



## Instructions for Installation, Operation, and Maintenance of Cutler-Hammer IQ 300 Electrical Distribution System Meter





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## Cutler-Hammer

# IQ 300 Electrical Distribution System Meter

## *Installation, Operation, and Maintenance*

### SECTION 1: INTRODUCTION

#### 1.1 PRELIMINARY COMMENTS AND SAFETY PRECAUTIONS

This Technical Document covers most aspects of installation, operation, and unit-level maintenance of the IQ 300. This document is a guide only for authorized and qualified personnel who select and use the IQ 300. 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.

##### 1.1.1 Warranty and Liability Information

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.

##### 1.1.2 Safety Precautions

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 ON THE NEXT PAGE.



## 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.**

### 1.1.3 Factory Correspondence

For additional information, technical assistance, or referral to a local authorized distributor, contact Power Management Application Support (PMAS) at 1-412-490-6714 or 1-800-809-2772, option 1.

## 1.2 PRODUCT OVERVIEW

The IQ 300 is a microprocessor based series of monitoring devices that provide three phase, 3 or 4 wire, and single phase 2 or 3 wire, electrical metering designed to replace numerous individual meters and recorders. The IQ 300 delivers ANSI C12.16 accuracy in three phase applications. The IQ 300 series devices are compact, and consist of a panel-mounted Display Module and a Base Module that can be attached to the Display Module or mounted remotely. The devices are password protected, menu driven, and display a variety of user-selected electrical system values and provide control over certain measurement and data output functions. The IQ 300 series Base Modules communicate with the IQ 300 Display Module, providing access to view and reset system, phase, and min/max values, and providing for viewing and editing of setpoints.

The IQ 300 series includes two variations of the IQ 300 Base Module and a single IQ 300 Display Module that functions with either Base type. The IQ 310 Base Module is a reduced function variation, while the IQ 320 Base Module has additional capabilities that include; a wider ranging power supply, INCOM communications, and a KYZ Pulse output.

***NOTE: Throughout this document, references to IQ 300 are intended for both Base types in the series, the IQ 310 and IQ 320 Base Modules. Base unit type dependent functional and specification differences are noted in the relevant sections.***

The IQ 300 monitors system and phase values in the following typical system wiring configurations.

3 Phase 4 Wire	3 Phase 3 Wire	3 Phase 3 or 4 Wire	Single Phase 2 or 3 Wire *
208Y/120VAC	240VAC	220/380VAC	120/240VAC
480Y/277VAC	480VAC	230/400VAC	
600Y/347VAC	600VAC	240/415VAC	

\* Not certified to ANSI C12.16 for single phase applications

The IQ300 displays the following values:

Values Displayed		
System	Each Phase	Minimum/Maximum
Power	Current	Currents
Frequency	Current Demand	Line to Line Voltages
Apparent Power Factor	Current Peak Demand	Line to Neutral Voltages
Displacement Power Factor	Line to Line Voltage	System Power (W, vars, VA)
Watt Hours	Line to Neutral Voltage	System Frequency
var Hours	Watts	System Apparent Power Factor
VA Hours	vars	System Displacement Power Factor
Demand (W, var, VA)	VA	
Peak Demand (W, var, VA)	Apparent Power Factor	
	Displacement Power Factor	

The IQ 320 Base Module, in addition to the Display port, provides the following data outputs above and beyond the functional capabilities of the IQ 310 Base Module:

- PowerNet communications, by way of the INCOM port, to provide information to the network master device (see *sections 2.3.4, 3.3.3, 4.9.3 and 4.10.3* for details)
- KYZ Pulse Output proportional to the energy consumed by the system being monitored (see *section 4.9.9 and 4.10.9* for details)

## SECTION 2: HARDWARE DESCRIPTION

### 2.1 GENERAL

This section describes the IQ 300 hardware, its functions and nomenclature, and lists the IQ 300 specifications. An IQ 300 consists of two components, the Display Module, figure 2.1, and a Base Module, figure 2.2. Do not attempt to disassemble or open the case of either the IQ 300 Display Module or either of the IQ 300 Base Modules (IQ 310 or IQ 320). The units contain no user-serviceable components.



Figure 2.1 IQ 300 Display Module



Figure 2.2 IQ 320 Base Module

#### 2.1.1 IQ 300 Display Module

The Display Module screen presents system values and functions. The *Menu*, *up/down Scroll*, and *Enter* buttons allow the operator to view, change, and reset system parameters. The port for connecting to an IQ 300 Base Module (IQ 310 or IQ 320) is located on the back side of the IQ 300 Display Module.

#### 2.1.2 IQ 300 Base Modules

The IQ 300 Base Modules measure system values and provide metering data. Current and voltage input terminals, power supply terminals, and the display port are all located on the rear face of the IQ 300 Base Modules. On the IQ 320 Base Module, additional I/O is provided by way of a KYZ pulse initiator port, INCOM™ communications port, and an INCOM™ transmit indicator LED.

### 2.1.3 Installation

The IQ 300 is usually mounted inside an environmentally suitable electrical switch-gear enclosure. The IQ 300 Display Unit and the IQ 300 Base Module can be mounted together or separately in a variety of ways, described fully in *SECTION 3: INSTALLATION*.

## 2.2 OPERATOR PANEL

The Operator Panel is the front face of the IQ 300 Display Module. It is usually installed so that it is visible and accessible from the outside of the panel or door into which it is mounted.

The *Menu*, *up/down Scroll*, and *Enter* buttons allow the operator to view, change, and reset various system parameters:



Figure 2.3 Operator Panel

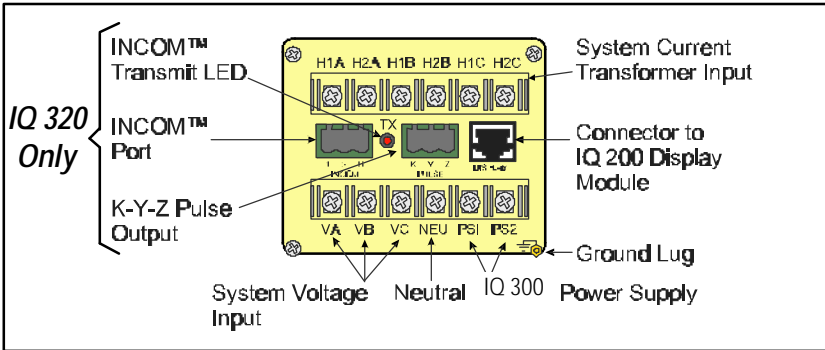
Display measured system, phase, and min/max values

- View and edit all or individual setpoints
  - Password
  - INCOM™ network address and baud rate - (only with IQ 320 Base)
  - System frequency
  - Wiring configuration
  - CT and PT ratios
  - Demand window
  - Energy tracking (KYZ pulse output) - (only with IQ 320 Base)
- View energy, view and reset peak demands, and all or individual minimum and maximum values.
- Change the display contrast for best viewing
- Enable/Disable auto scrolling of display.

The Operator Panel is an integral part of the IQ 300 Display Module. Do not attempt to remove it from the IQ 300 Display Module.

## 2.3 BASE MODULE INTERCONNECTION AREA

All wiring connections are made from the interconnection area of the chassis, shown in figure 2.4 below.



**Figure 2.4 IQ 300 Base Module (Interconnect Area View)**

**Note:** For sections 2.3.1 through 2.3.4 refer to figure 2.4.

### 2.3.1 Current and Voltage Inputs

The voltage terminal block is located at the bottom rear of the chassis. It has four terminals for wiring the phase voltages and the neutral, as shown below. The neutral terminal *must* be connected to system neutral or ground depending on system configuration. All connections must be made in accordance with national and local requirements and codes.

Phase	Voltage Terminal
A	VA
B	VB
C	VC
Neutral	NEU

The current transformer terminal block is located at the top rear of the base. It has six terminals, grouped into three pairs: one pair for each phase current transformer, as shown below.

Phase	CT Terminal Pair
A	H1A, H2A
B	H1B, H2B
C	H1C, H2C

### 2.3.2 Power Supply Input

The IQ 300 power supply input is connected to the PS1 and PS2 terminals on the lower right rear of the Base Module chassis. The IQ 310 Base version requires 110 to 240 VAC or 125 to 250 VDC. The IQ 320 Base version has a wider operating power supply input range in comparison to the IQ 310 version. The IQ 320 power

supply can accommodate 90 to 600 VAC or 48 to 250 VDC. The power supply may be directly wired to the monitored system, if the voltage is within the proper range.

### 2.3.3 Local Display Connection

The supplied *Category 5 cable* connects to the *DISPLAY* port located on the middle right rear of the base and to the port on the IQ 300 Display Module. *Do not route the Category 5 cable in the same enclosure or cable tray as 600V system wiring.*

### 2.3.4 PowerNet Communications (IQ 320 Base Module only)

The IQ 320 Electrical Distribution System Meter is a PowerNet compatible device. When connected to a PowerNet System, via the INCOM port, it can be remotely monitored and functionally modified.

PowerNet enables efficient monitoring, trending, and alarm indication for electrical distribution system equipment. PowerNet is a noise-immune communication system that permits communication between a master computer and system devices, such as the IQ 320.

Consult *TD17513 Wiring Specification Base Rules* for detailed information on proper installation and termination of network cable.

The following functions can be performed remotely when the IQ 320 is connected to an external PowerNet compatible network:

- Display measured system, phase, and min/max values
- View and edit setpoints
  - System frequency
  - Wiring configuration
  - CT and PT ratios
  - Demand window
  - Energy tracking (KYZ pulse output)

View energy, view and reset peak demands, and all or individual minimum and maximum values.

## 2.4 EXTERNAL HARDWARE

### 2.4.1 Current Transformers

The IQ 300 requires at least two user-supplied external *instrument class* current transformers with 5 amp secondaries. These transformers must be connected to the current transformer terminals on the IQ 300 Base Module as detailed in *section 3.3*. It is recommended that CT shorting terminal blocks be installed between the current transformers and the IQ 300 current input terminals.

### 2.4.2 Potential Transformers

The IQ 300 requires user-supplied potential transformers if the system line voltage is above 600 volts. These transformers must be connected to the voltage terminals on the IQ 300 Base Module as detailed in *section 3.3*. It is recommended some disconnect device be installed between the potential transformers and the IQ 300 voltage input terminals.

### 2.4.3 External Fuses

It is recommended that user-supplied fuses be installed as described below to protect the IQ 300 and related components from damage.

#### 2.4.3.1 IQ 300 Power Supply

External fuses should be installed in the IQ 300 power supply lines, near the IQ 300 Base Module. 600 volt ½ Amp BUSS type KTK-R-1/2 Fast Acting or equivalent fuses are recommended for the IQ 300 Base PS1 and PS2 power supply lines.

#### 2.4.3.2 Potential Transformers

External fuses should be installed in the potential transformer lines as specified in the National Electric Code for the specific application. A voltage disconnect switch is also recommended. The Cutler-Hammer C362NM16 switch with the CNMBH handle is recommended.

## 2.5 PRODUCT SPECIFICATIONS

Refer to tables 2.1 to 2.5 for all IQ 300 specifications.

### 2.5.1 Regulatory/Standards Compliance

The IQ 300 meets UL, CUL, CSA and CE requirements.





