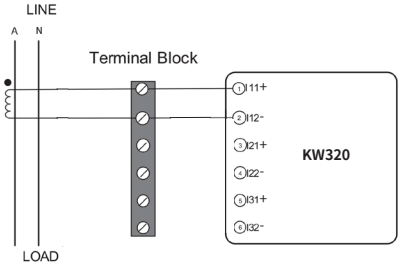


Figure 2-14 1CT

2.3.5 Frequently Used Wiring Method

In this section, the most common voltage and current wiring combinations are shown in different diagrams. In order to display measurement readings correctly, please select the appropriate wiring diagram according to your setup and application.

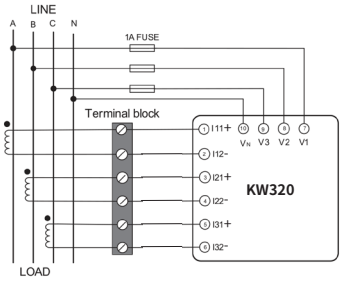


Fig 2-15 3LN, 3CT

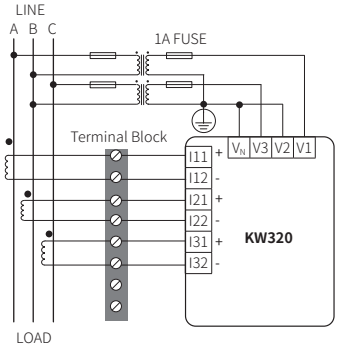


Fig 2-16 2LL, 3CT

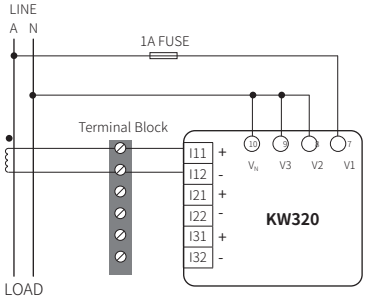


Fig 2-17 1LN, 1CT

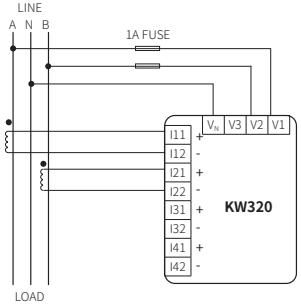


Fig 2-18 1LL, 2CT

2.3.6 Communication

The KW320 meter supports user selectable RS-485 serial Modbus-RTU, BACNet™ MS/TP, dual Ethernet ports with multiple communication protocols, and Wifi communication allows seamless integration with data acquisition systems.

KW320 series meter uses RS485 serial communication for both BACnet MS/TP and Modbus RTU protocols. The terminals of communication are A, B and S (14, 15, 16). A is differential signal +, B is differential signal - and S is connected to the shield of the twisted pair cables. Up to 32 devices can be connected on a RS485 bus. Use good quality shielded twisted pair cable, AWG22 (0.5mm²) or higher. The overall length of the RS485 cable connecting all devices should not exceed 1200m (40000 ft). The KW320 series meter is used as a slave device of masters such as a PC, PLC, Data Collector or RTU.

If the master does not have RS485 communication port, a converter (such as a RS232/RS485 or a USB/RS485 converter) will be required. Typical RS485 network topologies include 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(+), B(-) to B9(-) or it will influence the network or even damage the communication interface.

The connection topology should avoid "T" type which means there is a new branch and it does not begin from the beginning point.

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

When using a long communication cable to connect several devices, an anti-signal reflecting resistor (typical value 120Ω-300Ω/0.25W) is normally added to the end of the cable beside the last meter if the communication quality is distorted.

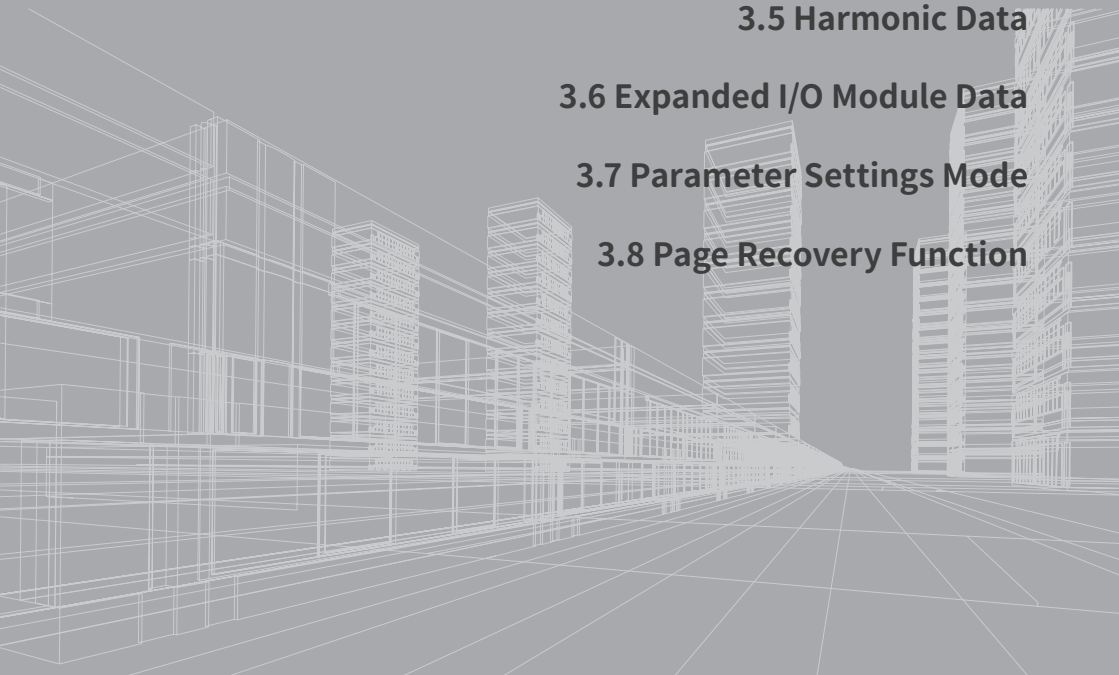
Use RS232/RS485 or USB/RS485 converter with optical isolated output and surge protection.

Refer to Chapter 6 of this manual for additional details on both Modbus RTU and BACnet MS/TP communication.

The ACI KW320 meter also includes dual Ethernet ports that enables seamless integration utilizing BACnet IP, Modbus TCP, IPv6, and additional communication protocols. Refer to Chapter 5 of this manual regarding wiring and meter configuration as it relates Ethernet.

KW320 Series Power Meter

Chapter 3: Meter Display and Parameter Settings



Detailed user interface of the meter will be described in this chapter. This includes viewing real-time metering data and setting parameters using different key combinations.

3.1 Display Panel and Keys

The front of the KW320 series meter consists of an LCD screen and four control keys. All the display segments are illustrated in Fig 3-1. Users should note that all the segments will not display in a single page under normal conditions.

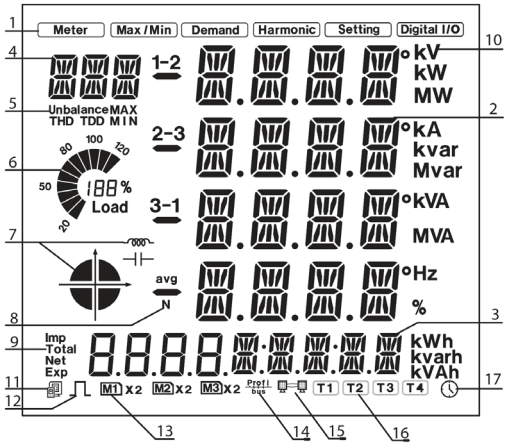
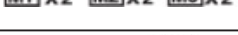
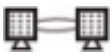


Figure 3.1 All Display Segments

SN	Display	Description
1	Display mode indication	Shows different modes on the display area. "Meter" for real-time measurement | "Max/Min" for statistic data | "Demand" for power demand data | "Harmonic" for harmonic data | "Setting" for parameters setting | "Digital I/O" for expanded I/O module data
2	2 Four lines of " " digits in the metering area	Main display area: displays metering data such as voltage, current, power, power factor, frequency, unbalance, phase angle, etc. Displays statistics such as maximum and minimum, demand data, display settings and expanded I/O mode display
3	Four " " and five " " digits	Display energy data and real-time clock. Also used for the setting mode and digital I/O mode display
4	Three " " digits	Item Icons: "U" for voltage | "I" for current | "P" for power | "Q" for reactive power | "S" for apparent power | "PF" for power factor | "F" for frequency | " ∠ " for phase angles | "DMD" for demand | "Mxx" for expanded I/O module type and display setting page number
5	Unbalance, THD, TDD, MAX, MIN	Item Icons: "Unbalance" for unbalance of the voltage and current | "THD" for total harmonics distortion | "TDD" for total demand distortion | "MAX" for maximum and "MIN" for minimum
6	Load rate 	Displays the percentage of load current to the nominal current
7	Four quadrant icon:  Load type icon: 	 :quadrant of the system power  :inductive load  :capacitive load
8	1-2, 2-3, 3-1, avg, N	1, 2, 3 for 3 phase A, B, C; 1-2, 2-3, 3-1 for 3 phase line-to-line AB, BC, CA; avg for average and N for neutral
9	Energy icon: Imp, Total, Net, EXP	Imp: import energy | Exp: export energy | Total: absolute sum of Imp and Exp energy | Net: algebraic sum of Imp and Exp energy
10	Units measure	Voltage: V, kV | Current: A, kA | Active power: kW, MW | Reactive Power: kvar, Mvar | Apparent power: kVA, MVA | Frequency: Hz | Active energy: kWh | Reactive energy: kvarh | Apparent energy: kVah | Percentage: % | Phase angle: °

SN	Display	Description
11	Communication icon 	No icon: no communication | One icon: query sent | Two icons: query sent and response received
12	Energy pulse output indicator 	No icon: no pulse output | With icon: icon blinks when sending pulse output
13	Expanded I/O module indicator 	M1: one AXM-IO1 connected | M1x2: two AXM-IO1 connected
14	Profibus module indicator 	No icon: Profibus module not connected | With icon: Profibus module connected
15	Ethernet module indicator 	No icon: Ethernet module not connected | With icon: Ethernet module connected, when the Second Communication Protocol is setting as Others BACnet module connected, when the Second Communication Protocol is setting as BACnet Mesh module connected, when the Second Communication Protocol is setting as Mesh
16	T1 | T2 | T3 | T4	Current tarif
17	Time icon 	Time display

There are four keys on the front panel, labeled H, P, E and V/A from left to right. Use these four keys to read real-time metering data, set parameters and 33 navigate the meter.

Note: If the LCD backlight is off, pressing any key one time will bring the backlight on.

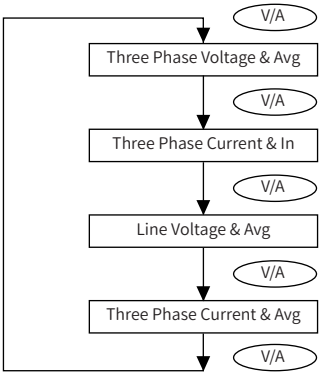
3.2 Metering Data

Pressing H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left. To enter the metering mode, move the cursor to "Meter" then press V/A. In metering mode, the meter displays measurements such as voltage, current, power, power factor, phase angle, unbalance, etc.

A) Voltage and Current:

Press V/A to read voltage and current in the metering area. The screen will roll to the next page when V/A is pressed again. It will go back to the first screen if you press V/A at the last screen.

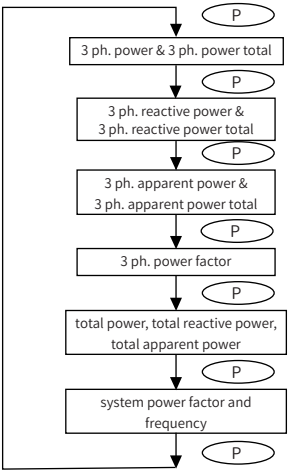
The following figure shows the sequence:



Note: When the meter is set to "2LL" or "3LL", there is no phase voltage or neutral current display. Therefore, only the third screen (line voltage & avg) and the fourth screen (three phase current & avg) will be displayed. When the meter is set to "1LN", there are only phase A voltage and phase A current display, without line voltages or other displays. When the meter is set to "1LL", there are no phase C voltage and phase C current display.

B) Power, Power Factor and Frequency:

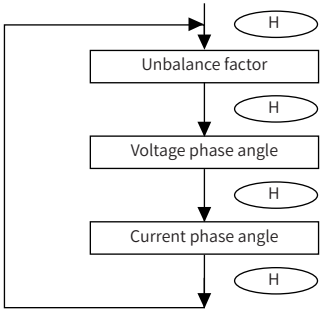
Press P to display power related data. The screen will roll to the next page when P is pressed again. It will go back to the first screen if you press P at the last screen. The following figure shows the sequence:



Note: When the meter is set to "2LL" or "3LL", only the fifth screen (system power) and the sixth screen (system power factor & frequency) will be displayed. When the meter is set to "1LN", there are only phase A power and phase A power factor display. When the meter is set to "1LL". there are no phase C power and phase C power factor display.

C) Phase Angles and Unbalance:

Press H to display phase angles and unbalance data. The screen will roll to the next page when H is pressed again. It will go back to the first screen if you press H at the last screen. The following figure shows the sequence:

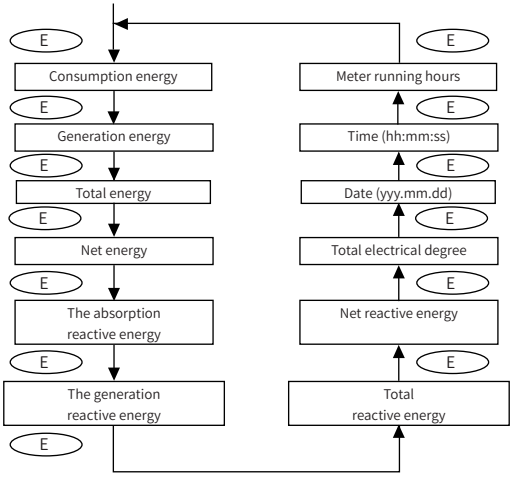


Note: When using "2LL" or "3LL" wiring setting mode, voltage stands for line-to-line voltage. Otherwise, voltage stands for line-to-neutral voltage. When the meter is set to "1LN", there is only phase A current to phase A voltage angle display. When the meter is set to "1LL", there is no phase C voltage or current to phase A voltage angle factor display.

D) Energy:

Press E to display energy and real time clock. The screen will roll to the next page when E is pressed again. It will go back to the first screen if you press E at the last screen.

The following figure shows the sequence:



KW320 series meter can be set to record primary energy or secondary energy. The unit of energy is kWh for active energy, kvarh for reactive energy and kVAh for apparent energy. The running time has a resolution of 0.01h. The meter begins accumulating time upon initial powering up of the unit. The accumulated time is stored in the non-volatile memory. It can be reset via communication or from the meter front.

3.3 Statistic Data

Pressing H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left. To enter the statistics data mode, scroll the cursor to "Max/Min" then press V/A.

In statistics data mode, the meter displays the maximum values and minimum values for voltage, current, power, power factor, unbalance, demand, THD, etc. User should note that time stamp for the parameters can be viewed only from the software through communication. No commands are associated with the key H in "Max/Min" display mode.

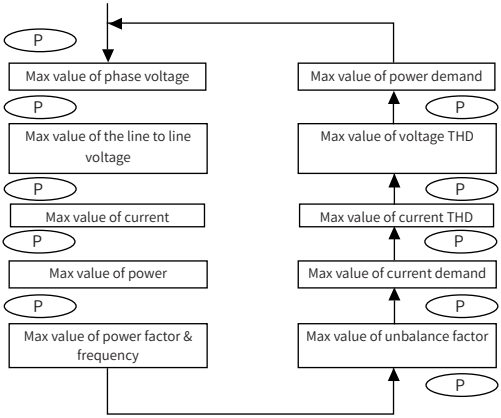
When P is pressed again, the screen will roll to the next page, and will roll back to the first screen when pressed at the last page.

When E is pressed, the screen will roll back to the previous page. It will roll back to the last screen when E is pressed at the first page.

Press V/A to switch the view between maximum and minimum. For example, if the current

display is the maximum phase voltage value, when V/A is pressed, the display will show the minimum phase voltage value. If V/A is pressed again, the display will switch back to show the maximum phase voltage value.

The following figure shows the sequence:



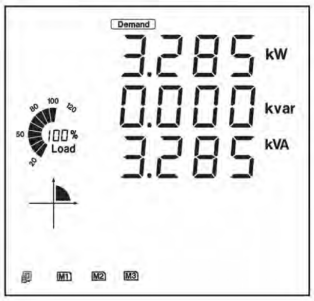
Note: The figure shows the rolling sequence when pressing P. The sequence will be reversed when pressing E. When the meter is set to "2LL" or "3LL", the first screen (max value of phase voltage) will not be displayed. When the meter is set to "1LL", there are no such displays as phase C voltage, Ubc and Uca line voltage, phase C current, three phase voltage and current unbalance factor, Uc and IC THD, phase C current demand, etc. When the meter is set to "1LN", there is only phase A display of phase voltage and current, only Ua and Ia THD display, only demand display of phase A. There are no such displays as three phase voltage and current unbalance factor, line voltage, etc.

3.4 Demand Data

Pressing H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left. To enter demand mode, move the cursor to "Demand", then press V/A.

In the demand data mode, the first screen displays the demand of active power, reactive power and apparent power. The second screen displays the current demand of phase A, phase B and phase C. When the meter is set to "1LL", there is no phase C current demand display. When the meter is set to "1LN", there are no phase B and C current demand display.

As shown in the figure, system active power demand is 3.285 kW, system reactive power demand is 0 kvar, system apparent power demand is 3.285 kVA.



3.5 Harmonic Data

Pressing H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left. To enter harmonic mode, move the cursor to "Harmonic", then press V/A.

In the harmonic data mode, meter displays the harmonic ratio of voltage and current, THD, odd HD, even HD, THFF, CF and KF.

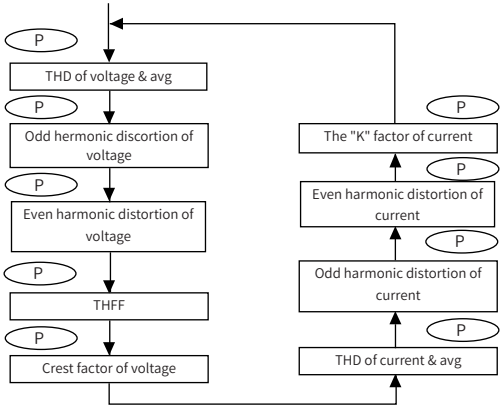
A) Power Quality Data:

Press H to display power quality data. When H is pressed again, the screen will roll to the next page and will roll bakc to the first screen when pressed at the last page.

No commands are associated with keys P and E in "Harmonic" display mode.

Press V/A to switch to harmonic ratio data display.

The following figure shows the sequence:



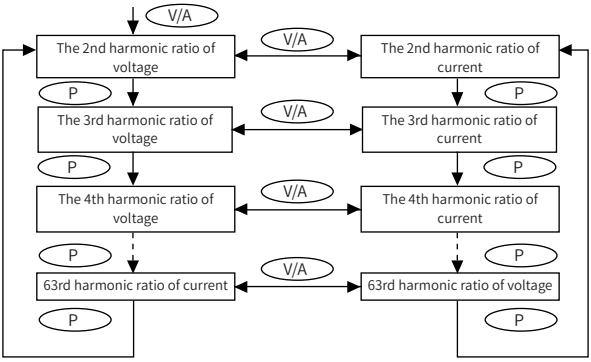
Note: When the meter is set to "1LN", there is only phase A display for voltage THD, voltage odd HD, voltage even HD, THFF, voltage crest factor, current THD, current odd HD, current even HD and current K factor. When the meter is set to "1LL", there is no phase C display.

B) Harmonic Ratio Data:

Press H to switch to power quality data display. The harmonic order will increase by one each time P is pressed and will return to the second when P is pressed at the 63rd harmonic.

Press V/A to switch display between voltage harmonics and current harmonics.

The following figure shows the sequence:



Note: The figure shows the rolling sequence when pressing P. If E is pressed, the sequence will reverse. Harmonic is 2nd~63rd. When the meter is set to "1LN", there is only phase A display for voltage and current harmonic magnitude. When the meter is set to "1LL", there is no phase C display for voltage and current harmonic magnitude.

3.6 Parameter Setting Mode

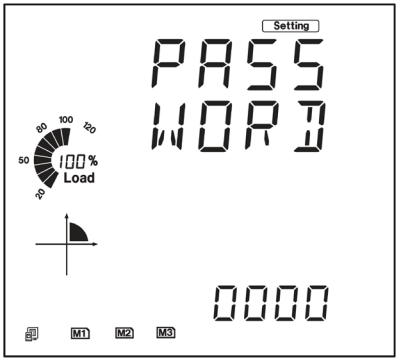
Pressing H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left. To enter parameter setting mode, move the cursor to "Setting" then press V/A.

In the parameter setting mode, parameters such as system parameters, alarm parameters and Ethernet module parameters can be read and modified.

A) Password Inquiry:

Parameter setting mode is password protected. Before entering the password and getting into the parameter setting mode, the meter's device communication address will display for 3 seconds. A four digit password (0000 to 9999) is required every time before accessing the parameter setting mode. The default password is 0000. After entering the password, press V/A to go to the parameter selection page. The meter will be still in the password inquiry page if a wrong password is entered.

The following figure shows the password inquiry page:



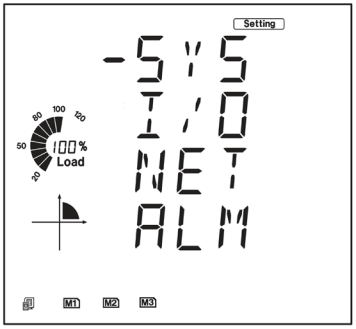
To input password:

- Press H to move the flashing cursor to the next position
- Press P to increase the number by 1
- Press E to decrease the number by 1
- Press V/A to confirm the password

B) Parameter Selection Mode:

There are four parameters to choose from in the parameter selection manual (system, Ethernet module and alarm).

No commands are associated with the H key in the parameter selection manual. Press P to move the cursor downwards, the cursor will move to the top when it reaches the bottom. Press the E key to move the cursor upwards, the cursor will move to the bottom when it reaches the top.



Press V/A to select and modify the parameter. The figure shows the parameter selection page. "SYS" stands for system parameter, "I/O" stands for expanded I/O module parameter, "NET" stands for Ethernet module parameter or BACnet module parameter ("MESH" stands for mesh module) and "ALM" stands for alarm parameter. As shown in the figure, the cursor points to the "SYS", which 51 means system parameter is selected.

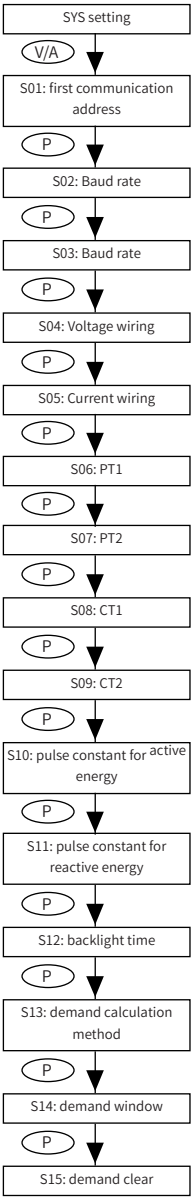
C) System Parameter Setting:

Users can select and modify system parameter in the system parameter setting mode.

Key functions for selecting a parameter:

- Press H to return to parameter selection mode
- The screen will roll to the next page each time P is pressed and will return to the first page when P is pressed at the last page
- The screen will roll to the last page each time E is pressed and will return to the last page when E is pressed at the first page
- Press V/A to modify the selected parameter
- Press H to move the flashing cursor to the next position
- Press P to increase the number by 1
- Press E to decrease the number by 1
- Press V/A to confirm the modification and return to parameter selection mode.

The following figure shows the sequence:



MODBUS: range is 1~247
DNP3.0: range is 0~65534

Select form 1200, 2400, 4800, 9600, 19200, 38400 bps

"Baud rate for external RS485 module select from 4800, 9600, 19200, 38400 bps" | Ethernet module and Profibus module only selects 38400 bps | Mesh module only selects 9600 bps

Voltage wiring mode can be one of "3LN", "2LL", "3LL", "1LN" or "1LL"

Current wiring mode can be one of "3CT", "1CT" or "2CT"

PT1: primary nominal value of P, range from 50.0V~500,000.0V

PT2: secondary nominal value of PT, range from 50.0V~400.0V. If no PT used, PT1 and PT2 as the nominal voltage of the meter

CT1: primary value of CT, range from 1A-50,000A

CT2: secondary value of CT. When the CT is 333mV voltage type, choose 333. When the CT is Rope CT, choose 100.

Which is active energy of each pulse from DO. The pulse of each 1kWh energy can be set to 1~60,000 pul/kvard (secondary). Description: the specific setting method, see the address table

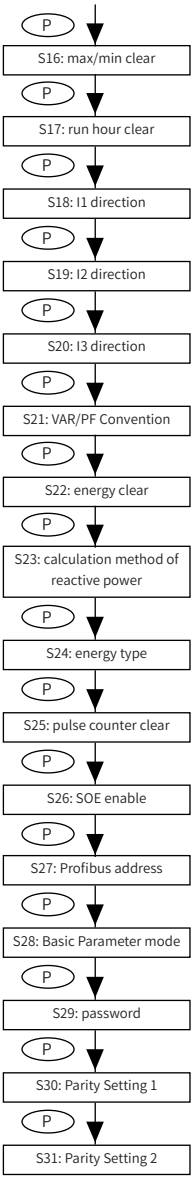
Which is reactive energy of each pulse from DO. The pulse of each 1kvarh energy can be set to 1~60000 pul/kvarh (secondary). Description: The specific setting method, see the address table.

The "on" time can be set from 0 to 120 minute. He backlights will always be "on" if the setting value is 0. If it is other value, it means after that long time it will go off if no key has been pressed. It will be "on" whenever you press any key if it is off.

1: sliding block, 2: thermal

Range from 1~30 minutes

Yes: clear, No: not clear



To clear the Max and Min value does not mean write 0 to all the registers, it will copy the metering value to the statistic registers and start a new statistic period.

Yes: clear, No: not clear

To adjust polarity of current, the three-current's direction can be set as "Negative" which means reversing 180 degrees and "Positive" which means normal

0: IEC, 1: IEEE

Yes: clear, No: not clear

0: true
1: generalized $Q = \sqrt{S^2 - P^2}$

Pre: primary energy
Sec: secondary energy

Range from 0-6
0: not clear | 1: AXM-IO11 clear | 2: AXM-IO21 clear | 3: AXM-IO31 clear | 4: AXM-IO12 clear | 5: AXM-IO22 clear | 6: AXM-IO32 clear

Range from 0-6
0: not clear | 1: AXM-IO11 clear | 2: AXM-IO21 clear | 3: AXM-IO31 clear | 4: AXM-IO12 clear | 5: AXM-IO22 clear | 6: AXM-IO32 clear

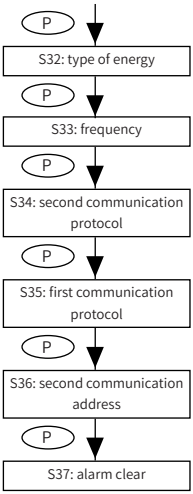
Any interger from 0-126

Pre: primary basic energy
Sec: secondary basic energy

Last page of the system parameter setting. Set the password in this page and make sure to remember the new password, or you may not use the meter properly. Onboard RS485 port Parity setting. It can be selected from NON1, NON2, Odd and Even.

NON1 represents non-parity, single stop bit; NON2 represents non-parity, double stop bit; odd represents odd-parity, single stop-bit; even represents even parity, single stop bit. By default, it is set as NON1.

RS485 module Parity setting. It can be selected from NON1, NON2, Odd and Even. Please refer to S31 for each selection details. By default, it is set as NON1. When user selects NET module or Profibus or Mesh module, Parity setting2 should set NON1.



0: Base, 1: full

0:50HZ, 1:60HZ, 2:400HZ | When select 400H type, only support full function.

2: Mesh, 1: BACnet, 0:Other Protocols if using BACNet module, you should select BACNet, Mesh module, you should select Mesh, if you are using Ethernet, Profibus, RS485 module, should select other

0: MODBUS, 1: DNO3.0, 2: BACnet

Optional range of 1~247

0x0A: clear, other: no

Note: The figure shows the rolling sequence for using the P key. If using the E key for rolling page, the sequence will reverse.

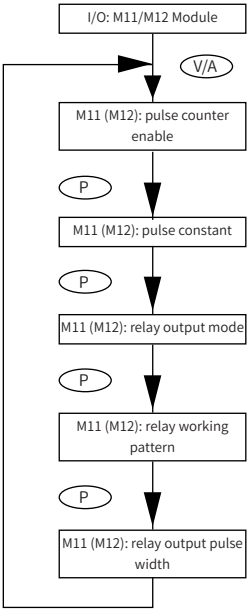
D) Expanded I/O Module Parameter:

Key functions for setting the I/O module parameter:

- Press H to return to I/O module selection mode
- The screen will roll to the next page each time P is pressed and will return to the first page when P is pressed at the last page
- The screen will roll to the last page each time E is pressed and will return to the last page when E is pressed at the first page
- Press V/A to modify the selected parameter

Key functions for modifying the parameter:

- Press H to move the flashing cursor to the next position
- Press P to increase the number by 1
- Press E to decrease the nunmber by 1
- Press V/A to confirm the modification and return to parameter selection mode



DI of AXM-IO-1 can be used as the pulse counter, each DI function corresponds to one bit of a 6-bit register. The correspondence bit of 0 means that the DI works as the digital status input and the correspondence bit of 1 means that the DI works as the pulse counter. For example, if the setting value is 000001, it means that DI1 is set as the pulse counter and other Dis work as digital status inputs.

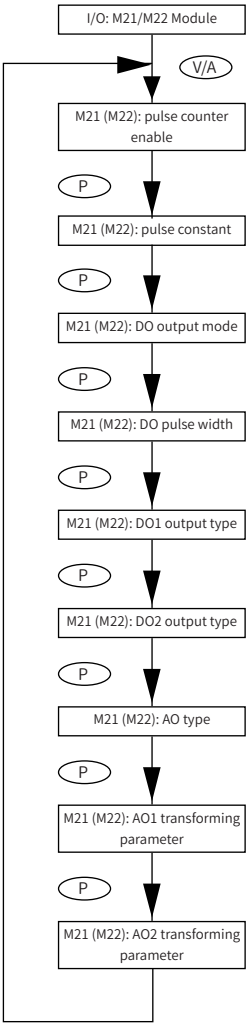
If the DI works as a pulse counter, when the number of pulses counted by the DI equals to the pulse constant, the pulse counter will increase by one. This means that the actual pulse number equals the number pulses counted multiplied by the pulse constant.

Relays of AXM-IO1 can be used as alarm output or control output. ALM:alarm output; control output.

When set as control output, relays have two control methods: latch or pulse.

LATCH: latch more; PUL: pulse mode

If relay pulse control method is selected, the relay contact will close for a present period and open afterwards. The pulse width range is 50~3000 ms.



DI of AXM-IO-1 can be used as the pulse counter, each DI function corresponds to one bit of a 6-bit register. The correspondence bit of 0 means that the DI works as the digital status input and the correspondence bit of 1 means that the DI works as the pulse counter. For example, if the setting value is 000001, it means that DI1 is set as the pulse counter and other Dis work as digital status inputs.

If the DI works as a pulse counter, when the number of pulses counted by the DI equals to the pulse constant, the pulse counter will increase by one. This means that the actual pulse number equals the number pulses counted multiplied by the pulse constant.

DO of AXM-IO1 can be used as either alarm output or energy pulse output. ALM: alarm output; PUL: energy pulse output

Range from 20-1000ms

Choose output energy type for DO1. Range from 0-4. 0: no output; 1: import active energy; 2: export active power; 3: import reactive energy; 4: export reactive energy.

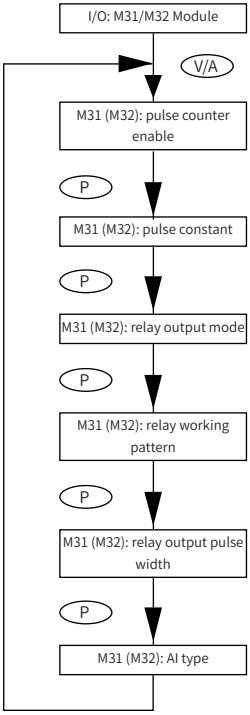
Follow the DO1 setup method to setup DO2. If DO type is set as alarm output, DO1 and DO2 output type parameters will have no effect.

Range from 0 to 3, 0: 0-20mA; 1: 4~20mA; 2: 0-5V; 3: 1-5V.

Be aware that modules with current option cannot be set as voltage type (i.e. option 2 and 3 are unavailable); modules with voltage option cannot be set as current type (i.e. option 0 and 1 are unavailable).

For AO1 and AO2 transforming parameter: Range: 0~29, see Chapter 5 page 99 "AO transforming parameter settings" for more detail When modifying AO parameter, AO input/output values reset s. default value.

The following table shows the sequence:



DI of AXM-IO-1 can be used as the pulse counter, each DI function corresponds to one bit of a 6-bit register. The correspondence bit of 0 means that the DI works as the digital status input and the correspondence bit of 1 means that the DI works as the pulse counter. For example, if the setting value is 000001, it means that DI1 is set as the pulse counter and other Dis work as digital status inputs.

If the DI works as a pulse counter, when the number of pulses counted by the DI equals to the pulse constant, the pulse counter will increase by one. This means that the actual pulse number equals the number pulses counted multiplied by the pulse constant.

When set as control output, relays have two control methods: latch or pulse

Relays of AXM-IO3 can be used as alarm output or control output. ALM:alarm output; CTRL:control output

If relay pulse control method is selected, the relay contact will close for a pre-set period and open afterwards. The pulse width range is 50~3000ms.

Range from 0 to 3. 0: 0~20mA; 1: 4~20mA; 2: 0~5V; 3: 1~5V. Be aware that modules with current option cannot be set as voltage type (i.e. option 2 and 3 are unavailable); modules with voltage option cannot be set as current type (i.e. option 0 and 1 are unavailable).

Note: The figure shows the rolling sequence for using the P key. If using the E key for rolling page, the sequence will reverse.

E) BACnet and Ethernet Module Parameter:

When the second communication protocol is set to BACnet, there is parameters display related to BACnet, while these pages only show as modules successfully connecting with the meter. If meter does not detect any module, there will show LOADING page. To set these parameters, first select, then modify and save. On the one side, if there is no extra BACnet module, setting will be meaningless and not saved after shutting down. On the other side, setting is valid and will be saved into BACnet module when there is a BACnet module attached. When the second communication is set to MESH, where is parameter display related to MESH module.

When second communicaiton protocol is other protocol, there is parameters display related to Ethernet. The condition is same as above.

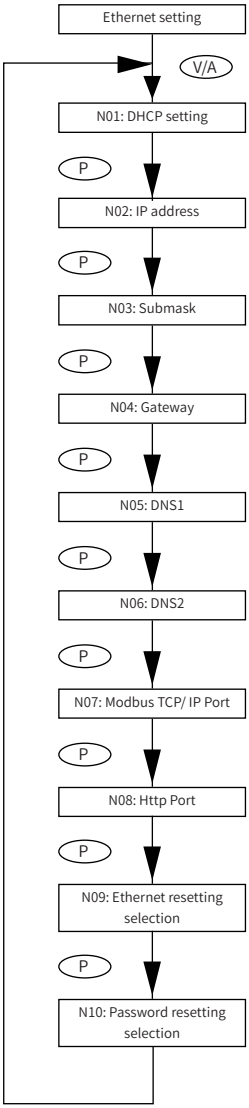
Key functions for finding the Ethernet module parameter:

- Press H to return to parameter selection mode
- The screen will roll to the next page each time P is pressed and will return to the first page when P is pressed at the last page
- THe screen will roll to the last page each time E is preassed and will return to the last page when W is pressed at the first page
- Press V/A to modify the selected parameter

Key functions for modifying the parameter:

- Press H to move the flashing cursor to the next position
- Press P to increase the number by 1, while the number was 9 (Ethernet) or 7 (BACnet IP) or 3 (BACnet MS/TP), the number will return to 0 after pressing P
- Press E to decrease the number by 1, while the number was 0, the number will return to 9 (Ethernet) or 7 (BACnet IP) or 3 (BACnet MS/TP) after pressing E
- Press V/A to confirm the modification and return to parameter selection mode.

The following figure shows the sequence of Ethernet module:



The selection of DHCP setting: MANU or AUTO
Default setting: MANU

IP address has four segments. Any segment can be set from 0~255.
Default setting: 192.168.1.254

Submask has four segments. Any segment can be set from 0~255.
Default setting: 255.255.255.0

Gateway has four segments. Any segment can be set from 0~255.
Default setting: 192.168.1.1

DNS1 has four segments. Any segment can be set from 0~255. Default setting: 202.106.0.20

DNS2 has four segments. Any segment can be set from 0~255. Default setting: 0.0.0.0

Range from 2000-5999, the default value is 502

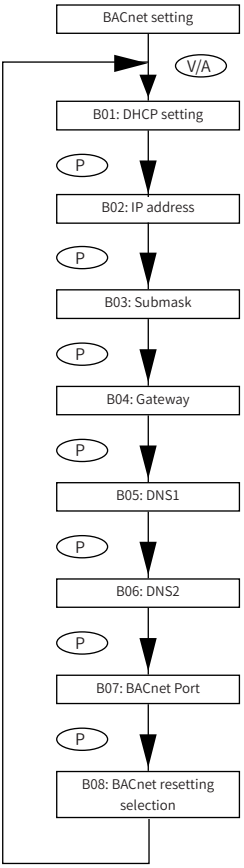
Range from 6000-9999, the default value is 80

0: No resetting; 1: Reset module after modifying parameters; 2: Reset module to default values

0: No resetting; 1: Reset password

Note: The figure shows the rolling sequence for using key P. If using key E for rolling page, the sequence will reverse.

BACnet IP module rolling sequence:



The selection of DHCP setting: MANU or AUTO Default setting: MANU

IP address has four segments. Any segment can be set from 0~255. Default setting :0.0.0.0

Submark has four segments. Any segment can be set from 0~255. Default setting:0.0.0.0

Gateway has four segments. Any segments can be set from 0~255. Default setting:0.0.0.0

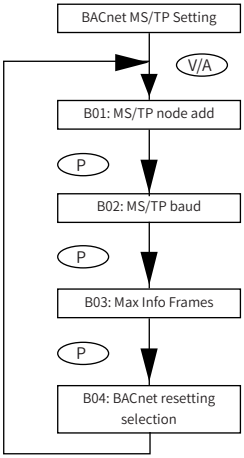
DNS1 has four segments. Any segments can be set from 0~255. Default setting:0.0.0.0

DNS2 has four segments. Any segments can be set from 0~255. Default setting:0.0.0.0

Range from 1~65535, the default value is 47808

0: No resetting 1: Reset module; 2: Reset module to default values before module reset

BACnet MS/TP module rolling sequence:



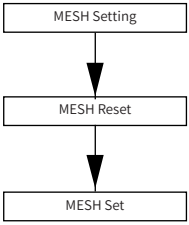
Range from 0~127, the default value is 0

Baud, 0:9600; 1:19200; 2: 38400; 3:57600

Range from 1~255, the default value is 1

0: No resetting; 1: Reset modules 2: Reset module to default values before module reset

MESH module interface part:



NO: No Reset
YES: Reset Module

NO: No Reset
YES: Reset Module

F) Alarm Parameter:

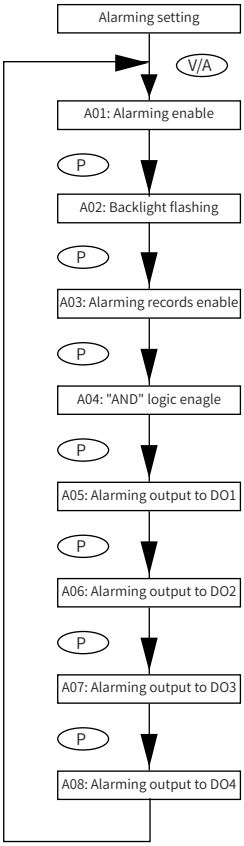
In the alarm parameter mode, user can view and modify the parameters.

Key functions for finding the alarm parameter:

- Press H to return to parameter selection mode
- The screen will roll to the next page each time P is pressed and will return to the first page when P is pressed at the last page
- The screen will roll to the last page each time E is pressed and will return to the last page when E is pressed at the first page
- Press V/A to modify the selected parameter

Key functions for modifying the parameter:

- Press H to move the flashing cursor to the next position
- Press P to increase the number by 1
- Press E to decrease the number by 1
- Press V/A to confirm the modification and return to parameter selection mode



Yes: Alarm enable; No: Alarm disable
It can be selected as cue signal for alarming. Yes: backlight flashes upon alarm condition; No: no backlight flashing

There are 16 alarm channels available. Each channel is controlled and enabled 1 bit each from a 16-bit register. Bit value of 1 means that the corresponding alarm channel is enabled whereas 0 means that the channel is disabled. The meter will display the value of this 16-bit register in decimal numbers (for different channel combination). For example, 00000 means that all channels are disabled; 00001 means only the first channel is enabled; 65535 means that all channels are enabled. Refer to section 4.4 on page 65 for more details.

"AND" logic relationship can be set among channels. When an "AND" logic is in place, both channels have to be triggered before the meter sends out the alarm signal. The logic can be set according to the predefined rule (refer to section 4.4 for more details). User can setup up to 8 logic relationships for alarming. Each logic relationship is controlled and enabled 1 bit each from a 16-bit register (only the lower 8 bits are used). Bit value of 1 means that the corresponding logic relationship is enabled whereas 0 means that the relationship is disabled. The meter will display this 8-bit value in decimal numbers (for different relationship combination). For example, 000 means that all relationships are disabled; 001 means only the first relationship is enabled; 255 means that all relationships are enabled.

When DO1 works in alarming mode, a 16-bit register is used to control which channels are associated with this output. Similar to the alarm channel selection, this 16-bit value is expressed in decimal when reading on the meter front. For example, 00000 means that no alarm channels are associated to this output; 00001 means that alarm channel 1 is associated to DO1; 65535 means that all alarm channels are associated to DO1. Refer to
section 4.4 for more details.

If 2 AXM-IO2 modules are attached to the meter, DO1 and DO2 denote to the first and the second DO channel of AXM-IO21; DO3 and DO4 denote to the first and the second DO channel of AXMIO22 respectively. DO2, DO3 and DO4 use the same setup method as DO1.

Note: The figure shows the rolling sequence for using the P key. If using the E key for rolling page, the sequence will reverse.

3.7 Page Recovery Function

KW320 series meter has a page recovery function. This means that the meter stores current display page in the non-volatile memory upon power loss and reloads the page when power recovers. If power goes off when viewing under the parameter setting mode, the meter will show voltage display when power recovers. If power goes off when viewing under the expanded I/O module data mode, and if the expanded I/O module is not connected when power recovers, the meter will show the voltage display page instead.

KW320 Series Power Meter

Chapter 4: Detailed Functions and Software

The KW320 series meter contains advanced metering tools and is able to measure a multitude of power, energy and power quality parameters. Some advanced functions may not be accessible directly from the meter front; therefore, every meter comes with a powerful software that helps access the information. The latest version of the software can be downloaded by clicking HERE. This chapter introduces these functions and the software.

4.1 Basic Analog Measurements

KW320 series meter can measure voltage, current, power, frequency, power factor, demand, etc. With high accuracy, as shown via the software below:

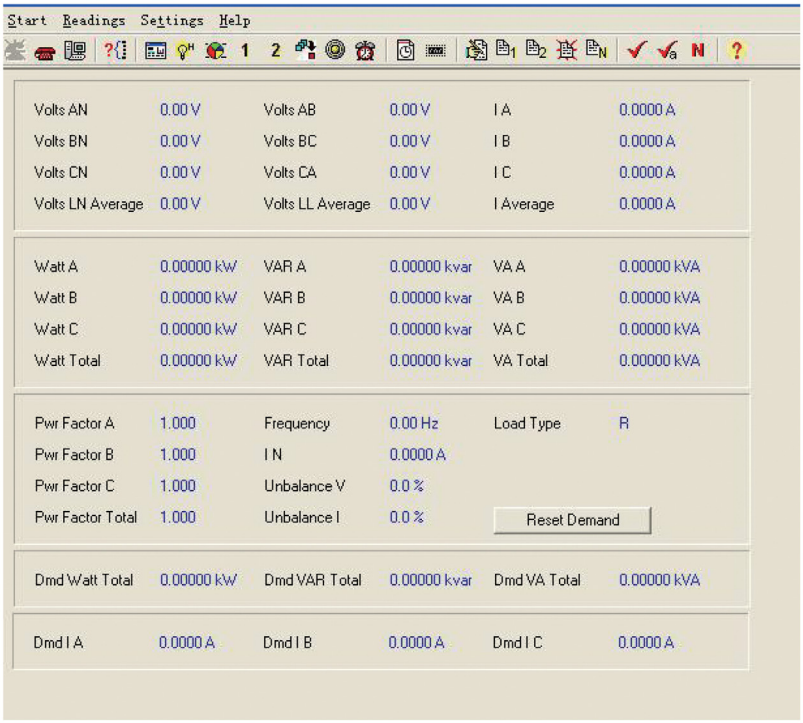


Figure 4-1 Real-Time Metering

Demand:

This meter consists of several types of demand calculation: total active power demand, total reactive power demand, total apparent power demand, phase A current demand, phase B current demand, and phase C current demand. When demand is reset, demand memory registers are set as 0.

Demand calculating mode can be set as sliding window and thermal according to user. The Fig 4-7 shows how it works.

When using the sliding window interval method, user selects an interval from 1 to 30 minutes, which is the period of the calculation. The demand updates every 1 minute as the window slides once.

Thermal demand method calculates the demand based on a thermal response which mimics a thermal demand meter. User selects the period for the calculation and the demand updates at the end of each period.

Energy:

This meter measures and accumulates energy in different directions (import and export). For real-time energy monitoring, it accumulates energy for kWh, kvarh and kVAh continuous (since its last reset).

Calculating mode:

1. User can select different energy calculating modes, fundamental based or full-wave based either from the meter front or via communication. Fundamental based calculating is used to accumulate energy without taking harmonics into consideration while full-wave based calculating is used to accumulate energy including fundamental and harmonics.

Note: When fundamental based calculating mode is selected, PF calculation will be based on the fundamental wave. When selecting 400Hz type, only support full-wave.

2. There are two ways to calculate reactive energy (power)

   Mode 0: real reactive energy $Q = \sqrt{S^2 - P^2 - D^2}$

   Mode 1: general reactive energy $Q = \sqrt{S^2 - P^2}$

3. User can choose primary energy or secondary energy either by pressing keys from the meter front or via communication as shown in Fig 4-7.

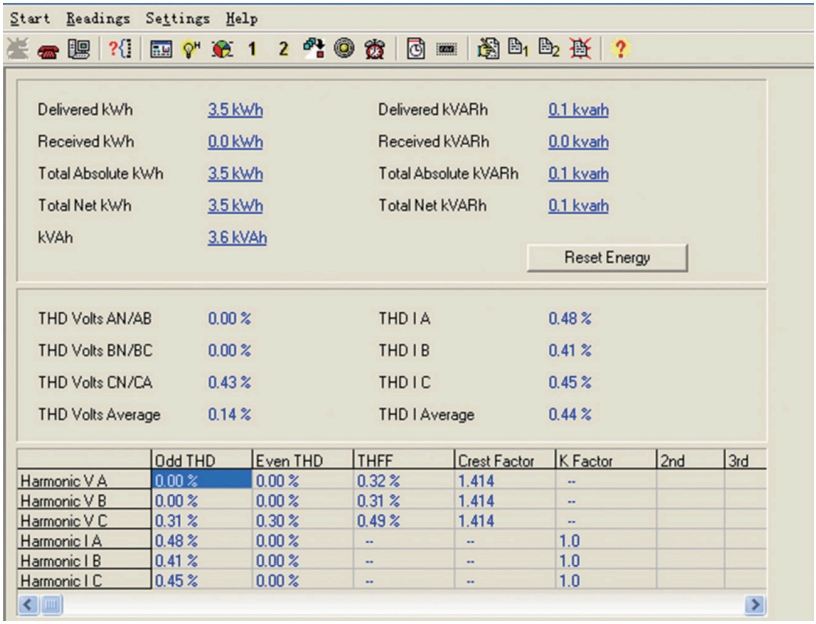


Fig 4-2 Energy and Power Quality Parameters

Current Direction Adjustment:

Under normal circumstances, current flows from input terminal 1 to terminal 2 (i.e. from I11 to I12 for phase A current); however, current may flow in the opposite direction due to incorrect wiring setup. Instead of rewiring the system, the meter provides users an option to reverse the polarity of the current. By default, current direction is set as "positive", to reverse the current polarity by 180 degrees, user can set current direction as "negative". Refer to Fig 4-7 for more details.

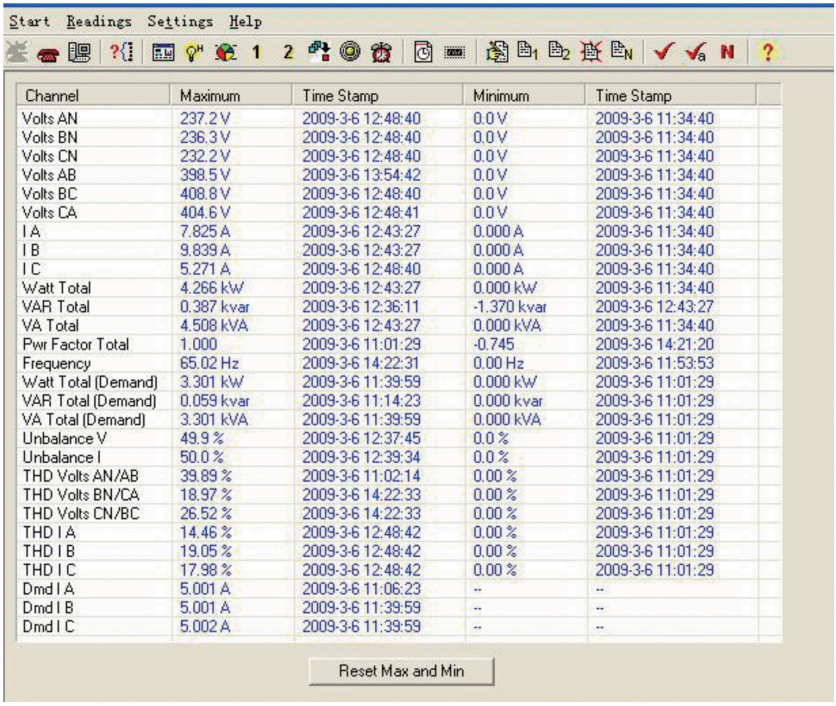


Fig 4-3 Max/Min

4.2 Max/Min

KW320 series meter logs maximum and minimum value statistics for phase/ line voltages, current, power, reactive power, apparent power, power factor, frequency, demand, unbalance factor, THD as well as the time they occur. All data is stored in nonvolatile memory so that statistic information can be preserved even when meter is shut off. All maximum and minimum data can be accessed via communication or from the meter front but time stamps can only be accessed via communication. Statistics can be cleared via communication or from the meter front.

4.3 Harmonics and Power Quality Analysis

Harmonics:

KW320 series meter can measure and analyze THD, harmonics support 2nd to 63rd, even HD, odd HD, crest factor, THFF, K factor etc. They are shown in Fig 4-2.

Note: When selecting 400Hz type, only support 2nd~15th harmonics.

Phase Angle:

Phase angle indicates the angle between phase A voltage and other voltage/ current parameters. Angle ranges from 0 to 360 degrees. This function is to help users find out the relationship between all input signals avoiding wrong wiring. When it is set to “2LL” or “3LL”, it gives out the phase angles of u23, u31, i1, i2, i3 corresponding to u12. When it is set to “3LN”, it gives out the phase angles of u2, u3, i1, i2 and i3 corresponding to u1. When it is set to “1LL”, it gives out the phase angles of u2, i1, i2 corresponding to u1. They are shown in Fig 4-4.

Sequence component and unbalance analysis:

KW320 series meter is able to perform sequential analysis for the input signal. It looks at the positive sequence, negative sequence and zero sequence of 73 the fundamental frequency and performs unbalance analysis for voltage and current. Sequence components are shown in Fig 4-4, unbalance of voltage and current are shown in Fig 4-1.

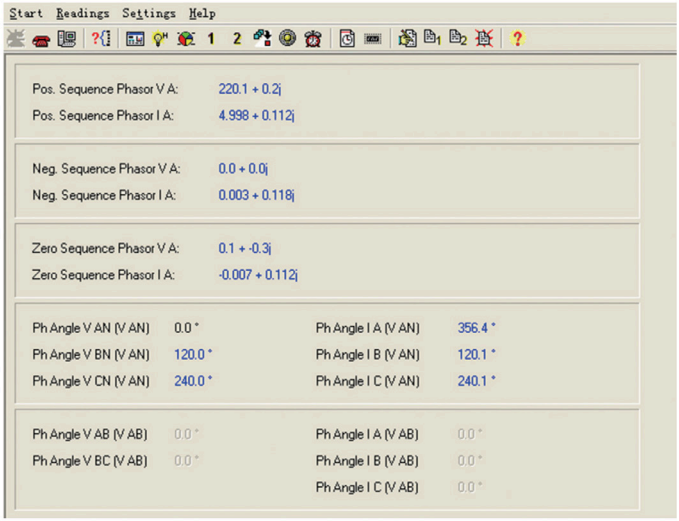


Figure 4-4 Sequence Component and Phase Angle

4.4 Over/Under Limit Alarming

KW320 series meter has over/under limit alarming capabilites. When the monitored parameter goes over/under the preset limit and stays at the level over the preset amount of time delay, the over/under limit alarm will be triggered. The over/under limit value and its time stamp will be recorded in the 74-alarming log. The meter can record up to 16 alarming records. When extended I/O modules are attached, digital outputs (DO) and relay outputs (RO) can be triggered upon alarm conditions and used to activate downstream devices such as a beacon light or a buzzer.

Before using the alarming function, alarm conditions such as logic dependency, target setpoint, time delay etc must be set correctly. Settings can be accessed and modified from the software via communication connection as shown in Fig 4-5.

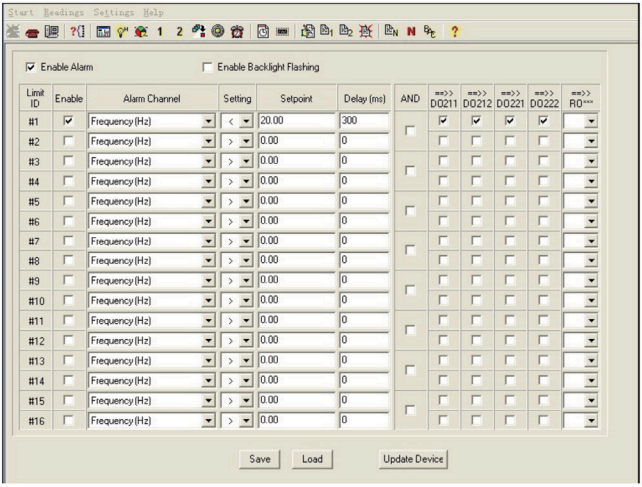


Figure 4-5 Alarm Setting

Single Alarming Group Setting:

Table 4-1 indicates the first group of settings, there are 16 groups in total with the same format.

Address	Parameter	Range	Property
104EH	First group: parameter code	0~79	R/W
104FH	First group: comparison mode	1: larger | 2: equal | 3:smaller	R/W
1050H	First group: setpoint value	Related with parameters	R/W
1051H	First group: delay time	0~3000(*10ms)	R/W
1052H	First group: output to relay	0:none | 1-8: related relay	R/W

Table 4-1 First Group of Alarming Settings

Parameter code: select target parameter for alarm monitoring for example: 0-frequency, 44-AI4 sampling data.

Comparison mode: set alarming condition 1: greater than, 2: equal to, 3: smaller than. For example: if you choose target parameter to be "frequency", condition to be "greater than" and setpoint to be "50", alarm will be triggered when the frequency is greater than 50Hz.

Note: setpoint value is the same as the actual value of the selected parameter.

Delay time: If the alarms condition lasts for the preset time period, the alarm signal will be triggered. The delay range is from 0 to 3000 (unit: 10ms). When it is set to 0, there is no delay, alarm will be triggered when the alarm condition is met. If it is set to 20, there will be a 200ms (20 x 10ms) delay. Output to relay: 0-alarming signal will not be sent to RO; if it is set as 1 and AXMIO11 is connected, it will output to RO1 when alarm triggers. RO1 will be turned off when all alarms output to RO1 are cleared. RO2~RO8 work in the same manner as RO1.

Note: If RO is under alarming mode, it can only work in “latch” mode. If the number is 51~79, there are special guide for contrast method and meaning of parameters, please refer to Chapter 6. After setting up the alarming parameters, user must also setup the global settings in order for the alarm to work properly.

Global settings:

Register addresses for global alarm settings are from 1046H~104DH. Please refer to section 5.3, page 95 "Global alarming settings" for more details.

“Global alarming enable” determines whether the alarming function of the meter is activated or not. The alarming function is enabled when it is set as "1".

When “Alarming flash enable“ is set as “1”, backlight will flash when alarm is triggered.

“Alarming channel enable setting” determines whether the corresponding alarm group is enabled or not. There are 16 groups in all and each one is corresponding to one bit of a 16- bit

register. The corresponding bit must be set to "1" in order to activate the alarm channel.

Logic "AND" between alarm setting: The 16 alarming records in the meter are divided into 8 pairs. Each pair has two alarm groups. The two groups can be logically “AND” by controlling the logic check box. When two groups are “AND”, alarming triggers only if both AND conditions are met. If the "AND" logic box is unchecked, the two alarm channels will work independently.

