

Installation Instructions for F Frame IQ Energy Sentinel™

I.L. 17537



Fig. 1 IQ Energy Sentinel - F Frame

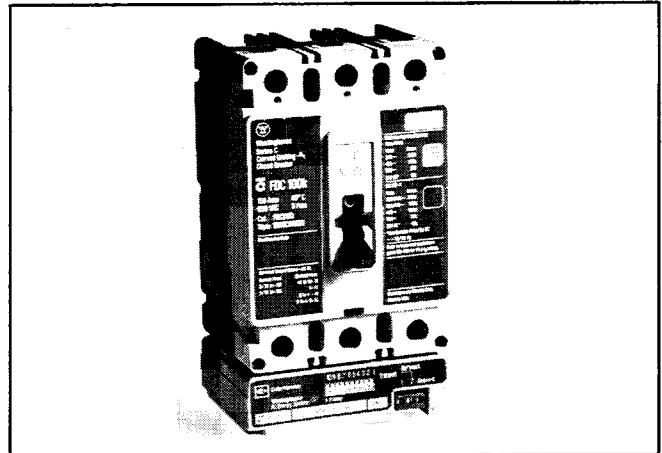


Fig. 3 IQ Energy Sentinel mounted on F Frame Breaker

THE IQ ENERGY SENTINEL™

The IQ Energy Sentinel™ is a microprocessor-based device designed to monitor kilowatts, kilowatt demand, and kilowatt-hours. It communicates this information directly back to an IQ Central Energy Display (IQCED) local display, computer, or other controller over the Westinghouse INCOM™ communications network that is part of an Integrated Monitoring, Protection, and Control Communications (IMPACC™) system. The F Frame IQ Energy Sentinel mounts directly on the load terminals of a F Frame Westinghouse 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.

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

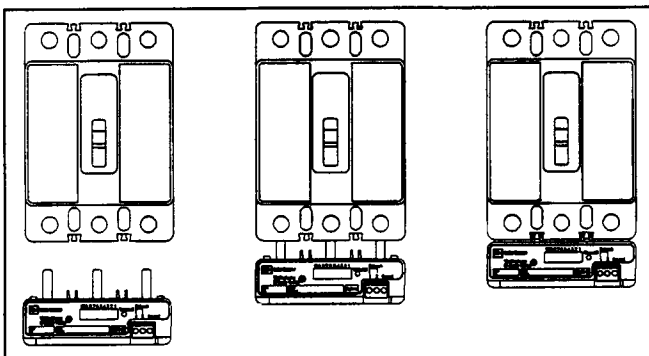


Fig. 2 Attachment of an Energy Sentinel to the load side of a Series C Circuit Breaker

USER INTERFACES

An IQCED can be used as a local display of information available from the IQ Energy Sentinels. The IQ Energy Sentinel can also be interfaced to Westinghouse Custom Billing Software or IMPACC Series III software running on a personal computer with a CONI or MINT-II network card.

TABLE I - 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 IQESF208	
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 IQESF400	
3 Phase, 3 or 4 Wire	480Y/277VAC
3 Phase, 3 Wire	480VAC
CATALOG NUMBER IQESF480	
3 Phase, 3 or 4 Wire	600Y/347VAC
3 Phase, 3 Wire	600VAC
CATALOG NUMBER IQESF600	

NOTE: For AC applications only



LISTED File: E64983
70Y6 Circuit Breaker Accessory

Table II - Specifications

Full Scale Rating	150A
Accuracy	$\pm 1\%$ of Full Scale Rating
Current Range of Full Scale Rating	1% - 125%
Current Overload Capability	125% of Full Scale Rating
Power Factors	All
Operating Voltage Range	$\pm 20\%$ of nominal voltage
Frequency	50/60 Hertz
Power Consumption	1 VA
Operating Temperature*	-25° to 70° C -13° to 158° F
Storage Temperature	-40° to 85° C -40° to 185° F
Humidity	0 to 95% R.H. Noncondensing
Communication Speed	9600 Baud
Dimensions(DxWxH)	3.20"x4.12"x1.30"
Shipping Weight	0.65 lbs.
* Operating temperature of Energy Sentinel only. Check circuit breaker IL for breaker operating temperature.	

INSTALLATION

CAUTION: Turn off power supplying the panelboard or switchboard in which the IQ Energy Sentinel is being installed, otherwise damage or injury could result.

The IQ Energy Sentinel is designed to be installed, operated, and maintained by adequately trained personnel. These instructions do not cover all details, variations, or combinations of the

equipment, its storage, delivery, installation, checkout, 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. (Figure 2) 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 that the cable is stripped to the proper length as defined by the National Electric Code. Note that 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. However, wire sizes of 3/0 and larger may require additional stripping of 1/8 - 1/4 inch.

NOTE: Wire stripping must comply fully with 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. (Figure 3)

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

POWER CABLES

The cable should be sized for the ampacity of the service as specified in the National Electric Code. Acceptable single conductor wire sizes are #14-1/0, #4-4/0, #4-4/01, and #14-1/0 AWG. The following insulation types are recommended with the IQ Energy Sentinel: types THW, THHN, and XHHW. The IQ Energy Sentinel will accept all standard wire sizes that are capable of mating with F-frame breaker terminals. The acceptable terminal style numbers include 624B100 G02, G17, G18, and G19. Refer to Series C Frame Book 29-101 for proper terminal application. Note: When using an EHD 15A or 20A circuit breaker, FD frame stainless steel or aluminum type terminals must be used.

INCOM WIRING

Use shielded twisted pair wire (Belden 9463 or Cutler-Hammer IMPCABLE) to connect each IQ Energy Sentinel to the INCOM network in daisy-chain 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. (Figure 4) Refer to the Advanced Product Support Center (1-800-809-2772) for the IMPACC Wiring Specification Guidelines.

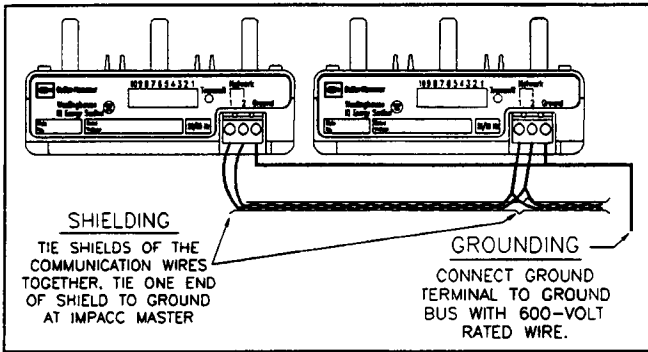


Fig. 4 Network Interwiring

GROUNDING

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 600 volt rated wire. (Figure 4) Ground wire sizes should be between #22A.W.G. - #12A.W.G.

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 IMPACC 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 5, the first example A0 is read as 1011 (Dip Switches 4,3,2,1) which converts 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 5 has three more examples and refers to Table III for hexadecimal conversion.

Table III 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

A0 = 1011 = B
 A1 = 0100 = 4
 A2 = 0011 = 3

 HEX ADDRESS = 34B

A0 = 1111 = F
 A1 = 1111 = F
 A2 = 0011 = 3

 HEX ADDRESS = 3FF

A0 = 0001 = 1
 A1 = 0011 = 3
 A2 = 0000 = 0

 HEX ADDRESS = 031

A0 = 1110 = E
 A1 = 1100 = C
 A2 = 0001 = 1

 HEX ADDRESS = 1CE

Fig. 5 Example Address Setting Calculation

STARTUP

CAUTION: Follow all instructions, warnings and procedures listed in F Frame Circuit Breaker Instruction Leaflet #IL 29C101-A 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

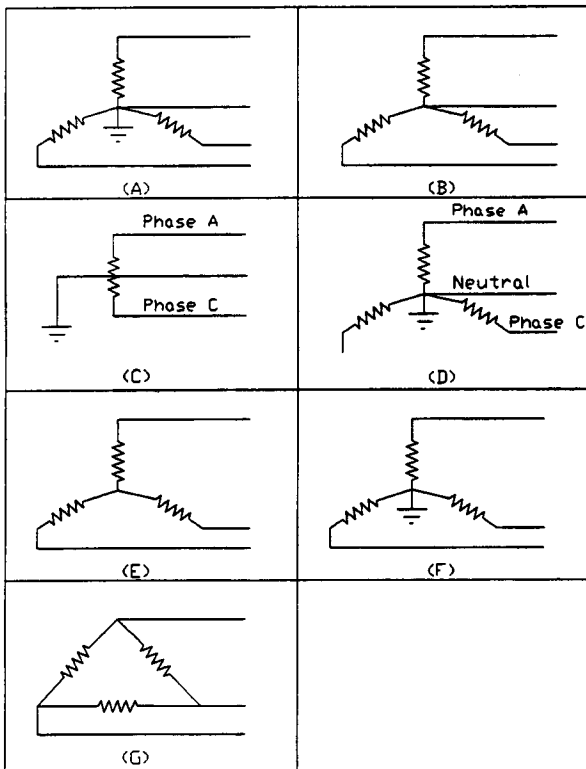


Fig. 6 Acceptable Supply Voltages

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 6. They are:

- A. Three-Phase Star, Four-Wire, Earthed Neutral.
- B. Three-Phase Star, Four-Wire, Non-Earthed Neutral.
- C. Single-Phase, Three-Wire, Earthed Mid-Point (Connect to A and C Phases).
- D. Two-Phase Star, Three-Wire, Earthed Neutral (Connect to A and C Phases).
- E. Three-Phase Star, Three-Wire.
- F. Three-Phase Star, Three-Wire, Earthed Neutral Point.
- G. Three-Phase Delta, Three-Wire.

TROUBLESHOOTING

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

1. Check to ensure that the circuit breaker is closed.
2. Check all wiring.
3. Check that the same device address is not duplicated and used more than once in the INCOM network.
4. Check that the IQCED or application software has been installed properly.
5. Check that the appropriate style of IQ Energy Sentinel is being used for the system voltage that is present.
6. Verify that all other devices on the network are communicating at 9600 baud.
7. If suggestions 1-6 do not remedy the problem, the IQ Energy Sentinel may require replacement.

There are no user serviceable parts in the IQ Energy Sentinel. The user should not attempt servicing this equipment. Please contact your local Cutler-Hammer representative.

If you have any technical or application questions or need service information regarding the IQ Energy Sentinel or any other IMPACC product, please contact the **Advanced Product Support Center (1-800-809-2772)**.

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