Instruction Bulletin

63230-216-213/A1
6/2001

POWERLOGIC® Energy Meter Communication Board

Installation

SQUARE D
Schneider Electric

Z102878-0A

NOTICE

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. This document is not intended as an instruction manual for untrained persons. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this manual.

Class A FCC Statement

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 designated 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.

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CHAPTER 1—INTRODUCTION

OVERVIEW

This document contains installation and operation instructions for the POWERLOGIC® Energy Meter Communication Card (EMCB). Before installing the EMCB (shown in Figure 1–1), you should have a general understanding of the POWERLOGIC Power Monitoring and Control System and related products and technology.

For more information about the POWERLOGIC System, refer to the following documents:

- POWERLOGIC System Architecture and Application Guide
- POWERLOGIC System Manager Software 3000 Setup Guide
- POWERLOGIC Energy Meter Instruction Bulletin

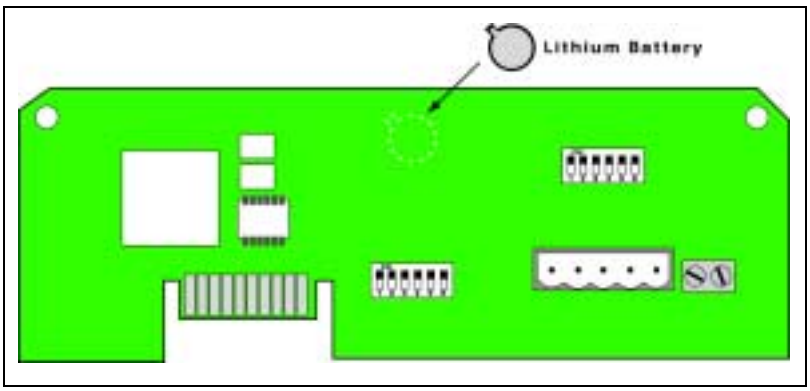

Figure 1–1: Energy Meter Communication Card

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WHAT IS AN ENERGY METER COMMUNICATION CARD?

The POWERLOGIC Energy Meter Communication Card (EMCB) is an optional field-installable card for the POWERLOGIC Energy Meter. The EMCB provides a means for MODBUS RTU protocol. The EMCB also enables the energy meter to provide true kW demand information.

Specifications

The easy-to-install EMCB thus provides a simple, cost-effective way to network energy meters.

Table 1–1 lists the specifications of the EMCB.

Table 1–1: EMCB Specifications

Communications	MODBUS
Output Type	MODBUS RTU
Connection	2-wire or 4-wire selectable
Baud Rate	2400, 4800, 9600, 19200
Parity	None/Odd/Even selectable
Address	1–63
Displayed Data:	
Energy	kWh
Real Power	kW, per phase and total
Reactive Power	kVar, total
Power Factor	per phase and total
Max Power	kW max
Voltage (V)	per phase and average
Current (A)	phase and average
Demand	kWD
Agency Compliance	UL, CUL

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CHAPTER 2—SAFETY PRECAUTIONS

This chapter contains important safety precautions that must be followed before attempting to install, service, or maintain electrical equipment. Carefully read and follow the safety precautions outlined below.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Only qualified workers should install this equipment. Such work should be performed only after reading this entire set of instructions.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Turn off all power supplying the energy meter and the equipment in which it is installed before installing the EMCB.
- Use a properly rated voltage testing device to verify that power has been turned off.
- Beware of potential hazards, wear personal protective equipment, and carefully inspect the work area for tools and objects that may have been left inside the equipment.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.

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

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CHAPTER 3—INSTALLATION

DESCRIPTION

This section identifies EMCB components and provides installation instructions. Figure 3–1 shows the components of the EMCB. Table 3–1 identifies those components and explains their functions. If the LEDs are not functioning correctly, see “Troubleshooting” on page 15 for instructions.