The 8 "AND" logic pairs are arranged as follows: 1st, 2nd channel form Pair 1; 3rd, 4th channel form Pair 2; 5th, 6th channel form Pair 3; 7th, 8th channel form Pair 4; 9rd, 10th channel form Pair 5; 11th, 12th channel form Pair 6; 13th, 14th channel form Pair 7; 15th, 16th channel form Pair 8.

This function is controlled by the lower 8 bits of the 16-bit register and each bit is corresponding to a pair. “1” means this function is enabled and “0” means disabled.

“Alarming output to DO1 setting”: When “Digital output mode” is set to “1”, DO1 can be used as alarming output. A 16-bit register is used to perform this function, its bit0~bit15 correspond to the 1st ~16th group respectively. When the related I/O module is connected and is under alarming mode, and if the corresponding bit is set to 1 and the alarming condition is met, alarm signal will be sent to DO1. DO1 will be turned off when all alarms correspond to DO1 are cleared. If related bit is set to 0, that alarm channel will not issue alarm signal to DO1. DO2~DO4 work in the same manner DO1.

After completing the setup steps correctly, alarming function can be used.

Setting Example:

Here is an example showing how to apply the logic "AND" function for a pair of alarm channels.

The conditions are as follows: I1 greater than 180A, delay 5s for the 1st alarm channel; U1 less than 9980V, delay 10s for the 2nd alarm channel. No alarm signals will be sent to outputs. The CT primary value of I1 is 200A, and CT2 is 5A. The PT ratio for U1 is 10000:100. The following shows how all the related registers are to be set.

Settings of first group:

- “Parameter code (104EH)” is set to 9, which stands for I1.
- “Comparison mode (104FH)” is set to 1, which stands for "greater than".
- “Setpoint value (1050H)” is set to 4500, according to the relationship between actual value and communication value (I=Rx * (CT1/CT2) /1000). 78
- “Delay time (1051H)” is set to 500, so the actual delay time is 500*10ms= 5s.
- “Output to relay (1052H)” is set to 0, because there is no output to RO.

Settings of second group:

- “Parameter code (1053H)” is set to 1, which stands for U1.
- “Comparison mode (1054H)” is set to 3, which stands for "smaller than".

Global settings:

- “Alarming channel enable setting (1048H)” set to 0003H to enable the first and the second channel.
- “Logic "AND" between alarming setting (1049H)”set to 0001H to enable logic "AND" in Pair 1.
- “Alarming output to DO1 setting (104AH)” set to 0, since no output to DO1.
- “Alarming output to DO2 setting (104BH)” set to 0.
- “Alarming output to DO3 setting (104CH)” set to 0.
- “Alarming output to DO4 setting (104DH)” set to 0.
- “Alarming flash enable (1047H)” set to 0 to disable backlight flashing when alarming occurs.
- “Global alarming enable (1046H)” set to 1 to enable over/under limit alarming.

Records of Alarming Event:

KW320 series meter has built in alarm logging capabilities. 16 entries can be recorded in total. The record sequence of these entries do not depend on the sequence of the 16 alarm channels. The meter begins logging alarm status starting from the 1st record location to the last one. Alarm logs are being recorded in a "cycle" fashion which means the latest event will overwrite the oldest record. When over/under limit parameters return to normal, its value and time stamp will be recorded as well. Therefore, users can determine the over/ under limit duration by checking the time difference.

Here is the 1st group of records. Other groups of records have the same format.

Address	Parameter	Range
42A9H	First group: alarming status	0~65535
42AAH	First group: parameter code	0~79
42ABH	First group: over/under limit or reset value	Related with parameters
42ACH~42B2H	First group: occure time: yyy:mm:dd:hh:mm:ss:ms	Time

“Alarming status” indicates information of current alarm status. It is a 16-bit unsigned integer. Parameter code is stored in the higher 8 bits. Bit1 indicates whether logic "AND" is enabled

or not, 1 means enabled and 0 means not. Bit0 indicates whether alarming has occured or recovered, 1 means occurred and 0 means recovered. Undefined bits are 0.

“Parameter code” specifies the monitored parameter.

“Value” shows the recorded value of the selected parameter when an alarm is triggered and when it recovers.

“Time” indicates the time stamp with the accuracy in milliseconds (ms).

Alarming event will set bit0 of “system status (102EH)” to be 1. When software sends clear alarm command, Bit0 of “system status (102EH)” will be set to 0.

Alarming group number (1032H): the range is 0~16, 0 is no alarm record, and others stand for which record is newest alarm. Alarming group number can be saved during meter power off, and it is cycling recording.

Here is an example:

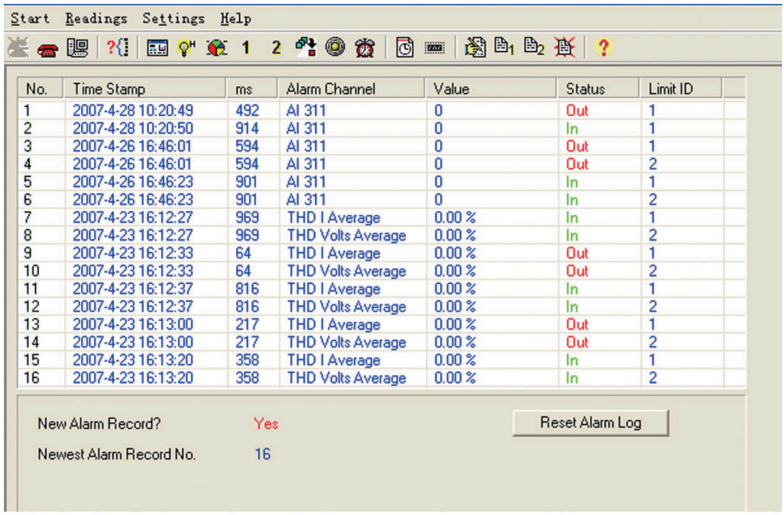


Fig 4-6 Alarming records

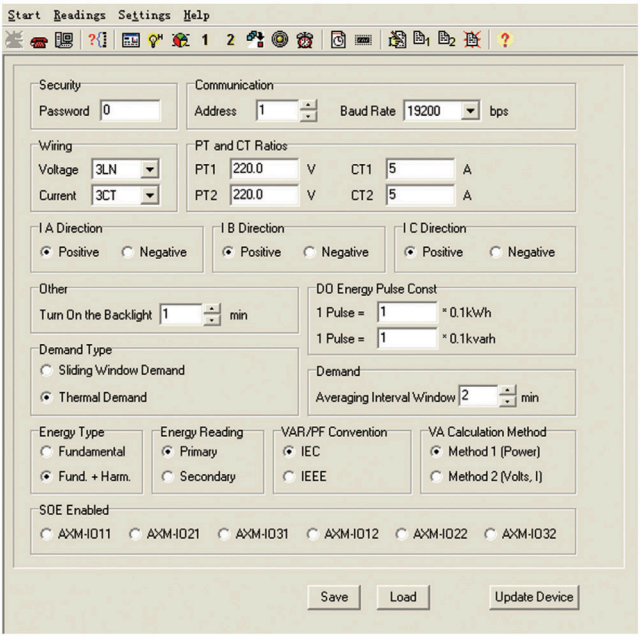


Fig 4-7 Basic settings

4.5 Data Logging

The KW320 and KW320Q meter provides data logging that records the data at a set interval. This meter has 8 GB of memory which gives it extensive datalogging capabilities. It has a real-time clock that allows logs to be time-stamped when log events are created.

Data log settings:

The KW320 and KW320Q meter has three sets of historical data logs. Each log can be independently programmed with individual settings, meaning that each can be used to monitor different parameters. You can program up to 117 parameters per log. You also have the ability to allocate available system resources among the three logs, to increase or decrease the size of the individual historical logs. The total size is no more than 100 sectors that has 64k bytes. The data log 1 setting is shown in Fig 4-8.

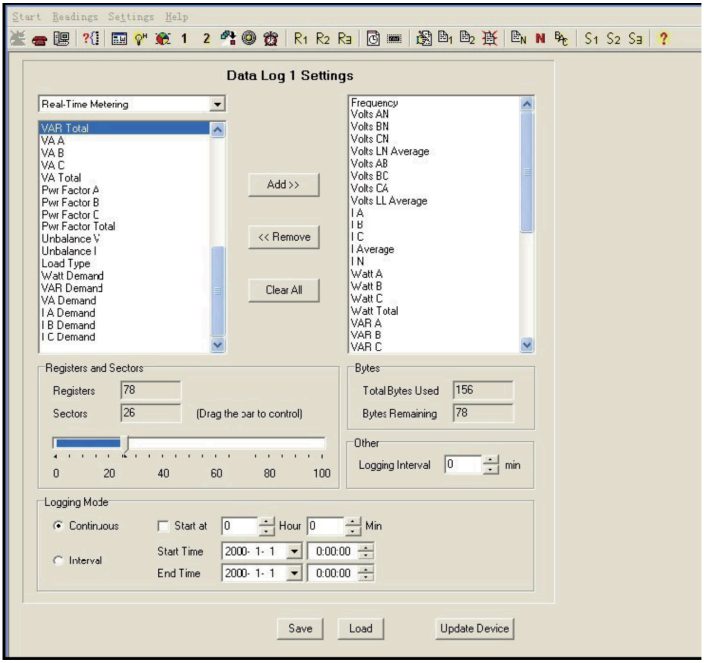


Fig 4-8 The data log 1 setting

Having three sets of historical logs provides you with the option of programming each log with unique parameters. For example, you can program Historical Log 1 to record measured values parameters (for example, Frequency, Voltage, Current), Log 2 to record energy values parameters, and Log 3 to record power quality parameters. Historical Log parameters can be selected from the following thirteen groups:

- Real-Time Metering (Frequency; Instantaneous Voltage; Instantaneous Current; Total and Per Phase Power and Power Factor; Neutral Current; unbalance V/I; load type; Current demand; and Per Phase/ Total Power demand)
- Energy (Ep_imp; Ep_exp; Ep_total; Ep_net; Eq_imp; Eq_exp; Eq_total; Eq_net; Es; Epa_imp; Epa_exp; Epb_imp; Epb_exp; Epc_imp; Epc_exp; Eqa_imp; Eqa_exp; Eqb_imp; Eqb_exp; Eqc_imp; Eqc_exp; Esa; Esb; Esc)
- THD Volts AN/AB (THD, 2nd -63rd Harmonic Magnitudes, ODD, EVEN, CF and THFF of Volts AN/AB)
- THD Volts BN/BC (THD,2nd -63rd Harmonic Magnitudes, ODD, EVEN, CF and THFF of Volts BN/BC)

- THD Volts CN/CA (THD, average THD, 2nd-63rd Harmonic Magnitudes, ODD, EVEN, CF and THFF of Volts CN/CA)
- THD IA (THD, 2nd-63rd Harmonic Magnitudes, ODD, EVEN, KF of IA)
- THD IB (THD, 2nd-63rd Harmonic Magnitudes, ODD, EVEN, KF of IB)
- THD IC (THD, average THD, 2nd-63rd Harmonic Magnitudes, ODD, EVEN, KF of IC)
- Sequence Component (positive, negative and zero sequence)
- Phase Angles (the angle between U1 and other voltage and current parameters.)

The following procedures show how to select and store parameters in historical log 1. The Group field determines the items that are available for selection.

1. Select a Group. The possible selections are: Real-Time Metering, Energy, THD Volts AN/AB, THD Volts BN/BC, THD Volts CN/CA, THD IA, THD IB, THD IC, Sequence Component, and Phase Angles.

2. Select items for your log:

   A. Highlight the parameter(s) you want to log into the meter's memory.

   B. Click Add to add the parameter to the Selected Parameter Area.

   C. To remove parameter(s), highlight them in the Selected Parameter Area and click Remove.

3. Set the logging interval (in minutes). Interval can be set from 0 - 1444 minutes according to different application.

   The logging interval determines when the meter takes a snapshot. When interval is set as 0, the set of historical data log is disabled.

4. There are 100 sectors in total for the 3 historical data logs. User can assign different sector size to each log according to different applications (as long as the total sector sizes of the 3 logs do not exceed 100).

5. Three Modes of historical log:

   A. Mode1: if correctly set historical log, can record without setting date and time, depending on first-in first-out recycling log.

   B. Mode2: if correctly set historical log, as set date and time, can record within begin to end time. Record will stop after buffer is full.

   C. Mode3: if correctly set historical log, as set hour and minute, only can record while the running time is equal to setting hour and minute, depending on firstin first-out recycling log.

NOTES:

- If the memory of the historical data log is full, the meter will erase the first sector in which the memory size is 65536 bytes (64kb). The following sector (the second sector) will become the first sector and the data from the erased sector will not be recoverable. Therefore, user should save the whole log before memory is full to maintain all the data.

- There are two display fields at the bottom of the data log setting screen. They show the registers in the logs, the total bytes used and the bytes remaining for this historical log. These fields are updated as you make selections on the screen. The total number of bytes available per log record is approximately 234.

Retrieving logs:

There are two ways of retrieving the logs: "read one window" and "read all". The retrieval screen is shown in Fig 4-9.

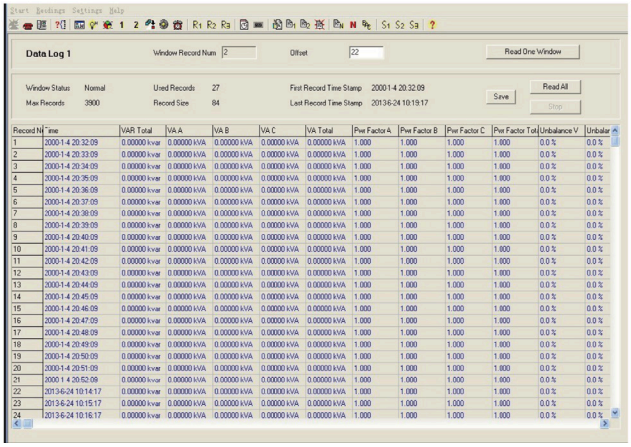


Fig 4-9 Retrieval screen

The "read one window" method allows you to access and read a specific log location at an offset from the first log. The "window record num" is the maximum number of record entries the software can read at a time, it is calculated by 246 / Record Size. The larger this number is, the faster data can be retrieved. Log type is the logs you want to retrieve, for example, log type 0 is data logging 1, log type 1 is data logging 2 and log type 2 is data logging 3. The "read all" method accesses and reads the historical data log automatically, the offset increases automatically until all the logs are retrieved.

The data logs contents are shown at the bottom of the page.

4.6 Power Quality Event Logging and Waveform Capture

Power Quality Event Logging

When a power quality event happens, such as voltage sag and swell, KW320W will record the event timestamp and the triggering condition. It can save up to 50,000 events.

Event Logging Data format:

- Timestamp (4 words) + Triggering Condition (1 word) + Rated Value (1 word) + Threshold (1 word) + Half Cycle Count (1 word)
- Each event has 8 words in total.
- Event Time: W1: Year—High Byte; Month-Low Byte; W2: Day-High Byte, Hour— Low Byte; W3: Minute—High Byte; Second—Low Byte; W4: Millisecond
- Triggering Condition: W5—Voltage Sags or Voltage Swells 0: logging disabled; Bit0: 1 – u1 voltage sag, 0 – no u1 voltage sag;
- Bit1: 1 – u2 voltage sag, 0 – no u2 voltage sag;
- Bit2: 1 – u3 voltage sag, 0 – no u3 voltage sag;
- Bit3: 1 – u1 voltage swell, 0 –u1 no voltage swell;
- Bit4: 1 – u2 voltage swell, 0 –u2 no voltage swell;
- Bit5: 1 – u3 voltage swell, 0 –u3 no voltage swell;
- Rated Value: W6—Voltage rated value;
- Threshold: W7—Threshold for voltage sag and swell.
- Half Cycle count: W8 (Voltage Swell: 0; Voltage Sag: 4~200)

Event Logging Triggering Conditions:

- **Voltage Sag**

  When any phase of the three-phase voltage is lower than the set value (voltage rated value x threshold %), there will be a voltage sag event. When one phase voltage sag happens, the other phase will not respond to voltage sag event logging. Only when all of the phases voltage restore back to normal, a new voltage sag event will be responded.

- **Voltage Swell**

  When any phase of the three-phase voltage is higher than the set value (voltage rated value x threshold %), there will be an Voltage Swell event. When one phase Voltage Swell happens, the other phase will not respond to Voltage Swell event logging. Only when all of the phases voltage restore back to normal, a new Voltage Swell event will be responded.

Note: The following figure depicts how to set the parameters for Power Quality Event Logging and Waveform Capture. In the parameter settings, Voltage Sag and Voltage Swell share the same voltage rated value. The parameters for event logging include: voltage rated value, voltage sag threshold, voltage sag half cycle count and voltage swell threshold. Those parameters also fit voltage sag 95 waveform capture. The other triggering conditions for Waveform Capture can be set when necessary. When the Waveform Capture triggering by Voltage Sag and Voltage Swell is enabled, the corresponding event log and waveform will be recorded when Voltage Sag or Voltage Swell happens.

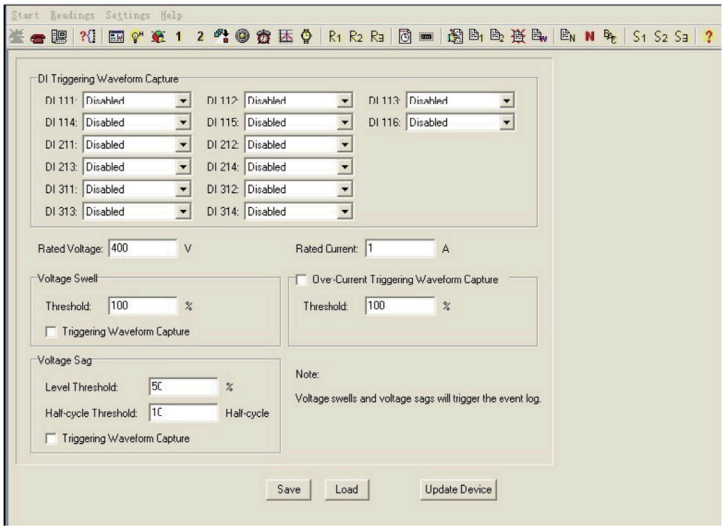


Fig 4-10

Event Log Retrieve:

When a new event log commences, the newest event number address (0X8CFDH) contains the newest event number. When the log is being retrieved, the starting event log number (0X8CFEH) and the event quantity for 96 each retrieve (0X8CFF) must be set correctly. It must be ensured that the starting number of event log should equal or smaller than the newest log number. When setup is correct, reading registers 0X8D00H—0X8D4FH will acquire the event log data. Each time a maximum of 10 logged events can be retrieved. The event log retrieve page is in the figure below. The Modbus register address of the event log is in the table below (see details in Chapter 6).

8CFDH	Newest event number	word	R	Range: 1~50,000 0: No event
8CFEH	Starting event log number	word	R/W	Range: 1-50,000 Note: smaller than or equal to the newest event number
8CFFH	Even quantity of each time retrieve	word	R/W	1-10

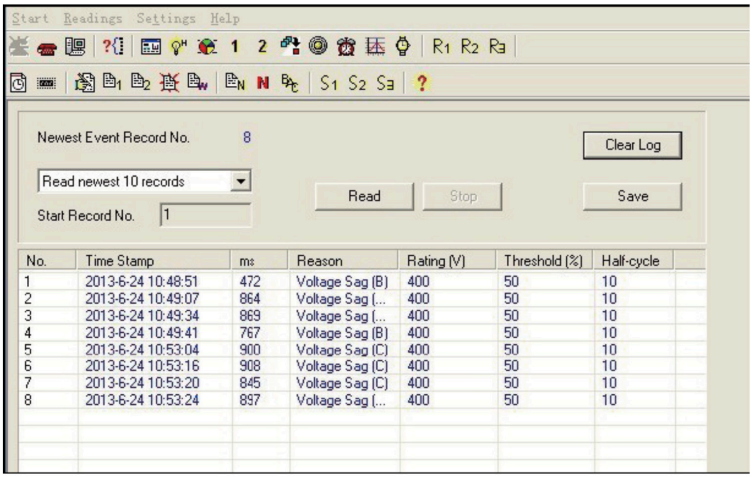


Fig 4-11

Waveform Capture

KW320Q can record 100 groups of voltage and current waveform data at a sampling rate of 64 points per cycle. It provides the captured waveform of 10 cycles before and after the triggering point (including U1, U2, U3, I1, I2, I3). The triggering condition is settable.

Waveform Capture Data Format:

Timestamp (7 words) + Triggering Condition (9 words)+ Kept Data Storage (48 words)+ U1, U2, U3, I1, I2, I3(Before triggering point 10 waveforms 64 x 10 x 6 words)+ U1, U2, U3, I1, I2, I3(After triggering point 10 waveforms 64x10x6 words).

Timestamp: Year (W1), Month (W2), Day (W3), Hour (W4), Minute (W5), Second(W6), Millisecond(W7)

Triggering Condition:

- W8—Manual Triggering (0: disable; 1: enable);
- W9— AXM-11 DI Triggering (bit1bit0: DI1(bit3bit2: DI2) bit5bit4: DI3; bit7bit6: DI4; bit9bit8: DI5; bit11bit10: DI6);
- W10—AXM-21 DI Triggering (bit1bit0: DI7; bit3 bit2: DI8; bit5bit4: DI9; bit7bit6: DI10);
- W11—AXM-31 DI Triggering (bit1bit0: DI11; bit3 bit2: DI12; bit5bit4: DI13; bit7bit6: DI14);
- (Two bits meaning: 00: No DI Triggering; 01: DI Triggering from OFF to ON; 10: DI Triggering From On to OFF)
- W12— Voltage Sag Triggering (0: disabled; Bit0: 1 – u1 voltage sag waveform, 0 – no u1 waveform; Bit1: 1 – u2 voltage sag waveform, 0 – no u2 waveform; Bit2: 1 – u3 voltage sag waveform, 0 – no u3 waveform)
- W13— Voltage Swell Triggering (0: disabled; Bit0: 1 – u1 voltage swell waveform, 0 – no u1 waveform; Bit1: 1 – u2 voltage swell waveform, 0 – no u2 waveform; Bit2: 1 – u3 voltage swell waveform, 0 – no u3 waveform;)
- W14— Over-current Triggering (0: disabled; Bit0: 1 – I1 voltage over-current waveform, 0 – no I1 waveform; Bit1: 1 – I2 voltage over-current waveform, 0 – no I2 waveform; Bit2: 1 – I3 voltage over-current waveform, 0 – no I3 waveform;)
- W15, W16----0 (Reserved)

Waveform Order:

- Before triggering point 10 U1 waveforms, 10 U2 waveforms, 10 U3 waveforms, 10 I1 waveforms, 10 I2 waveforms, 10 I3 waveforms.
- After triggering point 10 U1 waveforms, 10 U2 waveforms, 10 U3 waveforms, 10 I1 waveforms, 10 I2 waveforms, 10 I3 waveforms.

Waveform Capture Group:

Waveform Capture can log up to 100 groups of waveform data. When the 100-group data is full, it does not respond to any waveform triggering condition. Only when all the waveform data is reset / emptied, waveform capturing function will be normal. When the waveform data is emptied, new waveform data starts from the 1st group. The waveform data will not be lost when the power is off.

Note: Since the amount of each waveform group data is large, it takes more time to write into the flash memory. Therefore, Waveform Capture only responds to one triggering condition at one time. During the process of writing data into the flash memory, it does not respond to new triggering condition. After 99 the process of memory writing, it will respond to new waveform triggering condition.

Waveform Capture Triggering Condition:

1. Manual Triggering

   Manually trigger one group waveform capture.

2. DI Triggering

   DI Triggering must fulfill the following two conditions at the same time.

   IO modules with the logical address of 1 (AXM-IO11, AXM-IO21, AXM-IO31).

   DI channel type is set as “State”.

   The Modbus address assigns two bits for the DI channel. When they are set as “00”, it means DI Triggering Disabled; “01” means DI Triggering will be implemented when DI state changes from OFF to ON; “10” means DI Triggering will be implemented when DI state changes from ON to OFF; “11 “means DI Triggering will be implemented when DI state has any change.

3. Voltage Sag Triggering

   As mentioned in Voltage Sag event logging, when Voltage Sag Triggering Waveform is

enabled, both event logging and waveform capture will be implemented at the same time once a voltage sag happens.

4. Voltage Swell Triggering

   As mentioned in Voltage Swell event logging, when Voltage Swell Triggering Waveform is enabled, both event logging and waveform capture will be implemented at the same time once a voltage swell happens.

5. Over-current Triggering

   When Over-current Triggering is enabled, if any phase of the three-phase current is higher than the set value (rated value x threshold %), the waveform 100 capture will be implemented. If one phase is over-current, any other phase overcurrent cannot implement the waveform capture. Only when all of the phase current restores back to normal, waveform capture will be responding.

Waveform Capture Retrieve:

Because of large quantity of saved waveform, waveform retrieving window use 64 addresses to make retrieving data easier, which keeps consistent with recording points of one period. There are two retrieving methods, one retrieve waveform record reasons, another retrieve all data of one group waveform. Two methods are shown below.

First retrieving method is only retrieving waveform record reasons.

When 0x8E01H (Waveform Group Number) is set to 0, waveform record reason can be retrieved from data retrieving window, by changing Waveform Group Number for Retrieving (8E00H). Waveform record reason is 16 bytes and data window are 64 bytes, so that is the reason why each retrieving access include 4 group records.

For example, if the total number of Waveform Group Number for Retrieving is 19, the by this method, only through 5 times retrieving, all 20 groups waveform can be retrieved. Before retrieving, user should write 0 to 8E01H, and 1 to 8E00H, while at first time retrieving addresses from 8E00 to 8E43, these window data are the reasons of waveform group 1, 2, 3, 4. After retrieving, Waveform Group Number for Retrieving (8E00H) will automatically update to 5. While at second time retrieving addresses from 8E00 to 8E43, these window data are the reasons of waveform group 5, 6, 7, 8. Waveform Group Number for Retrieving (8E00H) will stop increasing after the value reaches 17.

Note: Unless user retrieves all data from 8E00H to 8E43H in one time, Waveform Group Number for Retrieving (8E00H) will automatically add 4, otherwise Waveform Group Number for Retrieving (8E00H) will keep present value if only 101 retrieving partial data. Waveform Group Number for Retrieving (8E00H) will stop increasing while value reaches Newest Waveform Group Number. If the value added 4, the value will be larger than Newest Waveform Group Number.

Second retrieving method is retrieving all waveforms data. When 0x8E01H (Waveform Group Number) is set to 1~121, each time only one group data of each number will be retrieved, then Waveform Group Number for Retrieving (8E01H) will automatically add 1 after retrieving. At next time, new Waveform Group Number will be retrieved. Waveform Group Number will stop increasing after value reach 121.

Note: The range of 0x8E01H is 0~121, within setting range, windows (8E04H~8E43H) are corresponding to waveform data.

0: Only retrieving waveform record reasons

1: Time and reasons of waveforms

2~11: Each waveform number of ten waveforms before U1 waveform is triggered

12~21: Each waveform number of ten waveforms before U2 waveform is triggered

22~31: Each waveform number of ten waveforms before U3 waveform is triggered

32~41: Each waveform number of ten waveforms before I1 waveform is triggered

42~51: Each waveform number of ten waveforms before I2 waveform is triggered

52~61: Each waveform number of ten waveforms before I3 waveform is triggered

62~71: Each waveform number of ten waveforms after U1 waveform is triggered

72~81: Each waveform number of ten waveforms after U2 waveform is triggered

82~91: Each waveform number of ten waveforms after U3 waveform is triggered

92~101: Each waveform number of ten waveforms after I1 waveform is triggered

102~111: Each waveform number of ten waveforms after I2 waveform is triggered

112~121: Each waveform number of ten waveforms after I3 waveform is triggered

Note: Unless user retrieves all data from 8E00H to 8E43H in one time, Waveform Group Number for Retrieving (8E01H) will automatically add 1, or Waveform Group Number for Retrieving (8E01H) will keep present value if only retrieving partial data.

8E00H		Waveform Group Number Retrieving	1~100 Note: When the value is smaller than or equal to neweest waveform record group number, this value is valid
8E01H		Waveform Group Number	Waveform number 0~121
8E02H		Waveform record window status	0x0BH: window data is valid 0xFF: window data is invalid 0xAA: waveform record memory is clearing (data is invalid)
8E03H		Newest Waveform Group Number	1~100 | 0~no record
8E04H - 8E43H	-------	Waveform record data retrieving window	-32768~32767

Relationship between voltage or current waveform value and real value:

The relationship between voltage waveform value and real value:

Real Value (Unit: V) = Waveform Value / 37.59105

The relationship between current waveform value and real value:

1. 5A,1A: Real Value (Unit: A) = Waveform Value/1683.153;

2. 333mV: Real Value (Unit: A) = Waveform Value/K (firmware above 3.21,K=14427.15; other: K = 15869.87);

3. 100mV(Rope-CT):Real Value(Unit: A) = Waveform Value/K (firmware above 3.21,K=20291.1; firmware 3.20, K=22068.8,other: K = 15869.87); 4)mA CT:Real Value (Unit: A) = Waveform Value/K (80mA CT:K=7414.289; 100mA:K=9267.440; 200mA:K=18514.68);The voltage and current value obtained from the waveform are the PT or CT secondary side value. The waveform capture retrieve page is shown in Fig 4-14.

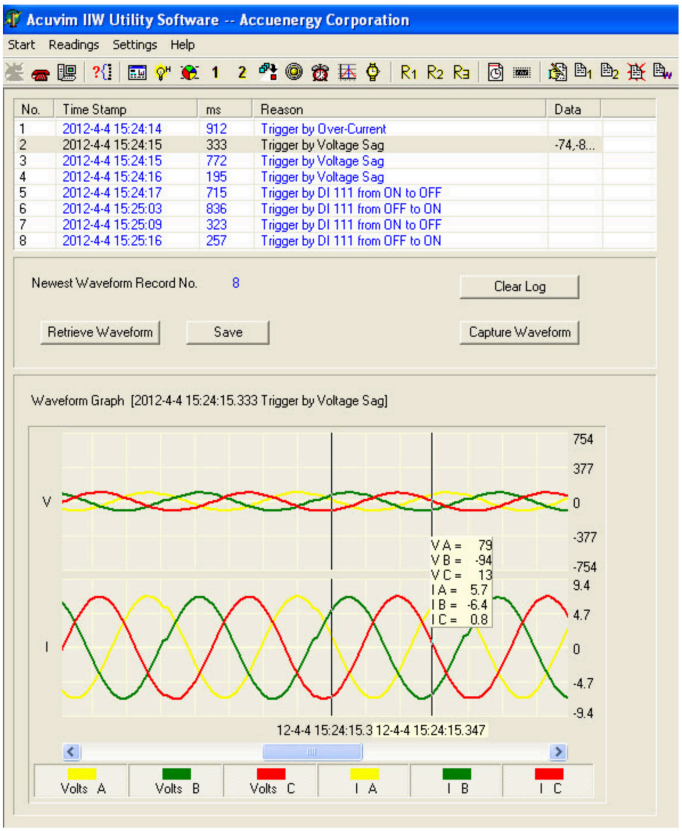


Fig 4-12

Note: When selecting 400Hz type, not support event logging and wave capture.

4.7 Sealing Function

The panel with seal, which has sealed key control, is different with one without seal. When the seal is in opened status, functions are same like normal meters. But when the seal is in sealed status, some functions of meters, which include parameters blocked by seal and optional parameters, will be blocked. These parameters can still be accessible by keys and communication way if they can be accessed before, but in sealed status, these parameters cannot be modified by keys or communication way anymore.

Addresses about seal function are 101EH and 101FH. Address 101EH is about parameters blocked by seal, which can be configured by users. These setting will be valid only when seal is in sealed status. Address 101FH is about if seal function is valid. When the panel is normal one, or the seal panel is in invalid sealed status, this address will show seal is open. When the seal is valid, this address will show sealed status and corresponding parameters will be blocked.

101EH	Sealed Nonstandard Parameters Selection	Bit0: 1st communication parameters | Bit1: 2nd communicaiton parameters | Bit2: run time clear | Bit3: DI pulse count | 1: valid of corresponding selection | 0: invalid
101FH	Seals status	0x0A: Seal sealed | Other: Seal opened

Parameters blocked by seal.

As long as seal is in sealed status, parameters below must be blocked, no matter what value of address 101EH.

Seal Standard Content:

Address	Parameter Description	Key	Communication
1003H	Voltage input wiring type	✔	✔
1004H	Current input wiring type	✔	✔
1005H	PT1 (High 16 bit)	✔	✔
1006H	PT1 (Low 16 bit)	✔	✔
1007H	PT2	✔	✔
1008H	CT1	✔	✔
1009H	CT2	✔	✔
100AH	kWh pulse constant	✔	✔
100BH	Kvarh pulse constant	✔	✔
100DH	Demand slid window time	✔	✔
100EH	Demand calculating mode	✔	✔
100FH	Clear demand memory	✔	✔
1012H	Current I1 direction	✔	✔
1013H	Current I2 direction	✔	✔
1014H	Current I3 direction	✔	✔
1015H	VAR/PF convention	✔	✔
1016H	Energy clear	✔	✔
1017H	Energy calculating mode	✔	✔
1018H	Reactive power measuring mode	✔	✔
1019H	Energy display mode	✔	✔
101DH	Basic parameter mode	✔	✔
101EH	Sealed Nonstandard Parameter Selection	-	✔

Table 4-2 Seal Standard Content

Note: " ✔ " means these addresses will be blocked for keys and communication, and "-" means this function is unavailable.

Energy:

Address	Parameter Description	Key	Communication
4048H-4049H	Energy IMP	-	✔
404AH-404BH	Energy EXP	-	✔
404CH-404DH	Reactive energy IMP	-	✔
404EH-404FH	Reactive energy EXP	-	✔
4050H-4051H	Energy TOTAL	-	✔
4052H-4053H	Energy NET	-	✔
4054H-4055H	Reactive energy TOTAL	-	✔
4056H-4057H	Reactive energy NET	-	✔
4058H-4059H	Apparent energy	-	✔
4620H~4621H	Phase A Energy IMP	-	✔
4622H~4623H	Phase A Energy EXP	-	✔
4624H~4625H	Phase B Energy IMP	-	✔
4626H~4627H	Phase B Energy EXP	-	✔
4627H~4629H	Phase C Energy IMP	-	✔
462AH~462BH	Phase C Energy EXP	-	✔
462CH~462DH	Phase A Reactive energy IMP	-	✔
462EH~462FH	Phase A Reactive energy EXP	-	✔
4630H~4631H	Phase B Reactive energy IMP	-	✔
4632H~4634H	Phase B Reactive energy EXP	-	✔
4634H~4635H	Phase C Reactive energy IMP	-	✔
4634H~4637H	Phase C Reactive energy EXP	-	✔
4638H~6439H	Phase A Apparent energy	-	✔
463AH~463BH	Phase B Apparent energy	-	✔
463CH~463DH	Phase C Apparent energy	-	✔

Table 4-3 Energy

DO:

Address	Parameter Description	Key	Communication
10A5H	Working mode of DO 1 and 2	✔	✔
10A6H	DO pulse width	✔	✔
10A7H	DO1 output	✔	✔
10A8H	DO2 output	✔	✔
10B7H	Working mode of DO 3 and 4	✔	✔
10B8H	DO pulse width	✔	✔
10B9H	DO3 output	✔	✔
10BAH	DO4 output	✔	✔

Table 4-4 DO

Sealed Nonstandard Parameters

When bit 0 of address 101EH is valid, parameters about 1st communication should be blocked.

Address	Parameter Description	Key	Communication
10A5H	Working mode of DO 1 and 2	✔	✔
10A6H	DO pulse width	✔	✔
10A7H	DO1 output	✔	✔
10A8H	DO2 output	✔	✔
10B7H	Working mode of DO 3 and 4	✔	✔
10B8H	DO pulse width	✔	✔
10B9H	DO3 output	✔	✔
10BAH	DO4 output	✔	✔

When bit 1 of address 101EH is valid, parameters about 2nd communication should be blocked.

Address	Parameter Description	Key	Communication
102FH	Baud rate 2	✔	✔
1030H	Parity Setting 2	✔	✔
1031H	Communication address 2	✔	✔
Ethernet Module	DHCP setting	✔	✔
	IP address 1st byte (high)	✔	✔
	IP address 2nd byte (low)	✔	✔
	IP address 3rd byte (high)	✔	✔
	IP address 4th byte (low)	✔	✔
	Submask 1st byte (high)	✔	✔
	Submask 2nd byte (low)	✔	✔
	Submask 3rd byte (high)	✔	✔
	Submask 4th byte (low)	✔	✔
	Gateway 1st byte (high)	✔	✔
	Gateway 2nd byte (low)	✔	✔
	Gateway 3rd byte (high)	✔	✔
	Gateway 4th byte (low)	✔	✔
	DNS1 1st byte (high)	✔	✔
	DNS1 2nd byte (low)	✔	✔
	DNS1 3rd byte (high)	✔	✔
	DNS1 4th byte (low)	✔	✔
	DNS2 1st byte (high)	✔	✔
	DNS2 2nd byte (low)	✔	✔

Address	Parameter Description	Key	Communication
Ethernet Module	DNS2 3rd byte (high)	✔	✔
	DNS2 4th byte (low)	✔	✔
	Modbus Tcp/Ip port	✔	✔
	Http port	✔	✔
BACnet Module	BACnet module enable	✔	✔
	DHCP setting	✔	✔
	IP address 1st byte (high)	✔	✔
	IP address 2nd byte (low)	✔	✔
	IP address 3rd byte (high)	✔	✔
	IP address 4th byte (low)	✔	✔
	Submask 1st byte (high)	✔	✔
	Submask 2nd byte (low)	✔	✔
	Submask 3rd byte (high)	✔	✔
	Submask 4th byte (low)	✔	✔
	Gateway 1st byte (high)	✔	✔
	Gateway 2nd byte (low)	✔	✔
	Gateway 3rd byte (high)	✔	✔
	Gateway 4th byte (low)	✔	✔
	DNS1 1st byte (high)	✔	✔
	DNS1 2nd byte (low)	✔	✔
	DNS1 3rd byte (high)	✔	✔
	DNS1 4th byte (low)	✔	✔
	DNS2 1st byte (high)	✔	✔
	DNS2 2nd byte (low)	✔	✔
	DNS2 3rd byte (low)	✔	✔
	DNS2 4th byte (high)	✔	✔
	MAC address	✔	✔
	BACnet baud rate	✔	✔
	Mac info frames	✔	✔
	BACnet Port	✔	✔
PROFIBUS Module	PROFIBUS address	✔	✔

When bit 2 of address 101EH is valid, parameters below should be blocked.

Address	Parameter Description	Key	Communications
1011H	Run time clear	✔	✔

When bit 3 of address 101EH is valid, parameters below should be blocked.

Address	Parameter Description	Key	Communication
101CH	Pulse counter clear	✔	✔
109EH	DI1-6 type	✔	✔
109FH	DI pulse constant	✔	✔
10A3H	DI7-10 type	✔	✔
10A4H	DI pulse constant	✔	✔
10AAH	DI11-14 type	✔	✔
10ABH	DI pulse constant	✔	✔
10B0H	DI15-20 type	✔	✔
10B1H	DI pulse constant	✔	✔
10B5H	DI21-24 type	✔	✔
10B6H	DI pulse constant	✔	✔
10BCH	DI25-28 type	✔	✔
10BDH	DI pulse constant	✔	✔

When bit 4 of address 101EH is valid, parameters below should be blocked.

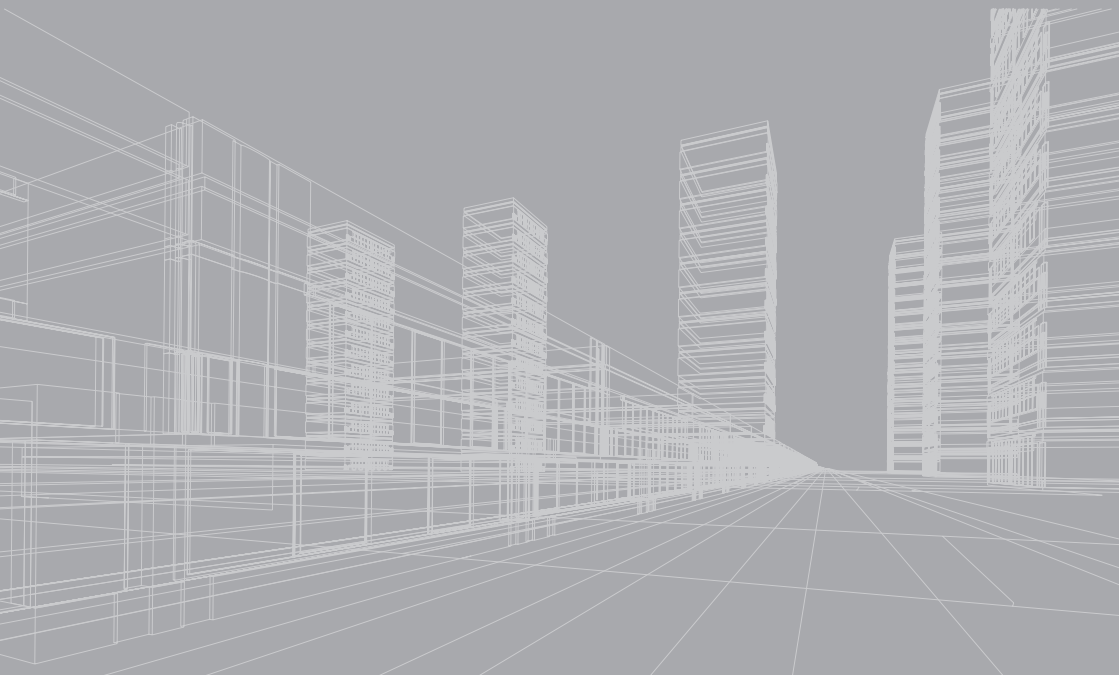
Address	Parameter Description	Key	Communication
103FH	Week	-	✔
1040H	Year	-	✔
1041H	Month	-	✔
1042H	Day	-	✔
1043H	Hour	-	✔
1044H	Minute	-	✔
1045H	Second	-	✔

Note: Standard time is valid within ± 5 minutes, it will be invalid if not in this range.

KW320 Series Power Meter

Chapter 5: Extended Modules

5.1 Ethernet Module (AXM-WEB2)



5.1 Ethernet Module (AXM-WEB2)

5.1.1 Introduction to Ethernet

The AXM-WEB2 Ethernet module comes standard with the ACI's KW320 base meter. Users will be able to use both Ethernet ports and WiFi simultaneously with different networks and data acquisition systems.

This communications module provides users with an industry leading 100ms and 40ms response rate via Modbus TCP that allows users to attain real time updates to key parameters such as voltage, current and power from the KW320 Series meter.

5.1.1.1 Introduction to Ethernet

Ethernet was originally developed by Xerox and then further developed by DEC and Intel. This networking technology uses Carrier Sense Multiple Access with Collision Detection (CDSM/CD) protocol and provides transmission speeds up to 100Mbps.

Ethernet is a not a network but more of a standard. It is the most current communication standard Local Area Network(LAN). This standard defines the type of cable that is used and the method of Signal Processing. The AXM-WEB2 module supports two Ethernet channels.

5.1.1.2 IPv6

The AXM-WEB2 module also supports IPv6 which is the latest version for the internet protocol. The protocol uses 128-bit addressing in comparison to IPv4 which uses 32-bit addressing. The difference for addressing allows for more devices to be connected using IPv6 as opposed to the IPv4 protocol. The protocol is more efficient and provides more secure routing over the internet.

5.1.2 Functional Description of the Ethernet Module

The AXM-WEB2 module supports a wide range of communication protocols. Some of the more commonly used protocols are briefly explained below.

This module supports the Modbus-TCP protocol. When connected to the KW320 series meter, it is a slave device that can only respond to queries. The default value for the Modbus Port is 502. The user defined range is 2000~5999.

The AXM-WEB2 grants users the ability to send emails based on a time interval or when there is a triggered event using the SMPT protocol. It can send mail from encrypted servers and servers that use different SMTP ports.

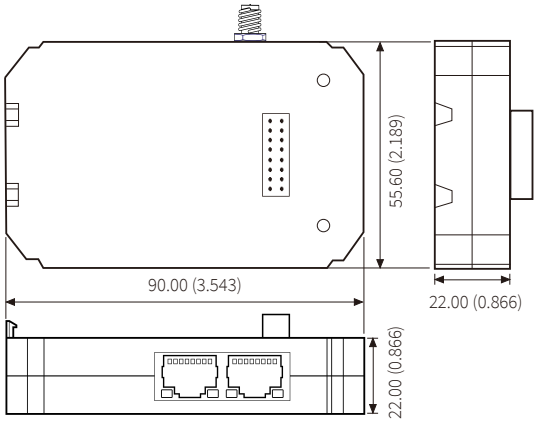
The AXM-WEB2 protocol supports HTTPS protocol. It is used as an HTTPS server and where the default value of the protocol port is 443. Using the HTTPS protocol, the AXM-WEB2 can send post requests to both HTTP and HTTPS servers.

The following are all the protocols supported by the AXM-WEB2 module:

- Modbus TCP
- IPv6
- RSTP
- BACnet-IP
- SNMP V3
- DNP 3.0 V2
- IEC 61850 2nd Edition
- SMTP, NTP, SNTP
- HTTP/HTTPs
- FTP
- sFTP
- WiFi WPA, WPA2 Enterprise
- Ethernet/IP
- MQtt

5.1.3 Appearance and Dimensions

The dimensions in the following diagram are in millimeters. Dimensions listed in the brackets are inches.

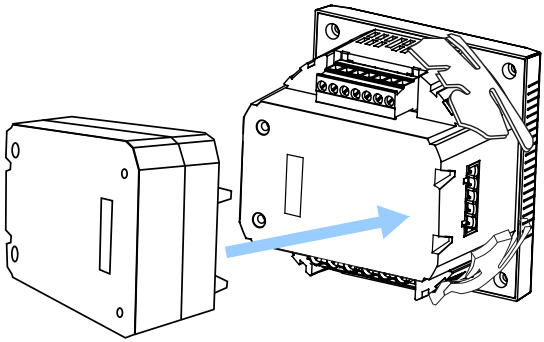


5.1.4 Installation Method

The AXM-WEB2 module is linked to the KW320 series meter by a communication plug.

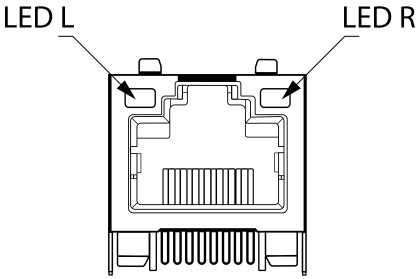
1. Remove cover from the back of the KW320 series meter which will expose the socket.
2. Insert the installation clips to the grooves in the KW320 series meter and then press the AXM-WEB2 module lightly to establish a linking between meter and module.
3. Tighten the installation screws.

NOTE: Installation with power to the meter is forbidden. The module must be installed/uninstalled while the meter is powered off.



5.1.4.1 Definition of RJ45

The AXM-WEB2 uses two standard RJ45 connectors to access the Ethernet network. The mechanical and electrical characteristics of the connector are consistent with the requirements of IEC 603-7.



Pin Number	Name	Description
1	TX+	Tranceive Data+
2	TX-	Tranceive 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 100Mpbs, whiles an off LED represents a speed of 10Mbps.

LED_R (Green): Displays the link and activity status. When the LED is on it indicates the link status. When the LED is flashing it indicates that there is activity.

5.1.5 Initializing the Ethernet Module

The default settings in the KW320 series meter are as followed:

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)

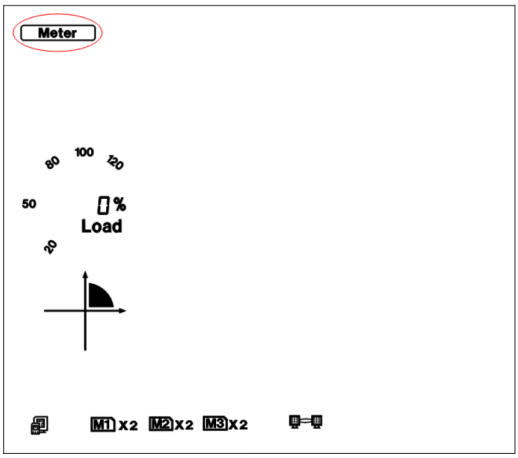
DNS Server 2 (8.8.4.4)

Modbus Port 502

Ethernet 2 (Dynamic IP address)

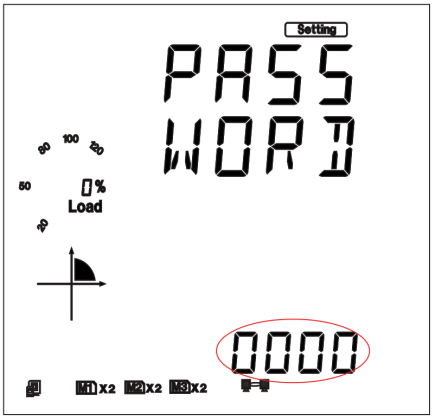
By default Ethernet 2 is configured for DHCP, meaning the network will dynamically assign its network properties. In order to view the Ethernet 2 IP address from the meters display the KW320 meter must be configured to the WEB2 protocol. The following explains how to change the meters protocol settings to work with the WEB2 module:

Press the 'H' and 'V/A' buttons simultaneously on the KW320 series. Release the buttons and the meter will enter the meter selecting mode, as indicated by the flashing 'Meter' cursor.

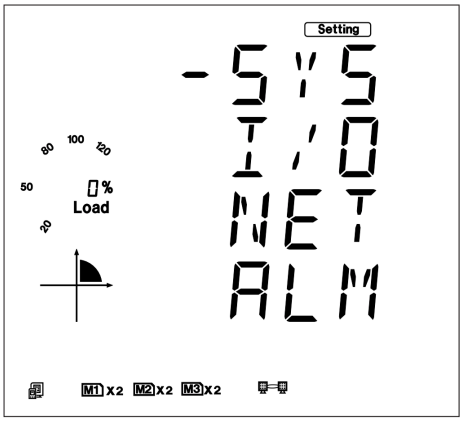


Press the 'P' or 'E' button to move the cursor to 'Setting'. Press 'V/A' button to enter the parameter setting mode. The device address page is the first page of the 'Setting' mode. It will show the Modbus address of the meter for a second before prompting for the password of the device.

You will be required to type in a password in the ‘PASSWORD’ screen. Leave the password as default ‘0000’ and press ‘V/A’ to enter the parameter selection Mode.

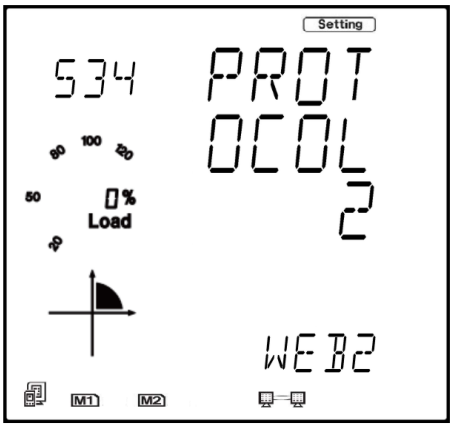


The cursor will be on ‘SYS’. Press ‘V/A’ on this screen to get to the system settings. This will show screen ‘S01 ADDR’.



Press the 'E' button until you get to 'S34 PROTOCOL 2'. Select the 'WEB2' protocol.

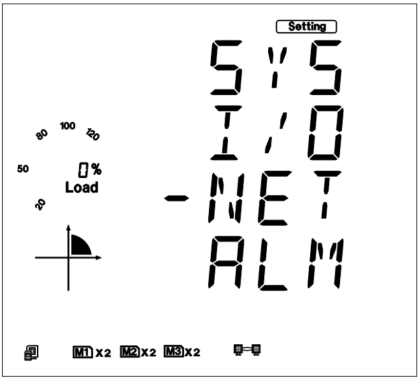
- Press ‘V/A’ to modify the setting; the cursor should now flash.
- Press ‘P’ or ‘E’ to select 'WEB2'.
- Press ‘V/A’ to confirm the change.



Once the protocol 2 setting of the KW320 meter is configured for WEB2, users can now view all necessary settings in the meters NET settings.

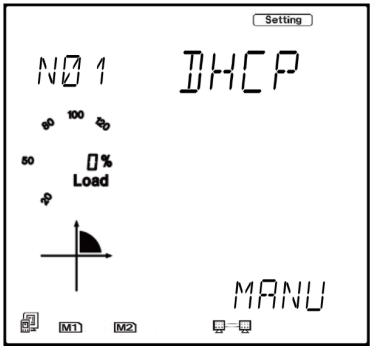
Press the 'H' button to exit the system setting, you will be directed to the parameter selection screen.

Press the 'P' or 'E' button to move the cursor to 'NET' and press the 'V/A' button to enter the Ethernet module settings.

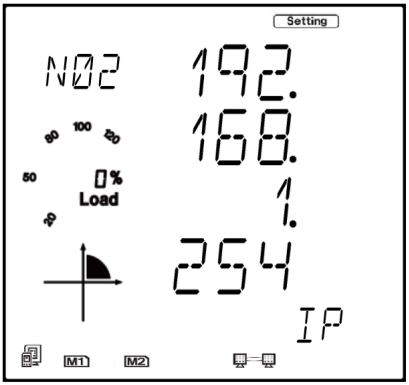


The first page of the NET Settings will be the N01 DHCP setting. By default this is configured to Manual. Setting this configuration to Auto will allow the router to assign the meter with an IP address, whiles Manual will allow the user to configure the IP address. Press the 'V/A' button to enter edit mode. Press 'P' or 'E' to change the setting and press 'V/A' to confirm.

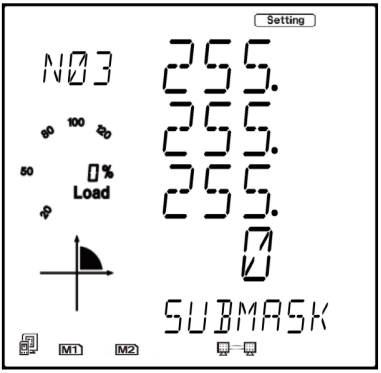
NOTE: If the DHCP is selected as Auto, the Ethernet module needs to be rebooted before it can be assigned with the new IP address.



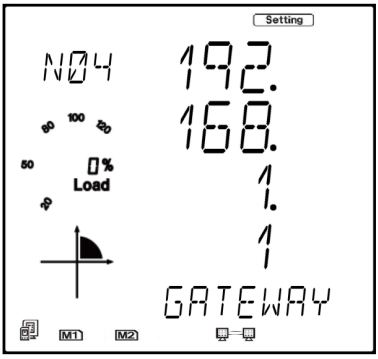
Press 'P' to get to "N02 IP address" This is the IP address for Ethernet 1 and can be used to access the web interface of the module. Users can configured the IP address if the DHCP is configured to Manual. Press 'V/A' to configure the IP address. The cursor of the first digit will begin to flash. Press 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.



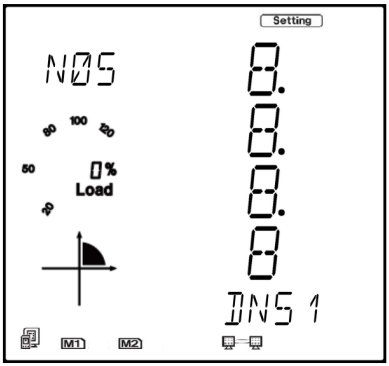
Press 'P' to get to "N03 Subnet Mask". Press 'V/A' to configure the subnet address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm.



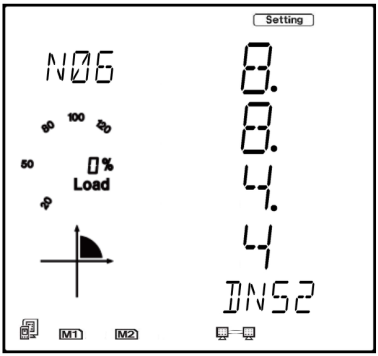
Press 'P' to get to "N04 Gateway". Press 'V/A' to configure the gateway IP address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm.



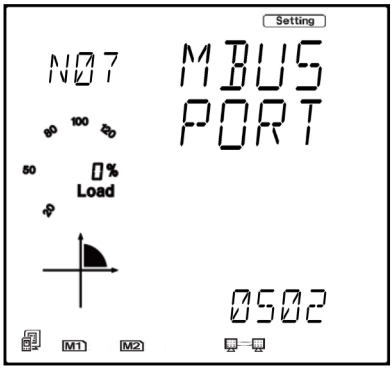
Press 'P' to get to "N05 DNS Primary Server". Press 'V/A' to configure the DNS address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm. The DNS parameters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



Press 'P' to get to "N06 DNS Secondary 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.

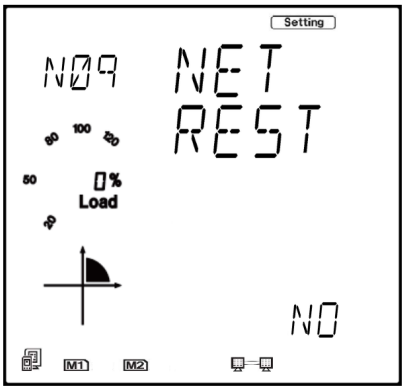


Press 'P' to get to "N07 Modbus Port". Press 'V/A' to configure the Modbus Port. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm.

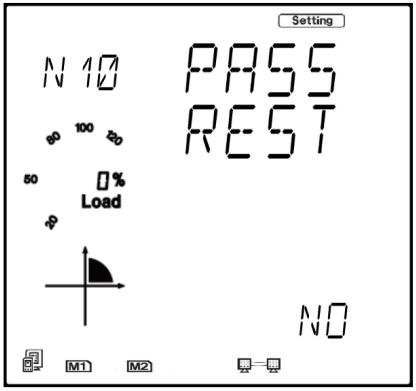


Press 'P' to get to "N08 HTTP Port". Press 'V/A' to configure the HTTP Port. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm.

