



Installation Instructions for IQ Universal Power Sentinel™ Internal CT

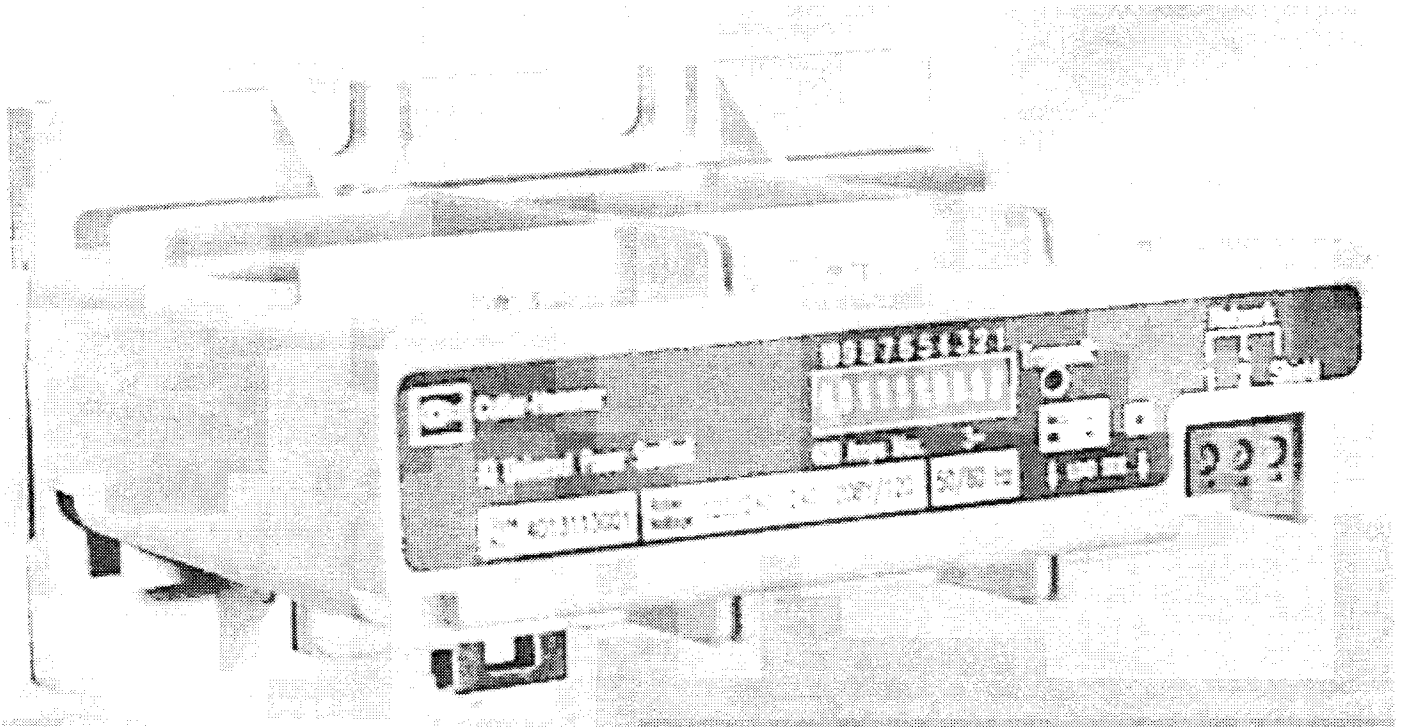


Fig. 1 IQ Universal Power Sentinel™ Internal CT

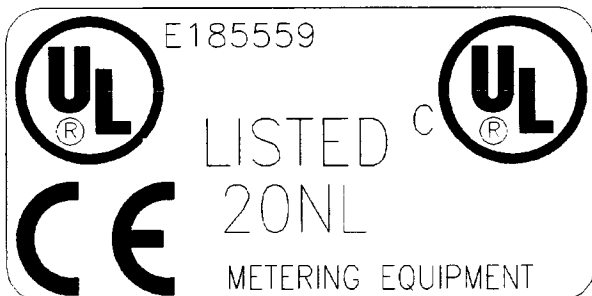
PRELIMINARY COMMENTS AND SAFETY PRECAUTIONS

This Information Leaflet covers all aspects of installation, operation, and unit-level maintenance of the IQ Universal Power Sentinel™ Internal CT. This document is a guide only for authorized and qualified personnel who select and use the IQ Universal Power Sentinel™ Internal CT. Please refer to the specific Warning and Caution in this section before proceeding. If you require further information regarding a particular installation, application, or maintenance activity, contact your Cutler-Hammer Representative.

FACTORY CORRESPONDENCE

Contact the Advanced Product Support Center (APSC) if you have any questions about operating or troubleshooting the IQ Universal Power Sentinel™ Internal CT.

APSC	1-800-809-2772
	1-412-494-3750
APSC BBS	1-412-494-3746
FRED	1-412-494-3745
(When using FRED dial the number from the handset of your fax machine.)	



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No warranties, expressed or implied, including warranties of fitness for a particular purpose of merchantability, or warranties arising from course of dealing or usage of trade are made regarding this information, recommendations, and descriptions contained herein. In no event will Cutler-Hammer be responsible to the purchaser or user in contract, in tort (including negligence), strict liability, or

otherwise for any special, indirect, incidental, or consequential damage or loss whatsoever, including but not limited to damage or loss of use of equipment plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information and descriptions contained herein.

SAFETY PRECAUTION