Table 2.1 IQ 300 Safety Specifications

Safety		
IEC 1010-1 (1990) Incl. Amend 1&2 (1995) EN61010-1 (1993) CSA C22.2 #1010.1 (1992) UL3111		
EMC		
<i>Emissions</i> FCC Part 15 Class A CISPR 11 (1990) / EN55011 (1991) Group 1 Class A		
<i>Immunity</i>		
Electrostatic Discharge		
EN61000-4-2 (1995) / EN50082-2 (1995)	4kV CD	8kV AD
Electrical Fast Transient		
EN61000-4-4 (1995) / EN50082-2 (1995)	2kV PL	2kV SL
Radiated Immunity		
EN61000-4-3 (1997) / EN50082-2 (1995)	10V/m	
Conducted Immunity		
EN61000-4-6 (1996) / EN50082-2 (1995)	10Vrms	
Power Frequency Magnetic Field		
EN61000-4-8 (1995)	30 A/m	

**Table 2.2 IQ 300 Operating Specifications**

<b>Control Power</b>		
Input Range <i>IQ 310 Base</i> <i>IQ 320 Base</i>	110-240 VAC $\pm$ 10% 90-600 VAC $\pm$ 10%	125-250 VDC $\pm$ 10% 48-250 VDC $\pm$ 10%
Frequency Range	50/60 Hz	—
Burden <i>IQ 310 Base</i> <i>IQ 320 Base</i>	AC 180 mA 180 mA	DC 7 W 7 W
<b>Environment</b>		<b>Indoor use only</b>
Maximum Operating Altitude	3000 meters	
Operating Temperature <i>Base Unit</i> <i>Display Module</i>	-20° to 50° C 0° to 70° C	
Storage Temperature <i>Base Unit</i> <i>Display Module</i>	-30° to 85° C -20° to 85° C	
Maximum Relative Humidity: <i>Base Unit</i> <i>Display Module</i>	(80% for temperatures up to 31° C) decreasing linearly to 50% at 50° C decreasing linearly to 50% at 50° C	
Current Inputs <i>Input Impedance</i> <i>Burden</i> <i>Overload Withstand</i> <i>Accuracy Range</i>	5 amp nominal, 10 amp maximum 0.01 $\Omega$ 0.25 VA 150 Amps ac 1 second 0.5% to 200% of nominal full scale	
Voltage Inputs <i>Input Impedance</i> <i>Overload Withstand</i>	90 to 600 volts nominal $\pm$ 10% 2 M $\Omega$ 660 VAC continuous	
INCOM Communication Speeds ( <i>IQ 320 only</i> )	1200 Baud ASK 9600 Baud FSK	
KYZ ( <i>IQ 320 only</i> ) <i>Input Voltage</i> <i>Maximum Current Rating</i> <i>Input/Output Isolation Voltage</i>	240 VAC/300 VDC 96 mA 3750 V <sub>rms</sub>	
Transient Overvoltage Category	OVERVOLTAGE CATEGORY III	
Pollution Degree	2 (IEC 664)	

**Table 2.3 IQ 300 Metering Accuracy**

Parameter	Accuracy
Current (< 5 amps)	± .5% of Full Scale
Current (> 5 amps)	± .5% of Reading
Voltage, line-to-line	± .5% of Full Scale
Voltage, line-to-neutral	± .5% of Full Scale
Watts (< 5 amps)	± 1% of Full Scale
Watts (> 5 amps)	± 1% of Reading
vars (< 5 amps)	± 1% of Full Scale
vars (> 5 amps)	± 1% of Reading
VA (< 5 amps)	± 1% of Full Scale
VA (> 5 amps)	± 1% of Reading
Power Factor	± 2% of Full Scale
Frequency	± 0.1 Hz

**ANSI C12 NOTE:** The IQ 300 has been designed and verified to meet ANSI C12 Class 10 Revenue metering accuracy. This classification makes the IQ 300 an ideal choice for energy sub-metering and sub-billing applications.

**Table 2.4 IQ 300 Measurement Ranges**

Parameter	Max Data Range
Current	0...65,535 amps
Voltage	0...2,097,120 volts
Power	
Watts	-1,073,709,057...+1,073,709,056 Watts
vars	-1,073,709,057...+1,073,709,056 vars
VA	0...2,147,450,880 VA
Energy	
Fwd / Rev Wh	0...999,999,999 kWh
Fwd / Rev varh	0...999,999,999 kvarh
Net Wh	-999,999,999...+999,999,999 kWh
Net varh	-999,999,999...+999,999,999 kvarh
Net VAh	0...999,999,999 kVAh
Power Factor	-1.00...+1.00
Frequency	0...255.996 Hz

Table 2.5 IQ 300 Physical Characteristics

Dimension	Display Module	Base Module
Length	1.14 in. <sup>(1)</sup>	6.74 in. <sup>(2)</sup>
Height	10.25 in.	3.56 in. <sup>(3)</sup>
Width	6.72 in.	3.56 in.
Base Unit Terminals		
Wire Size	#12-22 AWG	
Screw Size	#6-32	
Torque Rating	9 in.-lbs. Maximum	
Distance Between Barriers	0.32 in.	
Weight		
Display Module	1.8 lbs.	
Base Module	2.35 lbs.	

<sup>(1)</sup> includes 0.35 in. connector.

<sup>(2)</sup> includes 0.62 in. terminal block.

<sup>(3)</sup> centered on front face mounting plate

2.6 ORDERING INFORMATION

When ordering IQ 300 components, please refer to the Catalog Number listed in table 2.6.

Table 2.6 IQ 300 Ordering Information

Description	Catalog Number
IQ 310 Base Module & IQ 300 Display Module	IQ310
IQ 320 Base Module & IQ 300 Display Module	IQ320
IQ 310 Base Module (Replacement Only)	IQ310TRAN
IQ 320 Base Module (Replacement Only)	IQ320TRAN
IQ 300 Display Module (Replacement Only)	IQ300D
3 foot long Category 5 Cable	IQ23CABLE
6 foot long Category 5 Cable	IQ26CABLE
10 foot long Category Cable	IQ210CABLE

**IQ 310 Base Module**

- (1) IQ 310 Base
- (1) DIN Rail Clip
- (1) L-Bracket
- (4) ½" #10 (10-32) screws
- (4) #10 Locking Washers
- (2) ¼" #8 (8-32) screws

**IQ 320 Base Module**

- (1) IQ 320 Base
- (1) DIN Rail Clip
- (1) L-Bracket
- (4) ½" #10 (10-32) screws
- (4) #10 Locking Washers
- (2) ¼" #8 (8-32) screws
- (1) Phoenix Contact Cable Housing

**IQ 300 Display Module**

- (1) IQ 300 Display
- (1) 1' shielded Cat. 5 patch cable
- (1) Gasket
- (10) Self tapping screws

## SECTION 3: INSTALLATION

### 3.1 INTRODUCTION

The IQ 300 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 with industry standard safety practices for this class of equipment. Refer to figure 3.5 through 3.14 for wiring details.



#### WARNING

**A THREE PHASE SWITCH OR CIRCUIT BREAKER SHOULD BE IN CLOSE PROXIMITY TO THE IQ 300 MOUNTING LOCATION AND MARKED AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT. ADDITIONALLY, IT IS RECOMMENDED THAT CT SHORTING TERMINAL BLOCKS BE USED IN ORDER TO FACILITATE ANY FUTURE MAINTAINANCE OR REMOVAL OF THE IQ 300 BASE MODULE.**



#### WARNING

**TURN OFF AND LOCK OUT POWER SUPPLYING THE PANELBOARD OR SWITCHGEAR IN WHICH THE IQ 300 IS BEING INSTALLED. INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN RESULT.**

### 3.2 PANEL PREPARATION

It is recommended that the IQ 300 be mounted in an electrical switchgear enclosure that is suitable for its environment. The IQ 300 Display and IQ 300 Base Modules may be mounted together or separately. The IQ 300 is designed with flexibility in mind. While it is recommended that the IQ 300 Display Module be door- or panel-mounted, the Base Module may be attached to the IQ 300 Display Module; mounted remotely using the supplied L-bracket, or directly to a panel or floor; or attached to a DIN rail using the supplied DIN clip. For floor or panel mounting, a #10 (10-32) or #12 (12-28) screw is recommended.

In *all* instances where the IQ 300 Base Module is mounted remotely, the IQ 300 Display Module Chassis *must* be connected to earth ground.

Before installing the IQ 300, refer to dimensions listed in table 2.5 and allow adequate room for wiring of and access to the IQ 300 Base Module terminals and connectors.

### 3.2.1 Mounting the IQ 300 Modules as a Single Unit

Since the IQ 300 is typically mounted on an enclosure door, it is necessary to prepare a cutout in which it will be placed. The dimensions for this cutout along with mounting hole locations are shown in Figure 3.1. Note that the IQ 300 actually has ten mounting holes. Normally the top, bottom and center holes are used for a standard installation. If the installation is to be in a NEMA 3R or 12 inclosure, additional mounting holes are provided so that uniform pressure can be maintained on the gasket all the way around the unit.

Before actually cutting the panel, be sure that the required 3-dimensional clearances for the IQ 300 chassis allow mounting in the desired location. IQ 300 dimensions with and without a display unit are shown in Figure 3.2.

It is necessary to hold the tolerances shown when making the cutouts and placing the holes for the mounting screws. In particular, the horizontal dimensions between the center of the mounting holes and the vertical edge of the cutout must be within 0 and +0.050 in.:

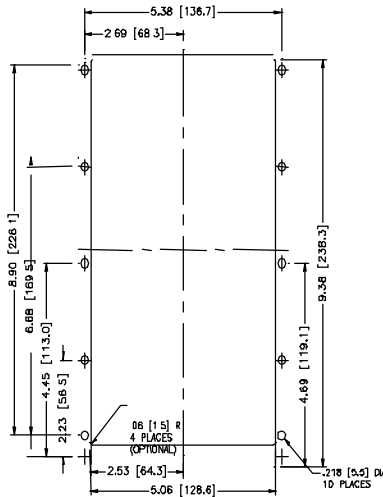


Figure 3.1 Mounting holes for the IQ 300 Display Module.

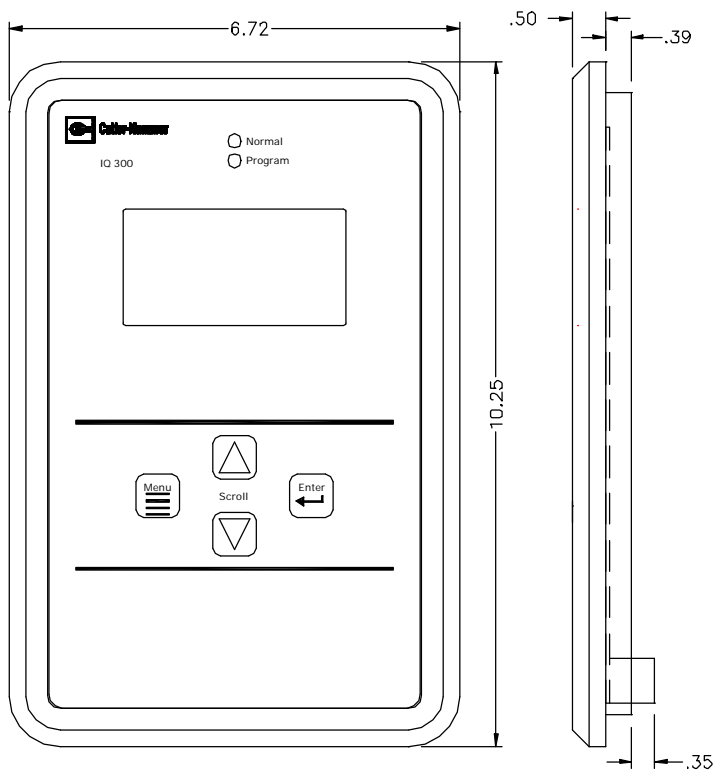


Figure 3.2 Dimension on the IQ 300 Display Module (Only).

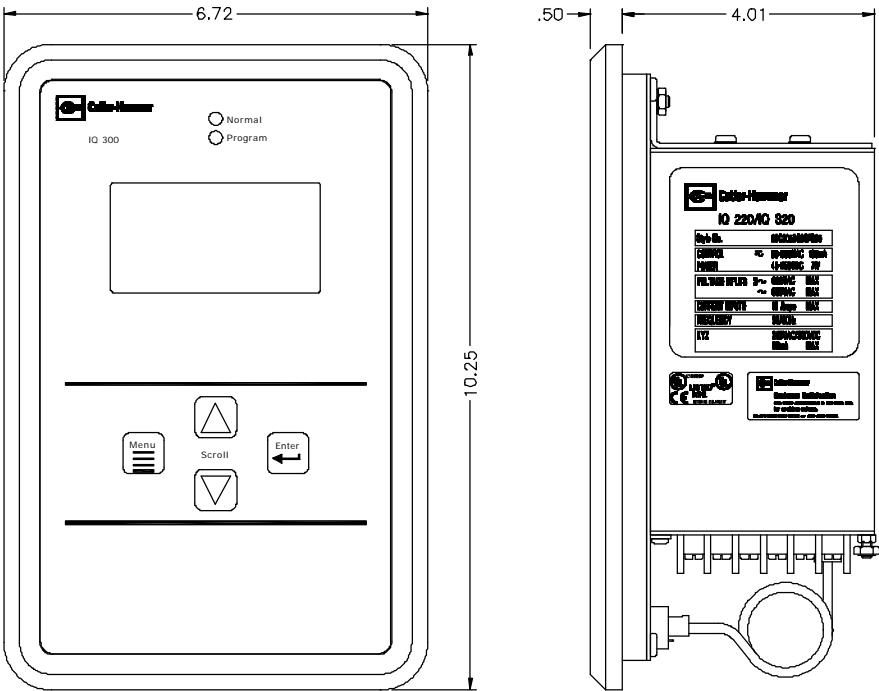


Figure 3.3 Dimensions for the IQ 300 Display Module with Base.



### 3.2.2 Mounting the IQ 300 Display and Base Modules Separately

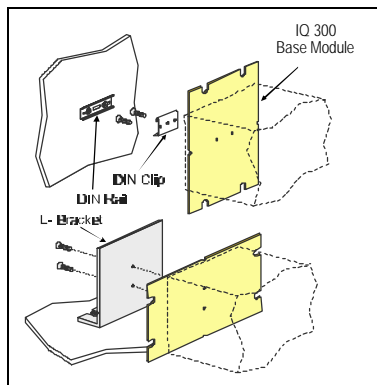
In *all* instances where the IQ 300 Base Module is mounted remotely, the IQ 300 Display Module Chassis *must* be connected to earth ground.