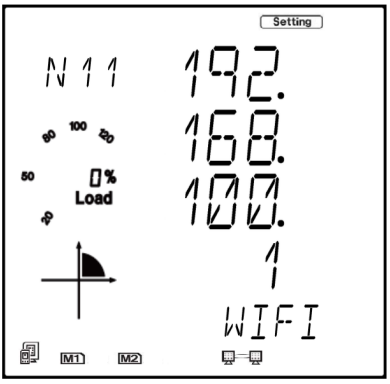
Press 'P' to get to "N09 NET REST". After making any changes to the NET settings, users must reboot the Ethernet module from this page for the settings to take effect. Press 'V/A' to reboot the module, the cursor will begin to flash. Press the 'P' or 'E' button to change the setting to 'Reset' and press 'V/A' to confirm. The cursor will return to 'No' once the module has successfully reset.



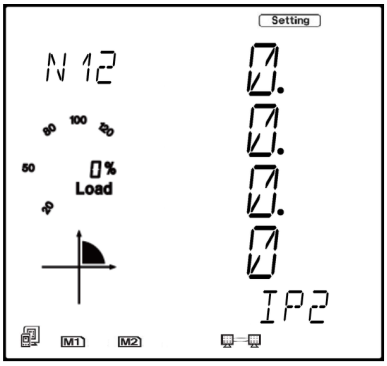
Press 'P' to get to "N10 PASSREST". Press 'V/A' to configure the password reset. The cursor of the first digit will begin to flash. Press the 'P' or 'E' button to change the setting to 'Reset' and press 'V/A' to confirm. The cursor will return to 'No' once successful.



Press 'P' to get to "N11 WiFi" This is the IP address of WiFi and will be the IP address to access the web interface of the module by using WiFi connection. This IP address cannot be modified from the meters display, it can only be configured on the meters web server.



Press 'P' to get to 'N12 IP2'. This is the IP address for Ethernet port 2, it is preset as dynamic DHCP. A new IP address will be assigned to it when it is connected to the internet via Ethernet port 2.



5.1.5.1 Cable

An RJ45 cable is needed to connect the meter to the network.

A shielded twisted pair cable(standard 568A or standard 568B) is recommended as reference to the EIA/TIA standard.

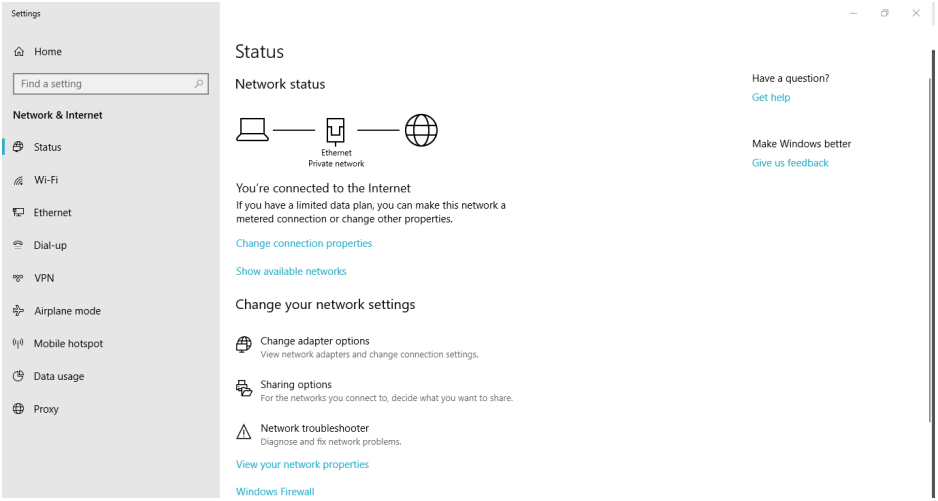
5.1.6 Connection Method

5.1.6.1 Direct Connect to a Computer

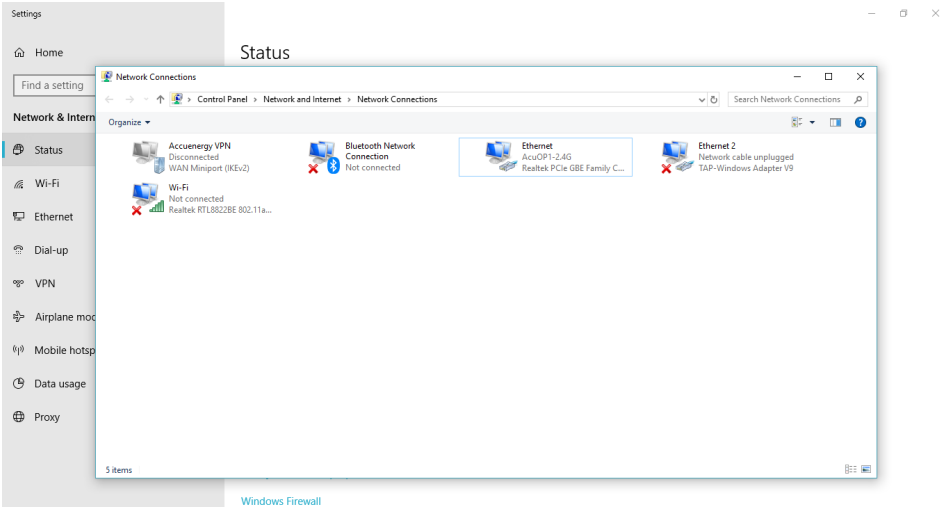
The AXM-WEB2 can be connected to a computer using a crossover cable(standard 568A). The AXM-WEB2 module supports Modbus-TCP and HTTPS Functions for this method of connection.

To connect meter directly to the computer, the computers IP must be within the same subnet as the meters IP address. The following steps outline how to change the computers IP using a computer running the Windows OS:

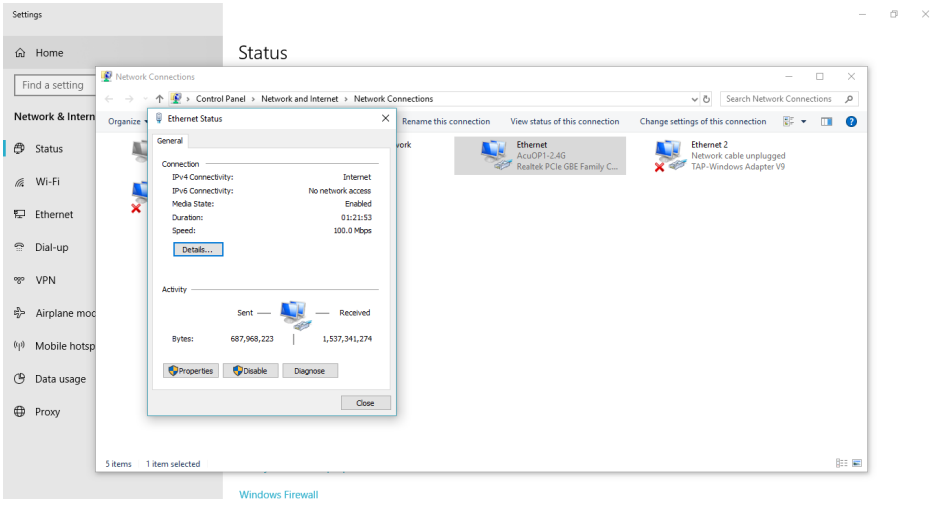
- Manually connect the meter via Ethernet cable to the computer
- Right click on the connection icon
- Select "Open Network Sharing Center"



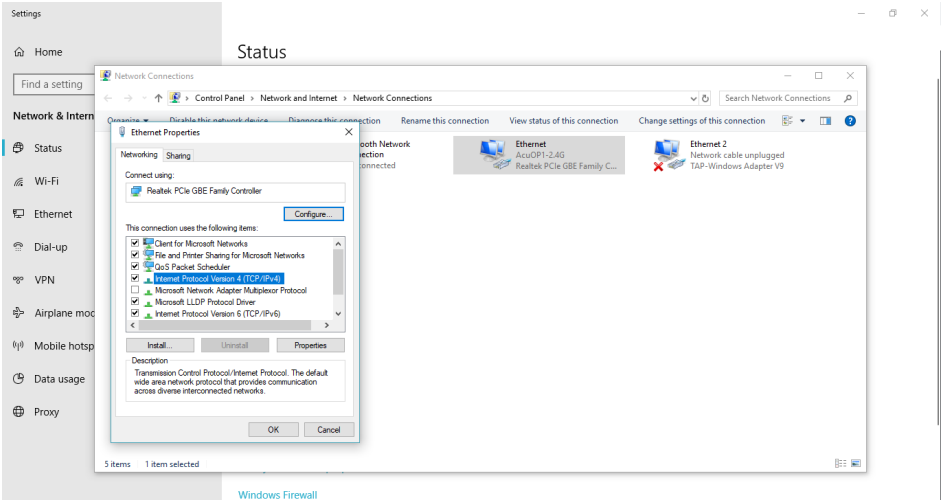
- Click on Change adapter options



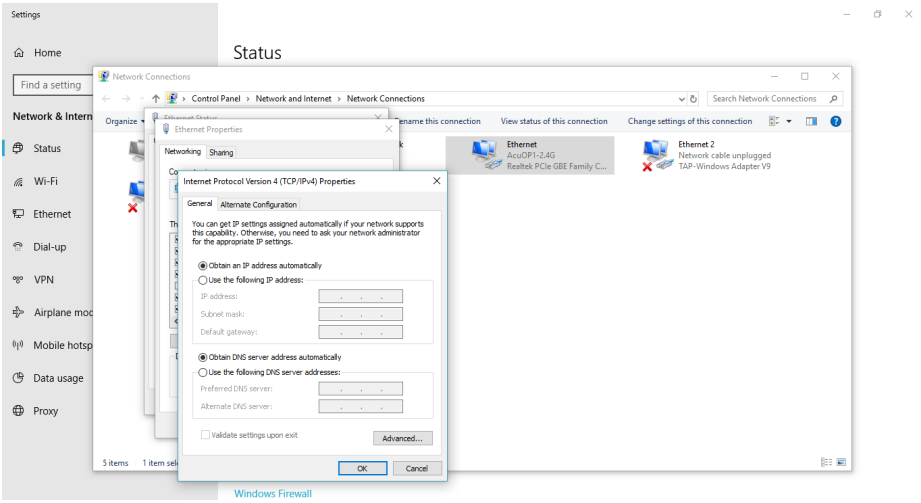
- Once there, right click on the local area connection icon and select properties.



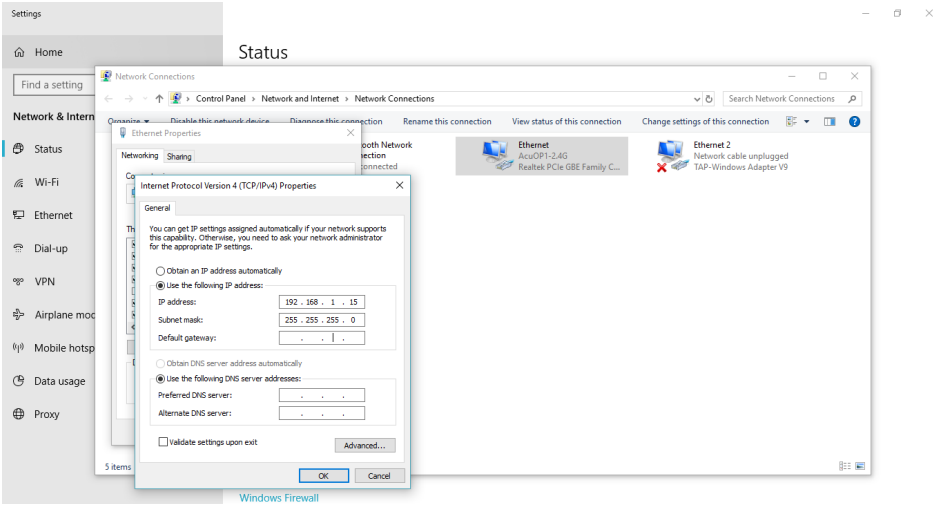
- Select the icon that says Internet Protocol Version 4 TCP/IP



- The Internet Protocol Version 4(TCP/IP) Properties box will pop up



- Click on ''Use the following IP address'' and enter in an IP number so that meter and computer are in the same local network range. For example, if the meter has IP address of 192.168.1.254, then the computer must be assigned with an IP 192.168.1.xxx, where xxx can be any number but cannot be the same as the value the meter has.



- Once you have entered in the IP address, press the Tab key on your keyboard until you hit the bottom and click OK

- Before selecting the OK button make note of the IP address you have assigned to the meter and then press OK.

NOTE: The meter and computer cannot have the same IP address, they must be different.

5.1.6.2 Direct Connect to a Router/Switch

The AXM-WEB2 can be connected to a router or switch using a patch cable. The DHCP can be configured to Auto to have the router assign the meter with an IP address or the DHCP can be configured to Manual to set an IP address and network settings manually.

AXM-WEB 2 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.

5.1.6.3 Connect through WiFi

The AXM-WEB2 can be connected through WiFi network.

By default the AXM-WEB2 will be in Access Point mode with default IP address of 192.168.100.1. Ensure the device connecting to the AXM-WEB2 has DHCP enabled or it should be in the same subnet as the AXM-WEB2. The module will appear in the WiFi network as AXM-WEB2-WIFI-(serial number of module) as the SSID or name of the wireless network. By default, the network key or password will be ''accuenergy''.

- Once connected to the network, open an internet browser and type in the IP address of the WIFI module: ***192.168.100.1***
- Log in at Admin access level, using the default password of ***'admin'***.

5.1.6.4 Description of Modbus-TCP Protocol

The Modbus-TCP protocol is used as one of the communication protocols in the AXM-WEB2. The protocol establishes a master and slave connection in Ethernet. The master device(client) first sets up a TCP-IP link with slave device(server). The master device then sends a request to the slave device and the slave device in return sends a response to the master device. Figure below shows how the Modbus-TCP protocol works.

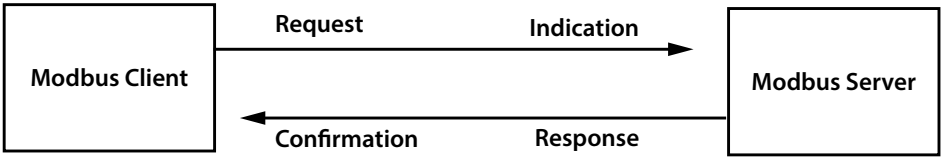
5.1.6.4.1 Protocol

a. Data Frame Format

MBAP Header	Function	Data
7x8 bits	8-bits	Nx8 bits

b. Modbus Application Header (MBA Header) Field

Modbus application header field is the start of the data frame, and consists of seven bytes.



Field	Length	Description
Transaction Identifier	2 Bytes	Identification of a Modbus Request/Response transaction
Protocol Identifier	2 Bytes	Modbus Protocol = 0
Length	2 Bytes	Number of following bytes
Unit Identifier	1 Byte	Slave address, in the range of 0-247 decimal

c. Function Field

The function code field of a message frame contains eight bits. Valid codes are in the range of 1-255. When a message is sent from a client to a server device, the function code field tells the server what kinds of action to perform.

Code	Meaning	Data
01	Read Relay Output Status	Obtain current status of Relay Output
02	Read Digital Input (DI) Status	Obtain current status of Digital Input
03	Read Data	Obtain current binary value in one or more registers
05	Control Single Relay Output	Force Relay to a state of ON or OFF
16	Write Multiple Registers	Place specific value into a series of consecutive multiple registers

d. Data Field

The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF. The data field of messages sent from a master to slave contains additional information which the slave must use to take the action defined by the function code. This can include information such as the register addresses, the quantity of registers to query and the count of the actual number of data bytes. For example, if the master requests a slave to read a group of holding registers(function code 03), the data field specifies the starting register and how many registers are to be read.

If the master needs to write data(function code 10 hexadecimal) to a group of registers in the slave, the data field specifies the starting register, how many registers to write, the count of data bytes to follow in the data field and the data to be written into the registers.

5.1.6.4.2 Format of Communication

Explanation of frame

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	06H	01H

Function Code	Data start register hi	Data start register lo	Data # of registers hi	Data # of registers lo
03H	40H	00H	00H	48H

The meaning of each abbreviated field above is:

Transaction identifier hi: High byte of transaction identifier

Transaction identifier lo: Low byte of transaction identifier

Protocol identifier hi: High byte of protocol identifier

Protocol identifier low: Low byte of protocol identifier

Length hi: High byte of length

Length lo: Low byte of length

Unit identifier: Slave address

Fun: Function code

Data start register hi: High byte of starting register address

Data start register lo: Low byte of starting register address

Data #of registers hi: High byte of number of registers

Data #of registers lo: Low byte of number of registers

1) Read Status of Relay (Function code 01)

Function Code 1

This function code is used to read the relay output status in the KW320 series meter.

1=On 0=Off

There are 8 relay outputs in the KW320 series meter and they start at address 0000H.

The following query is to read 2 relay output status of the KW320 series address 1.

Query

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	06H	01H

Fun	Data start register hi	Data start register lo	Data # of registers hi	Data # of registers lo
01H	00H	00H	00H	02H

Response

The KW320 series meter responds back with the MBAP header, function code, quantity of data bytes and the data.

An example of response to read the status of the first 2 relay outputs starting at 0000H is shown below. The status of relay output 1 and 2 is corresponds to the last 2 bits of data.

Relay 1: bit0 Relay 2: bit1

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	04H	01H

Fun	Byte count	Data
01H	01H	02H

The content of the data is,

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	0

MSB LSB

(Relay 1 = OFF, Relay 2 = ON)

2) Read Status of DI (Function Code 02)

Function Code 2

1=On 0=Off

There are 28 DIs in the KW320 series meter starting at address 0000H.

The following query is to read 4 DI statuses of AXM-IO1 module with logic address of 1 in the KW320 series meter.

Query

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	06H	01H

Fun	Data start register hi	Data start register lo	Data # of registers hi	Data # of registers lo
02H	00H	00H	00H	04H

Response

The response includes the MBAP header, function code, quantity of data characters and the data.

An example response from the meter to read the status of 4 DIs(DI1-On, DI2=On, DI3=On, DI4=On) is shown below. The status of each corresponds to the last 4 bits of the data.

DI1: bit0 DI2: bit1 DI3: bit2 DI4: bit3

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	04H	01H

Fun	Byte count	Data
02H	01H	0FH

The content of the data is,

7	6	5	4	3	2	1	0
0	0	0	0	1	1	1	1

MSB LSB

3) Read Data (Function Code 03)

Function Code 3

Query

This function allows the user to obtain the measurement results of the KW320 series meter.

Below is an example to read 6 registers corresponding to the device clock of the meter, starting at 1040H.

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	06H	01H

Fun	Data start reg hi	Data start reg lo	Data #of reg hi	Data #of reg lo
03H	10H	40H	00H	06H

An example response is provided to read the time (2006-12-18 14:15:20).

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	0FH	01H

Fun	Byte count	Data1 hi	Data1 lo	Data2 hi	Data2 lo	Data3 hi	Data3 lo	Data4 hi	Data4 lo	Data5 hi	Data5 lo	Data6 hi	Data6 lo
03H	0CH	07H	D6H	00H	0CH	00H	12H	00H	0EH	00H	0FH	00H	14H

4) Control Relay (Function Code05)

Function Code 5

Query

This function code enables the control of a single relay output in the KW320 series meter. Any relay output in the KW320 series meter can be controlled on or off starting at 0000H.

Sending the data 'FF00H' will set they relay output on and sending '0000H' will turn it off; all other values are illegal and will not affect they relay output status.

The example below is a request to a KW320 series meter to turn on relay output 1.

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	06H	01H

Fun	Data start reg hi	Data start reg lo	Data #of reg hi	Data #of reg lo
05H	00H	00H	FFH	00H

Response

The normal response to the command request is to retransmit the message as received after the relay output status has been altered.

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	06H	01H

Fun	Data start reg hi	Data start reg lo	Value hi	Value lo
05H	00H	00H	FFH	00H

5) Preset/Reset Multi-Register (Function Code 16)

Function Code 16

Query

This function code allows the user to modify the contents of a register. The example below is a request to an KW320 series meter with device address 1 to preset the CT1(500) and CT2(5) registers. The CT1 data address is 1008H and CT2 is at 1009H.

Transaction identifier hi	Transaction identifier lo	Protocol identifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	0BH	01H

Fun	Data start reg hi	Data start reg lo	Data #of reg hi	Data #of reg lo	Byte count	Value1 hi	Value1 lo	Value2 hi	Value2 lo
10H	10H	08H	00H	02H	04H	01H	F4H	00H	05H

Response

The normal response to a preset Multi-Register request including the MBAP Header, function code, data start register and the number of registers is shown below.

Transaction identifier hi	Transaction identifier lo	Protoco-lidentifier hi	Protocol identifier lo	Length hi	Length lo	Unit identifier
00H	00H	00H	00H	00H	06H	01H

Fun	Data start reg hi	Data start reg lo	Data #of reg hi	Data #of reg lo
10H	10H	08H	00H	02H

5.1.7 Web Interface Readings and Parameter Settings

The AXM-WEB2 module supports the HTTPS protocol to allow for the use of a web interface. The user will need to access the AXM-WEB2 web interface to configure the module and use its functions. The web interface allows for remote initial setup of the KW320 meter.

The AXM-WEB2 web interface allows for different user access levels.

To access the web interface the IP address for the WEB2 either Ethernet 1, Ethernet 2 or a WiFi IP address must be known.

5.1.7.1 User Access Login

Enter the correct IP address of the module in the search bar of the internet browser to access the web interface of the AXM-WEB2

The user will be redirected to a web page prompting to select the Access Level and enter appropriate password for that level.

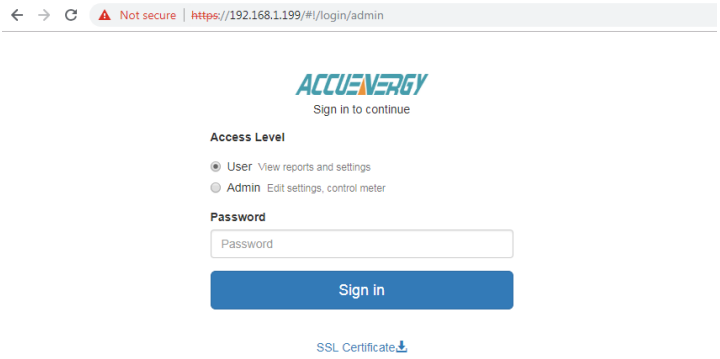
The ***User*** level is ideal for users who need only to take readings and view status from the meter.

The default password for the User level is ***view***.

It is recommended that no more than 5 users are logged in at the same time for this level to ensure optimal performance of web interface.

The ***Admin*** level is ideal for users who need access to configurations on the meter or the web interface and to view readings.

The default password for the Admin level is ***admin***.



The two different access levels are summarized below:

Access Level	Default Password	Read Parameter/Status	Configure Settings
User	view	Yes	No
Admin	admin	Yes	Yes

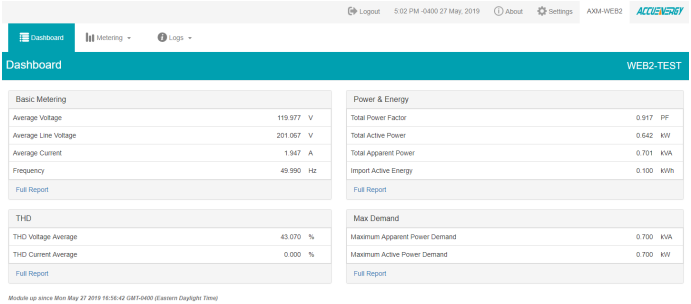
5.1.7.2 Dashboard

In the dashboard, the user will find the tabs to access different pages in the web interface such as '***Metering***', '***Logs***', and '***Settings***'. The dashboard is the first page the user will see once they have entered the correct password for the appropriate access level and is the same for both access levels.

The dashboard displays selected parameters from the different groups of metering parameters such as '***Basic Metering***', '***Power & Energy***', '***THD***' and '***Max Demand***'. By clicking on "Full report" under any one of these four metering parameter groups the user will be redirected to the web page which contains all the parameters supported by that metering parameter group.

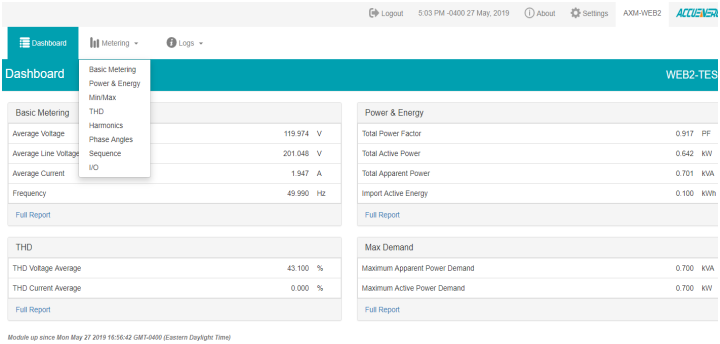
The dashboard also displays how long the AXM-WEB2 module has been connected to the network since the last reboot of the module in the bottom left corner of the page.

The parameters on this page are updated every 5 sec.



5.1.7.3 Metering web page

Click on the 'Metering' tab to visit the metering data web pages. There are eight kinds of metering parameter web pages. They are "Basic Metering", "Power & Energy", "Min/Max", 'THD', 'Harmonics', "Phase Angles", ''Sequence'' and ''I/O''. Each web page shows data from the KW320 series meter.

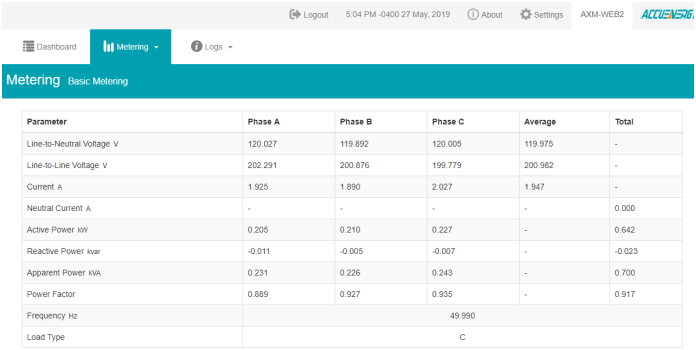


5.1.7.3.1 Basic Metering

The Basic Metering webpage includes the data of real-time parameters for the KW320 series meter. This includes the Line Voltages, Phase Voltages, Current, Neutral Current, Active, Reactive and Apparent Power, Power Factor, Frequency and Load type.

The parameters on this page are updated every 1 sec.

The values displayed in this webpage will depend on the wiring configuration mode of the meter. For example, if the meter is configured as '2LL' or '3LL' then the metering webpage will not display the phase readings, only the total values will be shown.



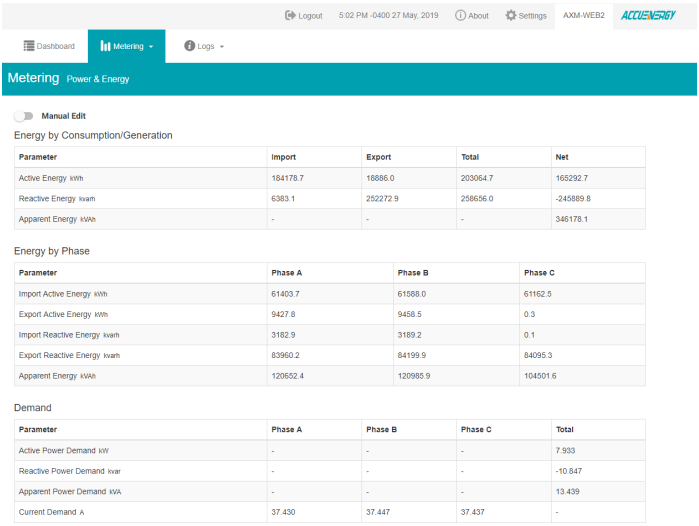
Parameter	Phase A	Phase B	Phase C	Average	Total
Line-to-Neutral Voltage V	120.027	119.892	120.005	119.975	-
Line-to-Line Voltage V	202.291	200.876	199.779	200.982	-
Current A	1.925	1.890	2.027	1.947	-
Neutral Current A	-	-	-	-	0.000
Active Power kW	0.205	0.210	0.227	-	0.642
Reactive Power kvar	-0.011	-0.005	-0.007	-	-0.023
Apparent Power kVA	0.231	0.226	0.243	-	0.700
Power Factor	0.889	0.927	0.935	-	0.917
Frequency Hz	49.990				
Load Type	C				

5.1.7.3.2 Power & Energy

The Power & Energy webpage shows the energy data for the KW320 series meter such as the Active and Reactive energy that is consumed and delivered as well as the Apparent energy per phase and total.

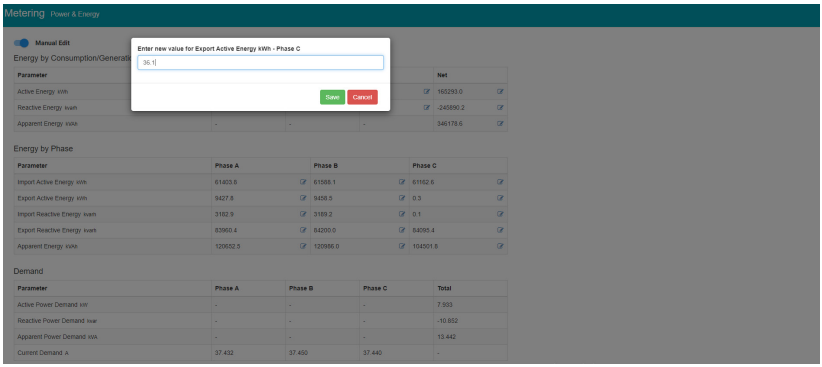
This webpage also shows the Demand parameters for the Active, Reactive and Apparent Power as well as the three phase Current demands.

The parameters in this webpage are updated every 5 sec.



From the Power & Energy page user have the option to edit and write new Energy values. Simply click on the 'Manual Edit' button to edit the energy values.

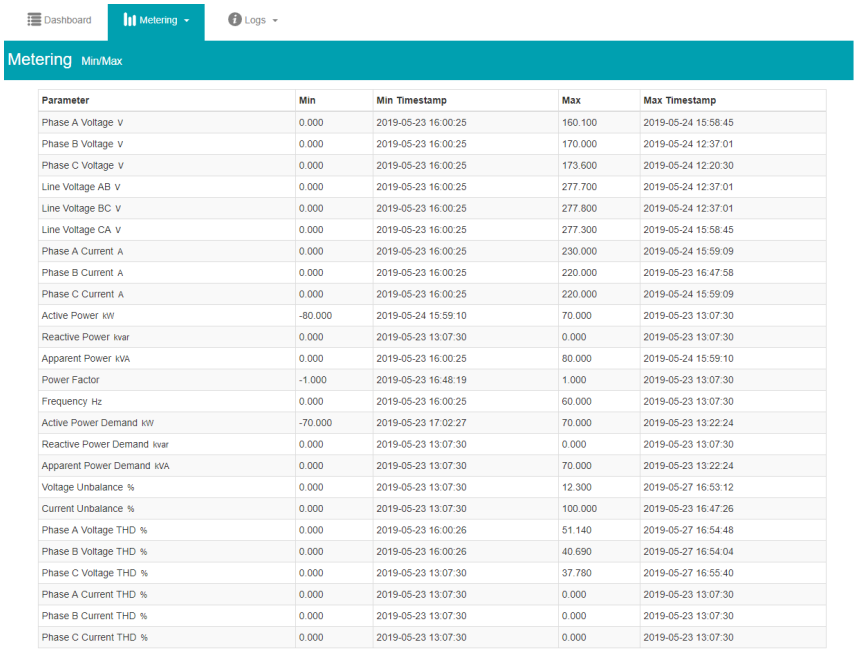
This will be useful for users who want to start and monitor energy accumulation at a certain kilowatt hour reading. All energy parameters including individual phase, total, import, export, and net for the real, reactive and apparent energies support this feature.



5.1.7.3.3 Min/Max

The Min/Max page shows the maximum and minimum statistics that the meter has records since the life time of the meter or from the last reset of the min/max statistics as well as the timestamps they were recorded at.

The parameters in this web page are updated every 10 sec.

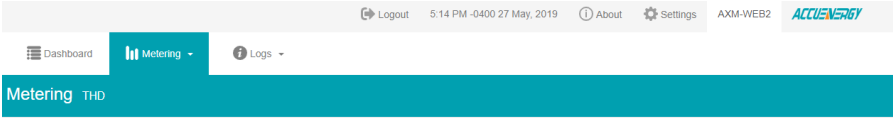


Parameter	Min	Min Timestamp	Max	Max Timestamp
Phase A Voltage V	0.000	2019-05-23 16:00:25	160.100	2019-05-24 15:58:45
Phase B Voltage V	0.000	2019-05-23 16:00:25	170.000	2019-05-24 12:37:01
Phase C Voltage V	0.000	2019-05-23 16:00:25	173.600	2019-05-24 12:20:30
Line Voltage AB V	0.000	2019-05-23 16:00:25	277.700	2019-05-24 12:37:01
Line Voltage BC V	0.000	2019-05-23 16:00:25	277.800	2019-05-24 12:37:01
Line Voltage CA V	0.000	2019-05-23 16:00:25	277.300	2019-05-24 15:58:45
Phase A Current A	0.000	2019-05-23 16:00:25	230.000	2019-05-24 15:59:09
Phase B Current A	0.000	2019-05-23 16:00:25	220.000	2019-05-23 16:47:58
Phase C Current A	0.000	2019-05-23 16:00:25	220.000	2019-05-24 15:59:09
Active Power kW	-80.000	2019-05-24 15:59:10	70.000	2019-05-23 13:07:30
Reactive Power kvar	0.000	2019-05-23 13:07:30	0.000	2019-05-23 13:07:30
Apparent Power kVA	0.000	2019-05-23 16:00:25	80.000	2019-05-24 15:59:10
Power Factor	-1.000	2019-05-23 16:48:19	1.000	2019-05-23 13:07:30
Frequency Hz	0.000	2019-05-23 16:00:25	60.000	2019-05-23 13:07:30
Active Power Demand kW	-70.000	2019-05-23 17:02:27	70.000	2019-05-23 13:22:24
Reactive Power Demand kvar	0.000	2019-05-23 13:07:30	0.000	2019-05-23 13:07:30
Apparent Power Demand kVA	0.000	2019-05-23 13:07:30	70.000	2019-05-23 13:22:24
Voltage Unbalance %	0.000	2019-05-23 13:07:30	12.300	2019-05-27 16:53:12
Current Unbalance %	0.000	2019-05-23 13:07:30	100.000	2019-05-23 16:47:26
Phase A Voltage THD %	0.000	2019-05-23 16:00:26	51.140	2019-05-27 16:54:48
Phase B Voltage THD %	0.000	2019-05-23 16:00:26	40.690	2019-05-27 16:54:04
Phase C Voltage THD %	0.000	2019-05-23 13:07:30	37.780	2019-05-27 16:55:40
Phase A Current THD %	0.000	2019-05-23 13:07:30	0.000	2019-05-23 13:07:30
Phase B Current THD %	0.000	2019-05-23 13:07:30	0.000	2019-05-23 13:07:30
Phase C Current THD %	0.000	2019-05-23 13:07:30	0.000	2019-05-23 13:07:30

5.1.7.3.4 THD

The THD web page shows the power quality data such as the THD, THFF, Crest and K Factor for both the voltage and current.

The parameters in this web page are updated every 15 sec.

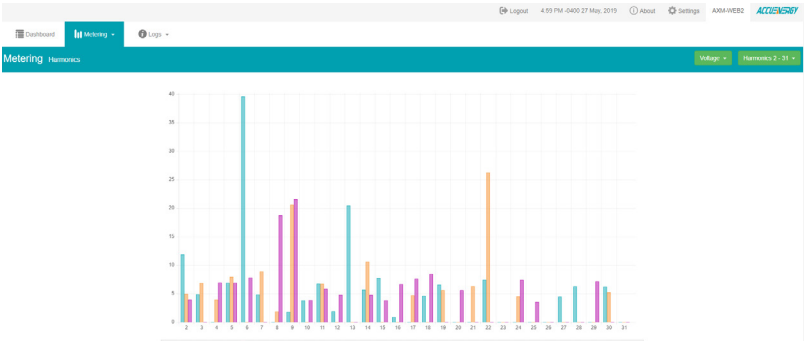


Parameter	Phase A	Phase B	Phase C
THD Voltage %	50.960	40.580	37.690
THD Current %	0.000	0.000	0.000
THD Odd Line Voltage %	26.090	27.480	26.150
THD Even Line Voltage %	43.780	29.870	27.150
Crest Factor Line Voltage	3.570	3.179	3.325
THFF Line Voltage %	27.820	43.690	26.010
THD Odd Current %	0.000	0.000	0.000
THD Even Current %	0.000	0.000	0.000
K Factor Current	0.000	0.000	0.000

5.1.7.3.5 Harmonics

The Harmonics web page will show the harmonics of the voltage and the current waveform being measured. It will display the harmonics of each phase in graphical and tabular format. Select between voltage and current to view their respective harmonics as well as between 2nd - 31st harmonics or 32nd - 63rd from the drop down list.

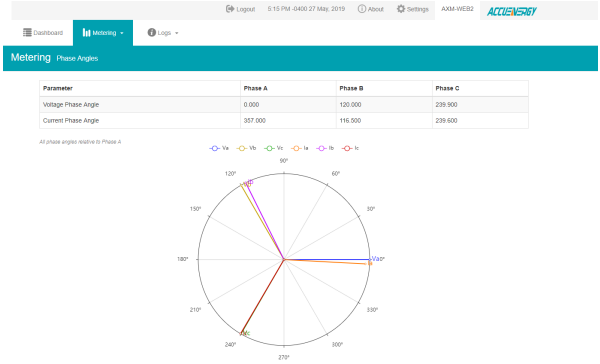
The parameters in this web page are updated every 15 sec.



5.1.7.3.6 Phase Angles

The Phase Angles web page will show the phase angles of the voltage and current waveform being measured which can be used for remote troubleshooting. This page provides a visual diagram of the phase angles with respect to the voltage connected to the Phase A voltage input.

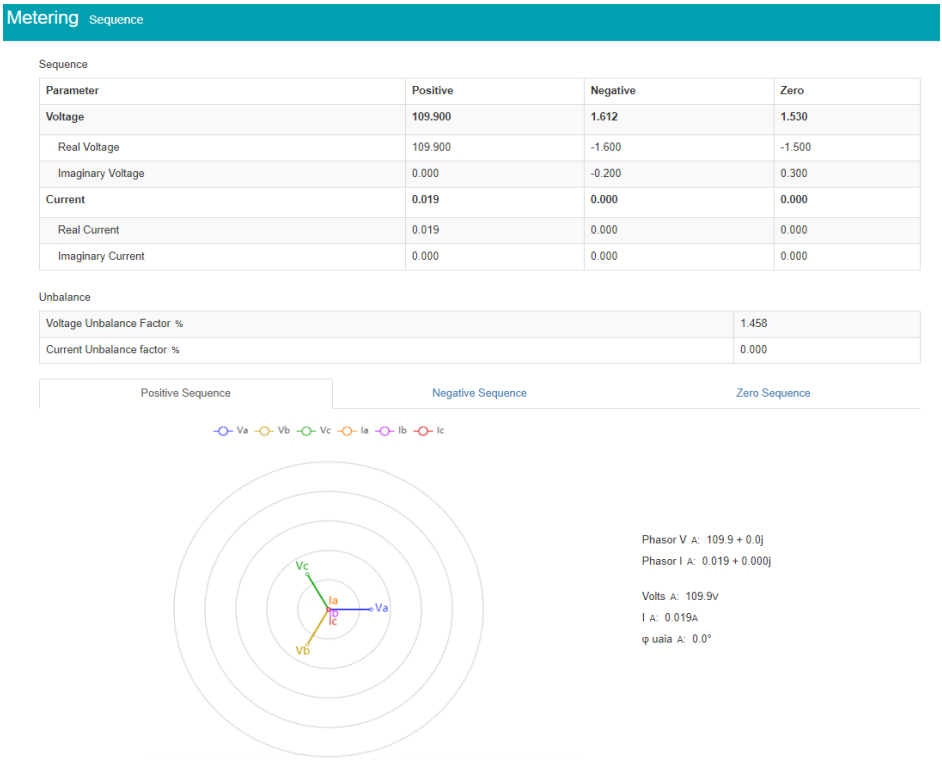
The parameters in this web page are updated every 10 sec.



5.1.7.3.7 Sequence

The Sequence web page will show the positive, negative and zero components of the voltage and current waveform being measured.

The parameters in this web page are updated every 10 sec.



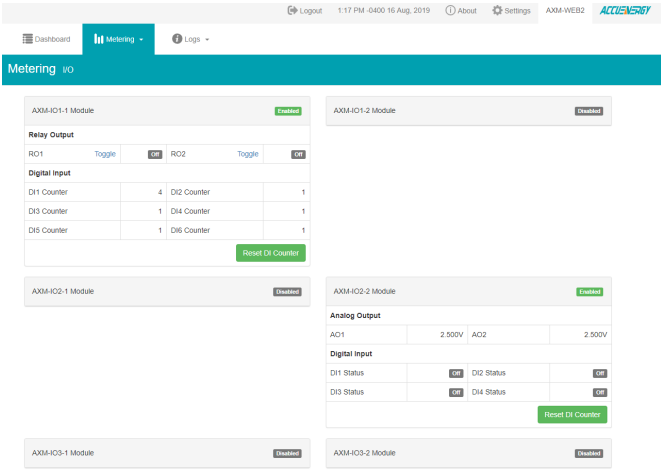
5.1.7.3.8 I/O

The I/O web page displays the status of the I/O modules that are connected and their values depending on the model of the module that is connected to the meter. I.E. The AXM-IO11 module will display the Relay Output status(on/off), DI status/counter. The I/O module can be configured in the general settings section of the web interface which is discussed later in the manual.

The parameters in this web page are updated every 5 sec.

From the IO readings page, users can perform the following functions depending on the IO module being used:

IO Module	Functions
AXM-IO1-1/2	• Read Digital Input Status or Digital Input Count value depending on the mode configured (Channels 1-6) • Read the Relay Output Channel 1 and 2 Status ON/OFF • Toggle Relay Output Channels 1 and 2 ON/OFF ***NOTE:*** Relay must be configured for Control Mode for toggle function to work • Reset DI Counter back to 0 (Counters 1-6)
AXM-IO2-1/2	• Read Digital Input Status or Digital Input Count value depending on the mode configured (Channels 1-4) • Read value of the Analog Output Channels 1 and 2, either 4-20mA, 0-20mA, 0-5V, 1-5V signals • Reset DI Counter back to 0 (counters (1-4)
AXM-IO3-1/2	• Read Digital Input Status or Digital Input Count value depending on the mode configured (Channels 1-4) • Read the Relay Output Channel 1 and 2 Status ON/OFF • Toggle Relay Output Channels 1 and 2 ON/OFF ***NOTE*:** Relay must be configured for Control Mode for toggle function to work • Read Analog Input Channels 1 and 2, either 4-20mA, 0-20mA, 0-5V, 1-5V signals • Reset DI Counter back to 0 (Counters 1-4)

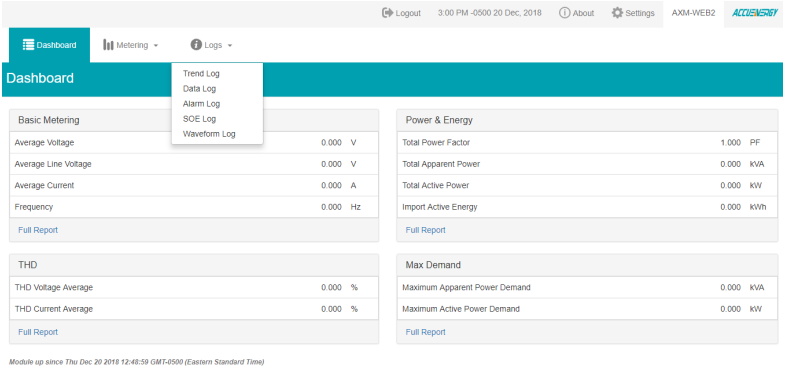


5.1.7.4 Logs

Click on the 'Logs' tab to visit the metering logs web pages.

There are six kinds of logs that can be viewed, they are "Trend Log", "Trendlog Management", "Data Log", "Alarm Log", "SOE Log" Event Log and "Waveform Log"(Only available in KW320W model).

Each web page shows data from the KW320 series meter.



5.1.7.4.1 Trendlog

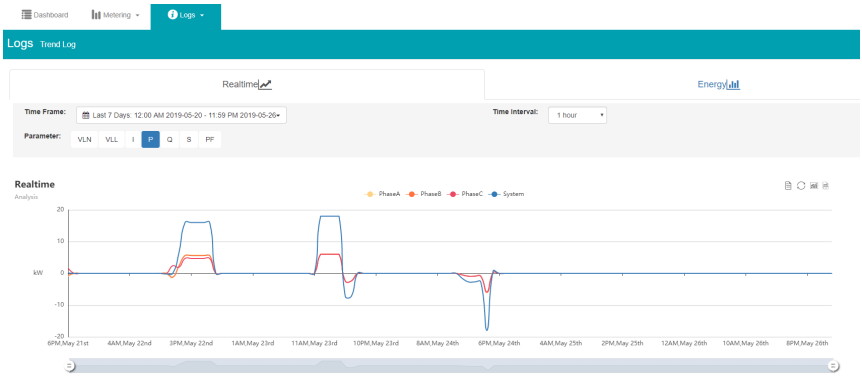
The Trend Log web page includes the real-time and energy trend diagram. The real-time trend log diagram can be selected to show the following parameters phase voltage, line voltage, current, active power, reactive power, apparent power and power factor for each phase as well as the totals. The energy trend log shows the imported and exported active energy, reactive energy, total energy, net energy and apparent energy.

The data of the trend log can be previewed and downloaded as a .csv file by clicking the **'Data Review'** and **'Data'** icons on the right top side of the diagram. The trend log diagram can also be saved as an image by clicking the **'Image'** icon.

5.1.7.4.1.1 Realtime

The real time parameters can be trended at different time intervals depending on the Time Frame selected. Listed below are the time intervals for each possible time frame setting:

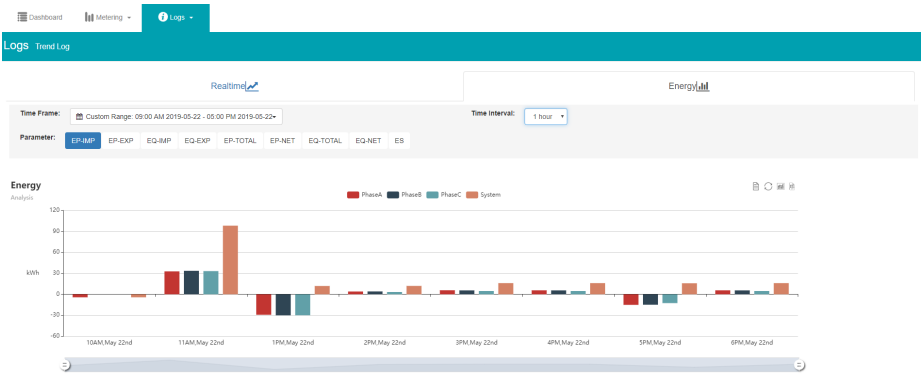
Time Frame	Time Intervals
Last 10 minutes	1 second 15 seconds 1 minute
Last 1 hour	1 minute
Today	15 minutes 1 hour
Yesterday	15 minutes 1 hours
Last 7 days	15 minutes 1 hour 1 day
Last 30 days	1 hour 1 day
Last Month	1 hour 1 day
Custom Range	Dependent on range specified



5.1.7.4.1.2 Energy

Similarly the energy parameters can be trended at different time intervals depending on the Time Frame selected. The table below displays the time intervals:

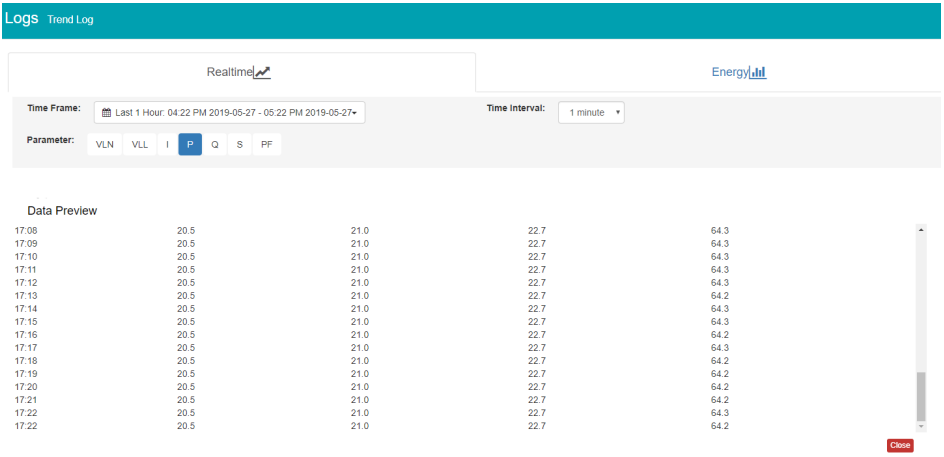
Time Frame	Time Intervals
Last 10 minutes	1 second 15 seconds 1 minute
Last 1 hour	1 minute
Today	15 minutes 1 hour
Yesterday	15 minutes 1 hours
Last 7 days	15 minutes 1 hour 1 day
Last 30 days	1 hour 1 day
Last Month	1 hour 1 day
Custom Range	Dependent on range specified



5.1.7.4.1.3 Data Preview

The data preview allows the user to view the graphical data in tabular form.

User can also download this data into a csv file for further examination.



5.1.7.4.2 Trendlog Management

The trendlog management page allows the user to download data from the meters data base. The trendlog management page acts as a back up to the data logs for users.

Log Param Type: Users can select which data they want to download from the meter. In the drop down menu there is a timestamp range to show the available data.

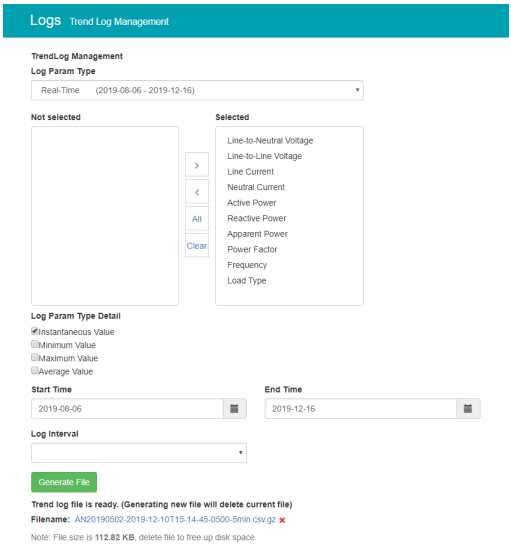
NOTE: *Energy data will remain in meter data base for up to 3 years, whereas all other metering data will remain in the meter data base for up to 1 month before overriding.*

Log Param Type Detail: This setting allows users to modify what values they see in the data log. Users can select the following parameter details:

- Instantaneous
- Minimum
- Maximum
- Average

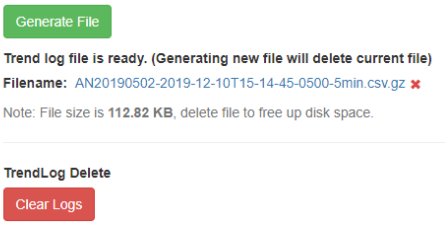
Only the 'Real-time' and 'Demand' parameters support the minimum, maximum and average parameter type details. All other parameter types such as Energy, Power Quality, and IO only support the instantaneous values displayed in the the data log.

The log file will be downloaded as a .gz file and will need to be unzipped in order to view the csv file.

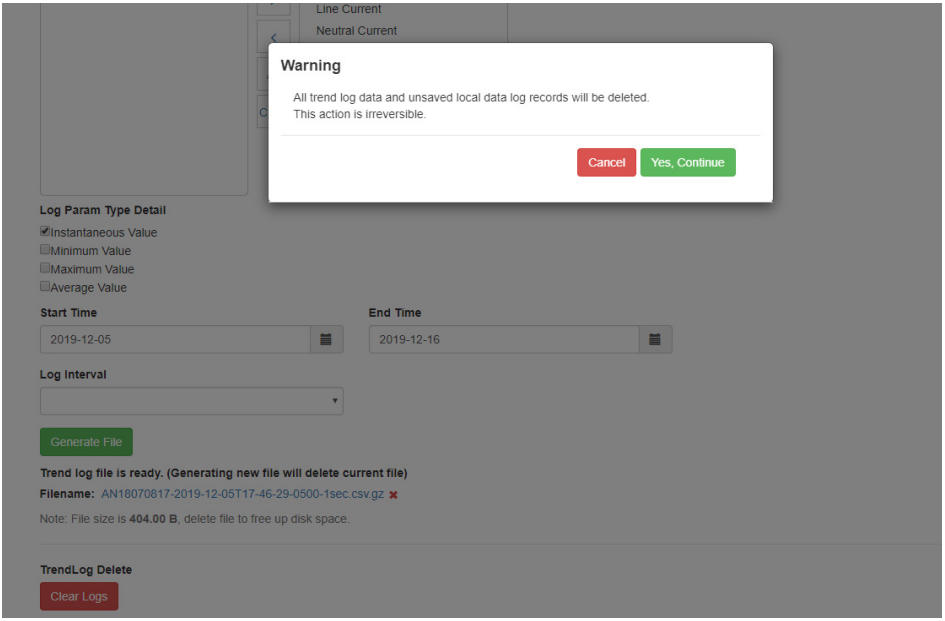


5.1.7.4.2.1 Clear Logs

The clear logs function allows the user to clear and remove all metering data stored on the module database. This will allow users to clear all readings and historical data without resetting all features and functions. Users can clear the logs by clicking on the button at the bottom of the Trendlog page.



To clear the logs click on "Clear Logs", a warning message is displayed notifying users that this action is irreversible once done.

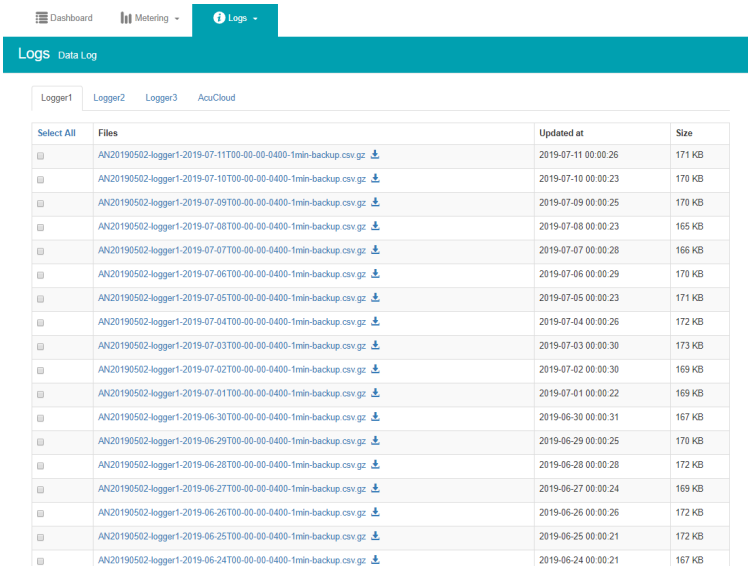


NOTE: *This cannot be undone, once the trend log is cleared all data in meter database is cleared.*

5.1.7.4.3 Data Log

The data log web page includes all the data file for three different loggers and AcuCloud.

You can select the different loggers by clicking the logger tab. After the logger is selected, the log file for this logger will show on the screen with the update time and file size. To download the file, click on the download icon to save the file in the computer. The data log will be saved as a compressed csv file.

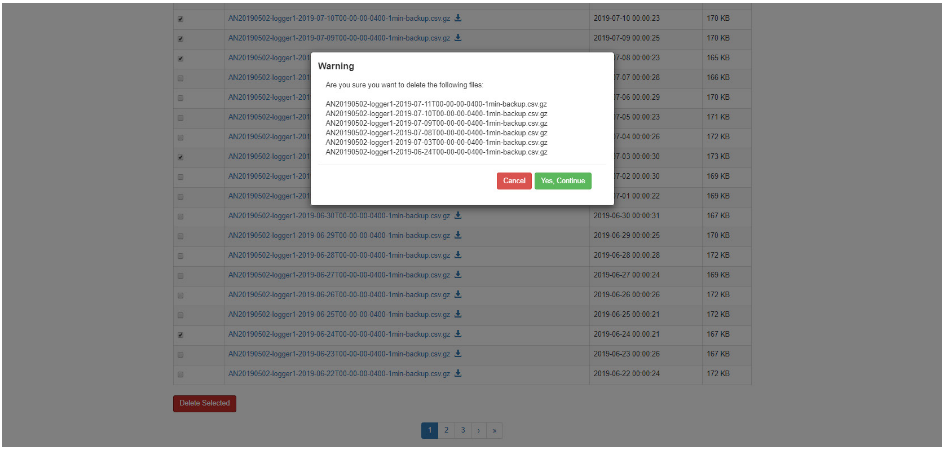


5.1.7.4.3.1 Deleting Data Logs

To delete the data logs users can check the box next to the data log file and click on the 'Delete Selected' button at the bottom of the page.

Users will be prompted by a window asking to confirm the data log delete.

