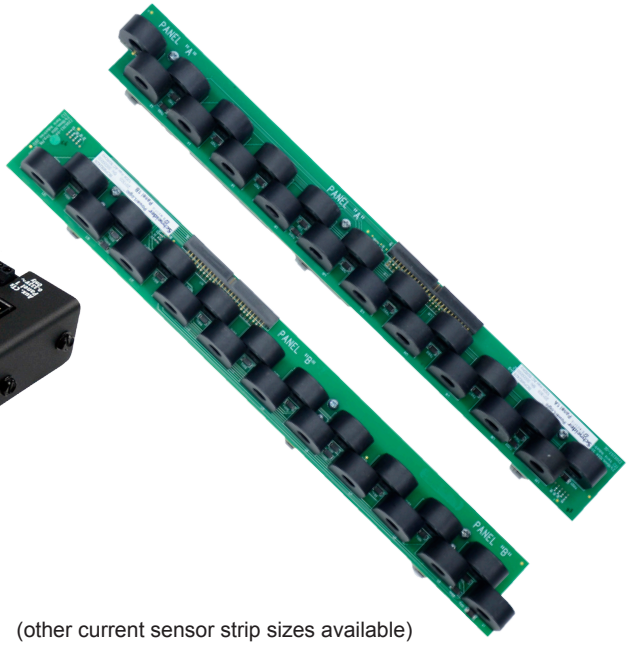
BCPM Series Panelboard Monitoring Systems

BCPME

User Guide

Panelboard Monitoring System with Ethernet Communication,
Solid-Core Branch Current Sensors
Z206856-0B
12/2015



(other current sensor strip sizes available)

Schneider Electric

Safety Information

Important information

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Notice is used to address practices not related to physical injury.

Safety Precautions

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462 in Canada, or applicable local codes.
- Read and understand the instructions before installing the product. Follow the instructions during installation.
- Installation, wiring, testing or service must be performed only by qualified persons in accordance with all applicable codes and regulations.
- Install the product in an appropriate electrical and fire enclosure per local regulations.
- Do not use the product for life or safety applications.
- Do not install the product in hazardous or classified locations.
- Do not exceed the product's ratings or maximum limits.
- The product may use multiple voltage/power sources.
- Turn off ALL power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm that all power is off.
- Do NOT depend on the product for voltage indication.
- Products rated only for basic insulation must be installed on insulated conductors.
- Current transformer secondaries (current mode) must be shorted or connected to a burden at all times.
- Remove all wire scraps and tools, replace all doors, covers and protective devices before powering the equipment.

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

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. NEC Article 100

If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Control system design must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to acheive a safe state during and after a path failure. Examples of critical control functions are emergency stop and over-travel stop.

⚠ WARNING

LOSS OF CONTROL

- Assure that the system will reach a safe state during and after a control path failure.
- Separate or redundant control paths must be provided for critical control functions.
- Test the effect of transmission delays or failures of communication links.[1]
- Each implementation of equipment using communication links must be individually and thoroughly tested for proper operation before placing it in service.

Failure to follow these instructions may cause injury, death or equipment damage.

[1]For additional information about anticipated transmission delays or failures of the link, refer to NEMA ICS 1.1 (latest edition). Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Controls or its equivalent in your specific country, language, and/or location.

Provide a disconnect device to disconnect the meter from the supply source. Place this device in close proximity to the equipment and within easy reach of the operator, and mark it as the disconnecting device. The disconnecting device shall meet the relevant requirements of IEC 60947-1 and IEC 60947-3 and shall be suitable for the application. In the US and Canada, disconnecting fuse holders can be used. Provide overcurrent protection and disconecting device for supply conductors with approved current limiting devices suitable for protecting the wiring.

For use in a Pollution Degree 2 or better environment only. A Pollution Degree 2 environment must control conductive pollution and the possibility of condensation or high humidity. Consider the enclosure, the correct use of ventilation, thermal properties of the equipment, and the relationship with the environment.

FCC Notice

FCC PART 15 INFORMATION

NOTE: This equipment has been tested by the manufacturer and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Modifications to this product without the express authorization of the manufacturer nullify this statement.

This Class A digital apparatus complies with Canadian ICES-003.

