EATON | Cutler-Hammer

K FRAME IQ ENERGY SENTINEL™

INSTRUCTION LEAFLET IL17539B

INSTALLATION INSTRUCTIONS FOR K FRAME IQ ENERGY SENTINEL™

IQ ENERGY SENTINEL™

The Eaton | Cutler-Hammer IQ Energy Sentinel ™ is a microprocessor-based submetering device designed to monitor watts, watt demand and watt-hours. It communicates this information directly back to an IQ Central Energy Display (IQCED) local display, a computer or other controller over the INCOM™ communications network via Cutler-Hammer PowerNet software. The K-Frame IQ Energy Sentinel mounts directly on the load terminals of a K-Frame Series C molded case circuit breaker. The IQ Energy Sentinel can be applied on three phase (3 or 4 wire) systems or on single phase (3 wire) systems.

Figure 1 - IQ Energy Sentinel - K Frame

⚠ WARNING ⚠

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS DOCUMENT ARE FOR PERSONNEL SAFETY AND PROTECTION FROM EQUIPMENT DAMAGE. THIS IS AN EXAMPLE OF A TYPICAL WARNING LABEL. THIS WILL HELP TO ENSURE THAT PERSONNEL ARE ALERTED TO CAUTIONS THAT APPEAR THROUGHOUT THE DOCUMENT.

⚠ CAUTION ⚠

COMPLETELY READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT PRIOR TO INSTALLATION OR OPERATIONS OF THE EQUIPMENT. ONLY QUALIFIED PERSONS SHOULD BE PERMITTED TO PERFORM ANY WORK ASSOCIATED WITH THE EQUIPMENT. ANY WIRING INSTRUCTIONS PRESENTED IN THIS DOCUMENT MUST BE FOLLOWED PRECISELY. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE, BODILY INJURY OR DEATH.

NOTE: For customer billing applications, consult local utility for metering accuracy requirements.

USER INTERFACES

Table 1 - Input Voltage Requirements

INPUT VOLTAGE	
3 Phase, 3 or 4 Wire	208Y/120Vac
3 Phase, 3 Wire	240Vac
1 Phase, 3 Wire	120/240Vac
Catalog Number	IQESK208
3 Phase, 3 or 4 Wire	220/380Vac
3 Phase, 3 or 4 Wire	230/400Vac
3 Phase, 3 or 4 Wire	240/415Vac
Catalog Number	IQESK400
3 Phase, 3 or 4 Wire	480Y/277Vac
3 Phase, 3 Wire	480Vac
Catalog Number	IQESK480
3 Phase, 3 or 4 Wire	600Y/347Vac
3 Phase, 3 Wire	600Vac
Catalog Number	IQESK600
NOTE: For ac applications only	

An IQCED can be used as a local display of available information from the IQ Energy Sentinels. The IQ Energy Sentinel can also be interfaced to PowerNet software running on a personal computer with a CONI or MINT II network card.

Table 2 - Specifications

Dimensions
* Height
1.25"
* Width
5.31"
* Depth
4.04"
* Shipping Weight
0.96 lbs.

Full Scale Rating
* 400A

Accuracy
* +/-1% of full scale rating

Current Input
* Current Range
1% - 125% of full scale rating
* Burden
1 VA
* Current Overload Capability
125% of full scale rating

Power Factor Range
* All (-1 to +1)

Operating Voltage
* Voltage Range
+/-20% of nominal voltage

Frequency
* 50-60 Hz

Communication
* Protocol
INCOM
* Speed
9600
* Compatibility
PowerNet

Certifications
Certifications
* CSA
File Number LR106359-1
* UL
File Number E64983

Table 2 - cont.