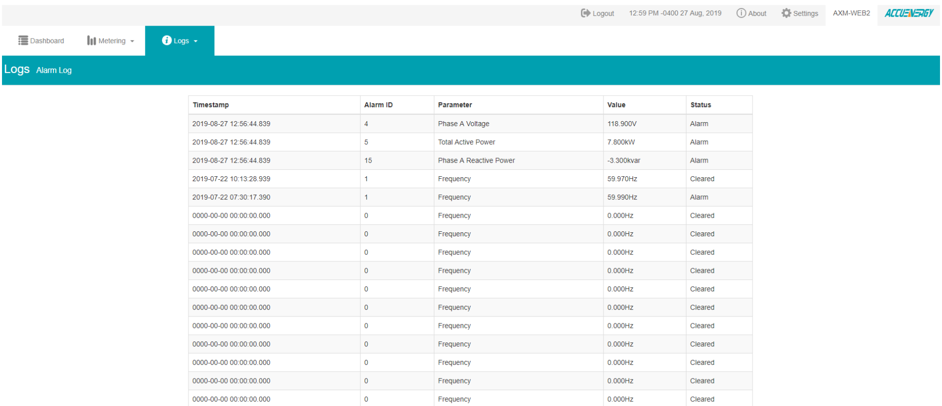
NOTE: *Deleting the data log is permanent, this cannot be undone once deleted.*



5.1.7.4.4 Alarm Log

The Alarm Log web page provides the user with a summary of the alarm events that have occurred with the meter. It will show the status of up to 16 alarm events indicating the alarm ID, status, parameter, value that exceeded or went below the threshold and the timestamp of the alarm event.

Once all 16 alarm events are full, the newest alarm event will then wrap around to alarm 1. The parameters in the alarm status web page are updated every 10 seconds.

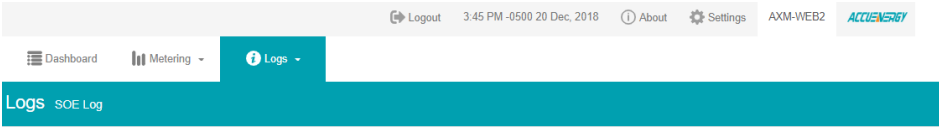


Timestamp	Alarm ID	Parameter	Value	Status
2019-08-27 12:56:44.839	4	Phase A Voltage	118.900V	Alarm
2019-08-27 12:56:44.839	5	Total Active Power	7.800kW	Alarm
2019-08-27 12:56:44.839	15	Phase A Reactive Power	-3.300kvar	Alarm
2019-07-22 10:13:28.939	1	Frequency	59.970Hz	Cleared
2019-07-22 07:30:17.390	1	Frequency	59.990Hz	Alarm
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared
0000-00-00 00:00:00.000	0	Frequency	0.000Hz	Cleared

5.1.7.4.5 SOE Log

The SOE web page will display the Sequence of Event log for the enabled I/O module that is attached to the KW320 series meter with timestamps and will display the DI status for up to 20 SOE events. The SOE must be enabled from the Acuview software.

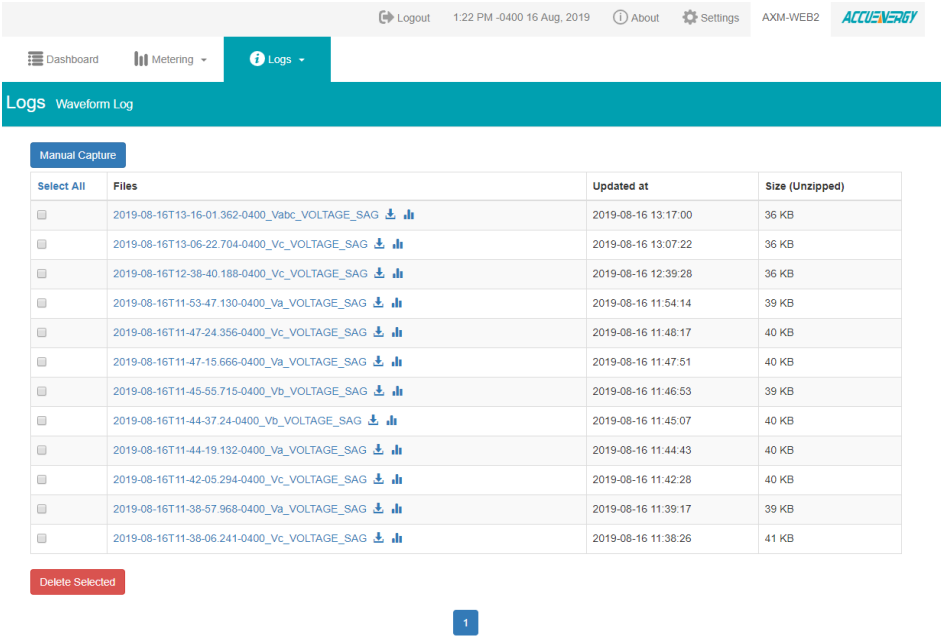
The SOE log parameters are updated every 10 sec.



Group	DI1 Status	DI2 Status	DI3 Status	DI4 Status	DI5 Status	DI6 Status	Timestamp
Group 1	Off	Off	Off	Off	Off	Off	2018-12-19 17:46:28
Group 2	Off	Off	Off	Off	On	Off	2018-12-19 17:46:34
Group 3	Off	Off	Off	Off	Off	Off	2018-12-19 17:46:34
Group 4	Off	Off	On	Off	Off	Off	2018-12-20 08:46:50
Group 5	Off	Off	Off	Off	Off	Off	2018-12-20 08:46:57
Group 6	On	Off	Off	Off	Off	Off	2018-12-20 10:32:41
Group 7	Off	Off	Off	Off	Off	Off	2018-12-20 10:32:41
Group 8	On	Off	Off	Off	Off	Off	2018-12-20 10:32:41
Group 9	Off	Off	Off	Off	Off	Off	2018-12-20 10:32:49
Group 10	On	Off	Off	Off	Off	Off	2018-12-12 13:22:03
Group 11	Off	Off	Off	Off	Off	Off	2018-12-13 08:50:12
Group 12	Off	Off	On	Off	Off	Off	2018-12-13 08:50:22
Group 13	Off	Off	Off	Off	Off	Off	2000-00-00 00:00:00
Group 14	On	Off	Off	Off	Off	Off	2018-12-17 08:53:36
Group 15	Off	Off	Off	Off	Off	Off	2018-12-17 08:53:42
Group 16	On	Off	Off	Off	Off	Off	2018-12-17 15:18:14
Group 17	Off	Off	Off	Off	Off	Off	2018-12-17 15:18:21
Group 18	On	Off	Off	Off	Off	Off	2018-12-19 17:45:17
Group 19	Off	Off	Off	Off	Off	Off	2018-12-19 17:45:26
Group 20	On	Off	Off	Off	Off	Off	2018-12-19 17:46:24

5.1.7.4.6 Waveform Log

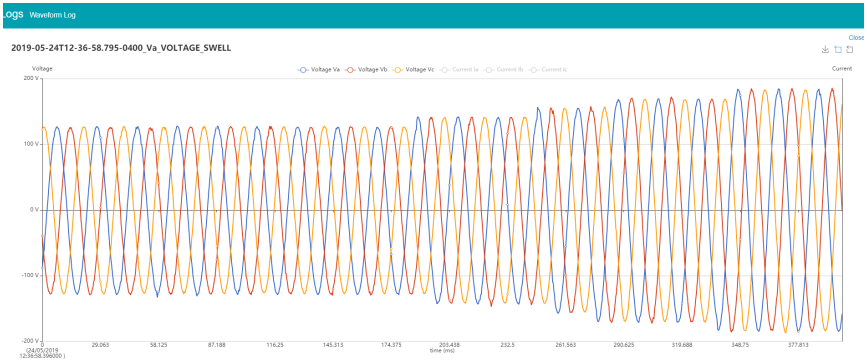
The waveform log is available only on KW320Q models of the KW320 series meter. This meter supports a waveform capture function that allows users to capture and record 10 cycles before and after the triggering point whether it be a voltage sag, swell, or over current. The waveform log on the web interface allows users to view these waveforms whenever a power quality event has occurred. The log displays is a table that includes the waveform files, the time the waveform is updated at, and the size of the file. The waveform file name includes the timestamp when the event occurred as well as the parameter name/event name that triggered the power quality event.



To view the waveform click on the icon. Users can select which voltage or current phase they want to view on the graph during the power quality event.

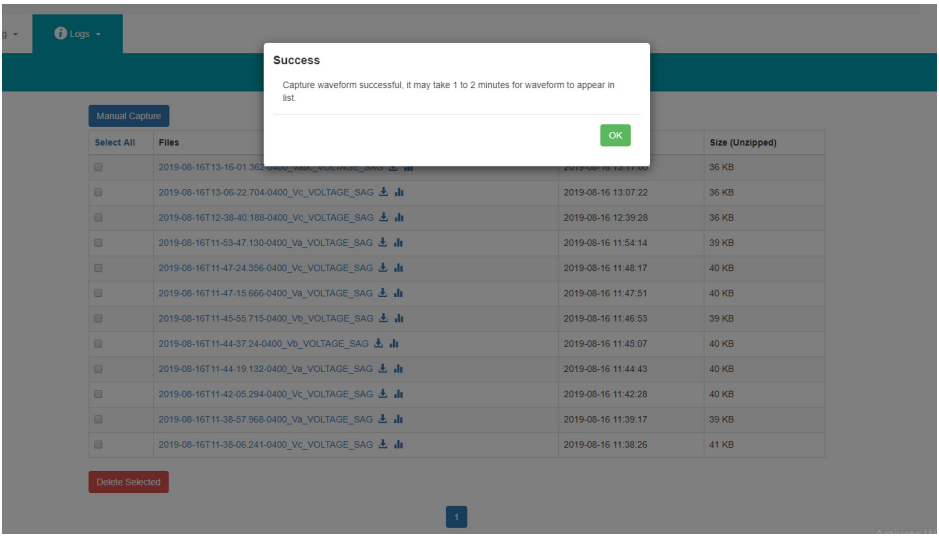
An image of the graph can be downloaded by clicking on the button.

Users can zoom into the graph for further detail by clicking on the . The graph can be reset back by double clicking the button.

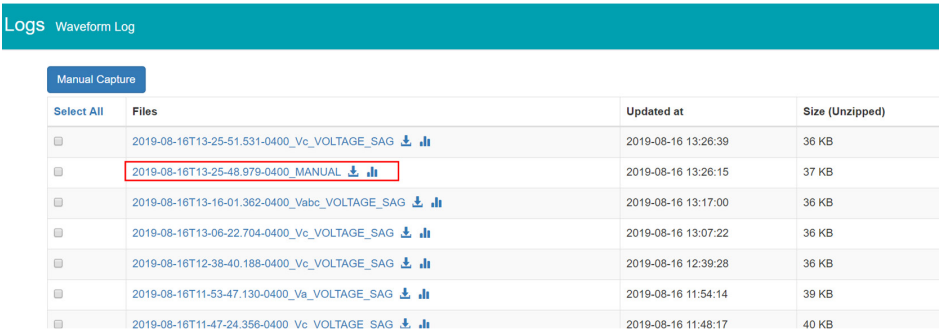


Users can select 'Close' to close the waveform and navigate back to the waveform Log.

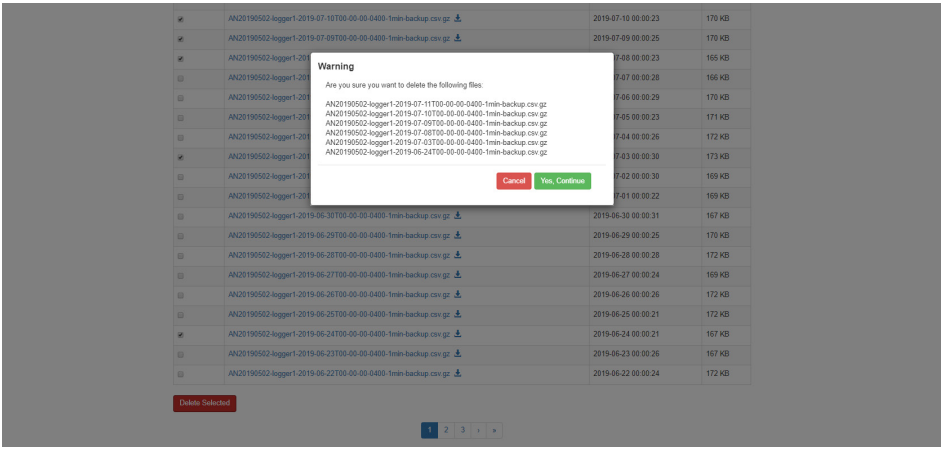
Users can perform a manual waveform capture by clicking on 'Manual Capture'. This will manually capture voltage and current waveforms of the system being monitored. Once the waveform is capture it will take approximately 1-2 minutes to appear in the waveform log.



The file name for the manually captured waveform will include the timestamp the capture occurred and the reason will say 'MANUAL' at the end of the file.



In the waveform log page, user also have the option to select and delete waveform files. Simply click on the check box next to the file to select it, alternatively users can click on the 'Select All'



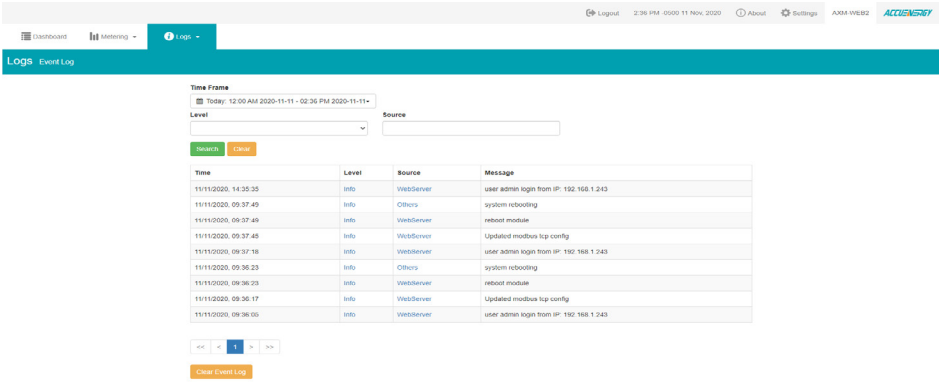
5.1.7.4.6.1 COMTRADE

The AXM-WEB2 allows users to download the waveform data as a COMTRADE file. COMTRADE is a file format for storing waveform data related to transient power system disturbances.

The file can be downloaded from the waveform log by clicking on the file name or by clicking on the button. Once downloaded the file can be read using a COMTRADE file reader where users can further analyze the waveform data provided from the meter.

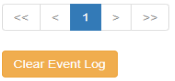
5.1.7.4.7 Event Log

The AXM-WEB2 provide the event log page for the user to track the activities of the module.



The user is able to specify the event level and source by choosing the level and the source type.

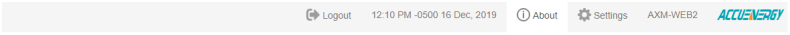
To clear the event logs, click “Clear Event Log”. Then click “Yes” to continue. Users can also export the Event log where it can be exported as a .csv file.



5.1.7.5 About

The About tab located at the top right corner of the web interface allows users to view the Device Information page. This page provides users with information about the KW320 series meter and the AXM-WEB2 module. The Device Information contains the model of the KW320 meter, serial number, firmware version and the meter addresses. It also contains the serial number, firmware version, hardware version and the MAC addresses of the AXM-WEB2 module.

The disk usage field at the bottom of the device information page allows users to view the percentage of the memory that is used on the AXM-WEB2 module.



Device Information

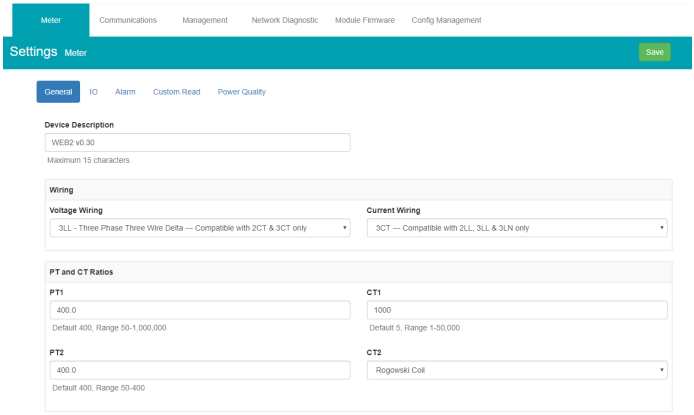
Setting	Value
Meter Model	AcuvimIIW-D-RCT
Meter Serial Number	AH18100109
Meter Firmware Version	v4.05
Device Description	WEB2 v1.11
Module Model	AXM-WEB2
Module Serial Number	AN18070817
Module Hardware Version	v1.01a
Module Firmware Version	v1.11
Ethernet 1 MAC Address	EC:C3:8A:20:29:DC
Ethernet 2 MAC Address	EC:C3:8A:20:29:DD
WiFi MAC Address	00:25:CA:3B:BD:59
Meter Channel 1 Address	123
Meter Channel 2 Address	1
Seals Status	Open
Meter Boot Version	FP00203310

5.1.7.6 Settings

5.2.7.6.1 Meter

5.1.7.6.1.1 General Setting

The basic metering configurations needed to set up the meter can be applied from the web interface by clicking on Settings and selecting the '**Meter**' tab. On the metering tab users will see the '**General**' tab selected and the page presented.



The general page include the following settings:

Device Description: A description for the meter can be provided in this field which will display on the Dashboard page.

Voltage Wiring: Select the type of wiring that the meter will be monitoring from the modes in the drop down list.

Current Wiring: Select the number of CT's that will be connected to the meter to measure the current.

PT1: Enter the rated input of the potential transformer that is connected to the meter. Possible range is from 50 to 1,000,000V. By default PT1 is 400.

PT2: Enter the rated output of the potential transformer. Possible range is from 50 to 400V. The default PT2 setting is 400.

NOTE: *If the voltage input is connected directly to the meter and there are no PTs (Potential Transformers) stepping down the voltage to the meters voltage input then the PT1 and PT2 settings can be left as the default of 400.*

CT1: Enter the rated input of the current transformer that is used with the meter. Possible ranges for the CT1 are from 1 to 50000A.

The default settings for CT1 are dependent on the current input type of the KW320 meter. The following table displays the default CT1 values for the different Current input options.

KW320 Current Input	Default CT1 Value
333mV	1
RCT	1000

CT2: Select the rated output of the current transformer from the drop down list. By default this setting is already configured.

Real time Reading: Select the mode of the readings for the meter when it is polled through Modbus. By default the meter is in Secondary mode which will require some parameters to be scaled by a relationship. Configuring the meter in Primary mode does not require any scaling.

I A Direction: Represents the flow of direction for the Phase A current being measured, configure this setting to troubleshoot issues related to incorrect polarity of readings such as real power, Power Factor and etc.

I B Direction: Represents the flow of direction for the Phase B current being measured, configure this setting to troubleshoot issues related to incorrect polarity of readings such as real power, Power Factor and etc.

I C Direction: Represents the flow of direction for the Phase C current being measured, configure this setting to troubleshoot issues related to incorrect polarity of readings such as real power, Power Factor and etc.

Demand Settings

Sliding Window: This setting refers to the demand type. There are 4 demand types that are supported by the KW320 series meter, users can choose one of the following:

1. ***Fixed Window*** - The demand is calculated based on selecting the calculation period between 1-30min. The meter will calculate and update the demand values at the end of each calculation period.
2. ***Sliding Window*** - The demand is calculated by selecting the calculation period between 1-30 min. The meter will average the energy accumulated within this period of time and the demand value is updated every minute.
3. ***Thermal*** - The demand is calculated based on thermal response, used in thermal demand meters. This method uses a sliding window to update the demand value at the end of each calculation period.
4. ***Rolling Window*** - The demand is based on selecting a calculation period between 1-30min, a subinterval(Demand Calculation Slip Time) and the demand value is updated at each subinterval. The subinterval must be a factor of the calculation period. For example, with a calculation period of 15min, the subinterval can be configured as 5min.

Sub Interval: The sub interval setting is only relevant if the Rolling Window Method is selected, this method requires a sub-interval time that must be a factor of the demand calculation period. the range for this setting is from 1-30 minutes.

Average Interval: The average interval window is the calculation period of the demand, and can be set from 1-30 minutes.

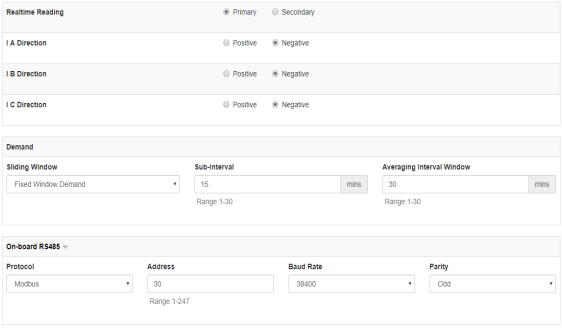
On-board RS485

Protocol: Select the protocol for the KW320 RS485 port, the protocol can be set to Modbus RTU, BACnet MS/TP, and DNP3.

Address: Select the RS485 address for the meter, the range for this setting is from 1-247.

Baud Rate: The baud rate is the communication speed of the RS485 data transfer, this ranges from 1200-38400.

Parity: Select the parity bit setting for the communication.



Display

Current Password: This password relates to the four digit password used to access the meter settings from the display of the meter. By default it is 0000, the range for this setting is 0000-9999.

New Password: Enter in a new four digit password.

Repeat Password: Repeat the new password configured in the previous setting.

Backlight: This setting refers to how long back light on the meters display is on for, the range is from 0-120 minutes, where 0 would disable to back light from turning off.

Rated Load: The rated load can be represented in terms of either power or current.

- If current is selected the rated current that is used would be the CT1 setting value in the PT and CT ratio settings section of the web page. For example if CT1 is set for 1000A, and the average current the meter is monitoring is 500A, the load percentage would be 50% (500/1000A).
- If power is selected the rated primary power would be used in the load percentage calculation. The max primary power can be calculated as follows:

Max Primary Power without using PTs = 3 * (480) * (CT1)

Max Primary Power using PTs = 3 * (PT1) * (CT1)

The max primary power would be the power that is entered in this setting.

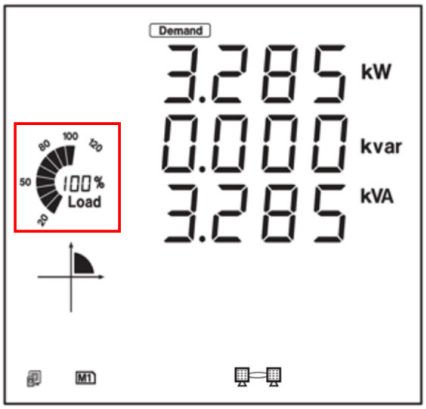
The load percentage is displayed on the front of the KW320 meter display. The load percentage

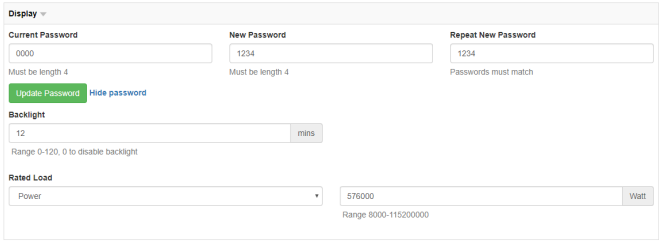
is calculated based on the following equation:

Load Percentage = (Active System Power / ((1A) * User Setting))) * 100%. The KW320 meter will have either Rogowski Coil (RCT) or 333mV Current Inputs and 1A is used in this equation.

For example if the max primary power of your system is 576000W (or 576kW), your system is currently using 211kW and the meters current input type is 1A, then the load percentage would be calculated as follows:

Load Percentage = (211kW / (1 * 576kW)) * 100 = 37%





Advanced

Energy Type: The energy type can either be selected as Fundamental or Fundamental + Harmonics

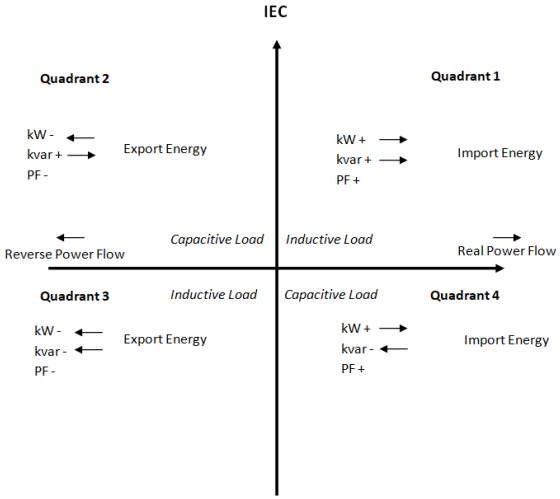
Energy Reading: This can be set to either Primary or Secondary, where Primary displays the energy accumulation in terms of the Primary and Secondary will display the energy accumulation in terms of the secondary with resolution of up to 1Wh.

NOTE: *When the energy reading mode is changed the energy will reset to 0 on the meter.*

VAR/PF Convention: The VAR/PF convention can either be set to IEEE or IEC.

IEC the power factor is dependent on the direction of the real power flow

IEEE the power factor is dependent on the nature of the load, i.e. capacitive, inductive.



VAR Calculation Method: Can be selected as either True or Generalized

- True Method - Uses the Budeanu Concept to calculate the 'True' reactive power. This method generally takes the harmonic components to do the calculation instead of using the power vector triangle method. This method can be defined by the following by the following expression for single phase circuit:
- Generalized Method - UsesFryze's concept to calculate the 'Generalized' reactive power. This method separates instantaneous current into two components, active and reactive currents.

Active current is calculated as: $$i_a(t) = \frac{P}{V_{RMS}^2} v(t)$$

and reactive current as: $$i_r(t) = i(t) - i_a(t).$$

Active and reactive powers are:

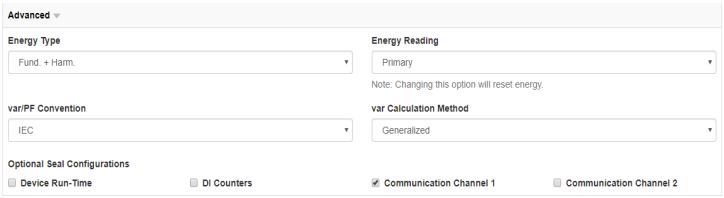
$$P = V_{\text{RMS}} \cdot I_{\text{a}}$$
$$Q_{\text{f}} = V_{\text{RMS}} \cdot I_{r}$$

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

Optional Seal Configurations: Users can choose to seal the following parameters from this setting:

- Device Run Time
- DI Counters
- Communication Channel 1
- Communication Channel 2

Once all settings have been configured users can click on save and then perform a module reboot in order for the settings to be saved to the meter.



5.1.7.6.1.2 Alarm Settings

The KW320 meters supports over/under alarms for different metering parameters..From the WEB2 interface users can configure these alarms on the Alarm page. This page can be found by clicking on 'Settings' and selecting the 'Alarm' tab.

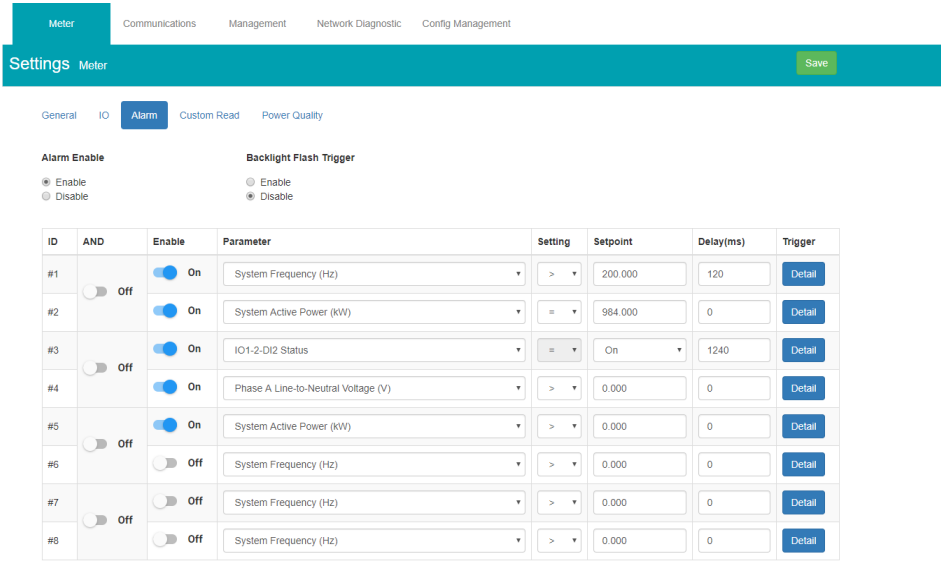
The meter supports up to 16 Alarm channels that users can monitor when the configured parameter goes over or under the alarm threshold. If users have extended I/O modules attached to the meter, digital outputs (DO) and relay outputs (RO) can be triggered upon alarm condition and used to activate external devices such as a buzzer, light, etc.

Alarm Enable: The alarm function can be enabled or disabled

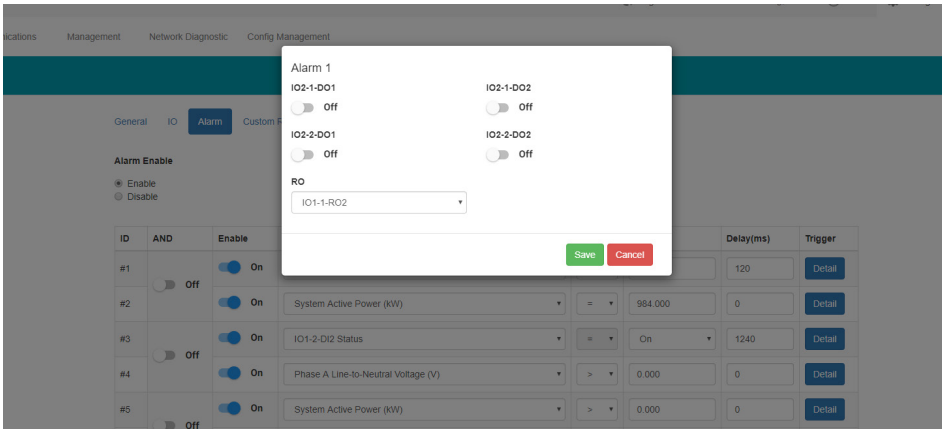
Backlight Flash Trigger: If enabled, when an alarm is triggered the backlight of the KW320 meter display will flash during the alarm event.

Steps to setup alarm channels:

- To configure an alarm channel, enable the preferred alarm channel(s).
- Select the required parameter for the alarm channel under the 'Parameter' column.
- Choose the required setpoint and then select the condition for the alarm, i.e greater than (>), less than (<), or equal to (=).
- Users have the ability to set a delay for the alarm trigger, the range is from 0-30000 ms.
- Users can use the 'AND' function to trigger an alarm event when two conditions have been met.



- If extended IO modules are being used, users can click on the detail tab to configure the digital output and relay outputs to be triggered when an alarm is triggered.



Once all alarm settings are configured, user must click on 'Save' and then reboot the communications module in order for the settings to be saved.

5.1.7.6.1.3 Custom Read

The KW320 meter supports a custom read function which allows users to customize a block of registers within the KW320 meter using different parameters (i.e. Basic metering, THD, Energy, etc) as well as different data types for the parameters (i.e. Int, float, etc). There is a total of 64 bytes that users have to create their customized register block.

NOTE: *The Custom Read Function is only available in meters with firmware version 3.51 and higher.*

The window on the left under 'Not Selected' are the list of parameters available for the custom read block. Users can choose between different parameters by clicking on the drop down menu under 'Parameter Type'. The available parameter types include:

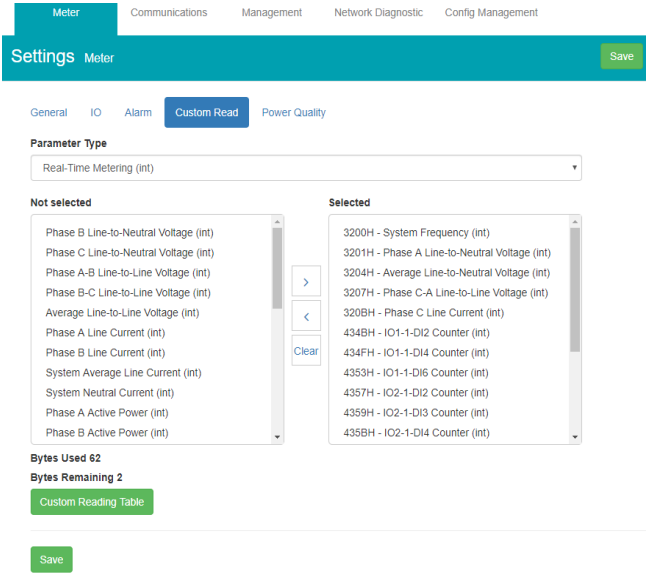
- Real-Time Metering
- Demand
- Energy
- THD
- Sequence
- Phase Angles
- DI Counter
- AO/AI value

Each of these parameter types are available in different data types, such as integer (int). float,

and double-word. Users may select the data type for each parameter from this drop down menu.

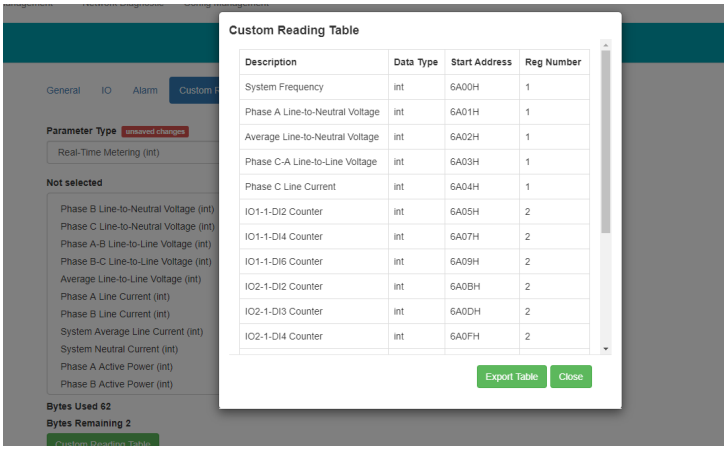
Users can select the parameters and click on the '>' button to add the parameters to the 'Selected' window. The parameters can be removed from the register block by clicking on the '<' button, and can clear the entire block by selecting the 'Clear' button.

As users add and remove parameters, there is a 'Bytes Used' and 'Bytes Remaining' value that lets users know how much space is left in the customized register block.



Once the block is configure, users can click on 'Save'.

A copy of the custom read register block can be viewed by selecting 'Custom Reading Table'. The table can be downloaded as a csv file by clicking on 'Export Table'.



5.1.7.6.1.4 Waveform Settings

The KW320W meters support a waveform caputure feature where users can capture waveforms based on power quality events such as voltage sags, voltage swells and over currents. From the WEB2 interface, users can configure these settings by clicking on the 'Settings' tab and then selecting the 'Wavform' tab.

Rated Voltage: The rated voltage of the system should be entered here, the range is from 50-400V for wye systems or 50-690V for delta systems.

Voltage Swell

- Triggering Waveform Capture - Select enable to capture voltage swell events
- Threshold - Enter in the percentage of the voltage swell to be captured, the range is from 50-140%. For example if the rated voltage is 277V, and the voltage swell threshold is set for 110%. The swell event would be captured when the voltage is 110% above 277V, which is roughly 304V.

Voltage Sag

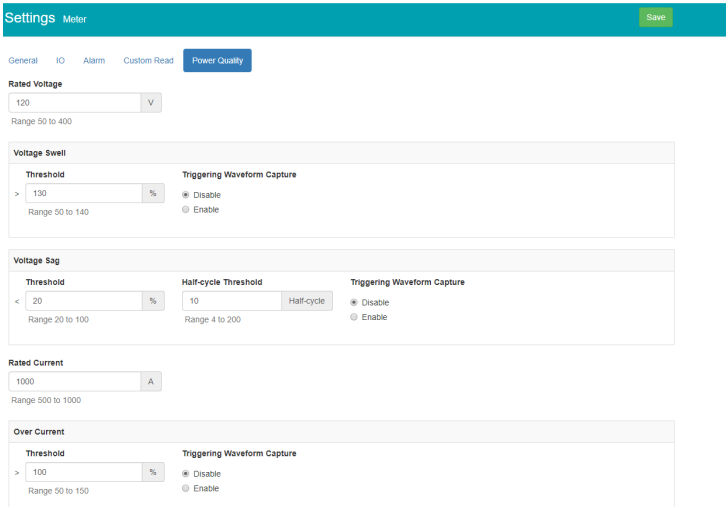
- Triggering Waveform Capture - Select enable to capture voltage sag events
- Threshold - Enter in the percentage of the voltage sag to be captured, the range is from 20-100%. For example if the rated voltage is 277V, and the voltage sag threshold is set for 50%. The sag event would be captured when the voltage drops 50% below 277V, which is roughly 138V.

- Half-cycle Threshold - Enter in the half cycle threshold for the sag event, the range is from 4-200 half cycles.

Rated Current: The rated current for the over current should be entered here, the range will be dependent on the CT1 value configured on the meter. The rated current range will be from 50-100% of the CT1 value. For example if CT1 is configured as 1000A, then the rated current range for the Power Quality event is from 500A to 1000A.

Over Current

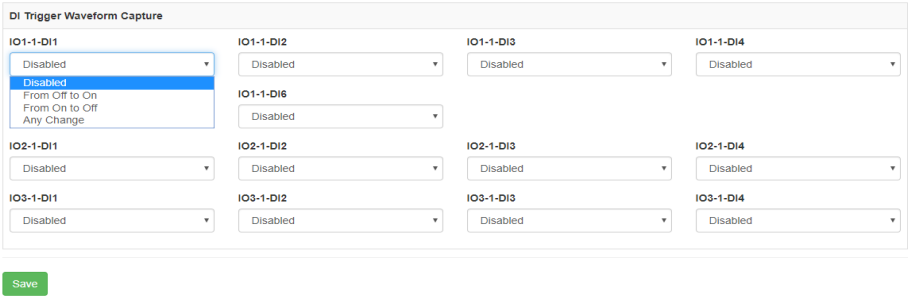
- Triggering Waveform Capture - Select enable to capture over current events
- Threshold - Enter in the percentage of the over current to be captured, the range is from 50-150%. For example if the rated current is 1000A, and the over current threshold is set for 50%. The over current event would be captured when the current is 50% of the rated current, which is 500A.



If user are using external I/O modules, the waveform capture can be triggered by the Digital Inputs Status. The DI can trigger the waveform by the following:

- From Status Off to On
- From Status On to Off
- Any Change

The DI triggering can be disabled is users do not require it to trigger the waveform capture.



5.1.8 Communications

The communication setting web page will allow the user to configure settings related to the Ethernet networks and the Wireless network. The functions and protocols that the AXM-WEB2 module supports can be configured by selecting the corresponding tab such as Emails, Time/Date , Datalog, AcuCloud Post for communicating with the AcuCloud software, BACnet-IP, SNMP, IEC61850, and DNP3.

5.1.8.1 Network

The first page the user will see after selecting the Communications option under the Settings tab is the Network page. The network settings allow users to configure all network related settings including both Ethernet 1 and Ethernet 2 as well as WiFi.

5.1.8.1.1 RSTP Protocol

The AXM-WEB2 supports the RSTP protocol where users can daisy chain the Ethernet ports on the AXM-WEB2 module to a network switch.

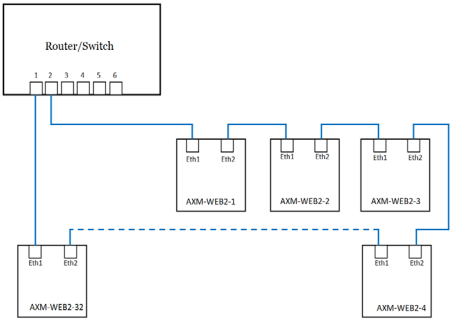
Users can configure the meters IP manually or by setting the DHCP set as Auto.

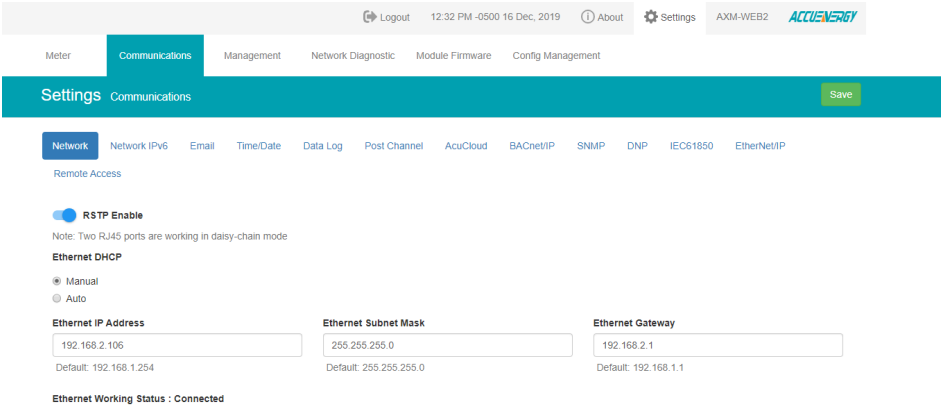
NOTE: *When the RSTP is enabled users will not be able to configure Ethernet 1 and Ethernet 2, there is only 1 IP per meter using RSTP protocol.*

Network Topology

Users can can daisy chain up to 32 devices using the RSTP protocol. This can cut down the amount of network switches required in different applications and allows the use of 1 network switch/

router to be used with up to 32 devices. Each device can be accessed by configuring a unique IP address or having the IP addresses assigned automatically by the network.



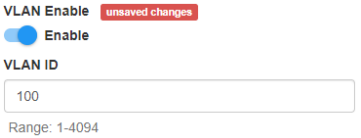


5.1.8.1.2 VLAN

Virtual Local Area Network (VLAN) allows devices under the same physical network to be grouped (by VLAN ID) and act as if they are in separate networks. VLANs are isolated from one another where traffic stays private in the same VLAN.

When VLAN of an interface is enabled, it allows the AXM-WEB2 module to communicate with other devices under the same VLAN without a VLAN switch, via this interface. In other words, the module can parse IEEE 802.1Q-tagged Ethernet VLAN frames by itself.

Users can enable VLAN from the web interface under either the Ethernet 1 or Ethernet 2 settings, once enabled a VLAN ID is required.



One of the common uses is when RSTP is enabled, the module can be put between two VLAN switches, where both ETH1 and ETH2 ports connecting to switches' trunk ports. In this method, the module can still forward all traffic between the switches; while other devices in the same VLAN can have access to the module, and no additional switch is required.

5.1.8.1.3 Network Settings

The settings for the Ethernet 1 and Ethernet 2 are as follows:

Ethernet 1 DHCP: Select 'Manual' to manually configure the IP address to access the meter. If set to 'Manual', you'll also need to set the Subnet Mask and Gateway. By default the IP address for ETH1 will be 192.168.1.254

Select 'Auto' to have the meter assigned a IP address automatically. With this selection the Subnet Mask, and Gateway will also be automatically assigned.

Note: *After changing DHCP to Auto, check the display of the meter(N02 NET Settings) to obtain the new IP address that has been assigned. The new IP address will be displayed only after a module reboot is performed and completed.*

IP Address: If the DHCP is configured to Manual, the IP address can be configured from this page. Default is 192.168.1.254

Subnet Mask: If the DHCP is configured to Manual, the Subnet Mask can be configured from this page. Default is 255.255.255.0

Gateway: If the DHCP is configured to Manual, the Gateway can be configured from this web page. Default is 192.168.1.1

The status of the Ethernet 1 port will display if it is connected or disconnected.

Ethernet 2 DHCP: By default the Ethernet 2 port is configured to have its DHCP set to 'Auto'. If configured to 'Manual' the default Manual IP address is 192.168.1.253. Users can configure the

IP address to any IP once the DHCP is configured for 'Manual', users will also need to set the Subnet Mask and Gateway if using this method.

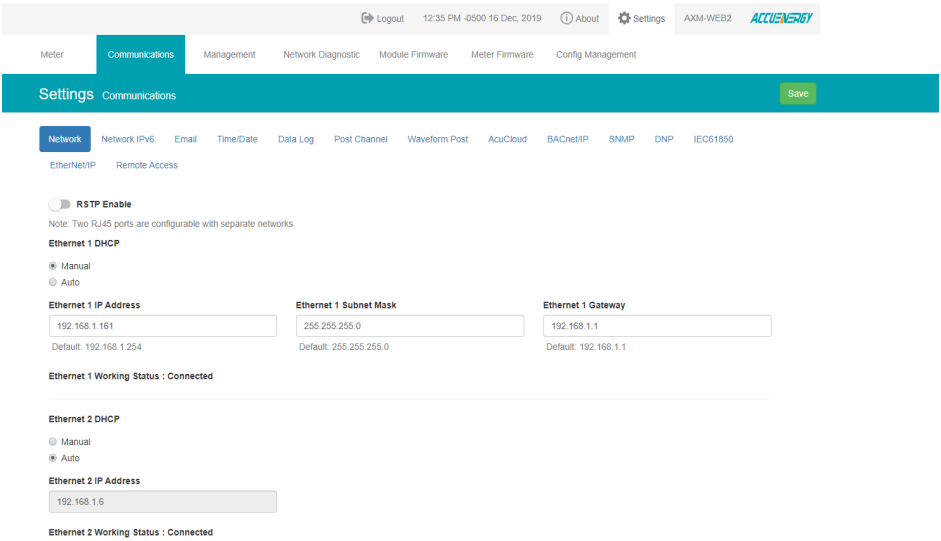
NOTE: *The IP address of the Ethernet 2 can be found page N12 of the NET Settings. The KW320 protocol setting must be configured to WEB2 to view this from the meters NET settings.*

IP Address: By default the IP address is configured by DHCP, this field will be grayed out. If the DHCP is configured to Manual, the IP address can be configured from this page.

Subnet Mask: If the DHCP is configured to Manual, the Subnet Mask can be configured from this page.

Gateway: If the DHCP is configured to Manual, the Gateway can be configured from this web page.

The status of the Ethernet 2 port will display if it is connected or disconnected.



WiFi Enabled: Select the Enable or Disable communication through WiFi.

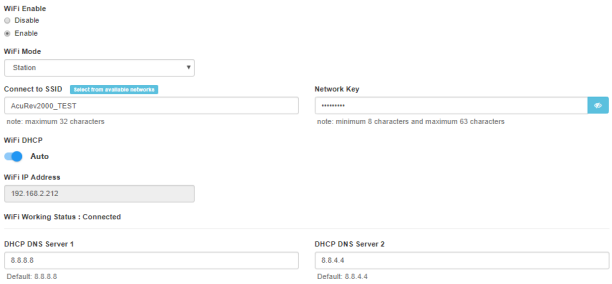
WiFi Mode: The WiFi can be configured to work in two modes just like any other WIFI device. It can be configured as either Access Point(AP) or Station mode.

Access Point: Default configuration for AXM-WEB2. The AXM-WEB2 will act as a wireless access point and will allow other wireless devices to connect and access the AXM-WEB2.

- In Access Point mode, users can configure the SSID, Network Key and IP of the AXM-WEB2 module as well as the DHCP DNS servers.

Station: The AXM-WEB2 will behave like a wireless client and bridge to another wireless network that is available.

- In Station mode, users can select the Wireless network to connect to under the "Connect to SSID" setting. Click on "Select from Available Networks" and enter the Network Key for the wireless network that the AXM-WEB2 will bridge to.
- If users are connecting to an open Wireless network that is not password protection, the password field can be left blank.
- The AXM-WEB2 also supports Enterprise WiFi, where users can connect using an enterprise level WiFi network which is common in many colleges/universities, hospitals, etc. When attempting to connect to an enterprise level WiFi network the interface will show options to connect to the network with a username and password.



In station Mode the DHCP can configured as either manual or auto.

- If manual, users can configure the IP, Subnet Mask and Gateway and DNS Servers.
- If auto, users can check the meter's display to get the IP address and all other network configurations assigned by the wireless network. The user can also configure the DNS servers if the DHCP is set to Auto.

NOTE: *The WiFi IP address for the AXM-WEB2 will be in parameter N11 of the NET settings. The KW320 protocol setting must be configured to WEB2 to view this from the meters NET settings.*

DNS Server 1: Enter the address of DNS server 1 in this field.

DNS Server 2: Enter the address of DNS server 2 in this field.

HTTPS Port: Enter the HTTPS port number of the meter. By default, this setting is configured to 443. The range can be from 6000 to 9999.

Meter Channel 2 Address (Modbus TCP): Enter the Modbus TCP address of the meter. By default, the address is 1.

NOTE: This setting should never be configured to 80. Enable the HTTP Enable configuration to access the web interface at port 80.

HTTP Enable: Enable HTTP so the the AXM-WEB2 cab be accessed through the HTTP protocol, by default the HTTP port is 80 but it can be configured from 6000-9999.

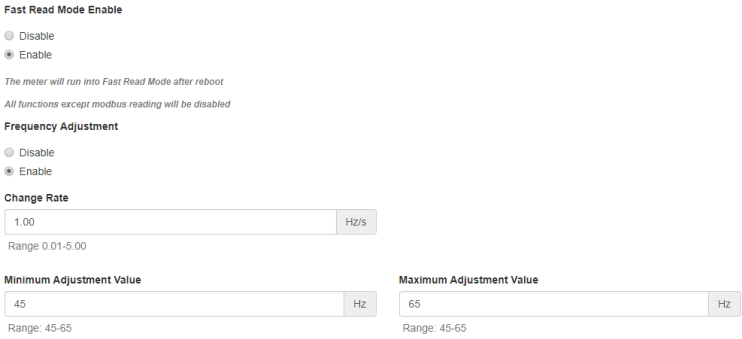
Modbus TCP Port: Enter the Modbus port number of the meter. By default, this setting is configured to 502. The range can be from 2000 to 5999.

Fast Read Mode Enable: Selecting Enable allows the user to read the real time parameters at 100ms.

- ***Frequency Adjustment:*** Allows users to control the rate of change of frequency. The range can be set from 1.00-5.00 Hz/s, by default this is set for 1 Hz/s.
  - The minimum range is 45Hz and the max range is 65Hz, any frequency outside of the range will not have the frequency adjustment applied.

NOTE: *Frequency Adjustment is only available when the meter is in Fast Read Mode.*

NOTE: *When Fast Read mode is enabled, all functions except Modbus and the Web server are disabled.*



Proxy Server Enable: Select enable to allow for forwarding of data log files to pass through the Proxy server first and then the data post server. IE. AcuCloud.

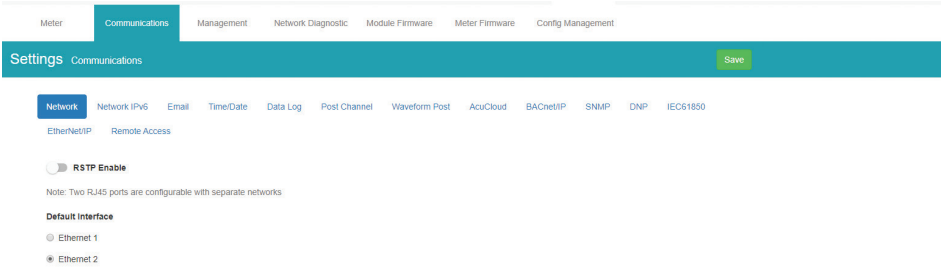
After making any changes on the network settings page, click 'Save'. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 will need to be rebooted from the 'Management' page in order for the settings to take effect.

5.1.8.1.4 Default Routing Interface (Outbound Traffic)

The AXM-WEB2 supports a routing default interface setting which allows users to configure which port to use for primary routing to external networks. Since there are multiple ways the user can connect such as Ethernet1/2, WIFI, RSTP, this setting will establish which one is used for the main routing interface. The other interfaces can be used for local routing if being used.

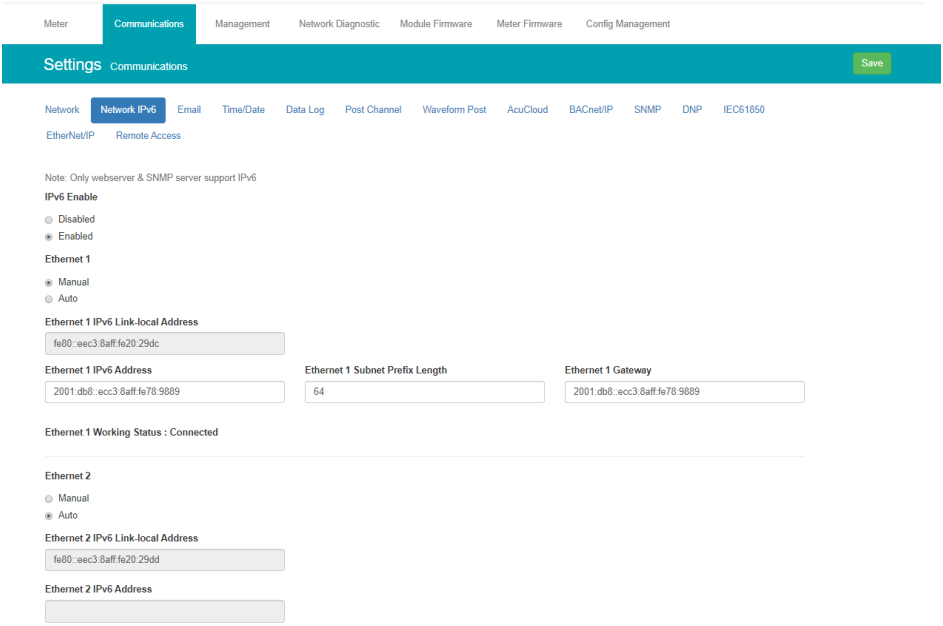
Users can select the default routing interface as:

- Ethernet 1
- Ethernet 2
- WIFI - only valid if WIFI is configured for station mode
- Bridge (RSTP) - only valid if RSTP is enabled



5.1.8.2 IPv6

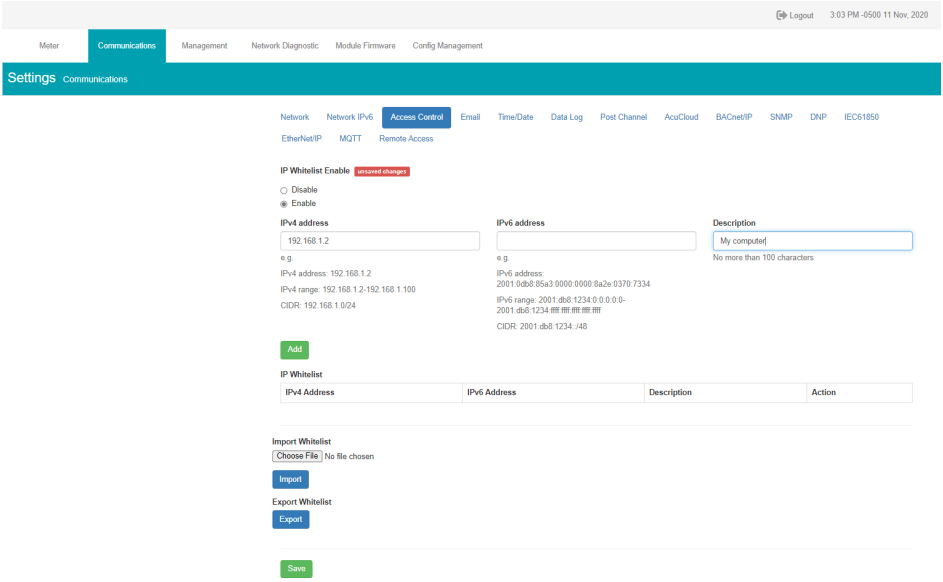
The AXM-WEB2 module supports IPv6 communication where users can use IPv6 to access the web interface as well as connect via SNMP protocol. The settings for IPv6 can be accessed by clicking on Settings and selecting the Communications tab. On the Communications page select the IPv6 tab to configure the settings.



5.1.8.3 Access Control

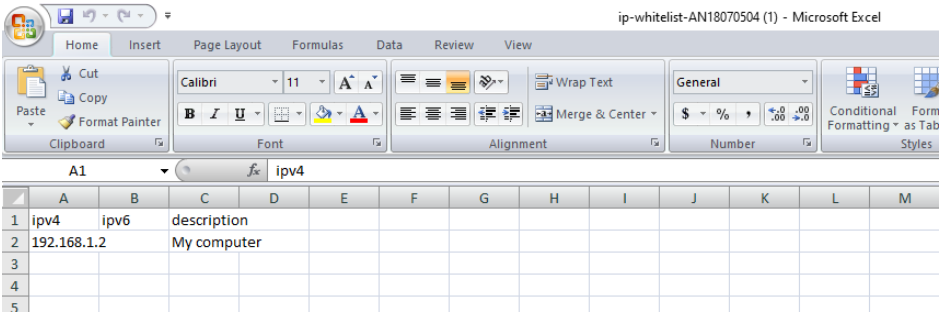
The AXM-WEB2 supports the access control function, also known as the IP whitelist.

When enabled, only the selected IP addresses can access the meter's web interface. Users can enter in an IPv4 or IPv6 address along with a description for the address. There is a maximum of 20 IP addresses that can be added to the IP Whitelist.



Users can import the IP whitelist or export an existing IP whitelist.

Click "Choose File" to import an whitelist, it should be an CSV file looks like below.



To export the IP whitelist, simply add the IP addresses and click “Export”. A CSV file will be downloaded automatically.

5.1.8.4 Email

The AXM-WEB2 supports the SMTP protocol where users can setup the email function to enable the meter to send emails based on a specific time interval or whenever there is an alarm or SOE event or a combination of both. The Email configuration page can be accessed by clicking on the '**Email**' tab on the settings page. Users must know their SMTP server provider and details regarding their SMTP server, which can be provided by users' IT personnel.

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

The first mode is '**Triggered Sending**' where emails are sent immediately when there is a new alarm, SOE, or waveform event.

The second mode is '**Timed Sending**' where users can receive emails at a certain period of time based on the time interval configured. The email will include the data that is selected to be sent.

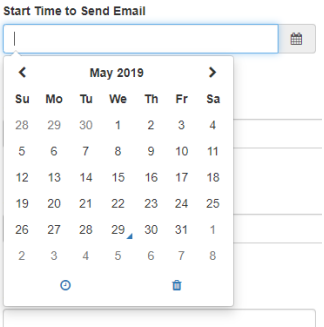
The third mode is when both of the above are enabled.