Contents

Specifications

Table 1: Specifications

Type	Description
Voltage Inputs	
Measurement Voltage	90 to 300 Vac line-to-neutral, 50/60 Hz
Control Power	100 to 277 Vac line-to-neutral, 50/60 Hz, 15 VA max.
Frequency	50/60 Hz
Accuracy	
Power/Energy	IEC 62053-21 Class 1, ANSI C12.1-2008 (1% system accuracy is for main board and branch CTs)
Voltage	±0.5% of reading 90 to 277 V line-to-neutral
Current	±0.5% of reading
Minimum ON Current	50 mA
Operation	
Sampling Frequency	2560 Hz
Update Rate	Modbus: 1.8 seconds (both panels) BACnet: 14 seconds SNMP: 20 seconds
Ethernet Communication	
Physical Interface	RJ45 connector with 10/100 Mbit Ethernet
Protocols Supported	Modbus TCP, BACnet IP, SNMP V2c
Serial Communication	
Physical Interface	2-wire RS-485
Serial Protocols Supported	Modbus RTU or BACnet MS/TP
Address Range	1 to 247 for Modbus RTU; 0 to 127 for BACnet MS/TP
Baud Rate	9600, 19200, 38400
Parity	Modbus RTU: NONE, ODD, EVEN BACnet MS/TP: NONE (fixed)
Communication Format	8 data bits, 1 start bit, 1 stop bit
Termination	2x3 position connector
Wire Size	Up to 16 AWG
Wire Size Range	
Aux CT Terminals	24 to 14 AWG
Voltage Input and Control Power Connectors	22 to 12 AWG
Terminal Block Torque	
Aux CT Terminals	3.5 to 4.4 in-lb (0.4 to 0.5 N-m)
Voltage Input and Control Power Connectors	4.4 to 5.3 in-lb (0.5 to 0.6 N-m)
Mechanical	
Ribbon Cable Support	4 ft. (1.2 m) round cable ships standard; up to 20 ft. (6 m) round or flat ribbon cables are available
Environmental	
Operating Temperature Range	0 to 60 °C (32 to 122 °F) (<95% RH, non-condensing)
Storage Temperature Range	-40 to 70 °C (-40 to 158 °F)
Altitude of Operation	3000 m
Compliance Information	
Agency Approvals	UL508 open type device**, IEC/EN61010-1
Installation Category	Cat III, pollution degree 2

Type	Description
Conducted and Radiated Emissions	FCC part 15 Class A, EN55011/EN61000-6-4 Class A (heavy industrial)
Conducted and Radiated Immunity	EN 61000-6-2 and EN 61326-1

Note: For indoor use only.

CE c UL us LISTED

* The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

**BCPM internal circuitry (cables and CTs) are not circuits as defined by UL508A, as they do not extend beyond the BCPM itself without further safety/fire isolation.

Introduction

The PowerLogic™ BCPME is designed to measure the current, voltage, and energy consumption of up to 92 circuits (84 branch circuits, two 3-phase mains, two neutrals), enabling users to monitor two panelboards or an entire data center PDU with a single product. It increases the board's current monitoring capability by combining the functions of two boards into one device. It also includes Ethernet capability, allowing communication in multiple protocols.

The BCPME consists of a data acquisition module and up to four current sensor strips, with eight auxiliary inputs. The strips have rows of solid-core CTs and are mounted on each side of the panel board along the termination points of each breaker. The conductor passes through the appropriate current sensor before terminating at the breaker. Each strip transmits the current data to the data acquisition board. The BCPME measures both current and power for the mains and branch circuits. The BCPME can easily accommodate different panel configurations, including any combination of multi-phase breaker positions, voltage phase mapping, and breaker sizes. To configure the BCPME for operation, use the Schneider Electric ION Setup configuration software tool. Get the latest version at https://schneider-electric.box.com/ionsetuplatest.

Data is transmitted via Ethernet with Modbus TCP, BACnet IP, or SNMP protocol, or via RS-485 with Modbus RTU or BACnet MS/TP protocols. Some protocols can be used simultaneously, and the Ethernet protocols all support access by multiple masters. Each data acquisition board requires two Modbus addresses, one for each set of two current sensor strips and four auxiliary inputs (two-strip models only require one Modbus address. As a circuit exceeds the user-defined thresholds, the BCPME activates the event indicators. The communication interfaces and protocols require some configuration at the time of installation.

