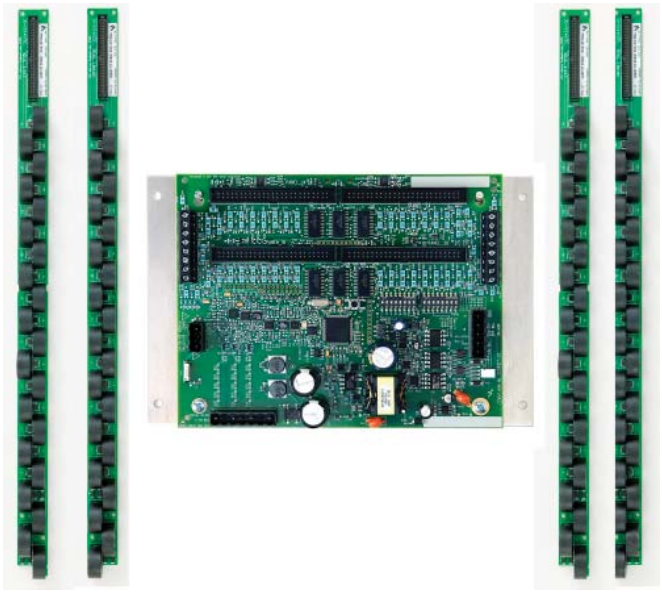
PowerLogic™ Branch Circuit Power Meter (BCPM)

Panel Board Monitoring System

Z204998-0D

Installation Guide



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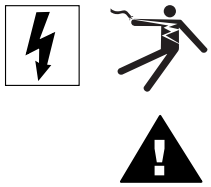
HAZARD CATEGORIES AND SPECIAL SYMBOLS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This Class A digital apparatus complies with Canadian ICES-003.

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⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Read, understand, and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm power is off.

  DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION
- Only install this product on insulated conductors.

Failure to follow these instructions will result in death or serious injury.

NOTE: This product is not intended for life or safety applications. Do not install this product in hazardous or classified locations. The installer is responsible for conformance to all applicable codes.

INSTALLATION OVERVIEW

1. Turn off all power.
2. Mount current sensor strips adjacent to breaker terminations.
3. Verify that the serial numbers on the CTs match the serial numbers on the printed circuit board (PCB).
4. Configure communication and addressing parameters using DIP switches.
5. Mount the main Data Acquisition Board in the electrical enclosure.
6. Connect current sensor strip cables to the main board, observing the 2-strip or 4-strip setup.
7. Wire control power.
8. Wire voltage taps, if applicable (models BCPMA and BCPMB only).
9. Wire RS-485 communications.
10. Connect mains monitoring CTs to the auxiliary inputs on the PCB and connect the CTs onto the mains conductors in the enclosure.
11. Commission the device for operation. See the “Commissioning” section later in this guide for detailed instructions.

    NOTE: For detailed instructions, please see the “Installation” section later in this guide.

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SPECIFICATIONS

Table 1 Specifications

Type	Description
General	
Control Power	90-277 Vac
Frequency	50/60 Hz
Sampling Frequency	2560 Hz
Update Rate	1.2 seconds per panel board
Overload Capability	10 kAIC
Ribbon Cable Support	Up to 20 ft.
Operating Temperature Range	0° to 60°C (32° to 122°F) (<95%RH, non-condensing)
Storage Temperature Range	-40° to 70°C (-40° to 158°F)
Accuracy	
Current Monitoring	0.25 A to 100 A: 3% of reading from 0.25 A to 2 A; 2% of reading from 2 A to100 A
Auxiliary Inputs	2% of reading from 1% to 10% of rated current; 1% of reading from 10% to 100% of rated current
Voltage Input	90-277 Vac; 1% of reading from 90-277 L-N (models BCPMA and BCPMB only)
Power	4% of reading from 0.25 A to 2 A; 3% of reading 2 A to 100 A* (models BCPMA and BCPMB only)
Network Communications	
Type	Modbus® RTU
Connection	DIP switch-selectable 2-wire or 4-wire, RS-485
Address	DIP switch-selectable address 1 to 247 (in pairs of 2)**
Baud Rate	DIP switch-selectable 9600, 19200, 38400
Parity	DIP switch-selectable NONE, ODD, EVEN
Communication Format	8-data-bits, 1-start-bit, 1-stop-bit
Termination	5-position depluggable connector (TX+ TX- SHIELD TX+/RX+ TX-/RX-)

* Add 1% for 0.8 pf to 0.5 pf
** See Configuration section for details

UL listed under standard 508 as an “open type device.”

Installation category: CAT III

The BCPM Series must be installed in an appropriate electrical and fire enclosure per local regulations.

For use in a Pollution Degree 2 or better environment only.

A Pollution Degree 2 environment must control conductive pollution and the possibility of condensation or high humidity. Consideration must be given to the enclosure, the correct use of ventilation, thermal properties of the equipment and the relationship with the environment.

IEC/EN: EN 61010 CE

Always use this product in the manner specified or the protection provided by the product may be impaired.

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INTRODUCTION

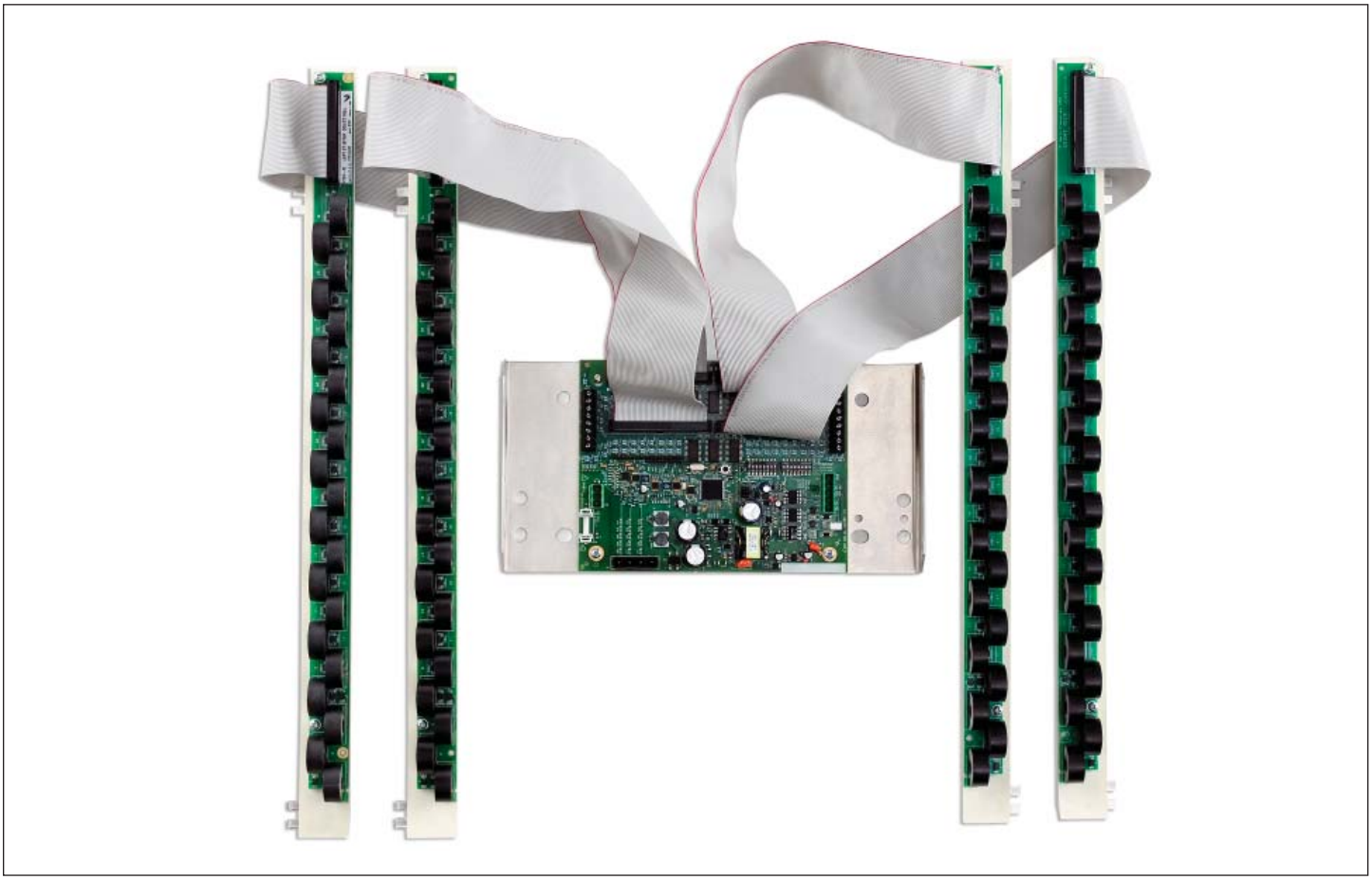
The PowerLogic® Branch Circuit Power Meter (BCPM) is a device designed to measure the current, voltage, and energy consumption of up to 92 circuits (84 branch circuits, plus 8 auxiliary circuits) on a single board. It increases the board's current monitoring capability by combining the functions of two boards into one device.

The BCPM consists of a Data Acquisition Board and four 21-unit current sensor strips and eight auxiliary inputs. The strips are mounted on each side of the panel board along the termination points of each breaker. The conductor passes through the appropriate current sensor before terminating at the breaker. Each strip transmits the current data to the Data Acquisition Board.