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this device.



WARNING

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS DOCUMENT ARE FOR PERSONNEL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL IS SHOWN ABOVE IN REVERSE TYPE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO ENSURE THAT PERSONNEL ARE ALERT TO WARNINGS WHICH MAY APPEAR THROUGHOUT THE DOCUMENT. IN ADDITION, CAUTIONS ARE ALL UPPER CASE AND BOLDFACED AS SHOWN BELOW.



CAUTION

COMPLETELY READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT BEFORE ATTEMPTING TO INSTALL, OPERATE OR USE THE EQUIPMENT. IN ADDITION, 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.

REGULATORY/STANDARDS COMPLIANCE

Safety:

- IEC 1010-1 (1990) Incl. Amend 1 & 2 (1995)
- EN61010-1 (1993)
- CSA C22.2 #1010.1 (1992)
- UL3111

EMC:

Emissions:

- FCC Part 15 Class B
- CISPR 11 (1990) / EN55011 (1991)
Group 1 Class B

Immunity:

Electrostatic Discharge

- EN61000-4-2 (1994) / EN50082-2 (1994): 4kV CD
8kV AD

Electrical Fast Transient

- EN61000-4-4 (1994) / EN50082-2 (1994): 2kV PL
2kV SL

Radiated Immunity

- ENV50140 (1993) / EN50082-2 (1994):10V/m
- ENV50204 (1993) / EN50082-2 (1994):10V/m

Conducted Immunity

- ENV50141 (1993) / EN50082-2 (1994):10Vrms

THE IQ UNIVERSAL POWER SENTINEL™ INTERNAL CT

The IQ Universal Power Sentinel™ Internal CT is a microprocessor-based monitoring device that provides electrical metering. It communicates information directly back to an IQ Central Energy Display II (IQCED II) with software version 4.3 or higher, Breaker Interface Module (BIM) with software version 1.05 or higher, a computer with CONI card or MINT-II running Series III software version 6.60 or greater, or other controller over the Westinghouse INCOM™ Internal CT communications network that is part of an Integrated Monitoring, Protection, and Control Communications (IMPACC™) system.