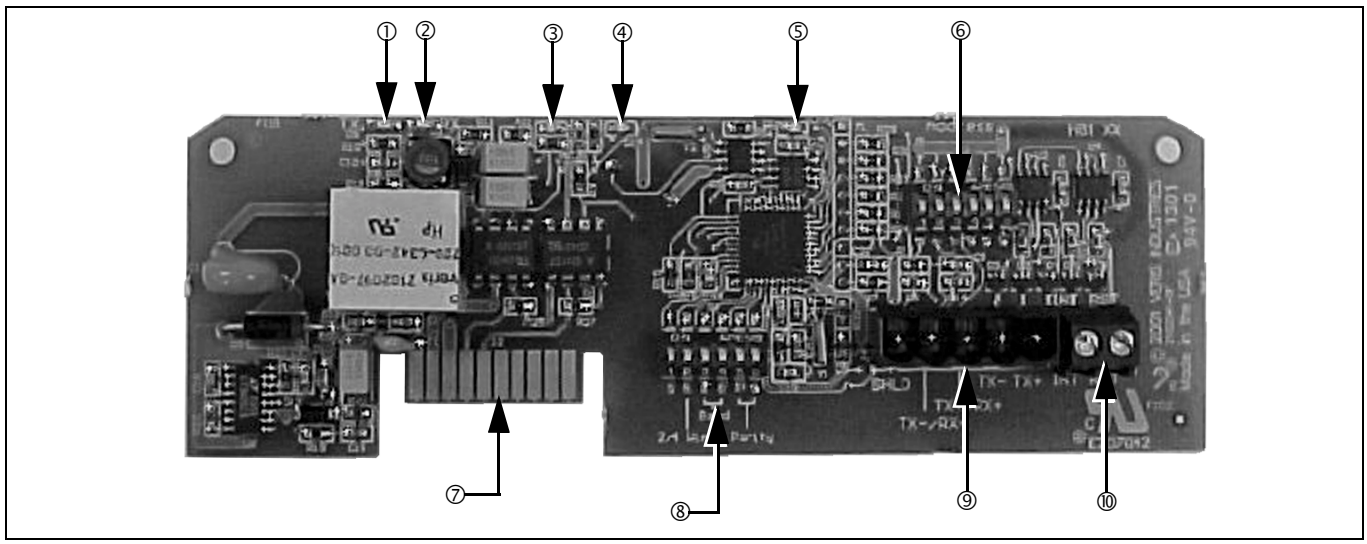

Figure 3–1: Bottom view of the EMCB, illustrating communication points

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Table 3–1: Energy Meter Communication Board Components

Ref. No.	Item	Description
1	RS-485 LED (TX)	Red LED; blinks to indicate that the EMCB is reciving data from the master.
2	RS-485 LED (RX)	Red LED; blinks to indicate that the EMCB is transmitting data to the master.
3	LED from main board (RX)	Green LED; blinks to indicate that the EMCB is receiving data from the main board.
4	LED from main board (TX)	Green LED; blinks to indicate that the EMCB is transmitting data to the main board.
5	“Alive” LED	Green LED; should blink once per second to indicate normal operation of the EMCB.
6	MODBUS address DIP switches	Use these DIP switches to set the network address for the EMCB.
7	Male connection to energy meter	Install the EMCB in the energy meter by inserting this connector into the connection slot of the energy meter.
8	Communication DIP switches	Use these DIP switches to set the EMCB wiring type, baud rate, and parity.
9	RS-485 communication terminals	Insert the RS-485 connector into these terminals. See Figure 3–4 on page 9 and Figure 3–5 on page 10 for instructions on wiring the connector for 2-wire or 4-wire communication.
10	End of demand subinterval terminal	Use this terminal as the input connector for “end of demand interval” signal from the utility or other source.

This section describes the communications settings you must make to the EMCB. When daisy-chaining MODBUS devices, follow these guidelines:

- You can connect up to 32 MODBUS devices on a single daisy chain. A maximum of 63 devices can be connected to the daisy chain if an RS-485 repeater is installed.
- Each MODBUS device on the daisy chain must have a unique address. Before connecting the EMCB to the RS-485 communication wires, set the address according to directions in “Selecting the Network Address—MODBUS Address DIP Switches” on page 7. If you assign the same address to two devices, neither device will communicate.
- Set the wiring type, baud rate, and parity according to directions in “Selecting Wiring Type, Baud Rate, and Parity—Communication DIP Switches” on page 7. The settings for each EMCB must match the other devices on its daisy chain.
- For MODBUS cables, use shielded, twisted-pair wire. (For 4-wire use Belden Cable 8723 or 9847or equivalent. For 2-wire use Belden 9841 or equivalent.)
- Terminate the last device on the daisy chain. If the EMCB is the last device, see instructions in “Terminating the EMCB” on page 11.

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SELECTING THE NETWORK ADDRESS—MODBUS ADDRESS DIP SWITCHES

Use the MODBUS address DIP switches (see Figure 3–1 on page 5 for their position) to select the network address. Each EMCB on a daisy chain must have a unique network address (from 1–63). Devices with the same address will be unable to communicate.

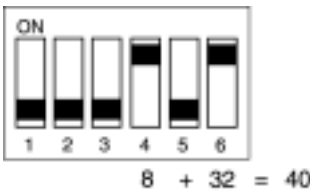
Always set the address before you install the EMCB in the energy meter and before you connect the energy meter to the daisy chain.

Each of the six DIP switches has a unique address value, Table 3–2 lists the value for each switch. Figure 3–2 gives an example of how a network address is set.

See “MODBUS Address DIP Switch Settings” on page 17 for a complete illustrated listing of the switch combinations for every address (1–63).

Table 3–2: MODBUS DIP Switch Values

Switch	Value
1	1
2	2
3	4
4	8
5	16
6	32



In this example, the network address for the device is 40. From Table 3–2, you can see that switch 4 and 6 offer the only combination of values that total 40.

This figure illustrates how to set the switches. Up is ON; down is OFF.

Figure 3–2: Setting the MODBUS DIP Switches

SELECTING WIRING TYPE, BAUD RATE, AND PARITY—COMMUNICATION DIP SWITCHES

Use the communication DIP switches (see Figure 3–1 on page 5 for their position) to set the EMCB wiring type, baud rate, and parity.

Table 3–3 lists the baud rate and parity switch settings.

Figure 3–3 on page 8 illustrates the locations of the switches that control wiring, baud rate, and parity.

Table 3–3: Wiring, Baud Rate, and Parity Settings

Parameter		Switch Number and Setting					
		1	2	3	4	5	6
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	—				ON	ON

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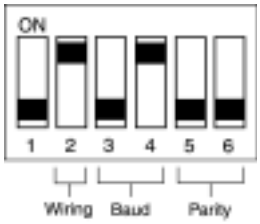

Switch 1 is unused. Always leave it in the OFF position.

This example illustrates the default switch settings for a 2-wire device that uses 9600 baud rate no parity.

Figure 3–3: Setting the Communication DIP Switches

RS-485 COMMUNICATIONS

This section describes the procedures for wiring the communications connection and terminating the EMCB (if it is the last device in its daisy chain).

Daisy Chain Maximum Distances

The maximum number of devices capable of being supported on a single daisy chain is determined based on the combination of baud rate, the length of the daisy chain, and the types of RS-485 devices (2-wire/4-wire) on the daisy chain. The RS-485 interface will support daisy chains that fall within the specifications shown in Tables 3–4 and 3–5.