Environmental Conditions
* Operating Temperature
-13° to 158° F
-25° to 70° C
(The operating temperature listed is for the Energy Sentinel ONLY. Check the circuit breaker IL for breaker operating temperature.)
* StorageTemperature
-40° to 185° F
-40° to 85° C
* Humidity
0-95% R.H. non-condensing

INSTALLATION

WARNING

TURN OFF THE POWER SUPPLYING THE PANELBOARD OR SWITCHBOARD IN WHICH THE IQ ENERGY SENTINEL IS BEING INSTALLED. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE, BODILY INJURY OR DEATH.

This document is provided as a guide to authorized and qualified personnel only for the installation, operation and maintenance of the K-Frame IQ Energy Sentinel. These instructions do not cover all details, variations or combinations of the equipment, its storage, delivery, installation, safe operation or maintenance. Care must be exercised to comply with local, state and national regulations, as well as safety practices for this class of equipment.

Insert voltage tangs against rear of the breaker's load side terminals. Insert cables through holes in the IQ Energy Sentinel and into the terminals of the breaker. Double barrel lug terminals are not suitable. Be sure the cable is stripped to the proper length as defined by the National Electric Code.

Note: The cable should usually be stripped the same distance as it would be if it were directly connected to the breaker without the IQ Energy Sentinel. Wire sizes of 3/0 and larger may require additional stripping of 1/8 - 1/4 inch.

CAUTION

WIRE STRIPPING MUST COMPLY FULLY WITH UNDERWRITERS LABORATORIES INC. (UL®) CREEPAGE AND CLEARANCE REQUIREMENTS.

Tighten terminals per the torque specifications stated on the breaker nameplate. Be sure that the IQ Energy Sentinel remains flush with the circuit breaker.

Single phase (3 wire) installation requires live voltage connection through phases A and C of a three pole breaker.

Figure 2 - IQ Energy Sentinel mounted on a K Frame

POWER CABLES

The cable should be sized for the ampacity of the service as specified in the National Electric Code (NEC®). Acceptable single conductor wire sizes are #250 - 500 kcmil. Cutler-Hammer recommends using THW, THHN and XHHW insulation with the IQ Energy Sentinel. The acceptable terminal catalog numbers are T350K and TA350KB. Refer to K-Frame Series C Instruction Leaflet 29C403 for proper terminal application.

INCOM WIRING

Use shielded twisted pair wire (Cutler-Hammer IMPCABLE or Belden 9463) to connect each IQ Energy Sentinel to the INCOM network in daisychain style. Attach the twisted pairs to terminals 1 and 2 of the terminal block located on the lower front of the IQ Energy Sentinel. The polarity of the twisted pair is not important.

GROUNDING

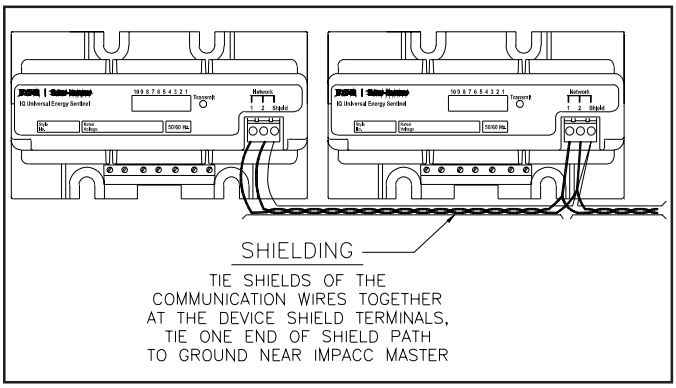

Figure 3 - Network Interwiring

The ground terminal of the IQ Energy Sentinel is used as the line-to-neutral voltage reference. This terminal should be connected to the ground bus or other non-current carrying ground with 600V rated wire. Ground wire sizes should be between #22AWG - #12AWG.

SHIELDING

Tie the communication wire shield to ground only once at the INCOM master. At each device tie the communication wire shields together. Do not connect the shield at the end of the branch to ground.

CAUTION

TIE THE SHIELD PATH BETWEEN THE IQ ENERGY SENTINELS TO GROUND AT ONE AND ONLY ONE POINT.

