Eaton® PDI JCOMM Enclosure

Installation and Operation Manual

E:T•N

Powering Business Worldwide

Thank you for your recent purchase of an Eaton PDI JCOMM Enclosure.

NOTICE

For safety reasons as well as to ensure optimal performance of your Eaton PDI JCOMM Enclosure, please carefully read the instructions before trying to install, operate, service or maintain the system.

For any questions regarding the installation, operation, service or maintenance, contact the Eaton Help Desk. See paragraph 2.7 *Getting Help* for details.

Please use the following e-mail for manual comments, suggestions, or to report a technical error in this manual.

E-ESSDocumentation@eaton.com

You can download the most recent version of this product manual from the Eaton web site's Product page, Resources section:

https://www.eaton.com/us/en-us/catalog/low-voltage-power-distribution-controls-systems/eaton-pdi-busway.resources.html

Eaton PDI JCOMM Enclosure Installation and Operation

Cover Photo: Eaton PDI JCOMM Enclosure with a WaveStar Color Monitor

EAT•N

Dear Customer,

On behalf of everyone at Eaton, we thank you for partnering with us, for trusting us to maintain your business continuity and for preventing downtime at your facility.

Our suite of backup power, power distribution and power management products are designed to protect you from a host of threats including power outages, surges, and lighting strikes, and enable you to monitor and control your power infrastructure.

We trust that our products will deliver high quality, reliable power for your business, and we are committed to your success.

Please read this manual, which details the installation and operation processes for your new Eaton product.

Thank you for choosing Eaton!

Table of Contents

Table of Contents

List of Figures

List of Figures

List of Tables

List of Tables

Chapter 1 Safety

<div align="center">⚠ DANGER</div>

This symbol is used throughout this manual to indicate the presence of high voltages, representing a hazard for electric shock, burn or explosion. Follow the instructions carefully to avoid serious or fatal injury.

Follow safe electrical work practices:

- Disconnect and lock-out all power supplying equipment before working on or installing JCOMM components. Use a properly rated voltage sensing device to confirm power is OFF.

- Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel and in accordance with all local safety codes. Power Distribution, Inc. assumes no responsibility for any consequences arising out of the use of this manual. This document should not be viewed as sufficient by otherwise non-qualified personnel to operate, service, or maintain the equipment discussed.

- Read, understand, and follow the instructions before installing this product.

- Install device in an appropriate electrical enclosure per local regulations.

- ESD sensitive equipment. Ground yourself, discharge any static charge and ensure that the device is effectively grounded before handling the unit.

Safety

Eaton PDI JCOMM Enclosure Installation and Operation Manual   P-164001107—Rev 02

Chapter 2 Eaton PDI JCOMM Unit Description

2.1   JCOMM Summary

The Eaton PDI JCOMM® provides an enclosure for one or two Eaton Branch Circuit Monitoring Systems (BCMSs) and can be attached to monitored power distribution equipment or mounted on a nearby wall. JCOMMs can retrofit BCMSs to operational power distribution units (PDUs) or Remote Power Panels (RPPs), both for Eaton and non-Eaton equipment.

Each JCOMM (Figure 1) can monitor these configurations:

• Two separate 208/120VAC/60Hz 3-phase 4-wire voltage sources to panelboards

• Up to four 42-circuit panelboards or 168 branch circuits in total

• Up to four main feeds to panelboards or four subdistribution feeds to remote power distribution equipment

Figure 1. JCOMM with WaveStar Color Monitor

Local Power Monitoring Station. A JCOMM can have an optional WaveStar® Color Monitor, a 7-inch color touchscreen display, capable of displaying information for up to 20 downstream BCMS devices, such as panelboards.

Alternatively, JCOMMs can be connected to a WaveStar BCMS Hub, which can typically monitor up to 70 BCMS devices.

JCOMM BCMS uses the same BCMS software that Eaton installs in factory-built power distribution equipment and can be networked with all other Eaton BCMSs.

(i)	**NOTE**	The term PDI in this manual refers to products previous manufactured by Power Distribution, Inc. All service and support for these features are now supplied by Eaton.

2.2 JCOMM Specifications

Table 1. JCOMM Specifications

Product Specifications	
Monitoring Capabilities	
BCMS Data Acquisition Boards	1 or 2 BCMS boards
Points list (Modbus register map) options	**Normal** list (specialized for customized alarms) or **Power-KWH** list (specialized for power measurements)**IEC** points (specialized for IEC panelboards)
1-2 Voltage sources	208/120VAC/60Hz 3-phase 4-wire
42-168 Branch circuits	Monitored with split-core 60A current transformers (CTs)
2-4 Main feeds or 2-4 subdistribution feeds (2 main or 2 subdistribution feeds per BCMS)	Monitored with-Split-core 5-250A CTs for ABCN-Split-core 5A CT for G
CT branch circuit cable harnesses	21 BC connectors; 5, 10, 15, 20 ft. lengths
CT main or subdistribution circuit cable harnesses	ABCNG connectors; 5, 15, 10, 20 ft. lengths
WaveStar Color Monitor, a 7-inch color touchscreen display	Optional; display can monitor 20 downstream BCMS devices, such as panelboards
Setup connection	USB 2.0 A-B high-speed cable
Enclosure	
Weight (without cables)	Approx. 11 lbs. or 5 kg.
Dimensions	20"W x 10"H x 6"D (51 cm x 25 cm x 15 cm)
Enclosure rating	NEMA 1
Network Communications	
Protocol	Modbus RTU via RS422/485; 2-wire or 4-wire (jumper selected)
Protocol options upstream from monitor	Modbus RTU, Modbus TCP/IP, SNMP
Modbus address range	1 to 247
Baud rate	9600
Parity	Odd, even, or none
Communication format	8 data bits, 1 start bit, 1 stop bit
Electrical Characteristics	
Input current rating	2.0A @ 115 VAC
Input voltage	120VAC +/- 10%, 3-phase +neutral + ground
Input frequency	60Hz +/-10%

Table 1. JCOMM Specifications (Continued)

Product Specifications	
Electrical Characteristics cont.	
Operating voltage	24VDC
Power usage	50W @ 24VDC
Modbus signals	3VDC
Ground strip	Computer grade single-point ground, compliant with FIPS Pub 94 and NEC requirements
Storage temperature	-36°C to +70°C (-33°F to 158°F)
Environmental Requirements	
Operating temperature	0°C to +60°C (32°F to 140°F).
Relative humidity ranges	0% to 95% non-condensing
Maximum operating altitude	3000 Meters
Standards Compliance	
Unit standards compliance	NFPA70, NFPA 75, IEC/ANSI/UL60950-1, CSA-C22.2, FIPS Pub, OSHA standards; applicable portions of IEC/ANSI/UL60950-1,CSA-C22.2
Manufacturing testing	NEMA, UL and CSA standards

2.3 JCOMM Enclosure

JCOMM has a single enclosure type for all mounting situations ([Figure 2](#)).

The entire front of the enclosure swings open and the inside frame slides out for easy servicing of the BCMS boards, optional monitor, and cabling. Opening the JCOMM front gives access to the Connections Panel (on left) and the Power Panel (on right).

Knockouts and pre-drilled mounting holes facilitate mounting on walls or on top of PDUs or RPPs.

⚠ DANGER

- Power must be turned off and locked out before removing the internal frame.

- Removing the internal frame should only be done by a licensed electrician or service technician.

Figure 2. JCOMM Enclosure
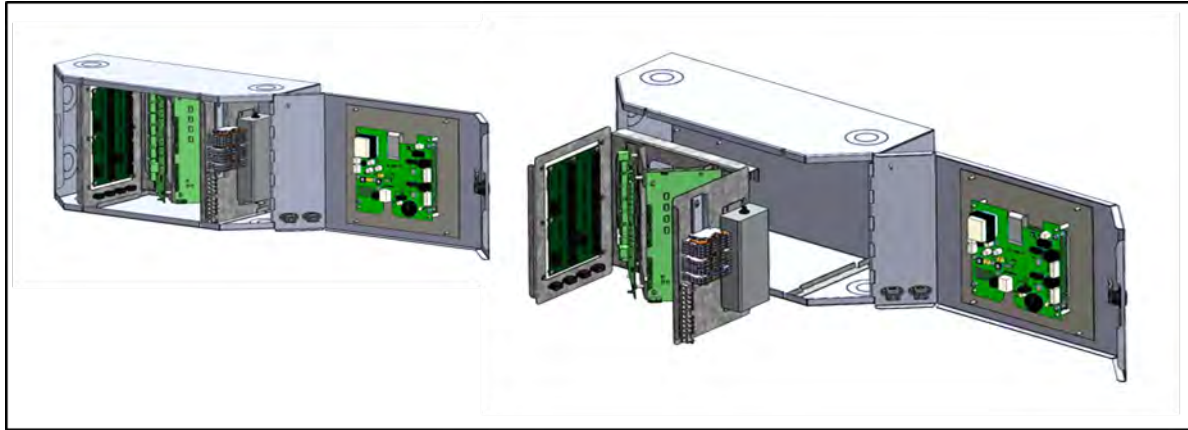
2.4 Optional WaveStar Color Monitor

The front panel mounts an optional WaveStar Color Monitor, a 7-inch color touchscreen.

The WaveStar Color Monitor can display information from the points lists for 20 downstream BCMS devices, such as panelboards. The monitor is part of the Modbus network and has its own points list.

The Monitor can connect to upstream networks using Modbus RTU, Modbus TCP/IP, or SNMP.

2.5 BCMS Data Acquisition Boards

The frame can mount two BCMS Data Acquisition Boards, which are identical to PCBs used in factory-installed BCMS and use the same software. Each BCMS is an independent monitoring system.

Each BCMS board contains points lists (Modbus register maps) for two panelboards and their associated main feeds. There are two points list options:

- The **Normal** list is specialized for alarm customization for branch circuits.

- The **Power-KWH** points list is specialized for power monitoring for branch circuits.

- The **IEC** points list is specialized for IEC panelboards.

BCMS software specific to the selected points list is loaded onto the board at the factory.

If subdistribution feeds are monitored, the BCMS also uses a small third points list for two subdistribution feeds.

2.6 Power and Connections Panels

JCOMM has connection panels so that customers do not have to make direct connections to the BCMS PCBs (Figure 3).

