POWERLOGIC®
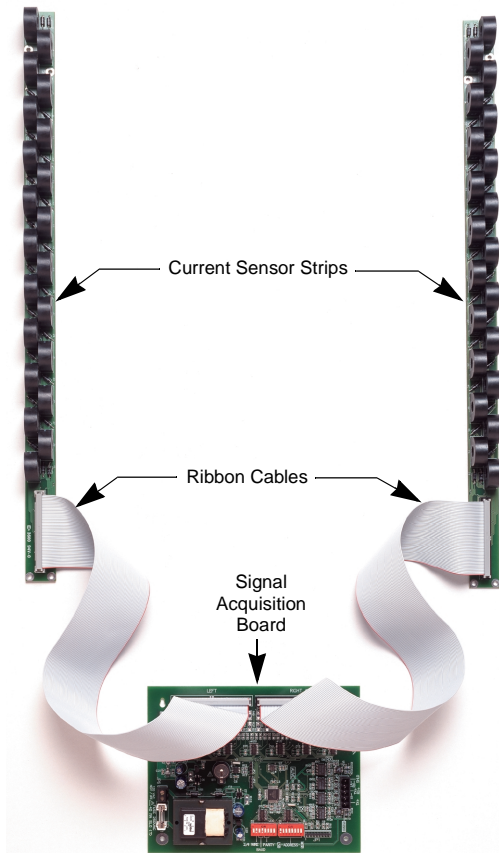## Branch Current Monitor (BCM42)

CONTENTS

Figure 1:   The BCM42 Branch Current Monitor

INTRODUCTION

The Branch Current Monitor (BCM42) is a current sensing device that monitors all poles of a 42-circuit SQUARE D NQOD Panelboard within a power distribution unit. Designed for use in multiple-location data centers, the BCM42 provides branch circuit amperage information. By providing current levels and initiating capacity alarm registers, the BCM42 enables the data center operator to manage power by anticipating overloaded circuit breakers.

The BCM42 consists of a signal acquisition board, two ribbon cables, and two current sensor strips (see Figure 1). The signal acquisition board mounts directly to the panelboard or power distribution unit (PDU). The current sensor strips, each containing 21 current sensors, mount to the left and right sides of the panelboard and align with the load lugs of each branch circuit breaker. The conductor passes through the current sensor and terminates at the corresponding circuit breaker. Through the snap-on ribbon cable, each strip transmits current data to the signal acquisition board, which is equipped with an RS-485 MODBUS communication port for remote data access.

SQUARE D   **#Z102469-0C**   **1**

Parts of the BCM42 Monitor   Figure 2 shows the parts of the BCM42 monitor, while Table 1 describes
these parts.
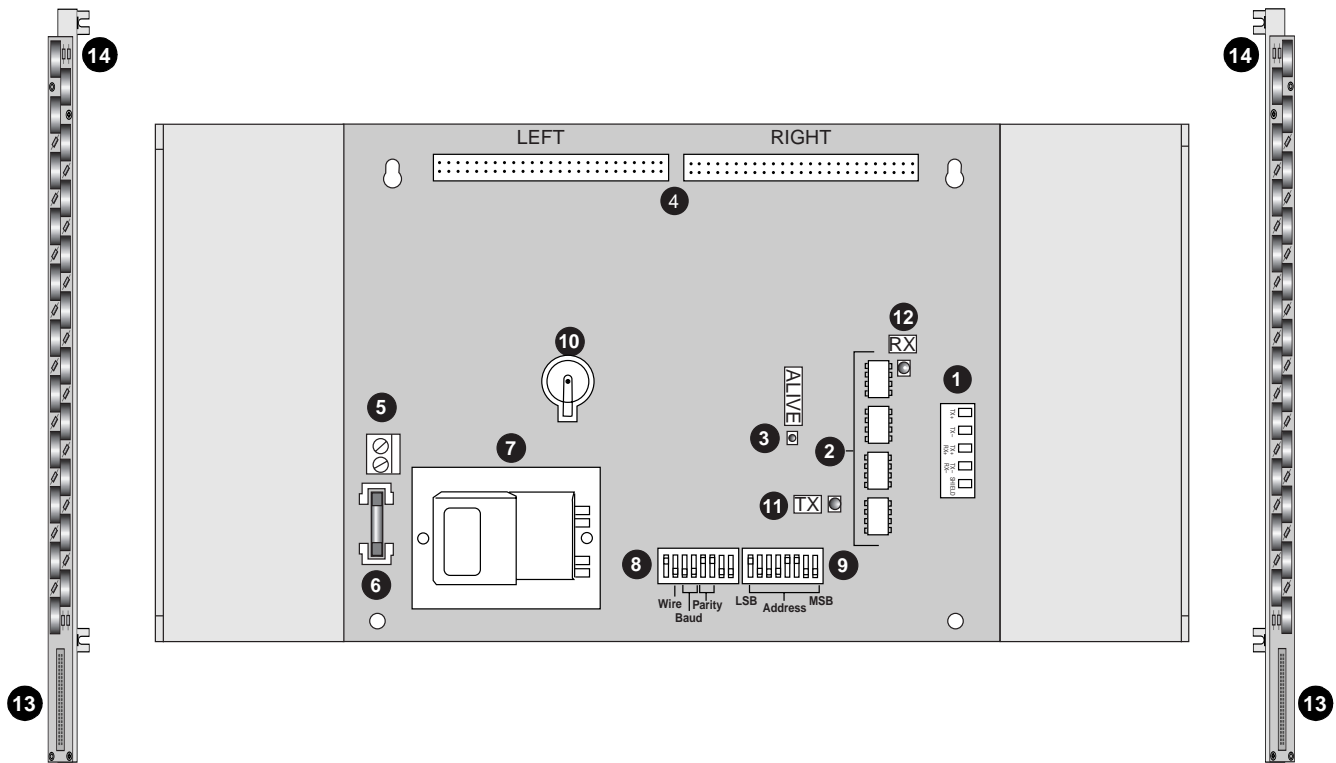
Figure 2:   Parts of the BCM42 Monitor