**Display Module** Cut a 5.38 in. wide by 9.38 in. high cutout in the switchgear door or other panel where the IQ 300 is to be mounted as shown in figure 3.1. Install the IQ 300 Display Module as shown in figure 3.1, following these steps:

- Slide the supplied gasket over the rear of the IQ 300 Display Module.
- Insert the IQ 300 Display Module with gasket installed into the cutout.
- From the inside of the panel use at least six screws through the ten mounting holes capturing the gasket between the Display Module and the panel.
- Insert one end of the Category 5 cable into the port on the rear of the Display Module.

**Base Module** Select a location for the IQ 300 Base Module.

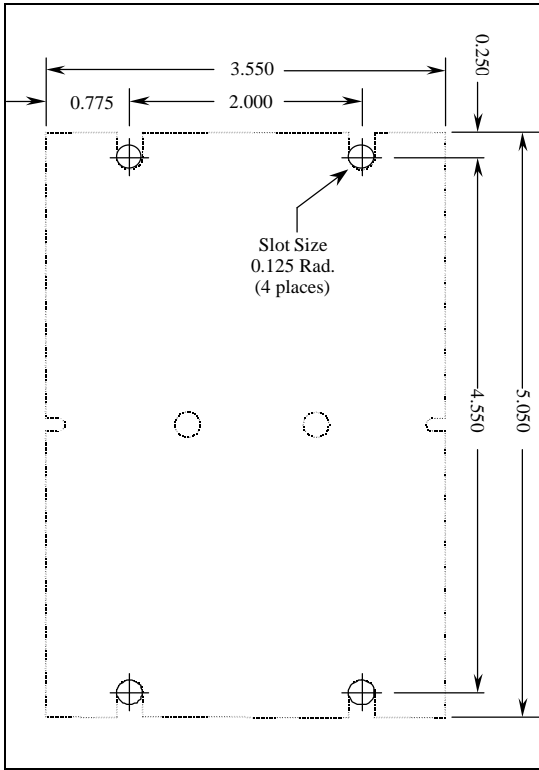
Depending on the location, use the mounting holes in the flange on the front face of the IQ 300 Base Module, the supplied L-bracket, or the DIN clip to secure the IQ 300 Base Module in the desired location and orientation. Typical mounting options are shown in figure 3.4. The hole drilling pattern for mounting the IQ 300 Base Module to floor, wall, or other surface is shown in figure 3.5.



**Figure 3.4 Typical Mounting Options for Mounting the IQ 300 Base Module**

Connect the IQ 300 Base Module to earth ground using the grounding terminal on the rear face.

Route the Category 5 cable from the IQ 300 Base Module to the IQ 300 Display Module. *Do not route the Category 5 cable in the same enclosure or cable tray as 600V system wiring.*



**Figure 3.5 Mounting Hole Pattern for the IQ 300 Base Module**

Connect the IQ 300 Display Module to the IQ 300 Base Module by inserting the remaining end of the Category 5 cable into the *DISPLAY* port on the IQ 300 Base Module.

Proceed to *section 3.3 Wiring*.

### 3.3 WIRING

The IQ 300 requires connection to system currents and voltages. If mounted separately, the cases of IQ 300 Display Module *and* the IQ 300 Base Module case *must* be connected to earth ground. If mounted together as one unit, the case of the IQ 300 Base Module *must* be connected to earth ground.

Additionally, the IQ 300 may require connection to a PowerNet network and/or an external pulse counter (*IQ 320 Base version*). The steps for completing each type of wiring are described in the following sections.



#### CAUTION

**ALL WIRING MUST CONFORM TO NATIONAL AND LOCAL CODES. SUFFICIENT ROOM MUST BE PROVIDED FOR ROUTING OF ALL POWER CABLES. ALL SIGNAL CABLES MUST BE ROUTED SEPARATELY FROM POWER CABLES. THE CATEGORY 5 CABLE CONNECTING THE IQ 300 DISPLAY MODULE AND THE IQ 300 BASE MODULE IS RATED AT 300V. THIS CABLE MUST NOT BE ROUTED IN THE SAME WIRING CHANNEL AS THE SYSTEM POWER.**

#### 3.3.1 Wiring System Current and Voltage

The IQ 300 must be connected to sources of current and voltage for each phase that is to be monitored. Current transformers having a 5 amp secondary provide the phase current measurement. Phase voltages under 600V may be measured directly by the IQ 300. Phase voltages over 600V must be measured using potential transformers.

#### 3.3.2 Wiring Diagrams for Various System Configurations

Recommended IQ 300 wiring diagrams for current and potential transformers are shown below in figures 3.6 through 3.15. It is the user's responsibility to determine which wiring diagram applies and to specify and install all current transformers, potential transformers, fuses, and other components.

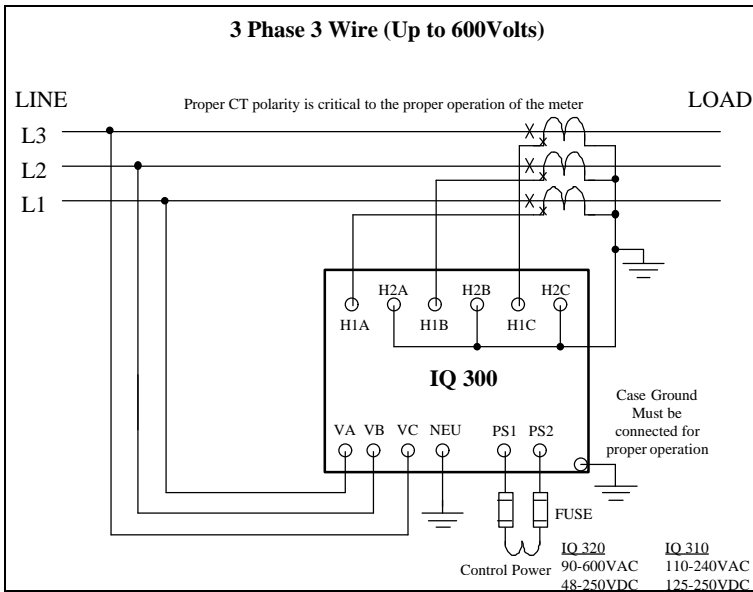


Figure 3.6 3 Phase 3 Wire Configuration (Up to 600 Volts)

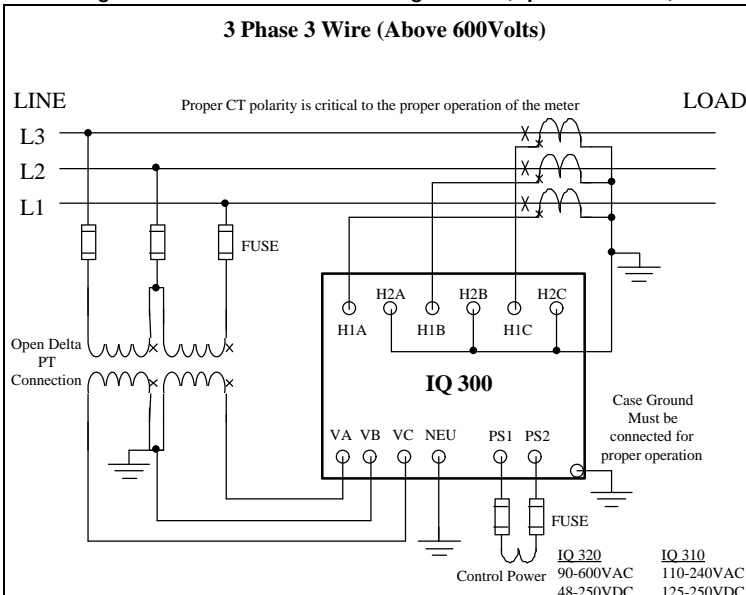


Figure 3.7 3 Phase 3 Wire Configuration (Above 600 Volts)

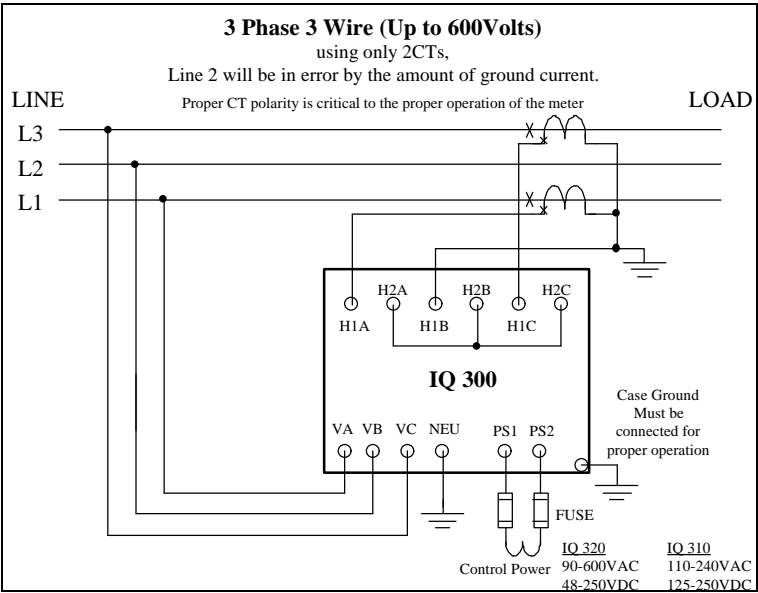


Figure 3.8 3 Phase 3 Wire, 2 CT Configuration (Up to 600 Volts)

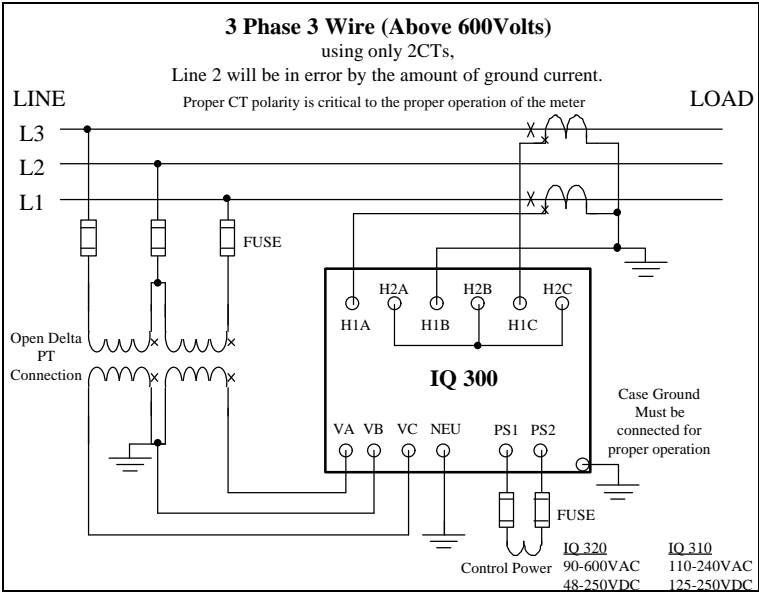


Figure: 3.9 3 Phase 3 Wire, 2CT Configuration (Above 600 Volts)

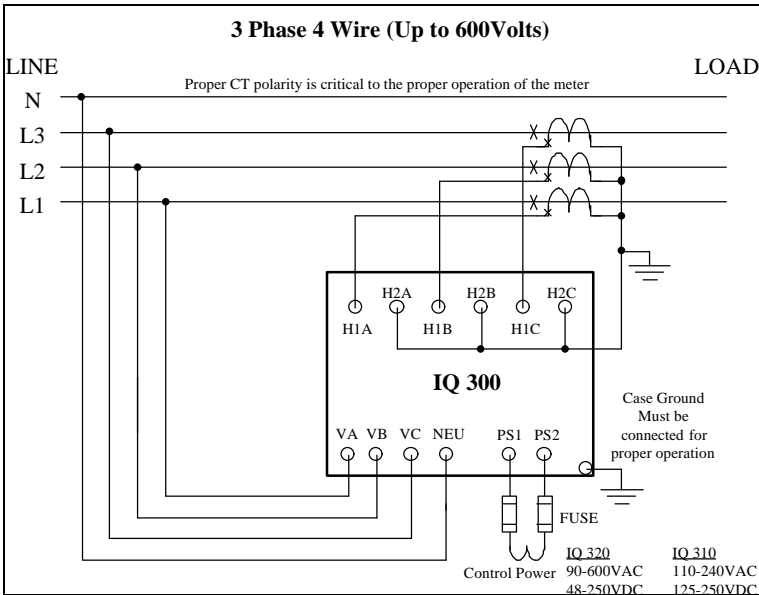


Figure 3.10 3 Phase 4 Wire Configuration (Up to 600 Volts)