Power Panel (right side). The Power Panel has connections for voltage measurement, power, and grounding:

- Two (2) sets of terminal blocks for two voltage sources (208/120VAC/60Hz 3-phase 4-wire), allowing separate voltages to each panelboard

- One (1) set of grounding terminals

- One (1) 24VDC power supply, fed from voltage source 1

- Two (2) power terminal blocks, providing 24VDC to the BCMS data acquisition boards and optional monitor

Figure 3. JCOMM Connection Panels and BCMS Boards

BCMS Data Acquisition Boards

Connections Panel
- Branch circuit CT cable harnesses
- Main/subdistribution feed cable harnesses
- Modbus connections

Power Panel
- Power/voltage sources
- Ground strip
- 24V power supply
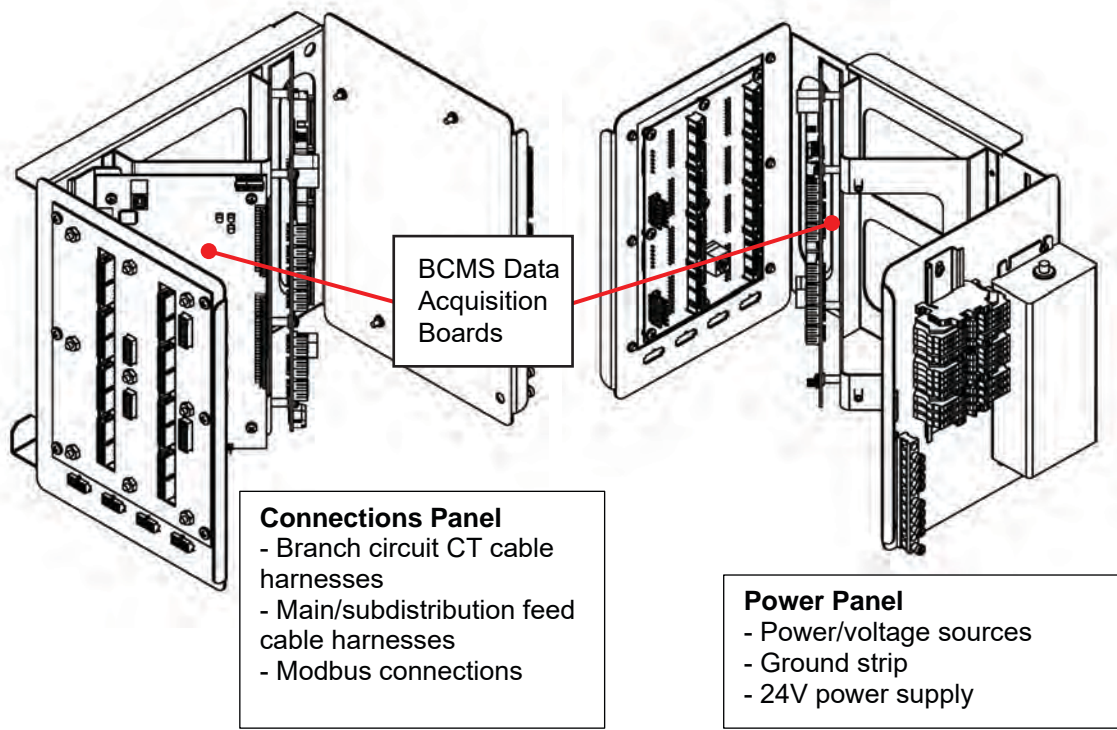
Connections Panel (left side). The Connections Panel has connections for current monitoring and communications:

- Eight (8) cable harness connection for branch circuit CTs, two connections (odd/even numbered sides) for each of the four (4) possible panelboards

- Four (4) cable harness connections for main feed CTs or subdistribution feeds

- Two (2) Modbus connections

2.7 Getting Help

If help is needed with any of the following:

- Scheduling initial startup

- Regional locations and telephone numbers

- A question about any of the information in this manual

- A question this manual does not answer

Please call the Eaton Help Desk at:

United States: **1-800-843-9433** or **1-919-870-3028**

Canada: **1-800-461-9166 ext 260**

All other countries: **Call your local service representative**

Please use the following e-mail for manual comments, suggestions, or to report a technical error in this manual.

E-ESSDocumentation@eaton.com

2.8 Warranty

To view the warranty please click on the link or copy the address to download from the Eaton website:

[Eaton Product Warranty](https://www.eaton.com/content/dam/eaton/products/backup-power-ups-surge-it-power-distribution/backup-power-ups/portfolio/eaton-three-phase-ups-warranty.pdf)

https://www.eaton.com/content/dam/eaton/products/backup-power-ups-surge-it-power-distribution/backup-power-ups/portfolio/eaton-three-phase-ups-warranty.pdf

Chapter 3   Planning a JCOMM Installation

The following is a list of actions to review when planning a JCOMM installation.

JCOMM enclosure installation

1. Select power distribution equipment to be monitored by JCOMM BCMSs.

2. Based on (1), determine the number of JCOMMs required (specified on order).

3. Select the location of each JCOMM and determine mounting method, conduit, and mounting hardware. The customer provides all conduit and mounting hardware. (See paragraph 4.2 *Install the JCOMM Enclosure*)

    a. Typically a JCOMM will be attached directly to a PDU or RPP or to a nearby wall.

    b. Plan conduit and CT cable harness lengths from JCOMM to circuits. If running cables from under a monitored unit, make provision for cable bends to create correct branch circuit addressing. (See paragraph 4.5 *Install Panelboard Branch Circuit CTs*)

4. For power/voltage connections, the customer must provide

    a. An approved electrical disconnecting means on each voltage source within sight of the JCOMM in accordance with local codes and NEC standards. (See paragraph 4.3 *Connect Ground and Voltage Sources*)

    b. A ground connection in accordance with FIPS Pub 64, NEC standards, and local codes.

    Monitors: local power monitoring stations

5. Determine monitors to be used as local power monitoring stations:

    a. Determine which JCOMMs will have a display.

    b. Determine which BCMS devices will be monitored downstream of the display (panelboards and subdistribution feeds).

    c. Alternatively, determine if JCOMM BCMSs will be connected to a WaveStar BCMS Hub.

    Communications

6. Determine protocols to be used between the JCOMM monitors and the building management system (BMS). (See paragraph 5.2 *Upstream Protocols Using a Monitor*)

7. Plan communications cables (type and length) and BCMS upstream links to the BMS. Customers must provide all communications cables for connections upstream or downstream of a JCOMM. (See paragraph 5.1 *Modbus Network Setup*)

8. Create a Modbus address map. Incorrect network addressing is a common BCMS startup problem. If using a JCOMM monitor or WaveStar BCMS Hub with a Modbus upstream protocol, plan for downstream Modbus addresses to be remapped upstream from monitors. (See paragraph 5.5 *Remapping Modbus Addresses with Monitors*)

    Monitoring options

9. Select a points list. Points lists must be specified at time of order for loading into the BCMS boards. (See paragraph 7.2 *Panelboard Points Lists*)

10. Plan setup options, especially warning and alarm parameters. (Review all of)

Building Management System

11. Create a Modbus address map for network addresses as seen from the BMS, including remapped upstream Modbus addresses when a JCOMM monitor or WaveStar BCMS Hub is used as a local power monitoring station. (See paragraph 5.5 *Remapping Modbus Addresses with Monitors*)

12. Plan for efficient polling of warnings and alarms. (See paragraph 7.3 *Alarm Handling*)

Chapter 4 JCOMM Installation

⚠ WARNING

JCOMM units must be installed by licensed electricians or by Eaton-authorized technicians.

A Eaton-trained technicians provide on-site support for software setup and network connection for new JCOMM installations.

For planning questions, installation problems, or post-installation support contact Eaton, see paragraph 2.7 *Getting Help*.

4.1   Installation Kit

Upon receipt of your JCOMM shipment:

1. Open your JCOMM shipping package(s).

2. Check the packing list against the contents of the kit to make sure that all items in the packing list have been included.

3. Check the enclosure, internal frame, boards, and connectors for damage.

4. Report any missing or damaged parts to Eaton support.

The contents of your JCOMM Installation Kit will include items from the following table:

Table 2. JCOMM Installation Kit Contents

Option	Part Description	Additional Part Information or Quantity
JCOMM Enclosure and Display Options		
JCOMM with WaveStar Color Monitor		A JCOMM unit can have various part numbers depending on features.
JCOMM with no display		A JCOMM unit can have various part numbers depending on features.
Cable and CT Kits		
Panelboard Kits (Branch Circuits): 1-4 Panelboard Kits		
(1) Panelboard Kit, 42-circuit panelboard	Cable harness for branch circuit split-core CTs: connectorized cable harness for 21 (60A) CTs in lengths of 5, 10, 15, or 20 ft.	
	Branch circuit split-core CTs ≤ 60A	42
Main Circuit Cable Kits (Main or Subdistribution Feeds): 0-4 Main Circuit Cable Kits		

Table 2. JCOMM Installation Kit Contents (Continued)

Option	Part Description	Additional Part Information or Quantity
(1) Main or subdistribution circuit cable kit	Main/subdistribution circuit CT cable harness: connectorized cable Qty 4 for split-core CTs (ABCN) and Qty 1 Ground split-core CT (G), in lengths of 5, 10, 15, or 20 ft.	
	Main/subdistribution feed CT: split-core CT, 5A - 250A (ABCN)	4
	Main/subdistribution feed CT: ground circuit, split-core CT, 5A (G)	1
Voltage/Power Cables: 0-2 Voltage/Power Cables		
Optional Eaton power/ voltage cable	Power/voltage cable, with inline 1A 1000V cartridge fuses, in lengths of 5, 10, 15, or 20 ft.	

4.2   Install the JCOMM Enclosure

⚠ **DANGER**

Severe or fatal injury can result from electrical shock during contact with high voltage conductors, monitoring PCBs, or similar equipment.

Disconnect power before drilling holes, attaching conduit, and attaching JCOMMs to walls, PDUs, RPPs, or other power distribution equipment.

Use Lock Out/Tag Out procedures.

Wear suitable personal protective clothing and use protective equipment for performing mechanical and electrical installations.

Leave ample space for attaching and routing wires.

The customer provides attachment hardware for mounting JCOMMs.