Figure 1 Branch Circuit Power Meter with Ethernet Communication

Parts of the BCPME

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

Figure 2 BCPME Panel Board Monitoring System

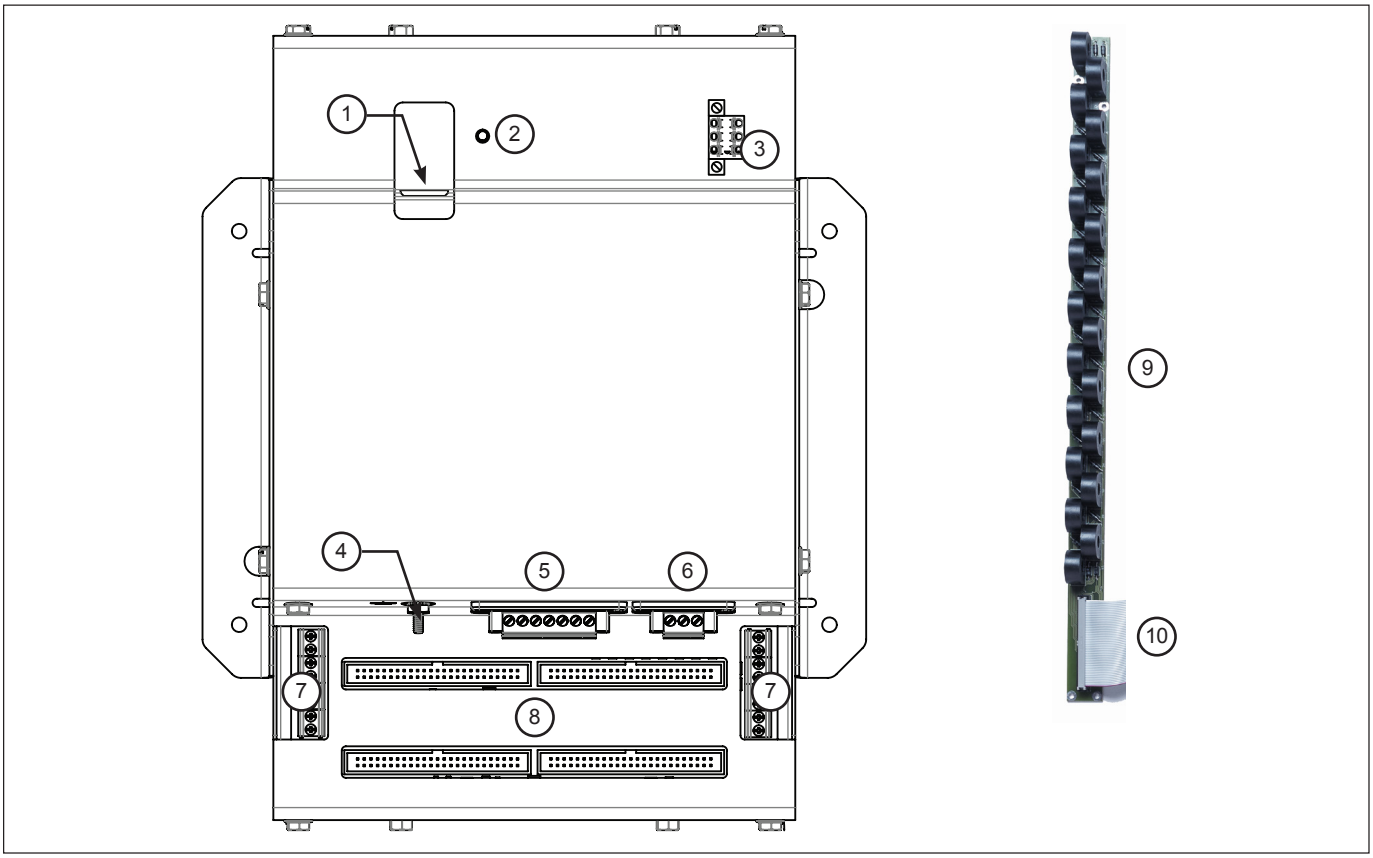
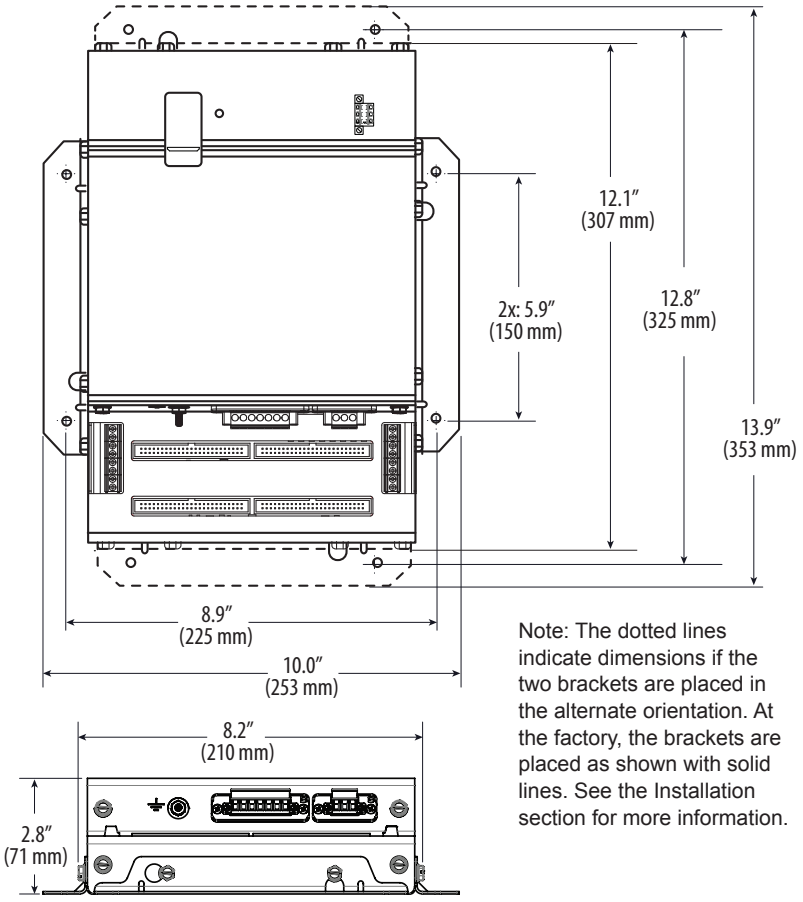