Table 1:   Parts Description of the Branch Current Monitor

	Part	Description
1	RS-485 communication terminals	Connection used to daisy-chain multiple BCM42 monitors and access data remotely, using a 2-wire or 4-wire MODBUS network.
2	Optical communications isolation	Optical isolators used to separate 120 Vac portions of the circuit from the RS-485 network.
3	"ALIVE" LED	Diagnostic indicator. Flashes once every second to indicate correct operation.
4	50-Pin ribbon cable connections (signal acquisition board)	18-in. ribbon cables provided for snap connection of the current sensor strips to the signal acquisition board.
5	120 Vac power connection	2-wire, 120 Vac, line to neutral, 50/60 Hz.
6	250 Vac, 40 mA slo-blow fuse	Fused power connection for circuit protection.
7	Power transformer	Linear power supply.
8	Communication DIP switches	Field-selectable RS-485 serial interface control.
9	MODBUS address DIP switches	Sets the unique, MODBUS network address of the monitor.
10	Lithium battery	The lithium battery backup allows for retention of configuration and calibration information in case of a power outage.
11	TX LED	Diagnostic indicator. Indicates successful transmission of information over the MODBUS network.
12	RX LED	Diagnostic indicator. Indicates reception of information over the MODBUS network.
13	50-Pin ribbon cable connectors	18-in. ribbon cables snap to connect the current sensor strips to the signal acquisition board.
14	Current sensors	Each current sensor can monitor conductors carrying up to a maximum of 50 amperes. Maximum wire size capacity is #6 THHN, 0.35 in. (9mm) diameter.

INSTALLATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that power is off.
- Replace all device doors and covers before turning on power to this equipment.
- Before energizing the panelboard, all unused spaces must be filled with blank fillers.

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

Installing the Current Sensor Strips

To install the current sensor strips, refer to Figure 3 and follow these steps:

1. Turn off all power supplying this equipment before working on or inside the equipment.
2. Use a properly rated voltage sensing device to confirm that power is off.
3. Loosen, but do not remove, the two panelboard rail screws (A).
4. Face the inside of the current sensor strip mounting bracket toward the circuit breaker and align the current sensors with the circuit breaker load lugs (B).
5. Slide the mounting brackets under the two panelboard rail screws (A), and tighten the screws to firmly hold the current sensor strip in place.
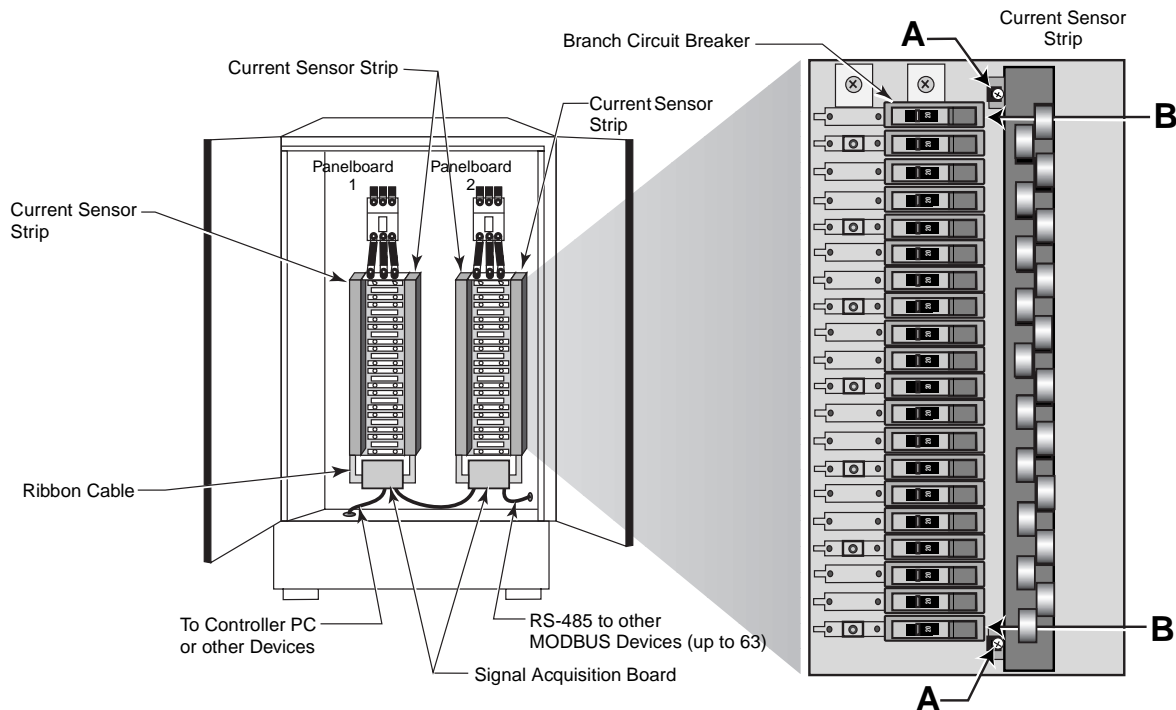6. Repeat steps 1–5 to install the other current sensor strip to other side of the panelboard.