Table 3. JCOMM Enclosure Installation Parts

JCOMM with WaveStar Color Monitor (various PNs depending on features)
JCOMM with no display (various PNs depending on features)

A JCOMM enclosure has four slots for mounting on a wall (Figure 4):

1. Mark (4) mounting holes on wall nearby equipment using the enclosed Mylar template. Place a level against the top of the drilling marks to make sure the holes are level.

2. Drill ¼-inch bolt holes at the target location.

3. Hang the enclosure to make sure the enclosure will be level and securely mounted.

4. JCOMM has 1- and 2-inch knockouts on the top, bottom, and both sides of the unit for attaching conduit.

When mounting a JCOMM to the top of an RPP or PDU, use conduit and other hardware to anchor the JCOMM to the unit.

Figure 4. Enclosure Knockouts and Hole Locations
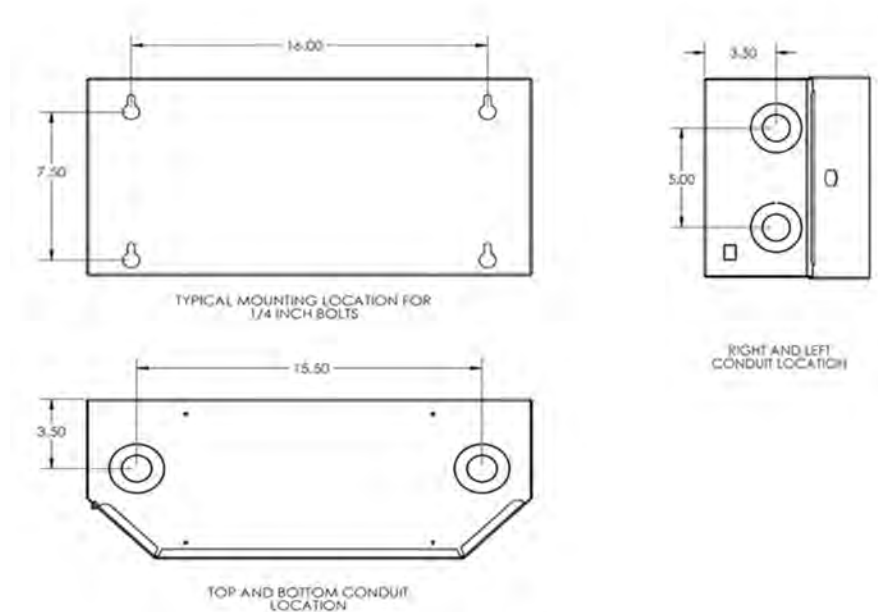
4.3   Connect Ground and Voltage Sources

Parts used in this step:

Table 4. Parts for Ground and Voltage Connection

Optional Eaton power/voltage cable, with inline 1A 1000V cartridge fuses, in lengths of 5, 10, 15, or 20 ft.

⚠ **IMPORTANT**

The customer must provide an approved electrical disconnecting means for Voltage Source 1 and, if used, Voltage Source 2, such as a panelboard circuit breaker or a fuse, within sight of the JCOMM in conformance to NEC standards and local codes.

The customer is responsible for providing power/voltage cables. Eaton can provide an optional power/voltage cable in lengths of 5, 10, 15, or 20 ft. with inline 1A 1000V AC/DC cartridge fuses on ABC phases. The wire ends are 18AWG and should have ferrules if connected to a branch circuit breaker.

Connect ground and voltage sources to the Power Panel (Figure 5):

1. Make a ground connection to the grounding strip in accordance with FIPS Pub 94, NEC requirements, and local codes.

2. Voltage Source 1:

    a. Connect **Voltage Source 1 ABCN** from a panelboard circuit breaker or main feed to the Source 1 terminal blocks, ABCN.

    b. Connect **Voltage Source 1 G** to shared terminal block G.

3. Voltage Source 2, if used:

a. Connect **Voltage Source 2 ABCN**, from a panelboard circuit breaker or main feed to the Source 2 terminal blocks, ABCN.

b. Connect **Voltage Source 2 G** to shared terminal block G.

Figure 5. JCOMM Power Panel

Voltage Source 1 has two functions:
1. External power source for the 24VDC power supply
2. Panelboard voltage monitored by the BCMS

Voltage Source 2 is monitored by the BCMS. It is only used if panelboards 1 & 2 use different voltages.

A
B
C
N — Voltage Source 1

A
B
C
N — Voltage Source 2

24VDC (-)
24VDC (+)
G — Shared Ground

Power Supply AC→24VDC

Power Terminal Block Connections

Grounding Strip

4.4 Connect Main or Subdistribution CTs

To measure current on main or subdistribution feeds, install split-core CTs rated at 250A on the wires (ABCNG) and connect to matching cable harnesses.

Different combinations of circuit phases can be monitored: ABCNG, ABC, N only, or G only. Specify in software setup which large circuit wires are monitored.

⚠ **DANGER**

Power must be disconnected and locked out before installing and connecting CTs.

Parts used in this step (for each main or subdistribution feed):

Table 5. Parts for Feed Connections

Quantity	Description
4	Main/subdistribution feed CT: split-core CT, 5A - 250A (ABCN)
1	Main/subdistribution feed CT: ground circuit, split-core CT, 5A (G)
1	Main/subdistribution circuit CT cable harness: connectorized cable for (4) XMR14321 split-core CTs (ABCN) and (1) XMR14321-005 split-core CT (G), in lengths of 5, 10, 15, or 20 ft.

Large-circuit split-core CTs (Figure 6):

1. Click a split-core 250A CT (XMR14213) over each main/subdistribution ABCN cable you are monitoring on the line side of the associated breaker, except for the ground phase.

2. Click the 5A ground CT (XMR14213-005) over the ground line, if ground is being monitored.

Figure 6. 250A CT and Cable Harness for Main and Subdistribution Feeds
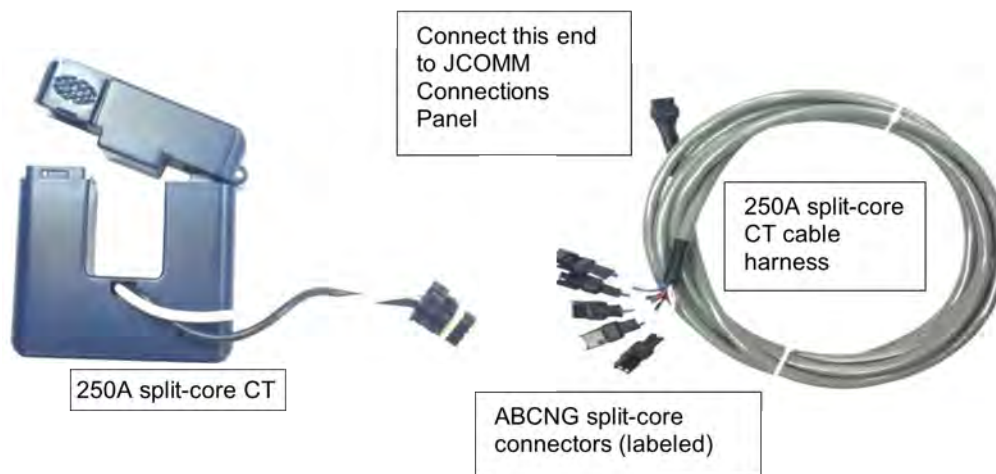
3. Run a cable harness through a left side JCOMM knockout leaving the five-connector end near the main or subdistribution feed CTs.

4. Connect the cable harness to the 10-pin connector for the corresponding main feed or subdistribution feed connector (1 or 2) for this BCMS at the bottom of the JCOMM Connections Panel (Figure 7). (There are two main feed or subdistribution feed connections for each BCMS.)

5. Each cable harness has five labeled connectors (ABCNG). Connect split-core CTs ABCNG to the connectors with matching labels on the cable harness for those phases being monitored.

Figure 7. JCOMM Connections Panel
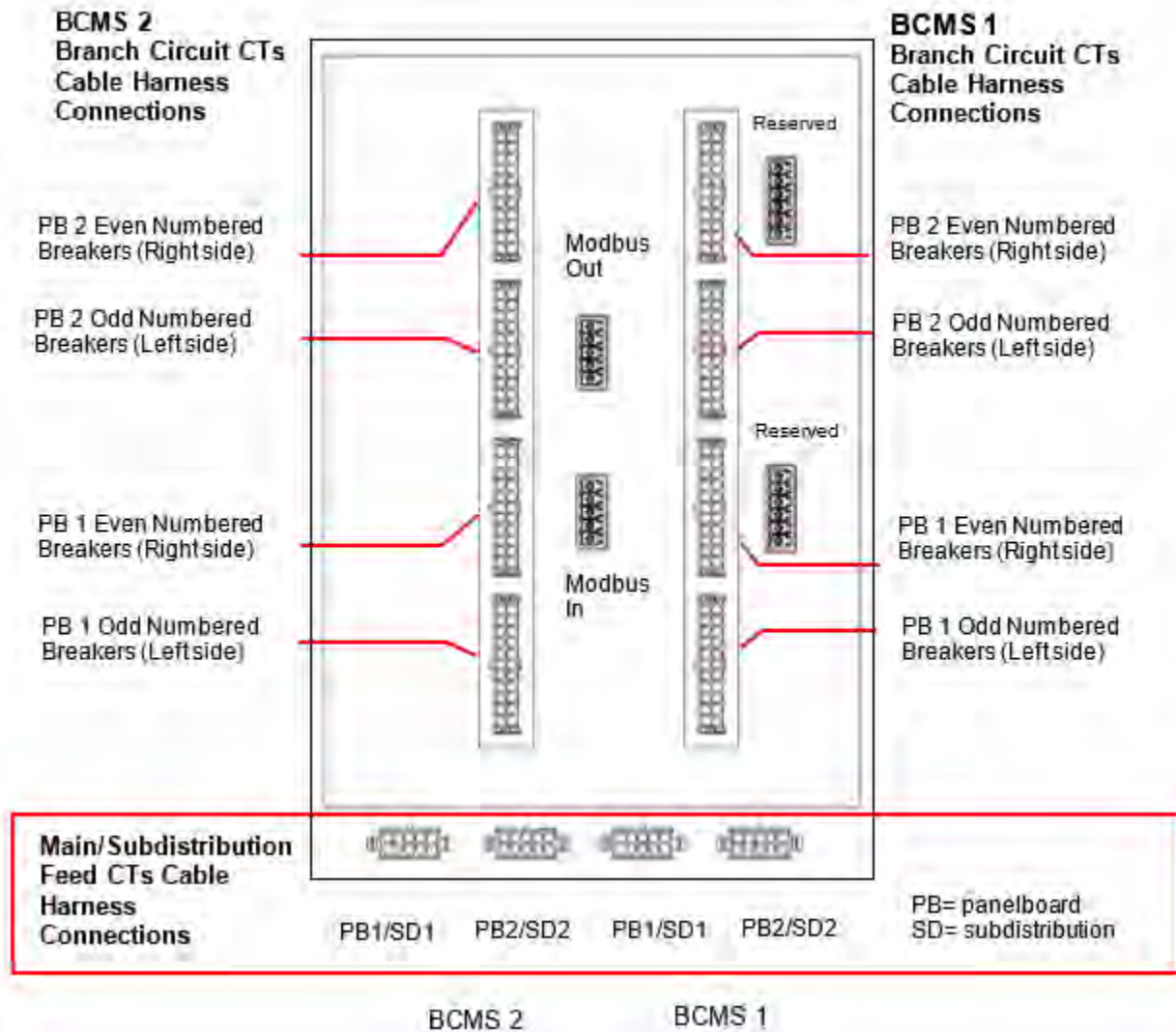
4.5   Install Panelboard Branch Circuit CTs