Table 2: Parts Description of the BCPME

Part		Description
1	Ethernet port	Provides Ethernet connection for the gateway component.
2	Power LED	Indicates power is applied to the meter.
3	2x3 RS-485 serial connection	Used for Modbus, BACnet, and SNMP serial communications.
4	Protective ground connection	Provides a grounding point for the device.
5	Voltage taps	1, 2, or 3 phase plus neutral connections. For voltage sensing and power calculations.
6	Control power connection	Provides power to operate the meter.
7	Auxiliary CT inputs	These 0.333 Vac inputs are used for monitoring the main breaker or other high amperage source. Inputs on the left are for panelboard 2; inputs on the right are for panelboard 1.
8	50-pin ribbon cable connectors	48-inch (1220 mm) ribbon cables are provided for easy connection of the current sensor strips to this point of the data acquisition board. Other ribbon cable lengths are available (sold separately) The two connectors on the left are for panelboard 2; the two on the right are for panelboard 1. Connect current sensor strips to the correct ribbon cable connectors for each panel. The top connectors are for the strip labeled Panel B, and the bottom connectors are for the strip labeled Panel A.
9	Branch current sensors	Each current sensor is capable of monitoring conductors rated up to a maximum of 100 amps.
10	50-pin ribbon cable connectors (branch current sensor strips)	Connects current signal from the current sensor strip to the main board via the ribbon connectors.

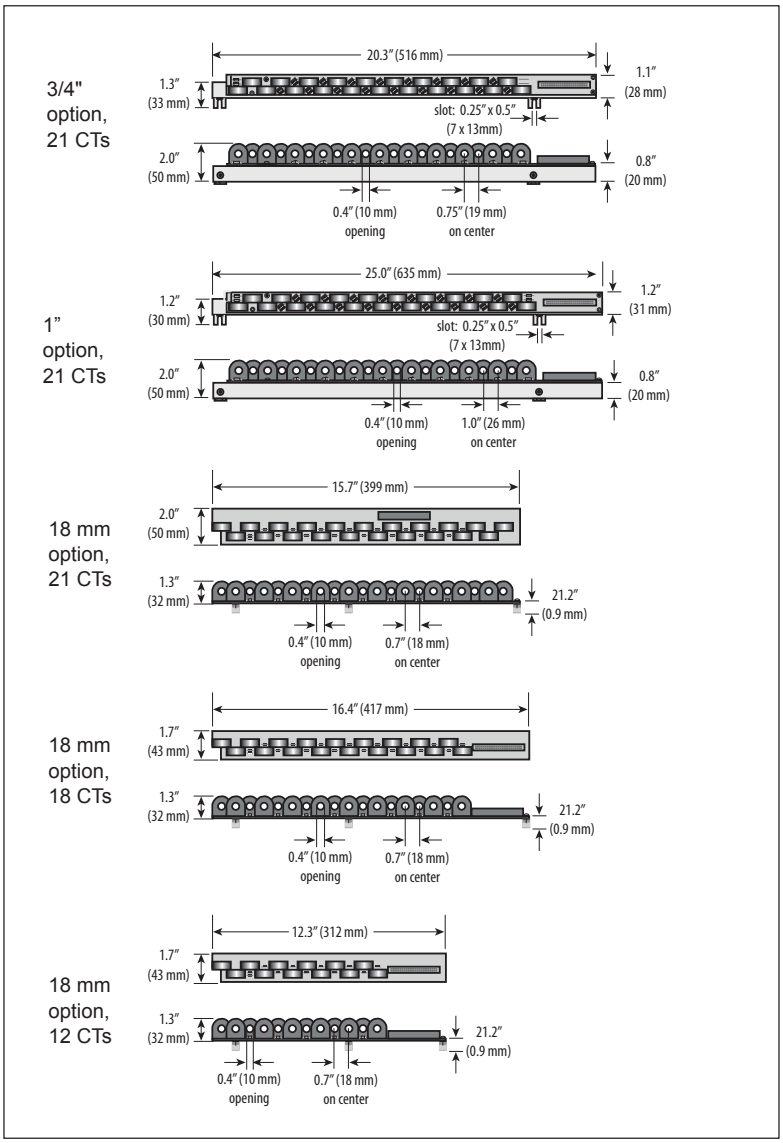
Dimensions

Figure 3 Data Acquisition Board and Mounting Bracket



Note: The dotted lines indicate dimensions if the two brackets are placed in the alternate orientation. At the factory, the brackets are placed as shown with solid lines. See the Installation section for more information.

Figure 4 Current Sensor Strips



Data Output

The BCPME provides several types of measurements that give a comprehensive view of power consumption for every load on the panel:

- Real-time measurements: A live and up-to-date view of present power levels and the factors that affect them.
- Demand measurements: Averages of values measured over a specified time interval. The time interval (typically 15 minutes) can be set from 10 seconds to more than a day. The demand calculation can be configured to use single intervals or the sliding average of up to 6 sub-intervals. Demand measurements are useful for tracking or graphing load levels over time to correlate with total energy consumption.
- Historic maximum measurements: These measurements store the largest value recorded for a specific measurement since the last time they were cleared. They are useful for identifying peak levels critical to equipment sizing or demand limits in utility agreements.
- Accumulated energy measurements: Ongoing totals of cumulative energy used since the last time the value was cleared. Energy values provide the informational basis for billing, cost allocation, carbon offset, BTU equivalent calculations, and other applications of overall energy use.