Table 3–4: 4-Wire Daisy Chain Maximum Distances

Baud Rate	Maximum Distances	
	1–16 Devices	17–32 Devices
1200	10,000 ft. (3,048 m)	10,000 ft. (3,048 m)
2400	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
4800	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
9600	10,000 ft. (3,048 m)	4,000 ft. (1,219 m)
19200	5,000 ft. (1,524 m)	2,500 ft. (762 m)
38400	5,000 ft. (1,524 m)	1,500 ft. (457 m)

Table 3–5: 2-Wire Daisy Chain Maximum Distances

Baud Rate	Maximum Distances	
	1–8 Devices	9–16 Devices
1200	10,000 ft. (3,048 m)	10,000 ft. (3,048 m)
2400	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
4800	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
9600	10,000 ft. (3,048 m)	4,000 ft. (1,219 m)
19200	5,000 ft. (1,524 m)	2,500 ft. (762 m)
38400	2,500 ft. (762 m)	1,500 ft. (457 m)

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Wiring the RS-485 Communications Connector

For this procedure, remove the connector from the RS-485 communication terminals of the EMCB (see Figure 3–1 on page 5). To wire RS-485 communications, follow these steps:

1. Wire the communications connector as shown in Figure 3–4 (2-wire communication) or Figure 3–5 (4-wire communication).

   NOTE: The Wire Type setting in the communication DIP switch must match this wiring type (see Table 3–3 for communication DIP switch settings).

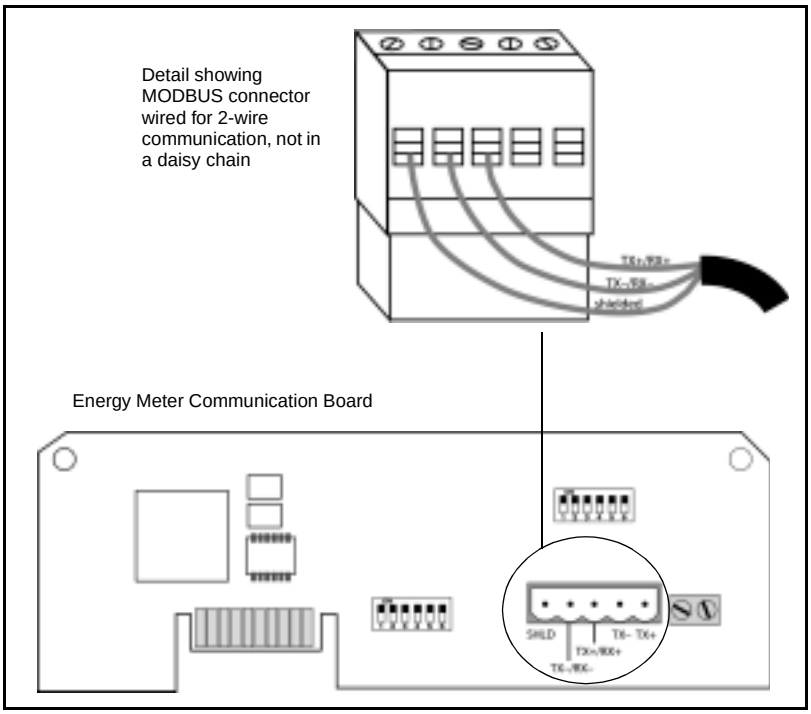

Figure 3–4: 2-wire Communications Wiring

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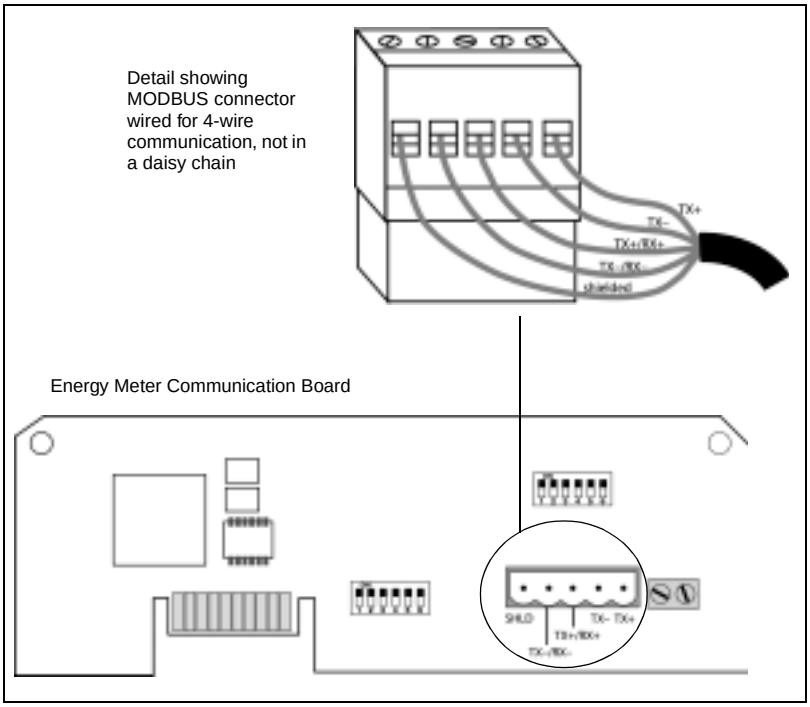

Figure 3–5: 4-wire Communications Wiring

2. Use a small, flat-blade screwdriver to tighten the connector screws.
3. Replace the connector on the RS-485 communication terminals of the EMCB.
4. If the EMCB is the last device on the daisy chain, terminate it, following directions in “Terminating the EMCB”.

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Terminating the EMCB

If the EMCB is the last device in a daisy chain, you need to terminate it to ensure reliable communication. To terminate the EMCB, use a 3090MCTAS485 terminator. (If you did not order a terminator when you ordered your EMCB, you must order it separately.) Follow these instructions to terminate the EMCB:

1. Insert the wires from the daisy chain into the terminals of the connector, following the instructions in “Wiring the RS-485 Communications Connector”.
2. Before tightening the connector screws, insert the wires of the terminator into the connector (see Figure 3–6).

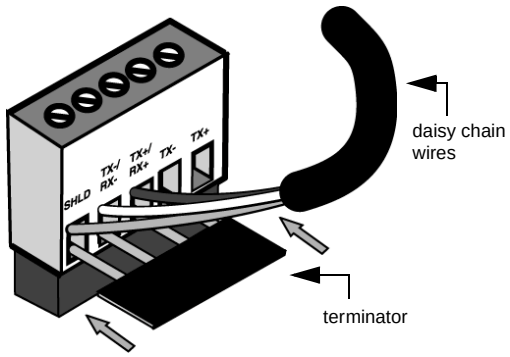

Figure 3–6: Installing the 3090CTAS485 Terminator

3. Use a small, flat-blade screwdriver to tighten the connector screws.

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INSTALLING THE EMCB

This section provides information on installing the EMCB in the energy meter.

NOTE: Before you begin this procedure, first set the wiring, baud rate, and parity, using the communication DIP switches; and set the network address, using the MODBUS address DIIP switches.

The EMCB is designed as a plug-and play accessory for the POWERLOGIC energy meter. Follow these instructions to install the EMCB into the energy meter.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Remove the voltage terminal and all fuses from the energy meter.
- Turn off all power to the energy meter and the equipment in which it is installed. To turn off power to the energy meter, do this:
  a. Remove the voltage terminal from the energy meter and all fuses.
  b. Always use a properly rated voltage sensing device to confirm that power is off.
- Use a properly rated voltage sensing device to confirm that all power is off.

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

1. Turn off all power to the energy meter and the equipment in which it is installed. To turn off power to the energy meter, do this:
   a. Remove the voltage terminal from the energy meter and all fuses.
   b. Always use a properly rated voltage sensing device to confirm that power is off.

CAUTION

ESD-SENSITIVE COMPONENTS

Use an anti-static or grounding strap (customer-supplied) to ground yourself and discharge any static charge before installing the EMCB. Static can damage electrostatic discharge-sensitive components in the circuit monitor and its accessories.

Failure to follow this instruction can result in equipment damage.

2. To discharge static, follow the instructions that come with your anti-static or grounding strap.
   NOTE: We recommend using an anti-static or grounding strap until you have completed installation of the EMCB.

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3. Slide the EMCB into the grooves in the energy meter. (Figure 3–7) The sides of the EMCB slide down into the channels on either side of the energy meter. When the male connection to the energy meter clicks into place, the EMCB is properly installed.

Figure 3–7: Inserting the EMCB into the energy meter.

4. Insert the RS-485 connector onto the RS-485 communication terminals (Figure 3–1 on page 5).
5. If using the subinterval feature, wire into the “end of demand subinterval terminal.”
6. Replace the voltage terminal into the energy meter and all fuses.
7. Verify that the green Alive LED is blinking on the board. If the LED is not lit, see “Chapter 4—Troubleshooting” on page 15.

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CHAPTER 4—TROUBLESHOOTING

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified personnel.
- Qualified persons performing diagnostics or troubleshooting that require electrical conductors to be energized must comply with NFPA 70 E - Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards - 29 CFR Part 1910 Subpart S - Electrical.

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

This section covers the solutions for some of the common problems you might encounter with the EMCB.

There are five LEDs that indicate various types of communication. Figure 4–1 indicates the locations of these LEDs. All LEDs will blink when operating normally.

If there is a problem communicating, first be sure that the board is properly seated in its slot on the energy meter. Verify that the sides of the EMCB are in the slots on the sides of the energy meter and that the connector has clicked into place in the connection slot of the energy meter.

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See Table 4–1 for other communication problems and solutions.

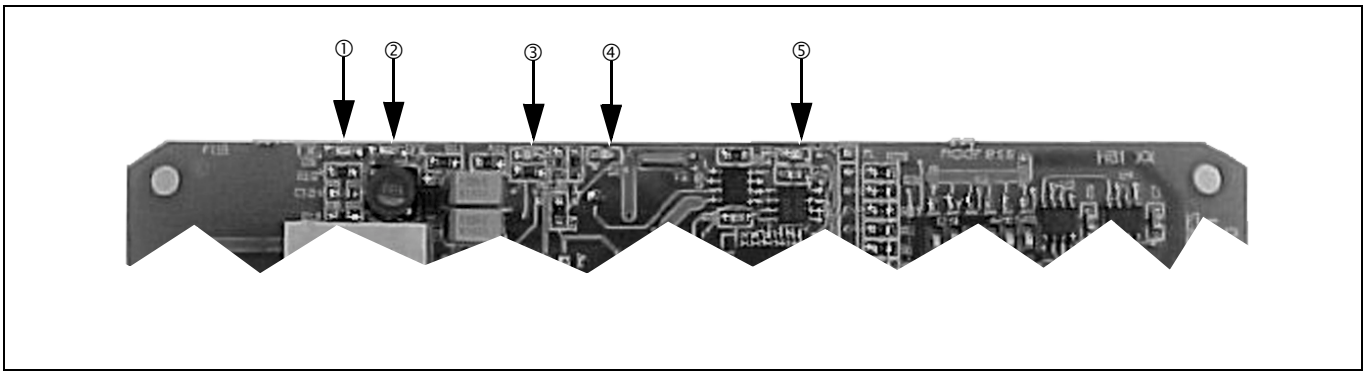

Figure 4–1: LED positions on the EMCB

Table 4–1: EMCB LED Problems and Solutions

Number	LED	Abnormal Operation	Solution
1	RS-485 (TX)	Not blinking	There is no communication from the master. Check the wiring; TX+/TX– and RX+/RX– may be reversed. Correct the wiring. If RX is blinking, verify the DIP switch address, parity, baud rate, and wire type.
2	RS-485 (RX)	Not blinking RX is steadily lit	There is no communication from the master. Check the wiring; TX+/TX– and RX+/RX– may be reversed. Correct the wiring. The RX+ and RX– wires are reversed. Correct the wiring.
3	From main board (RX)	Not blinking	The main board is not responding. Contact your local representative for technical support.
4	From main board (TX)	Not blinking, but “Alive” LED is blinking	There is an internal communications board error. Contact your local representative for technical support.
5	“Alive” status	Steadily lit	There is an internal communications board error. Contact your local representative for technical support.