Parts used in this step (for each panelboard):

Table 6. Parts for Panelboard Branch Circuit CTs

Quantity	Description
42	Branch circuit split-core CT ≤ 60A with 2-pin connector
2	Cable harness for branch circuit split-core CTs: connectorized cable harness for 21 XMR14320 (60A) CTs in lengths of 5, 10, 15, or 20 ft.

⚠ **DANGER**

Power must be disconnected and locked out before installing and connecting CTs.

To measure current on panelboard branch circuits, install split-core CTs rated at 60A and matching cable harnesses. CT installation has these steps:

1. Run cable harnesses in the correct orientation from panelboards to JCOMM.

2. Connect cable harnesses to JCOMM Connections Panel.

3. Connect split-core CTs to the cable harnesses.

4. Clip CTs over circuit wires in correct order.

4.5.1 Run Cable Harnesses to JCOMM

Figure 8. Cable Harness Orientation

The #1(J1) CT connector on the harness should always be connected to the CT at the top of the panelboard.

If the JCOMM CT harness is wired from **above** the monitored unit, put a **U-bend** in the cable harness so that the J1 connector is at top of the panelboard.

If the JCOMM CT harness is wired from **under** the monitored unit, the harness is strung straight up from the bottom and does not need a U-bend.

Typically, JCOMM cable harnesses are run from a top-mounted JCOMM. Run the cable harness to the panelboard through a JCOMM a knockout so that cable harness CT connector #1 (J1) connects to the top of the panelboard and #21(J21) to the bottom. Put a U-bend in the harness to orient the harness so that it

correctly addresses the circuit (Figure 8 and Figure 9). Use caution in creating the U-bend, allowing a gradual minimum bending radius.

If the CT harness is run into the monitored unit from the bottom, run the harness straight up from the bottom so that J1 is at the top. Do not add a U-bend in the harness.

> **(i) NOTE** If you are using IEC panelboards, connections #19-21 are not used.

4.5.2 Connect Cable Harnesses to JCOMM Connections Panel

Connect the cable harness to the corresponding 22-pin socket on the JCOMM Connections Panel. Each panelboard has an odd-numbered and even-numbered side connector (e.g., PB1/odd, PB1/even) (Figure 9). Refer to the Connections Panel layout in Figure 7.

Figure 9. Connect Cable Harness to JCOMM Connections Panel
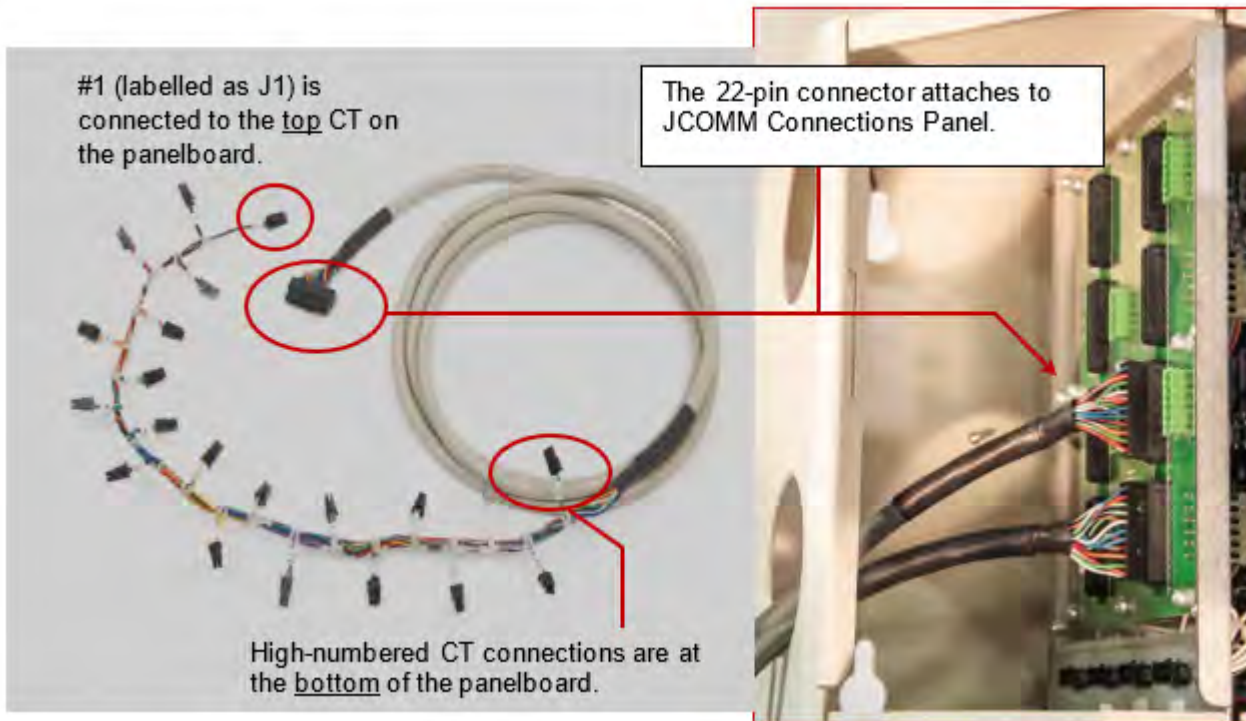
4.5.3 Connect CTs to Cable Harnesses

Connect a branch circuit CT to each cable harness connector (Figure 10). Branch circuit cable harnesses each have 21 CT connectors, labeled 1-21, with #1 (J1) connector at the top.

1. Align the CT 2-pin connector as shown in Figure 10.
2. Connect the 2-pin connectors together until they snap in place as illustrated.

Figure 10. Connect Branch Circuit CTs to Cable Harness

Branch circuit CT cable harness connectors are labeled J21 (bottom end of panelboard) to J1 (top end).

Click each 2-pin CT connector into the matching connector in the cable harness.

4.5.4 Clip CTs to Circuit Wires

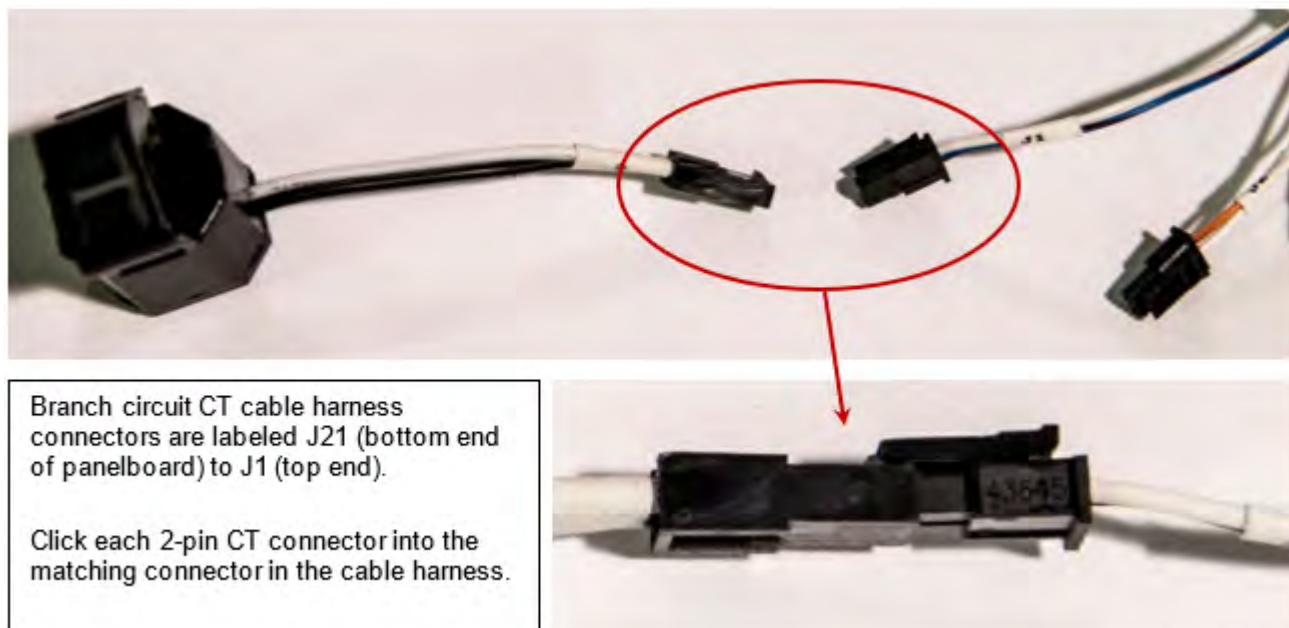1. Clip a 60A split-core CT over each branch circuit wire where it leaves the panelboard breaker in sequence top to bottom. Branch circuit CT cable harness connectors are labeled 1-21, with #21 connection at the bottom of the panelboard.

    a. Open the CT and snap it over the circuit wire as shown in Figure 11.

    b. **The split-core CT wire must always go to the right**, regardless of whether the CT and cable harness are on the left or right side of the panelboard. This is a standard connection procedure for all branch circuit CTs. BCMS automatically inverts the waveform for CTs on the right side of the panelboard to provide correct measurements. However, the appearance of the left and right sides of a panelboard will be different as shown in Figure 12 and Figure 13.