To use this function the following settings need to be configured:

SMTP Enabled: Select 'Enable' to enable and to further configure the settings related to the SMTP function.

Start Time to Send Email: Select the date and time for when the emails should begin to send.

- Click on the  icon to configure the time and date.
- Click on the  icon in the bottom right to clear the time and date.



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

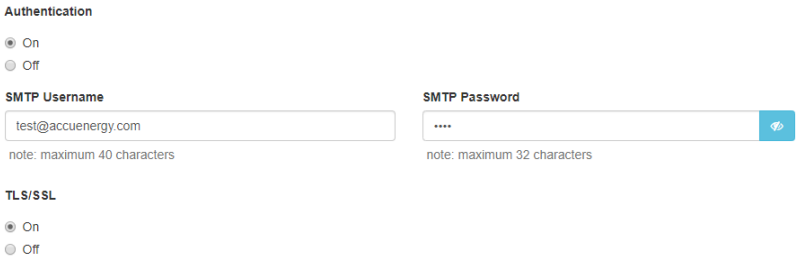
SMTP Port: Enter the port number associated with the SMTP server.

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

SMTP Subject: Enter a subject line for the emails

Authentication: Users can have email authentication on or off. If authentication is on users will need to provide the SMTP username and password.

- ***SMTP Username:*** Enter the SMTP user name for the SMTP server set above.
- ***SMTP Password:*** Enter the SMTP user password for the username set above.
- ***TLS/SSL:*** Users have the option to send emails using TLS/SSL protocols

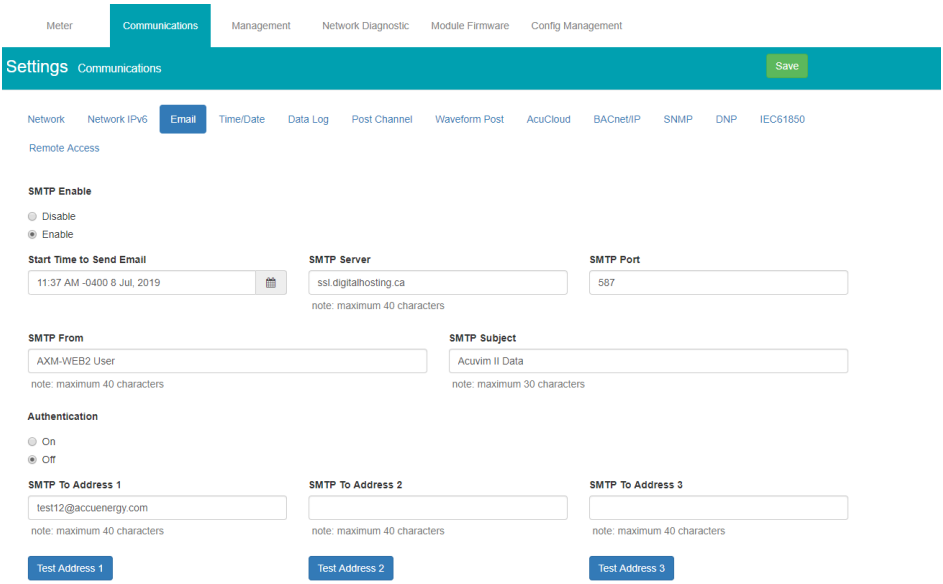


SMTP To Address 1;2;3: Enter up to three recipients that you wish to have the email sent to in 'SMTP To Address 1', 'SMTP To Address 2' and 'SMTP To Address 3'.

Test Address 1,2,3: Test the if the email can be sent to 'SMTP To Address 1', 'SMTP To Address 2', 'SMTP To Address 3'.

NOTE: *If the test address function fails, users can view the email post failure by clicking on the 'Details' option from the test post screen.*

After configuring the above settings, the next step is to select the content for the emails.



The content of the emails can either be time based triggered or event based triggered.

For receiving emails on a time based under Enable Periodic Email Reporting:

Enter a time between 5-1440 mins in the Set time interval

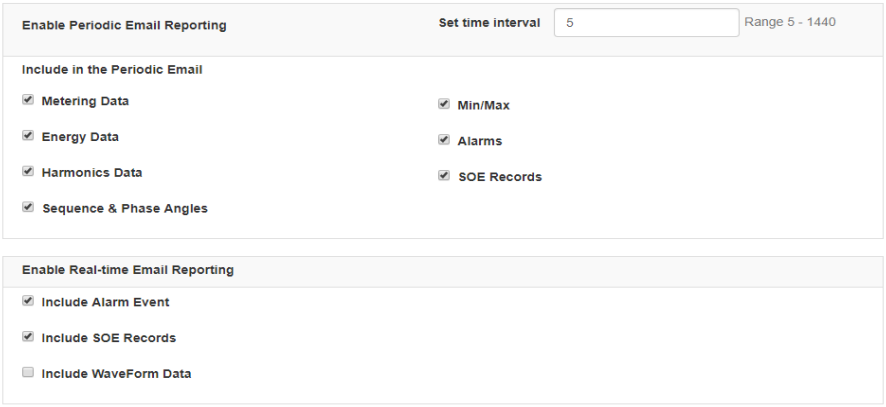
- Check off the box beside the parameters for the content the user should receive.
  - ***Metering Data:*** Report on Real-time voltage, current, power and etc.
  - ***Energy Data:*** Report on energy parameters.
  - ***Harmonics Data:*** Report on the voltage and current harmonics from 2nd to 63rd.
  - ***Sequence & Phase Angles:*** Report on the positive, negative and zero components of the voltage and current waveform.
  - ***Min/Max:*** Report on the maximum and minimum statistics that the meter has recorded since the lifetime of the meter or from the last reset of the min/max statistics.
  - ***Alarm:*** Report of the alarm log.
  - ***SOE Record:*** Report of the SOE log.
  - ***Waveform:*** Report of the waveform log.

The user will receive an email with csv file attachment.

For receiving emails on a event based select either Alarm Event, SOE Record or Waveform Data under the Enable Real-time Email Reporting.

NOTE: *Waveform Data is only available for KW320Q model*.

The user will receive an email with csv file attachment corresponding to the triggered event selected.



5.1.8.5 Time/Date

The device clock of the KW320 series meter can be set through the web interface of the AXM-WEB2 module. The AXM-WEB2 module also supports the NTP (Network Time Protocol) protocol so that the module can update the meter's device clock by synchronizing with a time server.

The module can sync with up to 3 time servers. If a time server is down, the module will synchronize with the second or third time server if they are configured.

The settings for the time and date can be found by clicking on the 'Settings' and selecting the 'Communications' tab. Users can select 'Time/Date' to configure the time settings.

The following must be configured to set the time/date and NTP settings:

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

Device Clock: Configure the date and time on the meter

- Click on the  icon to configure the date and time.
- Click on the  icon in the bottom right to clear the time and date.

Sync Time: Click on Force Update to have the AXM-WEB2 sync its time with the NTP server

NTP Type: Select the NTP type from NTP or SNTP. SNTP should be selected when using the IEC61850 protocol.

NTP Server 1;2;3: Enter up to 3 NTP servers in the "NTP Server 1", "NTP Server 2" and "NTP Server 3" fields.

Examples of North American SNTP servers are:

0.us.pool.ntp.org

1.us.pool.ntp.org

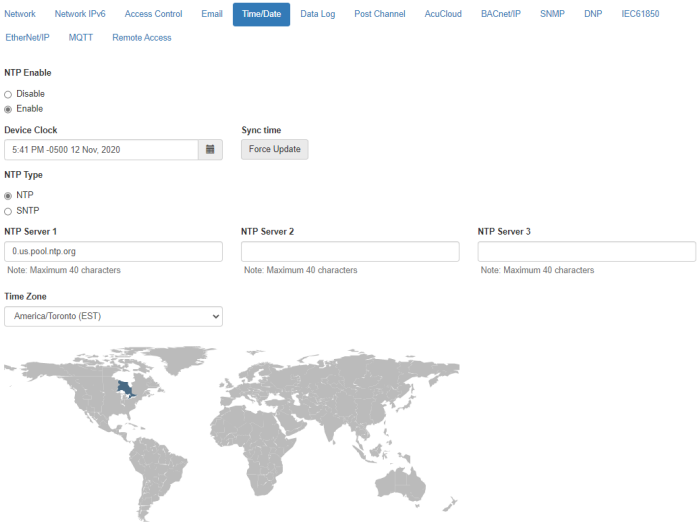
2.us.pool.ntp.org

3.us.pool.ntp.org

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

Time Zone: Select the time zone the meter is in or the time zone in which you would like the meter's time to be synchronized to from the drop down list. Users can also select the timezone by clicking on the region in the map.

Click 'Save' after configuring the time settings. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the settings to take effect.



5.1.8.6 Data Log

The AXM-WEB2 supports logging data onto its on board memory.

The module supports three loggers for different parameters and requirements.

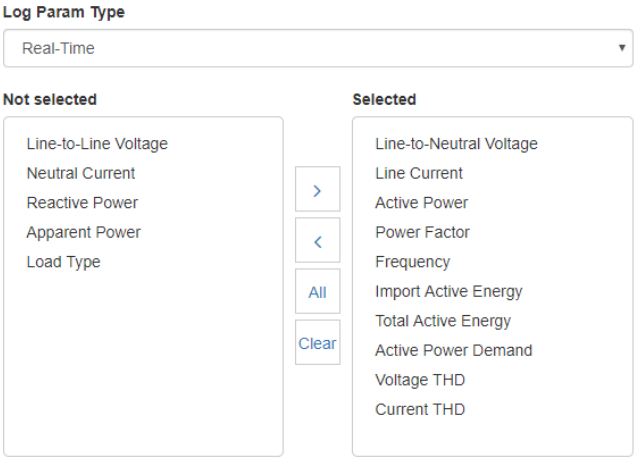
The data can be downloaded as a .csv file from the datalog page in the logs section or by using a HTTP/FTP client.

Logger Enable: To use the data log function to log the data onto the module, select 'Enable' to view and configure the settings that are applicable.

Post Channel: Select the channel to push the datalog to. Only an enabled post channel can be selected here. A post channel can be enabled in the 'Post Channel' tab on the settings page.

Log Param Type: Users can select the type of parameters they wish to log into logger.

Users can use the '**>**' button to add selected parameters into the data log, and use the '**<**' button to remove selected parameters from the data log. Users can also use the 'All' or 'Clear' buttons to add all or clear all parameters to and from the data log. The supported parameter types include real-time readings, energy readings, demand readings, power quality readings and I/O readings.



Log Param Type Detail: This setting allows users to modify what values they see in the data log. Users can select the following parameter details:

- Instantaneous
- Minimum
- Maximum
- Average

Only the 'Real-time' and 'Demand' parameters support the minimum, maximum and average parameter type details. All other parameter types such as Energy, Power Quality, and IO only support the instantaneous values displayed in the the data log.

The image below describes how these parameter details function in the data log. The image of the csv file below depicts a sample of a data log where the data is logged every 5 minutes. The first few columns are highlighted showing the Phase A Line-Neutral voltage.

- Column B highlighted in yellow shows the instantaneous value for Phase A voltage at every 5 minute interval.
- Column C highlighted in green shows the minimum value for Phase A voltage between each 5 minute interval.
- Column D highlighted in red shows the maximum value for Phase A voltage between each 5 minute interval.

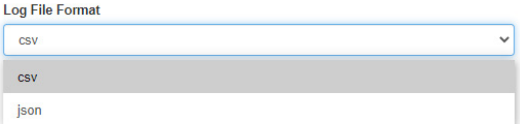
- Column E highlighted in orange shows the average value for Phase A between each 5 minute interval.

A1 fx Time

	A	B	C	D	E	F	G	H	I	J	K	L
1	Time	V1	V1_MIN	V1_MAX	V1_AVG	V2	V2_MIN	V2_MAX	V2_AVG	V3	V3_MIN	V3_MAX
2	2019-06-20 9:55	120.067	120.067	120.077	120.0714667	120.084	120.078	120.087	120.084	120.091	120.09	120.096
3	2019-06-20 10:00	120.072	120.032	120.076	120.0728667	120.079	120.077	120.087	120.081	120.091	120.09	120.094
4	2019-06-20 10:05	120.068	120.01	120.076	120.0720667	120.084	120.08	120.086	120.083	120.093	120.091	120.094
5	2019-06-20 10:10	120.073	120.065	120.073	120.0707143	120.083	120.079	120.088	120.083	120.092	120.091	120.094
6												
7												
8												
9												
10												

Log File Format: Users can select the log file format at either JSON or CSV.

NOTE: *JSON format is only supported via HTTP/FTP/MQTT posting and is not supported when logging data locally to the module memory. Only CSV file format is supported for local log files.*



Timestamp Format: Select the format of the timestamp for the data that is logged. The format for the timestamp can be based on the Local Time (not available for JSON format), UTC Seconds or based on ISO8601 Format.

Log File Name Format: Select the format of the log file name for the data that is logged. The format for the log file name can be based on the UTC timestamp or based on Time Interval Format.

Log Interval: Select how frequently the meter will log data to the file that will be uploaded to the server from the drop down list. The logging interval can be from 1 second to 1 month. The minimum time interval option is according to the selected parameter.

- The Real-time & IO's min Log Interval is 1 sec
- The Energy's min Log Interval is 15 sec
- The Demand & Power Quality's min Log Interval is 1 min

NOTE: *If selected parameters are Real-time and I/O, the min log interval is 1 sec. If selected parameters are Real-time and Energy, the min log interval is 15 sec.*

Post File Length: Select how frequently the log file will be uploaded to the server from the drop down list The log file length can be from 1 minute to 1 month.

Log File Name Prefix: Provide a name for the log file posted to post channel which will be appended to the beginning of the log file if "Time Interval Format" is selected as the Post File Name Format. By default "logger1" will be appended to the beginning of the log file.

Local Log File Length: Select the length of the local log file as 1 hour, 1 day, 7 days or 1 month of data from the drop down list. The log file will appear at the end of the log file length interval, for example if set for 1 day users will not see the local logs until the next day at 12AM. See the table below for more details.

Local Log File Length	Date Configured	Date log file will appear in module
1 hour	November 11th 2020 at 1:00PM	November 11th 2020 at 2PM
1 day	November 11th 2020 at 1PM	November 12th 2020 at 12AM
7 days	November 11th 2020 at 1PM	November 18th 2020 at 12AM
1 month	November 11th 2020 at 1PM	December 11th 2020 at 12AM

Local Log File Name Prefix: Provide a name for the local log file which will be appended to the beginning of the log file if "Time Interval Format" is selected as the Post File Name Format. By default "logger1" will be appended to the beginning of the log file.

NOTE: *The Post File Length and Local Log File Length must be less than or equal to the log interval selected.*

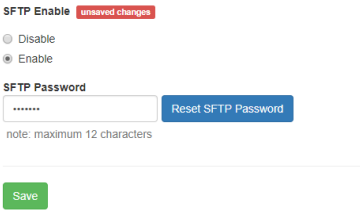
SFTP Enable: To download the logged data from the module using a FTP client, select Enable. The log file will then be available to be downloaded using a FTP client using the following credentials:

Host: *sftp://IPaddressofthemeter*

Username: *sftpuser*

SFTP Password: *accuenergy*

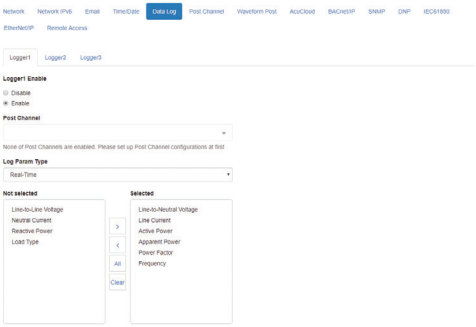
Port: *22*



By default the password for retrieving the backup log files is **accuenergy**. The user can configure any password or can reset to the default of accuenergy by clicking on the "Reset SFTP Password".

NOTE: *Affter enabling the SFTP function the user must reboot the communication module in order to access the data logs with the default password of 'accuenergy'.*

Click 'Save' after changing any settings. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the changes to take effect.



5.1.8.7 Post Channel

The AXM-WEB2 supports the HTTP and FTP Post functions to send data from the meter to a HTTP/FTP server. The AXM-WEB2 can post.csv/.jsonfiles to three different HTTP or FTP servers using HTTP Post or FTP Post.

In the case when there is no connection to the server, the AXM-WEB2 will store the posts and send it out after the connection is restored. The module can store up to 3GB of cache post files. The Clear Post Channel Logs button will allow users to clear the buffered files on meter.

NOTE: *If the disk usage exceeds 85% the module will begin to delete some older backup /post cached files.*

The AXM-WEB2 can post data to a server at intervals of time ranging from 1 minute to 1 month.

The settings for configuring the post channels to post the data can be found by clicking on 'Settings' and then selecting 'Communications' tab. Click "Post Channels" to configure any of the three post channels.

Post Channel 1/2/3 Enable: Enable the Post Channel 1 in order to configure the settings needed to post data via the HTTP(S)/FTP post functions

Post Method: Select the method for posting the files, the user can choose HTTP/HTTPS or FTP

Post Name Fixed: This configuration needs to be enabled in order for user to control the name of the file that will be posted. Otherwise file name will be based on the Log File Name Format configuration from the Data Log settings

Post File Name: Users can enter a name for the file that will be posted as if 'Post Name Fixed' is enabled

If the HTTP/HTTPs post method is selected:

Need Authorization: If the HTTP server requires some sort of password/authorization in order to send files users can enter that under the token field.

HTTP/HTTPS URL: Enter the URL for the HTTP/HTTPS server. The URL needs to begin with the prefix http:// or (https://)

HTTP/HTTPS Port: Enter the port number the server will be listening on

HTTP/HTTPS Meter ID: Enter a name or description for the meter to be identified on the server

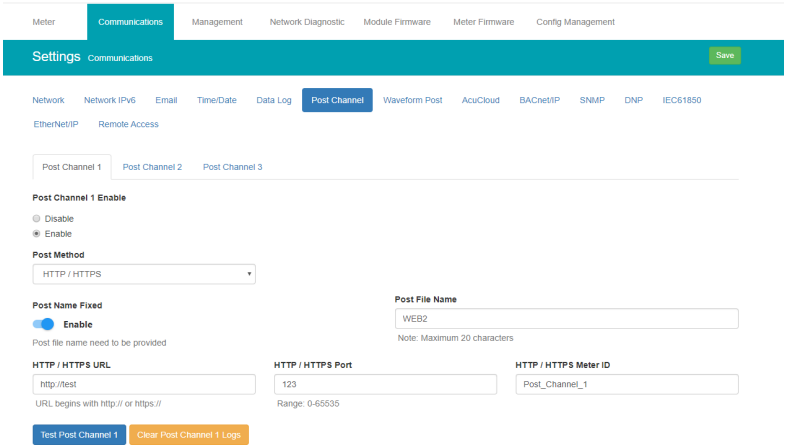
If the FTP post method is selected:

FTP URL: Enter the URL for the FTP server. The URL needs to begin with the prefix ftp://

FTP Port: Enter the port number the server will be listening on

FTP Username: Enter the username required to log into the FTP server

FTP Password: Enter the password required to log into the FTP server



NOTE: *The 'TEST Post Channel' button should only be utilized after clicking the 'Save' button otherwise a fail response will be observed. If a fail response occurs after clicking 'Save' confirm the network settings or credentials for the server.*

Click 'Save' after changing any settings. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the settings to take effect.

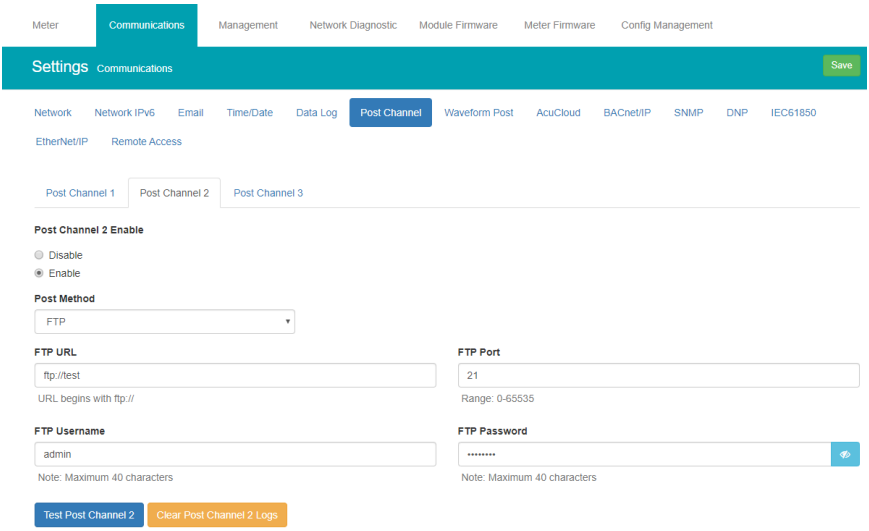
Select the Post Channel 2 tab to configure the settings for post to a second server.

Post Channel 2 Enable: Enable the Post Channel 2 in order to configure the settings needed to post data via the HTTP(S)/FTP post functions

Post Method: Select the method for posting the files, the user can choose HTTP/HTTPS or FTP

Post Name Fixed: This configuration needs to be enabled in order for user to control the name of the file that will be posted. Otherwise file name will be based on the Log File Name Format configuration from the Data Log settings

Post File Name: User can enter a name for the file that will be posted as if Post Name Fixed is enabled



If the HTTP/HTTPs post method is selected:

HTTP/HTTPS URL: Enter the URL for the HTTP/HTTPS server. The URL needs to begin with the prefix http:// or (https://)

HTTP/HTTPS Port: Enter the port number the server will be listening on

HTTP/HTTPS Meter ID: Enter a name or description for the meter to be identified on the server

If the FTP post method is selected:

FTP URL: Enter the URL for the FTP server. The URL needs to begin with the prefix ftp://

FTP Port: Enter the port number the server will be listening on

FTP Username: Enter the username required to log into the FTP server

FTP Password: Enter the password required to log into the FTP server

NOTE: *The "TEST Post Channel 2" button should only be utilized after clicking the 'Save' button otherwise a fail response will be observed. If the test post fails users can view the test post details by clicking on the 'Details' option from the test post screen.*

Click 'Save' after changing any settings. Users will be prompted to reboot the AXM-WEB2

immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the settings to take effect.

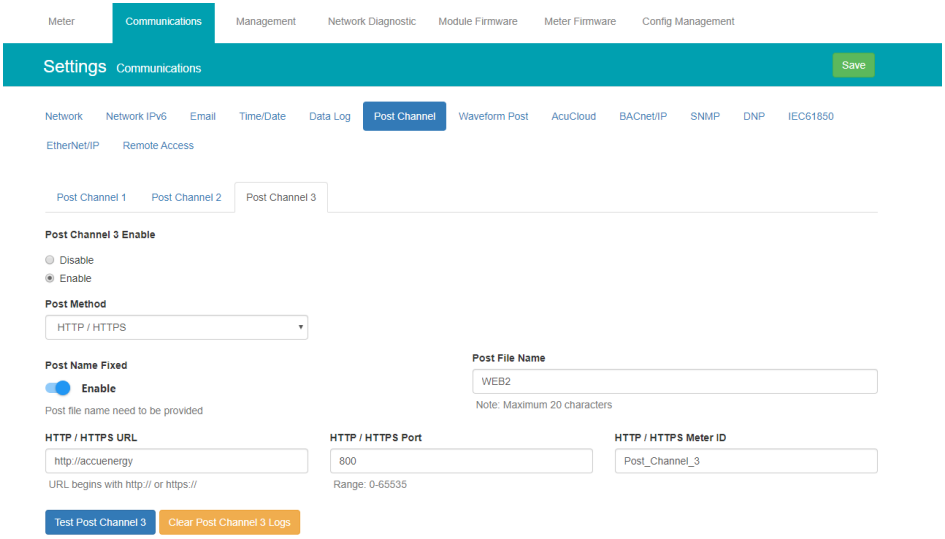
Select the Post Channel 3 tab to configure the settings for post to a second server.

Post Channel 3 Enable: Enable the Post Channel 3 in order to configure the settings needed to post data via the HTTP(S)/FTP post functions

Post Method: Select the method for posting the files, the user can choose HTTP/HTTPS or FTP

Post Name Fixed: This configuration needs to be enabled in order for user to control the name of the file that will be posted. Otherwise file name will be based on the Log File Name Format configuration from the Data Log settings

Post File Name: User can enter a name for the file that will be posted as if Post Name Fixed is enabled



If the HTTP/HTTPs post method is selected:

HTTP/HTTPS URL: Enter the URL for the HTTP/HTTPS server. The URL needs to begin with the prefix http:// or (https://)

HTTP/HTTPS Port: Enter the port number the server will be listening on

HTTP/HTTPS Meter ID: Enter a name or description for the meter to be identified on the server

If the FTP post method is selected:

FTP URL: Enter the URL for the FTP server. The URL needs to begin with the prefix ftp://

FTP Port: Enter the port number the server will be listening on

FTP Username: Enter the username required to log into the FTP server

FTP Password: Enter the password required to log into the FTP server

NOTE: *The "TEST Post Channel 3" button should only be utilized after clicking the 'Save' button otherwise a fail response will be observed. If the test post fails users can view the test post details by clicking on the 'Details' option from the test post screen.*

Click 'Save' after changing any settings. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the settings to take effect.

5.1.8.8 Waveform Post

The AXM-WEB2 supports the HTTP and FTP Post functions to send the meters waveform data from the meter to a HTTP/FTP server. The AXM-WEB2 can post the COMTRADE (.cfg and .dat) files to either an HTTP or FTP servers using the Waveform Post. The settings for the Waveform Post can be found by clicking on the 'Settings' tab and selecting 'Communications', from the Communications page click on the 'Waveform Post' tab.

NOTE: *This function is only available on KW320Q models which support the Waveform Capture Function, all other models will not have this feature available.*

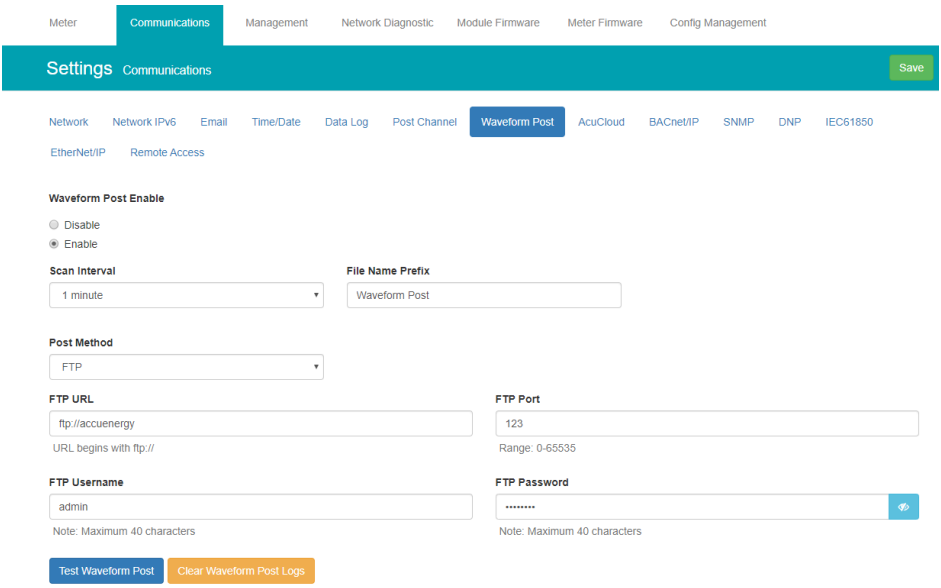
Waveform Post Enable: Select Enable to enable the waveform post and configure the settings further.

Scan Interval: Users can configure a scan interval where the AXM-WEB2 module scans at the KW320 meter to check whether there are any power quality events that occurred during the selected scan interval. For example if the scan interval is set for 15 minutes the module will scan for all the power quality events that occurred within 15 minutes and post it to the server.

The scan interval ranges from 15 seconds to 1 month.

File Name Prefix: Users can configure the file name prefix for the COMTRADE file that is sent to the server.

Post Method: From the drop down menu select either FTP or HTTP/HTTPs



For FTP configure the following:

FTP URL: Enter the URL for the FTP server. The URL needs to begin with the prefix ftp://

FTP Port: Enter the port number the server will be listening on

FTP Username: Enter the username required to log into the FTP server

FTP Password: Enter the password required to log into the FTP server

For HTTP/HTTPs configure the following:

HTTP/HTTPS URL: Enter the URL for the HTTP/HTTPS server. The URL needs to begin with the prefix http:// or (https://)

HTTP/HTTPS Port: Enter the port number the server will be listening on

HTTP/HTTPS Meter ID: Enter a name or description for the meter to be identified on the server

NOTE: *The 'Test Waveform Post' button should only be utilized after clicking the 'Save' button otherwise a fail response will be observed. If the test post fails users can view the test post details by clicking on the 'Details' option from the test post screen.*

Similar to the Post Channel function discussed earlier, in the case when there is no connection to the server the AXM-WEB2 will store the posts and send it out after the connection is restored. A maximum of 3000 files will be buffered on module. The 'Clear Waveform Post Channel Logs' button will allow users to clear the buffered waveform files on meter.

There is no interval setting for sending the waveform data using the waveform post, the data will post directly to the FTP/HTTP server when a power quality event has occurred.

NOTE: *All waveform capture settings must be configured on the Acuview software.*

5.1.8.9 AcuCloud

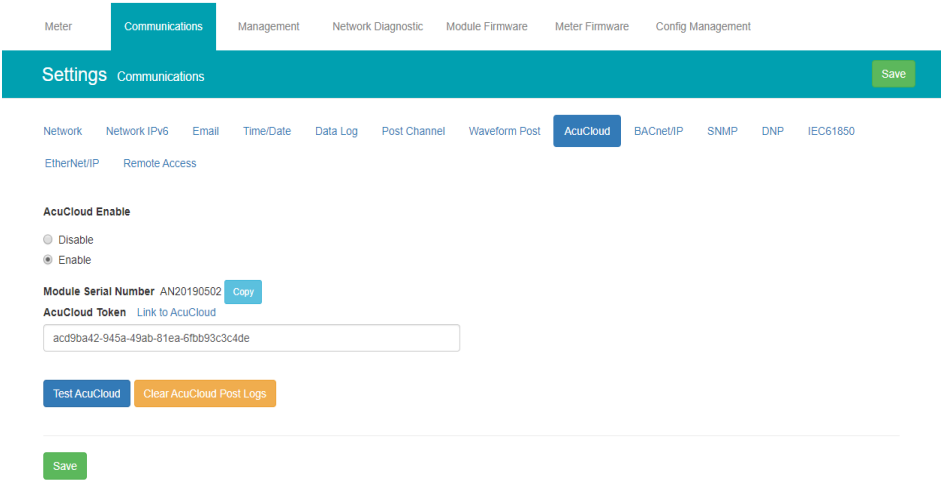
The AXM-WEB2 module can directly interface with the Accuenergy Cloud software AcuCloud. The AXM-WEB2 will post data to the cloud software every five minutes.

AcuCloud will require the serial number of the AXM-WEB2 module which will then provide a token that will be used to configure the AXM-WEB2 so it can send its data to AcuCloud.

The settings for the AcuCloud post function can be found by clicking on the 'Settings' tab and selecting 'Communications'. Select '**AcuCloud**' to access the settings to configure the AXM-WEB2 to send data to the cloud.

AcuCloud Enable: Select 'Enable' to enable the function and to further configure the settings related to AcuCloud.

AcuCloud Token: Copy and paste the token provided by the AcuCloud software into this field.



NOTE: *The "TEST AcuCloud" button should only be utilized after clicking the 'Save' button otherwise a fail response will be observed. If a fail response occurs after clicking 'Save', please double check the serial number entered in AcuCloud, the token pasted in the web page as well viewing the test post details by clicking on the 'Details' option.*

Users can use the 'Link to AcuCloud' to access the cloud software and configure the required settings on that platform. Users must have sufficient access to add devices on their account in order to correctly configure the meter on the software. For inquiries on creating your AcuCloud account please contact Accuenergy Technical Support.

Click 'Save' after changing any settings. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page for the settings to take effect.

The AXM-WEB2 will post the data continuously every 5 minutes after the reboot.

5.1.8.10 BACnet/IP

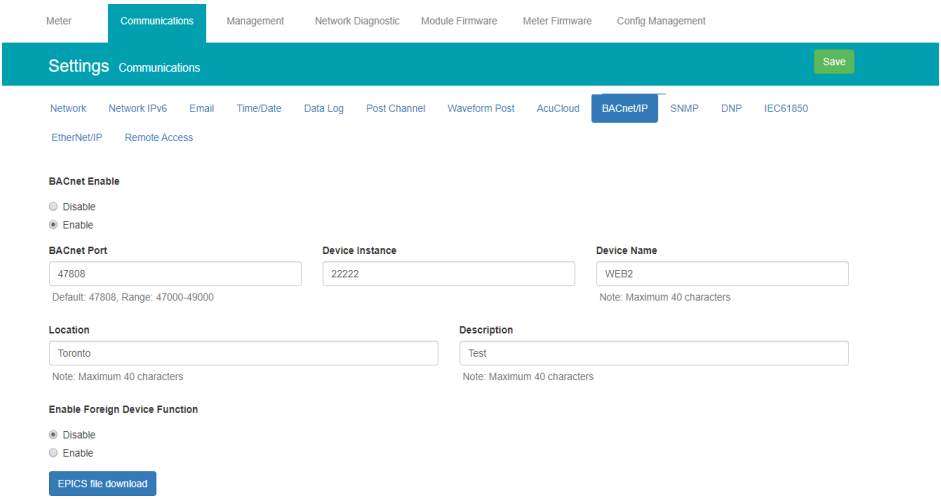
The AXM-WEB2 module supports the BACnet/IP protocol. The settings for the BACnet/IP protocol can be found on the web by clicking on the 'Settings' tab and selecting 'Communications'. Once on the communications page select "BACnet/IP" to access the settings to configure the AXM-WEB2 to communicate with a BACnet client.

BacNet Enabled: Select Enable to enable the BACnet protocol.

BACnet Port: Enter the BACnet or UDP port number. Default port is 47808.

Device Instance: Enter the instance number for the device in the BACnet system. It must be unique within the system.

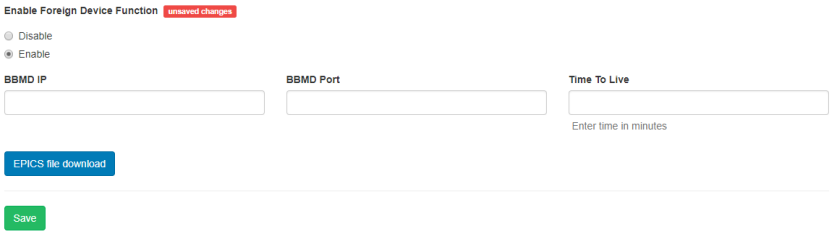
Device Name: Enter a name for the device to distinguish it from other devices within the network.



Under the "*Enable Foreign Device Function*", select 'Enable' to communicate with a BACnet device from another subnet.

- Enter the IP of the BACnet Broadcast Management Device(BBMD) under the 'BBMD IP' field for the device which will receive broadcast messages on one subnet and forward them to another subnet.
- Enter BACnet Port of the BBMD in "BBMD Port"
- Enter a value between 5-1440 min in the "Time To Live" for how often the foreign device will register in the BBMD's foreign device table.

Click 'Save' after changing any settings. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the settings to take effect.



5.1.8.11 SNMP

The AXM-WEB2 module supports the Simple Network Management Protocol(SNMP) protocol for reporting the metering data to the management station. The AXM-WEB2 uses a public community string for read-only access. By default the module will communicate using SNMP port 161. The AXM-WEB2 also supports 'traps' to send unsolicited messages to up to four management stations.

The settings for the SNMP protocol can be found by clicking on the 'Settings' tab and selecting 'Communications'. From the communications page select the 'SNMP' tab to access the settings to configure the AXM-WEB2 for communication with a SNMP management station.

SNMP Enable: Select 'Enable' to enable the function and to further configure the settings related to the SNMP protocol.

SNMP Version: Users can select the SNMP version, the WEB2 module supports SNMPv2c and SNMPv3.

SNMP Port: By default the SNMP Port is configured to 161. The SNMP Port can be any value from ranging from 16100 to 16199.

Read Only Community: By default the community string is Public, this configuration is similar to a password which allows only authorized users to access the meters data.

Trap Enable: Select 'Enable' so that the meter will send a message to the management station when an event is triggered. The event could be a change in Digital Input Status. The notification can then be sent to up to 4 stations.

Trap Target 1: Enter the IP address and port number of station number 1 that should be notified when there is an event.

Trap Target 2: Enter the IP address and port number of station number 2 that should be notified when there is an event.

Trap Target 3: Enter the IP address and port number of station number 3 that should be notified when there is an event.

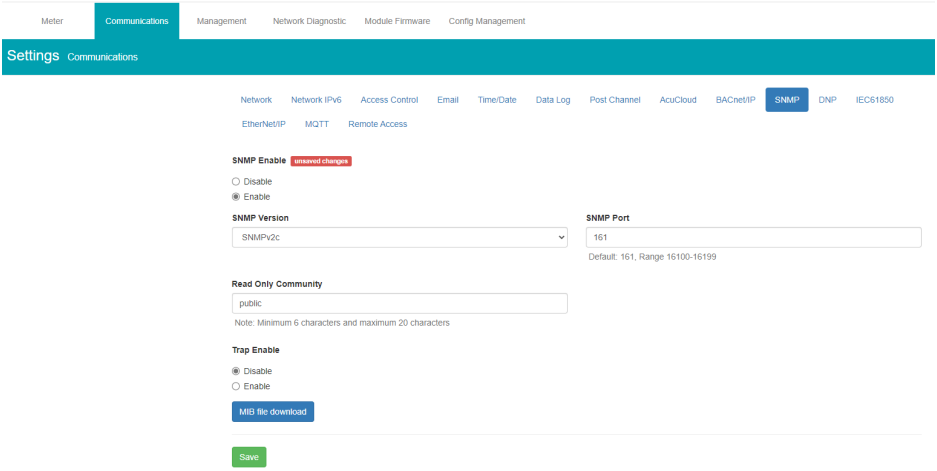
Trap Target 4: Enter the IP address and port number of station number 4 that should be

notified when there is an event.

Report Buffer Size: Enter the size of the buffer for the amount of notifications will be stored before being sent to the management station. A maximum of 30 notifications can be stored.

Report Hold Time: Enter the time in seconds for how long the notification will be in queue before it gets sent to the management station. By default, this setting is configured to 0 so the notification will be sent immediately after an event occurs. This setting could be configured from 0-30 seconds.

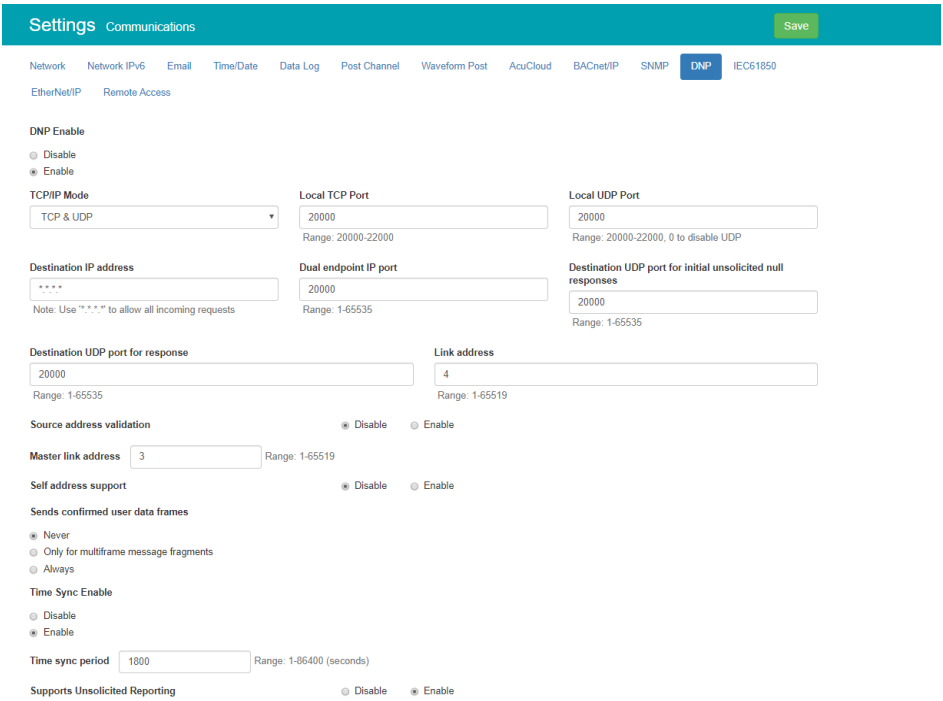
Click 'Save' after changing any settings. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the settings to take effect.



5.1.8.12 DNP

The AXM-WEB2 supports the DNP communications protocol. 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. meters), and master stations.

The settings for the DNP protocol can be found by clicking on the 'Settings' tab and selecting 'Communications'. Select 'DNP' to access the settings to configure the AXM-WEB2 to communicate with a DNP master.



DNP Enable: Select 'Enable' to enable the function and to further configure the settings related to the DNP function.

TCP/IP Mode: By default the TCP/IP is set as TCP&UDP, it can be changed to TCP dual endpoint mode or UDP only.

Local TCP Port: Enter the port number for the local TCP server.

Local UDP Port: Enter the port number for the local UDP server.

Destination IP address: The default IP address is set as *.*.*.* to allow all incoming requests.

Dual endpoint IP port: Enter the port number for the endpoint IP server.

Destination UDP port for initial unsolicited null responses: Enter the port number of the destination UDP server for the initial unsolicited null responses.

Destination UDP port for response: Enter the port number of the destination UDP server for response.

Link address: Enter the address number of the slave device.

Master link address: Enter the address number of the master device.

Source address validation: By default the validation is disabled, select 'Enable' to enable the destination address validation.

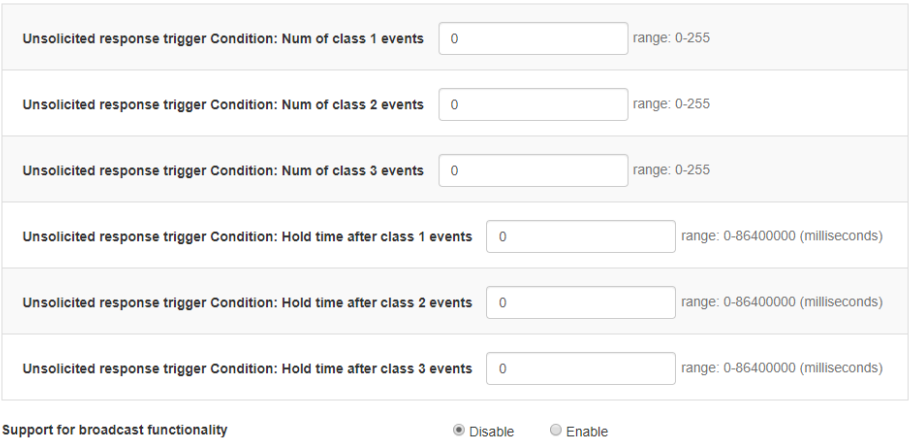
Supports Unsolicited Reporting: Select 'Enable' to enable the function and further configure the settings related to the unsolicited report.

Number of Unsolicited Retries: Number of retries can be selected as '0', '10' and 'infinite'.

Unsolicited response trigger Condition(Num of class # events): Enter the number of events for each class to setup the trigger point. The unsolicited response will be triggered once the number the class events reaches the configured triggering number. The range is from 0-255.

Unsolicited response trigger Condition(Hold time after class # events): Enter 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 0-86400000 milliseconds.

Support for broadcast functionality: In DNP there three broadcasting addresses that are supported. Enabling this setting would allow the module to respond to requests (from the client) sending them to the broadcasting addresses.



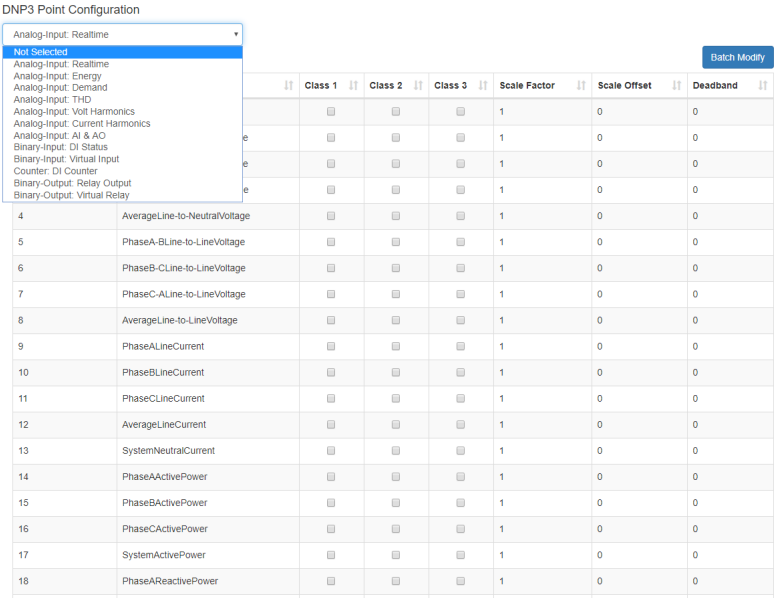
DNP3 Point Configuration

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.

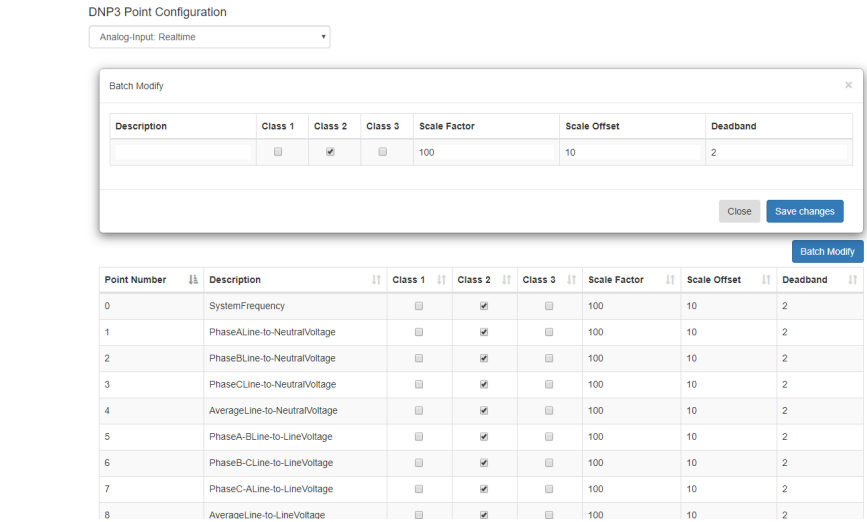
An offset can be applied to the reading.

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.



		Class 1	Class 2	Class 3	Scale Factor	Scale Offset	Deadband
		☐	☐	☐	1	0	0
		☐	☐	☐	1	0	0
		☐	☐	☐	1	0	0
		☐	☐	☐	1	0	0
4	AverageLine-to-NeutralVoltage	☐	☐	☐	1	0	0
5	PhaseA-BLine-to-LineVoltage	☐	☐	☐	1	0	0
6	PhaseB-CLine-to-LineVoltage	☐	☐	☐	1	0	0
7	PhaseC-ALine-to-LineVoltage	☐	☐	☐	1	0	0
8	AverageLine-to-LineVoltage	☐	☐	☐	1	0	0
9	PhaseALineCurrent	☐	☐	☐	1	0	0
10	PhaseBLineCurrent	☐	☐	☐	1	0	0
11	PhaseCLineCurrent	☐	☐	☐	1	0	0
12	AverageLineCurrent	☐	☐	☐	1	0	0
13	SystemNeutralCurrent	☐	☐	☐	1	0	0
14	PhaseAActivePower	☐	☐	☐	1	0	0
15	PhaseBActivePower	☐	☐	☐	1	0	0
16	PhaseCActivePower	☐	☐	☐	1	0	0
17	SystemActivePower	☐	☐	☐	1	0	0
18	PhaseAReactivePower	☐	☐	☐	1	0	0

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 'save changes'.



After all DNP settings are complete, click on 'Save'. Users will be prompted to reboot the AXM-WEB2 immediately or later. If later is chosen the AXM-WEB2 must be rebooted from the 'Management' page in order for the settings to take effect.

5.1.8.13 IEC61850

The AXM-WEB2 supports IEC 61850 which is a standard for Ethernet communication among IEDs (intelligent Electronic Devices) in substations.

The settings for IEC 61850 can be found by clicking on the 'Settings' tab and selecting 'Communications'. Select 'IEC61850' to access the settings to configure the AXM-WEB2 to communicate using the standard.

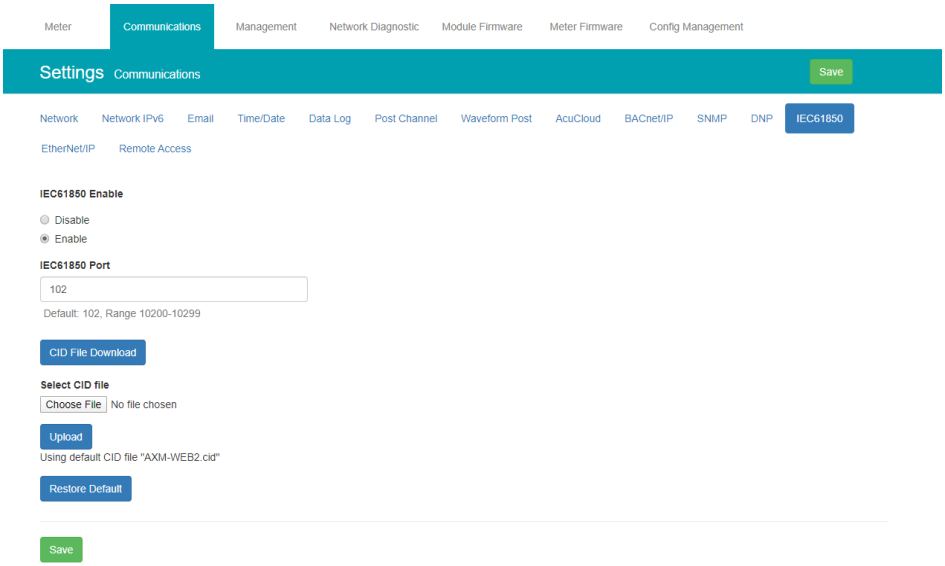
IEC61850 Enable: Select 'Enable' to enable the function and to further configure the settings related to the IEC61850 function.

IEC61850 Port: By default the IEC61850 Port is configured to 102. The IEC61850 Port can be any value from 10200 to 10299.

CID File: The CID file is the configuration file that holds the meter settings pertaining to the IEC 61850 standard. This file can be downloaded from this page and altered by the user in order to meet their requirements.

Select CID File: Users can upload their own CID configuration file by selecting 'Choose File' and then selecting 'Upload' once the correct file is chosen.

Restore to Default: At any point the user can divert back to the original CID file by selecting this button.



NOTE: CID file in v1.13 and lower are not compatible with firmware v1.14 and higher. If communicating with the meter using IEC61850 protocol and then update to fimrware v1.14 or higher, users will need to restore to default to use the compatible CID file.

Once all settings are entered in correctly click on 'Save' and reboot the communications module. If the user decides to reboot the module later, users will have to perform the reboot manually from the 'Management' page in order for the settings to take effect.

5.1.8.14 Ethernet/IP

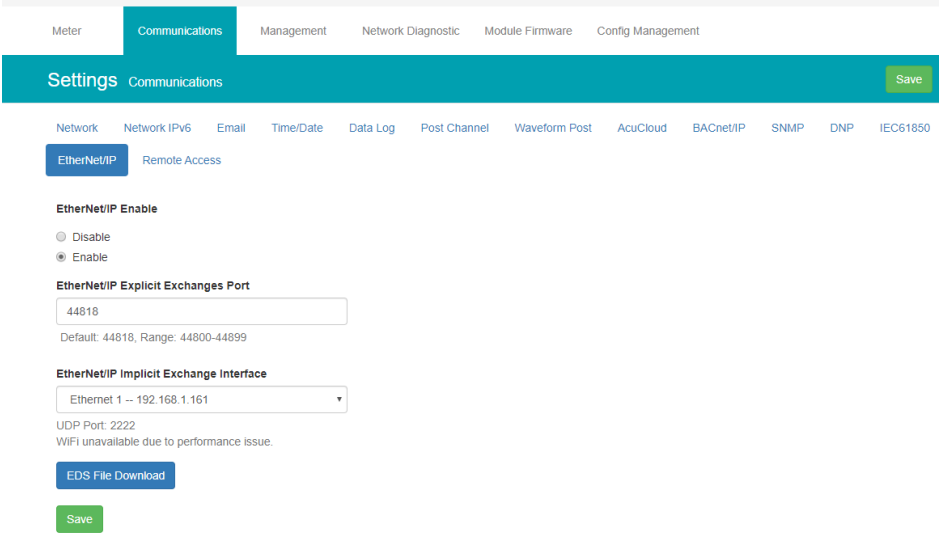
The AXM-WEB2 module supports the Ethernet/IP protocol which is an industrial based network protocol that uses standard Ethernet and TCP/IP technology.

Ethernet/IP Enable: Select Enable to enable the Ethernet/IP protocol

Ethernet/IP Explicit Exchanges Port: Users can configure the Ethernet/IP port, the default

port is 44818 and the port number ranges from 44800-44899.

Ethernet/IP Implicit Exchange Interface: Users can select Ethernet 1 or Ethernet 2 for communication.



5.1.8.15 MQTT

The AXM-WEB2 supports the MQTT protocol where the meter can publish device data to a subscriber using an MQTT broker. The MQTT broker is a central server where all MQTT clients would connect to. The broker/server manages all message topics and updates new messages to all clients that are subscribed to a particular topic (KW320). All related MQTT settings can be configured in the MQTT page under the Communications tab.

5.1.8.15.1 MQTT General Settings

Under the **General** tab in the MQTT page, users can enable the MQTT protocol and configure the broker settings.

Enable MQTT: Select Enable to use MQTT protocol

Broker Address: Enter the broker address of the MQTT server

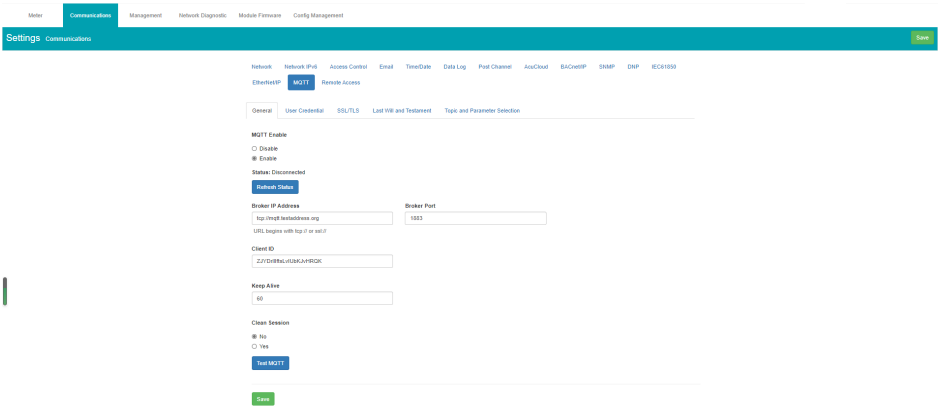
Broker Port: Enter the port number for the MQTT Broker

Client ID: Enter the Client ID for the KW320; must be a unique ID number

Keep Alive: The client communicates a time interval in seconds to the broker, “Keep-Alive” is the maximum length of time in seconds that the broker and the client cannot communicate with each other.

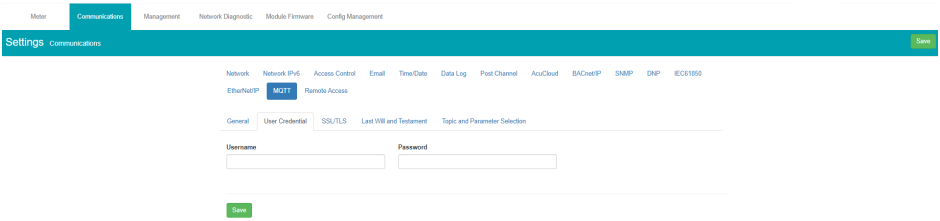
Clean Session: If selected as Yes the session data is cleared all offline data is lost, if selected as No messages are queued are received up reconnection.

Once all settings are configured click ***Save***. The connection to the broker can be tested by using the ***Test MQTT*** button.



5.1.8.15.2 MQTT Authentication

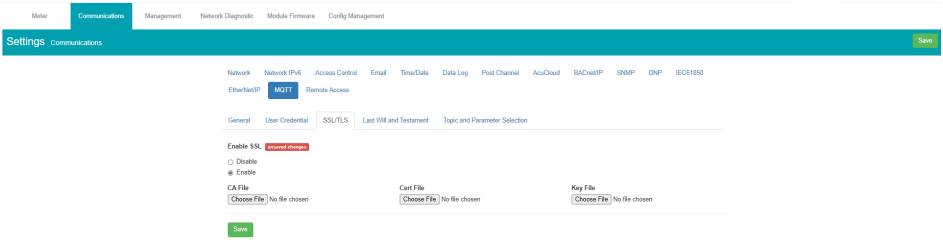
The ***User Credential*** tab allows users to configure a User Name and Password authentication if the broker is able to support it.



5.1.8.15.3 MQTT Encryption

The ***SSL/TLS*** tab allows users to use the MQTT protocol with encryption.

In this page users will be able to upload the required certificate and key files.



5.1.8.15.4 Last Will & Testament

The AXM-WEB2 supports Last Will and Testament messages via the MQTT protocol. These settings can be configured under the ***Last Will & Testament*** tab.