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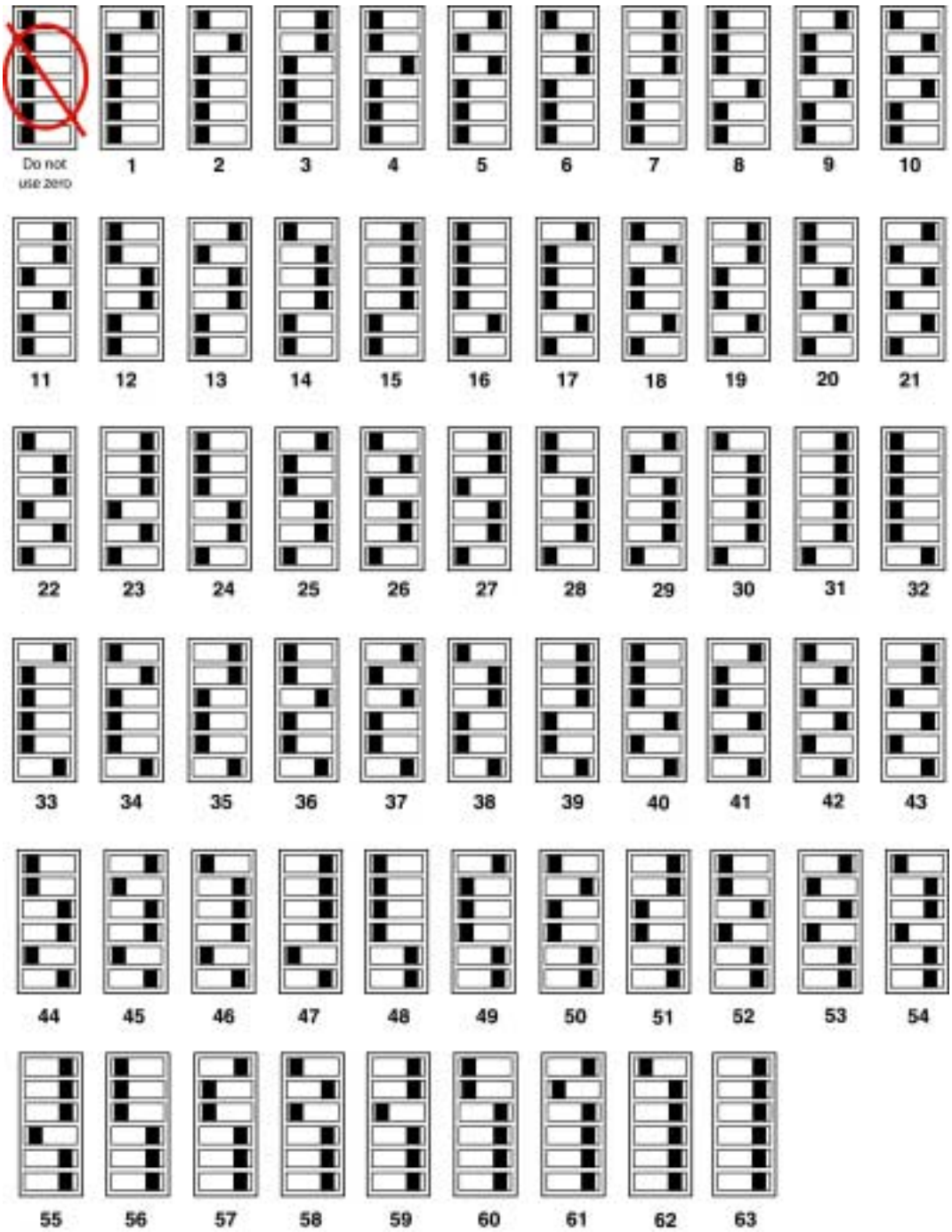
APPENDIX A—MODBUS ADDRESS DIP SWITCH SETTINGS

The figure below illustrates the switch settings, using the MODBUS address DIP switches, for each MODBUS address. See “Selecting the Network Address—MODBUS Address DIP Switches” on page 7 for instructions on setting the switches.



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