Figure 3:   Installing the BCM42 monitor

Installing the Signal Acquisition Board

Installation of the signal acquisition board depends on the design of the PDU. The signal acquisition board should be barriered from the panelboard. The following is one possible installation location for the signal acquisition board.

To install the signal acquisition board, refer to Figure 4 and follow these steps:

1. Mount the bracket of the signal acquisition board to the screw holes under the panelboard interior.

   NOTE: Other mounting brackets are available. Contact your local sales representative or the factory for sizes.
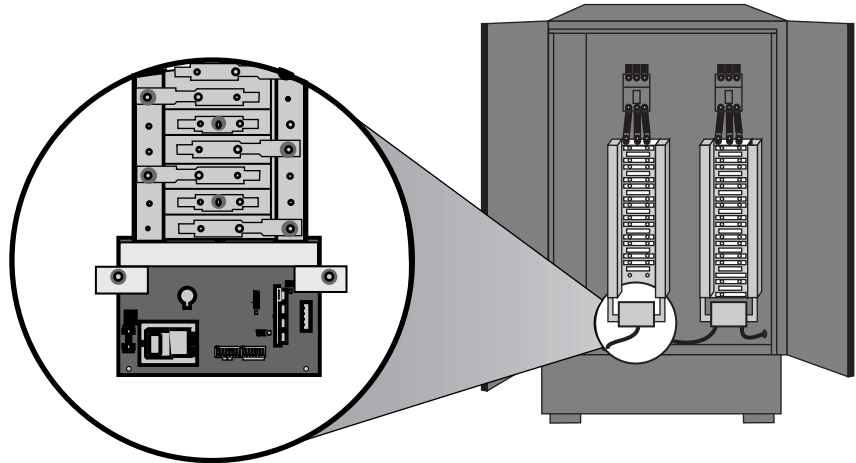

Figure 4: Installing the signal acquisition board

2. Attach the bracket using the screws and bolts provided.
3. Snap the ribbon cables into the connectors on the signal acquisition board and snap the other end of the cables into the connector on the current sensor strips (see Figure 1 on page 1).

COMMUNICATIONS

When daisy-chaining MODBUS devices, follow these guidelines:

- Up to 32 MODBUS devices can be connected together on a daisy chain. A maximum of 63 devices may be connected to the daisy chain if an RS-485 repeater is used.

- Each Modbus device on a daisy chain must have a unique address. Before connecting the BCM42 to the RS-485 communication wires, choose an address that is not in use, and set the switches as described in "Selecting the Network Address" on page 5. If the address conflicts with another device, neither device will communicate.

- To set up communications for the BCM42, set the communication and MODBUS DIP switches on signal acquisition board to select wiring type, baud rate, and parity (as described on page 5). The settings for these parameters must match the other devices on the daisy chain.

- Use shielded, twisted-pair wire (Belden Cable 1120A or equivalent) for the MODBUS cables. Do not ground the shield inside the electrical panel. Insulate all MODBUS wires, including the shield, to avoid contact with higher (Class 1) voltage conductors.

- Terminate the last device in the daisy chain. If the BCM42 monitor is the last device, see "Terminating the BCM42 Monitor" on page 8.

Selecting the Wiring Type, Baud Rate, and Parity Communication DIP Switches

Refer to Figure 2 on page 2 for the location of the wire type, baud rate, and parity communication DIP switches. Switches 1, 7, and 8 are unused and should remain in the default OFF positions. Table 2 lists the possible settings. Figure 5 is an example of the default switch setting for 2-wire, 9600 baud, and no parity (None).

Table 2: Baud rate and parity switch settings

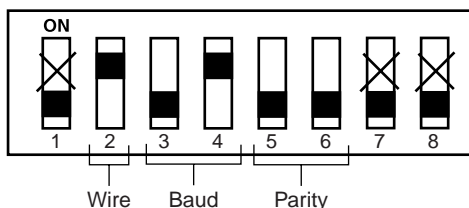| Parameter		Switch Number and Setting							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Wire Type	2-wire	—	ON					—	—
	4-wire	—	OFF					—	—
Baud Rate	2400	—		OFF	OFF			—	—
	4800	—		ON	OFF			—	—
	9600	—		OFF	ON			—	—
	19200	—		ON	ON			—	—
Parity	None	—				OFF	OFF	—	—
	Even	—				ON	OFF	—	—
	Odd	—				OFF	ON	—	—

Figure 5: Default switch settings (2-wire, 9600 baud, NO parity)

Selecting the Network Address

Each BCM42 monitor on the daisy chain must have a unique network address from 1–247. Monitors with the same address will be unable to communicate. Set the address before you connect the monitor to the daisy chain. Refer to Figure 2 on page 2 for the location of the address DIP switches.