Data is transmitted over an RS-485 Modbus® protocol. Each Data Acquisition Board requires two addresses, one for each set of two current sensor strips and four auxiliary inputs. Data is updated roughly once per second. As a circuit approaches the user-defined threshold, the BCPM activates the alarm indicators.

The BCPM is available in three model types. The BCPMA measures both current and power in the mains and branch circuits. The BCPMB measures power in the mains and current only in the branch circuits. The BCPMC measures current in the mains and branch circuits only.

Figure 1 Branch Circuit Power Meter (BCPM)



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Parts of the BCPM

Figure 2 shows the parts of the BCPM, while Table 2 describes these parts.

Figure 2 BCPM Panel Board Monitoring System

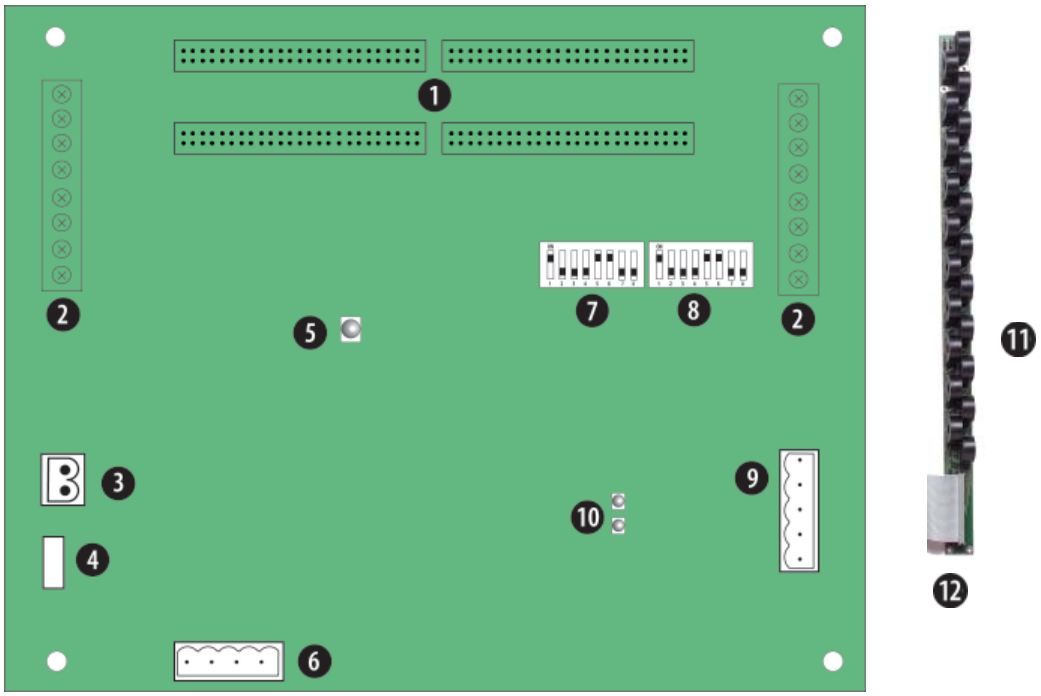

Table 2 Parts Description of the BCPM

Part		Description
1	50-Pin Ribbon Cable Connectors (Data Acquisition Board)	48-inch (1220 mm) ribbon cables are provided for easy snap connection of current sensor strips to this point of the Data Acquisition Board. The two connectors on the left are for Panelboard 1; the two on the right are for Panelboard 2.
2	Auxiliary Inputs	These 1 Vac inputs are used for monitoring the main breaker or other high amperage source. Inputs on the left are for Panelboard 1; inputs on the right are for Panelboard 2.
3	Control (Mains) Power Connection	Easy 2-wire 90-277 Vac 50/60 Hz connection.
4	Control Power Fuse	600 Vac, 500 mA time lag, factory-replaceable.
5	Alive LED	Red/green/amber LEDs. See Table 5 Blink Codes for LED blink codes.
6	Voltage Taps	1, 2, or 3 phase plus neutral connections. For voltage sensing and power calculations. Voltage connectors on models BCPMA and BCPMB only.
7	Communications Address DIP Switches	Each Modbus® device must have a unique address. Switches are binary weighted. Left-most switch has a value of 1; right-most switch has a value of 128. The 4-strip model uses two addresses.
8	Communications Settings DIP Switch	Configures baud rate, parity, 2- or 4-wire communications.
9	RS-485 Connection	Used for Modbus® serial communications. The Universal plug accommodates 2- or 4-wire connections.
10	RS-485 LEDs	The RX LED indicates the RS-485 is receiving information; the TX LED (closest to DIP switches) indicates transmission of information.
11	Current Sensors	Each current sensor is capable of monitoring conductors rated up to a maximum of 100 amps.
12	50 Pin Ribbon Cable Connectors (CT Strips)	Connects current signal from the current sensor strip to the main board via the ribbon connectors.

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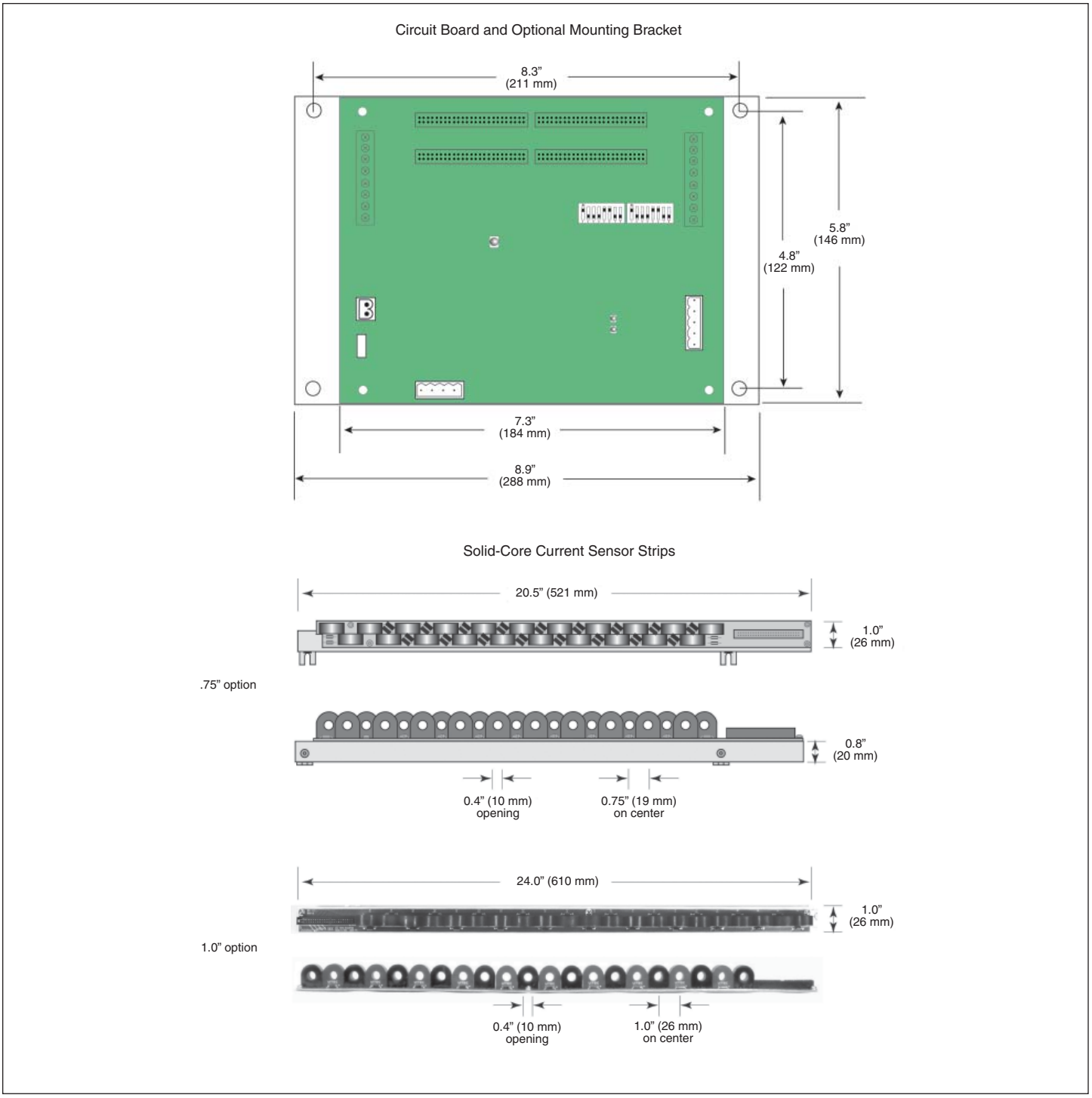
Dimensions

Figure 3 BCPM Dimensions



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Data Output

Table 3 Data Output

	BCPMA	BCPMB	BCPMC
Current, per phase	●	●	●
Current, per circuit	●	●	●
Current demand + max. per phase	●	●	●
Current demand + max. per circuit	●	●	●
kWh, total	●	●	
kWh, per circuit*	●		
kW, Real power per phase	●	●	
kW, Real power per circuit*	●		
kW demand + max., per phase	●	●	
kW demand + max., per circuit*	●		
Power Factor, total*	●	●	
Power Factor, per phase	●	●	
Power Factor, per circuit*	●		
Voltage, L-L; avg. of 3 phases	●	●	
Line to Line Voltage, phase A-B	●	●	
Line to Line Voltage, phase B-C	●	●	
Line to Line Voltage, phase A-C	●	●	
Voltage, L-N; avg. of 3 phases	●	●	
Voltage, L-N; per phase	●	●	
Frequency (Phase A)	●	●	
*Based on a 3-phase breaker rotation			