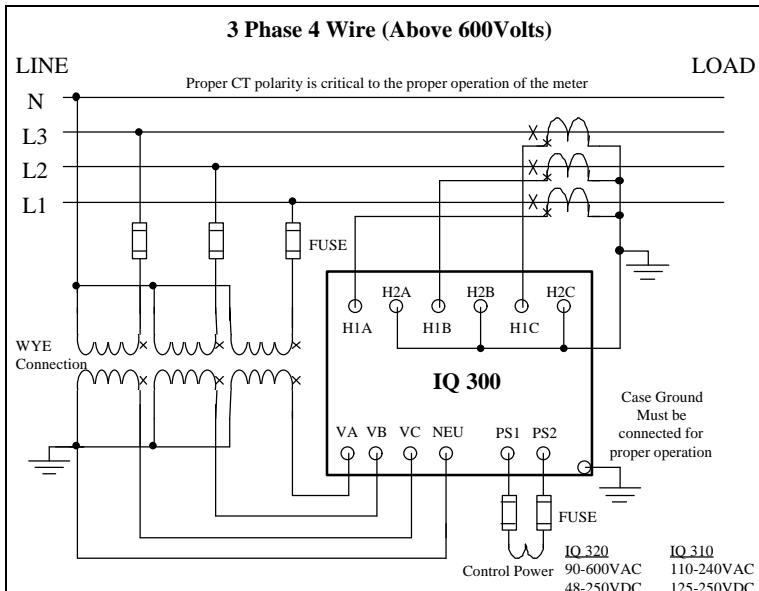


Figure 3.11 3 Phase 4 Wire Configuration (Above 600 Volts)

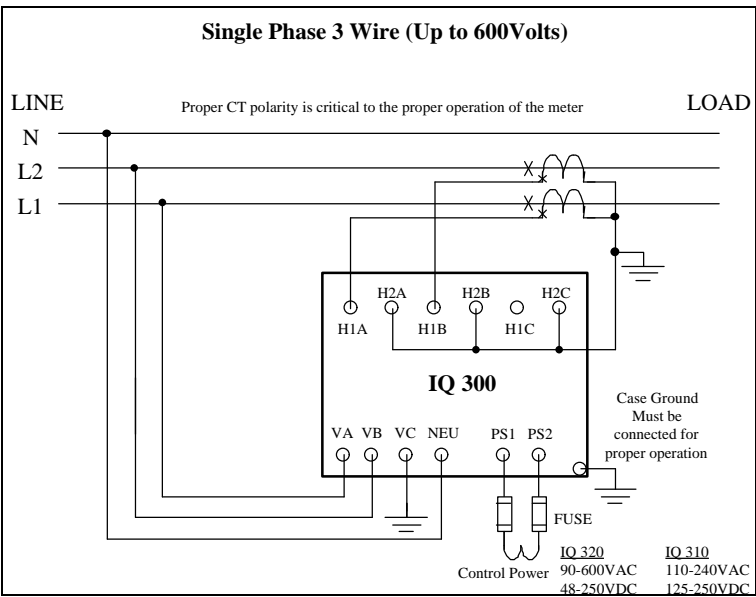


Figure 3.12 Single Phase 3 Wire Configuration (Up to 600 Volts)

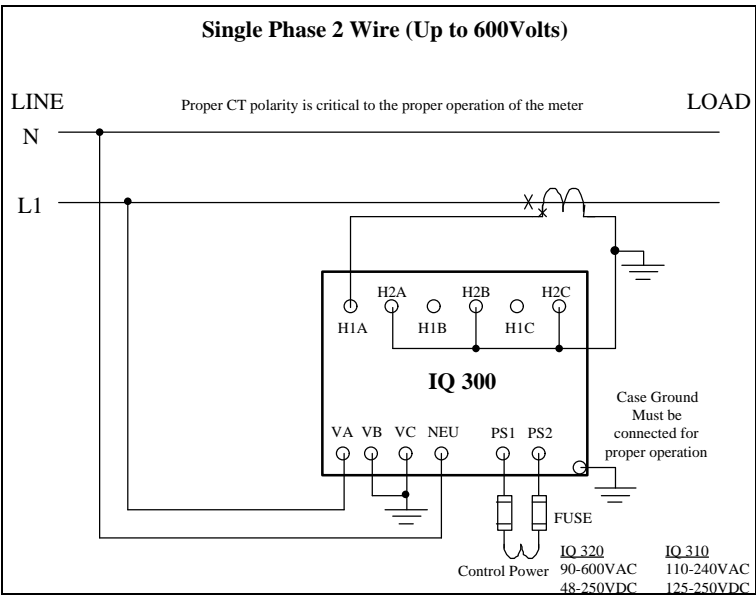


Figure 3.13 Single Phase 2 Wire Configuration (Up to 600 Volts)

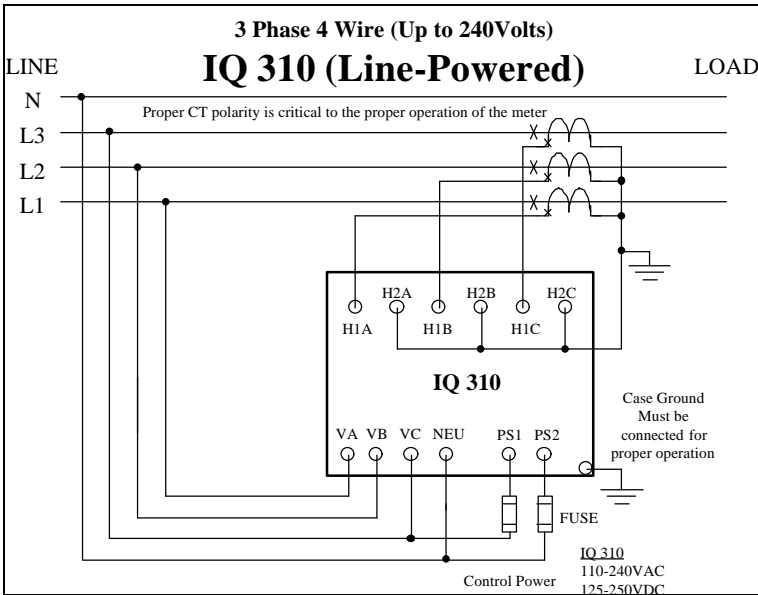


Figure 3.14 Typical IQ 310 Line-Powered Configuration (Up to 240 Volts)

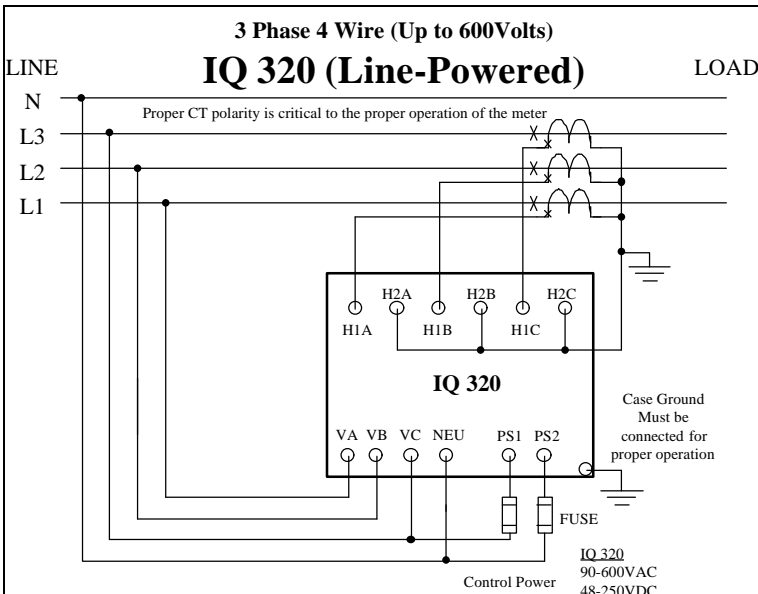


Figure 3.15 Typical IQ 320 Line-Powered Configuration (Up to 600 Volts)



### 3.3.3 PowerNet Communications (IQ 320 Base Module Only)

**Note:** To satisfy proper Wiring Specifications use only Belden 9463 or 3072F, or Culter-Hammer IMPCABLE shielded twisted pair cable or equivalent, according to system requirements. SEE TD17513, WIRING SPECIFICATIONS BASE RULES for more detailed information.

Connect the IQ 320 to the PowerNet network by connecting the twisted pair communication cable to the INCOM™ port located on the rear face of the IQ 320 Base Module. The polarity of the twisted pair is not important.

Tie the communication cable shield to ground only once at the INCOM™ master device. If there are more than one remote INCOM™ compatible devices (such as the IQ 320) cabled to the master device, tie the communication cable shields together but *do not* connect to ground.

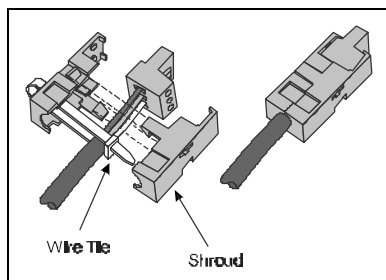
Care must be taken in stripping wire due to close proximity of terminals.



## CAUTION

**PREPARE THE CABLE FOR ATTACHMENT TO THE INCOM™ JACK TO AVOID SHORTING CABLE SHIELD TO POWER INPUT TERMINALS.**

Carefully strip the end of the communication wire as described in TD 17513. Install the INCOM™ jack onto the prepared cable. Place the cable and jack assembly into the recess in the side of the shroud component of the supplied Phoenix Contact Cable Housing that includes a supplied wire tie as shown in figure 3.16. Ensure that the supplied wire tie passes through the holes in the shroud so the ends of the tie flank the cable, as shown in figure 3.16. Tighten the wire tie to secure the cable to the shroud.



**Figure 3.16. Securing INCOM™ Cable to Shroud**

### 3.3.4 KYZ Pulse Initiator (IQ 320 Base Module Only)

The KYZ Pulse Initiator output can be wired to a 2-wire (K-Y terminals) or 3 wire (K-Y-Z terminals) pulse receiver. These terminal configurations and the resulting pulse trains are shown in figures 3.17 and 3.18. The energy represented by each pulse can be specified by the user as: *apparent power (VAh)*; *forward or reverse real power ( $\pm Wh$ )*; or *forward or reverse reactive power ( $\pm varh$ )*. The procedure for specifying the *energy per pulse* is described in section 4.10.8.

Each pulse that arrives at the pulse counter indicates that the specified energy has been consumed by the monitored system. The frequency and spacing of these pulses represent the energy consumption pattern of the monitored system.

Because the energy represented corresponds to the energy at the *secondary* winding of the PTs and CTs, the CT and PT ratios must be taken into account when specifying the *energy per pulse* value. An example of how to specify the *energy per pulse* value is given below.

*Example:*

System Configuration

CT = 1400:5

PT = 4:1

Desired value to monitor

Watt-hours

System parameters

**Assume** the IQ 320 is monitoring a constant system power of 38,400 Watts.

**Step 1:** Calculate the CT and PT ratios

CT ratio =  $1600/5 = 320$

PT ratio =  $4/1=4$

**Step 2:** Calculate the power at the secondary of the CTs and PTs

power at secondaries =  $38,400 \text{ Watts} / (\text{CT ratio} \times \text{PT ratio})$

power at secondaries =  $38,400 \text{ Watts} / (320 \times 4)$

power at secondaries =  $38,400 \text{ Watts} / 1280$

power at secondaries = 30 Watts (or 30 Watt-hours in 1 hour)

**Step 3:** Specify the energy per pulse as desired

Specify secondary energy per pulse = 1 Watt-hour per pulse;  
then, each pulse represents system energy of:

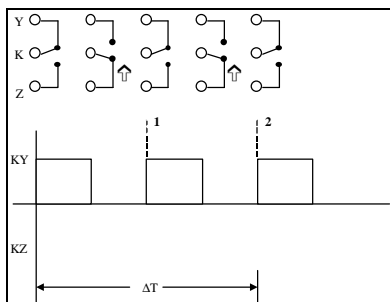
$$(1600/5) \times (4/1) \times 1; \text{ or } 1280 \text{ Watt-hours per pulse}$$

or

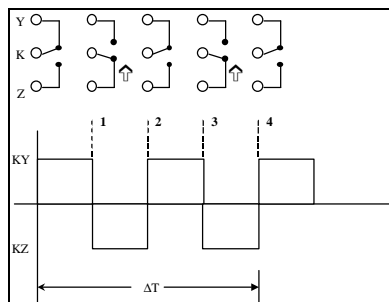
Specify secondary energy per pulse = 5 secondary Watt-hours per pulse;  
then, each pulse represents system energy of:

$$(1600/5) \times (4/1) \times 5; \text{ or } 6,400 \text{ Watt-hours per pulse}$$

A receiving system that uses both the K & Z contacts (as in Figure 3.18) will count every transition and will therefore account for all of the energy used. A receiving system that only counts one of the transitions (as in Figure 3.17) will only account for half of the energy used. Systems only using one of the pulses will need to multiply the energy per pulse in the previous example by a factor of 2.