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

The IQ Universal Power Sentinel™ Internal CT measures:

- AC Line Current (each phase)
- AC Line to Line Voltage
- AC Line to Neutral Voltages
- Watts (each phase and total)
- Vars (each phase and total)
- VA (each phase and total)
- Apparent Power Factor (each phase and total)
- Displacement Power Factor (each phase and total)
- Demand (Total Watts)
- Frequency
- Watt-hours

INPUT VOLTAGE	
3 Phase, 4 Wire	208Y/120VAC
3 Phase, 3 Wire	240VAC
1 Phase, 3 Wire	120/240VAC
CATALOG NUMBER	IQPSUI208
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	IQPSUI400
3 Phase, 4 Wire	480Y/277VAC
3 Phase, 3 Wire	480VAC
CATALOG NUMBER	IQPSUI480
3 Phase, 4 Wire	600Y/347VAC
3 Phase, 3 Wire	600VAC
CATALOG NUMBER	IQPSUI600

NOTE: For AC applications only 50/60Hz

Table 1 - Input Voltage Requirements

INSTALLATION

The IQ Universal Power Sentinel™ Internal CT 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. Refer to **Figure 5** through **Figure 8** for wiring details. Also, refer to **Table 1** for voltage style selection.



WARNING

CAUTION: TURN OFF POWER SUPPLYING THE PANELBOARD OR SWITCHBOARD IN WHICH THE IQ UNIVERSAL POWER SENTINEL™ INTERNAL CT IS BEING INSTALLED, OTHERWISE DAMAGE OR INJURY COULD RESULT.

MOUNTING REQUIREMENTS

It is generally recommended that the IQ Universal Power Sentinel be mounted in an electrical enclosure appropriately rated for the environment. The IQ Universal Power Sentinel™ Internal CT may be panel or DIN rail mounted. The drilling pattern for panel mounting is shown in **Figure 2**. The recommended screw size for panel mounting is a #10 (10-32) or #12 (12-28) screw.

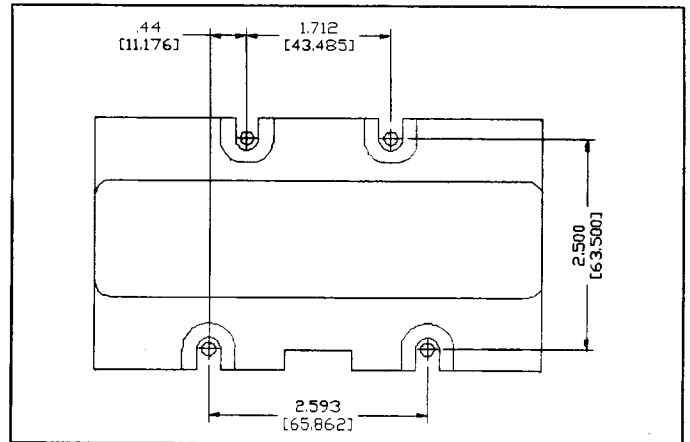


Fig. 2 IQ Universal Power Sentinel™ Internal CT Drilling Pattern

VOLTAGE CONNECTIONS

The voltage connections (V_A , V_B , V_C) of the IQ Universal Power Sentinel™ Internal CT are used to power the device as well as to input line voltages for measurement purposes. The IQ Universal Power Sentinel™ Internal CT can be applied on three phase (3 or 4 wire) systems as well as on single phase (3 wire) systems running at 50 or 60 Hz. The voltage connections must be made with wire rated at 600 volts and between the sizes of #10 AWG and #24 AWG.

EXTERNAL FUSES

External fuses should be installed near the IQ Universal Power Sentinel™ Internal CT as shown in **Figure 5** through **Figure 8**. The fuses used should be 1/10 Amp, 600 Volt, BUSS type KTK-R-1/10 Fast Acting or equivalent.

REFERENCE GROUND

The reference ground terminal of the IQ Universal Power Sentinel™ Internal CT is used as a reference ground for the device. This terminal should be connected to ground on 3 wire systems and neutral on 4 wire systems with 600 volt rated wire. The wire size should be between #10 AWG and #24 AWG.