- Energy snapshots: Energy totals that only change when the demand intervals are updated. They are samples of the free-running energy accumulators at the end of each demand interval, as configured by the user. These provide energy readings that are easily correlated to the demand values to simplify the tasks of sub-billing and cost allocation.
- Over-threshold Events (previously referred to as Alarms): Provide a warning of excessively high or low current on each branch and aux channel. The user can set two high-level and two low-level thresholds, and a delay time for latching events. Events are reported as both non-latched events and latched events. Non-latching events are active while the current exceeds the threshold, but go inactive if the current returns to a level within the specific thresholds. Latching events become active when the current exceeds the threshold for a time period greater than the specified delay and remain active until they are cleared remotely. Event status can be polled via any protocol. Via BACnet, Subscribe_COV can be used to generate event notifications. Via SNMP, they drive SNMP event notifications.

Advanced Features - The BCPME supports a number of advanced features. Some are always active, and others are configured manually via Modbus register 62017, BACnet object AV164, or SNMP MIB variable “spanels/panel1/p1Configuration/p1Setup/p1UserDefinedSettings” (OID .1.3.6.1 .4.1.3833.1.30.1.1.6.3.4.0). For models with 42 channels or more, these features are configured independently for each panel.

- Logical meter support: The BCPME can be configured to map any set of 1, 2 or 3 channels that are adjacent in the panel to a logical meter, referred to in the point map as a logical circuit, that provides accurate multi-phase measurement totals. Map these logical circuits by writing the desired logical circuit number into a set of registers/data objects provided for each branch and aux channel (per panel).
- The channels assigned to each logical circuit must be adjacent in the panel (usually used for multi-phase breakers), but there are no limitations on where those adjacent channels are aligned in the panel (any position where a multi-phase breaker can be installed). This functionality is always active, but a user selection affects the how the data can be accessed via Modbus. Measurement data via Modbus for logical circuits is presented in two ways, arranged either by logical circuit number (looks more like a collection of individual meters) or by measurement type (arranged similar to the single-phase data section of the point map).
- Legacy point map or alternate logical circuit point map: The BCPME can be configured to select a preferred version of the Modbus registers in the address range 4000 to 9999. If enabled (default), the logical circuits by measurement type is active. Otherwise, the legacy point maps for 2-phase and 3-phase breakers used in BCPM models with a firmware version earlier than 1.023 is active. The logical circuits functionality can also be accessed via the “Logical Circuits by Circuit” section of the point map (address range 10000 to 45000), regardless of the state of this selection.
- Phase angle measurements: The BCPME measures the phase angle of every voltage and current input and presents these measurements (in degrees) in additional data registers/objects. These values are used to verify that current inputs are assigned to the proper voltage phases and to help determine how power factor variations are influenced by current phase changes vs. harmonic distortion. Phase angle measurements are instantaneous and always active.
- User CT phase assignment: In the default mode, the BCPME assigns each channel to the corresponding phase that most 3-phase panels implement, so that the user does not have worry about it. The user can opt to replace this self-assignment paradigm with a mode that

allows explicit specification of the phase assignment for each channel. The explicit assignments set by the user are stored by the BCPME in non-volatile memory.

- Phase angle reference: The BCPME measures the phase angle of every current and voltage input. The user can select whether the phase angles are stated relative to an absolute reference (the phase angle of voltage input V1) or relative to the voltage phase assigned to that specific current input channel.
- Demand/snapshot time interval source: The BCPME offers two mechanisms for driving the demand/snapshot time interval, an interval timer or an RTC (real-time clock). The legacy mode (default) uses an interval timer that does not need to be set to an absolute time. When using the interval timer the demand/snapshot interval can be set from 10 to 32767 seconds (over 9 hours). An alternate mode utilizes an RTC set to a specific date and time to synchronize the results with a larger system. The RTC must first be set in order to run and capture demand values and energy snapshots. When power is interrupted, the RTC resets to a default date and time and must be set again in order to run. When using the RTC, the demand/snapshot interval can be set from 10 to 3600 seconds (1 hour).

Table 3: Data Outputs Table

Monitoring of Mains	
Real Time Measurements	Current: multi-phase average and per phase
	Current phase angle
	Real power (kW): multi-phase total and per phase
	Apparent power (kVA): multi-phase total and per phase
	Power factor: multi-phase average and per phase
	Voltage - L-L: multi-phase average and per phase
	Voltage - L-N: multi-phase average and per phase
	Frequency (phase A)
Demand Measurements	Current present demand: multi-phase average and per phase
	Real Power (kW) present demand: multi-phase average and per phase
Historic Maximums	Maximum instantaneous current: multi-phase average and per phase
	Maximum current demand: multi-phase average and per phase
	Maximum real power demand: multi-phase total and per phase
Accumulated Energy	Energy (kWh): multi-phase total and per phase
Energy Snapshots	Energy (kWh): multi-phase total and per phase
Monitoring of Branch Circuits	
Real Time Measurements	Current: multi-phase average and per phase
	Current phase angle per branch
	Real power (kW): multi-phase total and per phase
	Apparent power (kVA): multi-phase total and per phase
	Power factor: multi-phase average and per phase
Demand Measurements	Current present demand: multi-phase average and per phase
	Real power (kW) present demand: multi-phase average and per phase
Historic Maximums	Maximum instantaneous current: multi-phase average and per phase
	Maximum current demand: multi-phase average and per phase
	Maximum real power demand: multi-phase total and per phase
Accumulated Energy	Energy (kWh): multi-phase total and per phase
Energy Snapshots	Energy (kWh): multi-phase total and per phase

Modbus Events	
Events	Voltage over/under
	Branch current over/under
	Mains current over/under

Solid Core Branch Current Sensors

Table 4: Branch Current Sensor Specs

100 A Solid-Core Branch Current Sensors	
Voltage Rating	300 Vac
Measurement Range	120 A*
Temperature	0 to 60 °C (32 to 122 °F)
Agency	EN61010-1

*Momentary.

Installation

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462 in Canada, or applicable local codes.
- Read and understand the instructions before installing the product. Follow the instructions during installation.
- Installation, wiring, testing or service must be performed only by qualified persons in accordance with all applicable codes and regulations.
- Install the product in an appropriate electrical and fire enclosure per local regulations.
- Do not use the product for life or safety applications.
- Do not install the product in hazardous or classified locations.
- Do not exceed the product's ratings or maximum limits.
- The product may use multiple voltage/power sources.
- Turn off ALL power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm that all power is off.
- Do NOT depend on the product for voltage indication.
- Products rated only for basic insulation must be installed on insulated conductors.
- Current transformer secondaries (current mode) must be shorted or connected to a burden at all times.
- Remove all wire scraps and tools, replace all doors, covers and protective devices before powering the equipment.

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

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. NEC Article 100

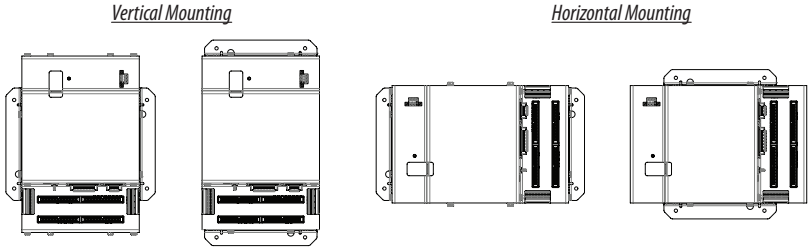
If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Observe precautions for handling static sensitive devices to avoid damage to the circuitry that is not covered under the factory warranty.

⚠ ⚠ The protective ground connection on the housing should be used if the device will not be mounted to a suitably grounded surface. Assure conductivity to the protective ground.

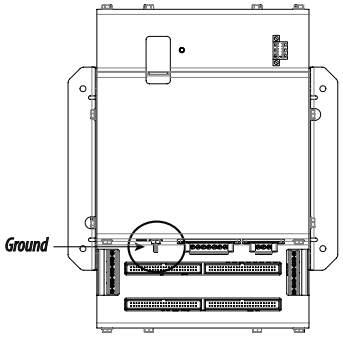
1. Always use a properly rated voltage sensing device to confirm power is off.
2. Determine where you will mount the BCMPE measurement unit. The preferred location is inside the enclosure of the panelboard being monitored. If sufficient space is not available there, then mount the unit in an appropriate enclosure nearby. Decide whether to mount it vertically or horizontally. The meter is shipped with the brackets placed on the two sides for vertical mounting. If desired, you can move the brackets from the sides to the ends of the housing. Loosen the screws on the sides of the BCPME that hold the brackets in place (do not fully remove the screws from the housing). Loosen the screws on the two ends of the housing (do not fully remove the screws from the housing), and set the brackets into their new positions. Tighten all screws to 25 in-lb (2.8 N-m).