**Figure 3.17 2-Terminal (K-Y)  
Configuration**



**Figure 3.18 3-Terminal (K-Y-Z)  
Configuration**

## SECTION 4: OPERATION

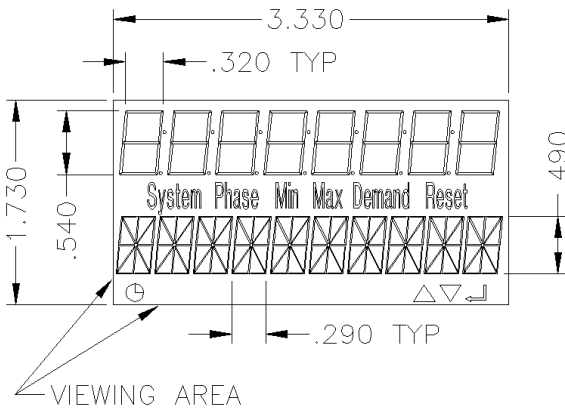
### 4.1 GENERAL

The IQ 300 Display Module provides both local display of system values and a method of configuring the IQ 300 base module.

The IQ 300 Display Module allows the user to view information and to specify or change the functions of the IQ 300 system. These items include system and phase data, min/max data, setpoints, and screen contrast.

It also provides a method of assigning a network address and communication baud rate to the IQ 320 Base variation, should it be networked to a PowerNet master device.

All functions of the IQ 300 are available through *menus* visible on the screen of the IQ 300 Display Module Operator Panel. Choice of menu and selection of menu options is accomplished by pressing the buttons on the face of the Operator Panel.



**Figure 4.0 IQ 300 Screen**

The screen of the IQ300 allows you to read the numerical value of what you have chosen in the top row of digits while the description of that value is shown in the bottom alphanumeric digits. There are also six useful icons located between the two rows of the display.

The determination of your present position in the menus is determined by the icons in the middle of the screen and the alpha-numeric row beneath the fixed words. The

combination of these words will tell you which menu and which branch of the menu you are in.

The six icons on the display are:

- System – When this icon is on three phase system values are being displayed.
- Phase – When this icon is on single phase values are being displayed.
- Min – When this icon is on a stored minimum value is being displayed.
- Max – When this icon is on a stored maximum value is being displayed.
- Demand – When this icon is on a power demand value is being displayed.
- Reset – This icon is on when in the reset values submenu.

Note that more than one icon can be active at the same time. For example if the maximum phase A current is being displayed both the Phase and Max icons will be turned on.

The symbols in the lower right hand corner of the screen indicate what buttons are active or inactive. The up triangle represents the *scroll up* button, the down triangle represents the *scroll down* button, and the arrow to the left represents the *Enter* button. When these symbols are lit, pushing those buttons will get a result. If one or more of the symbols is not lit, pushing those buttons will have no effect.

The clock symbol in the lower left hand corner is not in use at this time.

The menus provide access to the following values and functions:

System Data

Phase Data

Min/Max Data

View Setpoints

Edit Setpoints (with optional password protection)

Reset Values (with optional password protection)

Display Settings

Diagnostics

Exit Menu

## 4.2 BUTTONS

There are four buttons on the Operator Panel: *Menu*, up and down *Scroll*, and *Enter*. Their functions are described in the following table.

Button	Function
Menu	Displays the nine different screen menus; displays the immediately preceding screen
Scroll	Navigates the on-screen <i>selection arrow</i> (↕) through menu items <i>and</i> through system values to be displayed
Enter	Confirms the option, value, or screen currently selected. Also allows rapid movement through data screens.

### 4.3 CONTRAST

The contrast of the screen can be adjusted without entering the **Contrast Adjust** menu by holding in the *Enter* button while pressing the *Scroll* up arrow button (to decrease contrast) or the *Scroll* down arrow button (to increase contrast).

### 4.4 DISPLAYED SIGN CONVENTIONS

The IQ 300 not only displays system values, but also indicates whether factors are lagging or leading by displaying the following symbols:

Display	Indication
Lg	lagging (inductive)
Ld	leading (capacitive)

The IQ 300 is shipped with lagging vars and power factor represented by negative values at the load, conforming to the *mathematical sign convention*. The IQ 320 allows the user the ability to change to the *power engineer convention*, which assumes positive values at the load. The convention can be changed in the IQ 320 via the INCOM communications interface. The IQ 320 must be connected to a PowerNet network and programmed accordingly. Only the mathematical convention is available when using the IQ 310 Base.

The following relationships apply:

Convention	Load	var Values	Power Factor Values
Mathematic	Inductive	negative	negative (lagging PF)
Mathematic	Capacitive	positive	positive (leading PF)
Power Engineer	Inductive	positive	positive (lagging PF)
Power Engineer	Capacitive	negative	negative (leading PF)

The relationships among system power values are shown schematically in figure 4.1.

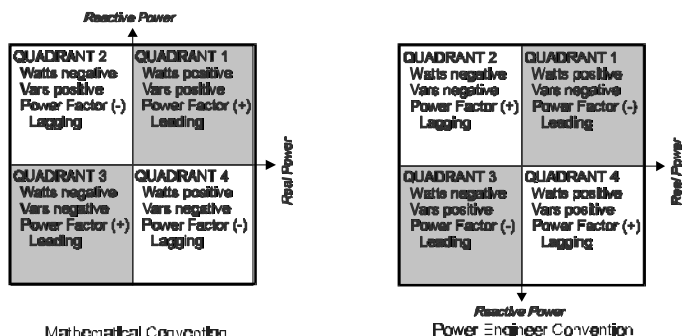


Figure 4.1 System Power Values Relationships

## 4.5 USING THE OPERATOR PANEL

When the IQ 300 is first powered on, the Operator Panel screen displays a brief initialization message identifying the product and version. The screen then displays the System Power screen. (At this point, pressing the *Scroll* arrows will display system data as described in *section 4.6 System Data Display Mode*.)

Press the *Menu* button to proceed. The *main menu items* display four at once, as shown in figure 4.2. The display will be one item at a time in IQ 300. Every menu item can be displayed by using the *Scroll* button arrows. The item currently selected is indicated by the selection arrow to its left.

The presence of additional items is indicated by ▼ and/or ▲ at the right edge of the screen.

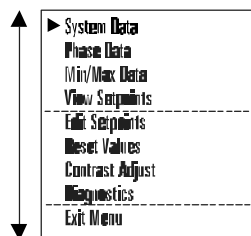


Figure 4.2 Main Menu

Keep in mind that the *values* displayed under several menu items depend on whether the system being monitored is 3 or 4 wire, and require that the appropriate configuration be selected under the Edit Setpoints menu. Menu descriptions cover both 3 and 4 wire systems where appropriate.

**Note:** the lagging or leading indicator and any signs may be the opposite of that shown in the sample screens.

4.6 MAIN MENU DISPLAY FOR THE IQ 300

The Main Menu provides access to all information monitored by the IQ 300. Press Menu to display the list of available items. Scroll through the menu list shown in figure 4.2 and hit Enter to access the values contained in that item. Refer to 4.9 View Setpoints to select 3 or 4 wire setup.

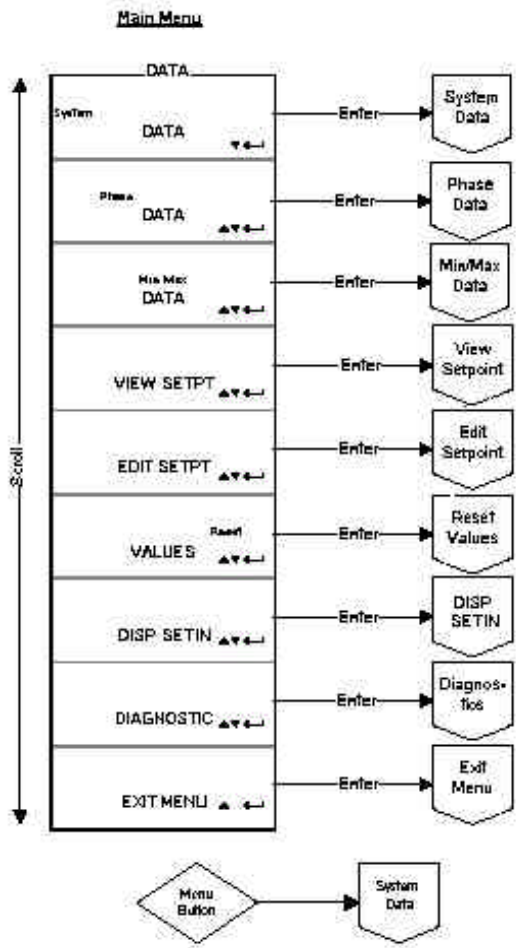


Figure 4.3 Main Menu



#### **4.6.1 SYSTEM DATA DISPLAY MODE**

The System Data menu provides access to System information monitored by the IQ 300. Press *Menu* to display the list of available items in the Main Menu. Select the System Data *menu* item and press *Enter*. The screens shown in figure 4.4 display as the *Scroll* down arrow is pressed.

#### **4.7 PHASE DATA DISPLAY MODE**

The Phase Data menu provides access to all Phase information monitored by the IQ 300.

Press *Menu* to display the list of available items in the Main Menu.

Select the Phase Data menu item and press *Enter*. Refer to 4.9 View Setpoints to select 3 or 4 wire setup.

##### **4.7.1 3 Wire System**

Figure 4.5 shows a list of the items in the (3 wire) Phase Data. Pay special note of how the *enter* button moves you ahead in the list.

##### **4.7.2 4 Wire System**

Figure 4.6 shows the items that are displayed in a (4 wire) Phase Data. The 30 screens shown in figure 4.6 display as the *Scroll* down arrow is pressed.

Note: Notice how the *Enter* button will move you forward through the display list.