The last will and testament message is used to notify other clients regarding other disconnected clients. The message is an MQTT message that contains a topic, a QoS level and a payload.

Topic: Refers to the path used to access the MQTT message.

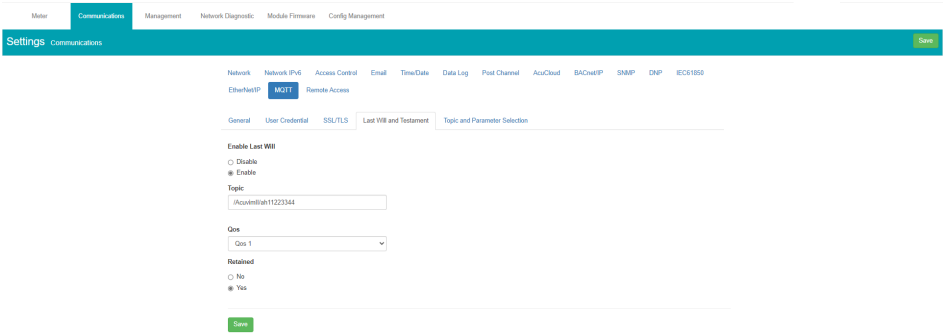
QoS: Stands for Quality of Service and refers to the reliability of the message delivery between the publisher and subscriber. There are three types of quality of service:

1. **QoS 0** - is the lowest level, and is defined as “at most once” delivery. This level has the fastest message delivery but the success rate of delivery is not reliable.

2. **QoS 1** - is defined as “at least once” delivery. These types of messages are reliable and are guaranteed, however the messaged may be sent as duplicates several times.

3. **QoS 2** - Is the highest level, and is defined as “exactly once” delivery. These messages are more reliable and are guaranteed to be sent once without any duplicates. This type of messaging sends the most reliable message however it has a slower message delivery. Each client can optionally specify its own LWT message when it connects to a broker. The broker stores this message so that if the client disconnects ungracefully, the broker will send the disconnected client’s LWT message to all the other clients that are subscribed to that last will message topic.

Retained: Users have the option retain messages or not. If a client retains messages that was published to topic, a second client that is subscribed to the same topic will be able to see the retained message.



5.1.8.15.5 Top and Parameter Selection

Under the ***Topic and Parameter Selection*** tab users can configure the sending interval and devices data they want to publish to the broker.

Topic: Users will enter in the Topic used to read all devices.

QoS: Users can configure the quality of service level, where Qos 0 is the lowest level and Qos 2 is the highest level.

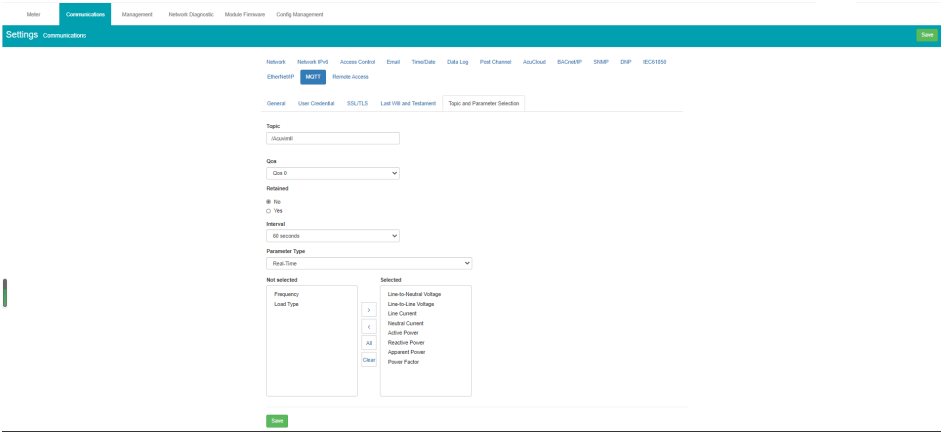
Retained: Users have the option retain messages or not. If a client retains messages that was published to topic, a second client that is subscribed to the same topic will be able to see the retained message.

Interval: Users can select the publishing interval, the range is from 10-600 seconds.

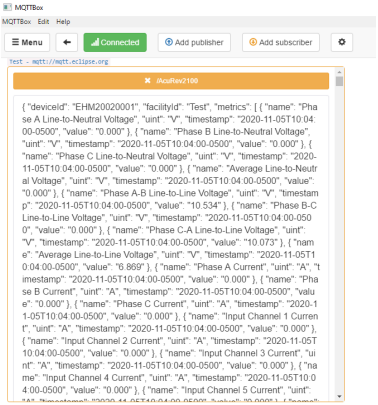
Parameter Type: Users can select different parameter types, i.e Real Time, Energy, Demand.

Parameter Selected/Not Selected: Users can click and select different parameters from the not selected panel and add them over to the selected panel using the right arrow button. Users can use the left arrow button to remove parameters from the selected panel. The All and Clear buttons are used to add All parameters or Clear all parameters form the selection box.

Once all settings are configured, click on Save and perform a reboot in order for the settings to be saved.



Once configured, on you can verify on your MQTT server if the data is being received. The data is received in JSON format.

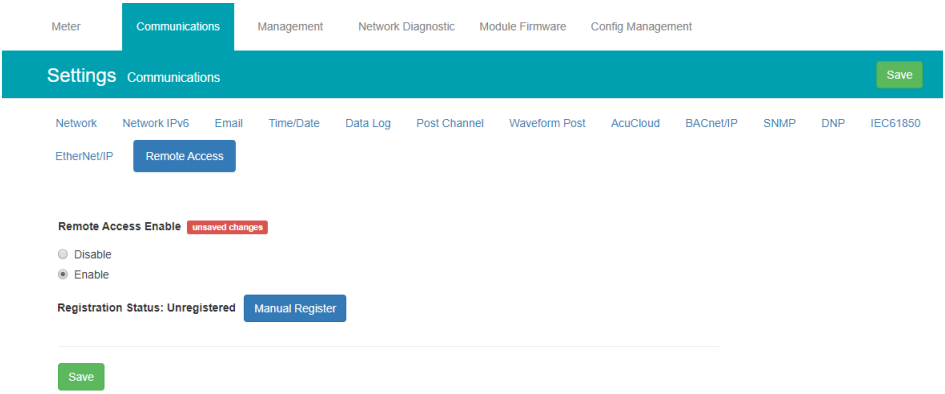


5.1.8.16 Remote Access

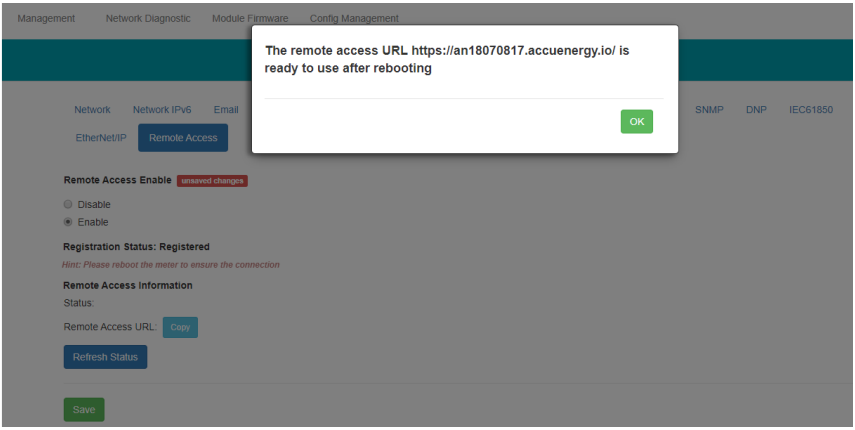
The AXM-WEB2 has a remote access function. This will allows users to provide other users with remote access to the meters web interface. Users will have full functionality and access to all meter readings and settings with this function.

Remote Access Enable: Select 'Enable' to enable the function and allow for Remote Access.

Current Status: Will provide user with a status of the Remote Access on whether it is 'Registered' or 'Unregistered'.



Users can click on the 'Manual Register' button to register the remote access. The following page will be displayed.



NOTE: *The module must be rebooted in order for the remote access connection to work properly.*

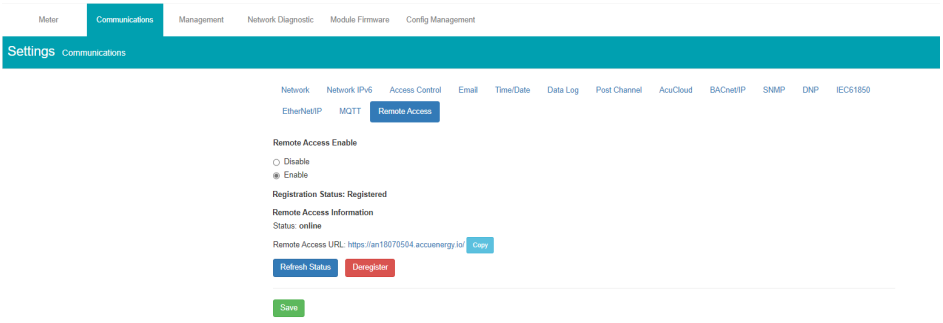
Registration Status: Displays the status as 'Registered' or 'Unregistered'

Remote Access Information: Lets users know if the remote access status is online or offline.

Remote Access URL: The URL used to access the meters web server remotely. This URL can be copied and shared with all users that require the remote access.

Remote Access Deregister: The user can reset the remote access link by deregistering the remote access if there is an issue.

Click "Deregister" and the URL will be reset. the user can reboot the meter or re-register the remote access to re-enable the link.



5.1.8.17 Config Management

The AXM-WEB2 module has a configuration management page that allows users to save all web settings with the exception of a certain settings into a configuration file. This is useful if users have more than one meter that needs to be programmed with the same settings, and eliminates any error when trying to configure another WEB2 module.

The following settings are saved in the configuration file:

All Meter settings (General, IO, Alarm, Custom Read, Waveform)

Network settings (Only DNS1, DNS2, Modbus TCP Port, HTTP Proxy)

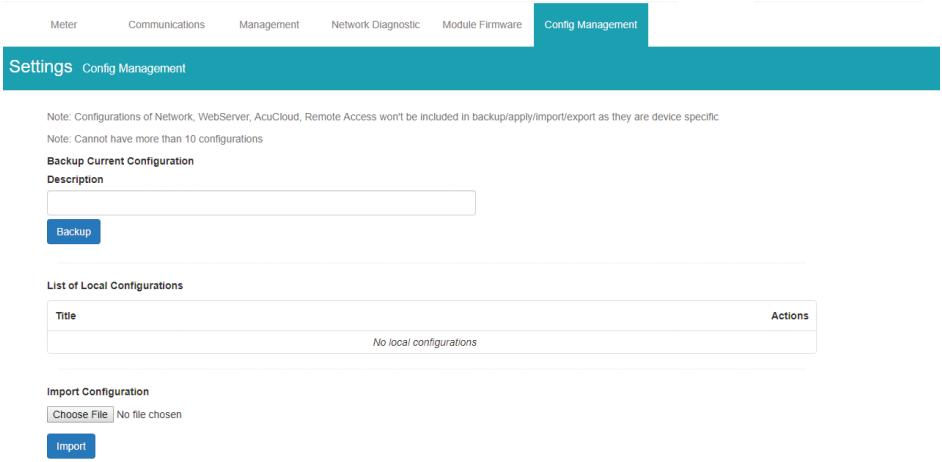
- All Email settings
- All Time/Date settings
- All Data Log settings
- All Post Channel settings
- All BACnet settings
- All SNMP settings
- All DNP settings (Point configuration will also be applied)
- All IEC61850 settings (CID file will also be applied)

- Management settings (the View and Admin Access Level passwords, SSH, and Debug Configuration)

The settings that are not included or effected by the Config Management file is:

- Most Network settings (RSTP, DHCP, IP, Submask, Gateway, HTTP Port for both Ethernet 1 and 2. All WiFi settings, Fast Read Mode, HTTP enable, and HTTPS port are not changed)
- IPv6
- AcuCloud
- Access Control (IP Whitelist)
- Remote Access

The Config Management page can be accessed by clicking on the **Settings** tab and selecting **Config Management**.



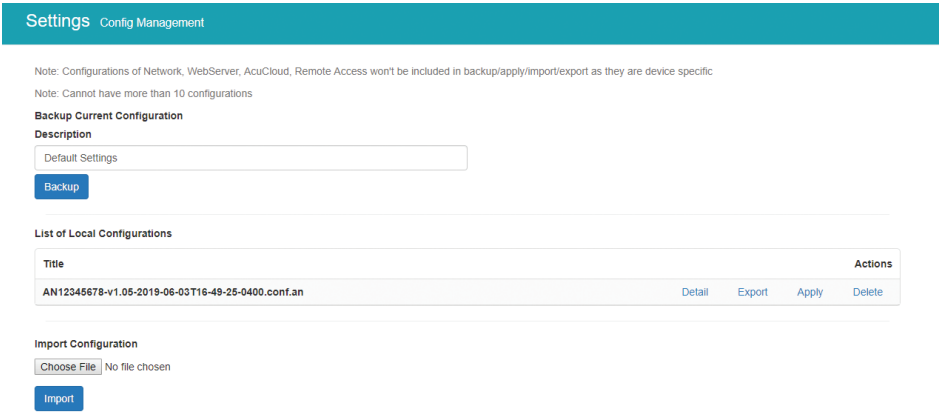
5.1.8.17.1 Backup Configuration

Users can create a backup of the current configurations on the WEB2 interface.

Backup Current Configuration Description: Enter in a description for the backup configuration file.

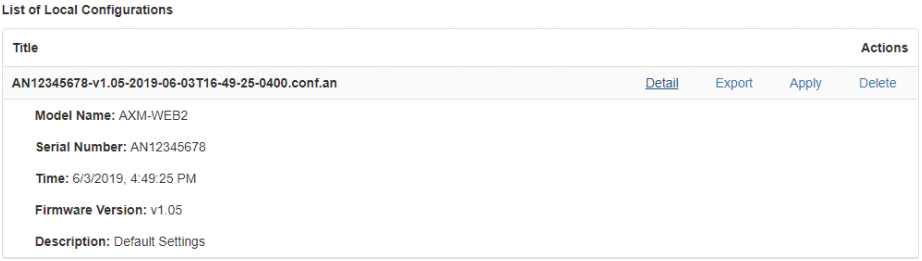
Once the description is entered in click on the 'Backup' button.

The backup is displayed in the List of Local Configurations. The file has a file format that includes the module serial number, module firmware version, and time stamp that the file was created.



NOTE: *Users cannot have more than 10 configurations in the List of Local Configurations.*

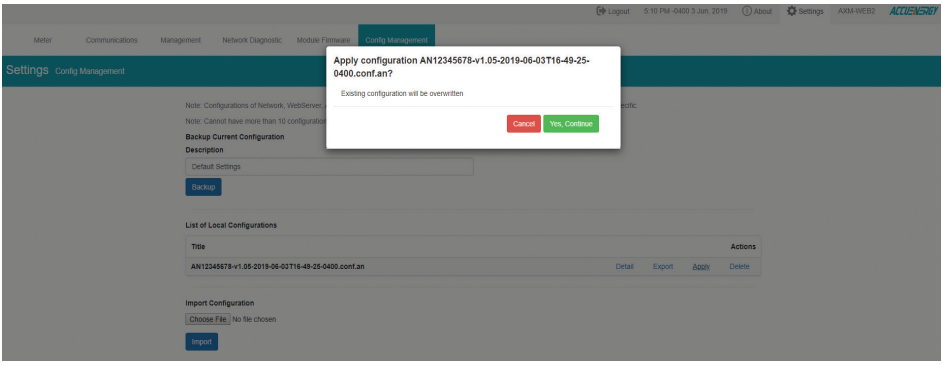
Users can click on Detail to view the description of the configuration file. The details include the Model name, serial number, time created, firmware version and the description entered when the backup was created. Users can remove any of the configuration files from the list at any time by selecting Delete.



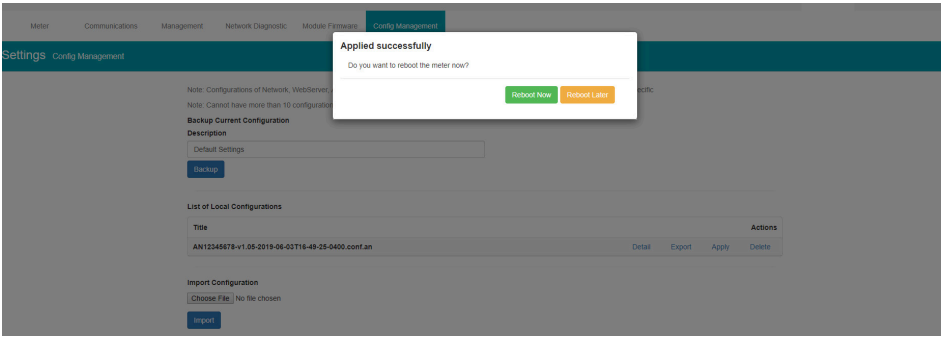
5.1.8.17.2 Export/Apply Configuration

Users can export the configuration file and use it on other WEB2 modules. The file is downloaded as a .an file.

To implement the configuration file click on ***Apply***. A prompt warning the user that the existing .conf.an file will be overwritten is shown. Click **Yes** to continue.

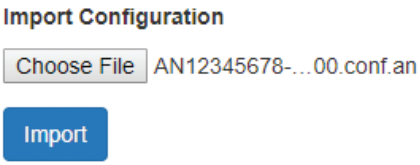


A module reboot is required for the configuration to take effect. if users decided to reboot later the reboot must be performed from the Management page in order for the settings to take effect on the device.

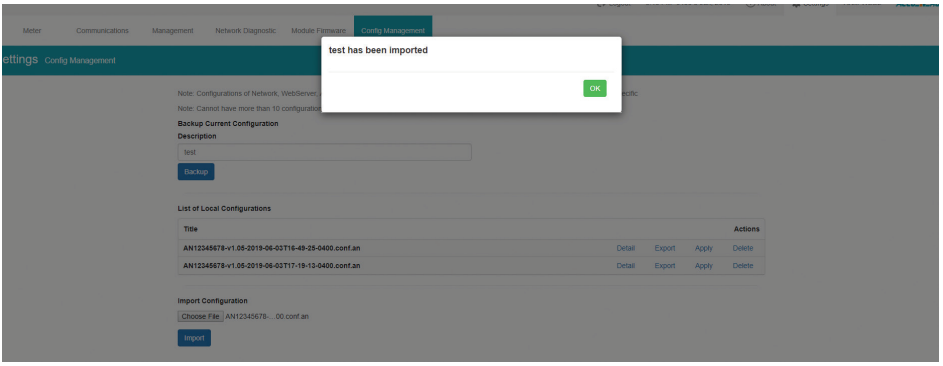


5.1.8.17.3 Import Configuration

Import Configuration: Users can import a configuration file (.conf.an file format) to the WEB2 module.



Click on **Import** to upload the configuration file to the WEB2 module.



The newly imported file will now appear in the List of Local Configurations.

List of Local Configurations

Title				Actions
AN12345678-v1.05-2019-06-03T16-49-25-0400.conf.an	Detail	Export	Apply	Delete
AN12345678-v1.05-2019-06-03T17-19-13-0400.conf.an	Detail	Export	Apply	Delete

NOTE: *Users cannot import a file that already exists on the local configurations, when the list already contains 10 config files, and cannot import a config file that has been exported from a WEB2 module with a higher firmware version.*

5.1.9 Management

5.1.9.1 Parameter Reset

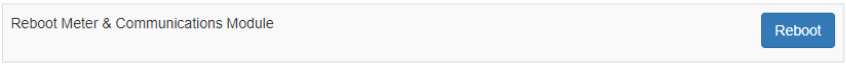
The Management web page allows the user to clear and reset certain parameters in the meter. The following parameters can be reset from the Management page:

- Demand
- Energy
- Max and Min
- Alarm Record
- Device Run Time

Setting	Action
Reset Demand	Reset
Reset Energy	Reset
Reset Max and Min	Reset
Reset Alarm Record	Reset
Reboot Communications Module	Reboot
Device Clock	12:43 PM -0400 3 Jun, 2019
Reset Device Run Time	Reset

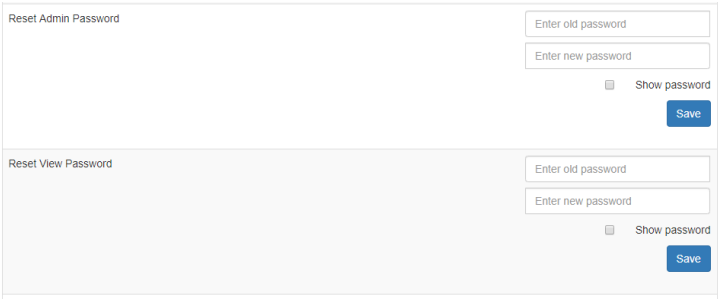
5.1.9.2 Reboot Meter & Communications Module

Users can also reboot the web module and meter which is required after any communication or meter setting is changed, if a module reboot is not performed the settings will not be saved to the meter and will go back to its default settings. This not only resets the communication module, it also performs a soft reboot on the KW320 meter.



5.1.9.3 Change Password

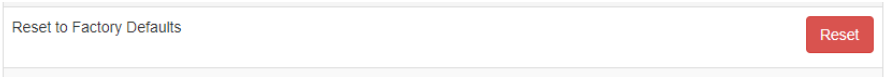
The access level passwords can be changed from the Management page as well, all new passwords must be 6 characters or more.



5.1.9.4 Reset to Factory

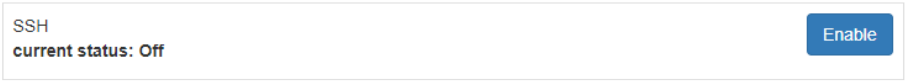
The AXM-WEB2 supports a reset to factory function where if reset the module settings would be configured back to its default factory settings. This impacts all configurations and logs stored on the module.

NOTE: *This setting is permanent and cannot be undone!*



5.1.9.5 SSH

The WEB2 module supports the SSH which can be enabled to allow users to remotely log into the meter using the SSH protocol. When enabled the status will show 'On', when disabled the status will show 'Off'.

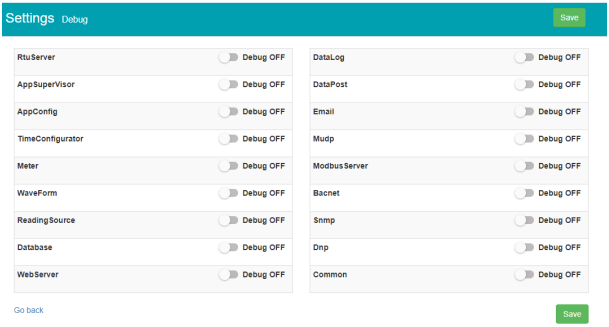


5.1.9.6 Debug Diagnostic

The debug diagnostic allows the user to enable or disable the debug logs. The current status will say 'All off' if disabled, 'All On' if enabled.

Users can click on the advanced link, to turn on or off specific debug logs. If certain debug logs are enabled the current status will show 'Partial On'.

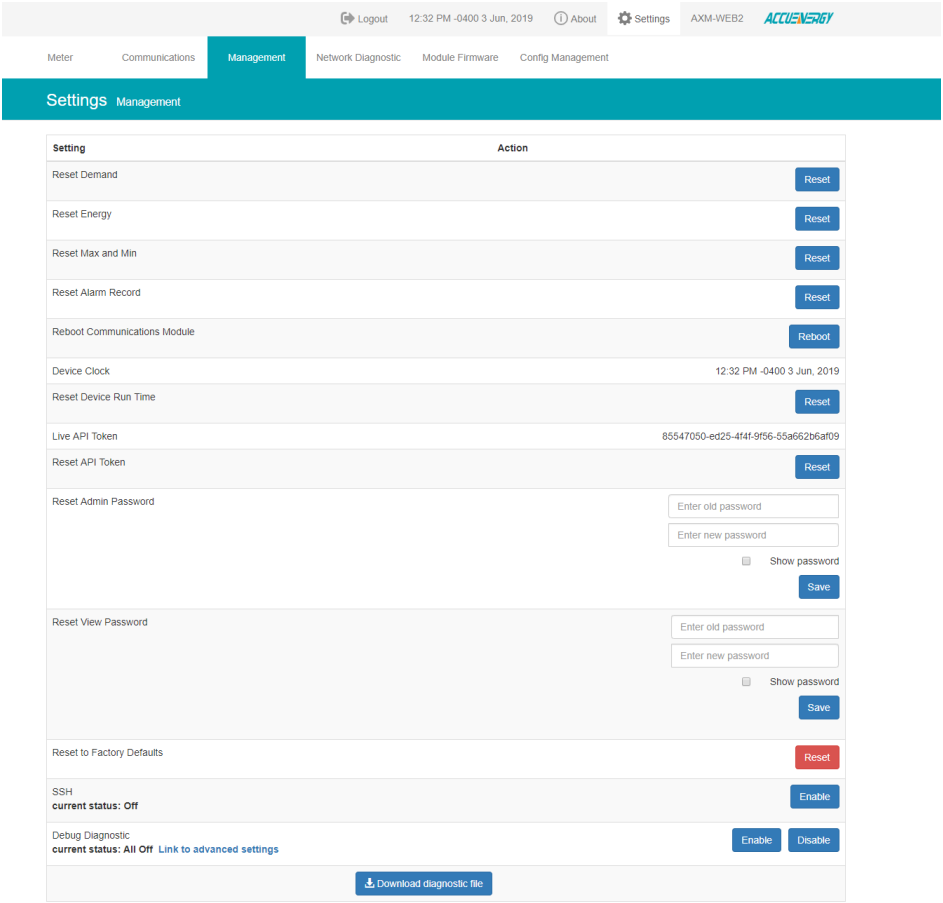
NOTE: *The system performance may be affected by enabling the debug logs.*



5.1.9.7 Diagnostic File

The is a diagnostic file on the WEB2 module that users can download which can be used to analyze the modules diagnostics.

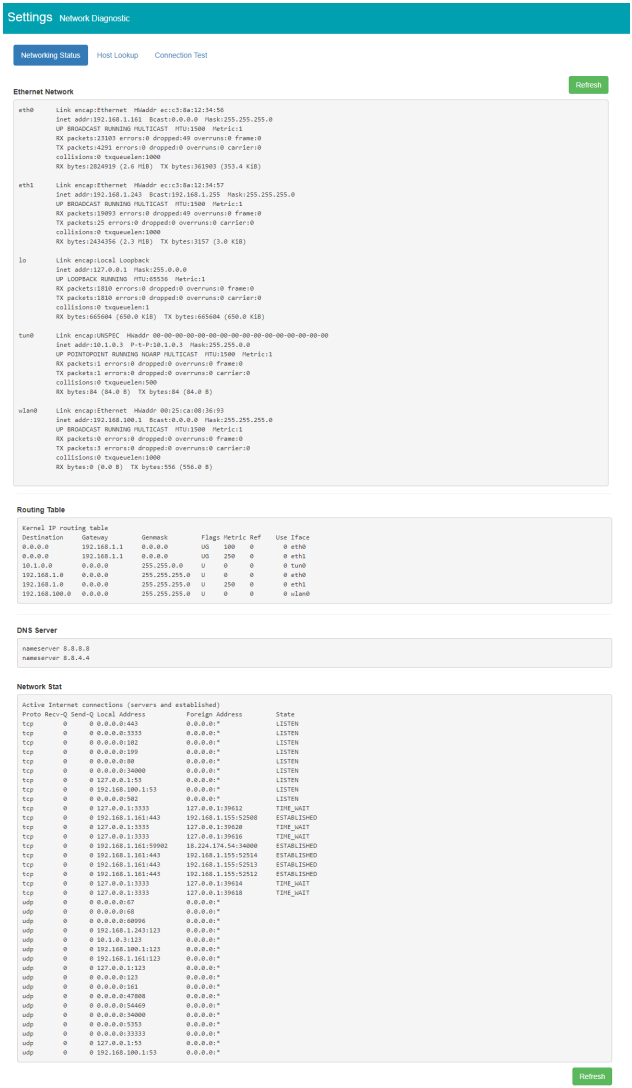
NOTE: *Please send the diagnostic file to ACI Technical Support (techsupport@workaci.com)* for analysis.



5.1.10 Network Diagnostic

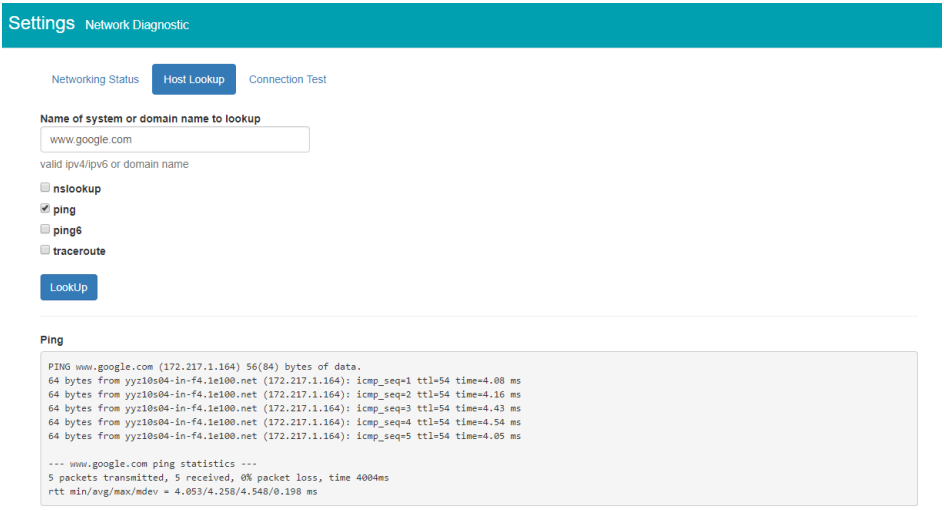
5.1.10.1 Network Status

The Network Diagnostic page can be used to monitor the network status of the module.



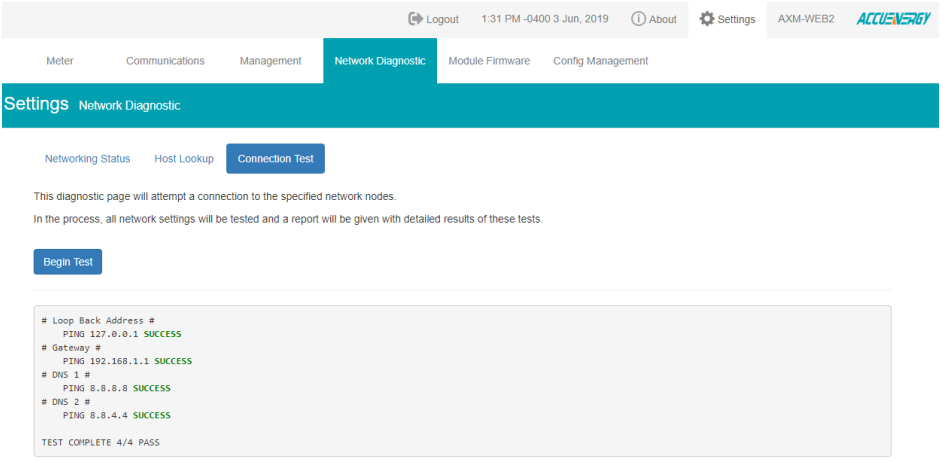
5.1.10.2 Host Lookup

In the **Host Lookup** tab users can utilize the 'ping' function to test the reach-ability to other networks. Users can also use the **ping6** function to ping an IPv6 address.



5.1.10.3 Connection Test

User can also use the Connection Test function to test the local network that the module connected to. The test result will show SUCCESS and PASS if there is no issues found.



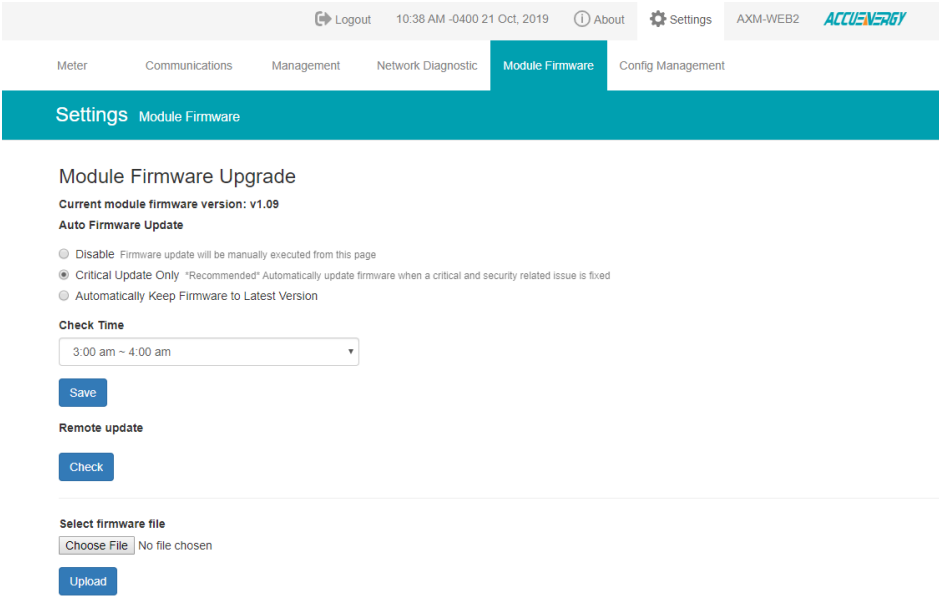
5.1.11 Firmware Update

5.1.11.1 Module Firmware Update

The Module Firmware web page is used for updating the firmware version on the AXM-WEB2 module. The user can check if the module they are using is up to date and update the module if needed using the remoter firmware update. Users can also manually update the firmware by uploading the firmware file. The current version of the firmware will be displayed on the Module firmware update page and can also be viewed on the 'Device Information' page of the web interface.

There is an Auto Firmware Update feature available also, this allows users to update the module automatically without manually going into the web server and performing the update.

NOTE: *Users can also contact ACI Technical Support for latest firmware.*



5.1.11.1.1 Auto Firmware Update

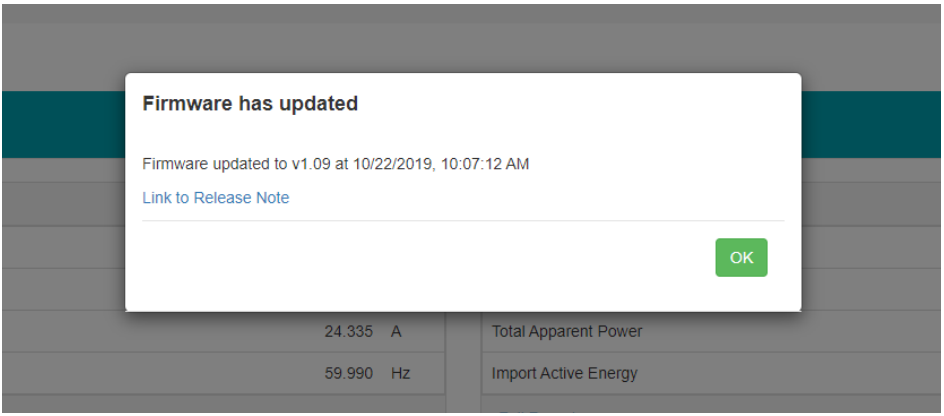
The auto firmware update allows users to select three different updating options.

- Disable - Disables the auto firmware update function
- Critical Update Only - Updates the module to the latest critical firmware
- Automatically keep firmware to Latest - Updates the module to the latest firmware

If users select critical or latest firmware update options, the time for the update can be configured. By default the update time is set for 3am-4am.

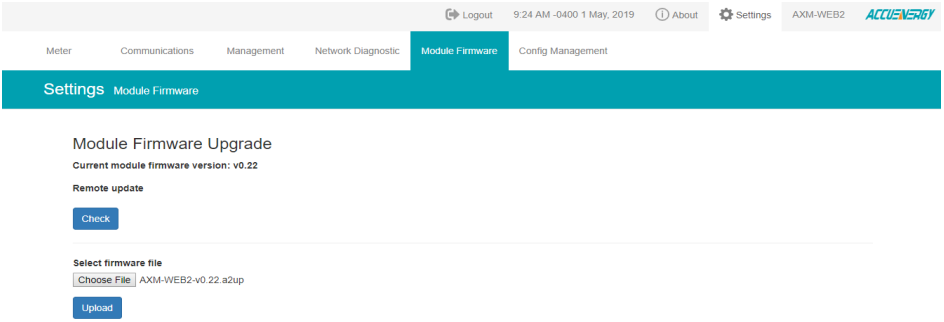
NOTE: *The one hour time block means that the update will occur anytime within the hour.*

After the automatic firmware update, when users log in to the web interface for the first time after the update they will see a message displayed, which shows the time and date the module was updated at as well as the firmware version updated to.

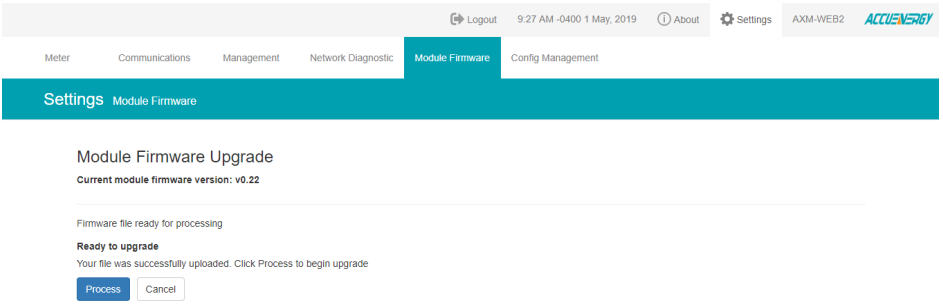


5.1.11.1.2 Manual Update

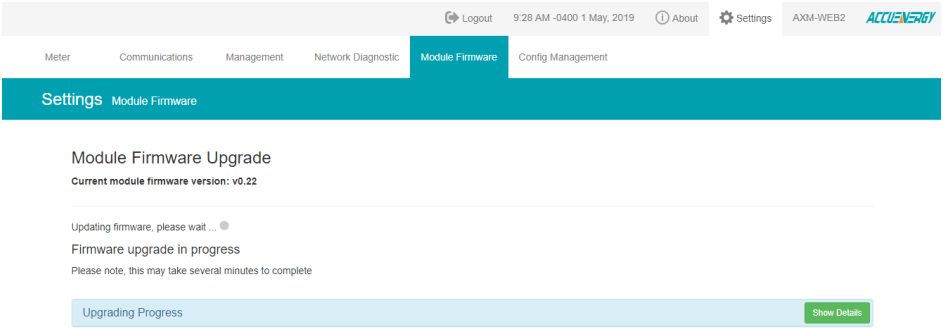
Select and upload the AXM-WEB2 firmware file, it is a .aup file extension.



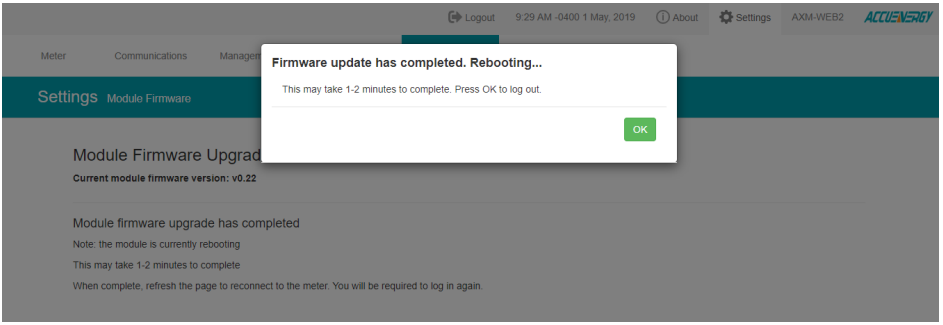
Once the upload was successfully uploaded you will see the following page confirming that the file was uploaded.



Click 'Process' to begin the update.



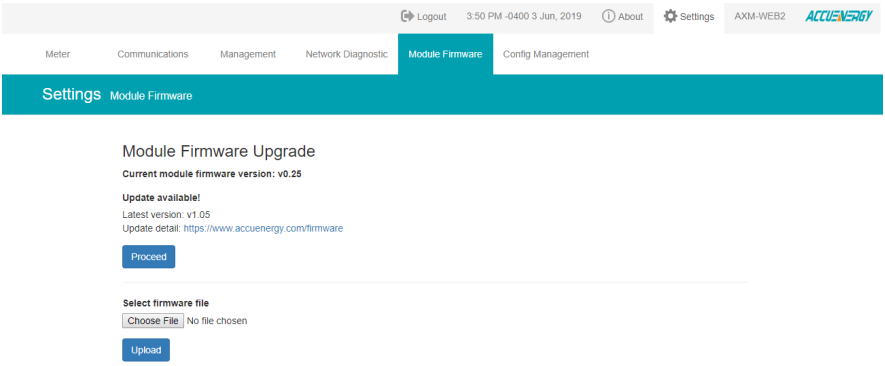
Click 'OK' to log out the web interface and wait for 1-2 minutes to complete the reboot.



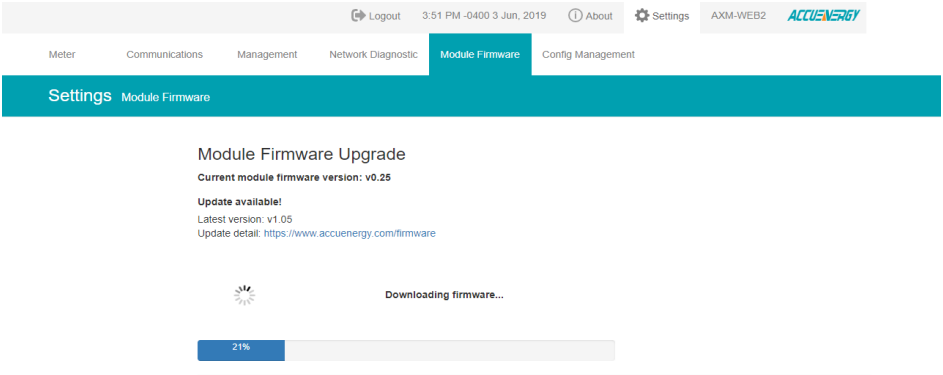
Login to the web interface of AXM-WEB2 after the reboot is complete, and go to the 'About' page to check if the module firmware version is updated.

5.1.11.1.3 Remote Update

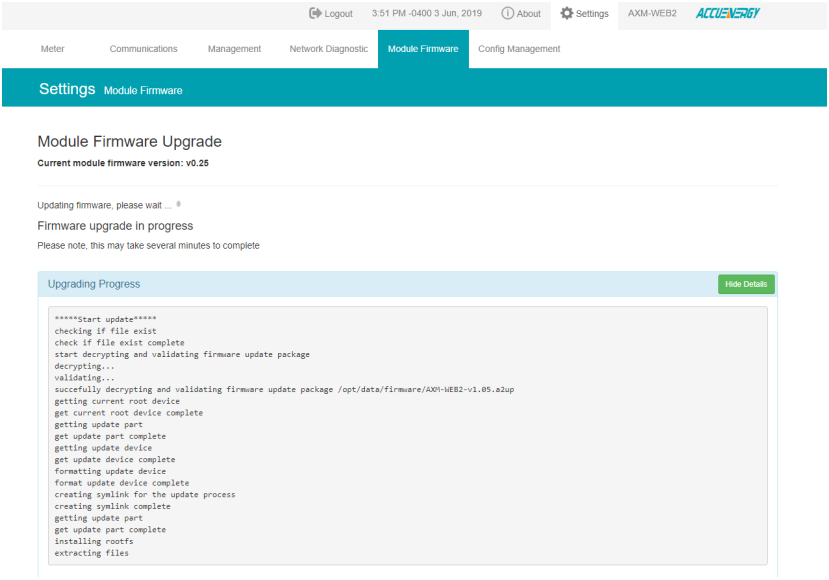
Users can also use the remote firmware server to update the module firmware. Click on 'Check' to verify if there is a firmware update available.



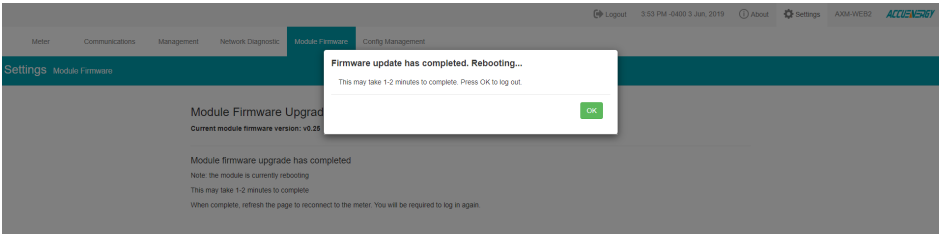
If there is a update available users can proceed to download the firmware.



Once the download is complete the updating process will begin.



When the firmware update is complete, the module will reboot. The rebooting process will take 1-2 minutes to complete.

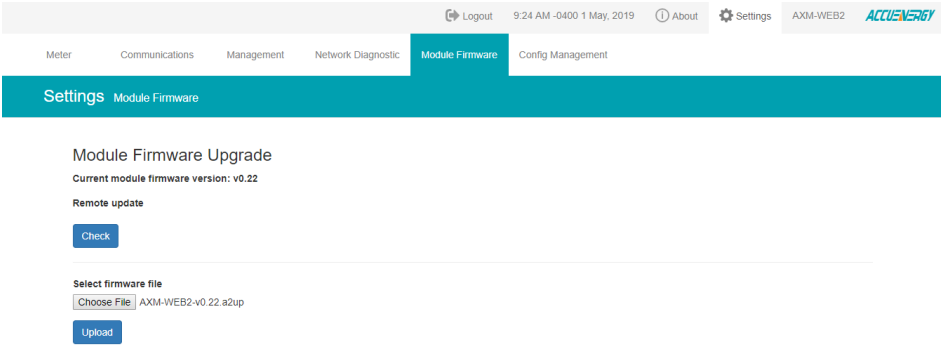


After the module reboots, users will be able to log back into the web interface. When logged in click on the 'About' tab located on the top right corner of the web page to view the 'Device Information' page. From the Device Information page users can ensure that the meter was updated correctly to the right firmware version.

5.1.11.2 Meter Firmware Update

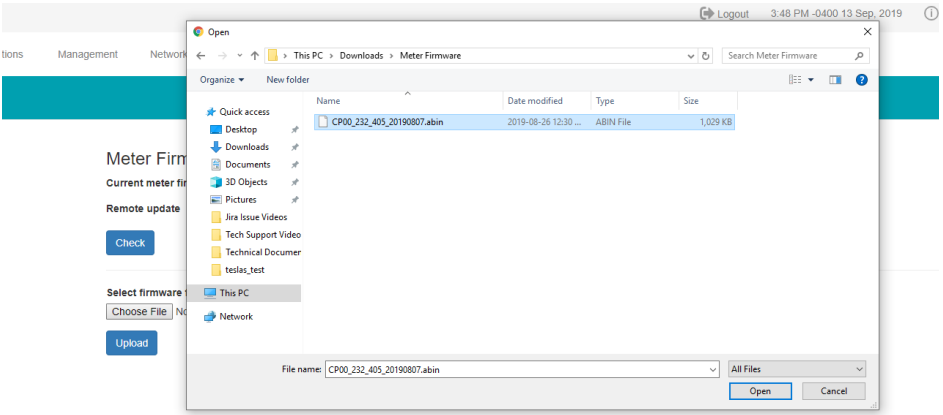
The AXM WEB2 allows users to update the meters firmware from its web server. The meters firmware can be updated manually by uploading the required firmware file or by connecting to our remote firmware server.

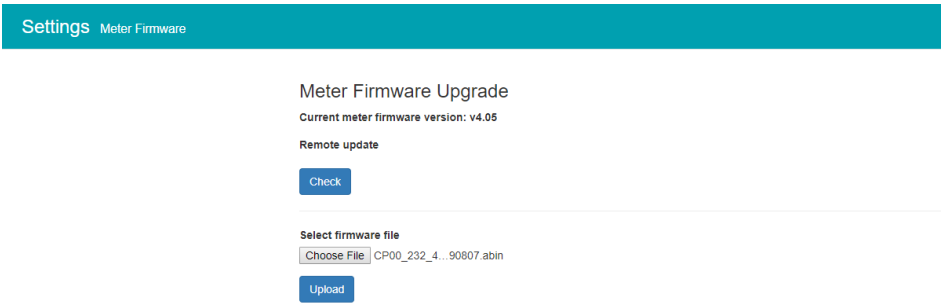
NOTE: *The meter firmware update option is only available on meters that are firmware version 3.69 and above.*



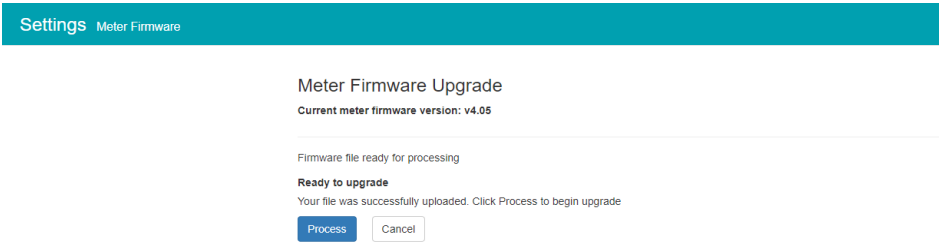
5.1.11.2.1 Manual Update

Users can update the meter firmware manually by loading the firmware file to the web server. Click on 'Choose File' and upload the correct file. All firmware files are .abin type files.

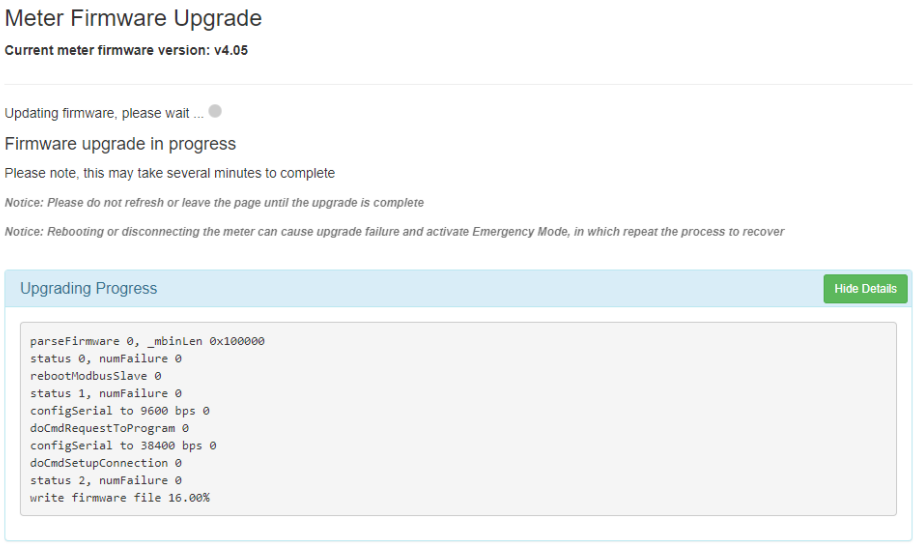




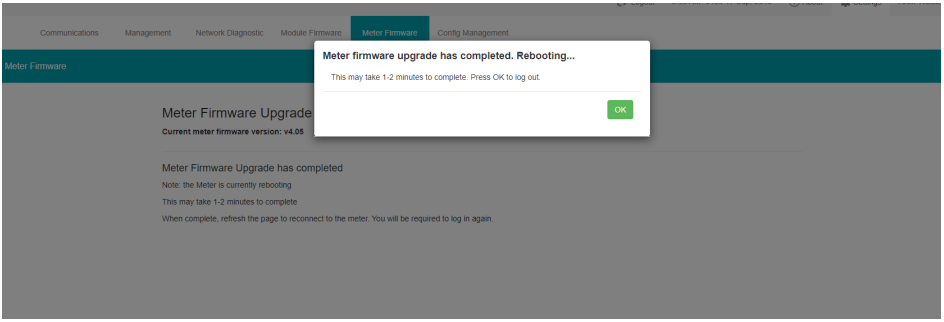
Once the file is selected click on 'Upload'.



After the firmware has uploaded to the web server, click on 'Process'. The firmware update will take approximately 5-10 minutes to complete.



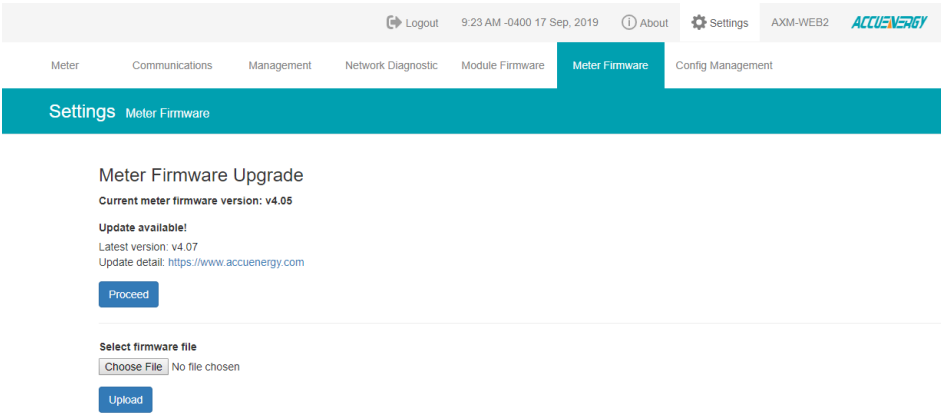
When the firmware update is complete, the module will reboot. The rebooting process will take 1-2 minutes to complete.



After the meter reboots, users will be able to log back into the web interface. When logged in click on the 'About' tab located on the top right corner of the web page to view the 'Device Information' page. From the Device Information page users can ensure that the meter was updated correctly to the right firmware version.

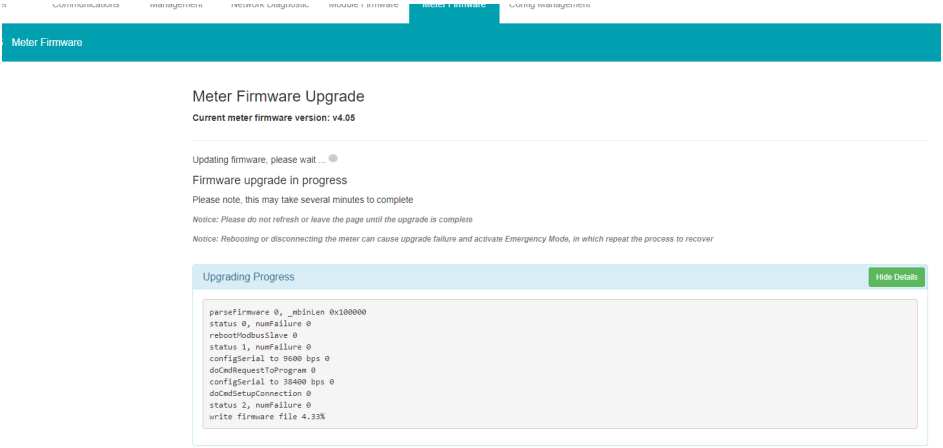
5.1.11.2.2 Remote Update

Users also have the option to use the remote firmware server to update the meters firmware. Click on 'Check' to verify if there is a firmware update available.



If there is a update available users can proceed to download the firmware. Once the download is complete the updating process will begin.

Users can click on 'Show Details' to view the update percentage of the firmware.



When the firmware update is complete, the module will reboot. The rebooting process will take 5-10 minutes to complete.

After the meter reboots, users will be able to log back into the web interface. When logged in click on the 'About' tab located on the top right corner of the web page to view the 'Device Information' page. From the Device Information page users can ensure that the meter was updated correctly to the right firmware version.

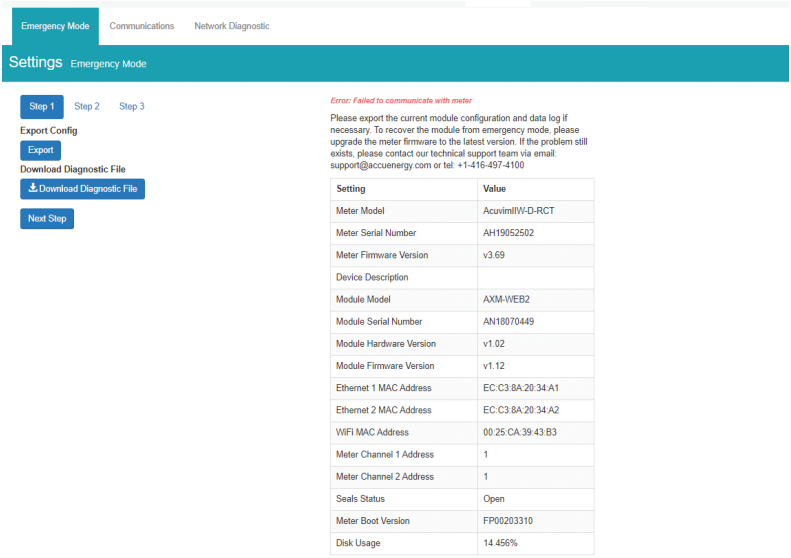
5.1.11.3 Emergency Mode

During the meter firmware update process if the meter loses power or connectivity to the web interface the meter will run in emergency mode. In this mode the next time the user logs into the web interface instead of seeing the dashboard the following screen will be displayed.

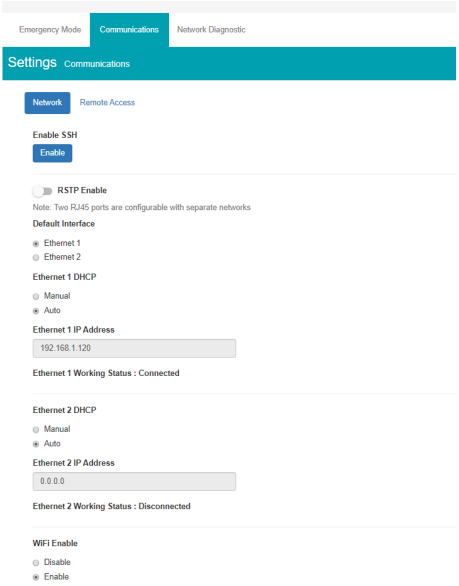
It lets users know that the meter firmware update process has failed and to try updating the meter firmware again. The meter will stay in this mode until the meters firmware has been updated successfully.