The values of each DIP switch are listed in Table 3. To determine the address of the monitor, add the values of the switches that are set to ON. For example, in Figure 6 switch number 4 has an ON value of 8 and switch number 6 has an ON value of 32, so the address is 40 (8 + 32 = 40). To assist you in quickly setting addresses from 1–63, Figure 7 on page 6 shows a graphical representation of all 63 address settings.
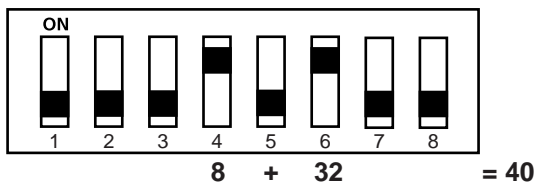

8 + 32 = 40

Figure 6: MODBUS Address DIP switch values

Table 3: Address switch values

Switch / Value
1 = 1
2 = 2
3 = 4
4 = 8
5 = 16
6 = 32
7 = 64
8 = 128

DO NOT USE ZERO 1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20 21

22 23 24 25 26 27 28 29 30 31 32

33 34 35 36 37 38 39 40 41 42 43

44 45 46 47 48 49 50 51 52 53 54

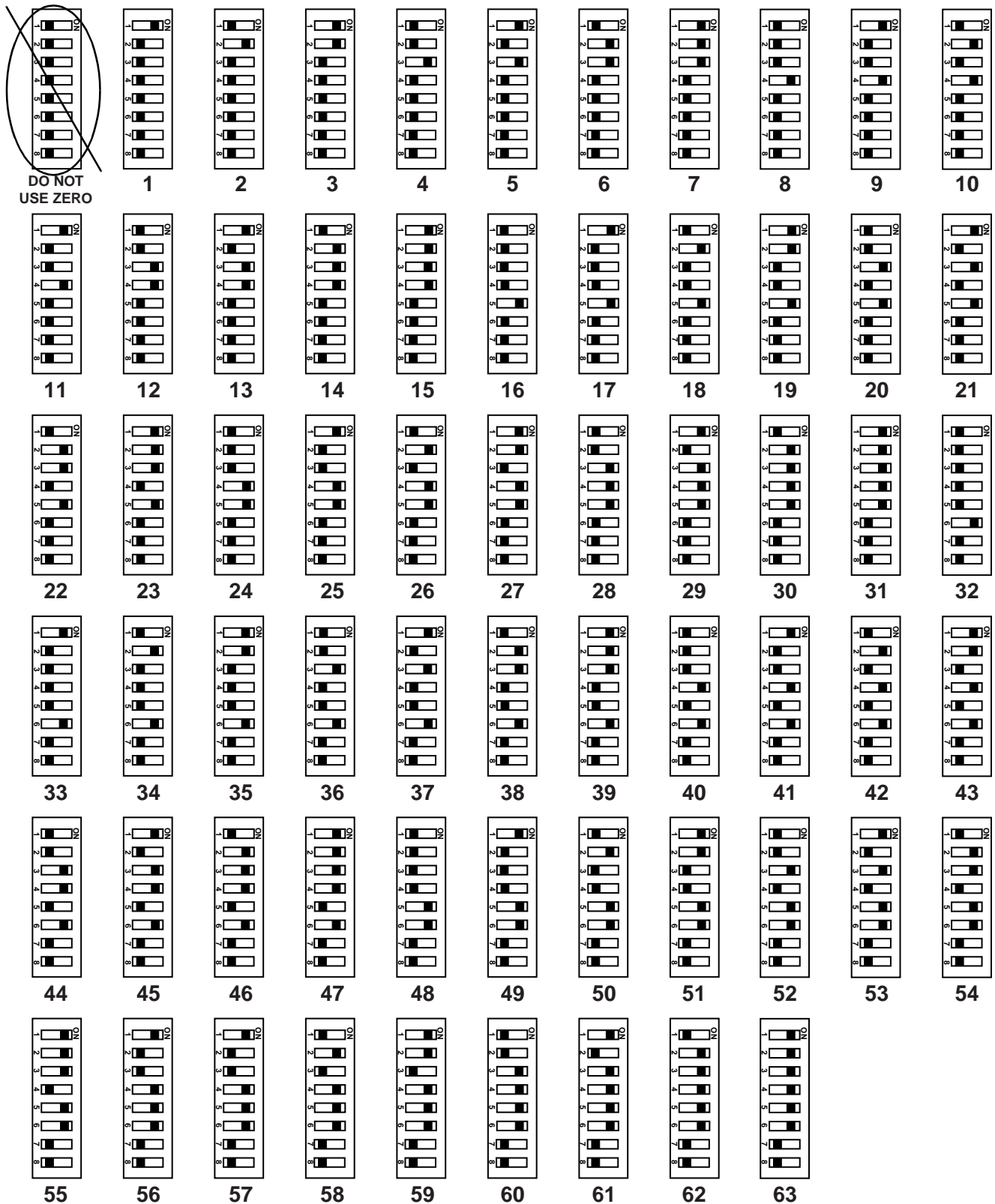55 56 57 58 59 60 61 62 63

Figure 7:   Address selection switches from 1 to 63

Making the Communications Connections

For this procedure, you can remove the connector from the signal acquisition board and reinstall it after you have installed the wiring. To wire the communications, follow these steps:

1. Wire the communications connector of the BCM42, as shown in Figures 8 or 9.

   NOTE: The wire type setting on the communication DIP switch must match this wiring type.

2. Using a small flat blade screwdriver, tighten the connector screws.

3. If the BCM42 is the last device on the daisy chain, terminate it following the instructions in "Terminating the BCM42 Monitor" on page 8.