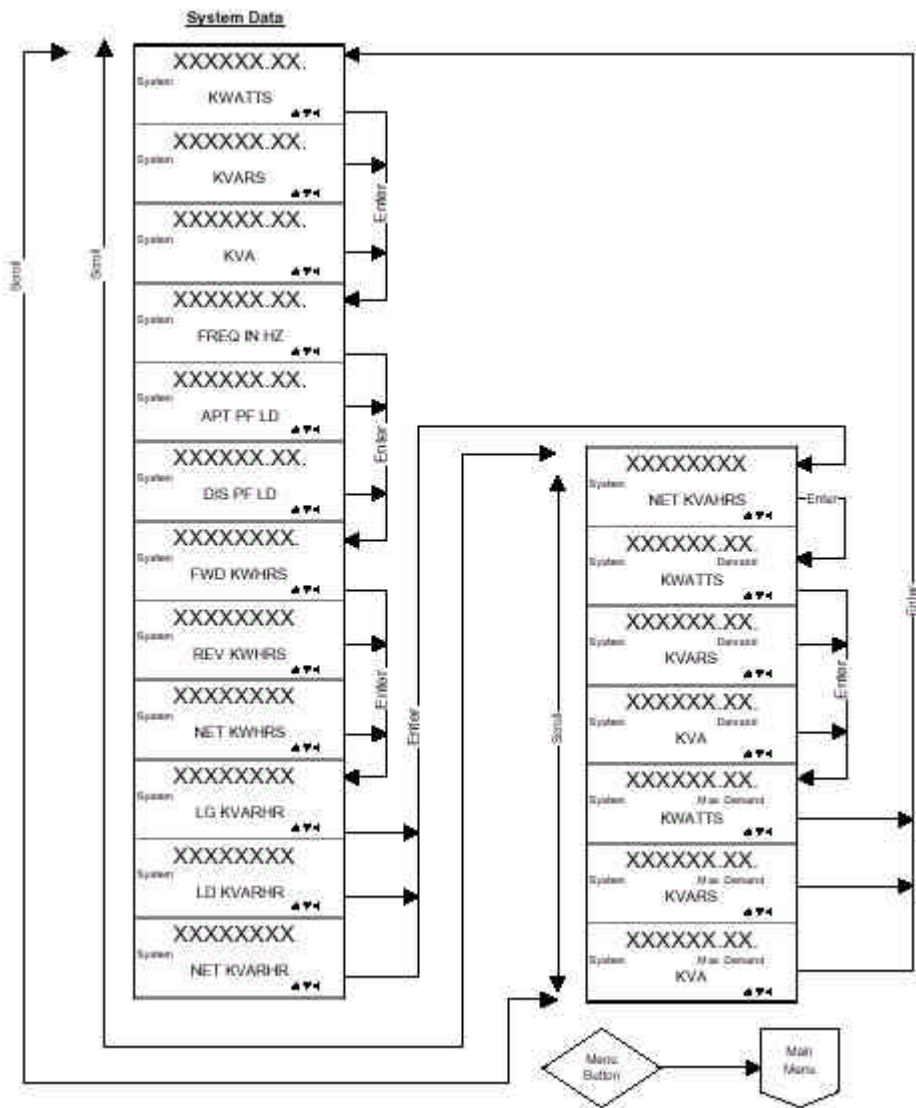


Figure 4.4 System Display 3 and 4 wire Systems

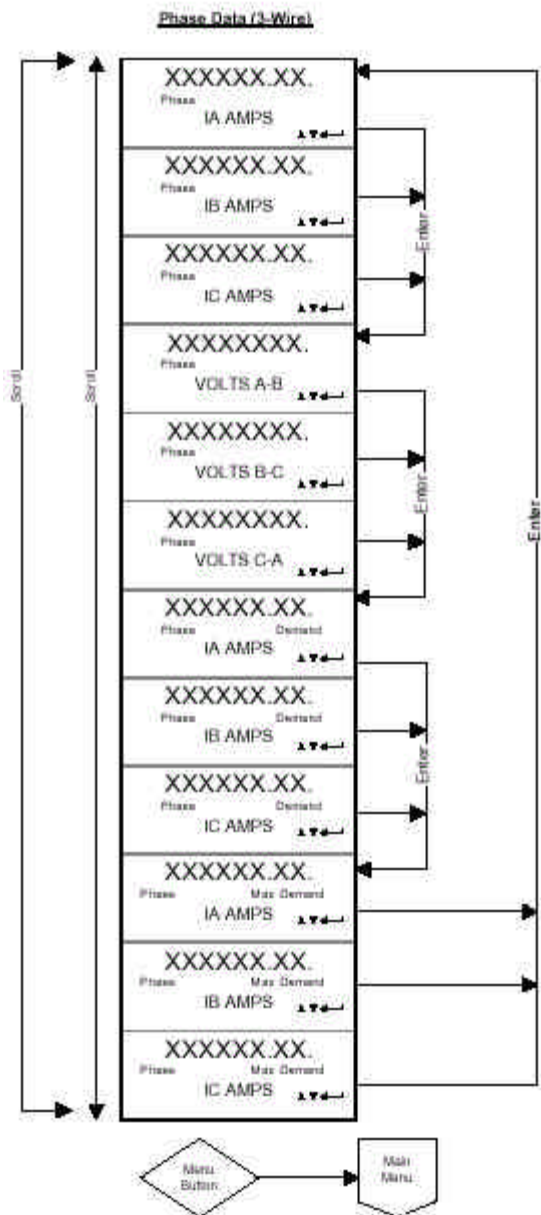


Figure 4.5 Phase Display 3 Wire Systems

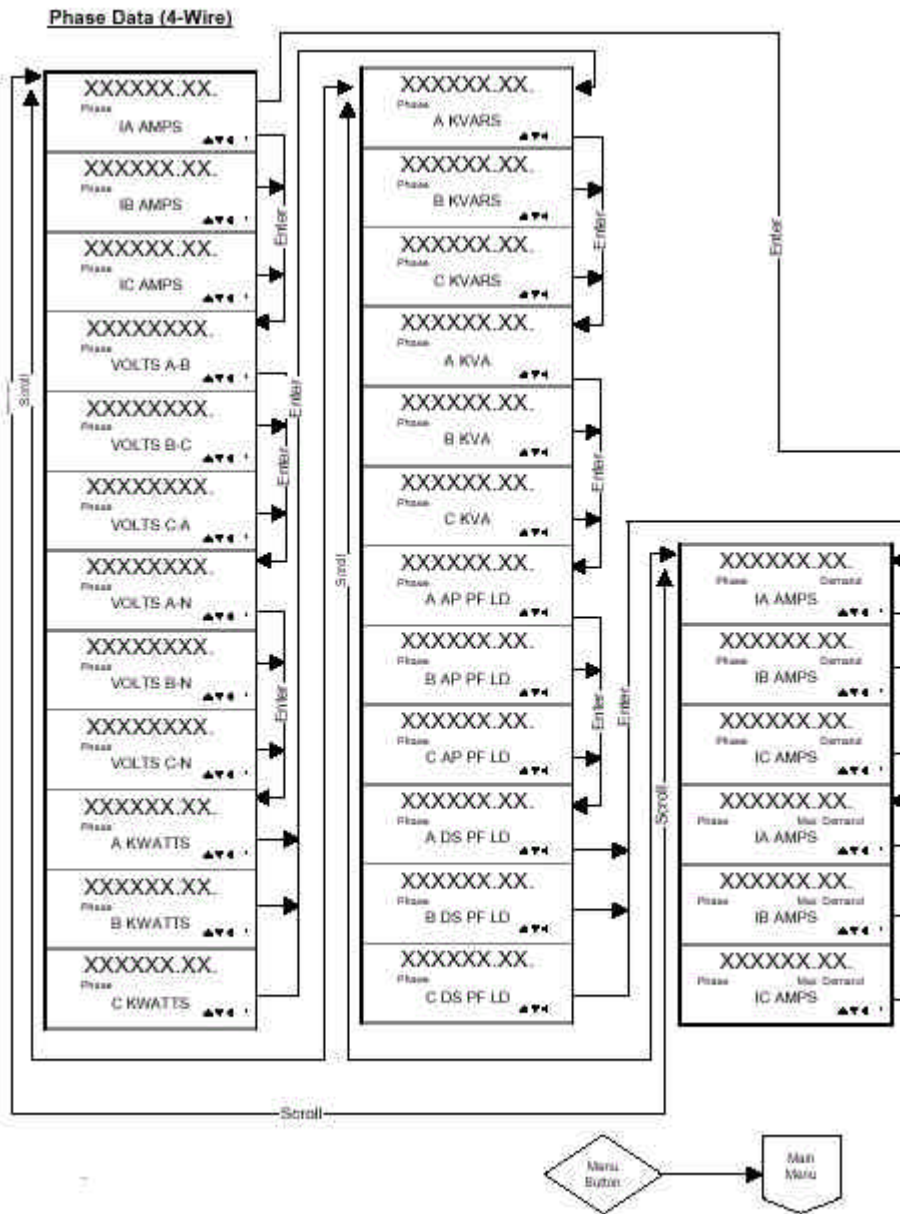


Figure 4.6 Phase Display 4 Wire Systems

## 4.8 MIN/MAX DATA DISPLAY MODE

Refer to 4.9 View Setpoints to select 3 or 4 wire configuration.

### 4.8.1 3 Wire System

These screens, shown in figure 4.7, display the minimums and maximums of values monitored by the IQ 300.

Press *Menu* to display the list of available items.

Select arrow next to Min/Max Data and press *Enter*.

The list below displays as the *scroll* buttons are pressed. Note how the *enter* button moves you forward through the list.

### 4.8.2 4 Wire System

These screens, shown in figure 4.8, display the minimums and maximums of values monitored by the IQ 300.

Press *Menu* to display the list of available items.

Select Min/Max Data from the Main Menu and press *Enter*.

The list below displays as the *scroll* buttons are pressed. Note how the *enter* button moves you forward through the list.

## 4.9 VIEW SETPOINTS

This *menu* selection permits the user to *view* but *not change* all of the IQ 300 setpoints and system parameters. To *change* these values, proceed to *section 4.10 Edit Setpoints*.

Press *Menu* to display the list of available items.

Select View Setpoints and press *Enter*.

Figure 4.9 details the set of displays can be scrolled through to view the current setpoints