Users can update the meters firmware manually or through the remote server while the meter is in Emergency mode. After the update is complete the meter will come out of emergency mode and users will be able to see the web server in its normal mode.

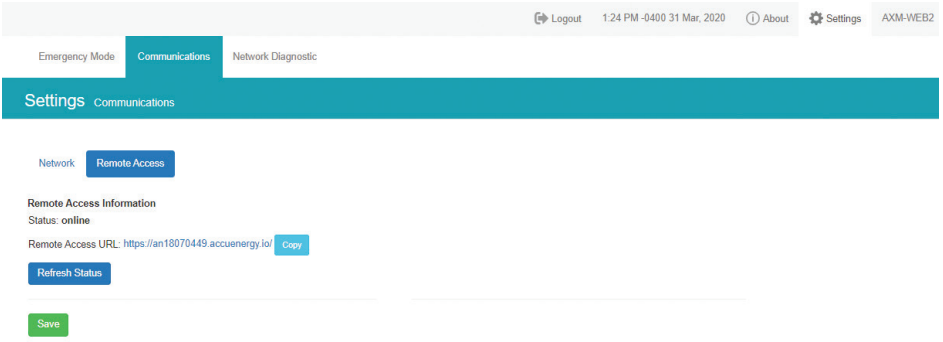
NOTE: *The meter will only go into emergency mode if the Meter firmware update fails, emergency mode is not applicable if the Module firmware update fails.*



While in emergency mode users can still view the meters network settings under the Communications tab. From here all the network related settings can be viewed and configured for the meter.



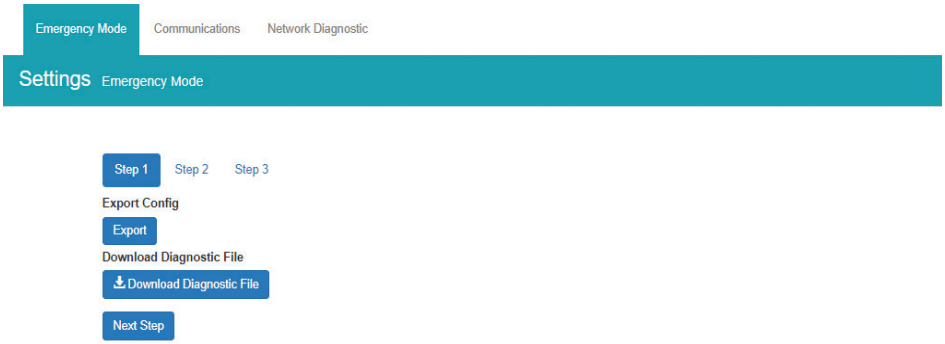
Also in the communications tab users can enable remote access. The meter is still accessible remotely when in emergency mode.



There is a three step process to ensure that users can save all data and meter configuration before completing the update.

Step 1:

In step one of emergency mode users can export the module configuration, this allows users to save all module settings which can be imported to any WEB2 module. Also in the meters diagnostic file can be downloaded, this file will provide detailed analysis of any errors that occur within the AXM-WEB2 module and should be provided to Accuenergy Technical Support for further analysis. Only provide the file if you are experiencing issues with the AXM-WEB2 communications module.

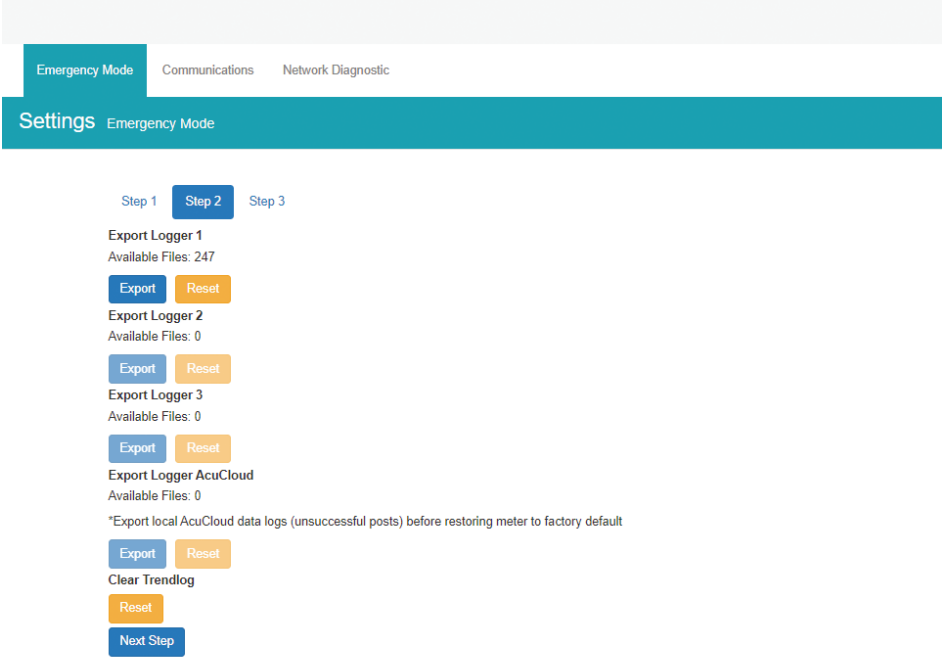


Step 2:

In step two of emergency mode users can export and download data from the data loggers. If all three data loggers have been configured users can export or reset the data on the module. The AcuCloud data can also be exported and deleted from this page, this data will only be deleted from the module and will still be available on the cloud server.

The Clear Trendlog option allows users to reset and delete all existing data on the module.

Users may will find it useful to clear the trend logs and all data logs if the module disk space is full. Users can check the disk usage under the Emergency mode tab in the device information table.



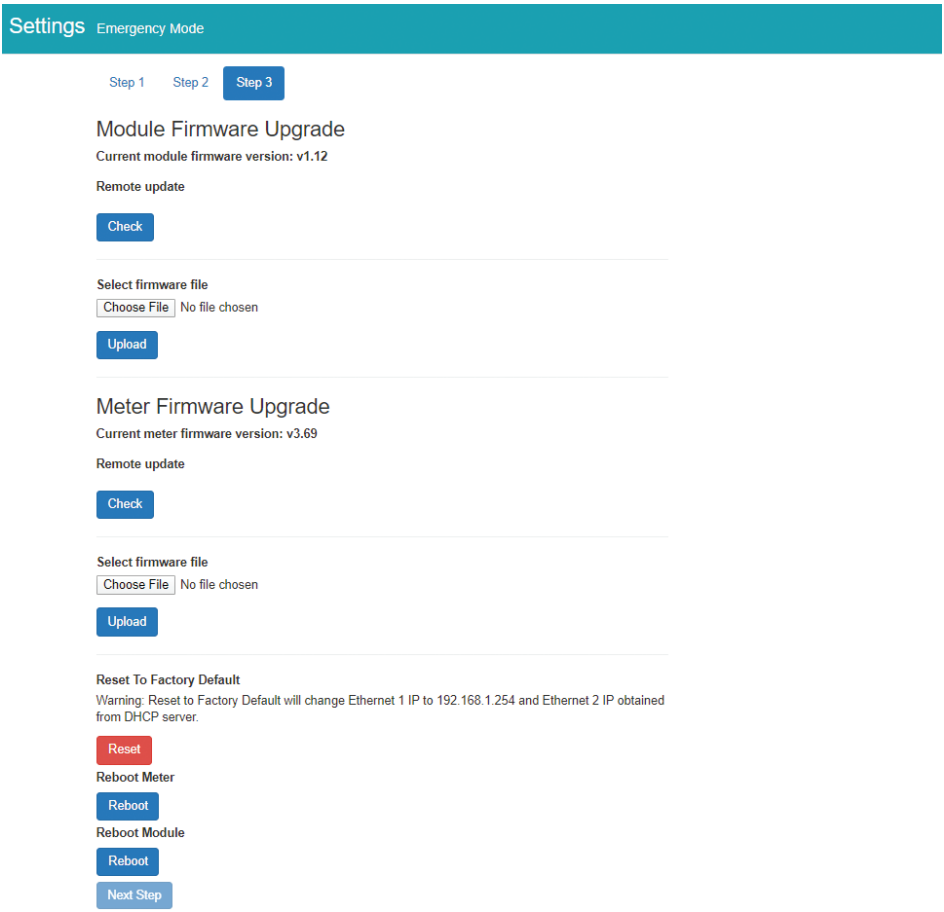
Step 3:

In step three of emergency mode, users can update the module/meter firmware and can also perform soft reboots to both meter/module as well.

Users can reset the entire module back to its factory settings,

NOTE: *When resetting the module back to factory while in emergency mode the meters network settings will go back to its default setting.*

Updating the module firmware while in emergency mode will keep the meter in emergency mode. The only way for the meter to exit emergency mode is to update the meter firmware successfully. The meter firmware can be updated either remotely or by manual upload.


Settings
Emergency Mode
Step 1
Step 2
Step 3
Module Firmware Upgrade
Current module firmware version: v1.12
Remote update
Check
Select firmware file
Choose File
No file chosen
Upload
Meter Firmware Upgrade
Current meter firmware version: v3.69
Remote update
Check
Select firmware file
Choose File
No file chosen
Upload
Reset To Factory Default
Warning: Reset to Factory Default will change Ethernet 1 IP to 192.168.1.254 and Ethernet 2 IP obtained from DHCP server.
Reset
Reboot Meter
Reboot
Reboot Module
Reboot
Next Step

KW320 Series Power Meter

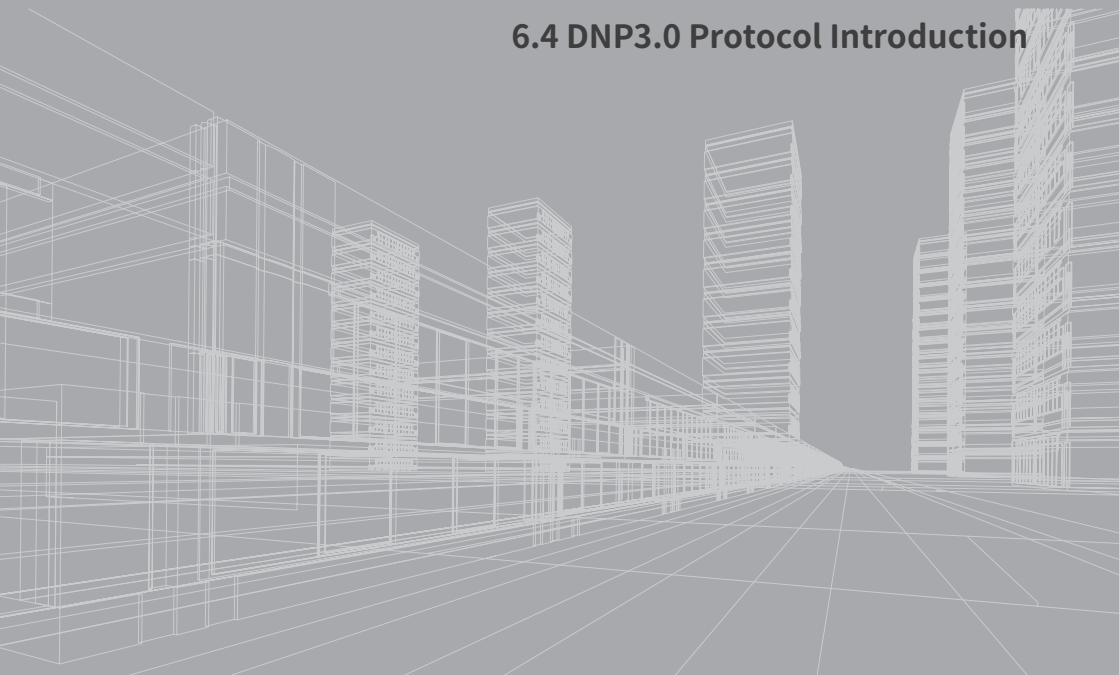
Chapter 6: Communication

6.1 Modbus Protocol Introduction

6.2 Communication Format

6.3 Data Address Table and Application Details

6.4 DNP3.0 Protocol Introduction



This chapter will mainly discuss how to handle the meter via the communication port using software. It is highly recommended that previous chapters be read before moving onto Chapter 5, a familiarity with Modbus would also be helpful.

6.1 Modbus Protocol Introduction

ModbusTM RTU protocol is used for communication in KW320 series meters. Data format and error check methods are defined in Modbus protocol. The half duplex query and respond mode is adopted in Modbus protocol. There is only one master device in the communication network. The others are slave devices, waiting for the query of the master.

Transmission mode

The mode of transmission defines the data structure within a frame and the rules used to transmit data. The mode is defined in the following which is compatible with Modbus RTU Mode*.

Framing

Address	Function	Data	Check
8-Bits	8-Bits	Nx8-Bits	16-Bits

Coding System	8-Bit Binary
Start bit	1
Data bits	8
Parity	no parity, odd parity, even parity
Stop bit	1 or 2
Error checking	CC chek

Address Field

The address field of a message frame contains eight bits. Valid slave device addresses are in the range of 0~247 decimal. A master addresses a slave by placing the slave address in the address field of the message. When the slave sends its response, it places its own address in this address field of the response to let the master know which slave is responding.

Function Field

The function code field of a message frame contains eight bits. Valid codes are in the range of 1~255 decimal. When a message is sent from a master to a slave device the function code field tells the slave what kind of action to perform.

Code	Meaning	Action
01	Read Relay Output Status	Obtain current status of Relay Output

Code	Meaning	Action
02	Read Digital Input (DI) Status	Obtain current status of Digital Input
03	Read Data	Obtain current binary value from one or more registers
05	Control Relay Output	Force relay state to "ON" or "OFF"
16	Press Multiple-Register	Place specific binary values into a series of consecutive Multiple-Registers

Data Field

The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF hexadecimal. The data field of messages sent from a master to slave devices contains additional information which the slave must use to take the action defined by the function code. This can include items such as register addresses, the quantity of items to be handled, and the count of actual data bytes in the field. For example, if the master requests a slave to read a group of holding registers (function code 03), the data field specifies the starting register and how many registers are to be read. If the master writes to a group of registers in the slave (function code 10 hexadecimal), the data field specifies the starting register, how many registers to write, the count of data bytes to follow 234 in the data field, and the data to be written into the registers.

If no error occurs, the data field of a response from a slave to a master contains the data requested. If an error occurs, the field contains an exception code that the master application can use to determine the next action to be taken. The data field can be nonexistent (of zero length) in certain kinds of messages.

Error Check Field

Field Every message includes an error checking field which is based on the Cyclical Redundancy Check (CRC) method. The CRC field checks the contents of the entire message. It is applied regardless of any parity check method used for the individual characters of the message. The CRC field is two bytes long, containing a 16-bit binary value. The CRC value is calculated by the transmitting device, and is appended to the message.

The receiving device recalculates the CRC value during reception of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error will be reported. CRC calculation is first started by preloading the whole 16-bit register to 1's. The process begins by applying successive 8-bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits, and the parity bit, do not apply to the CRC. When generating the CRC, each 8-bit character is exclusive ORed with the register contents. The result is shifted towards the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined, if the LSB equals to 1, the register is

exclusive ORed with a preset, fixed value; if the LSB equals to 0, no action will be taken. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next 8-bit byte is exclusive ORed with the register's current value, and the process repeats for eight more shifts as described above. After all the bytes of the message have been applied,the final contents of the register, which should exchange the high-byte and the low-byte, is the CRC value. When the CRC is appended to the message, the loworder byte is appended first, followed by the high-order byte.

6.2 Communication Format

Explanation of frame

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	CRC 16 HI	CRC 16 LO
06H	03H	00H	00H	00H	21H	84H	65H

The meaning of each abbreviated word is:

Addr: Address of slave device

Fun: Function code

Data start reg HI: Start register address high byte

Data start reg LO: Start register address low byte

Data #of reg HI: Number of register high byte

Data #of reg LO: Number of register low byte

CRC16 HI: CRC high byte

CRC16 LO: CRC low byte

1. Reading Relay Status

Function Code 01

This function code is used to read the status of the relay in the meter.

1=On 0=Off Relay1's address is 0000H,

Relay2's address is 0001H, and so on.

The following query is to read the relay status for the meter with communication address 17.

Query

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	CRC 16 HI	CRC 16 LO
11H	01H	00H	00H	00H	02H	BFH	SBH

Response

The KW320 series meter response includes the meter address, function code, quantity of data byte, the data, and error checking. An example response to read the status of Relay1 and Relay2 is shown as Table 5-5. The status of Relay1 and Relay2 are responding to the last 2 bits of the data.

Relay1: bit0 Relay2: bit1

Address	Function Code	Byte Count	Data	CRC High	CRC Low
11H	01H	01H	02H	D4H	89H

The content of the data is:

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	0
MSB							LSB

Relay1 = PFF (LSB), Relay2 = ON (Left to LSB)

2. Read Status of DI

Function Code 02 1=On 0=Off

DI1's address is 0000H, DI2's address is 0001H, and so on.

The following query is to read the Status of 4 DIs of KW320 series meter with communication address 17.

Query

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	CRC 16 HI	CRC 16 LO
11H	02H	00H	00H	00H	04H	7BH	59H

Response

The KW320 series meter response includes the meter address, function code, quantity of data characters, the actual data characters and error checking. An example response to read the status of 4 DIs are shown in Table 5-7. The DI status corresponds to the last 4 bits of the data.

DI1: bit0; DI2: bit1; DI3: bit2; DI4: bit3.

3. Read Data (Function Code 03)

Query

This function allows the master to obtain the measurement results from the KW320 series meter. Table 6-8 is an example of reading the measured data (F, V1 and V2) from slave device number 17, the data address of F is 4000H, 4001H; V1's address is 4002H, 4003, and V2's address is 4004H, 4005H.

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	CRC 16 HI	CRC 16 LO
11H	03H	40H	00H	00H	06H	D2H	98H

Response

The KW320 series meter response includes the meter address, function code, quantity of data bytes, data, and error checking. An example response to read F, V1 and V2 (F=42480000H (50.00Hz), V1=42C7CCCDH (99.9V), V2=42C83333H (100.1V)) is shown:

Addr	Fun	Byte Count	Data 1 HI	Data 1 LO	Data 2 HI	Data 2 LO	Data 3 HI	Data 3 LO	Data 4 HI	Data 4 LO
11H	3H	0CH	42H	48H	00H	00H	42H	CH	CCH	CDH

Data 5 HI	Data 5 LO	Data 6 HI	Data 6 LO	Data 16 HI	Data 16 LO
42H	C8H	33H	33H	CAH	7FH

4. Control Relay (Function Code 05)

Query

This message forces a relay to either turn "ON" or "OFF". Any relay that exists within the KW320 series meter can be forced to either "ON" or "OFF" status. The data value FF00H will set the relay on and the value 0000H will turn it off; all other values are invalid and will not affect that relay.

The example below is a request to the KW320 series meter with the address of 17 to turn on Relay1.

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	CRC 16 HI	CRC 16 LO
11H	05H	00H	00H	FFH	00H	8EH	AAH

Response

The normal response to the command request is to retransmit the message as received after the relay status has been altered.

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	CRC 16 HI	CRC 16 LO
11H	05H	00H	00H	FFH	00H	8EH	AAH

5. Preset / Reset Multi-Register (Function Code 16)

Query

Function 16 allows the user to modify the contents of a multi-register. Some registers of KW320 series meter can have their contents changed by this message. The example below is a request to an KW320 series meter with the address of 17 to preset Ep_imp as "17807783.3KWh", while its HEX value is 0A9D4089H. Ep_imp data address is 4048H and 4049H.

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	Byte Count
11H	10H	40H	48H	00H	02H	04H

Value HI	Value LO	Value LO	Value LO	CRC HI	CRC LO
0AH	9DH	40H	89H	F1H	6AH

Response

The normal response to a preset multi-register request includes the KW320 series meter address, function code, data start register, the number of registers, and error checking.

Addr	Fun	Data start reg HI	Data start reg LO	Data # of regs HI	Data # of regs LO	CRC 16 HI	CRC 16 LO
11H	10H	40H	48H	00H	02H	D6H	8EH

6.3 Data Address Table and Application Details

There are several rules to follow in using the meter:

1. Data type:

“bit” refers to binary.

“word” refers to 16-bit unsigned integer using one data address and 2 bytes of memory, it varies from 0 to 65535.

“int” refers to 16-bit integer using one data address and 2 bytes of memory, it varies from -32768 to32767.

“dword” refers to 32-bit unsigned integer using two data addresses and 4 bytes of memory with high word at the front and low word at the end, it varies from 0 to 4294967295. Rx=high word *65536+low word.

“float” refers to 32-bit single value using two data addresses and 4 bytes of memory, it varies from -1.175494E-38 to 3.402823E+38.

2. Relationship between communication value and numerical value.

It is important to note, the numerical value may not be the same as the communication value. The following table shows how they respond to each other.

Note: In current channel, CT are optional, which include voltage type CT or current type CT.

1) When current type CT is selected and the value of CT2 is 1 or 5, and using relationship listed below to count primary value, the value of CT2 should be original 1 or 5.

2) When voltage type CT is selected and the value of CT2 is 333, and using relationship listed below to count primary value, the value of CT2 should not be 333, but 1.

3) When you select 100mv/50Hz, or 120mv/60Hz Rope-CT, the value of CT2 is 100, and using relationship listed below to count primary value, the value of CT2 should not be 100,but 1;

4) When you select 80/100/200 mA CT,the value of CT2 is 80, 100 or 200, and using relationship listed below to count primary value,the value of CT2 should not be 80, 100 or 200, but 1.

Parameters	Relationship	Unit	Format Code
System parameter	Numerical value equals to communication value	No unit	F1
Run time	T=Rx/100	Hour	F2
Clock	Numerical value equals to communication value	Unite of time	F3
Energy (primary)	Ep=Rx/10	kWh	F4
Reactive energy (primary)	Ep=Rx/10	kvarh	F5
Apparent energy (primary)	Ep=Rx/10	kVA	F6
Energy (secondary)	Ep=Rx/1000	kWh	F7

Parameters	Relationship	Unit	Format Code
Reactive energy (secondary)	Ep=Rx/1000	kvarh	F8
Apparent energy (secondary)	Ep=Rx/1000	kVA	F9
Frequency	Ep=Rx/100	Hz	F10
Voltage	U=Rx X(PT1/PT2)/10	V	F11
Current, current demand	I=Rx X(CT1/CT2)/1000	A	F12
Power, demand	P=Rx X(PT1/PT2)X(CT1/CT2)	W	F13
Reactive power, demand	Q=Rx X(PT1/PT2)X(CT1/CT2)	Var	F14
Apparent power, demand	S=Rx X(PT1/PT2)X(CT1/CT2)	VA	F15
Power factor	PF=Rx/1000	No unit	F16
Unbalance factor	Unbl=(Rx/1000)x100%	No unit	F17
THD	THD=(Rx/10000)x100%	No unit	F18
Harmonics	HDn=(Rx/10000)x100%	No unit	F19
Total odd HD	HDo=(Rx/10000)x100%	No unit	F20
Total even HD	HDe=(Rx/10000)x100%	No unit	F21
Crest factor	CF=Rx/1000	No unit	F22
K factor	KR=Rx/10	No unit	F23
THFF	THFF=(Rx/10000)x100%	No unit	F24
Phase angle	Phase angle=Rx/10	Degree	F25

Important Note: Regions from “System parameters settings” to “Data logging 3 settings” are the regions that can be set and modified. Please follow these guidelines when communicating with the meter.

1. When function code 10H is used, one communication command can only modify contents in one region, such as “System parameters settings”,” System status parameter”, “Date and Time table”, “Over/under limit alarming-Global settings”, “Over/under limit alarming-Single settings”, “I/O Modules settings”, Data logging 1 settings, Data logging 2 settings, Data logging 3 settings. It cannot be accomplished in one communication order to modify contents in both of two or more regions above.

2. When function code 03H is used, the rules and limitations described above will not be applied.

6.3.1 System Parameter Setting

System parameters determine how the meter works. Please refer to Chapter 3 and Chapter 4 for more details.

Function code: 03H for reading, 10H for writing. Data type: word. Format code: F1.

Address	Parameters	Default	Range	Data Type	Property
0FFDH	Frequency	0	0:50Hz | 1:60Hz | 2:400Hz	Word	R/W
0FFEH	First communication Protocol	0	0: MODBUS Protocol | 1:DNP3.0 Protocol	Word	R/W
0FFFH	Parity Setting 1	3	0:EVEN | 1:ODD | 2:NON2 | 3:NON1	Word	R/W
1000H	Password	0	0~9999	Word	R/W
1001H	Communication address	1	1~247 (MODBUS) | 0~65534 (DNP3.0)	Word	R/W
1002H	Baud rate	19200	1200~38400	Word	R/W
1003H	Voltage input wiring type	0	0:3LN | 1:2LN | 2:2LL | 3:3LL | 4:4LL	Word	R/W
1004H	Current inpit wiring type	0	0:3CT | 1:1CT | 2:2CT	Word	R/W
1005H	PT1 (High 16 bit)	0	50.0~500000.0	Word	R/W
1006H	PT1 (Low 16 bit)	220.0	50.0~500000.0	Word	R/W
1007H	PT2	5	50.0~400.0	Word	R/W
1008H	CT1	5	1~50000	Word	R/W
1009H	CT2	1	1, 5, 333, 80, 100, 200	Word	R/W
100AH	kWh pulse constant	1	1~60000 (setting method, see Remarks)	Word	R/W
100BH	kvarh pulse constant	1	1~60000 (setting method, see Remarks)	Word	R/W
100CH	LCD backlight time	1	0~120	Word	R/W
100DH	Demand slid window time	15	1~30	Word	R/W
100EH	Demand calculation mode	1	1: sliding window | 2: thermal	Word	R/W
100FH	Clear demand memory	0	Only 1 works	Word	R/W
1010H	Max/Min clear	55H	Only 0AH works	Word	R/W
1011H	Run time clear	0	Only 1 works	Word	R/W
1012H	Current I1 direciton	0	0: Positive | 1: Negative	Word	R/W

Address	Parameters	Default	Range	Data Type	Property
1013H	Current I2 direction	0	0: Positive | 1: Negative	Word	R/W
1014H	Current I3 durection	0	0: Positive | 1: Negative	Word	R/W
1015H	VAR/PF convention	0	0: IEC | 1: IEEE	Word	R/W
1016H	Energy clear	0	Only 1 works	Word	R/W
1017H	Energy calculating mode	1	0: fundamental | 1: full-wave	Word	R/W
1018H	Reactive power measuring mode	0	0: real | 1: general	Word	R/W
1019H	Energy display mode	0	0: primary | 1: secondary	Word	R/W
101AH	Ethernet module reset	0	0: none | 1: reset | 2: load default and reset	Word	R/W
101BH	SOE enable	0	0: none | 1: AXM-IO11 | 2: AXM-IO21 | 3: AXM-IO31 | 4: AXM-IO12 | 5: AXM-IO22 | 6: AXM-IO32	Word	R/W
101CH	Pulse counter clear	0	0: none | 1: AXM-IO11 | 2: AXM-IO21 | 3: AXM-IO31 | 4: AXM-IO12 | 5: AXM-IO22 | 6: AXM-IO32	Word	R/W
101DH	Basic parameter mode	0	0: secondary | 1: primary	Word	R/W

Note:

1. When 0FFEH is 0, first communication protocol is set to MODBUS, while 0FFEH is 1, first communication protocol is DNP3.0. At this time, special DNP3.0 software is needed, and normal software will be invalid.

2. 100AH, 100BH setting method:1000 * 3600 / (U * I * n * pulse constant) = pulse period (S), pulse period calculated by the pulse constant must be greater than the pulse width (20ms ~ 1000ms) of IO module DO setting, wherein n is applied with the user, and if the three-phase signals are added, then n is 3. U and I generally equal to user settings PT2, CT2, ie, rated voltage and tated current. 3)0x1017H: When selecting 400Hz type, only support full-wave.

6.3.2 System Status Parameters

"System status" indicates what events happened in the meter, what kinds of flags are read by user and the index of the storage of events. Flags should be cleared after being read by the controller, otherwise new data will not be stored properly.

Function code: 03H for reading, 10H for writing. Data type: word.

Address	Parameters	Format Code	Range	Data Type	Property
101EH	Sealed Nonstandard Parameters		Bit0: 1st communication parameters | Bit1: 2nd communication parameters | Bit2: run time clear | Bit3 DI pulse count | 0: invalid	Word	R/W
101FH	Seal status		0x0A: clear | other: not clear	Word	R/W
1020H	Reserved			Word	R/W
1021H	Alarm record clear		0x0A: clear | other: not clear	Word	R/W
1022H~ 102DH	Reserved			Word	R/W
102EH	System status		Bit0: new alarming or not | Bit1: new SOE or not	Word	R/W
102FH	Baud rate 2	38400	4800~38400	Word	R/W
1030H	Parity Setting 2		0: EVEN | 1: odd | 2: NON2 | 3: NON1	Word	R/W
1031H	Communication address 2		1~247	Word	R/W
1032H	Alarming number	F1	0: no alarming record | 1~16: last alarming record group number	Word	R/W
1033H	SOE group number	F1	0: no SOE record | 1~20: last SOE group number	Word	R/W
1034H	Run time (high)	F2	0~999999999	Word	R/W
1035H	Run time (low)	F2	0~999999999	Word	R/W
1036H	Expanded IO Modules connecting status		Bit0: AXM-IO11 | Bit1: AXM-IO12 | Bit2: AXM-IO21 | Bit3: AXM-IO22 | Bit4: AXM-IO31 | Bit5: AXM-IO32 | 0: disconnected | 1: connected |	Word	R/W
1037H	Reserved			Word	R/W

Address	Parameters	Format Code	Range	Data Type	Property
1038H	2nd communication selection		2: Mesh | 1:BACnet Protocol | 0: Other Protocol	Word	R/W
1039H	Ten years download setting enable		1: enable is valid	Word	R/W
103AH	Fee of sharp demand clear		0x0A: clear | Other: not clear	Word	R/W
103BH	Fee of peak demand clear		0x0A: clear | Other: not clear	Word	R/W
103CH	Fee of valley demand clear		0x0A: clear | Other: not clear	Word	R/W
103DH	Fee of normal demand clear		0x0A: clear | Other: not clear	Word	R/W
103EH	Total fee of demand clear		0x0A: clear | Other: not clear	Word	R/W

Note:

1. Please refer to Chapter 3 and Chapter 4 for more details about parameter settings.
2. When 1038H is 2, second communication is set to MESH, you should set 9600bps and NON1 for the second communication. When 1038H is 1, second communication protocol is set to BACnet protocol, while second communication should select BACnet module. When 1038H is 0, second communication protocol is set to other protocols, while second communication should select second RS-485 module, PROFIBUS module or Ethernet module. If selected protocol doesn't match attached module, communication can not process. If you use Ethernet or PROFIBUS module, you should set 38400 bps and NON1 for the second communication. When Ethernet or Profibus module will connect normally, user can't change the protocol, baud and parity.

6.3.3 Date and Time Table

Function code: 03H for reading, 10H for pre-setting.

Address	Parameters	Format Code	Range	Data Type	Property
103FH	Week	F3	0~6	Word	R/W
1040H	Year	F3	2000~2099	Word	R/W
1041H	Month	F3	1~12	Word	R/W
1042H	Day	F3	1~31	Word	R/W
1043H	Hour	F3	0~23	Word	R/W
1044H	Minute	F3	0~59	Word	R/W
1045H	Second	F3	0~59	Word	R/W

6.3.4 Over/Under Limit Alarming Setting

This setting consists of global alarm settings and single channel alarm settings. Global alarm settings contain settings of all global variables. There are 16 groups of records with the same format. Function code: 03H for reading, 10H for writing. Please refer to Chapter 4 for more details.

Global Alarming Settings

Address	Parameters	Range	Data Type	Property
1046H	Global alarming enable	0: disable | 1: enable	Word	R/W
1047H	Alarming flash enable	0: disable | 1: enable	Word	R/W
1048H	Alarming channel enable setting	0~65535 Bit0: channel 1 | 1: enable | 0: disable | Bit1: cahnnel 2 ..... Bit15: channel 16	Word	R/W
1049H	Logic "And" between alarming setting	0~255 | Bit0: first logic switch | 1: enable | 0: disable | Bit1: second logic switch ..... Bit7: eigth logic switch	Word	R/W
104AH	Alarming output to DO1 setting	0~65535 Bit0: channel 1 | 1: enable | 0: disable | Bit1: cahnnel 2 ..... Bit15: channel 16	Word	R/W
104BH	Alarming output to DO2 setting	0~65535 The same as previous	Word	R/W
104CH	Alarming output to DO3 setting	0~65535 The same as previous	Word	R/W
104DH	Alarming output to DO4 setting	0~65535 The same as previous	Word	R/W

Single Channel Alarming Settings

Address	Parameters	Format Code	Range	Data Type	Property
104EH	First group: parameter code	F1	0~79	Word	R/W
104FH	First group: comparison mode	F1	1: greater than | 2: equal to | 3: less than	Word	R/W
1050H	First group: setpoint value	F10~ F18	Related with parameters	Word	R/W
1051H	First group: delay	F1	0~3000(*10ms)	Word	R/W
1052H	First group: output to relay	F1	0: none | 1~8: related relay	Word	R/W
1053~ 109DH	2nd to 16th group		Same as the first group	Word	R/W

Alarming Parameter Code Table

Setting Value	Alarming Object	Setting Value	Alarming Object	Setting Value	Alarming Object
0	Frequency	1	Va	2	Vb
3	Vc	4	Average phase voltage	5	Uab
6	Ubc	7	Uca	8	Average line voltage
9	current of phase A	10	current of phase B	11	current of phase C
12	Average current	13	Neutral current	14	Power of phase A
15	Power of phase B	16	Power of phase C	17	Power of all
18	Reactive power of phase A	19	Reactive power of phase B	20	Reactive power of phase B
21	Reactive power of all	22	Apparent power of phase A	23	Apparent power of phase B
24	Apparent power of phace C	25	Apparent power of all	26	PF of A
27	PF of B	28	PF of C	29	PF
30	Voltage unbalance factor U_unbl	31	Current unbalance factor I_unb	32	Load characteristic (R/L/C)
33	THD_V1 (V1 or V12)	34	THD_V2 (V2 or V31)	35	THD_V3 (V3 or V23)
36	Average THD_V	37	THD_I1	38	THD_I2
39	THD_I3	40	Average THD_I	41	AI1 sampling value
42	AI2 sampling value	43	AI3 sampling value	44	AI4 sampling value
45	Active power demand of all	46	Reactive power demand of all	47	Apparent power demand of all
48	Current demand of phase A	49	Current demand of phase B	50	Current demand of phase C
51	Reversed phase sequence	52~79	DI1~DI28t		

Note:

1. When reversed phase sequence (51) is selected, whether the value of comparison mode or setpoint value is set or not doesn't affect alarm result and angle of Ub to Ua will be recorded.

2. When DI (52~79) is selected, whether the value of comparison mode is set or not doesn't affect alarm result and as long as setpoint value is set to 1, 2 or 3.

   1 stands for DI alarm is from OFF to ON, and recovery is from ON to OFF.

   2 stands for DI alarm is from ON to OFF, and recovery is from OFF to ON.

   3 stands for DI alarm from ON to OFF, and recovery is from OFF to ON, and present DI status is recorded.

6.3.5 I/O Modules Settings

I/O module setting changes will be made only if the corresponding I/O modules are installed, no changes will be made otherwise. Please check the I/O module connection status before doing any settings. Function code: 03H for reading, 10H for writing. Please refer to Chapter 5 Extended Modules for more details.

AXM-IO11

Address	Parameters	Default	Range	Data Type	Property
109EH	DI1~6 type	0	Bit0: DI1 | Bit1: DI2 | Bit2:DI3 | Bit3: DI4 | Bit4: DI5 | Bit6: DI6 | 0: DI | 1: pulse counter	Word	R/W
109FH	DI pulse constant	0	1~65535	Word	R/W
10A0H	Working mode of relay 1 and 2	0	0: control output | 1: alarming output	Word	R/W
10A1H	Output mode of relay 1 and 2	0	0: latch | 1: pulse	Word	R/W
10A2H	Pulse width	50	50~3000ms	Word	R/W
10A3H	DI11~14 type	0	Bit0: DI7 | Bit1: DI8 | Bit2: DI9 | Bit3: DI10| 0: DI | 1: pulse counter	Word	R/W
10A4H	DI pulse constant	0	1~65535	Word	R/W
10A5H	Working mode of relay 3 and 4	0	0: pulse output | 1: alarming output	Word	R/W
10A6H	Output mode of relay 3 and 4	0	20~1000ms	Word	R/W
10A7H	Pulse width	50	0: none | 1: consumption power | 2: generating power | 3: absorption reactive power | 4: generating reactive power	Word	R/W
10A8H	AI1, 2 type	1 or 2	Same as above	Word	R/W
10A9H	Pulse width	50	0: 0~20mA | 1: 4~20mA | 2: 0~5V | 3: 1~5V	Word	R/W

AXM-IO31

Address	Parameters	Default	Range	Data Type	Property
10AAH	DI11~14 type	0	Bit0: DI11 | Bit1: DI12 | Bit2: DI13 | Bit3: DI14 | 0: DI | 1: pulse counter	Word	R/W
10ABH	DI pulse constant	0	1~65535	Word	R/W
10ACH	Working mode of relay 3 and 4	0	0: control output | 1: alarming output	Word	R/W
10ADH	Output mode of relay 3 and 4	0	0: latch | 1: pulse	Word	R/W
10AEH	Pulse width	50	50~3000ms	Word	R/W
10AFH	AI1, 2 type	1 or 2	0: 0~20mA | 1: 4~20mA | 2: 0~5V | 3: 1~5V	Word	R/W
10B0H	DI15~20 type	0	Bit0: DI15 | Bit1: DI16 | Bit2: DI17 | Bit3: DI18 | Bit4: DI19 | Bit5: DI20 | 0: DI | 1: pulse counter	Word	R/W
10B1H	DI pulse constant (high)	0	1~65535	Word	R/W
10B2H	Working mode of relay 5 and 6	0	0: control output | 1: alarming output	Word	R/W
10B3H	Output mode of relay 5 and 6	0	0: latch | 1: pulse	Word	R/W
10B4H	Pulse width	50	50~3000ms	Word	R/W

AXM-IO22

Address	Parameters	Default	Range	Data Type	Property
10B5H	DI21~24 type	0	Bit0: DI21 | Bit1: DI22 | Bit2: DI23 | Bit3: DI24 | 0: DI | 1: pulse counter	Word	R/W
10B6H	DI pulse constant	0	1~65535	Word	R/W
10B7H	Working mode of DO3, 4	0	0: pulse output | 1: alarming output	Word	R/W
10B8H	DO pulse width	20	20~1000ms	Word	R/W
10B9H	DO3 output	0	0: none | 1: consumption power 2: gererating | power 3: absorption reactive | power 4: generating reactive power	Word	R/W
10BAH	DO4 output	0	Same as above	Word	R/W
10BBH	AO3, 4 type	1 or 2	0: 0~20mA | 1: 4~20mA, 2: 0~5V | 3: 1~5V	Word	R/W

AXM-IO32

Address	Parameters	Default	Range	Data Type	Property
10BCH	DI25~28 type	0	Bit0: DI25 | Bit1: DI26 | Bit2: DI27 | Bit3: DI28 | 0: DI | 1: pulse counter	Word	R/W
10BDH	DI pulse constant	0	1~66535	Word	R/W
10BEH	Working mode of relay 7 and 8	0	0: control output | 1: alarming output	Word	R/W
10BFH	Output mode of relay 7 and 8	0	0: latch | 1: pulse	Word	R/W
10C0H	Pulse width	50	50~3000	Word	R/W
10C1H	AI3, 4 type	0 or 2	0: 0~20mA | 1: 4~20mA | 2: 0~5V | 3: 1~5V	Word	R/W

AO Transforming Select

Address	Parameters	Default	Range	Data Type	Property
10C2H	AO1 transforming parameter	0	Refer to following table	Word	R/W
10C3H	AO2 transforming parameter	0	Refer to following table	Word	R/W
10C4H	AO3 transforming parameter	0	Refer to following table	Word	R/W
10C5H	AO4 transforming parameter	0	Refer to following table	Word	R/W

AO Transforming Parameter Settings

Setting Value	Transforming Object	Setting Value	Transforming Object	Setting Value	Transforming Object
0	Frequency	1	Va	2	Vb
3	Vc	4	Average phase voltage	5	Uab
6	Ubc	7	Uca	8	Average line voltage
9	Current of phase A	10	Current of phase B	11	Current of phase C
12	Average current	13	Neutral current	14	Power of phase A
15	Power of phase B	16	Power of phase C	17	Power of all
18	Reactive power of A	19	Reactive power of B	20	Reactive power of C
21	Reactive power of all	22	Apparent power of phase A	23	Apparent power of phase B

Setting Value	Transforming Object	Setting Value	Transforming Object	Setting Value	Transforming Object
24	Apparent power of phase C	25	Apparent power of all	26	PF of A
27	PF of B	28	PF of C	29	PF

Address	Parameters	Default	Range	Data Type	Property
10D0H	AO1 Gradient Number Selection of input/ output transfer curve	1	1: 1 Gradient | 2: 2 Gradient | 3: 3 Gradient	INT	R/W
10D1H	AO1 following value range setting start point		Please see Note	INT	R/W
10D2H	AO1 following value range setting point 2			INT	R/W
10D3H	AO1 following value rance setting point 3			INT	R/W
10D4H	AO1 following value range setting end point			INT	R/W
10D5H	AO1 output range setting start point		Ao typw of 0~24A or 0~6: 0~4915 AO type of 4~24A or 1~6: 819~4915	INT	R/W
10D6H	AO1 output range setting point 2			INT	R/W
10D7H	AO1 output range setting point 3			INT	R/W
10D8H	AO1 output range setting end point			INT	R/W
109H-10E1H	AO2 Gradient Setting (same as AO1)		same as AO1	INT	R/W
10E2H-10EAH	AO3 Gradient Setting (same as AO1)		same as AO1	INT	R/W
10EBH-10F3H	AO4 Gradient Setting (same as AO1)		same as AO1	INT	R/W

Note:

1. AO Gradient Number Selection of input/output transfer curve:

When number is 1, only AO following value range setting start point, AO following value range setting end point, AO1 output range setting start point and AO1 output range setting end point should be set. When number is 2, only AO following value range setting start point, AO1 following value range setting point 2, AO following value range setting end point,

AO1 output range setting start point, AO1 output range setting point 2 and AO1 output range setting end point should be set.

When number is 3, only AO following value range setting start point, AO1 following value range setting point 2, AO1 following value range setting point 3 and AO following value range setting end point should be set. At the same time, AO1 output range setting start point, AO1 output range setting point 2, AO1 output range setting point 3 and AO1 output range setting end point should be set.

2. Following value range setting:

AO following value range setting start point, AO1 following value range setting point 2, AO1 following value range setting point 3 and AO following value range setting end point are increasing value, while they should be within range of AO following value. Otherwise, the function of AO will be affected.

Frequency: When selecting 50Hz or 60Hz type, frequency range is 45Hz ~ 65Hz,real setting value is 4500 ~ 6500;

When selecting 400Hz type, frequency range is 300Hz ~ 500Hz,real setting value is 30000~50000.

Phase voltage V1, V2, V3 and average phase voltage: 0~480V, real setting value is 0~4800.

Line voltage V12, V23, V31 and average line voltage: 0~831V, real setting value is 0~8310.

Current I1, I2, I3 and average current: 0~10A, real setting value is 0~10000.

Power Pa, Pb and Pc: -4800~4800W, real setting value is -4800~4800.

System power: -14400~14400W, real setting value is -14400~14400.

Reactive power Qa, Qb and Qc: -4800~4800 Var, real setting value is-4800~4800.

System reactive power: -14400~14400 Var.

Apparent power Sa, Sb and Sc: 0~4800VA, real setting value is 0~4800.

System apparent power: 0~14400VA, real setting value is 0~14400.

Power factor PFa, PFb, PFc and System power factor: -1~1, real setting value is -1000~1000.

3. AO output range setting:

AO output value range setting start point, AO1 output value range setting point 2, AO1 output value range setting point 3 and AO output value range setting end point are increasing value, while they should be within range of AO output value.

When AO type is 0~20mA, the setting value range is 0~ 4915, and the relationship is mA=setting value*20/4096.

When AO type is 4~20mA, the setting value range is 819~ 4915, and the relationship is mA=setting value*20/4096.

When AO type is 0~5V, the setting value range is 0~ 4915, and the relationship is V=setting value*5/4096.

When AO type is 1~5V, the setting value range is 819~ 4915, and the relationship is V=setting value*5/4096.

6.3.6 100ms Refresh Metering Parameter

Address	Parameters	Code	Relationship	Data Type	Property
3000H~3001H	Frequency	F1	F=Rx	Float	R
3002H~3003H	Phase voltage V1	F1	U=Rx(PT1/PT2)	Float	R
3004H~3005H	Phase voltage V2	F1	U=Rx(PT1/PT2)	Float	R
3006H~3007H	Phase voltage V3	F1	U=Rx(PT1/PT2)	Float	R
3008H~3009H	Average voltage Vavg	F1	U=Rx(PT1/PT2)	Float	R
300AH~300BH	Line voltage V12	F1	U=Rx(PT1/PT2)	Float	R
300CH~300DH	Line voltage V23	F1	U=Rx(PT1/PT2)	Float	R
3010H~3011H	Average line voltage Vlavg	F1	U=Rx(PT1/PT2)	Float	R
3012H~3013H	Current I1	F1	I=Rx(CT1/CT2)	Float	R
3014H~3015H	Current I2	F1	I=Rx(CT1/CT2)	Float	R
3016H~3017H	Current I3	F1	I=Rx(CT1/CT2)	Float	R
3018H~3019H	Average current lavg	F1	I=Rx(CT1/CT2)	Float	R
301AH~301BH	Neutral current In	F1	I=Rx(CT1/CT2)	Float	R
301CH~301DH	Phase A power Pa	F1	1P=Rx(PT1/PT2)x(CT1/CT2)	Float	R
301EH~301FH	Phase B power Pb	F1	1P=Rx(PT1/PT2)x(CT1/CT2	Float	R
3020H~3021H	Phase C power Pc	F1	1P=Rx(PT1/PT2)x(CT1/CT2	Float	R
3022H~3023H	System power Psum	F1	1P=Rx(PT1/PT2)x(CT1/CT2	Float	R
3024H~3025H	Phase A reactive power Qa	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
3026H~3027H	Phase A reactive power Qb	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
3028H~3029H	Phase C reactive power Qc	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
302AH~302BH	System reactive power Qsum	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
302CH~302DH	Phase A apparent power Sa	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R
302EH~302FH	Phase B apparent power Sb	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R

Address	Parameters	Code	Relationship	Data Type	Property
3030H~3031H	Phase C apparent power Sc	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R
3032H~3033H	System apparent power Ssum	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R
3034H~3035H	Phase A power factor PFa	F1	PF=Rx	Float	R
3036H~3037H	Phase B power factor PFb	F1	PF=Rx	Float	R
3038H~3039H	Phase C power factor PFc	F1	PF=Rx	Float	R
303AH~303BH	System power factor PFsum	F1	PF=Rx	Float	R

6.3.7 Metering Parameter Address Table

Basic Analog measurements

There are two different modes to read basic analog measurements, one is secondary mode, and another is primary mode. In primary mode, the numerical value in the register of the meter is equal to the real physical value. In secondary mode, the relationship between the numerical value in the register and the real physical value is shown in the following table. (Rx is the numerical value in register of KW320 series meter)

Function code: 03H for reading.

Address	Parameters	Code	Relationship	Data Type	Property
4000H~4001H	Frequency	F1	F=Rx	Float	R
4002H~4003H	Phase voltage V1	F1	U=Rx(PT1/PT2)	Float	R
4004H~4005H	Phase voltage V2	F1	U=Rx(PT1/PT2)	Float	R
4006H~4007H	Phase voltage V3	F1	U=Rx(PT1/PT2)	Float	R
4008H~4009H	Average voltage Vavg	F1	U=Rx(PT1/PT2)	Float	R
400AH~400BH	Line voltage V12	F1	U=Rx(PT1/PT2)	Float	R
400CH~400DH	Line voltage V23	F1	U=Rx(PT1/PT2)	Float	R
400EH~400FH	Line voltage V31	F1	U=Rx(PT1/PT2)	Float	R
4010H~4011H	Average line voltage Vlavg	F1	U=Rx(PT1/PT2)	Float	R
4012H~4013H	Current I1	F1	I=Rx(CT1/CT2)	Float	R
4014H~4015H	Current I2	F1	I=Rx(CT1/CT2)	Float	R
4016H~4017H	Current I3	F1	I=Rx(CT1/CT2)	Float	R
4018H~4019H	Average current Iavg	F1	I=Rx(CT1/CT2)	Float	R
401AH~401BH	Neutral current In	F1	I=Rx(CT1/CT2)	Float	R
401CH~401DH	Phase A power Pa	F1	P=Rx(PT1/PT2)x(CT1/CT2)	Float	R
401EH~401FH	Phase B power Pb	F1	P=Rx(PT1/PT2)x(CT1/CT2)	Float	R

Address	Parameters	Code	Relationship	Data Type	Property
4020H~4021H	Phase C power Pc	F1	P=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4022H~4023H	System power Psum	F1	P=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4024H~4025H	Phase A reactive power Qa	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4026H~4027H	Phase B reactive power Qb	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4028H~4029H	Phase C reactive power Qc	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
402AH~402BH	System reactive power Qsum	F1	Q=Rx(PT1/PT2)x(CT1/CT2)	Float	R
402CH~402DH	Phase A apparent power Sa	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R
402EH~402FH	Phase B apparent power Sb	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4030H~4031H	Phase C apparent power Sc	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4032H~4033H	System apparent power Ssum	F1	S=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4034H~4035H	Phase A power factor PFa	F1	PF=Rx	Float	R
4036H~4037H	Phase B power factor PFb	F1	PF=Rx	Float	R
4038H~4039H	Phase C power factor PFc	F1	PF=Rx	Float	R
403AH~403BH	System power factor PFsum	F1	PF=Rx	Float	R
403CH~403DH	Voltage unbalance factor I_unbl	F1	Unbalance=Rx x 100%	Float	R
403EH~403FH	Current unbalance factor I_unbl	F1	Unbalance= Rx x 100%	Float	R
4040H~4041H	Load characteristic (L/C/R)	F1	76.0/67.0/82.0(ASCII)	Float	R
4042H~4043H	Power demand	F1	P=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4044H~4045H	Reactive power demand	F1	P=Rx(PT1/PT2)x(CT1/CT2)	Float	R
4046H~4047H	Apparent power demand	F1	P=Rx(PT1/PT2)x(CT1/CT2)	Float	R

Note: When CT2 = 5, calculating use CT2 = 5 in the formula,others use CT2 = 1 in the formula. Real time energy measurement

Data stored in this block can be preset or cleared.

Function code: 03H for reading, 10H for writing. Data type: dword.

It can be set as primary energy or secondary energy according to user. Please refer to F7, F8, and F9 for more details about the relationship between numerical value in the register and the real physical value.

Address	Parameters	Code	Relationship	Data Type	Property
4048H~4049H	Energy IMP	F4/F7	0~999999999	dword	R/W
404AH~404BH	Energy EXP	F4/F7	0~999999999	dword	R/W
404CH~404DH	Reactive energy IMP	F5/F8	0~999999999	dword	R/W
404EH~404FH	Reactive energy EXP	F5/F8	0~999999999	dword	R/W
4050H~4051H	Energy TOTAL	F4/F7	0~999999999	dword	R/W
4052H~4053H	Evergy NET	F4/F7	-999999999~999999999	dword	R/W
4054H~4055H	Reactive energy TOTAL	F5/F8	0~999999999	dword	R/W
4056H~4057H	Reavtive energy NET	F5/F8	-999999999~999999999	dword	R/W
4058H~4059H	Apparent enrgy	F6/F9	0~999999999	dword	R/W
4620H~4621H	Phase A energy IMP	F4/F7	0~999999999	dword	R/W
4622H~4623H	Phase A energy EXP	F4/F7	0~999999999	dword	R/W
4624H~4625H	Phase B energy IMP	F4/F7	0~999999999	dword	R/W
4626H~4627H	Phase B energy EXP	F4/F7	0~999999999	dword	R/W
4628H~4629H	Phase C energy IMP	F4/F7	0~999999999	dword	R/W
462AH~462BH	Phase C energy EXP	F4/F7	0~999999999	dword	R/W
462CH~462DH	Phase A reactive energy IMP	F5/F8	0~999999999	dword	R/W
462EH~462FH	Phase A reactive energy EXP	F5/F8	0~999999999	dword	R/W
4630H~4631H	Phase B reactive energy IMP	F5/F8	0~999999999	dword	R/W
4632H~4633H	Phase B reactive energy EXP	F5/F8	0~999999999	dword	R/W
4634H~4635H	Phase C reactive energy IMP	F5/F8	0~999999999	dword	R/W
4636H~4637H	Phase C reactive energy EXP	F5/F8	0~999999999	dword	R/W
4638H~4639H	Phase A apparent energy	F6/F9	0~999999999	dword	R/W
463AH~463BH	Phase B apparent energy	F6/F9	0~999999999	dword	R/W
463CH~463DH	Phase C apparent energy	F6/F9	0~999999999	dword	R/W

Address	Parameters	Relationship	Data Type	Property
On 1 number of electic power				
463EH~466DH	Sequence with system electricity+Split phase electricity	0~999999999	dword	R/W
On 2 number of electic power				
466EH~469DH	Sequence with system electicity+Split phase electricity	0~999999999	dword	R/W
On 3 number of electic power				
469EH~46CDH	Sequence with system electicity+Split phase electricity	0~999999999	dword	R/W
On 4 number of electic power				
46CEH~46FDH	Sequence with system electicity+Split phase electricity	0~999999999	dword	R/W
On 5 number of electric power				
46FEH~472DH	Sequence with system electicity+Split phase electricity	0~999999999	dword	R/W
On 6 number of electic power				
472EH~475DH	Sequence with system electicity+Split phase electricity	0~999999999	dword	R/W
On 7 number of electic power				
475EH~478DH	Sequence with system electicity+Split phase electricity	0~999999999	dword	R/W

Harmonics

THD, Harmonics, odd HD, even HD, Crest Factor, THFF, K factor etc are all stored here. The data type is “word”. Voltage parameters refer to line voltage when it is set to “2LL/3LL” and phase voltage for others. Function code: 03H for reading.

Address	Parameters	Code	Range	Data Type	Property
The following are the THD of voltage and current					
405AH	THD_V1 of V1(V12)	F18	>=0	Word	R
405BH	THD_V1 of V2(V31)	F18	>=0	Word	R
405CH	THD_V1 of V3(V23)	F18	>=0	Word	R
405DH	Average THD_V	F18	>=0	Word	R
405EH	THD_I1	F18	>=0	Word	R
405FH	THD_I2	F18	>=0	Word	R
4060H	THD_I3	F18	>=0	Word	R
4061H	Average THD_1	F18	>=0	Word	R
Voltage Harmonics, even HD, odd HD, Crest Factor are show as below					
4062H~407FH	Harmonics of V1(V12)(the 2nd to 31st)	F19	>=0	Word	R
4500H~451FH	Harmonics of V1(V12)(the 32nd to 63rd)	F19	>=0	Word	R
4080H	Odd HD of V1(V12)	F20	>=0	Word	R
4081H	Even HD of V1(V12)	F21	>=0	Word	R

Address	Parameters	Code	Range	Data Type	Property
4082H	Crest Factor of V1(V12)	F22	0~65535	Word	R
4083H	THFF of V1(V12)	F24	>=0	Word	R
4084H~40A5H	Parameters of V2(V31)	Same as V1		Word	R
4520H~453FH	Harmonics of V2 (V31) (the 32nd to 63rd)	F19	>=0	Word	R
40A6H~40C7H	Parameters of V2 (V31)	Same as V1		Word	R
4540H~455FH	Harmonics of V3 (V23) (the 32nd to 63rd)	F19	>=0	Word	R
Current Harmonics, even HD, odd HD, K factor are shown as below					
40C8H~40E5H	Harmonics of I1 (the 2d to 31st)	F19	>=0	Word	R
4560H~457FH	Harmonics of I1 (the 32nd to 63rd)	F19	>=0	Word	R
40E6H	Odd HD of I1	F20	>=0	Word	R
40E7H	Even HD of I1	F21	>=0	Word	R
40E8H	K Factor of I1	F23	0~65535	Word	R
40E9H~4109H	Parameters of I2	Same as I1		Word	R
4580H~459FH	Harmonics of I2 (the 32nd to 63rd)	F19	>=0	Word	R
410AH~412AH	Parameters of I3	Same as I1		Word	R
45A0H~45BFH	Harmonics of I3 (the 32nd to 63rd)	F19	>=0	Word	R

Note: When selecting 400Hz type, harmonics support 2nd ~ 15th.

MAX/MIN

records MAX/MIN value and time stamp. Function code: 03H for reading.