4. Reinstall the connector back into the signal acquistition board.
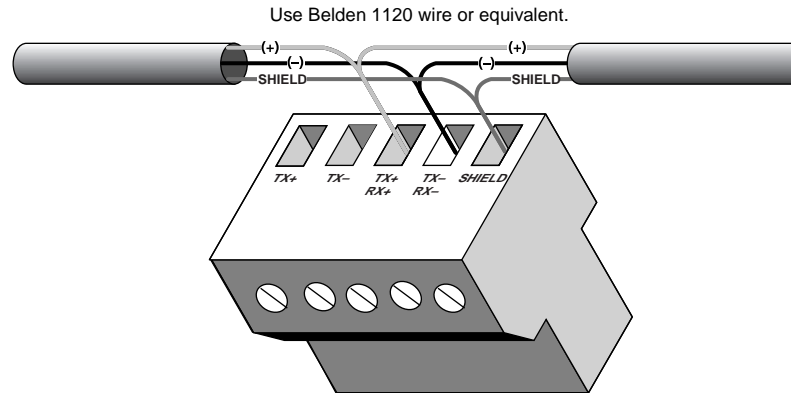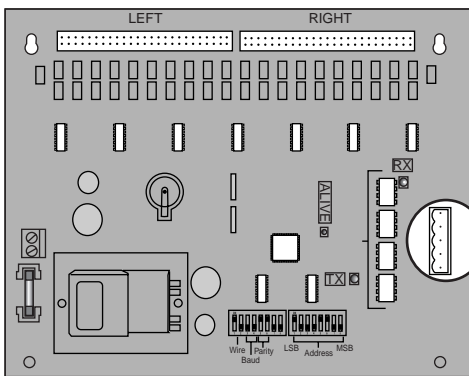
5. Secure the communications cable in the enclosure.
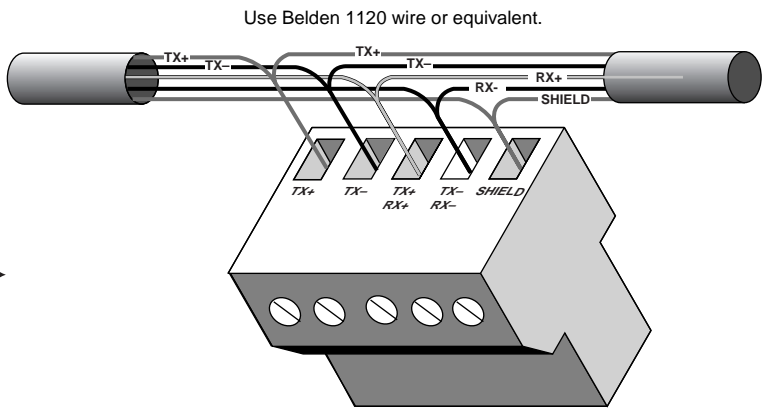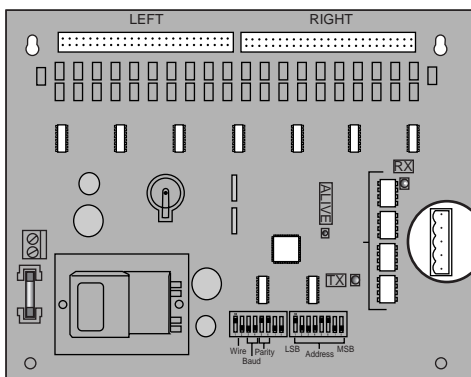
Figure 8:   2-wire communications wiring

Figure 9:   4-wire communications wiring

Terminating the BCM42 Monitor

If the BCM42 monitor is the last device, terminate it using the 3090MCTAS485 terminator to ensure reliable communications. Refer to Figure 10 and follow these steps:

1. Insert the wires of the daisy chain as described in "Making the Communications Connections" on page 7, and insert the wires of the terminator into the holes of the RS-485 communications connector.

2. Using a small flat blade screwdriver, tighten the connector's screws.

3. Reinstall the connector back into the signal acquisition board.

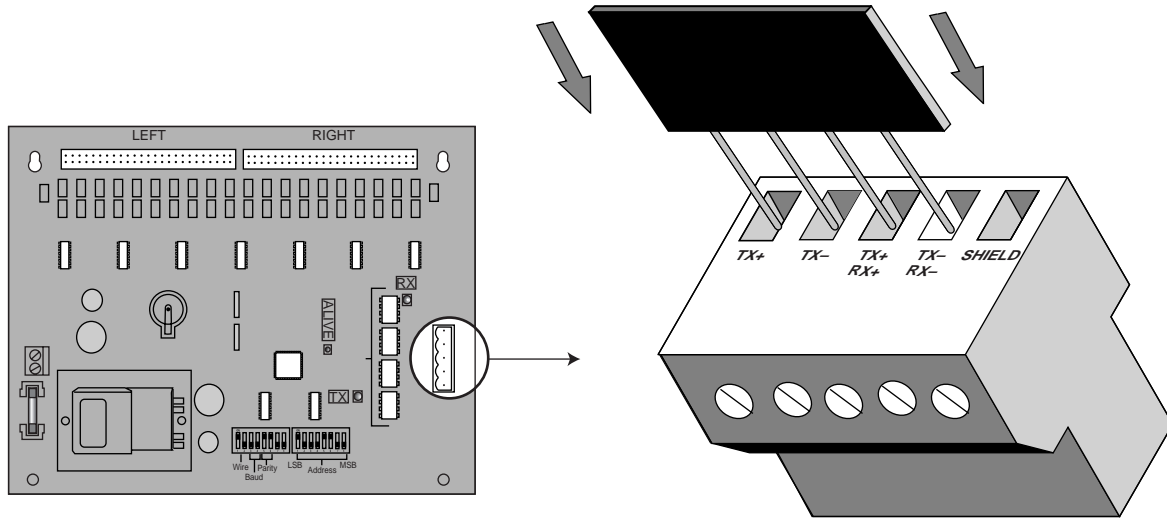4. Secure the communications cable in the enclosure.