POWER CABLES

The cable should be sized for the ampacity of the service as specified in the National Electric Code. Single conductor wire sizes up to #500 MCM are acceptable. The following insulation types are recommended with the IQ Universal Power Sentinel™ Internal CT: types THW, THHN, and XHHW.

In order to avoid negative power readings, the IQ Universal Power Sentinel™ Internal CT must be installed such that the line side of the power cables is pulled from the top of the device. The load side is therefore below the device as indicated on the faceplate label.

INCOM™ WIRING

Use shielded twisted pair wire (Belden 3072F or Cutler-Hammer IMPCABLE) to connect each IQ Universal Power Sentinel™ Internal CT 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 Universal Power Sentinel™ Internal CT. The polarity of the twisted pair is not important.

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.

SIMPLIFIED NETWORK WIRING RULES

The following simplified rules apply given a system consisting of a single daisy chained main cable link between master and slave devices. For more complex considerations including star configurations please refer to the IMPACCT™ Wiring Specification or the APSC for wiring instructions and system capacity considerations. The IMPACCT™ Wiring Spec is T.D. 17513.

- The maximum system capacity is 10,000 feet of communications cable and 1000 slave devices.
- Main cable link must be terminated at each end by a 1/4 watt, 100Ω, carbon resistor.
- Nonterminated taps up to 200 feet in length off the main link are permitted, but add to the total cable length.
- Make sure that there is a twisted wire pair present that is intended for IMPACCT™ network use. Use shielded twisted pair wire (IMPCABLE or Belden 3072F) to connect each slave device to the IMPACCT™ network, daisy-chain style. **The polarity of the twisted pair is not important.**

TRANSMIT LED

The transmit LED indicate that the device has received a message and is now in the process of sending a response back to an IQCED II, BIM, computer with CONI card or MINT-II running Series III software, or other controller.

PROGRAMMING THE ADDRESS SWITCH

The ten-position dip switch on the front of the IQ Universal Power Sentinel™ Internal CT 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. We must convert the binary number to an equivalent hexadecimal number because the IQCED and IMPACCT™ 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 switch positions 4,3,2 and 1. This is hexadecimal address A0. In **Figure 3**, the first example A0 is read as 1011 (Dip Switches 4,3,2,1) which converts from **Table 2** 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. This gives the final hexadecimal address of 34B (A2,A1,A0). **Figure 3** has three more examples and refers to **Table 2** for hexadecimal conversion.

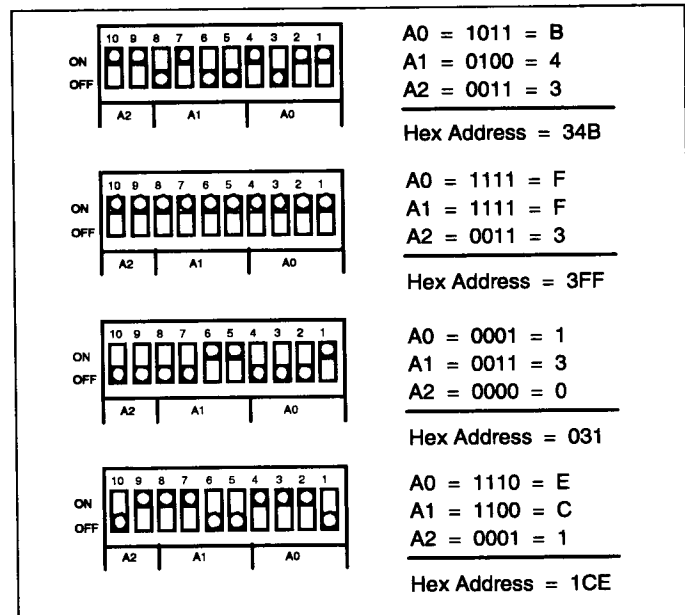


Fig. 3 Example Address Setting Calculation

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

Table 2 Binary to Hexadecimal Conversion

MISCELLANEOUS SPECIFICATIONS

Table 3 shows the miscellaneous specifications for the IQ Universal Power Sentinel™ Internal CT.