Table 4 Alarms

Alarms
Voltage Over/Under (BCPMA and BCPMB only)
Current High-High, High, Low, Low-Low, and Zero Current
Phase Loss A
Phase Loss B
Phase Loss C

Blink Codes

Table 5 LED Blink Codes

Color and Pattern	Status Description
Green, once per second	Normal operation
Amber, once per second	Volts or Amps over range
Red, solid	Device failure
Green, solid	Internal Error
Amber, solid	
Off, solid	

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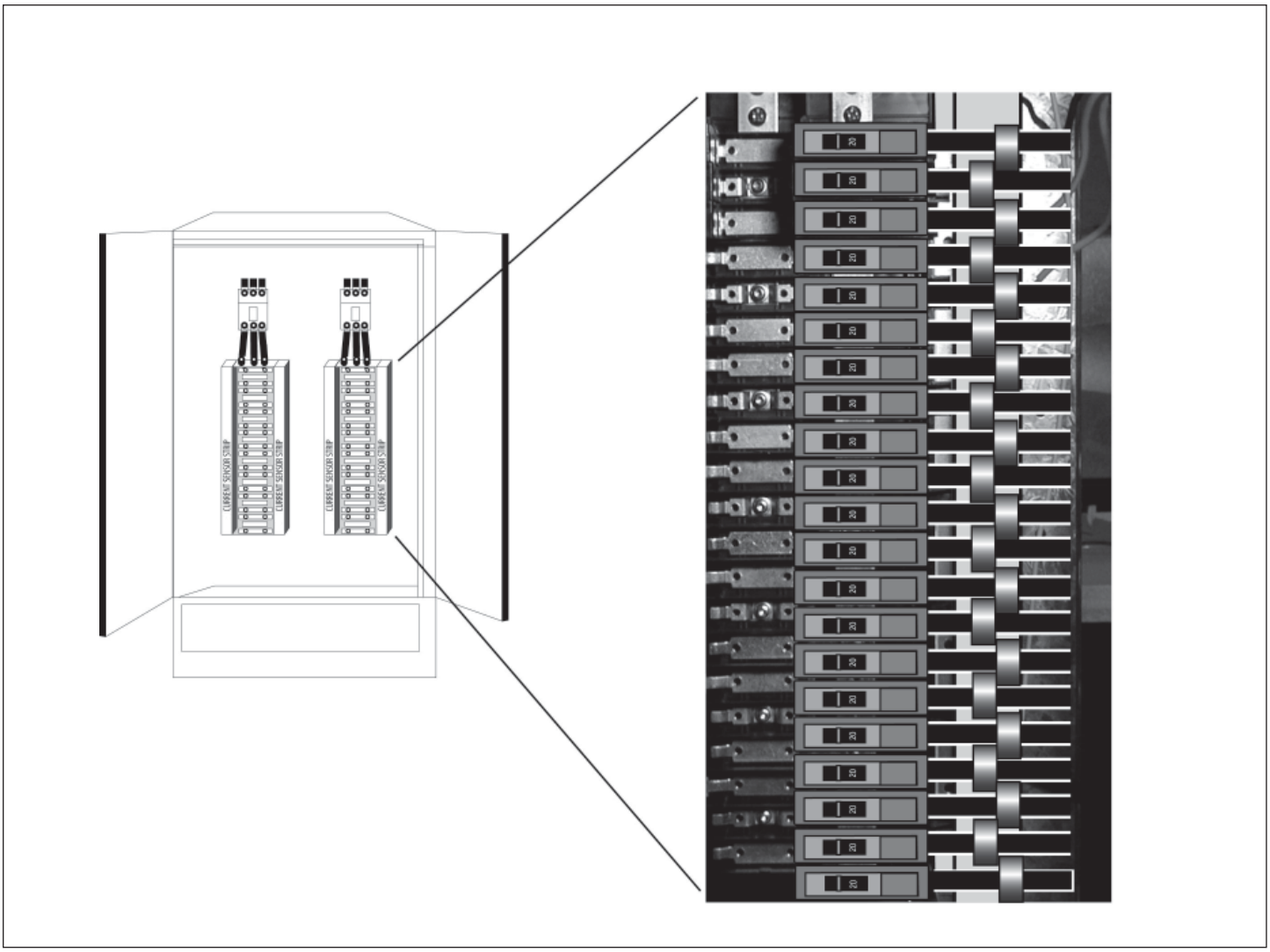
INSTALLATION

1. Turn off all power to the electrical panel and lock it out.
2. Install the current sensor strips in the panel. The panel board screws are 16.50” (420 mm) apart. Line up current sensors directly with the breaker terminations (Figure 4).

Figure 4 Installing the current sensor strips in the panel



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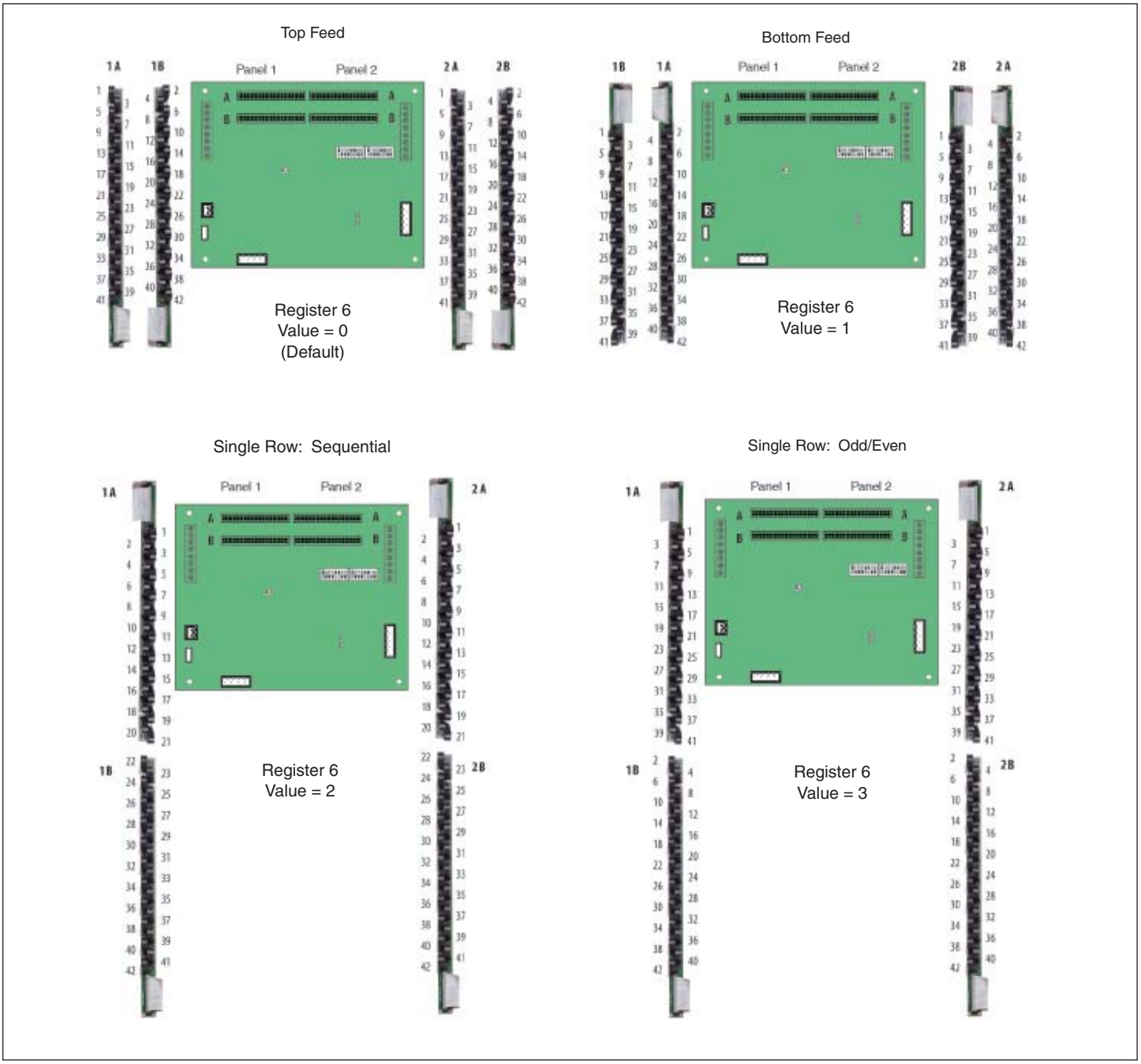
3. The current sensor strips should be arranged in one of the four configurations shown in Figure 5. Orientation of the circuit numbers can be adjusted in the field during commissioning by writing to Modbus® Register 6.

Figure 5 Circuit Number Orientation



4. Check that the serial numbers printed on the current sensor strip and on the Data Acquisition Board match. The board and the strip are sold as a calibrated set.

5. Configure communication and addressing parameters using DIP switches. The BCPM requires two addresses, one for each set of two current sensor strips and four auxiliary inputs. See the “Configuration” section for more information.