Figure 10: Installing the 3090MCTAS485 terminator

WIRING

<table>
<tr><td colspan="2">

⚠ **DANGER**

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that power is off.
- Replace all device doors and covers before turning on power to this equipment.
- Before energizing the panelboard, all unused spaces must be filled with blank fillers.

Failure to observe this instruction will result in death or serious injury.
</td></tr>
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Wiring Through the Current Sensors

Current sensors accommodate #6 THNN sized conductor, 0.35 in. (9 mm) diameter maximum. Use insulated wire only. For each circuit breaker, pass the wiring through the corresponding current sensor and attach it to the load lug on the end of the circuit breaker as shown in Figure 11 (A). Observe local codes and the wire manufacturer's recommendations for bending radius.
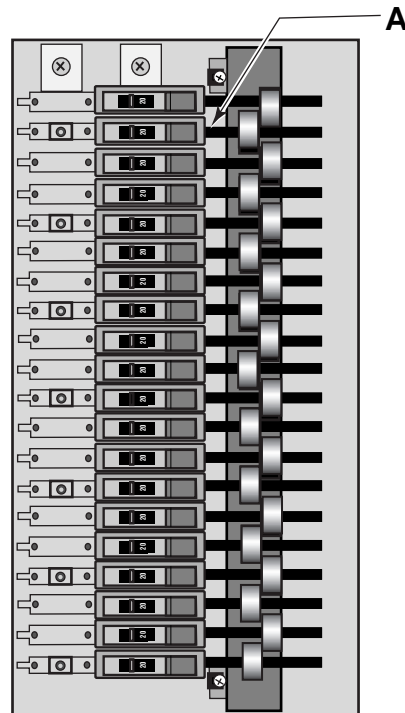

Figure 11: Pulling the cables

**Wiring the Power Supply to the
Signal Acquisition Board**

To connect the power supply, follow these steps:

1. Connect the 2-wire, 120 Vac power source to the power terminals on the signal acquisition board (Figure 12).
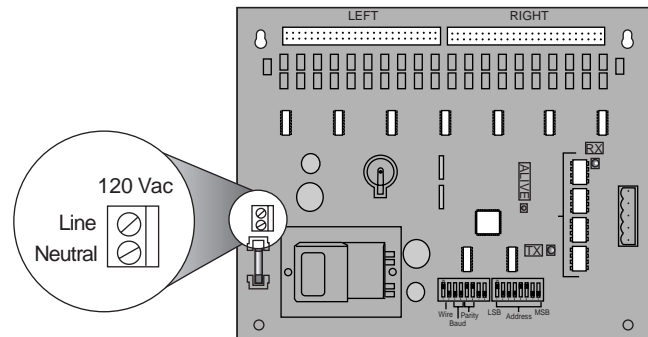

Figure 12: Wiring the power to the BCM42 monitor

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

• Remove all foreign objects such as metal scraps or tools from the panelboard or power distribution unit enclosure.

• Close all enclosure doors.

Failure to observe this instruction will result in death or serious injury.

2. Replace all device doors and covers before turning on power to this equipment.
3. Restore power to the panelboard or power distribution unit.
4. Using the BCM software or System Manager™ Software (System Support add-on available after 3/2001), configure the following circuit breaker settings:

• circuit breaker size

• warning alarm levels and time delay

• critical alarm levels and time delay

TROUBLESHOOTING

Table 4: Troubleshooting

Problem	Possible Solution
ALIVE LED does not illuminate.	Check the fuses and voltage connections.The ALIVE LED should blink regardless of MODBUS connections and DIP switch settings.
BCM42 monitor interferes with another Modbus device on the communication string.	Set the DIP switches to a MODBUS address that is not in use.

MAINTENANCE

Before working on this equipment, follow these safety precautions:

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that power is off.
- Replace all device doors and covers before turning on power to this equipment.
- Before energizing the panelboard, all unused spaces must be filled with blank fillers.

Failure to observe this instruction will result in death or serious injury.

Changing the Battery

To change the 5-year lithium battery, follow these steps:

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Use only Type CRF 1220 lithium battery or equivalent.
- Dispose of battery according to the manufacturer's instructions.

Failure to observe this instruction will result in death or serious injury.

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1. Turn off the power to the panelboard or power distribution unit, and verify that the power supply to the signal acquisition board is turned off.
2. Remove the old lithium battery, taking care not to short the battery terminals.
3. Install the new lithium battery, Type CRF 1220 or equivalent.
4. Reconnect the power supply to the signal acquisition board.
5. Close the enclosure doors and restore power to the panelboard or power distribution unit.

Changing the Fuse

If the fuse is blown, use only 250 Vac / 40 mA, Slo-Blow T, 5x20 mm, Littlefuse 218 series or equivalent. Follow these steps to replace it:

1. Turn off the power to the panelboard or power distribution unit, and verify that the power supply to the signal acquisition board.
2. Remove the old fuse and replace it with the new one.
3. Reconnect the power supply to the signal acquisition board.
4. Close the enclosure doors and restore power to the panelboard or power distribution unit.