Nominal Full Scale Current	400 Amps
Current Accuracy Range	1% - 125% of Full Scale
Current Overload Capability	250% of Full Scale
Power Factors	All
Nominal Operating Line-to-Line Voltages	G01 208 G02 400 G03 480 G04 600
Maximum Operating Voltage Fluctuation	G01 ±20% G02 ±10% G03 ±10% G04 ±10%
Maximum Power Consumption	G01 2 VA G02 5 VA G03 5 VA G04 6 VA
Frequency	50/60Hz
Communication Speed	9600 Baud FSK
Dimensions (DxWxH)	4.36"x5.31"x3.00"
Shipping Weight	1.10 Pounds
Environment	Indoor use only
Maximum Operating Altitude	2000 meters
Operating Temperatures	-25° to 70° C -13° to 158° F
Storage Temperatures	-40° to 85° C -40° to 185° F
Maximum Relative Humidity	80% for temperatures up to 31°C decreasing linearly to 50% at 70°C
Transient Over Voltage Category	OVERVOLTAGE CATEGORY III
Pollution Degree	2 (IEC 664)

Table 3 Miscellaneous Specifications

STARTUP

After the IQ Universal Power Sentinel™ Internal CT has been installed, check the operation of each device by

providing power to the device and initializing the IQCED II or application software. Program the selected IQ Universal Power Sentinel™ Internal CT addresses into the IQCED II 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

Acceptable supply voltages are displayed in **Figure 4**. They are:

- A) Three-Phase Star, Four-Wire, Earthed Neutral (see **Figure 5**).
- B) Three-Phase Star, Four-Wire, Non-Earthed Neutral (see **Figure 5**).
- C) Single-Phase, Three-Wire, Earthed Mid-Point (see **Figure 8**).
- D) Two-Phase Star, Three-Wire, Earthed Neutral (see **Figure 7**).
- E) Three-Phase Star, Three-Wire (see **Figure 6**).
- F) Three-Phase Star, Three-Wire, Earthed Neutral Point (see **Figure 6**).
- G) Three-Phase Delta, Three-Wire (see **Figure 6**).
- H) Three Phase Open Delta, Three Wire, Earthed Junction (see **Figure 6**).