Figure 11. Clip Split-Core CT Over Circuit Wire

Open a 60A split-core CT and place it over the branch circuit where the wire leaves its panelboard breaker.

The wire exiting the CT must face to the right on both sides of the panelboard.
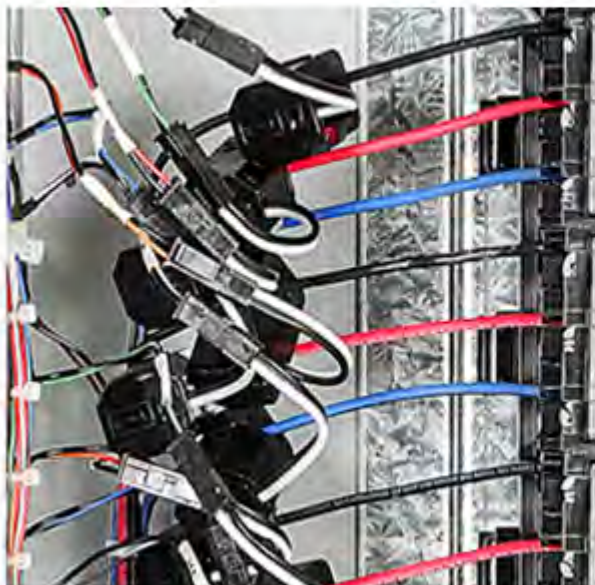
Snap the CT shut over the circuit wire.

The clasp on the reverse side should click shut.

Figure 12. Wire Orientation on Panelboards

The CT wire must ALWAYS exit the CT to the right on both sides of the panelboard.

On the LEFT SIDE of the panelboard, the wire exits the CT to the right, but bends back to connect to the cable harness.

On the RIGHT SIDE of the panelboard, the wire exits the CT to the right and continues straight to connect to the cable harness.

NOTE	Always attach the CTs over the circuit wires as the last step if the panelboard will be energized at any time during installation. CT installation steps can be varied for convenience IF and ONLY IF the panelboard will not be energized at any time during installation.

⚠ WARNING

Before applying power to the panelboard, make sure that all CTs are connected to their cable harness and that the cable harness is connected to the left-side JCOMM Connections Panel. The Connections Panel has burden resistors to prevent a voltage surge in the CTs. If power is applied to a panelboard with CTs installed on circuit wires, but NOT connected through a cable harness to the connection panel, a voltage surge can be generated in the CTs that can damage electronics when all connections are completed.

Figure 13. Completed Panelboard

JCOMM (door open) with CT harnesses and completed CT installation.
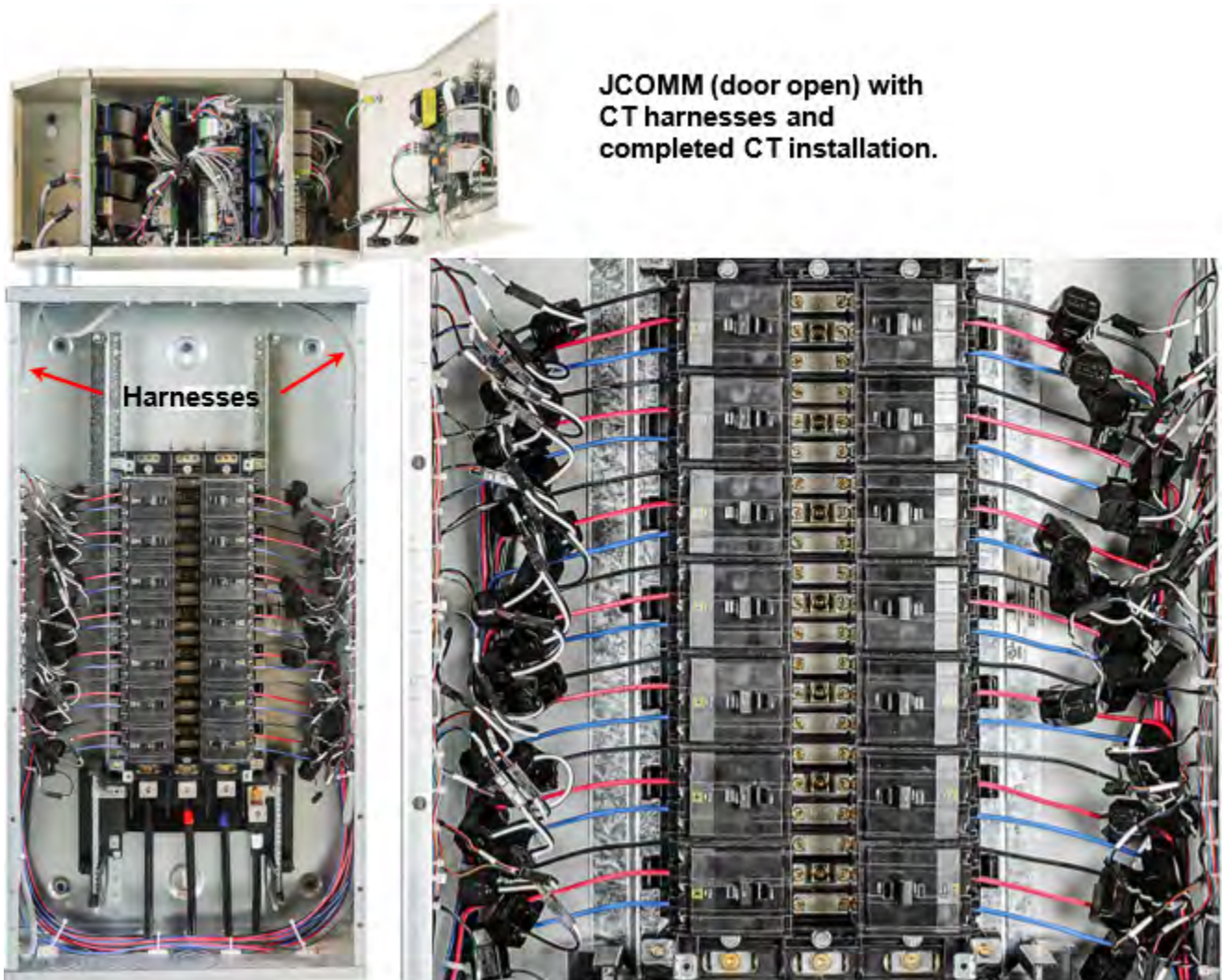
4.6   Alternate Panelboards

Panelboards are available in different configurations. JCOMM BCMS is designed for standard North American panelboards with 42 circuits distributed in two columns, 21 circuits per side.

There are also column-width panelboards with all circuits in a row in a single column, numbered sequentially, 1-42, which are addressed differently. For addressing column-width panelboards contact Eaton, see paragraph 2.7 Getting Help.

Chapter 5 Networking

This chapter describes incorporation of JCOMMs and their BCMSs into a network. Networking problems are among the most common BCMS installation problems. Network addressing in particular should be carefully planned.

5.1 Modbus Network Setup

The networking protocol for JCOMM BCMS boards is Modbus RTU with the following characteristics:

- 9600 bps network speed

- Even (default), odd, or no parity (specified during BCMS software setup)

- 4-wire or 2-wire (2-wire selected by jumpers on the Connection Panel)

All customer Modbus network connections are made through two Modbus connectors on the Connections Panel (Figure 14). The customer provides Modbus cables for network connections.

Figure 14. Modbus Connections
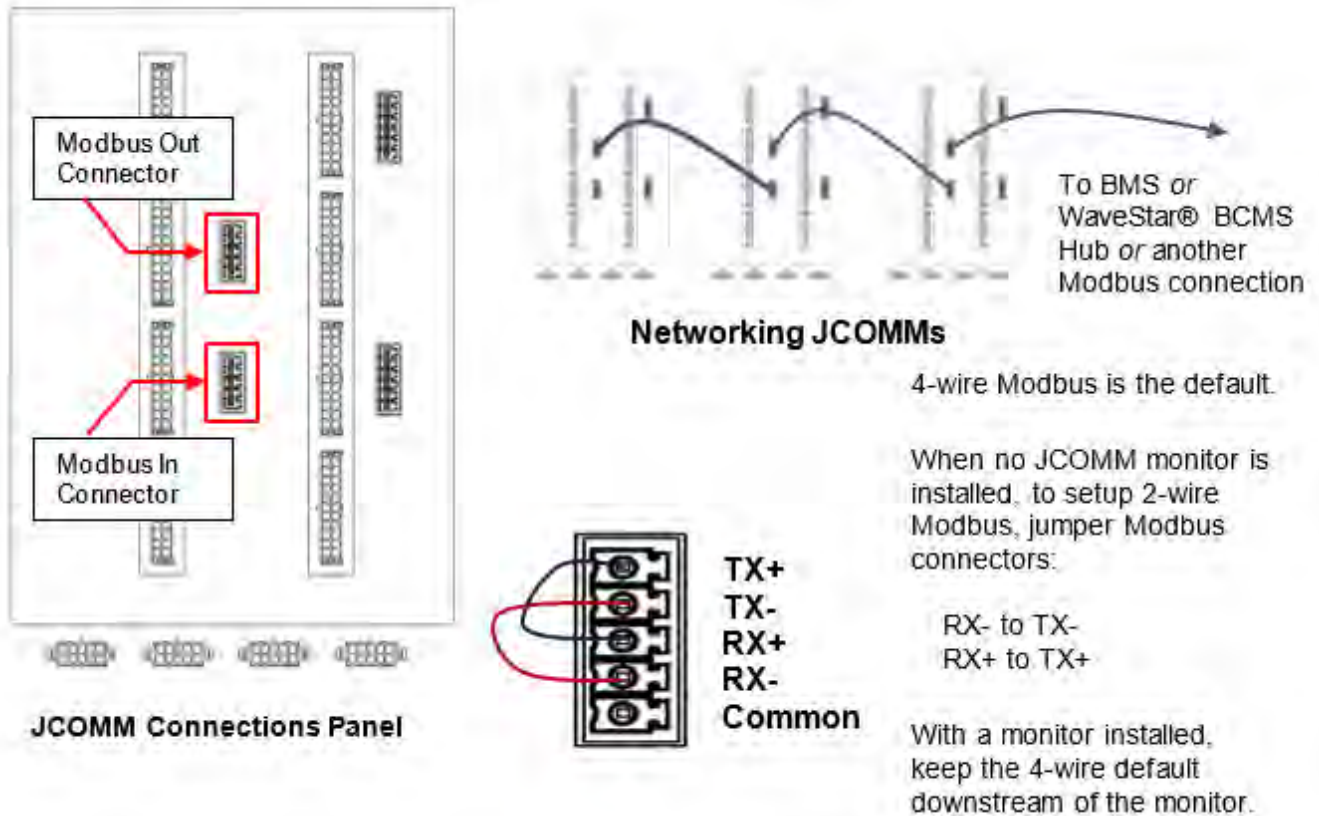
All JCOMMs in a Modbus loop must be configured identically. 4-wire Modbus is the default. With a JCOMM monitor, 4-wire Modbus must be used downstream of the monitor.