Address	Parameters	Code	Range	Data Type	Property
4136H	MAX of V1	F11	-32768~32767	int	R
4137H~413CH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
413DH	MAX of V2	F11	-32768~32767	int	R
413EH~4143H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
4144H	MAX of V3	F11	-32768~32767	int	R
4145H~414AH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
414BH	MAX of V12	F11	-32768~32767	int	R
414CH~4151H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
4152H	MAX of V23	F11	-32768~32767	int	R
4153H~4158H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
4159H	MAX of V31	F11	-32768~32767	int	R
41A0H~41A5H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41A6H	MAX of apparent power demand	F15	-32768~32767	int	R

Address	Parameters	Code	Range	Data Type	Property
41A7H~41ACH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41ADH	MAX voltage unbalance factor	F17	-32768~32767	int	R
41AEH~41B3H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41B4H	MAX of current unbalance factor	F17	-32768~32767	int	R
41B5H~41BAH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41BBH	MAX of V1(V12) THD	F17	-32768~32767	int	R
41BCH~41C1H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41C2H	MAX of V2(V12) THD	F17	-32768~32767	int	R
41C3H~41C8H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41C9H	MAX of V3(V23) THD	F17	-32768~32767	int	R
41CAH~41CFH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41D0H	MAX of I1 THD	F17	-32768~32767	int	R
41D1H~41D6H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41D7H	MAX of I2 THD	F17	-32768~32767	int	R
41D8H~41DDH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
41DEH	MAX of I3 THD	F17	-32768~32767	int	R
41DFH~41E4H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
The addresses for the MIN value of the above parameters are located in 14E5H to 4293H. They have the same format as the MAX value					

Note: The MAX and MIN Frequency value should use word data type(0~65535).

Sequence Component

U1 (U12), I1 are consisting of real part and complex part. They have positive sequence, negative sequence and zero sequence. Data type is “int”. Function code: 03H for reading.

Address	Parameters	Code	Range	Data Type	Property
4294H	positive sequence real part of UA	F11	-32768~32767	int	R
4295H	positive sequence complex part of UA	F11	-32768~32767	int	R
4296H	negative sequence real part of UA	F11	-32768~32767	int	R
4297H	negative sequence complex part of UA	F11	-32768~32767	int	R
4298H	zero sequence real part of UA	F11	-32768~32767	int	R
4299H	zero sequence complex part of UA	F11	-32768~32767	int	R

Address	Parameters	Code	Range	Data Type	Property
429AH	positive sequence real part of IA	F12	-32768~32767	int	R
429BH	positive sequence complex part of IA	F12	-32768~32767	int	R
429CH	negative sequence real part of IA	F12	-32768~32767	int	R
429DH	negative sequence complex part of IA	F12	-32768~32767	int	R
429EH	zero sequence real part of IA	F12	-32768~32767	int	R
429FH	zero sequence complex part of IA	F12	-32768~32767	int	R

Phase Angle

All voltage and current's phase angles corresponding to V1 (V12) are stored here. You can find out the phase sequence according to them. Data type is "word". Function code: 03H for reading.

Address	Parameters	Code	Range	Data Type	Property
42A0H	phase angle of V2 to V1 V1/V2 (3$4) phase angle of V23 to V12 V12/V23 (3$3)	F25	0~3600	Word	R
42A1H	phase angle of V3 to V1 V1/V3 (3$4) phase angle of V31 to V12 V12/V31 (3$3)	F25	0~3600	Word	R
42A2H	phase angle of I1 to V1 V1/I1 (3$4) phase angle of I1 to V12 V12/I1 (3$3)	F25	0~3600	Word	R
42A3H	phase angle of I2 to V1 V1/I2 (3$4) phase angle of I2 to V12 V12/I2 (3$3)	F25	0~3600	Word	R
42A4H	phase angle of I3 to V1 V1/I3 (3$4) phase angle of I3 to V12 V12/I3 (3$3)	F25	0~3600	Word	R
42A5H	Reserved			Word	
42A7H	Reserved			Word	
42A8H	Reserved			Word	

Alarming Records

There are 16 groups of records with the same format. Function code: 03H for reading, 10H for writing. Please refer to Chapter 4 for more details.

Address	Parameters	Code	Range	Data Type	Property
42A9H	First group: alarming status	F1		Word	R
42AAH	First group: alarming parameter code	F1		Word	R
42ABH	First group: over/under limit or reset value	F10~F18		Word	R
42ACH~42B2H	First group: Time stamp: yyyy:mm:dd:hh:mm:ss:ms	F3		Word	R
42B3H~42BCH	Second group	Same as the first group			
42BDH~42C6H	Third group	Same as the first group			
42C7H~42D0H	Fourth group	Same as the first group			
42D1H~42E4H	Fifth group	Same as the first group			

Address	Parameters	Code	Range	Data Type	Property
42DBH~42E4H	Sixth group	Same as the first group			
42E5H~42EEH	Seventh group	Same as the first group			
42EFH~42F8H	Eighth group	Same as the first group			
42F9H~4302H	Ninth group	Same as the first group			
4303H~430CH	Tenth group	Same as the first group			
430DH~4316H	Eleventh group	Same as the first group			
4317H~4320H	Twelfth group	Same as the first group			
4321H~432AH	Thirteenth group	Same as the first group			
432BH~4334H	Fourteenth group	Same as the first group			
4335H~433EH	Fifteenth group	Same as the first group			
433FH~4348H	Sixteenth group	Same as the first group			

Counting Number of I/O Modules

DI are arranged according to expanded I/O module addresses, user can check othe counting number of DI along with those modules. The DI counting records are stored in a non-volatile memory and will not be erased during power off. They can be reset via communication and panel.Data type is “dword”. Function code: 03H for reading.

Address	Parameters	Code	Range	Data Type	Property
AXM-IO11					
4349H~434AH	DI1 pulse counter number	F1	0~4294967295	dword	R
434BH~434CH	DI2 pulse counter number	F1	0~4294967295	dword	R
434DH~434EH	DI3 pulse counter number	F1	0~4294967295	dword	R
434FH~4350H	DI4 pulse counter number	F1	0~4294967295	dword	R
4351H~4352H	DI5 pulse counter number	F1	0~4294967295	dword	R
4353H~4354H	DI6 pulse counter number	F1	0~4294967295	dword	R
AXM-IO21					
4355H~4356H	DI7 pulse counter number	F1	0~4294967295	dword	R
4357H~4358H	DI8 pulse counter number	F1	0~4294967295	dword	R
4359H~435AH	DI9 pulse counter number	F1	0~4294967295	dword	R
435BH~435CH	DI10 pulse counter number	F1	0~4294967295	dword	R
AXM-IO31					
435DH~435EH	DI11 pulse counter number	F1	0~4294967295	dword	R
435FH~4360H	DI12 pulse counter number	F1	0~4294967295	dword	R
4361H~4362H	DI13 pulse counter number	F1	0~4294967295	dword	R
4363H~4364H	DI14 pulse counter number	F1	0~4294967295	dword	R
AXM-IO12					
4365H~4366H	DI15 pulse counter number	F1	0~4294967295	dword	R
4367H~4368H	DI16 pulse counter number	F1	0~4294967295	dword	R
4369H~436AH	DI17 pulse counter number	F1	0~4294967295	dword	R
436BH~436CH	DI18 pulse counter number	F1	0~4294967295	dword	R

Address	Parameters	Code	Range	Data Type	Property
436DH~436EH	DI19 pulse counter number	F1	0~4294967295	dword	R
436FH~4370H	DI20 pulse counter number	F1	0~4294967295	dword	R
AXM-IO22					
4371H~4372H	DI21 pulse counter number	F1	0~4294967295	dword	R
4373H~4374H	DI22 pulse counter number	F1	0~4294967295	dword	R
4375H~4376H	DI23 pulse counter number	F1	0~4294967295	dword	R
4377H~4378H	DI24 pulse counter number	F1	0~4294967295	dword	R
AXM-IO32					
4379H~437AH	DI25 pulse counter number	F1	0~4294967295	dword	R
437BH~437CH	DI26 pulse counter number	F1	0~4294967295	dword	R
437DH~437EH	DI27 pulse counter number	F1	0~4294967295	dword	R
437FH~4380H	DI28 pulse counter number	F1	0~4294967295	dword	R

AI Input Value

The output of AI is mapped to the range of 0~4095 according to its sampling value using some algorithm. Data type is “word”. Function code: 03H for reading. Please refer to Chapter 5 Extended Modules for more details.

Address	Parameters	Code	Range	Data Type	Property
4385H	AI1 sampling value	F1	0~4095	Word	R
4386H	AI2 sampling value	F1	0~4095	Word	R
4387H	AI3 sampling value	F1	0~4095	Word	R
4388H	AI4 sampling value	F1	0~4095	Word	R

AO Output

The output of AO is the actual value of output. There are 2 output options for AO - V or mA. Over/under limit or Data type is “float”. Function code: 03H for reading. Please refer to Chapter 5 Extended Modules for more details.

Address	Parameters	Code	Range	Data Type	Property
4389H~438AH	Value of A01	F1		Float	R
438BH~438CH	Value of A02	F1		Float	R
438DH~438EH	Value of A03	F1		Float	R
438FH~4390H	Value of A04	F1		Float	R

SOE Records

There are 20 groups of records with the same format. Function code: 03H for reading. Before gathering SOE records, the selected I/O module must be SOE enabled. If the SOE enabled I/O module is not connected, SOE record logs will not be collected. Please refer to Chapter 5

Extended Modules for more details.

Address	Parameters	Code	Range	Data Type	Property
4399H~439FH	First group: time stamp: yyyy:mm:dd:hh:mm:ss:ms	F3		Word	R
43A0H	First group: DI status	F1		Word	R
43A1H~4438H	2nd to 20th group			Word	R
4439H	Value of A04	F1	0:none | 1:AXM-IO11 | 2:AXM-IO21 | 3:AXMIO31 | 4:AXM-IO12 | 5:AXM-IO22 | 6:AXMIO32	Word	R

Current Demand

Include real-time current demand, the maximum current demand and time of occurance. Function code: 03H for reading.

Address	Parameters	Code	Range	Data Type	Property
4600H~4601H	Phase A current demand	F1	I=Rx(CT1/CT2)	Float	R
4602H~4603H	Phase B current demand	F1	I=Rx(CT1/CT2)	Float	R
4604H~4605H	Phase C current demand	F1	I=Rx(CT1/CT2)	Float	R
4606H	MAX of phase A current demand	F12	-32768~32767	int	R
4607H~460CH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
460DH	MAX of phase B current demand	F12	-32768~32767	int	R
460EH~4613H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
4614H	MAX of phase C current demand	F12	-32768~32767	int	R
4615H~461AH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	int	R
4F02H	MESH Status		0:unnormal or not connect | 0xaa: normal	unit16	R
4F03H~4F0AH	MESH MAC address		16 ASCII (from high byte to low byte)	unit16	R
4F0BH~4F14H	MESH identifier		20 ASCII (from high byte to low byte)	unit16	R

DI Status

Current DI status, if related I/O module isn't connected, the DI status will be set to 0. Function code: 02H for reading.

Address	Parameters	Range	Data Type
AXM-IO11			
0000H	DI1	1=ON | 0=OFF	bit
0001H	DI2	1=ON | 0=OFF	bit
0002H	DI3	1=ON | 0=OFF	bit
0003H	DI4	1=ON | 0=OFF	bit
0004H	DI5	1=ON | 0=OFF	bit
0005H	DI6	1=ON | 0=OFF	bit
AXM-IO21			
0006H	DI7	1=ON | 0=OFF	bit
0007H	DI8	1=ON | 0=OFF	bit
0008H	DI9	1=ON | 0=OFF	bit
0009H	DI10	1=ON | 0=OFF	bit
AXM-IO31			
000AH	DI11	1=ON | 0=OFF	bit
000BH	DI12	1=ON | 0=OFF	bit
000CH	DI13	1=ON | 0=OFF	bit
000DH	DI14	1=ON | 0=OFF	bit
AXM-IO12			
000EH	DI15	1=ON | 0=OFF	bit
000FH	DI16	1=ON | 0=OFF	bit
0010H	DI17	1=ON | 0=OFF	bit
0011H	DI18	1=ON | 0=OFF	bit
0012H	DI19	1=ON | 0=OFF	bit
0013H	DI20	1=ON | 0=OFF	bit
AXM-IO22			
0014H	DI21	1=ON | 0=OFF	bit
0015H	DI22	1=ON | 0=OFF	bit
0016H	DI23	1=ON | 0=OFF	bit
0017H	DI24	1=ON | 0=OFF	bit
AXM-IO32			
0018H	DI25	1=ON | 0=OFF	bit
0019H	DI26	1=ON | 0=OFF	bit
001AH	DI27	1=ON | 0=OFF	bit
001BH	DI28	1=ON | 0=OFF	bit

Relay Status

Function code: 01H for reading, 05H for controlling output.

Address	Parameters	Range	Data Type
AXM-IO11			
0000H	Relay 1	1=ON | 0=OFF	bit
0001H	Relay 2	1=ON | 0=OFF	bit
AXM-IO31			
0002H	Relay 3	1=ON | 0=OFF	bit
0003H	Relay 4	1=ON | 0=OFF	bit

Address	Parameters	Range	Data Type
AXM-IO12			
0004H	Relay 5	1=ON | 0=OFF	bit
0005H	Relay 6	1=ON | 0=OFF	bit
AXM-IO32			
0006H	Relay 7	1=ON | 0=OFF	bit
0007H	Relay 8	1=ON | 0=OFF	bit

6.3.8 Data Logging

Data Logging Setting

In order to generate historical logs for the selected parameters, users should program the meter so that selected parameters from the cooresponding Modbus registers can be copied to the historical log record. Since certain parameters occupy two registers, to supplement this, the programmable settings for the historical logs contain a list of descriptors. Each descriptor lists the number of Modbus registers for the specified parameter. By combining these two lists, the historical log record can be interpreted.

For example: Registers 4002H and 4003H are programmed to be recorded by the historical log. Since 2 registers are used, the corresponding descriptor is set as 2. These registers program the log to record “Volts AN.”

The historical log programmable settings are comprised of 3 blocks, one for each log. Each log works identical to each other; therefore, only historical log 1 is described here. All register addresses in this section are shown within the address range of historical log 1.

1100H-11DFH (Historical Log 1)

11C0H-127FH (Historical Log 2)

1280H-133FH (Historical Log 3)

Block Size: 192 registers per log (384 bytes)

Data Log Setting’s address map:

Address	1100H		1101H	
Byte	0 (low byte)	1 (high byte)	2 (low byte)	3 (high byte)
Value	Sectors	Registers	Interval	

Registers: The number of registers to log in the record range from {0-117}. The size of the record in memory is [12 + (Registers x 2)].

Sectors: The number of memory sectors allocated to this log. Each sector is 64kb in size. 100 sectors are available for allocation among the three historical logs. Valid allocation range is from

0~100 (When the sector is set 0, this log is disable).

Interval: The data capture interval for historical log records. Valid time interval can be set from 0-1440 minutes. When the interval is set to 0, this log is disable.

Note: When sectors or Register or Interval is zero, this log is disable.

Register List:

Registers: 1102H-1176H

Size: 1 or 2 register(s) per parameter, 117 available registers per historical log. The register list controls which Modbus registers are recorded in each historical log record. Since many parameters, such as Voltage, Energy, etc., take up more than 1 register, multiple registers are allocated for those parameters.

For example: In order to record "Volts AN" into the historical log, Volts AN's Modbus address (4002H and 4003H) are assigned and programmed to the log record list so that information can be stored into the historical log registers.

- Each unused register item should be set to 0000H or FFFFH to indicate no parameters are associated with them.
- The actual size of the record, and the number of items in the register list which are used, is determined by the registers in the header.
- Valid register address ranges that can be recorded in the historical log registers are 4000H-412BH, 4294H-42A8H, 4349H-4398H, 4500H-461BH, 4620H-463DH.

Item Descriptor List:

Registers: 1177H– 11B1H

Size: 1 byte per item, 117 bytes (59 registers)

While the register list describes what to log, the Item descriptor list describes how to interpret that information. Each descriptor describes how many Modbus addresses are used to describe a parameter. Either 1 or 2 addresses will be used for each parameter.

For example: If the first descriptor is 2, and the second descriptor is 1, then the first 2 register items belong to the 1st descriptor, and the 3rd register item belongs to the 2nd descriptor.

NOTE: As can be seen from the example above, it is not a 1-to-1 relation between the register list and the descriptor list. A single descriptor may refer to two register items.

Logging Timer Setting:

If data logging only records one period data, or only start from one specific time, corresponding time and logging mode should be set then data logging can work well.

Modbus address 11B2H is used as the logging mode select. When value is 0, logging mode is= set to mode1, without time setting. When value is 1, logging mode is set to mode2, so 11B3H-11B5H (start year, month, day, hour, minute, and second) and 11B6H-11B8H (end year,

month, day, hour, minute, and second) should be set. When value is 2, logging mode is set to mode3, so only 11B4H (hour) and 11B5H (minute) should be set. How data logging works is in Chapter 4.

Registers 11B3H-11B5H (start time)

11B6H-11B8H (end time)

Size 2 Registers

Byte	0	1	2	3	4	5
Value	Month	Year	Hour	Day	Second	Minute

Log Status Block

The Log Status Block describes the current status of the log in question.

Address	Parameters	Range	Data Type	Property
6100H~6101H	Max Records	0~468104	dword	R
6402H~6103H	Used Records	1~468104	dword	R
6104H	Record Size	14~246	word	R
6105H	Reserved		word	R
6106H~6108H	First Record Time Stamp		word	R
6109H~610BH	Last Record Time Stamp		word	r
6200H~620BH	Data logging 2 status	Same as the first group		
6300H~630BH	Data logging 3 status	Same as the first group		

Max Records: The maximum number of records the log can hold given the record size and sector allocation.

Used Records: The number of records stored in the log. This number will equal the Max Records when the log has filled. This value will be set to 1 when the log is reset.

Record Size: The number of bytes in this record, including the time stamp.

The record's format in the meter is: record number (4bytes)+ time stamp(6bytes) + [data1~dataN] (2Nbytes) + CRC(2bytes).

First Record Time Stamp: Time stamp of the oldest record.

Last Record Time Stamp: Time stamp of the newest record.

Log Retrieval Block

The log retrieval block consists of 2 parts: the header and the window. The header is used to verify the data shown within the requested log window. The window is a sliding block of data that can be used to access any record in the specified log.

Registers 6000H-6003H

Size 4 Registers

Address	Parameters	Property	Format	Description
6000H	Log type	R/W	Nnnnnnnn	Log type
			ssssssss	Reserved
6001H	Record number, status	R/W	Nnnnnnnn	Record number
			wwwwwwww	Status
6002H~6003H	Offset	R/W		
6004H~607EH	Window	R		

Log type: The log to be retrieved. Write this value to set which log is being retrieved.

0 -Historical Log 1

1 -Historical Log 2

2 -Historical Log 3

Records number: The number of records that fit within a window. This value is settable, any number less than a full window may be used. This number tells the retrieving program how many records to expect to be fetched in the window. (record number x Record Size) = bytes used in the window. This value should be ((123 x 2) / Record Size), rounded down. The greater this number is, the faster the retrieving speed is.

For example, with a record size of 50, the Records number = ((123 x 2) / 50) =4.92 ≈ 4.

Status: The status of the current window. Since the time to prepare a window may exceed an acceptable Modbus delay (1 second), this acts as a ready status flag to notify when the window is ready for retrieval. When this value indicates that the window is not ready, the data in the window should be ignored. Window Status is Read-only, any writes are ignored.

This value also indicates the memory erasing status when setting the date logging settings.

BH Window is Ready

FFH Window is Not Ready

AAH memory is erasing

BBH memory erasing is finished

CXH register list is setted error.

X:bit0 1, register list is setted error in datalogging 1;

bit1 1,register list is setted error in datalogging 2;

bit2 1,register list is setted error in datalogging 3.

For example,0xC6H, register lists are error in datalogging2 and 3

Offset: The offset of the record number of the first record in the data window and the record number of the "first record time stamp". Setting this value controls which records will be available in the data window. When the log is retrieved, the first (oldest) record is “latched.” This means that offset 0 will always point to the oldest record at the time of latching.

Window: The actual data of the records, arranged according to the above settings.

Note: If the logging timer is disabled, the first recording sector will be erased when the log is full. Therefore, user should not read the whole log when the used record numer is near to the max record number. Under this condition, user should read the "Used Records" field and compare it to the previous "Used Records" field from the last reading before retrieving the information and reading the window.

If the current "Used Records" field is greater than the "Used Records" field from the last reading and if the "Offset" field is less than the difference between the current and previous "Used Records" field, the first sector has been erased and the difference between the "UsedRecords" field should be subtracted from the recording number.

If the "Offset" field is greater than the difference between the current and previous "Used Records" field, the "Offset" number should be subtracted from the recording number.

To avoid this situation, user should read the log before it is almost full.

For example: Data logging 1 has 3 sectors and each has 448 records, and the total records are 1344. If you press the "Read All" button when the "Used Records" number is at 1340 and if the first sector is erased before the information is transferred to the computer, the data stored in this sector is erased permanently and cannot be retrieved. If the records from the first sector can be retrieved before it gets erased, the new value of "Offset" will equal to the original "Offset" field minus the value of the difference between the current and previous "Used Records" field.

Data Logging Operation Examples

The following example illustrates a data logging operation. The example makes the following assumptions:

- The log is Historical Log 1.
- The log contains VAN, VBN, VCN (12 bytes), the interval is 1min, the sectors is 10, the registers is 6, the logging timer function is disabled.
- Retrieval is starting at record offset 0 (oldest record). 283
- No new records are recorded to the log during the log retrieval process.

a) Data logging settings

Now set the data log 1 according to the assumptions:

1. Set the data log with VAN, VBN, VCN, here we should set their modbus address 0x4002,0x4003,0x4004,0x4005,0x4006 and 0x4007 to 0x1102, 0x1103, 0x1104, 0x1105, 0x1106 and 0x1107. And the descriptor is 2, so set the 0x0202 and 0x0200 to 0x1177 and 0x1178.
2. The register is 6 and sector is 10, so we set 0x060A to 0x1100.
3. The interval is 1min , so set the 0x0001 to 0x1101.
4. The logging timer function is disabled, so set the 0 to 0x11B9.

b) Log Retrieval Procedure

The following procedure documents how to retrieve a single log from the oldest record to the newest record.

1. Compute the number of records per window, as follows: RecordsPerWindow = (246 \ RecordSize)=246\24=10.
2. Write the Records per window and Record offset, in this example set the 0x0A0B and 0x0000 to 0x6001d and 0x6002.

   This step tells the meter what data to return in the window.
3. Read the record window status from 0x6001.

   • If the Window Status is 0xFF, go to step 2.

   • If the Window Status is 0x0B, Read the data window.
4. Read the data window and compute next Expected Record offset.

• Compute the next expected record offset by adding Records Per Window and go to step 2.

• If there are no remaining records after the current record window, stop reading.

Address	Parameters	Data Type	Property	Range	Default	Factory Setting
8000H	Manual Triggering Waveform	Word	R/W	0XAA:Enable | 0:Disable	0	0
8001H	DI Triggering - AXM-11	Word	R/W	bit1bit0: DI1 | bit3bit2:DI2 | bit5bit4: DI3 | bit7bit6: DI4 | bit9bit8: DI5 | bit11bit10: DI6 | 00: Disable | 01: From OFF to ON | 10: From ON to OFF | 11: Any DI state change	0	0
8002H	DI Triggering - AXM-21	Word	R/W	Bit1bit0: DI7 | bit3bit2 : DI8 | bit5bit4: DI9 | bit7bit6: DI10 | The same as above	0	0
8003H	DI Triggering - AXM-31	Word	R/W	Bit1bit0: DI11 | bit3bit2 : DI12 | bit5bit4: DI13 | bit7bit6: DI14 | The same as above	0	0
8004H	Voltage Rated Value	Word	R/W	50V - 400V or 50V - 690V (only in 3LL)	400	400
8005H	Voltage Sag Triggering Waveform	Word	R/W	1: Enable | 0: Disable	0	0
8006H	Voltage Sag Threshold	Word	R/W	20-100 (%)	10	10
8007H	Voltage Sag half cycle count	Word	R/W	4-200 half cycles	0	0
8008H	Voltage Swell Triggering Waveform	Word	R/W	1: Enable | 0: Disable	100	100
8009H	Voltage Swell Threshold	Word	R/W	50-140 (%)		
800AH	Reserved	Word	R/W		5000	5000
800BH	Current Raited Value	Word	R/W	1: Enable | 0: Disable		
800CH	Over-current Triggering Waveform	word	R/W	1: Enable | 0: Disable	0	0
800DH	Over-current	Word	R/W	50-150 (%)	100	100
Threshold						
800EH	Clear Waveform	Word	R/W	0X55 enable	0	0
800FH	Clear Power Quality Event	Word	R/W	0X55 enable	0	0

Note: In 3LL and 2LL, voltage rated value is line voltage; in 3LN, 1LN and 1LL, voltage rated value is phase voltage.

Waveform Capture Data Retrieve Address

Waveform Capture includes timestamp, triggering condition, and waveform data. Every group uses the same data format. Only one group of waveform is saved in the registers. When retrieving the waveform, firstly write 1-8 group number into 0X801FH, then read the registers after it to acquire waveform corresponding to the written group number.

The relationship between voltage waveform value and real value:

Real Value (Unit: V) = Waveform Value / 37.59105

The relationship between current waveform value and real value:

1. 5A, 1A: Real Value (Unit: A) = Waveform Value/1683.153
2. 333mV: Real Value(Unit: A) = Waveform Value/K (firmware above 3.21,K=14427.15; other: K = 15869.87)
3. 100mV(Rope-CT):Real Value(Unit: A) = Waveform Value/K (firmware above 3.21,K=20291.1; firmware 3.20, K=22068.8,other: K = 15869.87)
4. mA CT:Real Value(Unit:A) = Waveform Value/K (80mA CT:K=7414.289; 100mA:K=9267.440; 200mA:K=18514.68)

The voltage and current value obtained from the waveform are the PT or CT secondary side value.

Read: 03, Preset: 10. For more information, please refer to Chapter 4.7.

Address	Parameters	Default	Range	Data Type	Property
8E00H	Waveform Group Number for Retrieving		1~100 Note: When the value is smaller than or equal to newest waveform record group number, this value is valid	Word	R/W
8E01H	Waveform group number		Waveform number 0-121	Word	R/W
8E02H	Waveform record window status		0x0BH: window data is valid. 0xFF: window data is invalid. 0xAA: waveform record memory is clearing(data is invalid)	Word	R/W
8E03H	Newest Waveform Group Number		1~100 0: no record	Word	R/W
8E04H~ 8E43H	Waveform record data retrieving window		-32768~32767	Word	R/W

Power Quality Event Retrieve Address

Power quality event includes timestamp, triggering condition and related settings. Every group uses the same data format. Only 10 groups of data are saved in the registers. When retrieving the event data, its parameters must be correctly set in order to get correct information.

Read: FC03, Preset: FC16. For more information, please refer to Chapter 4.7.

Address	Parameter	Data Type	Property	Range	Default	Factory Settings
8CFDH	Newest Event Group Number	Word	R	1-50000 0: No Data	0	0
8CFEH	Event for Retrieving starting group number	Word	R/W	1-50000 Note: only valid smaller or equal to Newest Event Group Number	1	1
8CFFH						
No.1 Event						
8D00H	Timestamp High Byte - Year | Low Byte - Month	Word	R	Time		
8D01H	Timestamp High Byte - Day | Low Byte - Hour	Word	R	Time		
8D02H	Timestamp High Byte - Minute | Low Byte - Second	Word	R	Time		
8D03H	TImestamp - Millisecond	Word	R	Time		
8D04H	Voltage Sag or Voltage Swell condition	Word	R	0: disabled | 1: Voltage Sag | 2: Voltage Swell		
8D05H	Rated Value	Word	R	50V ~ 400V or 50V ~ 690V (only in 3LL)		
8D06H	Threshold	Word	R	Voltage Sag: 20- 100 (%) Voltage Swell: 50- 140 (%)		
8D07H	Half-Cycle Count	Word	R	Voltage Sag Event: 4~200 | Voltage Swell Event: 0		
8D08H~ 8D0FH	No. 2 Event	Word	R			
8D10H~ 8D17H	No. 3 Event	Word	R			
8D18H~ 8D1FH	No. 4 Event	Word	R			

Address	Parameter	Data Type	Property	Range	Default	Factory Settings
8D20H~ 8D27H	No. 5 Event	Word	R			
8D28H~ 8D2FH	No. 6 Event	Word	R			

6.4 DNP3.0 Protocal Introduciton

Structure Model

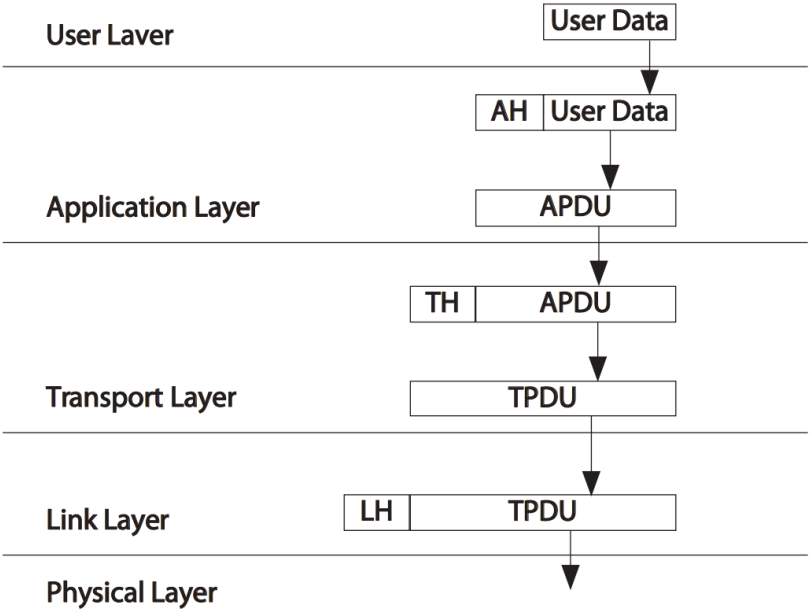


Figure 6-1 Each Layer of the relationship between the data unit

6.4.1 Overview

This document describes the DNP3.0 communications protocol employed by KW320 Series Power Meter. This protocol can be selected for the serial communication port which can consist of RS232/RS485. It is assumed that the reader is familiar with the DNP3.0 protocol and serial communications in general. This DNP3.0 is a reduced set of the Distributed Network Protocol Version 3.00, and it gives enough functionality to= get critical measurement from the KW320 Series Power Meter. The DNP3.0 supports class0 object only. No event generation is supported.

This DNP3.0 is always act as a slave device.

6.4.2 Physical Layer

The physical layer supported by DNP3.0 must transmit or receive data in serial mode. The data unit transferred will be 8 bits in length.

The port must be asynchronous half-duplex RS-485.

The data format supporting 8 bit data, 1 start bit, 1 stop bit, no parity.

The baud rate can be set to any supported value.

6.4.3 Data Link Layer

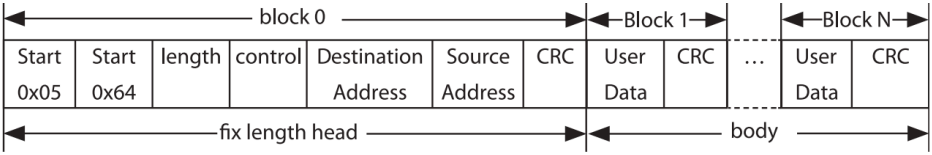
The KW320 Series Power Meter always acts as a Slave device. The device address can be set from 0 to 65534. The link layer complies with the stand FT3 frame format. The fixed length user data field is behind the fixed head. The link layer supports Reset Link, Reset User and Read Link Status. In order to ensure the stability of communication, it is recommended that you should better reset the link and reset the user before communicate with the KW320 Series Power Meter.

The function code supported as follows:

Reset Link (0X00), Reset User (0X01), Link Status (0X09).

FT3 Frame Format:

An FT3 frame is defined as a fixed length header block followed by optional data blocks. Each block has a 16-bit CRC appended to it. The header fields consist of 2 start octets, 1 octet length, 1 octet control, a destination address, a source address and a 16-bit CRC appended to it.



6.4.4 Transport Layer

The pseudo-transport layer segments application layer messages into multiple data link frames. For each frame, it inserts a single byte function code that indicates if the data link frame is the first frame of the message, the last frame of a message, or both (for single frame messages). The function code also includes a rolling frame sequence number which increments with each frame and allows the receiving transport layer to detect dropped frames.

6.4.5 Application Layer

The KW320 Series Power Meter implementation supports a subset of the objects and application layer function codes. The KW320 Series Power Meter will neither accept nor send multiple fragment application layer messages. The KW320 Series Power Meter's fragment size is fixed at 2k bytes.

Each application layer fragment begins with an application layer header followed by one object header or object header and data combinations. The application layer header contains an application control code and an application function code. The application control code contains an indication if the fragment is one of a multifragment message, contains an indication if an application layer confirmation is requested for the fragment, contains an indication if the fragment was unsolicited, and contains a rolling application layer sequence number. The application layer sequence number allows the receiving application layer to detect fragments that are out of sequence, or dropped fragments.

In the KW320 Series Power Meter, the DNP3.0 supports the Read function, the Direct Operate function and the Direct Operate Unconfirmed function.

The Read function (0X01)

The read function is the basic code used for requesting data objects from an Outstation. Here this function is used for reading the measurement data from 317 the Power Meter. Learning more about the measurement data, please refer to the Data Address Table. In this function, the qualifier could be selected contain 0X00, 0X01, 0X06.

The qualifier 0X00 refers that there two bytes called Range followed by, one is the start address want to request, the second is the stop address, this Range would be from 0 to 255.

The qualifier 0X01 indicates that the followed Range there are four bytes, the first two is the Start Address want to be request, the last two is the Stop Address, the two bytes consist of two 8-bit binary number, the low byte first, that the address Range would be from 0 to 65535.

The qualifier 0X06 means read All data from the object with its respective variations which would be list in the queue.

More about the message please see Message Layout, the detailed examples.

The Direct Operate function (0X05)

The function is selects and sets or operates the specified outputs, the status of the control points will be responded. Here this function is intended for resetting the energy counters and the demand counters. These actions are mapped to Objects 12 Variations 1, point 1 and point 2,

there are seen as a control relay. The relay must be operated On in 0 millisecond, and released Off in 1 millisecond. The qualifiers 0X17 and 0X28 are supported for writing the energy reset and demand reset. The examples will be shown in Message Layout.

The Direct Operate function (0X06)

The function is selects and sets or operates the specified outputs but do not send a response to the request. Here this function is intended for switching the DNP3.0 protocol to Modbus protocol using the same communication port. This switching is seen as a control relay mapped into Object 12 Variation 1 and point 318 0 in the KW320series Power Meter. The relay must be operated with qualifier 0X17, code 3, count 0, with 0 millisecond On and 1millisecond Off. After sending the request the current communication port will be changed to the Modbus protocol only. The example will be shown in the Message Layout.

6.4.6 Error Reply

When meet the can't recognize request, the unknown Object, the unknown variation ,the point unsupported , the unsupported function code , the unsupported qualifier ,the unsupported range, the buffer overflow or any other exception error , an error reply will be generate from the KW320 series Power Meter to send to the requester station . The Internal Indicator field will reflect the type of error.

6.4.7 Profile

1. Device Function

   Slave

2. Maximum Data Link Frame Size

   Transmitted 292

   Received 292

3. Maximum Application Fragment Size

   Transmitted 2048

   Received 2048

4. Transport Multi-Fragment

   Supported

5. Data Link Layer Confirmation

   Supported

6. Application Layer Confirmation

   Supported

7. Application Layer Function

   Request

   Supported 0X01, Read

   Qualifier, 0X00, 0X01, 0X06.

   Response

   Supported 129, Read Response

   Qualifier, 0X00

   Supported Error Internal Indicator Response

8. 8) DATA OBJECT LIBRARY

a) ANALOG INPUT OBJECT 30

   Variation: 3, 32-BIT ANALOG INPUT WITHOUT FLAG

   Variation: 4, 16-BIT ANALOG INPUT WITHOUT FLAG

   Variation 5, 32-BIT FLOAT WITH FLAG

b) COUNTER OBJECT DEFINITIONS 20

   Variation: 5, 32-BIT COUNTER WITHOUT FLAG

c) ALTERNATE NUMERIC OBJECT 100 320

   Variation: 1 SHORT FLOATING POINT

d) CONTROL RELAY OUTPUT BLOCK Object 12

   Variation: 01, static digital output control

6.4.8 Data Address Table

Point Descriptions

The following tables describe the DNP3.0 data objects provided by the KW320 series Power Meter. The object, variation, and point numbers are specified for each parameter, as well as the application layer function codes which may be used to operate on the parameter.

Description:

Object	Variation	32-BIT ANALOG INPUT WITHOUT FLAG
30	3	
Object	Variation	16-BIT ANALOG INPUT WITHOUT FLAG
30	4	
Object	Variation	32-BIT FLOAT INPUT WITH FLAG
30	5	
Object	Variation	32-BIT FLOAT INPUT WITH FLAG
100	1	
Object	Variation	32-BIT COUNTER WITHOUT FLAG
20	5	
Object	Variation	CONTROL RELAY OUTPUT BLOCK
12	1	

Object	Point	Variation	Name	Format	Range	Multiplier	Units	Descriptor
100	0	1	Freq_rms	Float		1.0	Hz	Frequency
100	1	1	Ua_rms	Float		1.0	V	Voltage A
100	2	1	Ub_rms	Float		1.0	V	Voltage B
100	3	1	Uc_rms	Float		1.0	V	Voltage C
100	4	1	Uavg_rms	Float		1.0	V	Phase Voltage Avg
100	5	1	Uab_rms	Float		1.0	V	Voltage A-B
100	6	1	Ubc_rms	Float		1.0	V	Voltage B-C
100	7	1	Uca_rms	Float		1.0	V	Voltage C-A
100	8	1	Ulag_rms	Float		1.0	A	Line Voltage Avg
100	9	1	Ia_ms	Float		1.0	A	Cuurent A
100	10	1	Ib_rms	Float		1.0	A	Current B
100	11	1	Ic_rms	Float		1.0	A	Current C
100	12	1	Iavg_rms	Float		1.0	A	Cuurent Avg
100	13	1	In_rms	Float		1.0	A	Neutral Current
100	14	1	Pa_rma	Float		1.0	W	Pa
100	15	1	Pb_rms	Float		1.0	W	Pb
100	16	1	Pc_rms	Float		1.0	W	Pc
100	17	1	P_rms	Float		1.0	W	Total Active Power
100	18	1	Qa_rms	Float		1.0	var	Qa
100	19	1	Qb_rms	Float		1.0	var	Qb
100	20	1	Qc_rms	Float		1.0	var	Qc
100	21	1	Q_rms	Float		1.0	var	Total Reactive Power
100	22	1	Sa_rms	Float		1.0	VA	Sa
100	23	1	Sb_rms	Float		1.0	VA	Sb
100	24	1	Sc_rms	Float		1.0	VA	Sc
100	25	1	S_rms	Float		1.0	VA	Total Apparent Power
100	26	1	PFa_rms	Float		1.0	None	PFa
100	27	1	PFb_rms	Float		1.0	None	PFb
100	28	1	PFc_rms	Float		1.0	None	PFc
100	29	1	PF_rms	Float		1.0	None	Total Power Factor
100	30	1	Unbl_u2	Float		1.0	None	Voltage Imbalance
100	31	1	Unbl_i2	Float		1.0	None	Current Imbalance
100	32	1	RIc_rms	Float		1.0	None	Load Characteristics
100	33	1	P_dema	Float		1.0	W	P Demand
100	34	1	Q_dema	Float		1.0	Var	Q Demand
100	35	1	S_dema	Float		1.0	VA	S Demand

Object	Point	Variation	Name	Format	Range	Multiplier	Units	Descriptor
100	36	1	Ia_Demand	Float		1.0	A	Ia Demand
100	37	1	Ib_Demand	Float		1.0	A	Ib Demand
100	38	1	Ic_Demand	Float		1.0	A	Ic Demand

Object	Point	Variation	Name	Format	Range	Multiplier	Units	Descriptor
20	0	5	Active_Energy_IMP	UINT32	0~999999999	0.1/0.001	W/hr	Active_Energy_IMP
20	1	5	Active_Energy_EXP	UINT32	0~999999999	0.1/0.001	W/hr	Active_Energy_EXP
20	2	5	Reactive_Energy_IMP	UINT32	0~999999999	0.1/0.001	W/hr	Reactive_Energy_IMP
20	3	5	Reactive_Energy_EXP	UINT32	0~999999999	0.1/0.001	W/hr	Reactive_Energy_EXP
20	4	5	Active_Energy_TOTAL	UINT32	0~999999999	0.1/0.001	W/hr	Active_Energy_TOTAL
20	5	5	Active_Energy_NET	UINT32	0~999999999	0.1/0.001	W/hr	Active_Energy_NET
20	6	5	Reactive_Energy_TOTAL	UINT32	0~999999999	0.1/0.001	W/hr	Reactive_Energy_TOTAL

Object	Point	Variation	Name	Format	Range	Multiplier	Units	Descriptor
20	7	5	Reactive_Energy_NET	UINT32	0~999999999	0.1/0.001	var/hr	DI1Counts
20	8	5	Apparent_Energy	UINT32	0~999999999	0.1/0.001	VA/hr	DI2Counts
20	9	5	DI1Counts	UINTS32	0~4294967259	1	none	DI3Counts
20	10	5	DI2Counts	UINTS32	0~4294967259	1	none	DI4Counts
20	11	5	DI3Counts	UINTS32	0~4294967259	1	none	DI5Counts
20	12	5	DI4Counts	UINTS32	0~4294967259	1	none	DI6Counts
20	13	5	DI5Counts	UINTS32	0~4294967259	1	none	DI7Counts
20	14	5	DI6Counts	UINTS32	0~4294967259	1	none	DI8Counts
20	15	5	DI7Counts	UINTS32	0~4294967259	1	none	DI9Counts
20	16	5	DI8Counts	UINTS32	0~4294967259	1	none	DI10Counts
20	17	5	DI9Counts	UINTS32	0~4294967259	1	none	DI11Counts
20	18	5	DI10Counts	UINTS32	0~4294967259	1	none	DI12Counts
20	19	5	DI11Counts	UINTS32	0~4294967259	1	none	DI13Counts
20	20	5	DI12Counts	UINTS32	0~4294967259	1	none	DI14Counts
20	21	5	DI13Counts	UINTS32	0~4294967259	1	none	DI15Counts
20	22	5	DI14Counts	UINTS32	0~4294967259	1	none	DI16Counts
20	23	5	DI15Counts	UINTS32	0~4294967259	1	none	DI17Counts
20	24	5	DI16Counts	UINTS32	0~4294967259	1	none	DI18Counts
20	25	5	DI17Counts	UINTS32	0~4294967259	1	none	DI19Counts
20	26	5	DI18Counts	UINTS32	0~4294967259	1	none	DI20Counts
20	27	5	DI19Counts	UINTS32	0~4294967259	1	none	DI21Counts
20	28	5	DI20Counts	UINTS32	0~4294967259	1	none	DI22Counts
20	29	5	DI21Counts	UINTS32	0~4294967259	1	none	DI23Counts
20	30	5	DI22Counts	UINTS32	0~4294967259	1	none	DI24Counts
20	31	5	DI23Counts	UINTS32	0~4294967259	1	none	DI25Counts
20	32	5	DI24Counts	UINTS32	0~4294967259	1	none	DI26Counts
20	33	5	DI25Counts	UINTS32	0~4294967259	1	none	DI27Counts

Object	Point	Variation	Name	Format	Range	Multiplier	Units	Descriptor
20	34	5	DI26Counts	UINTS32	0~4294967259	1	none	DI28Counts
20	35	5	DI27Counts	UINTS32	0~4294967259	1	none	DI1Counts
20	36	5	DI28Counts	UINTS32	0~4294967259	1	none	DI2Counts

Object	Point	Variation	Name	Format	Range	Multiplier	Units	Descriptor
30	0	4	THD_V1	UINT16	0~10000	0.01	none	THD_V1
30	1	4	THD_V2	UINT16	0~10000	0.01	none	THD_V2
30	2	4	THD_V3	UINT16	0~10000	0.01	none	THD_V3
30	3	4	THD_V	UINT16	0~10000	0.01	none	THD_V
30	4	4	THD_I1	UINT16	0~10000	0.01	none	THD_I1
30	5	4	THD_I2	UINT16	0~10000	0.01	none	THD_I2
30	6	4	THD_I3	UINT16	0~10000	0.01	none	THD_I3
30	7	4	THD_I	UINT16	0~10000	0.01	none	THD_I

Object	Point	Variation	Name	Format	Range	Multiplier	Units	Descriptor
12	0	1	DNP_MODBUS	None	1	1	None	Responds to Function 6 (Direct Operate-No Ack) , Qualifier Code 17x, Control Code 3, Count 0, On 0 msec, Off 1 msec ONLY
12	1	1	Reset_Energy_ Counters	None	1	1	None	Responds to Function 5 (Direct Operate) Qualifier Code 17x or 28x, Control Code 3, Count 0, On 0 msec, Off 1 msec ONLY
12	2	1	Reset_ Demand_ Counters	None	1	1	None	Responds to Function 5 (Direct Operate) Qualifier Code 17x or 28x, Control Code 3, Count 0, On 0 msec, Off 1 msec ONLY

6.4.9 DNP3.0 Message Layout

The following table is the abbreviation and explain.

DestL	The destination address low byte
DestH	The destination address high byte
SorcL	The source address low byte
SorcH	The source address high byte
CrcL	The Cyclic Redundancy Checksum low byte
CrcH	The Cyclic Redundancy Checksum high byte
x	The transport layer data sequence num
y	The applicaiton layer data sequence num
II1	The first byte of Internal Indicator
II2	The second byte of Internal Indicator

Link Layer Frames

Reset Link:

Request	05	64	05	C0	DestL	DestH	SorcL	SorcH	CrcL	CrcH
Response	05	64	05	00	SorcL	SorcH	DestL	DestH	CrcL	CrcH

Reset User:

Request	05	64	05	C1	DestL	DestH	SorcL	SorcH	CrcL	CrcH
Response	05	64	05	00	SorcL	SorcH	DestL	DestH	CrcL	CrcH

Link Status:

Request	05	64	05	C9	DestL	DestH	SorcL	SorcH	CrcL	CrcH
Response	05	64	05	00	SorcL	SorcH	DestL	DestH	CrcL	CrcH

Application Layer Frames

Reset Energy:

	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**
Reset Energy									
Request	05	64	18	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	05	0C	01	17	01	01	03
	00	00	00	CrcL	CrcH				
Response	05	64	1A	44	SorcL	SorcH	DestL	DestH	CrcL
	Cx	Cy	81	II1	II2	0C	01	17	01
	01	00	00	00	00	CrcL	CrcH		
Request	05	64	1A	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	05	0C	01	28	01	00	01
	01	00	00	00	00	CrcL	CrcH		
Response	05	64	1C	44	SorcL	SorcH	DestL	DestH	CrcL
	Cx	Cy	81	II1	II2	0C	01	28	01
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Reset Energy									
Request	CrcH								
	00	00	00	00	00	01	00	CrcL	CrcH
Response	CrcH								
	01	03	00	00	00	00	00	CrcL	CrcH
Request	CrcH								
	00	03	00	00	00	01	00	CrcL	CrcH
Response	CrcH								
	00	01	00	03	00	01	00	CrcL	CrcH
	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**
Reset Energy									

Request	05	64	18	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	05	0C	01	17	01	01	03
Response	05	64	1A	C4	DestL	DestH	SorcL	CorcH	CrcL
	Cx	Cy	81	II1	II2	0C	01	17	01
	01	00	00	00	00	CrcL	CrcH		
Request	05	64	1A	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	05	0C	01	28	01	00	02
	00	00	00	CrcL	CrcH				
Response	05	64	1A	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	81	II1	II2	0C	01	28	01
	00	00	01	00	00	CrcL	CrcH		
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Rest Energy									
Request	CrcH								
	00	00	00	00	00	01	00	CrcL	CrcH
Response	CrcH								
	02	03	00	00	00	00	00	CrcL	CrcH
Request	CrcH								
	00	03	00	00	00	00	00	CrcL	CrcH
Response	CrcH								
	00	02	00	03	00	00	00	CrcL	CrcH

Switch to Modbus:

	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**
Request	05	64	18	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	06	0C	01	17	01	00	03
	00	00	00	CrcL	CrcH				
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Request									
00	00	00	00	00	00	01	00	CrcL	CrcH

Request Data

Qualifier 0X06:

	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**
Reset Energy	0x06								
Request	05	64	0B	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	01	1E	04	06	CrcL	CrcH	

Response	05	64	1F	44	SorcL	SorcH	DestL	DestH	CrcL
	Cx	Cy	81	II1	II2	1E	04	00	00
	Data3 L	Data3 H	Data4 L	Data4 H	Data5 L	Data5 H	Data6 L	Data6 H	Data7 L
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Reset Energy	0x00								
Request	CrcH								
Response	CrcH								
	07	Data0 L	Data0 H	Data1 L	Data1 H	Data2 L	Data2 H	CrcL	CrcH
	Data7 L	CrcL	CrcH						

Qualifier 0X00:

	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**
Reset Energy	0x00								
Request	05	64	0D	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	01	64	01	00	03	07	CrcL
Response	05	64	1F	44	SorcL	SorcH	DestL	DestH	CrcL
	Cx	Cy	81	II1	II2	64	01	00	03
	Data4 1	Data4 2	Data4 3	Data4 4	Flag 5	Data5 1	Data5 2	Data5 3	Data5 4
	Data7 2	Data7 3	Data7 4	CrcL	CrcH				
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Reset Energy									
Request	CrcH								
	CrcH								
Response	CrcH								
	07	Flag 3	Data3 1	Data3 2	Data3 3	Data3 4	Flag 4	CrcL	CrcH
	Flag 6 L	Data6 1	Data6 2	Data6 3	Data6 4	Flag 7	Data7 1	CrcL	CrcH

Qualifier 0X00:

	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**
Reset Energy	0x00								
Request	05	64	0D	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	01	14	05	00	03	07	CrcL
Response	05	64	1F	44	SorcL	SorcH	DestL	DestH	CrcL
	Cx	Cy	81	II1	II2	15	05	00	03
	Data6 L	Data6 H	Data7 L	Data7H	CrcL	CrcH			
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Reset Energy									
Request	CrcH								
	CrcH								
Response	CrcH								
	07	Data3 L	Data3 H	Data4 L	Data4 H	Data5 L	Data5 H	CrcL	CrcH

Qualifier 0X01:

	01	02	03	04	05	06	07	08	09
Reset Energy	0x01								
Request	05	64	0F	C4	DestL	DestH	SorcL	SorcH	CrcL
	Cx	Cy	01	14	05	01	00	00	0A
Response	05	64	3D	44	SorcL	SorcH	DestL	DestH	CrcL
	Cx	Cy	81	II1	II2	14	05	01	00
	Data2 L	Data2 H	Data3 L	Data3 H	Data4 L	Data4 H	Data5 L	Data5 H	Data6 L
	Data10 L	Data10 H	CrcL	CrcH					
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Reset Energy									
Request	CrcH								
	00	CrcL	CrcH						
Response	CrcH								
	00	0A	00	Data0 L	Data0 H	Data1 L	Data1 H	CrcL	CrcH
	Data6 H	Data7 L	Data7 H	Data8 L	Data8 H	Data9 L	Data9 H	CrcL	CrcH

Error Reply:

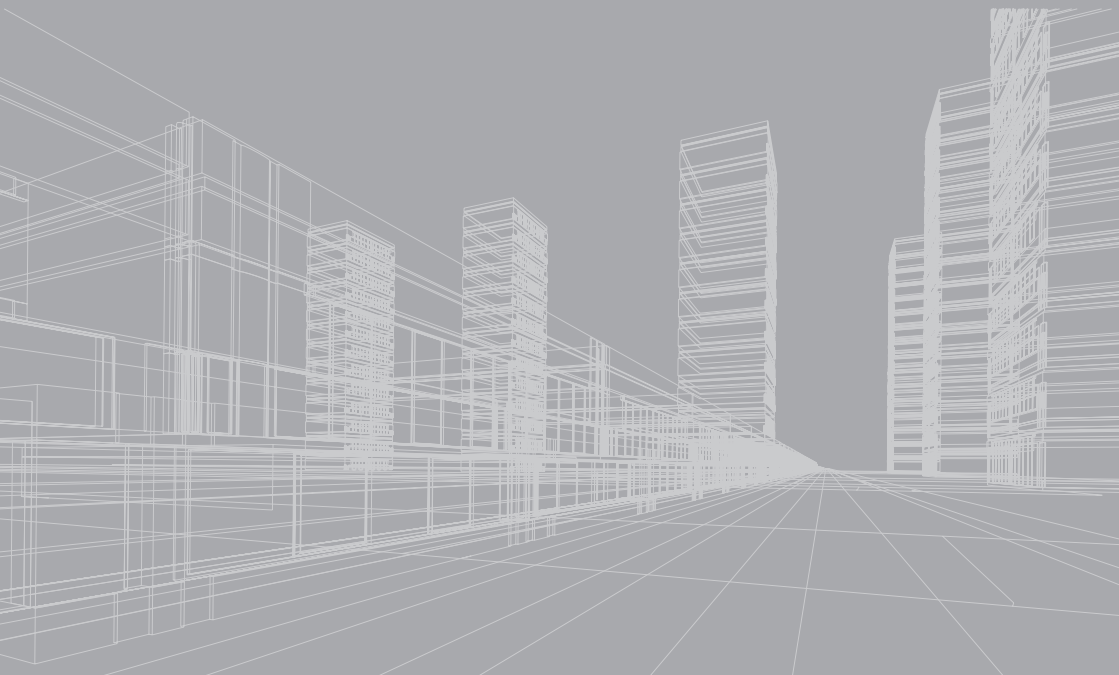
Reset Energy										
Response	05	64	0A	44	DestL	DestH	SorcL	SorcH	CrcL	CrcH
	Cx	Cy	81	II1	II2	CrcL	CrcH			

KW320 Series Power Meter

Appendix

Appendix A - Technical Data and Specification

Appendix B - Ordering Information



Appendix A – Technical Data and Specification

Energy Accuracy (KW320R)	
Active power (according to IEC 62053-22) (according to ANSI C12.20)	 Class 0.2S Class 0.2
Harmonic Resolution	
Metered Value	2nd~63rd (50Hz or 60Hz type) 2nd~15th (400Hz type)

Voltage Input	
Nominal Full Scale	400Vac L-N, 690Vac L-L
Withstand	1500Vac continuous | 3250Vac, 50/60Hz for 1 minute
Input Impedance	2Mohm per phase
Metering Frequency	45Hz~65Hz
Pickup Voltage	10Vac
Accuracy	0.2% full scale

Current Inputs (Each Channel)	
Nominal Current Metering Range Pickup Current	1A (333mV), 1A (100mV Rope CT) 0~1.2A, 0~1.2A 5mA
Withstand	20Arms continuous, 100Arms for 1 second, non-recurring
Burdern	0.05VA (typical) @ 5Arms
Accuracy	0.2% full scale

Accuracy

Parameters		Accuracy	Resolution	Range
Voltage		0.2%	0.1V	10V~1000kV
Current		0.2%	0.0001A	5mA~50000A
Power		0.2%	1W	-9999MW~9999MW
Reactive Power		0.2%	1Var	-9999MVar~9999MVar
Apparent Power		0.2%	1VA	0~9999MVA
Power Demand		0.2%	1W	-9999MW~9999MW
Reactive Power Demand		0.2%	1Var	-9999MVar~9999MVar
Apparent Power Demand		0.2%	1VA	0~9999MVA
Power Factor		0.2%	0.001	-1.000~1.000
Frequency		0.2%	0.01Hz	45.00~65.00Hz (50Hz or 60Hz type) 300.00~500.00 (400 type)
Energy	Primary	0.2%	0.1kWh	0~99999999.9kWh
	Secondary	0.2%	0.001kWh	0~999999.999kWh
Reactive Energy	Primary	0.2%	0.1kvarh	0~99999999.9kWh
	Secondary	0.2%	0.001kvarh	0~999999.999kWh
Apparent Energy	Primary	0.2%	0.1kVah	0~99999999.9kWh
	Secondary	0.2%	0.001kVah	0~999999.999kWh
Harmonics		1.0%	0.1%	>=0.0%
Phase Angle		2.0%	0.1°	0.0° ~359.9°
Imbalance Factor		2.0%	0.1%	0.0%~100%
Running Time		<1secondary/day	0.01h	0~9999999.99h
Temperature Drift		<100ppm/°C		
		0.5‰ /year		

Control Power

AC/DC Control Power	
Operating Range	100~415Vac, 50/60Hz; 100~300Vdc
Burden	5W
Withstand	3250Vac, 50/60Hz 1min Installation Category III (Distribution)

Standard Compliance	
Measurment Standard	IEC 62053-22; ANSI C12.20
Environmental Standard	IEC 60068-2
Safety Standard	IEC 61010-1, UL 61010-1
EMC Standard	IEC 61000-4/-2-3-4-5-6-8-11, CISPR 22
Outlines Standard	DIN 43700, ANSI C39.1

Appendix B Ordering Information

KW320 Series Meter

STANDARD ORDERING						
Model #	Item #	mV CT Input	Rogowski Coil Input	Meter Only	Panel Upgrade	Waveform Capture
KW320-P1-D-W-RC-XX	148244		•	•		
KW320-P1-D-W-SC-XX	148245	•		•		
KW320-P1-D-W-RC-PC	148246		•		•	
KW320-P1-D-W-SC-PC	148247	•			•	
KW320Q-P1-D-W-RC-XX	148250		•	•		•
KW320Q-P1-D-W-SC-XX	148249	•		•		•
KW320Q-P1-D-W-RC-PC	148251		•		•	•
KW320Q-P1-D-W-SC-PC	148257	•			•	•

KW320 Base Meter Ordering Example: KW320-P1-D-W-RC-XX

I/O Option Module

IO Module Ordering Example: AXM-IO2-1A

Note:

1. No more than 2 of the same I/O modules may be attached to the meter (example: 2 AXMIO2). The same two I/O modules must be a different component number.
2. A maximum of 3 modules may be attached to the meter. If a communication module is used (example: AXM-WEB2), it must be installed on the back of the meter FIRST before the other modules are attached.
3. If you select KW320Q products, and prepared to use DI recorder function, then select the IO module can only select logic number 1module.
4. If you select KW320Q products,you can only select 50Hz or 60Hz type.

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[Engineering a Better Sensor Solution]

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