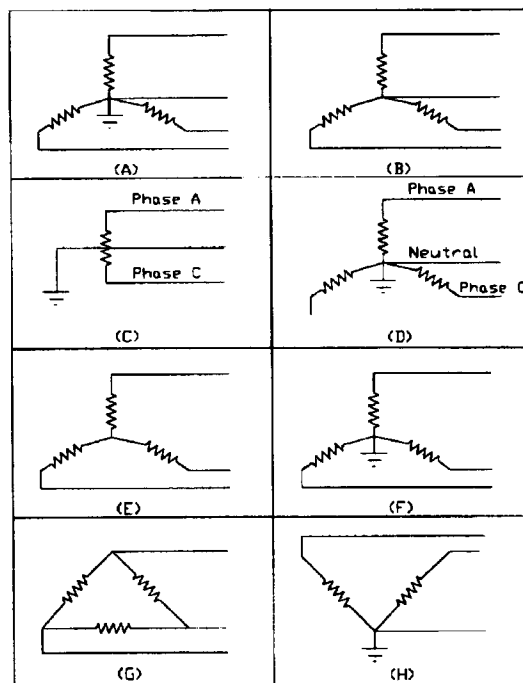


Fig. 4 Acceptable Supply Configurations

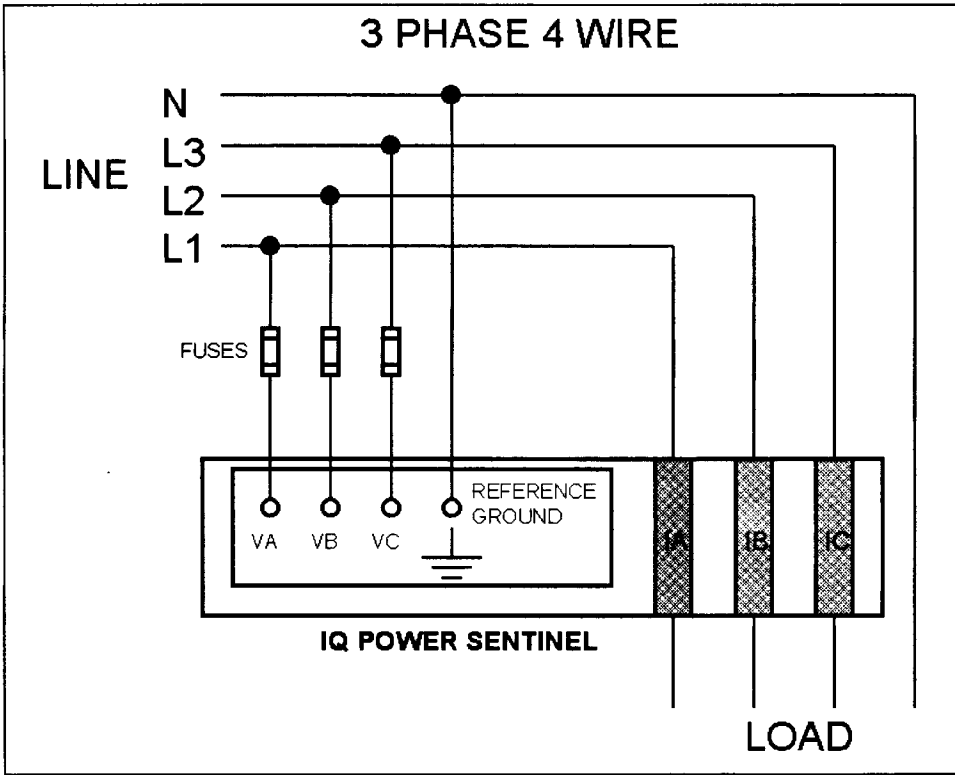


Fig. 5 3-Phase, 4-Wire Wiring Configuration

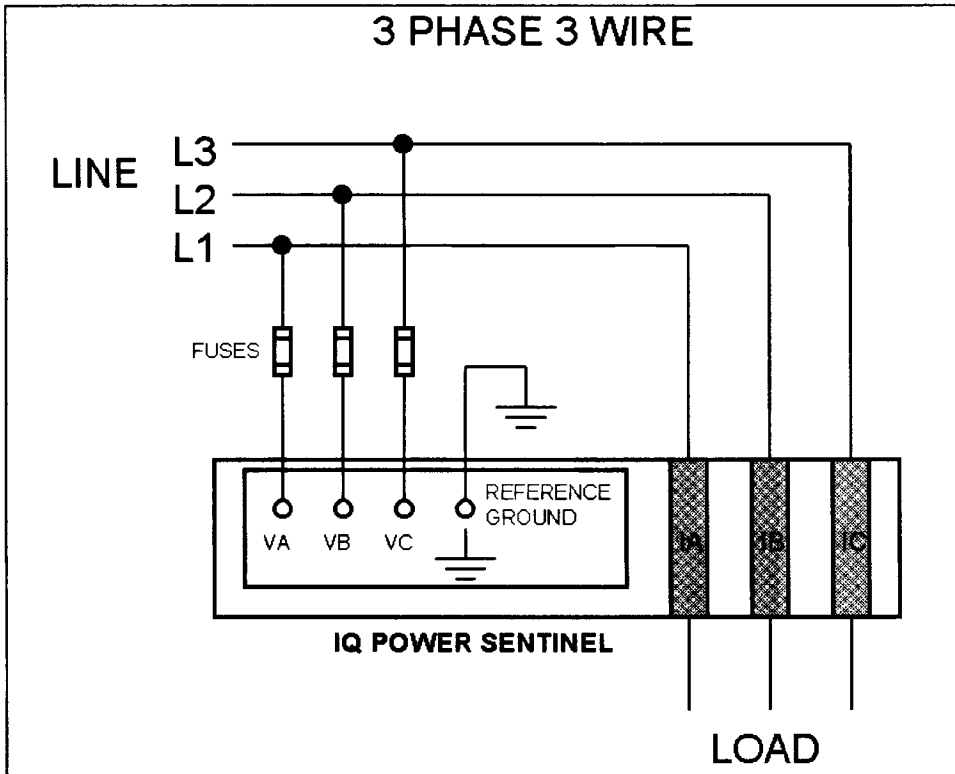


Fig. 6 3-Phase, 3-Wire Wiring Configuration

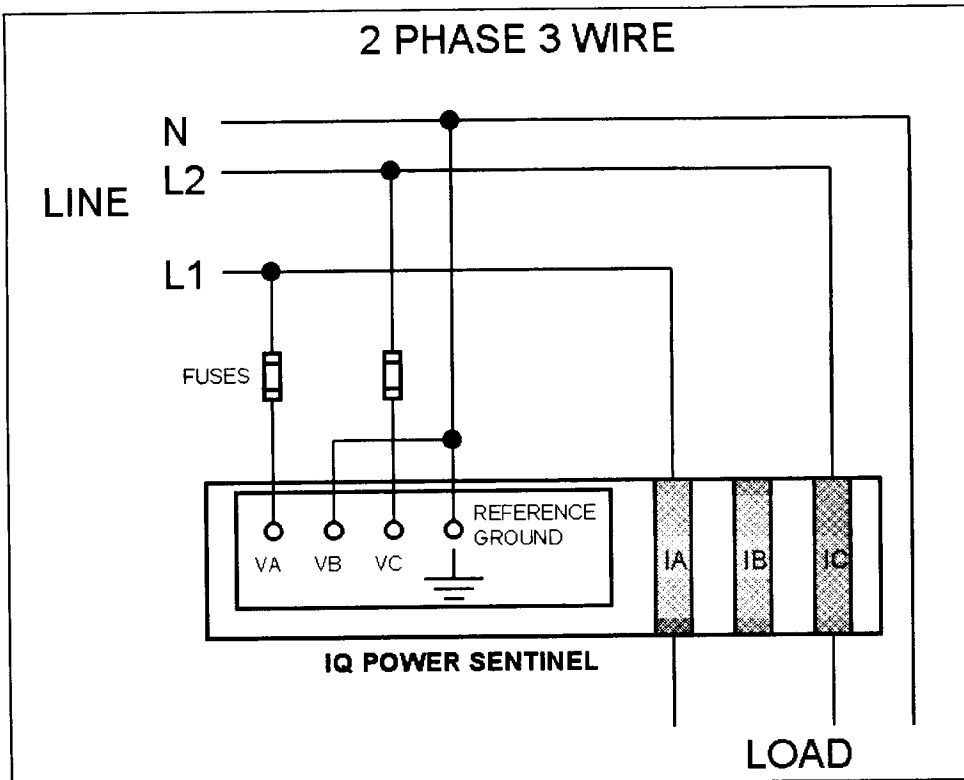


Fig. 7 2-Phase, 3-Wire Wiring Configuration

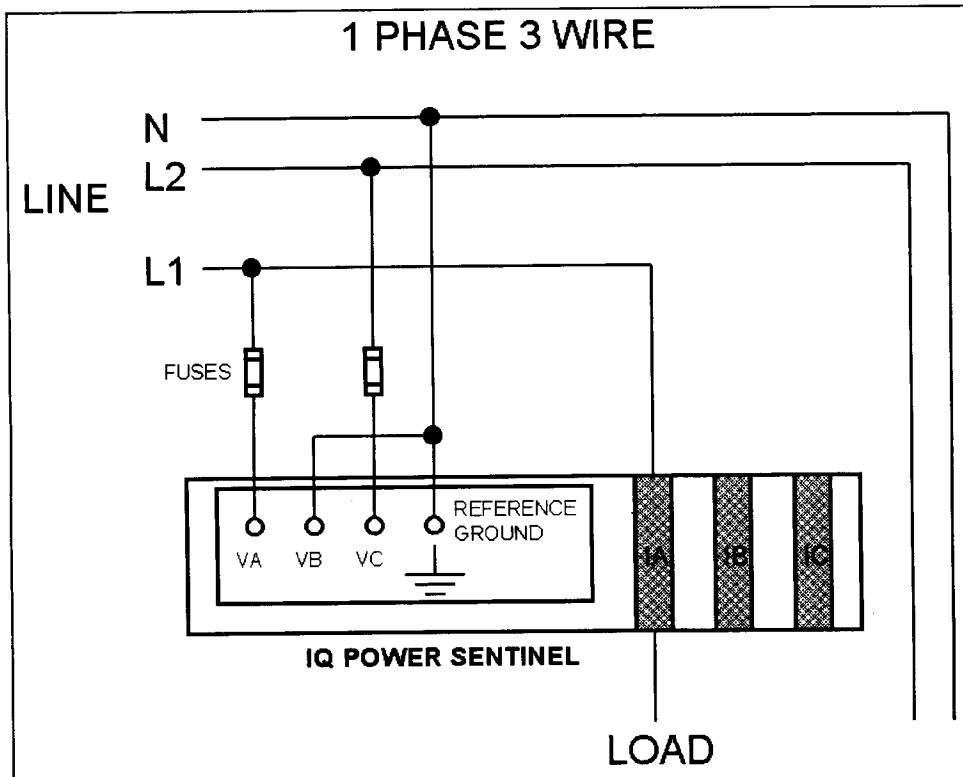


Fig. 8 1-Phase, 3-Wire Wiring Configuration

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 device is powered.
- 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 II or application software has been installed properly.
- 5) Check that the appropriate style of IQ Universal Power Sentinel™ Internal CT 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 negative power readings are encountered, check that the power cables have been installed correctly through the device or whether the device is above a generator.
- 8) If suggestions 1-7 do not remedy the problem, the IQ Universal Power Sentinel™ Internal CT may require replacement.

There are no user serviceable parts in the IQ Universal Power Sentinel™ Internal CT. 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 Universal Power Sentinel™ Internal CT or any other IMPACC™ product, please contact the **Advanced Product Support Center**.

EQUIPMENT CLEANING



WARNING

CAUTION: TURN OFF POWER SUPPLYING THE PANELBOARD OR SWITCHBOARD IN WHICH THE IQ UNIVERSAL POWER SENTINEL™ INTERNAL CT IS INSTALLED, OTHERWISE DAMAGE OR INJURY COULD RESULT.

Clean the IQ Universal Power Sentinel™ Internal CT with a clean dry cloth.

METERING SPECIFICATIONS

Table 4 shows the metering specifications for the IQ Universal Power Sentinel™ Internal CT.

Accuracy is maintained from 1% to 125% of the Full Scale Current rating of the device.

Item	Accuracy
Current, (<400Amps)	±0.5% of Full Scale
Current, (>400Amps)	±0.5% of Reading
Voltage, line-to-line	±0.5% of Full Scale
Voltage, line-to-neutral	±0.5% of Full Scale
Watts (<400Amps)	±1% of Full Scale
Watts (>400Amps)	±1% of Reading
Vars (<400Amps)	±1% of Full Scale
Vars (>400Amps)	±1% of Reading
VA (<400Amps)	±1% of Full Scale
VA (>400Amps)	±1% of Reading
Power Factor	±2% of Full Scale
Frequency	±0.1 Hz
Energy	±1%

Table 4 Metering Specifications

Drawing Number 8163A23H01

Cutler-Hammer

Five Parkway Center
Pittsburgh, PA 15220 USA

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EATON