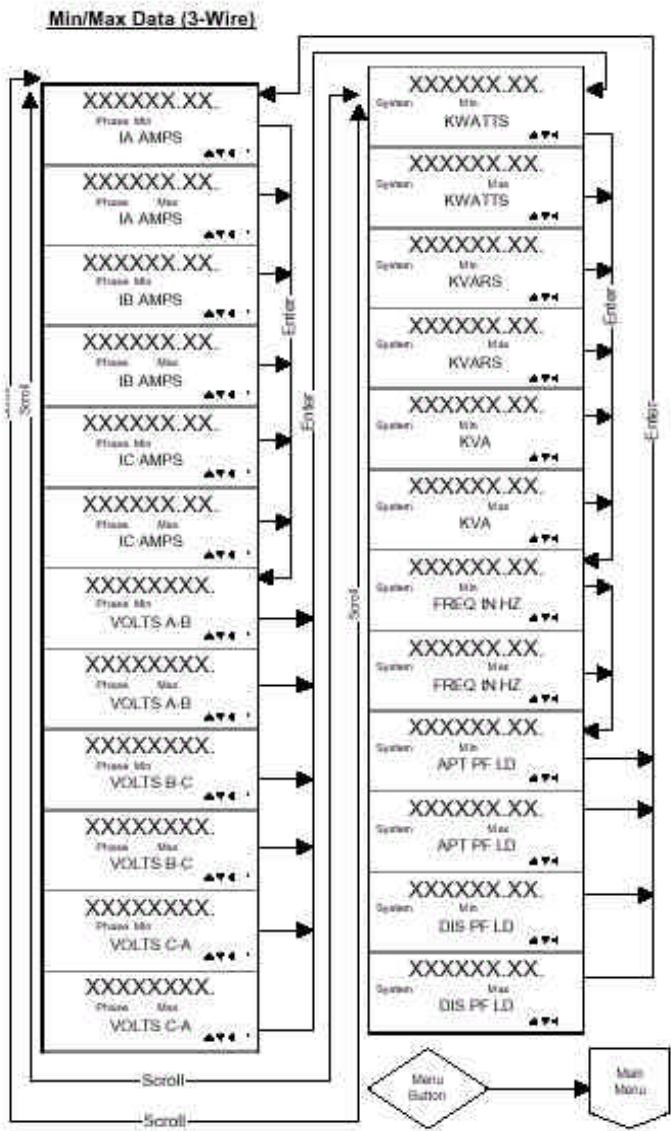


Figure 4.7 Min/Max Data Display, 3 Wire System

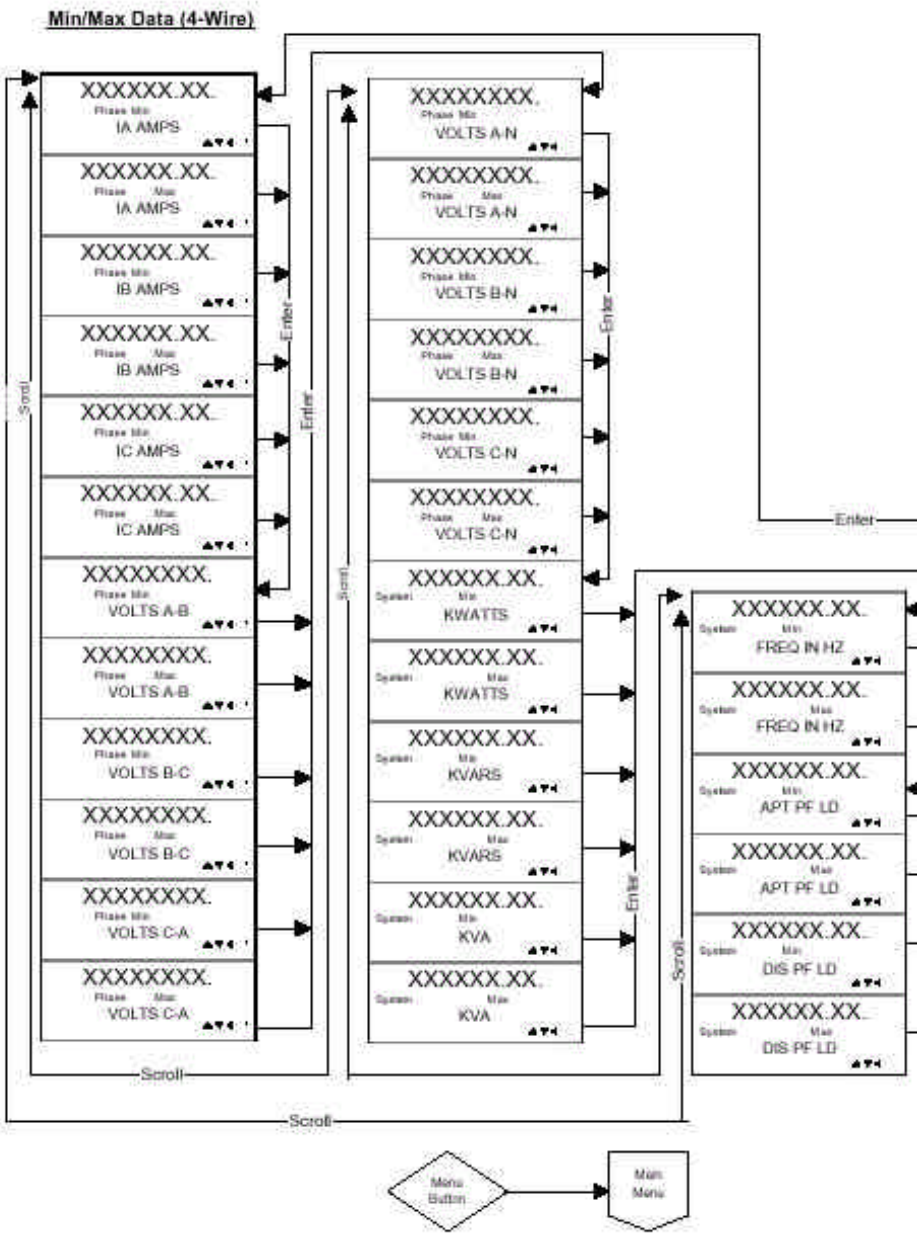


Figure 4.8 Min/Max Data Display, 4 Wire System

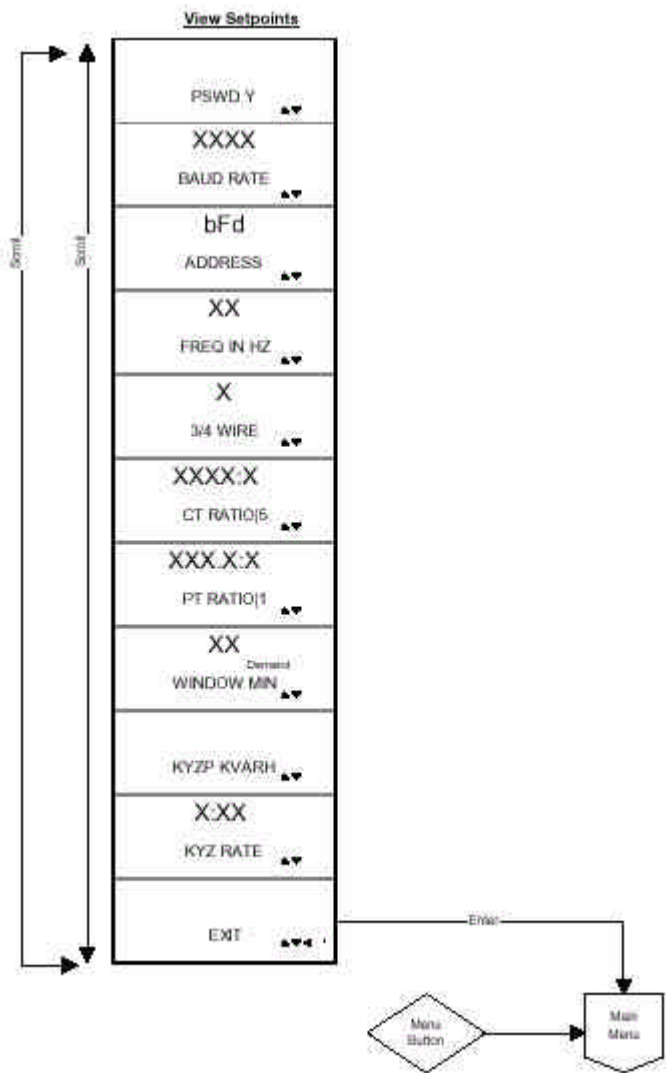


Figure 4.9 View Setpoints



### 4.9.1 Password Setup

Scroll to PSWD. One of two screens will display. One screen, figure 4.11, indicates that *no password* is necessary to change the IQ 300 setpoints or system parameters. The other screen, figure 4.10, indicates that *a password is required* to change setpoints or system parameters.

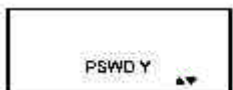


Figure 4.10 Password Required

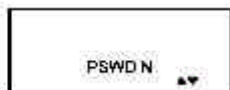


Figure 4.11 No Password Required

### 4.9.2 INCOM™ Setup (IQ 320 Base Module only)

Scroll until the BAUD RATE selection of figure 4.9 is displayed. This screen indicates the baud rate at which the IQ320 communications will operate over the PowerNet network or the Modbus network. (Whichever is installed.)

Scroll down to the ADDRESS selection of figure 4.9. This screen indicates the network address (in hexadecimal) assigned to the IQ320. This address will be used by the PowerNet network or the Modbus network. (Whichever is installed.)

If the Baud rate or the Address is not correct, proceed to *section 4.10 Edit Setpoints*.

### 4.9.3 System Frequency

Scroll to the FREQ IN HZ selection of figure 4.9. This screen indicates the frequency selected as the frequency of the system being monitored. The screen will display either 50 Hz or 60 Hz. If the frequency displayed is not correct, proceed to *section 4.10 Edit Setpoints*.

### 4.9.4 Wiring Configuration

Scroll to the 3/4 WIRE selection of figure 4.9. This screen indicates the wiring configuration selected as the configuration of the system being monitored. The screen will display either 3 or 4. If the wiring configuration displayed is not correct, proceed to *section 4.10 Edit Setpoints*.

### 4.9.5 CT Ratio

Scroll to the CT RATIO:5 selection of figure 4.9. This screen indicates the current transformer ratio selected as the ratio of the current transformers being used with the IQ300. If the ratio displayed is not correct, proceed to *section 4.10 Edit Setpoints*.

#### 4.9.6 PT Ratio

Scroll to the PT Ratio:1 selection of figure 4.9. This screen indicates the potential transformer ratio selected as the ratio of the potential transformers being used with the IQ300. If the ratio displayed is not correct, proceed to *section 4.10 Edit Setpoints*.

#### 4.9.7 Demand Window

Scroll to the Window MIN selection of figure 4.9. This screen indicates the time window over which demand parameters are measured. If the time displayed is not correct, proceed to *section 4.10 Edit Setpoints*.

#### 4.9.8 KYZ Setup (IQ 320 Base Module only)

Scroll to the KYZP ????? selection of figure 4.9. This screen indicates the system value which the IQ320 will monitor. The system value monitored will replace the ??????. The values that can replace the ?????? are **NONE**, **VAh**, **-VARh**, **+VARh**, **-Wh**, **+Wh**.

Scroll down to KYZ RATE selection of figure 4.9. This screen indicates the secondary *energy per pulse* rate over which energy demand (consumption) is measured. If the values displayed are not correct, proceed to *section 4.10 Edit Setpoints*.

#### 4.9.9 Exit

Pressing Enter when this menu item is selected returns the display to the main menu.

### 4.10 EDIT SETPOINTS (3 and 4 wire systems)

This *menu* selection permits the user to *change* all of the IQ 300 setpoints and system parameters.

Press *Menu* to display the list of available items.

Select Edit Setpt and press *Enter*.

If the *Password* option has been enabled, the system requests the password.

To enter the password, use the Scroll up arrow to increase the digit or the Scroll down arrow to decrease the digit. Press *Enter* to move to the next digit. Repeat the last steps until the least significant digit is set. Press *Enter* to lock in the selection.

If an incorrect password is entered, the message *Error* displays. Press *Menu* to return to the previous screen showing *Edit Setpoints* selected. Press *Enter* to retry entering the password.

If the correct password is entered, or if the *Password* option is not enabled, the following set of displays can be scrolled through:

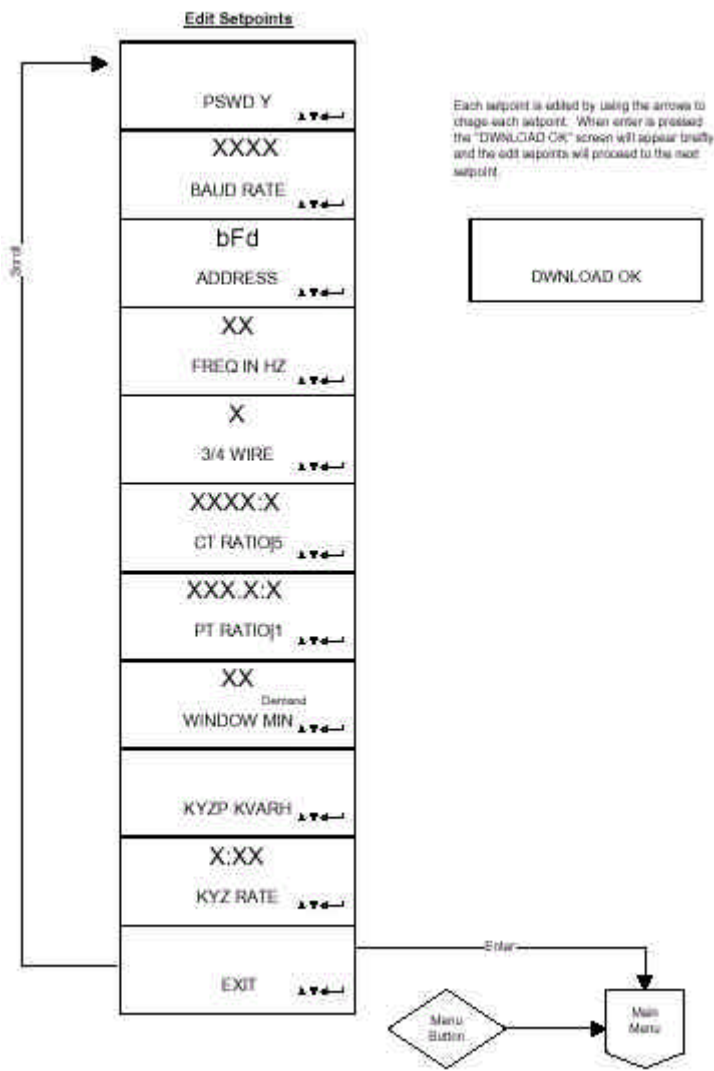


Figure 4.12 Edit Setpoints

### 4.10.1 Password Setup

Select Password and press *Enter*.

The user can specify if a password is required to change the IQ 300 setpoints or system parameters and what the password is or would be if it were in use.

To specify if a password is required, press either of the Scroll arrows to toggle between y and n. When the desired choice is displayed, press *Enter* to lock in the selection. The screen changes to show the first digit of the current password underlined. To change any digit of the password, use the Scroll up arrow to increase the digit or the Scroll down arrow to decrease the digit. Press *Enter* to move to the next digit. Repeat the last steps until the least significant digit is set. Press *Enter* to lock in the selection.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

### 4.10.2 INCOM™ Setup (IQ 320 Base Module only)

Note: A display is required to configure the INCOM™ address.

To set these values on IQ 320 Base modules installed without a permanently connected IQ 300 display module, temporarily connect an IQ 300 display module and follow the procedure below.

Scroll until the Baud Rate selection of figure 4.12. To select a baud rate at which the IQ 320 will communicate over the PowerNet network, press either of the *Scroll* arrows to step through the choices 9600 or 1200 baud. When the desired choice is displayed, press *Enter* to lock in the selection.

Scroll down to the Address selection of figure 4.12. The current network address (in hexadecimal) is displayed. To change any digit of the address, first select it by pressing *Enter*. Then use the *Scroll* up arrow to increase the digit or the *Scroll* down arrow to decrease the digit. Press *Enter* to move to the next digit. Repeat the last steps until the least significant digit is set. Press *Enter* to lock in the selection.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

### 4.10.3 System Frequency

Select Freq in HZ display of figure 4.12. This screen displays the electrical system frequency in HZ.

This screen initializes with the frequency of the system being monitored selected and displayed. The screen will display either 60 Hz or 50 Hz.

To specify the frequency of the system being monitored, press *Enter*. Use either of the *Scroll* arrows to toggle between 60 Hz and 50 Hz. When the desired choice is displayed, press *Enter* to lock in the selection.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

### 4.10.4 Wiring Configuration

Select 3/4 WIRE display of figure 4.12. This screen displays the current wiring configuration of the system being monitored.

This screen initializes with the wiring configuration of the system being monitored selected and displayed. The screen will display *either* 3 Wire or 4 Wire. To specify the wiring configuration of the system being monitored, press *Enter*. Use either of the *Scroll* arrows to toggle between 3 Wire and 4 Wire. When the desired choice is displayed, press *Enter* to lock in the selection.

### 4.10.5 CT Ratio

**Note:** See table 2.4 for data ranges before specifying the CT ratio.

Select CT Ratio:5 of figure 4.12. This screen displays the ratios of the current transformers connected to the IQ320. This screen initializes with the ratio of the current transformers being used with the IQ320 selected and displayed.

To specify the ratio of the current transformers being used with the IQ 300, press *Enter*. Press either of the *Scroll* arrows repeatedly to step through the choices individually, or press and hold either of the *Scroll* arrows to step through the choices rapidly. There are 256 choices from 5 to 8000, displayed as follows:

- to 110 in increments of 5
- 110 to 1000 in increments of 10
- 1000 to 1250 in increments of 25
- 1250 to 8000 in increments of 50

When the desired choice is displayed, press *Enter* to lock in the selection.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

#### 4.10.6 PT Ratio

**Note:** See table 2.4 for data ranges before specifying the PT ratio.

Select PT Ratio display of figure 4.12. This screen displays the ratio of the potential transformers connected to the IQ300.

This screen initializes with the ratio of the potential transformers being used with the IQ 300 selected and displayed.

To specify the potential transformer ratio of the potential transformers being used with the IQ 300, press *Enter*. Press either of the *Scroll* arrows repeatedly to step through the choices individually, or press and hold either of the *Scroll* arrows to step through the choices rapidly. There are 256 choices from 1.0 to 1690, displayed as follows:

- to 6 in increments of 0.1
- to 20 in increments of 1
- 20 to 260 in increments of 5
- 260 to 1690 in increments of 10

**Note:** If no potential transformers are being used, set the PT ratio to 1.0 to 1.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

#### 4.10.7 Demand Window

Select Demand Min display of figure 4.12.

This screen displays the current value of the demand time window.