SPECIFICATIONS

Table 5:   Specifications

Type	Description
General	
Operating Temperature Range	0 to 60°C (< 95% relative humidity, non-condensing)
Storage Temperature Range	−40°C to 70°C
Power Source	120 Vac (+10/−25%), line-to-neutral, 50/60 Hz
Primary Fusing	250 Vac / 40 mA Type T Slo Blo, 5x20 mm, Littlefuse 218 series or equivalent
Measured Current Inputs	
Number of Channels	42
Frequency	50/60 Hz
Sample Frequency	1280 Hz
Update Rate	1.2 seconds
Measured Current Range	0–50 A (with maximum conductor size #6 THHN)
Accuracy	±5% of reading from 5 A to 50 A
Overload Capability	Tested to 10,000 A single-cycle
Connection to Conductor	Solid-core toroid
Network Communications	
Type	MODBUS RTU
Connection	DIP switch-selectable 2-wire or 4-wire
Address	DIP switch-selectable address 1 to 247
Baud Rate	DIP switch-selectable 2400, 4800, 9600, 19200
Parity	DIP switch-selectable NONE, ODD, EVEN
Communication Format	8-data-bits, 1-start-bit, 1-stop-bit
Termination	5-position pluggable connector
Configuration Defaults	
Breaker Size	20 A (configurable)
Warning Alarm Level	60% of current sensor max. (configurable)
Critical Alarm Level	70% of current sensor max. (configurable)
Listings	
UL	UL Listed under Standard 508 as an "open type device."
	Critical components evaluated to UL 1950.
Lithium Battery Life	5 years (replace with Type CRF 1220 or equivalent).

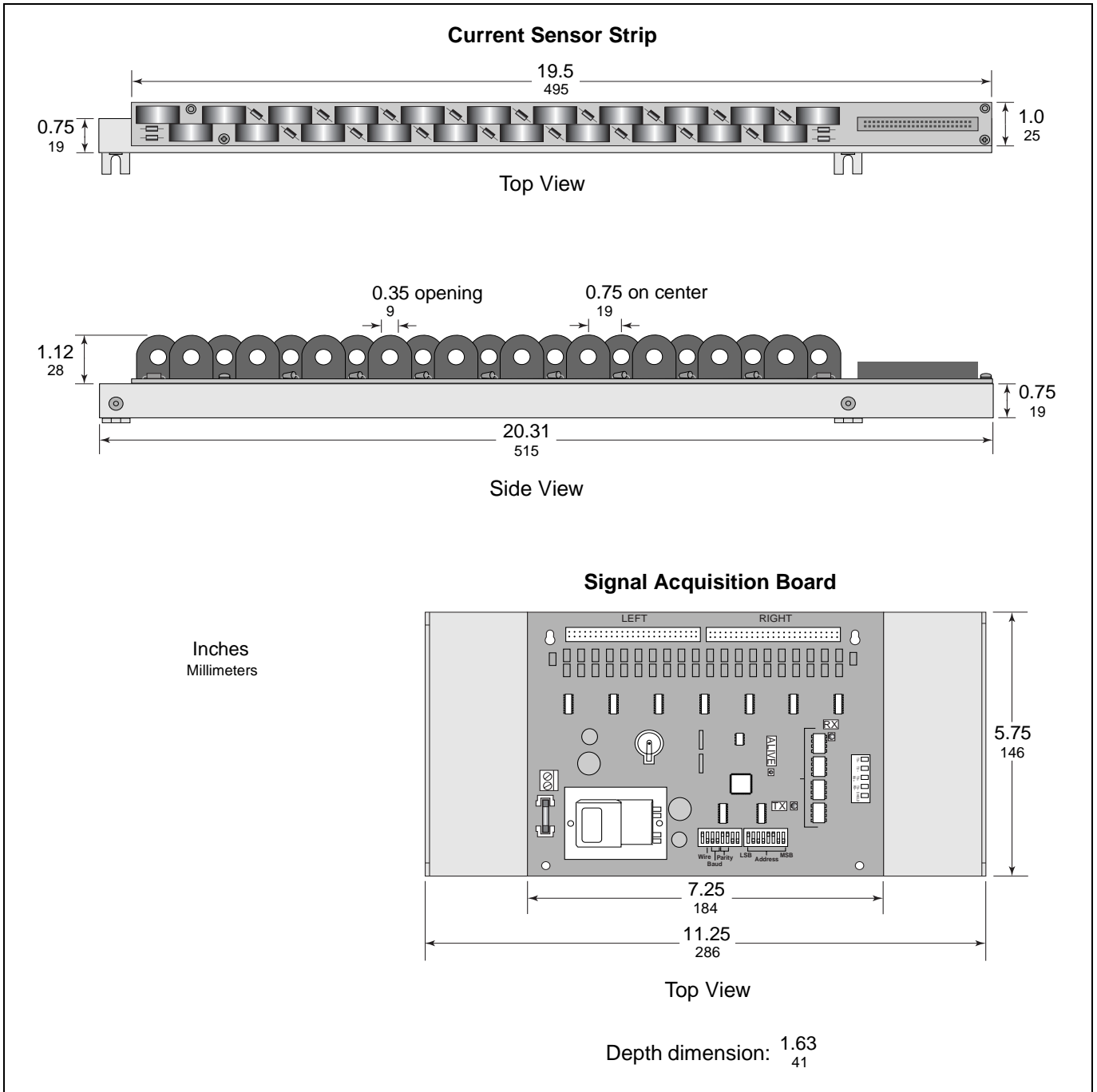## APPENDIX A—DIMENSIONS

**Figure 13: Branch circuit monitor dimensions**

APPENDIX B—SYSTEM MANAGER SOFTWARE: DEVICE SUPPORT FOR THE BCM42

This section explains how to establish communications between System Manager Software (SMS) and a BCM42. Before you begin, you should be familiar with device setup and communication within SMS. New SMS users might want to review the Quick Starts in the SMS online help file.

NOTE: Add-on device support software is scheduled for availability 3/2001.

BCM42 Setup Dialog Box in SMS

Use the BCM42 Setup Device dialog box (shown below) to set up the parameters for the BCM42.
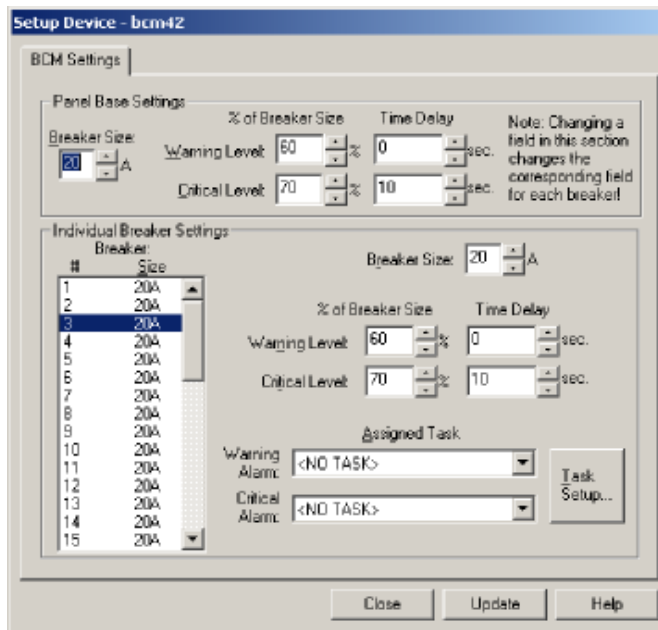
Any changes to the top section will also change all individual circuit breaker settings. Enter the information for the panel base settings first, then enter any settings that are different for individual circuit breakers. The drawing below illustrates the individual circuit breaker positions.
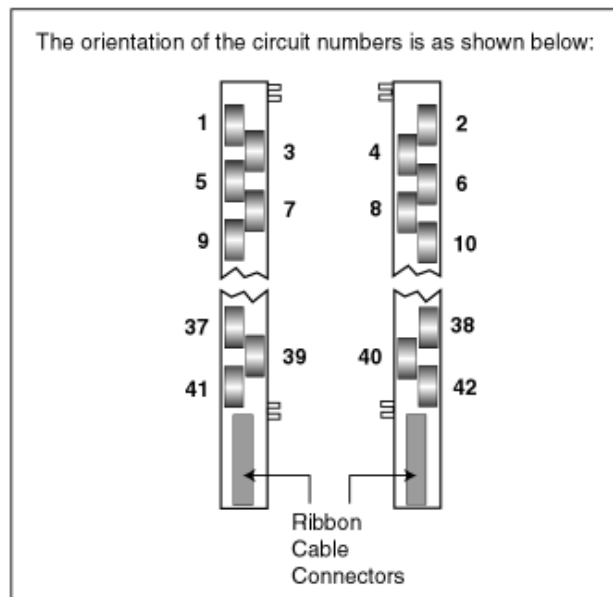
Figure 14: BCM42 setup and circuit breaker orientation

Adding the BCM42 as a Device to SMS

To add the BCM42 as a device to SMS, follow these steps:

1. Add the device and its route. If you need more instructions, see the SMS Quick Starts.
2. Enter the appropriate settings for the circuit breakers.

   See the BCM42 Software Help for help with each setup field. Use the top box of the dialog box, Panel Base Settings, to enter settings for all circuit breakers in the panelboard that the BCM42 is monitoring.

   NOTE: Anything you enter in this box becomes the setting for every circuit breaker in the panelboard.

3. If the majority of the circuit breakers have the same settings, but you want to change the settings for individual circuit breakers, follow this procedure:
   - First, use the Panel Base Settings box to enter the common settings for the majority of the circuit breakers.
   - Second, use the Individual Breaker Settings box to enter the settings for individual circuit breakers.

Using Alarms in SMS

Using SMS, you'll be able to establish audible PC alarms, as well as having the BCM42 alarms appear in an active alarm list. SMS reads the on-board alarms from the BCM42, and reports the alarm status from the device. See the SMS Quick Starts for instructions on setting up alarms within SMS.

Using Scheduled Tasks in SMS

You can use SMS to set up two kinds of tasks: program tasks and mail tasks. To begin setting up tasks, click Task Setup at the bottom right of the BCM Settings dialog box. See the SMS Quick Starts for instructions on setting up these tasks.

NOTE: When you open the Tasks dialog box to set up a task, you'll see several types of tasks; only the "exe" and mail tasks are functional for the BCM42.

Electrical equipment should be serviced only by qualified maintenance personnel. No responsibility is assumed by Square D for any consequences arising out of the use of this material.

SQUARE D