2-wire Modbus can be used on JCOMM network connections when a monitor is not installed. For 2-wire Modbus loops, install jumpers connecting RX- to TX- and RX+ to TX+ on each JCOMM Modbus connector.

5.2 Upstream Protocols Using a Monitor

BCMS boards use Modbus RTU protocol downstream from a JCOMM monitor.

Upstream from a JCOMM monitor, there are three protocol choices, which can be used simultaneously:

- Modbus RTU

- Modbus TCP/IP (high-speed protocol using an Ethernet link)

- SNMP (high-speed, event-driven protocol over an Ethernet link)

TCP/IP can also be used to display Color Monitor web pages. These protocols are specified in monitor setup. See the *WaveStar Color Monitor, Installation and Operation* manual (referenced in **Bibliography**) for setup information.

5.3 Modbus Addresses

Figure 15. Modbus Addresses Assigned to Points Lists
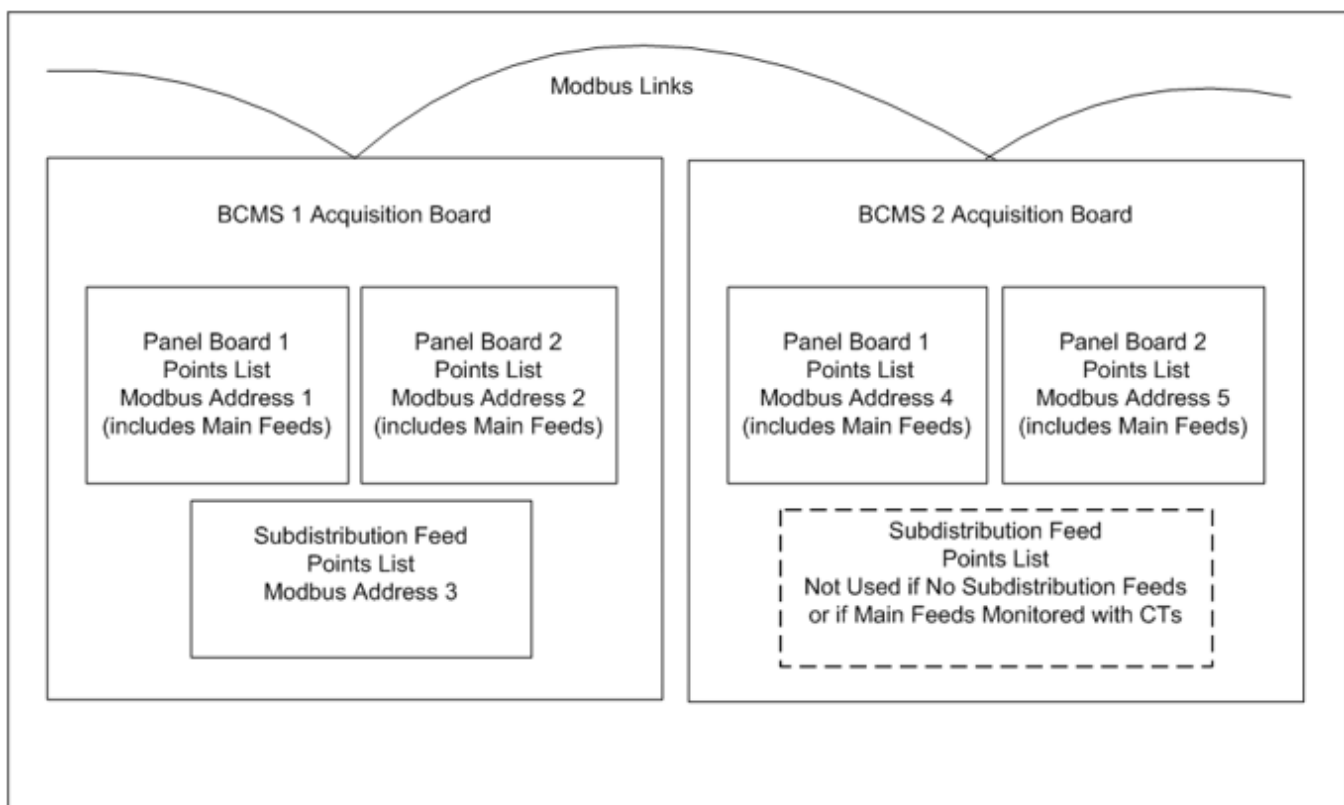
JCOMM with Two BCMS Acquisition Boards

Each BCMS points list must be assigned a Modbus address (Figure 15):

- Modbus addresses are for points lists: 1 Modbus address = 1 Points List= 1 BCMS device.

- Each panelboard has a separate points list.

- There are no separate points lists for main feeds. Main feed current measurements are included in each panelboard's points list, whether BCMS measures main feeds with CTs or computes main feed current from branch circuit measurements.

- If subdistribution feeds are monitored, there is a third small points list for storing data about two subdistribution feeds. When main feeds are monitored with CTs, subdistribution feeds cannot be monitored on that BCMS because the large circuit connections are used by the main feeds.

- Points list addresses within a BCMS must be sequential. Assign these addresses during BCMS software setup.

5.4   Modbus Addressing with Monitor Installed

If there is no JCOMM monitor, each BCMS responds to the Modbus addresses assigned in BCMS setup. But if the JCOMM has a monitor, the monitor is connected between the BCMS boards and the Modbus network (Figure 16). The monitor intercepts and responds to Modbus addresses on behalf of the BCMSs, but it must remap these addresses as explained in the following sections.

Figure 16. BCMS Network Connections with and without a Monitor
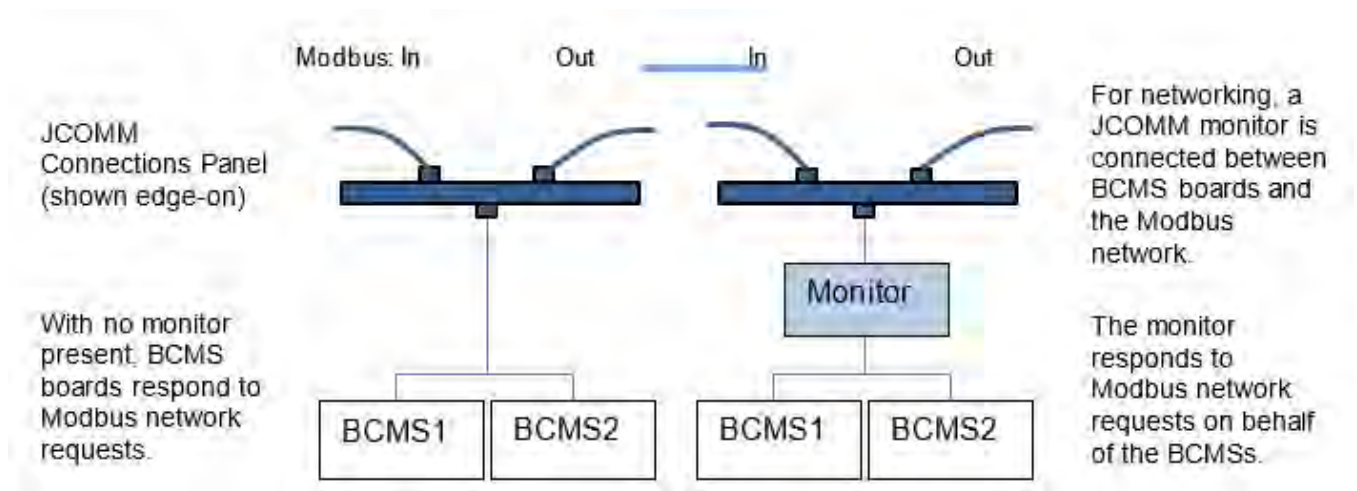
5.5   Remapping Modbus Addresses with Monitors

In a Modbus network only the client device can poll a downstream device. There can be only one client, typically the BMS. However, a JCOMM monitor must also poll its downstream devices.

Because there cannot be two Modbus clients, when both a monitor and BMS are present, the network must be divided into segments at the monitor with one client per segment (Figure 17).

- **Upstream segment:** BMS is client to the monitor; monitor is server to BMS.

- **Downstream segment**: monitor is client to its downstream BCMS devices.

The BMS cannot address BCMS devices downstream of the monitor because the monitor is the endpoint of that network segment.

Instead, the monitor remaps its downstream device addresses to upstream segment addresses. When the BMS requests data from a device downstream of a monitor, it addresses the downstream device indirectly through the monitor. Downstream devices are only visible to the BMS through these remapped addresses.

The monitor caches data from its downstream devices. It responds to BMS requests with cached data or retrieves fresh data from the downstream device.

Figure 17. Network Segmentation When a Monitor is Present
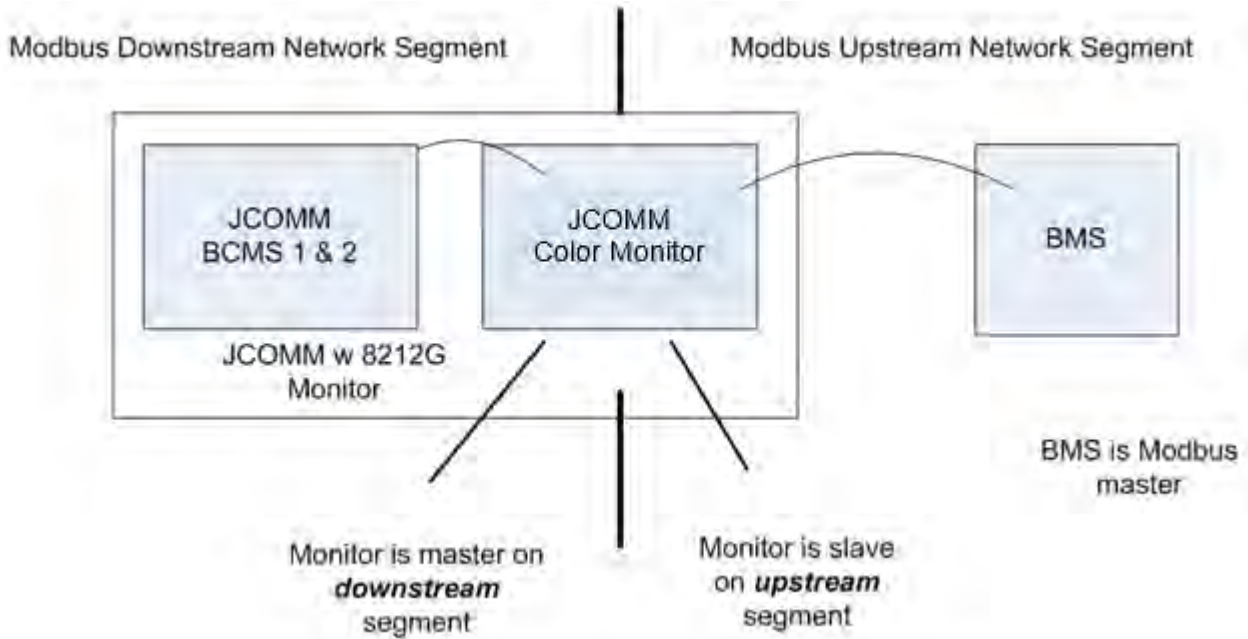
When planning BCMS with local JCOMM monitors, plan for remapping panelboard and subdistribution feed Modbus addresses to the monitor's upstream side. These remapped addresses are what the BMS must use to address the downstream BCMS devices (Figure 18).

Figure 18. Modbus Upstream Address Remapping with JCOMM Monitor
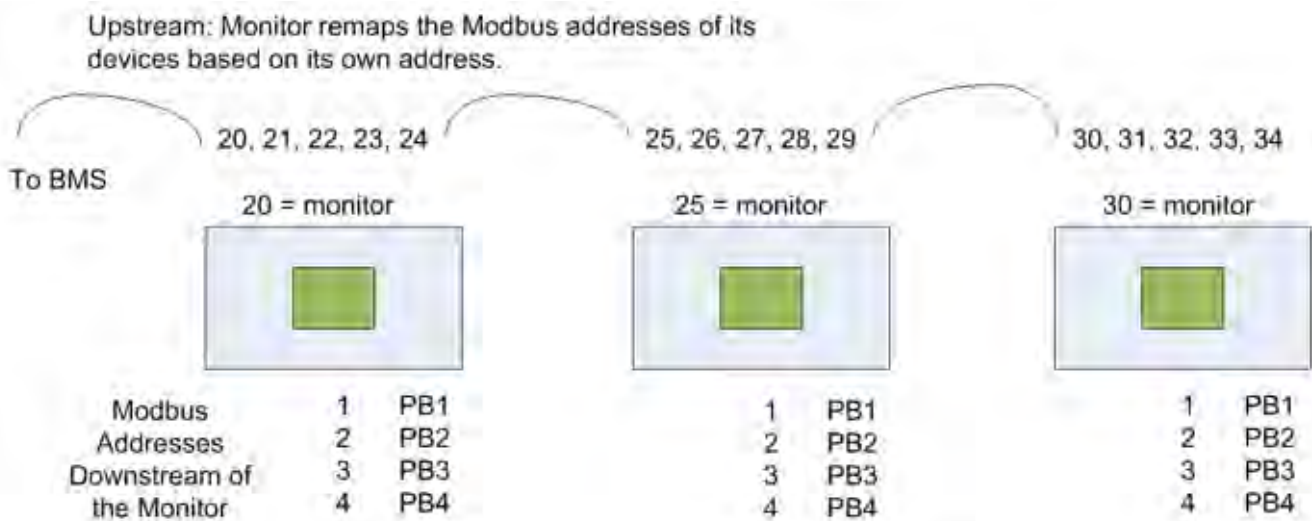
If you use SNMP as the protocol upstream from the monitor, the monitor does not remap Modbus addresses, because there is only one Modbus network segment and only one client.

Chapter 6 Troubleshooting Installation Problems

The following troubleshooting tips cover the most common installation and setup problems.

If problems continue after performing the following checks, contact Eaton Service, see paragraph *2.7 Getting Help*.

6.1 Communication Problems

The most common JCOMM and BCMS installation and setup problems are communications problems.

6.1.1 Check Modbus Network Setup for the BCMS Board

- Verify that ModBus connectors have the correct pin-out. (See paragraph 5.1 *Modbus Network Setup*)

- 4-wire Modbus is the default network configuration. If using 2-wire Modbus, check that Modbus connectors on the Connections Panel are jumpered TX+ to RX+ and TX- to RX-. (See paragraph 5.1 *Modbus Network Setup*)

6.1.2 Check Modbus Addresses

Modbus addresses can only be set using BCMSII setup software. Modbus addresses are not stored in the points lists.

Verify that the Modbus addresses have been setup correctly in the BCMS board:

- If a JCOMM WaveStar Color Monitor is installed as a local power monitoring station:

  - Check the monitor's front panel to verify that there are no communication errors present.

  - Verify that each panelboard can be displayed on the monitor.

  - Access the monitor setup page by accessing the setup pressing the ESC key and verify that the upstream addresses of the monitor are set correctly:

    ○ The WaveStar Color Monitor remaps its downstream devices to upstream addresses that can be accessed by the BMS. The number of devices monitored by the monitor is shown on its setup page.

    ○ For example, if the WaveStar display monitors four panelboards in a JCOMM and the panelboard addresses are 1, 2, 3, and 4. If the monitor's address is 20, it will respond to addresses 21, 22, 23, 24 for panelboard addresses, when addressed by the BMS. (See paragraph 5.5 *Remapping Modbus Addresses with Monitors*)

- Verify that the BMS is addressing the correct addresses. A very common problem is that the BMS addresses the *downstream* addresses that were established in setup when a monitor or WaveStar BCMS Hub is present. The BMS should be addressing the addresses *upstream* of the monitor or Hub, as they have been remapped. (See paragraph 5.4 *Modbus Addressing with Monitor Installed*)

- If the display does not resume communication with the BMS, verify that its upstream cable is undamaged and that communication wires are correctly connected.

6.2 BCMS Board Power Problems

- Check the LED's on the BCMS board. LEDs should be blinking when the BCMS board has 24VDC power.

- If power LEDs are not blinking, check the connections from the 24VDC power supply (on the right side Power Panel) through the terminal blocks to the BCMS board. (See Figure 5)

6.3 Data Problems

6.3.1 No Current Readings

If the BCMS is not showing direct measurements of current for one or all circuits, perform the following checks:

1. Check connections for the branch circuit CTs and their cable harness:

    a. Check that CTs for circuits with no current readings are snapped shut over their circuit wires.

    b. Also check that these CTs are securely connected to the cable harness at the correct connector.

    c. Check that the cable harness for these CTs is securely connected to the JCOMM Connections Panel at the correct location. (See Figure 7)

2. Check the orientation of branch circuit CTs:

    a. Current measurements on a circuit depend on flow of current passing through the installed CT. The green dot on the CT and the CT wire on branch circuit split-core CTs should be oriented to the right as you face the panelboard to ensure correct directional flow of current through the CT. CTs must be oriented this way on both the left and right sides of the panelboard.

    b. Note: while current can be measured for the CT if its orientation is reversed, correct CT orientation is necessary for determining related measurements, such as power factor.

6.3.2 No Voltage or Power Readings

If voltage or power readings are not displaying, perform these checks:

1. Check that the voltage option listed is correct for your installation.

2. Check that branch circuit CTs are oriented correctly with the CT's wire oriented to the right as you face the panelboard. Incorrect CT orientation produces incorrect power factor measurements. (See Figure 10 and Figure 11)

Chapter 7   Operation

Each JCOMM BCMS functions independently and can monitor two panelboards and optionally two subdistribution feeds to remote power distribution equipment.

7.1   Points List Options

Each panelboard has a points list, or Modbus register map, where BCMS records data for that panelboard, including its main feeds. Customers can choose between two types of panelboard points lists, which are specialized for different power monitoring requirements:

- The **Normal** list provides warning and alarm customization for each branch circuit.

- The **Power-KWH** is specialized for power measurement, recording KW, KWH, KVA, KVAR, and power factor for each branch circuit.

There is a small separate **Subdistribution** points list for subdistribution feeds, if these are present and monitored, providing current data and overcurrent alarms on these circuits.

7.2   Panelboard Points Lists

A panelboard points lists contains data on both the branch circuits in the panelboard and main feeds to the panelboard:

- Options and parameters from setup, such as voltage sources, main feed CT configuration, and warning and alarm thresholds

- Direct (calibrated) measurements from CTs and voltage sources

    – Current measurements for all 42 branch circuits in a panelboard

    – Panelboard measurements, such as voltage, frequency, and current on main feeds (If main feeds are not directly measured with CTs, BCMS computes panelboard current totals from branch circuit measurements.)

- Data derived or accumulated from direct measurements, such as min-max current, power factor, or KWH

- Warnings and alarms for branch circuits and panelboards

Configuration options and warning and alarm data are held in non-volatile storage on the board.

The points list documents indicate which registers can be read or written.

Points list documents are available as PDFs from Eaton, see paragraph 2.7 *Getting Help*.