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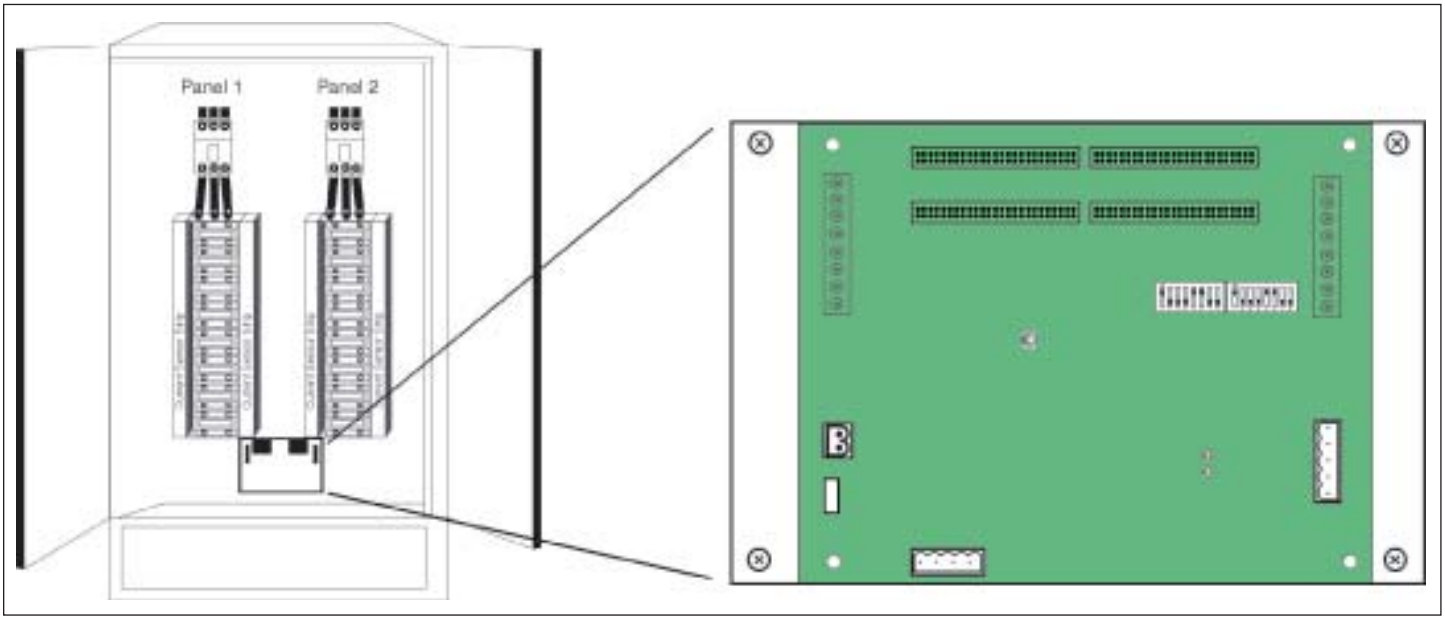
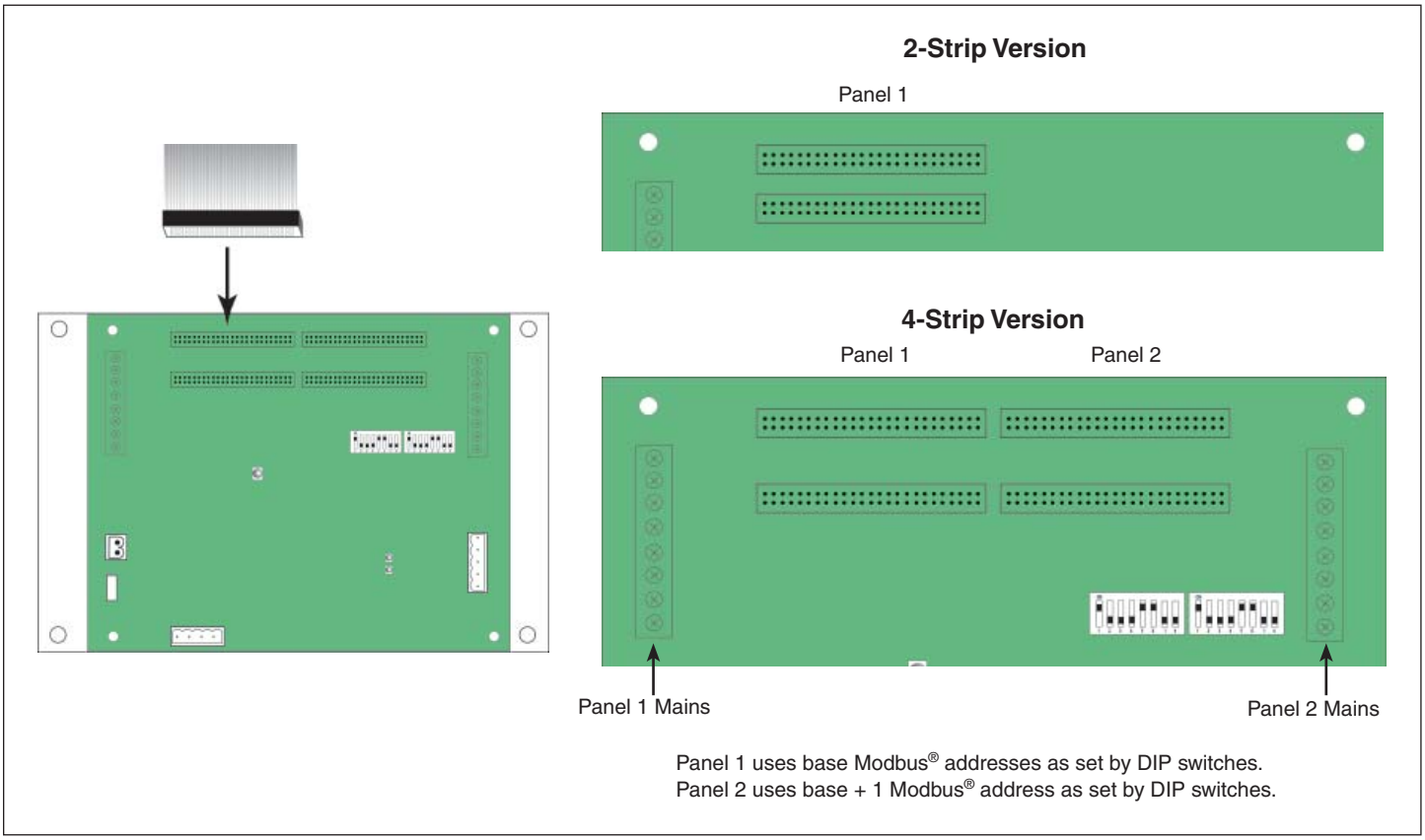
6. Install the BCPM Data Acquisition Board mounting bracket in the panel using screws and bolts provided (Figure 6).

Figure 6 BCPM Data Acquisition Board



7. Connect the current sensor cables to the 50-pin connectors on the main board (Figure 7).

Figure 7 Connectors



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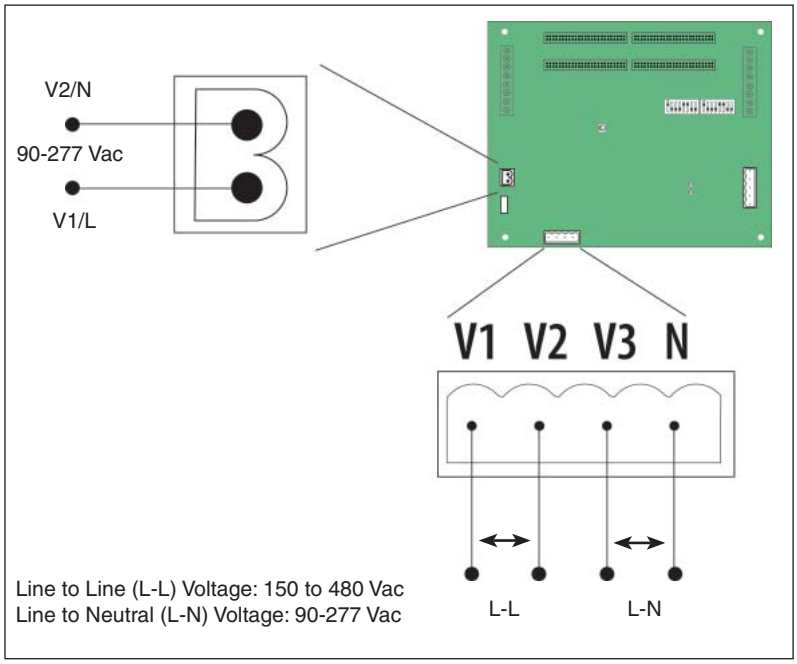
8. Connect 2-wire 90-277 Vac power to main power terminals. Observe polarity. For the BCPMA and BCPMB, connect voltage lines to the voltage taps (Figure 8). Voltage lines must be equipped with fuses.