PROGRAMMING THE ADDRESS SWITCH

The ten-position dip switch on the front of the IQ Energy Sentinel is used to program the INCOM device address. Each device on a given network must have a unique address. The address is read as a 10 bit binary number with the off position implying a zero and the on position implying a one. Next we must convert the binary number to an equivalent hexadecimal number because the IQCED and PowerNet software will display network address locations in hexadecimal numbers. The hexadecimal address is read as a three part address (A2, A1, A0) each part representing a hexadecimal number 0-F. First read position switches 4, 3, 2 and 1. This is hexadecimal address A0. In Figure 4 the first example, A0, is read as 1011 (Dip Switches 4, 3, 2, 1) which coverts from Table 3 to B. Next switches 8, 7, 6 and 5 are read as hexadecimal address A1. In the example they are 0100 (Dip Switches 8, 7, 6, 5) which converts to hexadecimal 4. The final two positions, 10 and 9, need two leading zeros for conversion and are considered hexadecimal address A2. From the example, 0011 (ZERO, ZERO, Dip Switches 10, 9) which converts to hexadecimal 3. So the final hexadecimal address is 34B (A2, A1, A0). Figure 4 has three more examples and refers to Table 3 for hexadecimal conversion.

Table 3 - Binary to Hex Conversion

Binary	HEX	Binary	HEX
0000	0	1000	8
0001	1	1001	9
0010	2	1010	A
0011	3	1011	B
0100	4	1100	C
0101	5	1101	D
0110	6	1110	E
0111	7	1111	F

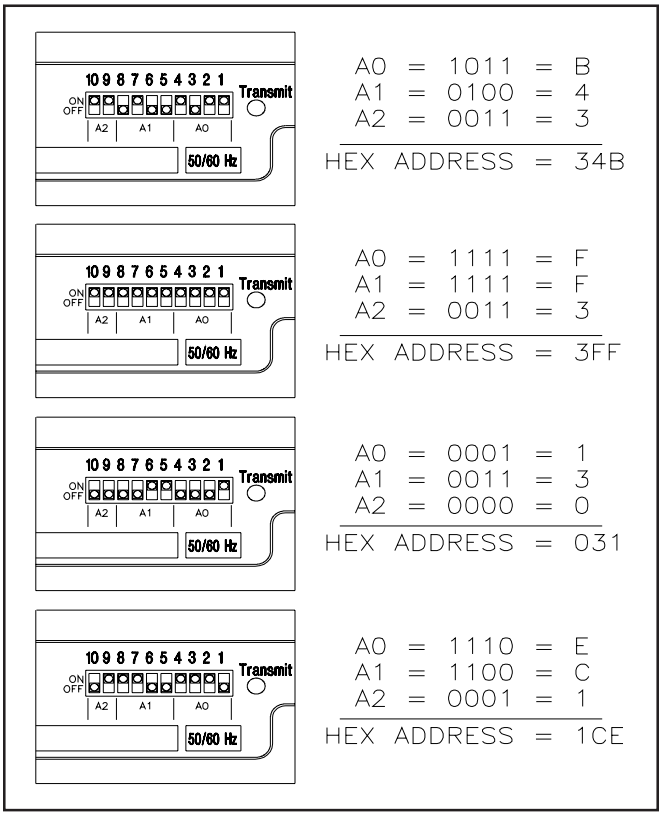

Figure 4 - Example Address Setting Calculation

START-UP

WARNING

FOLLOW ALL INSTRUCTIONS, WARNINGS AND PROCEDURES LISTED IN K-FRAME CIRCUIT BREAKER INSTRUCTION LEAFLET 29C403 BEFORE ENERGIZING.

After the IQ Energy Sentinel has been installed, check the operation of each device by closing the breaker and initializing the IQCED or application software. Program the selected IQ Energy Sentinel addresses into the IQCED or interfacing software. Verify that the product responds by flashing its LED (OFF to receive, ON while transmitting, OFF to receive, etc.). The flashing LED indicates that the product is functioning properly.