7.2.1   Panelboard Points Lists Content Summary

The Normal and Power-KWH points lists have most points in common, but are specialized for specific tasks. Information unique to a points list is shown with a grey background in the following tables:

- BCMS Measurements (Table 7)

- BCMS Alarm and Warning Configuration (Table 8)

- BCMS Alarms and Warnings (Table 9)

Table 7. BCMS Measurements: Normal and Power-KWH Points Lists

BCMS Measurements: Normal and Power-KWH Points Lists BC = branch circuit, PB = panelboard	
Direct Measurements	
Current, branch circuits 1-42	Direct measurement from branch circuit CTs
Current, main feeds ABCNG	Specify which main circuit phases are monitored with CTs in setup. If there are no main feed CTs, BCMS computes main feed ABC values for each panelboard from branch circuit current totals. (Note: this computed value is not a simple sum of BC measurements.)
Voltage source 1 and voltage source 2	Voltage source 1 is required. JCOMM BCMS can monitor two voltage sources. Voltage is measured at one source per panelboard.
Frequency	Frequency is measured from voltage source 1 or 2, phase A.
Accumulated and Derived Data – Branch Circuits	
Minimum current (BC 1-42)	The lowest current measured on each branch circuit
Maximum current (BC 1-42)	The highest current measured on each branch circuit
KW (BC 1-42)	The **Power-KWH points list** provides detailed power measurements for each branch circuit as shown in this section (grey background). These measurements are not available in the **Normal** points list.
KVA (BC 1-42)	
KVAR (BC 1-42)	
Power Factor (BC 1-42)	
Accumulated and Derived Data – Panelboards	
Current, ABC, each panelboard	PB total current is measured from main feed CTs or computed by BCMS from branch circuit current measurements.
Current, ABC, panelboards summed	Current for both PBs summed is measured from a single main feed to both PBs or a computed sum of the current to both PBs. (Not available if panelboards use separate voltages)
Percent total load on panelboard	**Full load** on a panelboard is specified during setup. BCMS reports panelboard usage as a percentage of **full load**, but does not use this number as an alarm.
Real Power kW	PB power measurement
Real Power phase A	PB power measurement
Real Power phase B	PB power measurement
Real Power phase C	PB power measurement
Reactive Power kVAR	PB power measurement
Apparent Power kVA	PB power measurement
Total Power Factor phase A	PB power measurement
Power Factor phase A	PB power measurement
Power Factor phase B	PB power measurement

Table 7. BCMS Measurements: Normal and Power-KWH Points Lists (Continued)

BCMS Measurements: Normal and Power-KWH Points Lists BC = branch circuit, PB = panelboard	
Power Factor phase C	PB power measurement
Energy Consumption, KWH	PB power measurement
Total Harmonic Distortion, Voltage Source 1	PB power measurement; only provided if THD option was checked during "Set BCMS Options"
Total Harmonic Distortion, Voltage Source 2	PB power measurement; only provided if THD option was checked during "Set BCMS Options"

Table 8. BCMS Alarm and Warning Configuration: Normal and Power-KWH Points Lists

BCMS Alarm and Warning Configuration: Normal and Power-KWH Points Lists BC = branch circuit, PB = panelboard	
Global Settings for Branch Circuits Note: Both **Normal** and **Power-KWH** points lists allow branch circuit breaker size and warning/alarm thresholds to be set globally (uniformly) for all branch circuits.	
Breaker size, set uniformly for all branch circuits (BC 1-42)	Default BC breaker size is 20A. Branch circuit warnings and alarm thresholds are based on breaker size.
Warning threshold, set uniformly for all branch circuits (BC 1-42)	Percent breaker size, default = 70%
Alarm threshold, set uniformly for all branch circuits (BC 1-42)	Percent breaker size, default = 80%
Warning time delay, set uniformly for all branch circuits (BC 1-42)	Number seconds the warning threshold must be exceeded before a warning is issued, default = 0
Alarm time delay, set uniformly for all branch circuits (BC 1-42)	Number seconds the alarm threshold must be exceeded before a warning is issued, default = 0
Individual Settings for Branch Circuits	
Breaker size for individual branch circuits 1-42	BC warning/alarm thresholds are given as a percent of breaker size. Both **Normal** and **KWH** points lists allow breaker size to be specified individually for each BC breaker (default = 20A).
The **Normal** points list allows customization of warnings and alarms for each branch circuit as shown in this section (grey background). Not available in the **Power-KHW** points list.	
Warning thresholds (BC 1-42)	Percent breaker size, default = 70%
Alarm thresholds (BC 1-42)	Percent breaker size, default = 80%
Warning time delays (BC 1-42)	Number seconds the warning threshold must be exceeded before a warning is issued, default = 0
Alarm time delays (BC 1-42)	Number seconds the alarm threshold must be exceeded before a warning is issued, default = 0

Table 9. BCMS Alarms and Warnings: Normal and Power-KWH Points Lists

BCMS Alarms and Warnings: Normal and Power-KWH Points Lists BC = branch circuit, PB = panelboard	
Branch Circuit Alarms and Warnings	
Zero current registers (3 registers, 1 bit for each branch circuit)	Alarms for active circuits that go to zero current, one bit set for each BC with zero current reading
Warning registers (3 registers, 1 bit for each BC)	Summary status, one bit set for each BC in warning
Alarm registers (3 registers, 1 bit for each BC)	Summary status, one bit set for each BC in alarm
Quick status alarm (1 register)	Summary alarm for BCs: one bit set for each alarm/warning/zero current register that is in an alarm state
Panelboard Alarms Note: All over/under panelboard alarms are based on thresholds specified in setup.	
Over/under current panelboard	Current to PBs is measured from main feed CTs or computed by BCMS from branch circuits and compared to specified thresholds
Over/under current both panelboards	Current values are summed for both PBs and compared to specified thresholds.
Over/under voltage panelboard	Voltage to PB is outside specified thresholds.

7.3   Alarm Handling

There are four contiguous Modbus registers in both points lists that summarize alarm status for individual branch circuits and panelboards. The BMS should read these registers regularly to be appraised of power conditions requiring immediate attention:

- **Quick status alarm** has a bit set for each of the branch circuit alarm or warning registers:
    - Zero current registers
    - Warning registers
    - Alarm registers
- Over/under current panelboard
- Over/under current both panelboards
- Over/under voltage panelboard

Operation

Chapter 8 Service

8.1 Eaton Large Systems Service and Support Department

With more than 40 years of experience servicing industry-leading power quality equipment, Eaton can help you maintain the reliable performance of your power quality equipment, giving you a higher return on your investment. Our commitment to our products commences with our startup service, continues with our factory Warranty and is continuously maintained through our Preventive Maintenance and Service Contracts.

8.2 Startups

An Eaton Customer Support Engineer (CSE) will get your power quality equipment up and running as you demand. By following our standard startup procedures, you can be assured that you power quality equipment will perform to meet your requirements. Some of the features and benefits are as follows:

- Startup services provide a factory trained CSE to oversee visual inspection of the installation and system calibration.

- Startup service also provides factory trained CSEs to assist with operational training.

8.3 Eaton Service Contracts

Eaton Service contracts help to provide the added insurance that the reliability of your critical power systems is intact. By following our stringent maintenance procedures, Eaton's factory trained Customer Support Engineers provide the added assurance for the availability of critical systems, thereby maximizing the company's profitability. See below for further details.

8.3.1 The Service Promise

With factory-trained technicians in every major city in North America, Eaton can respond rapidly and provide on-site assistance in emergency down time situations. Eaton provides telephone support 24 hours a day, 7 days a week with a direct line to Service (1-800-843-9433).

8.3.2 Preventive Maintenance

During a preventive maintenance visit, Eaton technicians inspect, test, calibrate, update and clean components, as well as update software as applicable. You'll receive a report at the end of the visit detailing the results of the inspection and specific recommendations for remedial actions, proactive replacements, and upgrades.

8.3.3 Eaton Provides Flexibility and Commitment

- We understand that service plans are not "one size fits all." That's why we offer a broad range of service options, designed to meet the varied requirements and applications of businesses of all shapes and sizes. Eaton can modify your contract on variables such as number of PM visits per year, scope of coverage, response time and length of contract.

- Eaton employs 250+ field technicians with an average tenure of more than ten years. Eaton CSEs are experts on Eaton products and receive ongoing product training and certification. Our technicians have expertise in power, electrical engineering, software and connectivity, batteries, UPSs and related products, and can deliver advanced troubleshooting and a reduced mean time to repair.

- When you rely on an Eaton service plan, rest assured that every factory-trained field technician stocks a solid inventory of parts to remedy emergencies.

8.3.4 Time and Materials

In most cases the customer will be covered by startup service or Maintenance Contracts, however, there may be times when the customer needs Eaton service and lacks the benefits that these two packages provide. Therefore, Eaton provides Time and Material coverage for those in need of our customer support engineers.

Service

Chapter 9 Bibliography

Manuals for Related Products

JCOMMs can have an optional Eaton PDI WaveStar Color Monitor or can be monitored from a Eaton PDI WaveStar BCMS Hub.

- Eaton PDI WaveStar® Color Monitor, Setup and Operation, P-164001109

- Eaton PDI WaveStar BCMS Hub Installation and Operation, P-164001108

Points Lists

For Points Lists or BCMS points lists, Contact Eaton Service, See paragraph 2.7 *Getting Help*:

Once the software file is received, unzip the file and open the directory \Points List for BCMS Version to find the following points lists and use the latest revision given:

- **BCMS Normal** panelboard points list is "BCMSII points list".

- **BCMS KWH** panelboard points list is "BCMSII plus points list Power KWH".

- **BCMS IEC** panelboard points list (for IEC format panelboards with 36 or 72 1P circuits) is "72 BCMSII plus points list Europe KWH".

Bibliography

Chapter 10 Glossary

Acquisition board	The central component of a BCMS; PCB containing BCMS software, including points list, that accumulates monitoring data from CTs, computes derived information, declares alarms, and presents power monitoring information to displays and to building management systems.
BCMS	Branch Circuit Monitoring System.
BCMS device	Power distribution elements monitored by a single points list (or Modbus register map) and addressed by a single Modbus address. Example: a panelboard is a BCMS device because it is monitored with one points list and has one Modbus address. An acquisition board can monitor three BCMS devices—two panelboards and one set of subdistribution feeds.
BMS	Building management system
CRU	Customer-replaceable unit.
CT	Current transformer.
Modbus RTU	An industrial communications protocol.
Modbus TCP	Modbus protocol with TCP, which allows higher transmission speeds.
PDU	Power Distribution Unit.
points list	Modbus register map.
RPP	Remote Power Panel
RTU	Remote terminal unit; see Modbus RTU.
scale factor	Ratio of current measured with a current transformer (or voltage by the acquisition board) and an independent measure given by a power meter; used in calibrating BCMS CT measurements.
SNMP	Simple Network Management Protocol.
subdistribution	A large circuit from a PDU that does not feed that PDU's panelboards, but rather runs to another unit, typically an RPP.
THD	Setup option for measuring total harmonic distortion.