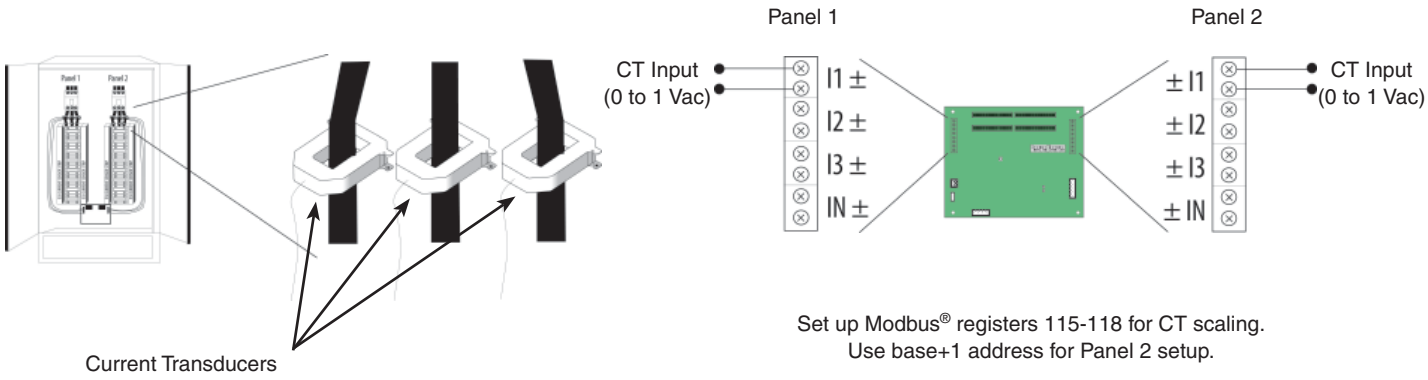
Figure 8 Connecting power to power terminals



9. Wire RS-485 communications. See the diagrams in the “Wiring” section.

10. Connect the CTs to the main conductors by snapping CTs around lines, observing local codes regarding bending radius (Figure 9).

Figure 9 Connect CTs to main conductors



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WIRING

Power must be disconnected and locked out before making any wiring connections.

1. Connect 2-wire or 4-wire Modbus® RS-485 daisy chain network. See Figures 10 and 11.

Figure 10 Communications Connector

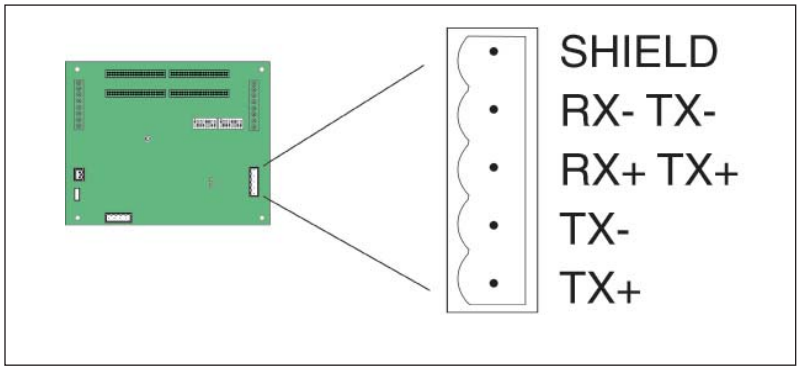
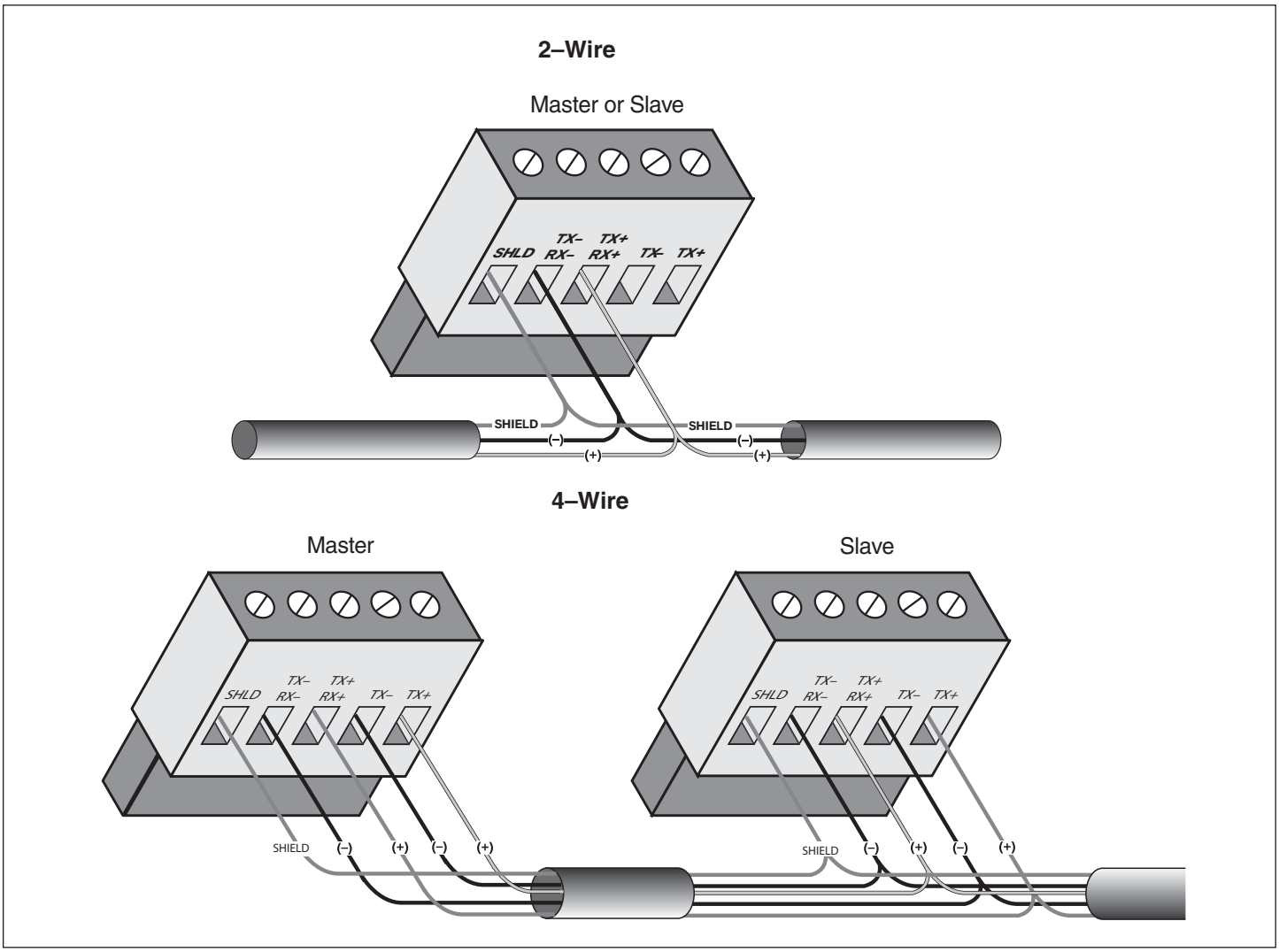


Figure 11 2-wire and 4-wire communications wiring



2. The RS-485 cable should be mechanically secured where it enters the electrical panel.

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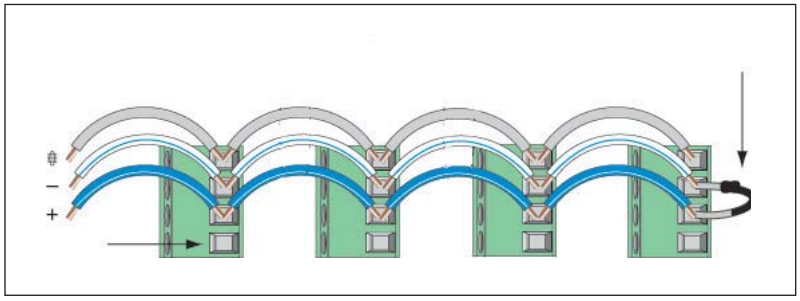
3. All RS-485 devices should be connected together in a daisy-chain fashion, and properly terminated (Figure 12).

Figure 12 Properly terminated daisy chain network



4. The RS-485 cable should be shielded using twisted pair wire such as Belden 1120A. The cable must be voltage rated for the installation.

   NOTE: After wiring the RS-485 cable, remove all scraps of wire or foil shield from the electrical panel. This could be dangerous if wire scraps come into contact with high voltage conductors.

5. Use ION Setup to set up breaker size, demand interval, and alarm levels. See Appendix A later in this document for more information. ION Setup is available online at http://www.powerlogic.com.

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CONFIGURATION

1. Communications Configuration: Communications parameters for the BCPM are field selectable for your convenience. Please see the Product Diagram section for selector location. The following parameters are configurable:

   - Baud Rate: 9600, 19200, 38400
   - Parity On or Off
   - Parity: Odd or Even
   - Wiring: 2 or 4

Figure 13 Switch settings

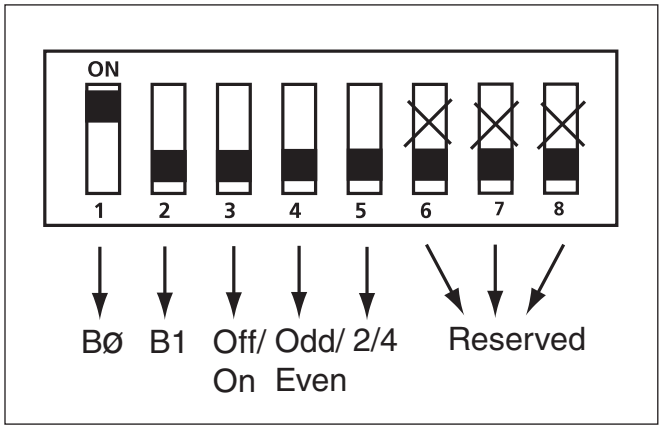

Table 6 2-wire 19200 Baud No Parity (Default Only)

1	2	3	4	5	6	7	8	
off	off				X	X	X	9600
on	off				X	X	X	19200
off	on				X	X	X	38400
on	on				X	X	X	Custom
		off	off		X	X	X	No Parity
		on	off		X	X	X	Odd Parity
		off	on		X	X	X	No Parity
		on	on		X	X	X	Even Parity
				on	X	X	X	4-wire RS-485
				off	X	X	X	2-wire RS-485

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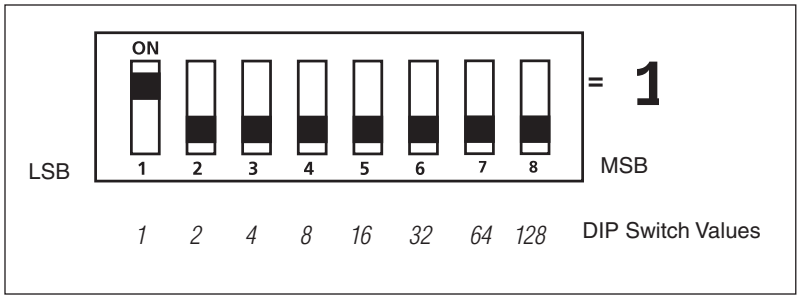
2. Each Modbus® device on a single network must have a unique address. The switch block must be set to assign a unique address before the device is connected to the Modbus® RS-485 network. If an address is selected which conflicts with another device, neither device will be able to communicate.

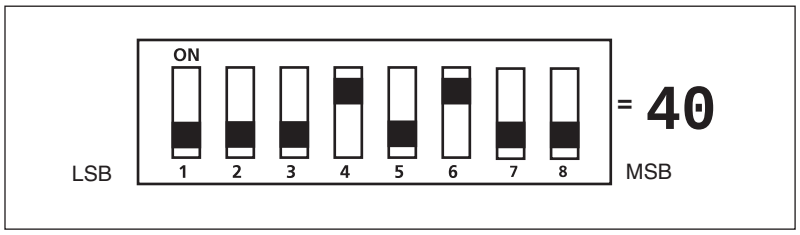
   The BCPM uses two logical addresses. Panel 1 uses the base address as set on the DIP switches, and Panel 2 uses this base address + 1. The BCPM can be addressed as any whole number between and including 1-247. Each unit is equipped with a set of eight DIP switches for addressing (Figure 14).

Figure 14 Default switch settings



To determine an address you simply add the values of any switch that is on (Figure 15).

Figure 15 Modbus® address DIP switch values



Switch number 4 has an ON Value of 8 and switch number 6 has an ON Value of 32. (8 + 32 = 40). Therefore, the address for Meter 1 is 40, and the address for Meter 2 is 41.

See the Communications Setup section for a pictorial listing of the first 63 switch positions.

NOTE: DIP switch settings automatically update every 1.6 seconds.

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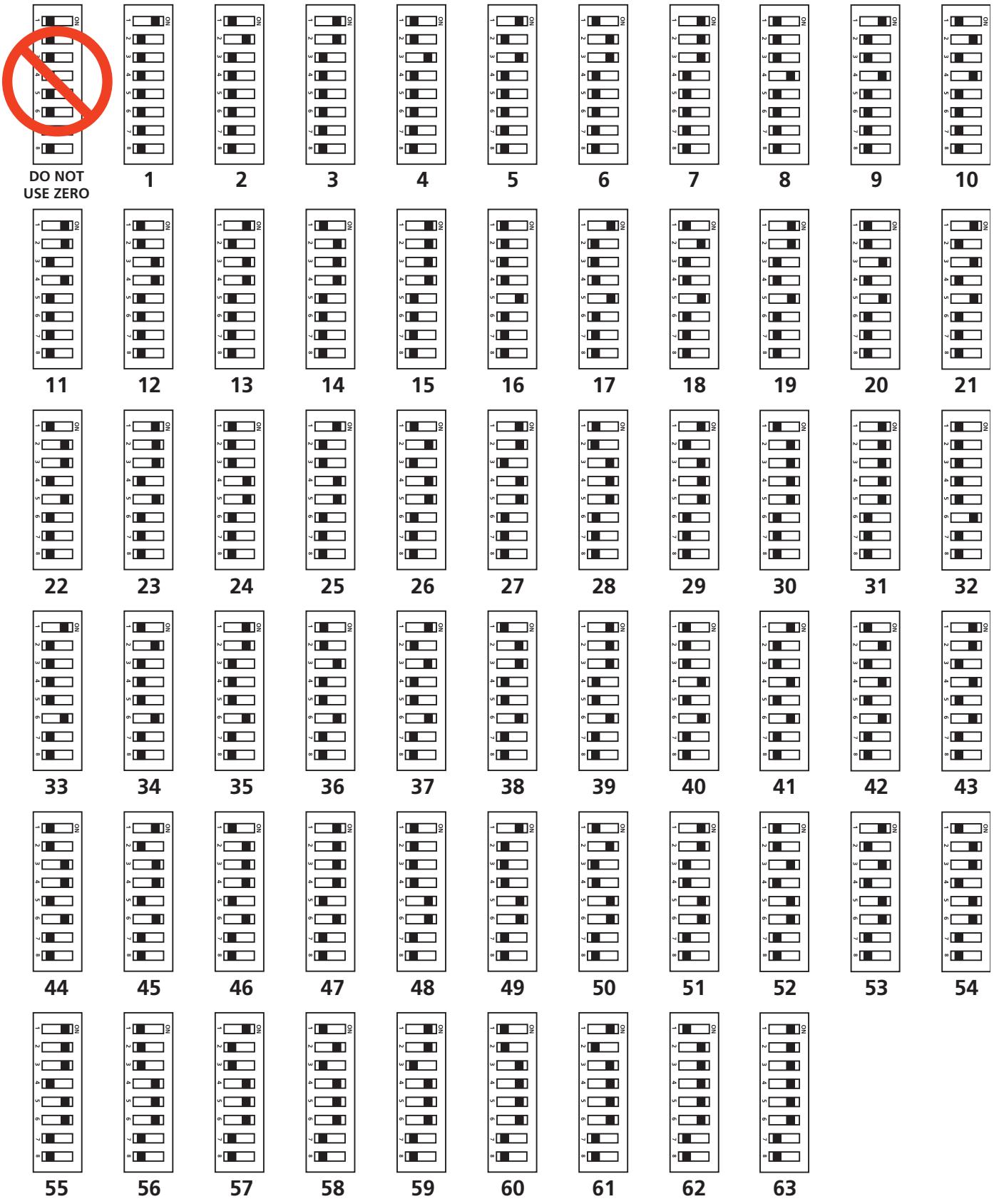
COMMUNICATIONS SETUP

Figure 16 **Address selection switches from 1 to 63**



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COMMISSIONING

1. Reconnect power to the panel.
2. Use ION Setup to configure the BCPM. ION Setup is used with the BCPM to perform basic setup, to set alarm thresholds and delays, and to set the demand interval. You can download ION Setup from http://www.powerlogic.com.
3. Connect to the BCPM using ION Setup. For connection instructions, refer to “ION Setup Online Help,” and “PowerLogic™ ION Setup 2.2 User Guide,” both available online at http://www.powerlogic.com.
4. Follow the instructions in Appendix A to use ION Setup to configure the BCPM.

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APPENDIX A—ION SETUP

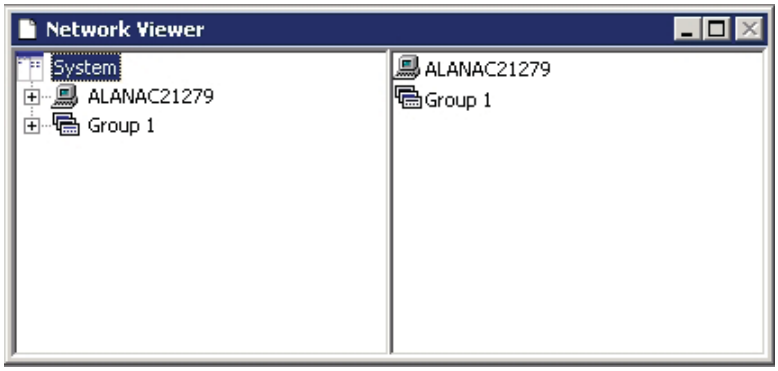
This section provides basic instructions for using ION Setup to configure the BCPM.

Basic Setup

To use ION Setup to configure the BCPM:

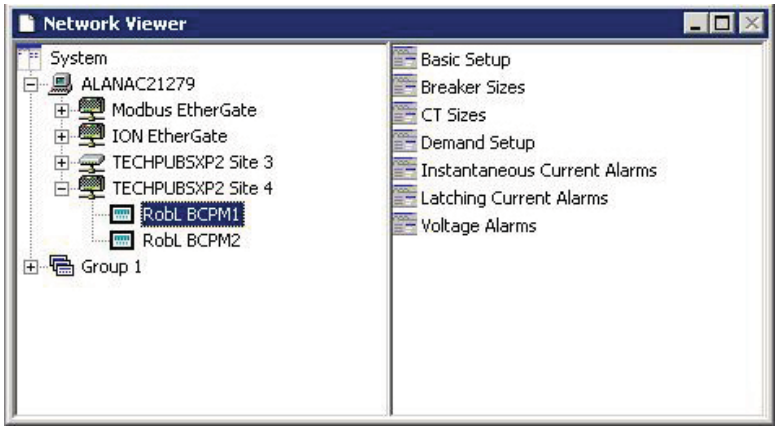
1. Start ION Setup.

Figure 17 ION Setup start page



2. Click View > Setup Screens.
3. Select the BCPM from the list in the left pane. Individual icons for the setup parameters will appear in the right pane.

Figure 18 BCPM ION Setup Parameters



NOTE: If you have a 4-current sensor strip BCPM, you will configure your BCPM as two devices: one device for monitoring Panel 1 and one device for monitoring Panel 2. You will configure each device separately in ION Setup.

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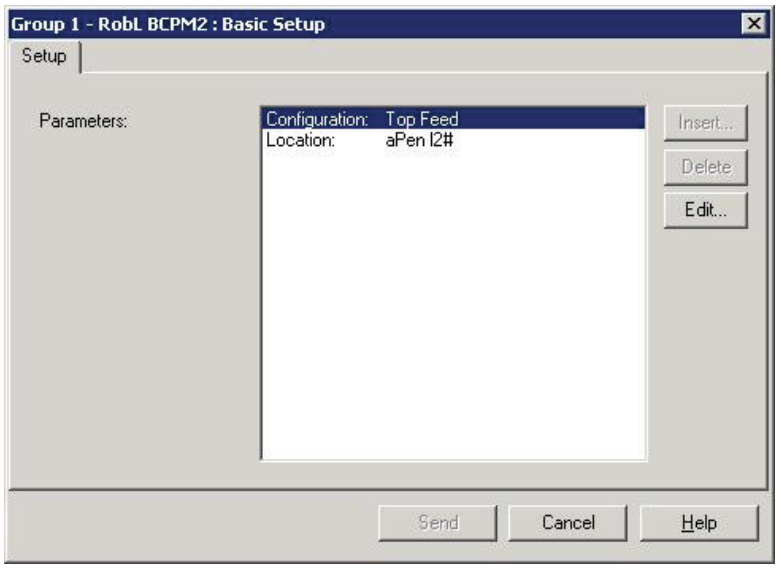
4. Double-click the “Basic Setup” icon in the right pane. The Basic Setup dialog box will appear.

Figure 19 Basic Setup Dialog Box



5. To edit the configuration, select “Configuration” in the “Parameters” list and click “Edit.” The Select Configuration dialog box will appear.

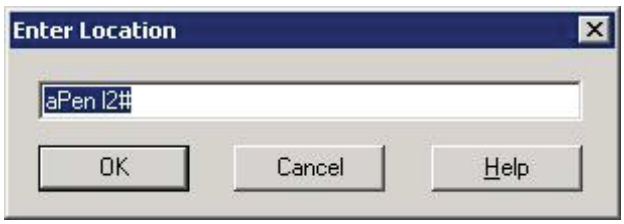
Figure 20 Select Configuration Dialog Box

6. Select “Top Feed,” “Bottom Feed,” “Single Row: Sequential,” or “Single Row: Odd/Even” from the drop-drown list, then click “OK.”

   NOTE: Refer to Figure 5 “Circuit Number Orientation” for configuration setting examples.

7. The location string allows a 128 character string to be associated with the BCPM (i.e. PDU#1). To edit the location, select “Location” in the “Parameters” list and click “Edit.” The Enter Location dialog box will appear.

Figure 21 Enter Location Dialog Box



8. Enter the location you want to use, then click “OK.”

9. When you finish making Basic Setup changes, click “Send” in the Basic Setup dialog box to save the changes.

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Configuring Breaker Sizes

See Table 7 below for the default breaker sizes.

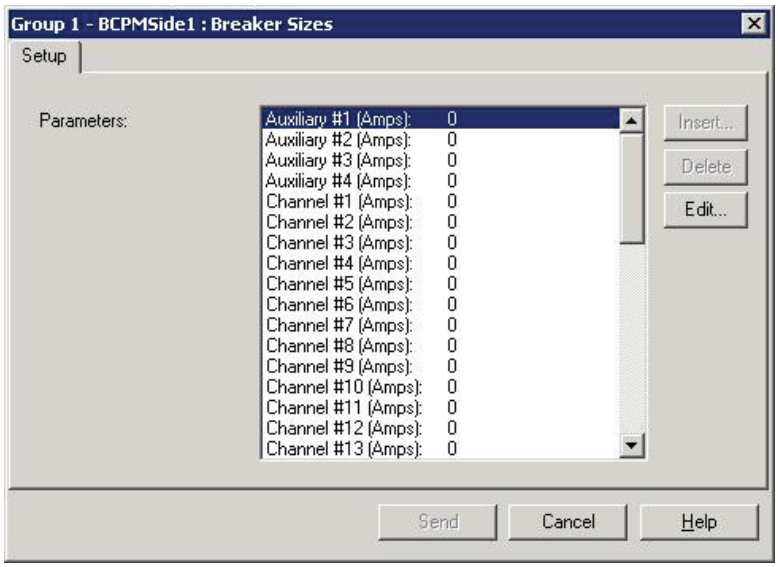
Table 7 Default Breaker Sizes

Breaker Size Defaults
Auxiliary (Mains) Breaker Size = 225 A Channel (Branch) Breaker Size = 20 A

To set BCPM breaker sizes in ION Setup:

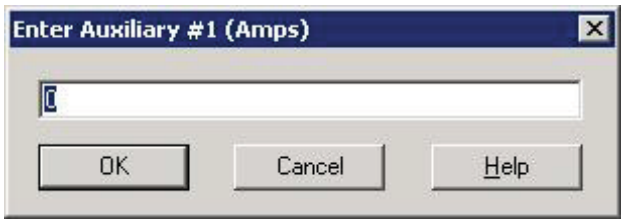
1. Double-click the “Breaker Sizes” icon in the right pane. The Breaker Sizes dialog box will appear.

Figure 22 Breaker Sizes Dialog Box



2. Select the auxiliary or channel you want to configure in the “Parameters” list, then click “Edit.” The dialog box for the setting you selected will appear.

Figure 23 Breaker Sizes Configuration Dialog Box



3. Enter the amperage for the auxiliary or channel setting you have selected, then click “OK.”
4. Repeat Steps 2 and 3 until you have configured all the settings you require.
5. After setting the setting(s), click “Send” in the Breaker Sizes dialog box to save the changes.

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Configuring CT Sizes

See Table 8 below for the default CT sizes.

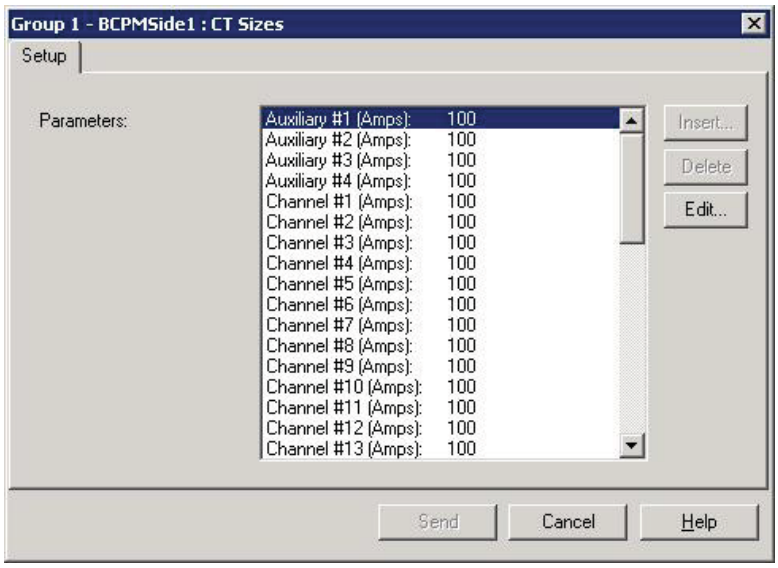
Table 8 Default CT Sizes

CT Size Defaults
Auxiliary (Mains) CT Size = 200 A Channel (Branch) CT Size = 100 A

To set BCPM CT sizes in ION Setup:

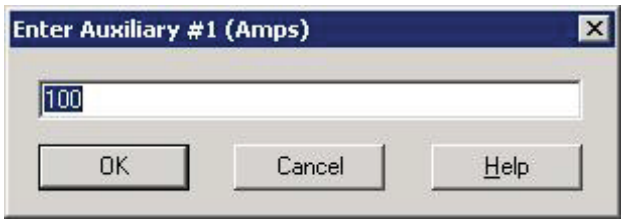
1. Double-click the “CT Sizes” icon in the right pane. The CT Sizes dialog box will appear.

Figure 24 CT Sizes Dialog Box



2. Select the auxiliary or channel you want to configure in the “Parameters” list, then click “Edit.” The dialog box for the setting you selected will appear.

Figure 25 CT Sizes Configuration Dialog Box



3. Enter the amperage for the auxiliary or channel setting you have selected, then click “OK.”
4. Repeat Steps 2 and 3 until you have configured all the settings you require.
5. After setting the setting(s), click “Send” in the CT Sizes dialog box to save the changes.

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Configuring Demand Setup

See Table 9 below for the default demand setup.

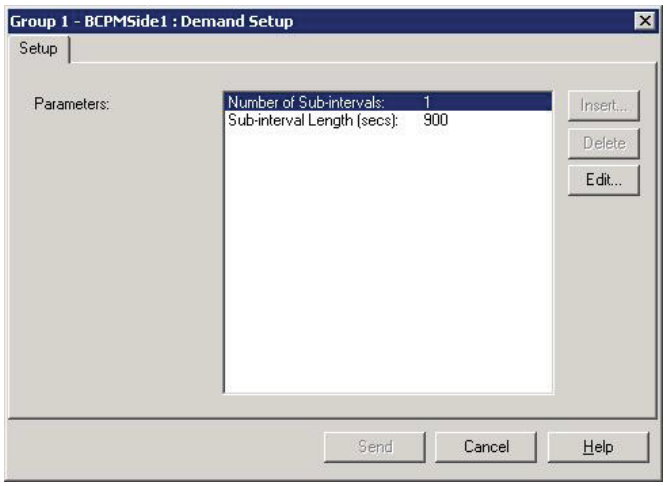
Table 9 Default Demand Setup

Demand Defaults
Sub-Interval Length = 900 s (15 minutes) Number of Sub-Intervals = 1

To set BCPM demand setup in ION Setup:

1. Double-click the “Demand Setup” icon in the right pane. The Demand Setup dialog box will appear.

Figure 26 Demand Setup Dialog Box

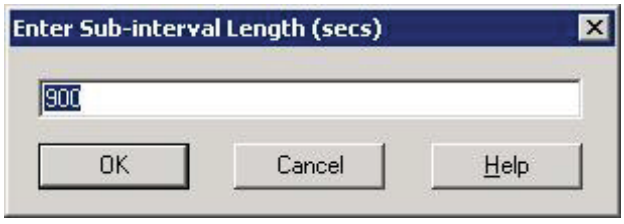


2. To configure the number of sub-intervals, select “Number of Sub-intervals” in the “Parameters” list, then click “Edit.” The dialog box for the setting you selected will appear.

Figure 27 Number of Sub-intervals Configuration Dialog Box

3. Enter the number of sub-intervals you require, then click “OK.”
4. To configure the length of sub-intervals, select “Sub-interval Length” in the “Parameters” list, then click “Edit.” The dialog box for the setting you selected will appear.

Figure 28 Sub-interval Length Configuration Dialog Box



5. Enter the length of sub-intervals you require (in seconds), then click “OK.”
5. After setting the setting(s), click “Send” in the CT Sizes dialog box to save the changes.

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Configuring Instantaneous Current Alarms

See Table 10 below for the default instantaneous current alarms settings.

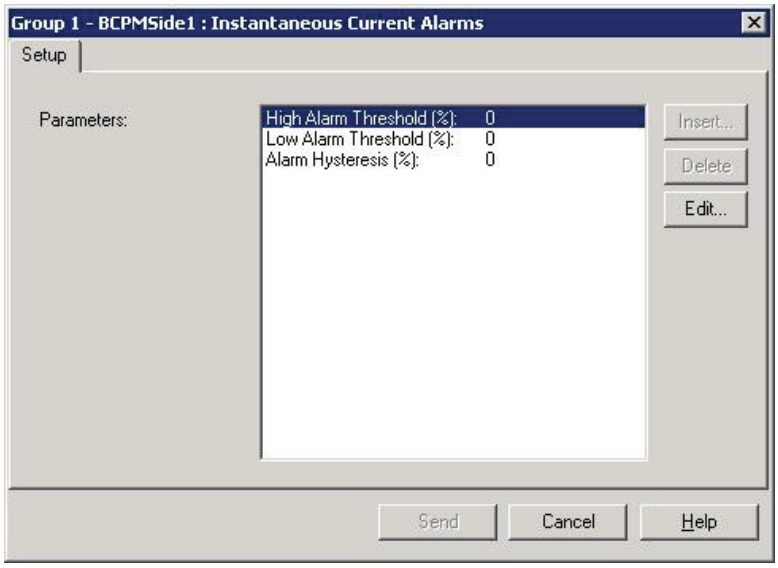
Table 10 Default Instantaneous Current Alarms Settings

Instantaneous Current Alarms Defaults
High Alarm Threshold = 60% of breaker size Low Alarm Threshold = 5% of breaker size Hysteresis = 5% of setpoint

To set BCPM instantaneous current alarms:

1. Double-click the “Instantaneous Current Alarms” icon in the right pane. The Instantaneous Current Alarms dialog box will appear.

Figure 29 Instantaneous Current Alarms Dialog Box



2. Select the alarm threshold or hysteresis you want to configure in the “Parameters” list, then click “Edit.” The dialog box for the setting you selected will appear.

Figure 30 Instantaneous Current Alarms Configuration Dialog Box

3. Enter the percentage for the alarm threshold or hysteresis setting you have selected, then click “OK.”
4. Repeat Steps 2 and 3 until you have configured all the settings you require.
5. After setting the setting(s), click “Send” in the Instantaneous Current Alarms dialog box to save the changes.

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Configuring Latching Current Alarms

See Table 11 below for the default latching current alarms settings.

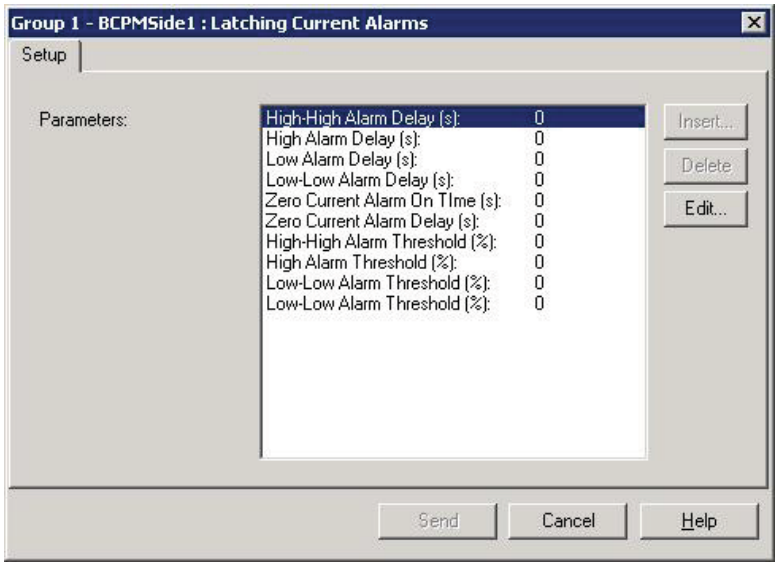
Table 11 Default Latching Current Alarms Settings

Latching Current Alarms Defaults
High-High Threshold = 70% of breaker size
High Alarm Threshold = 60% of breaker size
Low Alarm Threshold = 7.5% of breaker size
Low-Low Alarm Threshold = 2.5% of breaker size
High-High Alarm Delay = 10 s
High Alarm Delay = 10 s
Low Alarm Delay = 10 s
Low-Low Alarm Delay = 10 s
Zero Current Alarm Delay = 10 s

To set BCPM latching current alarms:

1. Double-click the “Latching Current Alarms” icon in the right pane. The Latching Current Alarms dialog box will appear.

Figure 31 Latching Current Alarms Dialog Box



2. Select the alarm delay, threshold or hysteresis you want to configure in the “Parameters” list, then click “Edit.” The dialog box for the setting you selected will appear.

Figure 32 Latching Current Alarms Configuration Dialog Box

3. Enter the value for the voltage alarm delay time or voltage threshold value setting you have selected, then click “OK.”
4. Repeat Steps 2 and 3 until you have configured all the settings you require.
5. After setting the setting(s), click “Send” in the Latching Current Alarms dialog box to save the changes.

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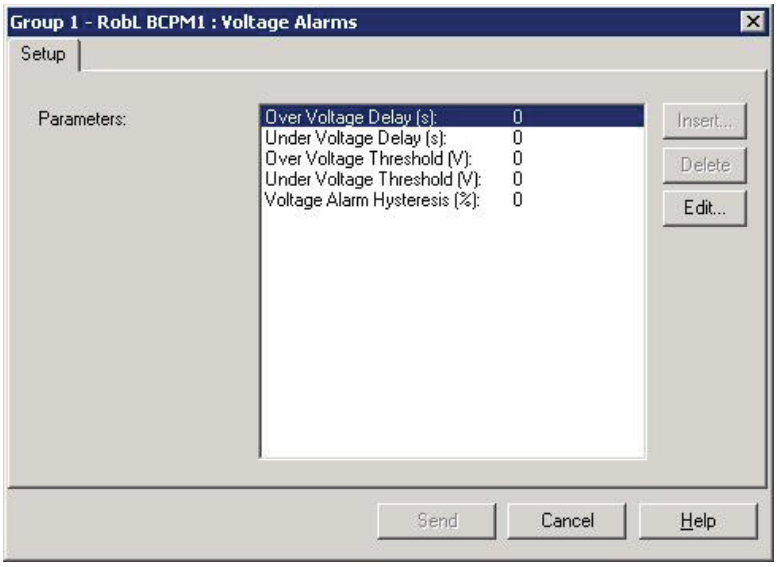
Configuring Voltage Alarm Thresholds

To set BCPM voltage alarm thresholds in ION Setup:

1. Double-click the “Voltage Alarms” icon in the right pane. The Voltage Alarms dialog box will appear.

Figure 33 Voltage Alarms Dialog Box



2. Select the alarm you want to configure in the “Parameters” list, then click “Edit.” The dialog box for the alarm you selected will appear.

Figure 34 Alarm Configuration Dialog Box

3. Enter the value for the voltage alarm delay time, voltage threshold value, or voltage alarm hysteresis setting you have selected, then click “OK.”
4. After setting the alarm(s), click “Send” in the Voltage Alarms dialog box to save the changes.

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