SYSTEM VOLTAGE CONSIDERATIONS

The IQ Energy Sentinel uses Line-Ground voltage for the power calculations. The Ground terminal should be connected to Earth Ground to ensure accuracy. Acceptable supply voltages are displayed in Figure 5. They are:

- Three-Phase Star, Four-Wire, Earthed Neutral
- Three-Phase Star, Four-Wire, Non-Earthed Neutral
- Single-Phase, Three-Wire, Earthed Mid-Point (Connect to A and C Phases)
- Two-Phase Star, Three-Wire, Earthed Neutral (Connect to A and C Phases)
- Three-Phase Star, Three-Wire
- Three-Phase Star, Three-Wire, Earthed Neutral Point
- Three-Phase Delta, Three-Wire

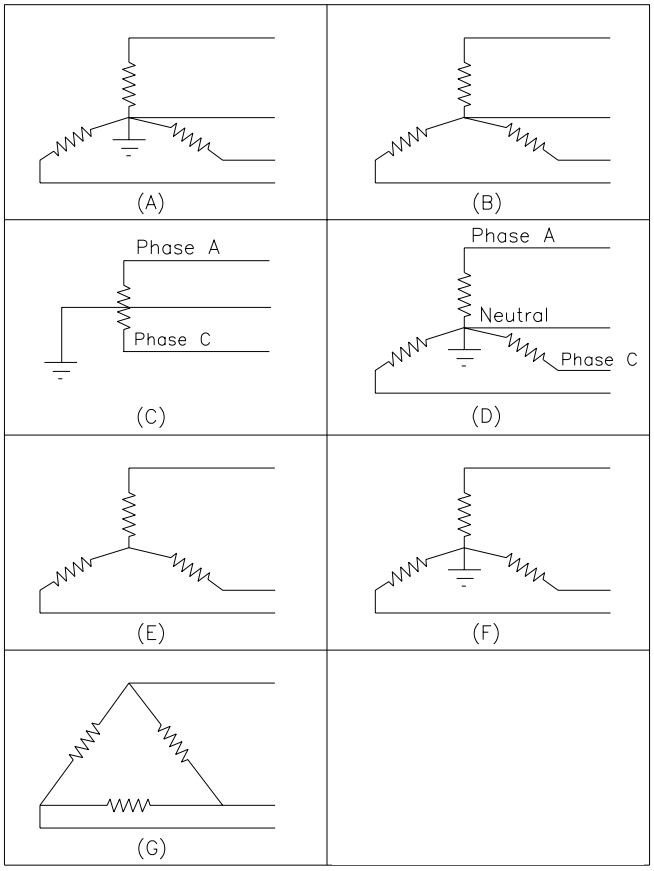

Figure 5 - Acceptable Supply Voltages

TROUBLESHOOTING

In the unlikely event that the LED remains OFF, communication errors occur or readings are erratic, perform the following steps:

- Check to ensure that the circuit breaker is closed.
- Check all wiring.
- Check that the same device address is not duplicated and used more than once in the INCOM network.
- Check that the PowerNet software has been installed properly.
- Check that the appropriate style of IQ Energy Sentinel is being used for the system voltage that is present.
- Verify that all the other devices on the network are communicating at 9600 baud.

If the above suggestions do not remedy the problem call Power Management Application Support (1-800-809-2772 option 1 / option 1) for additional information. There are no user serviceable parts in the IQ Energy Sentinel. The user should not attempt to service this equipment.

TECHNICAL ASSISTANCE

For additional information, technical assistance or referral to a local authorized distributor, contact Power Management Applications Support at 1-800-809-2772, option 1 / option 1 (outside the United States please call 1-414-449-7100 option 1 / option 1). You can also e-mail us at pmpapps@eaton.com or visit us on the web www.cutler-hammer.eaton.com and follow the power management products' link.

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