The screen initializes with the time window over which demand (parameters) are measured, selected, and displayed.

To specify Demand Window, press *Enter*. Press either of the *Scroll* arrows to step through the choices. There are 8 choices from 5 minutes to 60 minutes, displayed as follows:

- 5 min. to 30 min. in increments of 5 min.
- 45 min.
- 60 min.

When the desired choice is displayed, press *Enter* to lock in the selection.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

The Demand Window is a *fixed* period of time over which average system parameters are calculated. For example, setting the Demand Window to 15 instructs the IQ 300 to calculate the average current or power over the past 15 minutes and to update that calculation every 15 minutes.

If multiple IQ 300 units exist on a PowerNet network, all their Demand Windows can be simultaneously reset and synchronized using INCOM™ communication.

#### 4.10.8 KYZ Setup (IQ 320 Base Module Only)

Select arrow next to KYZP ????? display of figure 4.12. This screen displays the system value communicated by the KYZ pulse train in the ????? position.

This screen initializes with the system value which the IQ 320 will Track selected.

To select a system value ( $\pm$ kWh,  $\pm$ kvarh, kVAh) which the IQ 320 will Track, press *Enter*. Press either of the *Scroll* arrows repeatedly to step through the choices individually, or press and hold either of the *Scroll* arrows to step through the choices rapidly. There are up to 32 choices from 1/32 to 100 displayed as follows:

- 1/32, 1/16, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4
- 1 through 15 in increments of 1
- 20 through 100 in increments of 10

When the desired choice is displayed, press *Enter* to lock in the selection.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

Scroll *down* to KYZ Rate display of figure 4.12. To change the rate, press *Enter*. Press either of the *Scroll* arrows to step through the choices. When the desired choice is displayed, press *Enter* to lock in the selection. See 3.3.4 KYZ Pulse Initiator for details about choosing Track and Rate.

If the procedure completes successfully, Download OK appears briefly. The display then returns to the previous screen.

#### 4.10.9 Exit Setpoints Menu

Pressing *Enter* when the EXIT SMENU menu item is selected returns the display to the *Main Menu*.

### 4.11 RESET VALUES

This *menu* item allows the user to reset to zero or to default IQ 300 system values and parameters.

Press *Menu* to display the list of available items.

Select Reset Values from the Main Menu and press *Enter*. The displays of figure 4.13 will be displayed.

The screens, shown in figure 4.13, display the Reset Values. Every choice can be displayed by using the *Scroll* button arrows. If All is chosen, *all* the Min/Max values (Amps, Volts, Power, Freq, PF) will be reset.

Select a screen of your choice and press *Enter*.

For all choices selected, a screen similar to figure 4.14 displays.



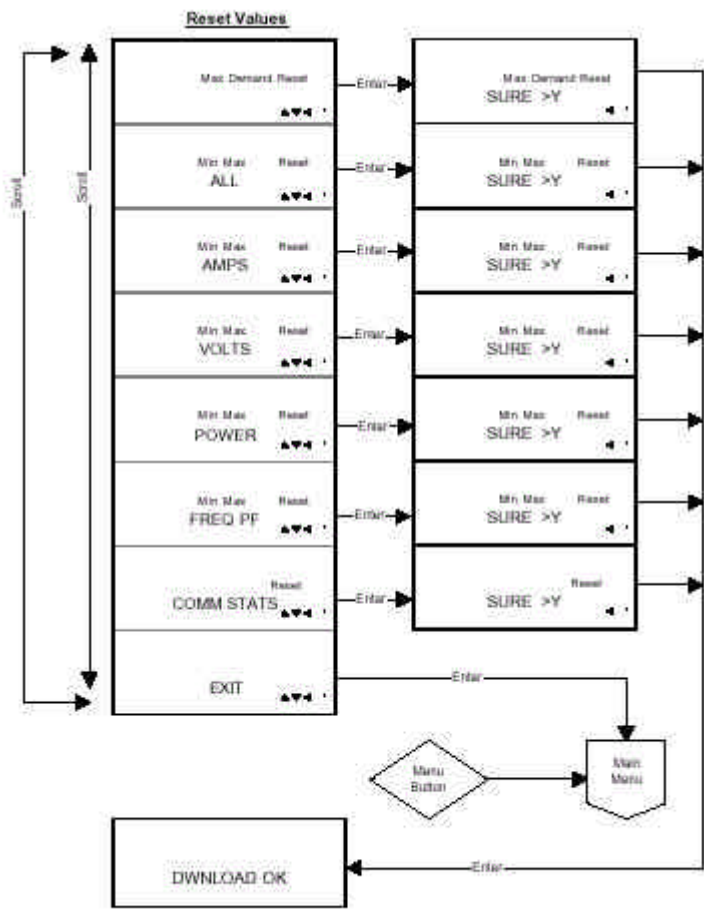


Figure 4.13 Reset Values

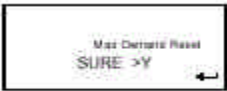


Figure 4.14 Confirmation Window

Pressing *Enter* while *No* is selected returns to the *Reset Values* screen.

To change the selection to *Yes*, press either of the *Scroll* arrows to toggle between *No* and *Yes*. When *Yes* is displayed as selected, press *Enter* to lock in the selection. If the procedure completes successfully, *Download OK* appears briefly. The display then returns to the previous screen.

#### **4.12 CONTRAST ADJUST**

To adjust the contrast move down the *MAIN MENU* until *DISP SETIN*. Push *Enter* to get to *Contrast* and push *Enter* again. The screen will read *ADJ* above the word *Contrast*.

Press either of the *Scroll* arrows repeatedly to see the contrast change slowly, or press and hold either of the *Scroll* arrows to see the contrast change rapidly. Press *Enter* and the contrast value will be stored to be used again if the unit is reset or power cycled. Press the *Menu* button to exit and return to the *main menu*.

Alternatively, the contrast of the screen can be adjusted *without* entering the *Contrast Adjust* menu by holding in the *Enter* button while pressing the *Scroll* up arrow button (to decrease contrast) or the *Scroll* down arrow button (to increase contrast).

#### **4.13 DIAGNOSTICS**

This *menu* item is reserved for the use of Cutler-Hammer service personnel. There are no user-accessible functions on this screen.

#### **4.14 EXIT MENU**

Press *Enter* to return to the previous menu; then pressing *Enter* or *Menu* will return to the *PHASE Data* menu. (See figure 4.3 in Section 4.6)

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## SECTION 5: TROUBLESHOOTING AND MAINTENANCE

### 5.1 GENERAL

#### 5.1.1 Level of Repair

These troubleshooting procedures will determine only if the IQ 300 Display Module or the IQ 300 Base Module is the cause of the malfunction. They will not permit troubleshooting of components within the IQ 300 Modules. If an IQ 300 Module is determined to be at fault, replace it with a spare and return the malfunctioning Module to Cutler-Hammer for repair.

#### 5.1.2 Maintenance and Care

The IQ 300 is designed to be a self-contained and maintenance-free unit. The printed circuit boards are calibrated and conformally coated at the factory. They are intended to be serviced by factory trained personnel only.

Never clean the IQ 300 with the voltage inputs energized or control power on. Clean the IQ 300 using only a clean, dry cloth. Do not use water or solvents of any kind.

Operate the IQ 300 Base Module in an environment within the temperature range of -20°C to 50°C and the display unit within a range of 0°C to 70°C. The environment should also be free of excess humidity.

If you have spare units, store them in the original packing material and container. The base unit and display module storage environment temperature range should be -30°C to 85°C.

### 5.2 REMOVAL AND REPLACEMENT



#### WARNING

**ALL MAINTENANCE PROCEDURES MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE IQ 300 AND ITS USES. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SERIOUS INJURY, DEATH, AND/OR EQUIPMENT DAMAGE.**

**TROUBLESHOOTING PROCEDURES MAY INVOLVE WORKING ON EQUIPMENT IN AREAS WITH EXPOSED ENERGIZED (LIVE) ELECTRICAL WIRING AND/OR PARTS WHERE THE HAZARD OF FATAL ELECTRIC SHOCK IS PRESENT. PERSONNEL MUST EXERCISE EXTREME CARE TO AVOID INJURY OR DEATH. ALWAYS DISCONNECT, LOCK OUT, AND TAG THE CURRENT AND VOLTAGE SOURCES AND THE CONTROL POWER SUPPLY CIRCUIT BEFORE TOUCHING THE CONNECTIONS OR COMPONENTS ON THE REAR FACE OF THE IQ 300 BASE UNIT.**

### 5.2.1 General Safety Precautions

Turn off, lock out, and tag all sources of system power to the IQ 300 Base Module.

Temporarily install a short circuit between the output legs of each current transformer connected to the IQ 300 Base Module, and tag.

Turn off, lock out, and tag the IQ 300 Base Module power supply circuit.

### 5.2.2 IQ 300 Display Module

Perform the following steps to replace the IQ 300 Display Module.

Disconnect the Category 5 cable from the IQ 300 Base Module, and mark it for later reconnecting.

If the IQ 300 Base Module is attached to the IQ 300 Display Module, detach it by removing the four #10 screws that secure the Base to the mounting brackets.

Grasp the IQ 300 Display Module to prevent it from falling and remove the hex nuts and washers that secure the mounting brackets, gasket, and Display Module to the panel.

Withdraw the IQ 300 Display Module and gasket (if in use).

To reinstall or to replace the IQ 300 Display Module, reverse the above steps, or consult the installation section 3.2.

### 5.2.3 IQ 300 Base Module

Perform the following steps to replace the IQ 300 Base Module.

Disconnect the Category 5 cable from the IQ 300 Base Module, and mark it for later reconnecting.

Disconnect the INCOM™ cable, if used, and mark it for later reconnecting.

Disconnect all system voltage and current leads, and mark them for reconnecting.

Making a simple sketch of the connections may be helpful during reinstallation.

Remove the ground connection and mark it for reconnecting.

If the IQ 300 Base Module is attached to the IQ 300 Display Module, detach it by removing the four #10 screws that secure the Base to the mounting brackets.

If the IQ 300 Base Module is mounted using the DIN clip, remove it by disengaging the DIN clip mounted on the IQ 300 Base Module from the DIN rail on the mounting surface.

If the IQ 300 Base Module is mounted using an L-bracket or other device, remove any attachments between the IQ 300 Base Module and the mounting device.

Identify and retain all attachments for reinstallation.

To reinstall the IQ 300 Base Module, reverse the above steps or consult the installation section 3.2.

### 5.3 GENERAL TROUBLESHOOTING PROCEDURES

These procedures cover the IQ 300 only, and can only indicate or eliminate the IQ 300 as a cause of the malfunction. Because these procedures are not exhaustive, the user must be aware that other system components may be causing or contributing to system malfunctions.

To use the following troubleshooting guide, first identify the *symptom* of the malfunction in the first column. Then note the corresponding *probable cause* listed in the second column. Attempt one or more of the corresponding *possible solutions* in the third column. If following this general troubleshooting guide fails to correct the malfunction, contact the plant maintenance department or contact Cutler-Hammer Power Management Applications Support at 1-800-809-2772, option 1.

IQ 300 Troubleshooting Guide		
Symptom	Probable Cause	Possible Solution
One or more voltage phases read incorrectly	Incorrect PT ratio	Check PT ratio using the View Setpoints screen of the display module. Adjust if incorrect using the edit setpoints screen.
Incorrect or zero current readings	Incorrect CT ratio	Check CT ratio using the View Setpoints screen of the display module. Adjust if incorrect using the edit setpoints screen.
Incorrect Power readings	Incorrect phasing of voltage and (or) currents	Check phasing and verify connections with wiring diagrams.
Unit fails to communicate over PowerNet network (IQ 320 only)	Wrong or conflicting address set for IQ 320	Check the address of the IQ 320 base unit via a display module and verify that the software is addressing the proper unit.
	Incorrect baud rate set for the IQ 320	Check the baud rate set for the base unit via a display module and verify that it is the same as the system rate.
	Communication wiring error	Verify that wiring conforms to proper wiring base rules. (see TD 17513)
Display module LCD screen is blank	Contrast is set too low	Press and hold the ENTER button the press and hold the "down" scroll button to adjust the contrast.
	Power to display module is absent	Check Category 5 cable connection to display module and base unit. Check control power fuses, wiring connections, and voltage level.

## **5.4 TECHNICAL ASSISTANCE**

For information, technical assistance, or referral to an authorized distributor, contact Cutler-Hammer Power Management Applications Support at 1-412-490-6714, 1-800-809-2772 option 1, or connect to our website at [www.cutlerhammer.com](http://www.cutlerhammer.com).

## **5.5 RETURN PROCEDURE**

This troubleshooting guide is intended to help service personnel determine if an observed malfunction is caused by the IQ 300 or by other external circumstances. If the malfunction is determined to be within the IQ 300, return the IQ 300 to Cutler-Hammer for repair or replacement. To return the IQ 300, contact the local authorized Cutler-Hammer distributor for specific instructions.

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NOTES:

