KW320B Series BACnet IP 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 KW320B 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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1. BACnet Overview

The Building Automation and Control Network (BACnet), described in the ANSI/ASHRAE Standard 135-1995, is one of the most widely used building management systems protocols. BACnet was designed to allow communication of building automation and control systems for applications such as heating, ventilating, and air-conditioning control, lighting control, access control, and fire detection systems and their associated equipment. The BACnet protocol provides mechanisms for computerized building automation devices to exchange information, regardless of the particular building service they perform.

2. Introduction

The KW320B Series Power Meter supports BACnet IP communication only. It communicates in native BACnet IP over Ethernet to seamlessly integrate with most building automation/ control systems. The BACnet IP protocol supports 106 objects which lets you track up 78 measurements and 28 IO parameters.

The KW320B Series Power Meter supports native BACnet/IP that lets it act as a BACnet server in any BACnet application. The KW320B Series Power Meter's BACnet IP also comes with a Web interface that allows users to configure the BACnet related parameters and read measurements by using a standard browser.

3. About BACnet Protocol

The BACnet protocol operates in a client-server environment. A client machine sends a service request (message) to a server machine; once the service is performed the results are reported back to the client machine. BACnet defines 5 groups (or classes) of 35 message types. For example, one class contains messages for retrieving and manipulating the object properties described above. An example of a common service request in this class is "Read-Property." When the server machine receives this message from a client machine, it locates the requested property of the requested object and sends the value to the client.

The BACnet protocol consists of Objects that contain different kinds of information. Each Object has properties that contain data related to it.

4. Using the KW320B Series Power Meter's BACnet Protocol

There are different serial and Ethernet based-versions of BACnet. The most common serial version is called BACnet MS/TP while the dominant Ethernet version is BACnet/IP. The ACI KW320B series power meter is Ethernet BACnet/IP Only.

BACnet/IP has been developed to allow the BACnet protocol to use TCP/IP networks. You could say that BACnet/IP is a way of hooking BACnet up to the Internet and communicating with different Local Area Networks (LANs). This enables system owners, facility managers, or even external suppliers to access BACnet networks and manage their devices and systems remotely.

BACnet/IP Characteristics	
Network Type	Ethernet based network using UDP for data transfer.
Topology	Line or star topology (Standard Ethernet topology)
Installation	Ethernet twisted pair cables with RJ45 connectors
Speed	10/100 Mbit/s full duplex
Max. Station	No network limitation of number of nodes.
Data	Up to 1476 bytes per frame

Table 5-1

5. Using The BACnet Module (AXM-BACnet)

5.1 Definition of RJ45 Interface

The BACnet/IP module uses a standard RJ45 connector to access the network. The mechanical and electrical characteristics of the connectors comply with the requirements of IEC 603-7.

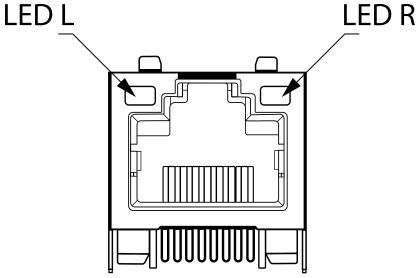


Figure 5-2

Script	ID	Content
1	TX+	Trancieved Data+
2	TX-	Trancieved Data-
3	RX+	Recieved Data+
4	n/c	Not Connected
5	n/c	Not Connected
6	RX-	Recieved Data-
7	n/c	Not Connected
8	n/c	Not Connected

5.2 Initializing The BACnet Modules

5.2.1 BACnet/IP Module (AXM-BIP)

AXM-BIP Module's default settings are as follows:

IP Address (192.168.1.254);Subnet Mask (255.255.255.0);Gateway (192.168.1.1); DNS1

(8.8.8.8); DNS2 (8.8.4.4);

The KW320B will need to be configured in order to communicate with the AXM-BIP.

The following process shows how to configure BACnet module settings by using the keys on

the display:

- Pressing “H” key and “V/A” key simultaneously on the meter will go to the menu selecting mode. The “Meter” cursor flashes in this mode.
- Press the "P” key or “E” key to move the cursor to "Setting". Press “V/A” key to go in to the meter parameter setting mode. Device address page is the first page of “Setting” mode. It shows the address of the device for several seconds, and then the screen goes to the parameter settings menu. Press the "V/A' key to enter the "SYS" system setting page.

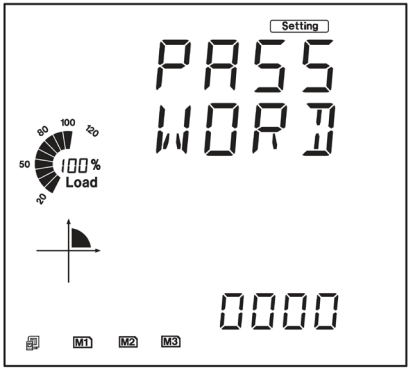


Figure 5-3

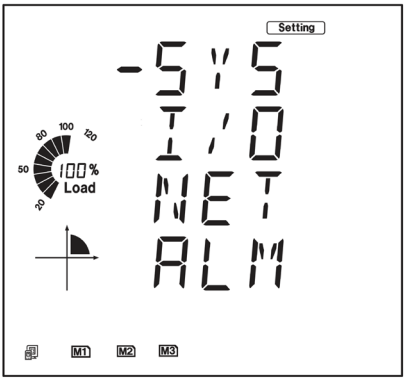


Figure 5-4

- Once in the system settings menu, the initial page is S01 ADDR, the meters address page. Press the "P" key to go to the S03 BPS2 page. The baud rate should be at 38400.
- Press the "V/A" key to enter edit mode to configure the desired baud rate using the "P" or "E" key. Select 38400. Press the "V/A" key to confirm.
- Press the "P" key or "E" key to move to page S31 Parity2 page. Press the "V/A" key to enter edit mode.
- Press the "P" key or "E" key to change the setting to "1NO" and press the "V/A" key to confirm the setting.
- Press the "P" key or "E" key to move to page S34 PROTOCOL 2 page. Press the "V/A" key to enter edit mode.

- Press the "P" key or "E" key to change the setting to "Other" and press the "V/ A" key to confirm the setting.
- Press the "H" key to back out of the system settings and press the "E" key to move the cursor to "NET"
- Press"V/A" key to enter the BACnet module settings page to configure the IP address of the AXM-BIP.
- Press the "P" key to move to N02 IP page. If you would like to change it, press the "V/A" key to enter edit mode.

  Press 'V/A' to modify; the first digit will begin to flash.

  Press 'P' or 'E' to change the number of the flashing digit

  Press 'H' to switch the flashing digit

  Press 'V/A' to confirm the setting.
- Press the "P" key to move to N03 SUBMASK page. If you would like to change it, press the "V/A" key to enter edit mode and follow the procedure for changing the IP address above.
- Press the "P" key to move to N04 GATEWAY page. If you would like to change it, press the "V/A" key to enter edit mode and follow the procedure for changing the IP address above.
- Press the "P" key to move to N05 DNS1 page. If you would like to change it, press the "V/A" key to enter edit mode and follow the procedure for changing the IP address above.
- Press the "P" key to move to N06 DNS2 page. If you would like to change it, press the "V/A" key to enter edit mode and follow the procedure for changing the IP address above.

  After making any changes to the settings above, the AXM-BIP will require a reset in order for the setting to take effect.
- Press the "P" key to move to N09 NET REST page.
- Press "V/A" key to modify; 'NO' should begin to flash
- Press "P" key to change 'NO' to 'RESET'.
- Press "V/A" key to reset the module. 'NO' will be displayed on the screen and the AXM-BIP module settings should now take effect.

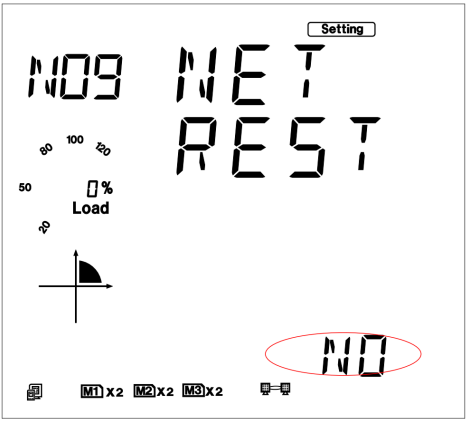


Figure 5-5

6. BACnet Objects

6.1 AXM-BIP Reading Objects

The AXM-BIP module for the KW320B series power meter supports 78 predefined objects based on the meters real-time measurement parameters. There is no programming or mapping necessary to use the BACnet objects. The object's name easily identifies the measurement they contain.

The following objects have the object type as Analog Inputs. The table below lists each of the objects with their instance number and the units of measurement

Instance	Object Type	Name	Object Data Type	Units
1	Analog Input	Frequency	Float	Hz
2	Analog Input	Phase A Voltage	Float	V
3	Analog Input	Phase B Voltage	Float	V
4	Analog Input	Phase C Voltage	Float	V
5	Analog Input	Average Line Voltage	Float	V
6	Analog Input	Line Voltage AB	Float	V
7	Analog Input	Line Voltage BC	Float	V
8	Analog Input	Line Voltage CA	Float	V
9	Analog Input	Average Line Voltage	Float	V
10	Analog Input	Phase A Current	Float	A
11	Analog Input	Phase B Current	Float	A
12	Analog Input	Phase C Current	Float	A
13	Analog Input	Average Current	Float	A
14	Analog Input	Neutral Current	Float	A
15	Analog Input	Phase A Active Power	Float	kW
16	Analog Input	Phase B Active Power	Float	kW
17	Analog Input	Phase C Active Power	Float	kW
18	Analog Input	Total Active Power	Float	kW
19	Analog Input	Phase A Reactive Power	Float	kvar
20	Analog Input	Phase B Reactive Power	Float	kvar
21	Analog Input	Phase C Reactive Power	Float	kvar
22	Analog Input	Total Reactive Power	Float	kvar
23	Analog Input	Phase A Apparent Power	Float	kVA
24	Analog Input	Phase B Apparent Power	Float	kVA
25	Analog Input	Phase C Apparent Power	Float	kVA
26	Analog Input	Total Apparent Power	Float	kVA
27	Analog Input	Phase A Power Factor	Float	
28	Analog Input	Phase B Power Factor	Float	
29	Analog Input	Phase C Power Factor	Float	
30	Analog Input	Total Power Factor	Float	
31	Analog Input	Voltage Unbalance Factor	Float	%
32	Analog Input	Current Unbalance Factor	Float	%
33	Analog Input	Load Type	Float	
34	Analog Input	Active Power Demand	Float	kW
35	Analog Input	Reactive Power Demand	Float	kwar
36	Analog Input	Apparent Power Demand	Float	kVA
37	Analog Input	Phase A Current Demand	Float	A
38	Analog Input	Phase B Current Demand	Float	A
39	Analog Input	Phase C Current Demand	Float	A
40	Analog Input	Import Active Energy	Float	kWh
41	Analog Input	Export Active Energy	Float	kWh
42	Analog Input	Import Reactive Energy	Float	kWh

Instance	Object Type	Name	Object Data Type	Units
43	Analog Input	Export Reactive Energy	Float	kWh
44	Analog Input	Energy Total	Float	kWh
45	Analog Input	Energy Net	Float	kWh
46	Analog Input	Reactive Energy Total	Float	kvarh
47	Analog Input	Reactive Energy Net	Float	kvarh
48	Analog Input	Apparent Energy	Float	kVah
49	Analog Input	Phase A Import Active Energy	Float	kWh
50	Analog Input	Phase A Export Actuve Energy	Float	kWh
51	Analog Input	Phase B Import Active Energy	Float	kWh
52	Analog Input	Phase B Export Active Energy	Float	kWh
53	Analog Input	Phase C Import Active Energy	Float	kWh
54	Analog Input	Phase C Export Active Energy	Float	kWh
55	Analog Input	Phase A Import Reactive Energy	Float	kvarh
56	Analog Input	Phase A Export Reactive Energy	Float	kvarh
57	Analog Input	Phase B Import Reactive Energy	Float	kvarh
58	Analog Input	Phase B Export Reactive Energy	Float	kvarh
59	Analog Input	Phase C Import Reactive Energy	Float	kvarh
60	Analog Input	Phase C Export Reactive Energy	Float	kvarh
61	Analog Input	Phase A Apparent Energy	Float	kVah
62	Analog Input	Phase B Apparent Energy	Float	kVah
63	Analog Input	Phase C Apparent Energy	Float	kVah
64	Analog Input	Phase A Voltage THD	Float	%
65	Analog Input	Phase B Voltage THD	Float	%
66	Analog Input	Phase C Voltage THD	Float	%
67	Analog Input	Average Voltage THD	Float	%
68	Analog Input	Phase A Current THD	Float	%
69	Analog Input	Phase B Current THD	Float	%
70	Analog Input	Phase C Current THD	Float	%
71	Analog Input	Average Current THD	Float	%

Table 6-1: Analog Inputs

Instance	Object Type	Name	Object Data Type
1	Binary Input	IO11-DI1	Bit
2	Binary Input	IO11-DI2	Bit
3	Binary Input	IO11-DI3	Bit
4	Binary Input	IO11-DI4	Bit
5	Binary Input	IO11-DI5	Bit
6	Binary Input	IO11-DI6	Bit
7	Binary Input	IO11-DI1	Bit
8	Binary Input	IO11-DI12	Bit
9	Binary Input	IO11-DI13	Bit
10	Binary Input	IO11-DI14	Bit
11	Binary Input	IO11-DI1	Bit
12	Binary Input	IO11-DI2	Bit
13	Binary Input	IO11-DI3	Bit
14	Binary Input	IO11-DI4	Bit
15	Binary Input	IO11-DI1	Bit
16	Binary Input	IO11-DI2	Bit
17	Binary Input	IO11-DI3	Bit
18	Binary Input	IO11-DI4	Bit
19	Binary Input	IO11-DI5	Bit
20	Binary Input	IO11-DI6	Bit
21	Binary Input	IO11-DI1	Bit
22	Binary Input	IO11-DI2	Bit
23	Binary Input	IO11-DI3	Bit
24	Binary Input	IO11-DI4	Bit
25	Binary Input	IO11-DI1	Bit
26	Binary Input	IO11-DI2	Bit
27	Binary Input	IO11-DI3	Bit
28	Binary Input	IO11-DI4	Bit

Table 6-2: Binary Inputs

Instance	Object Type	Name	Object Data Type	Units
1001	Analog Input	IO21-AI1	Float	mA/Volts
1002	Analog Input	IO21-AI2	Float	mA/Volts
1003	Analog Input	IO21-AI3	Float	mA/Volts
1004	Analog Input	IO21-AI4	Float	mA/Volts
1005	Analog Input	IO21-AI1	Float	mA/Volts
1006	Analog Input	IO21-AI2	Float	mA/Volts
1007	Analog Input	IO21-AI3	Float	mA/Volts
1008	Analog Input	IO21-AI4	Float	mA/Volts

Table 6-3: Analog Inputs - IO Module

Instance	Object Type	Name
2001	Analog Input	IO11-DI1-Counter
2002	Analog Input	IO11-DI2-Counter
2003	Analog Input	IO11-DI3-Counter
2004	Analog Input	IO11-DI4-Counter
2005	Analog Input	IO11-DI5-Counter
2006	Analog Input	IO11-DI6 Counter
2007	Analog Input	IO21-DI1-Counter
2008	Analog Input	IO21-DI2-Counter
2009	Analog Input	IO21-DI3-Counter
2010	Analog Input	IO21-DI4-Counter
2011	Analog Input	IO31-DI1-Counter
2012	Analog Input	IO31-DI2-Counter
2013	Analog Input	IO31-DI3-Counter
2014	Analog Input	IO31-DI4-Counter
2015	Analog Input	IO12-DI1-Counter
2016	Analog Input	IO12-DI2-Counter
2017	Analog Input	IO12-DI3-Counter
2018	Analog Input	IO12-DI4-Counter
2019	Analog Input	IO12-DI5-Counter
2020	Analog Input	IO12-DI6-Counter
2021	Analog Input	IO22-DI1-Counter
2022	Analog Input	IO22-DI2-Counter
2023	Analog Input	IO22-DI3-Counter
2024	Analog Input	IO22-DI4-Counter
2025	Analog Input	IO32-DI1-Counter
2026	Analog Input	IO32-DI2-Counter
2027	Analog Input	IO32-DI3-Counter
2028	Analog Input	IO32-DI4-Counter

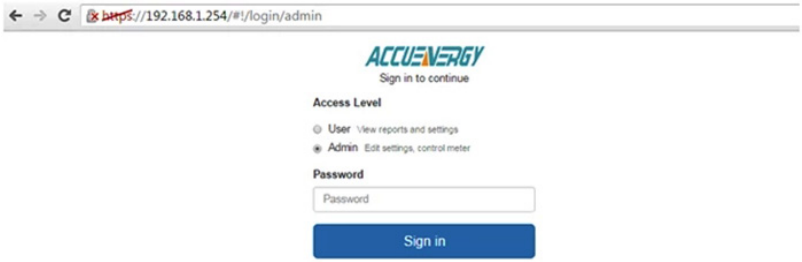
Table 6-4: Analog Inputs - DI Counter

7. AXM-BIP Through The Web Server

7.1 Configuring The BACnet-IP Settings

To configure the BACnet related setting on the AXM-BIP, users must use the built in web server. Ensure the network settings related to the AXM-BIP is configured correctly so it can be accessed by a computer within the Local Area Network.

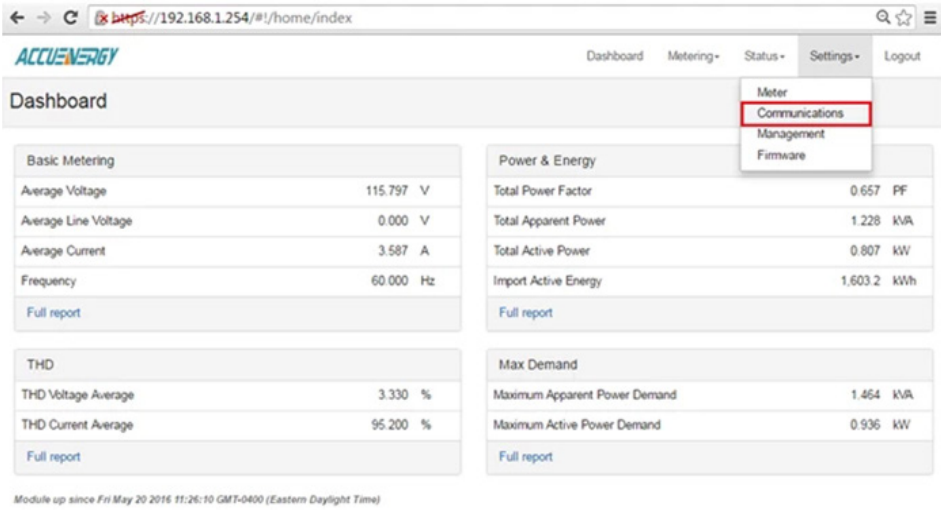
- Open an Internet browser and enter the IP address of the meter.



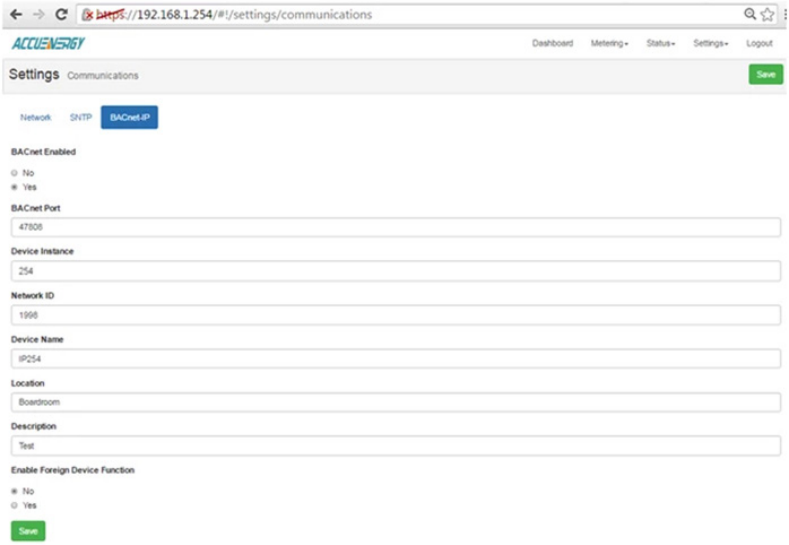
- Login in with 'Admin' access.

  Note: The default password for the Admin user access is 'admin'.

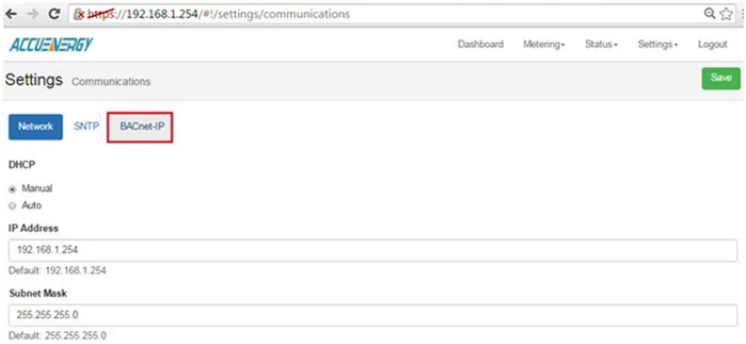
- Click on 'Settings' and select 'Communications'.



- Select the 'BACnet-IP' tab to configure the settings related to BACnet-IP protocol.



- Under "BACnet Enabled" select 'Yes' to enable the BACnet protocol.



- Enter the "BACnet Port" or the UDP port number. Default port is 47808.
- Enter a "Device Instance" for the device which is the instance number for the device object in the BACnet system. It must be unique within the system.
- Enter the "Network ID" number for the BACnet IP network in which the device resides in. The Network ID would need to be the same for the BACnet devices to communicate with each other.

- Enter a "Device 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"

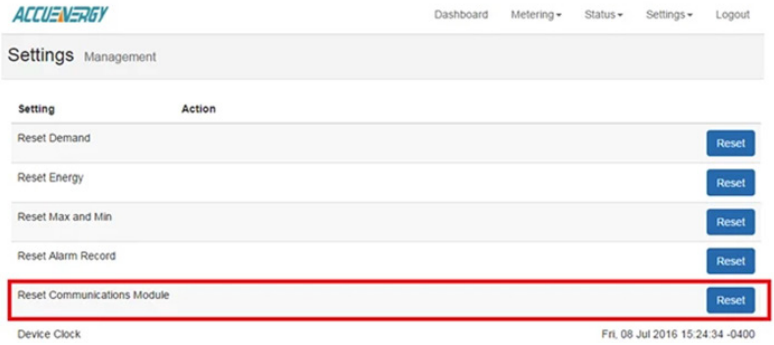
- Enter a value between 5-1440 min in the "Time To Live" for how often the foreign device will register in the BBMD's foreign device table.

- Click 'Save' to save all settings to the module.

  The module will require a reboot in order for the settings to take effect.

- Click on 'Settings' and select 'Management'.

- Click on the 'Reset' button on the "Reset Communications Module" option.



7.2 BACnet Protocol Implementation Conformity Statement

The PICS document for the AXM-BIP can be downloaded from the following URL:
https://accuenergy.com/files/acuvim-ii/EPICS_accu.tpi.zip

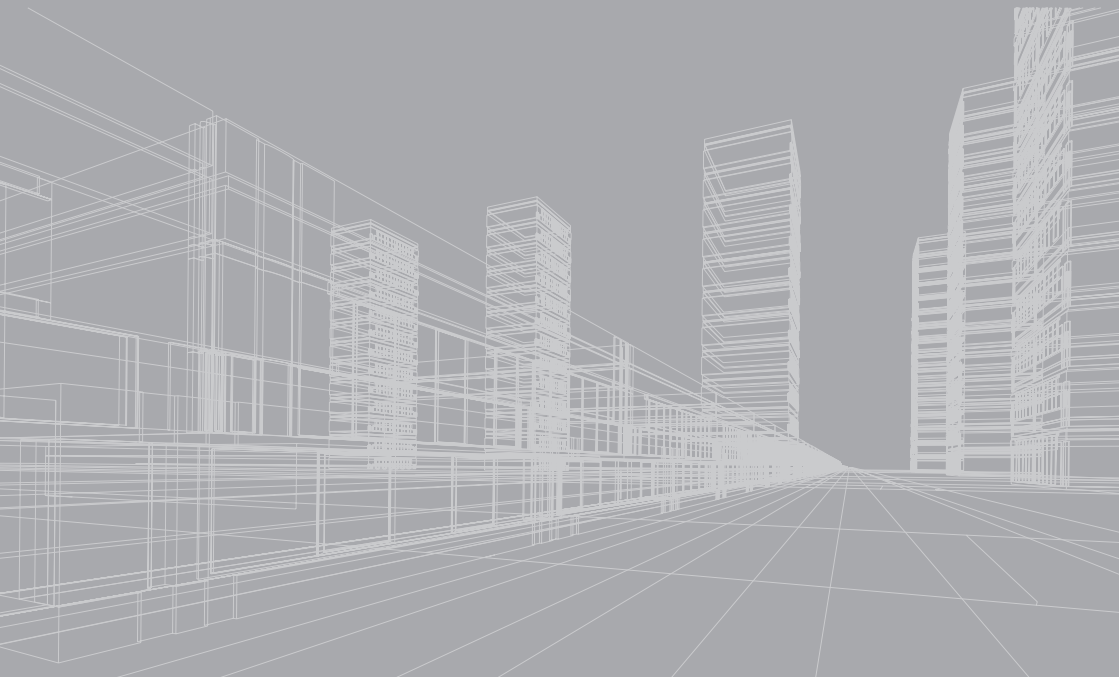
KW320 Series Power Meter

Chapter 8: Installation

8.1 Appearance and Dimensions

8.2 Installation Methods

8.3 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.

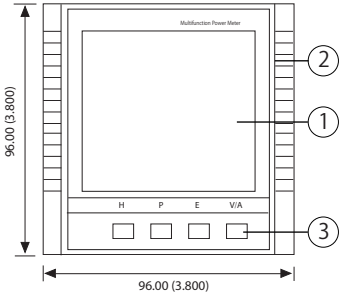
DISCONNECT DEVICE: The following part is considered the equipment disconnect device.

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.

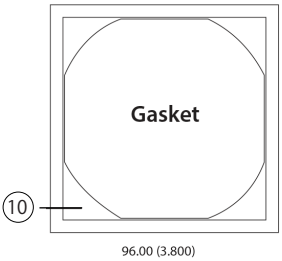
The installation method is introduced in this chapter. Please read this chapter carefully before beginning installation.

8.1 Appearance and Dimensions

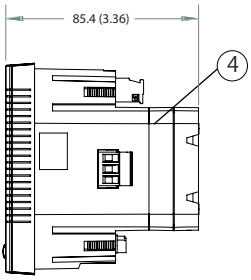
KW320 Dimensions



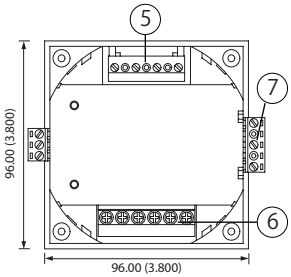
Front View



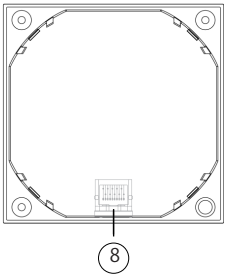
Gasket



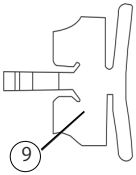
Side View (Display Meter)



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

8.2 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.

Unit: mm (inches)

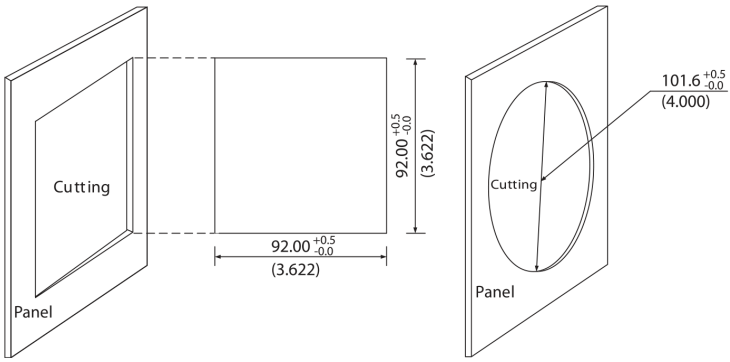


Figure 2-2 Panel Cutout

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.

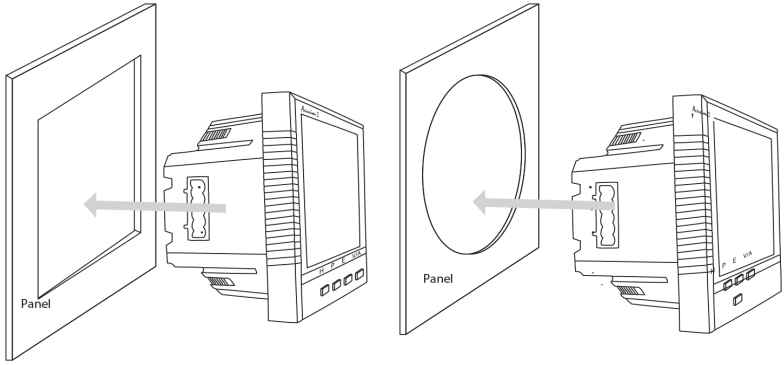


Figure 2-3 Put the meter into the opening

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

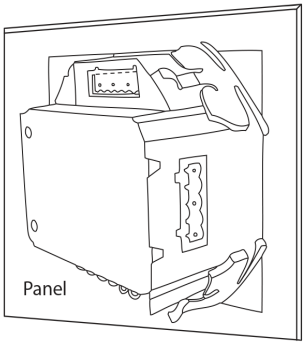


Fig 2-4 Use the clips to fix the meter on the panel

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.

8.3 Wiring

8.3.1 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.

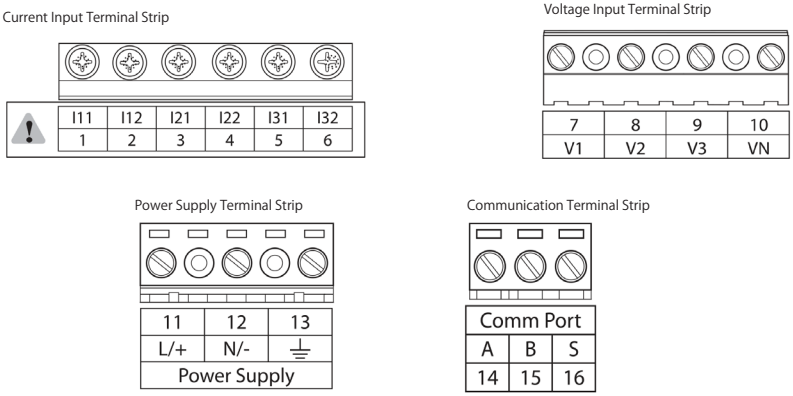


Figure 2-5 Terminal Strips of KW320 series meter

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

8.3.2 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.

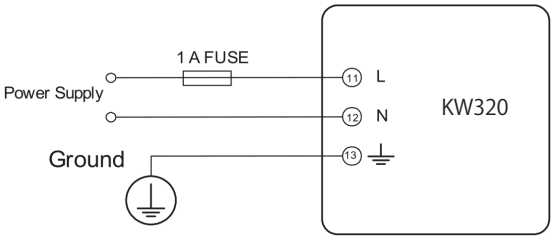
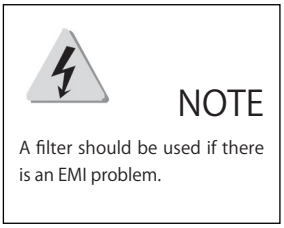


Figure 2-7 Power Supply

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.

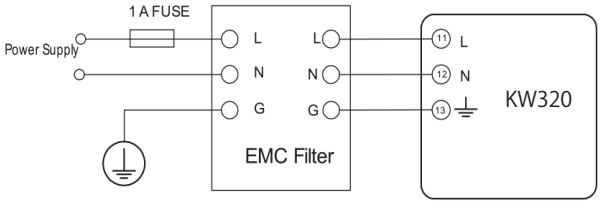


Figure 2-8 Power Supply With EMC Filter

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.

8.3.3 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.

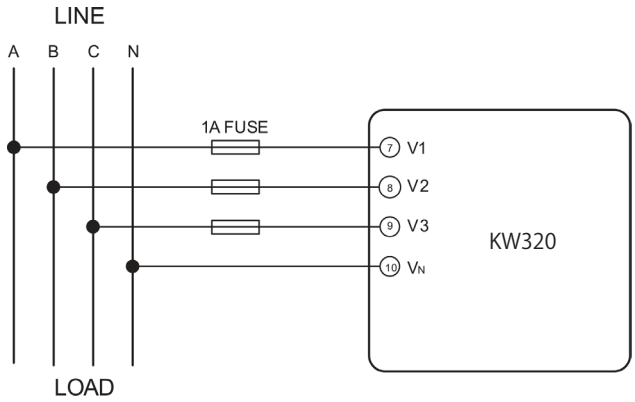


Figure 2-9a 3LN Direct Connection

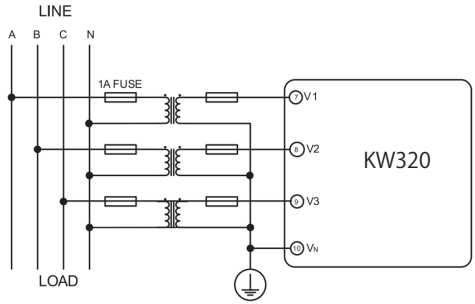


Figure 2-9b 3LN With 3PT

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.

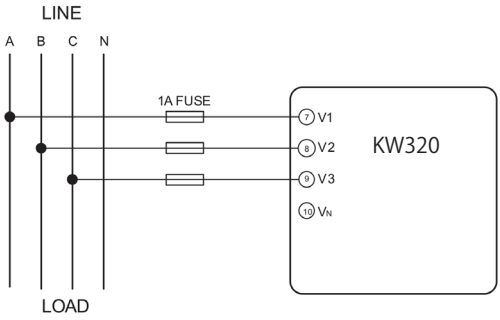


Figure 2-10 3LL 3-Phase 3-Line Direct Connection

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.

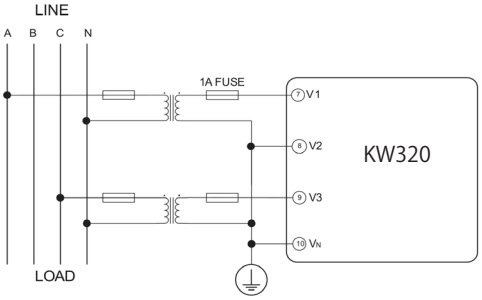


Figure 2-11 2LL With 2PT's

8.3.4 Current Input Wiring

3CT:

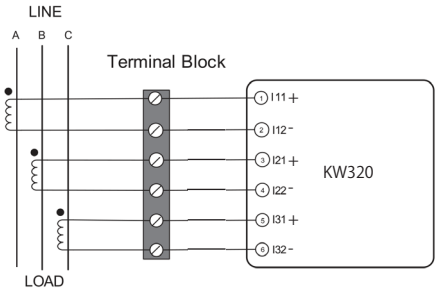


Figure 2-12 3CT's

2CT:

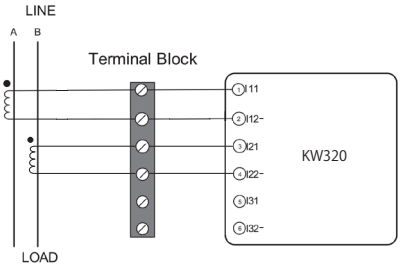


Figure 2-13 2CT's

1CT:

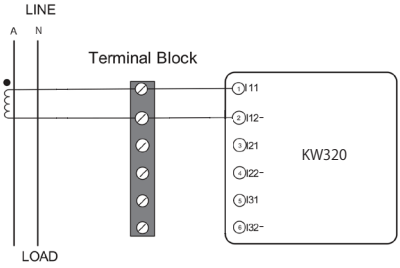


Figure 2-14 1CT

8.3.5 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.

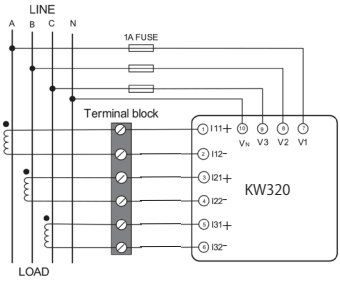


Fig 2-15 3LN, 3CT

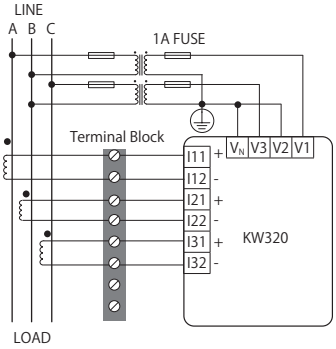


Fig 2-16 2LL, 3CT

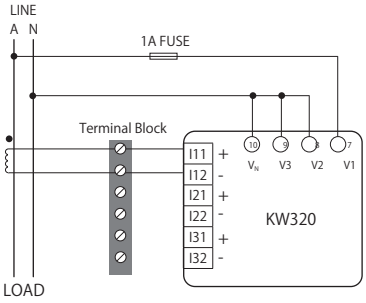


Fig 2-17 1LN, 1CT

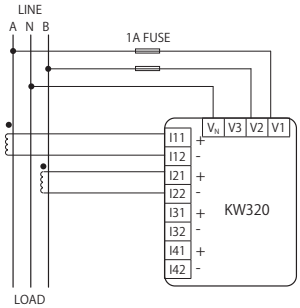


Fig 2-18 1LL, 2CT

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