Figure 5 Brackets positioned for vertical and horizontal mounting



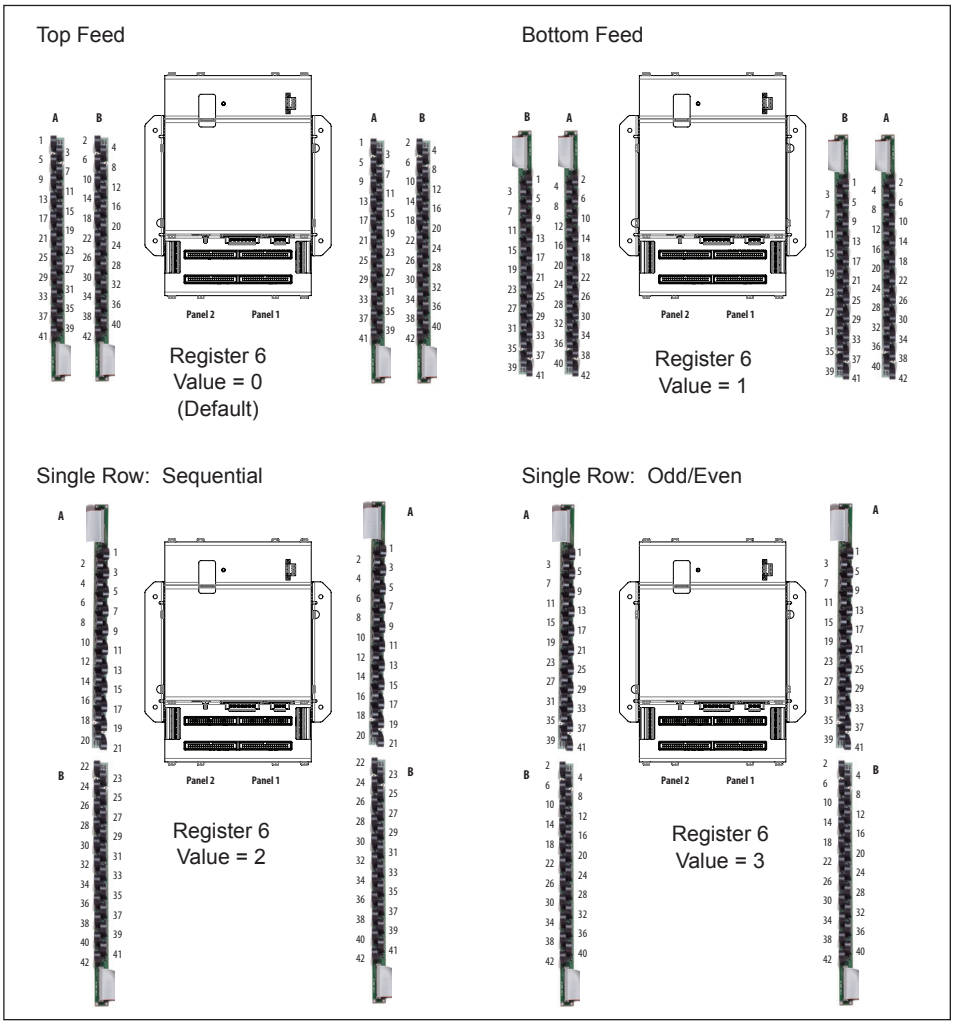
Install the BCPME in the panel. A grounding connection is located on the housing (see below).

Figure 6 BCPME Ground stud



3. Install the branch current sensor strips into the panel. Select one of the four circuit configurations shown below and arrange the CTs strips accordingly. For more detailed installation diagrams and help identifying what circuit configuration setting to use, refer to the appendix titled: Panel Configuration Diagrams and Selection Matrix. Adjust configuration of the circuit numbers in the field during commissioning by writing to Modbus Register 6 (or the corresponding BACnet object or SNMP variable) or use ION Setup configuration software. Most of the examples in this graphic show the 21 current sensor strips. The same configuration options are available for the 18 and 12 current sensor strips.

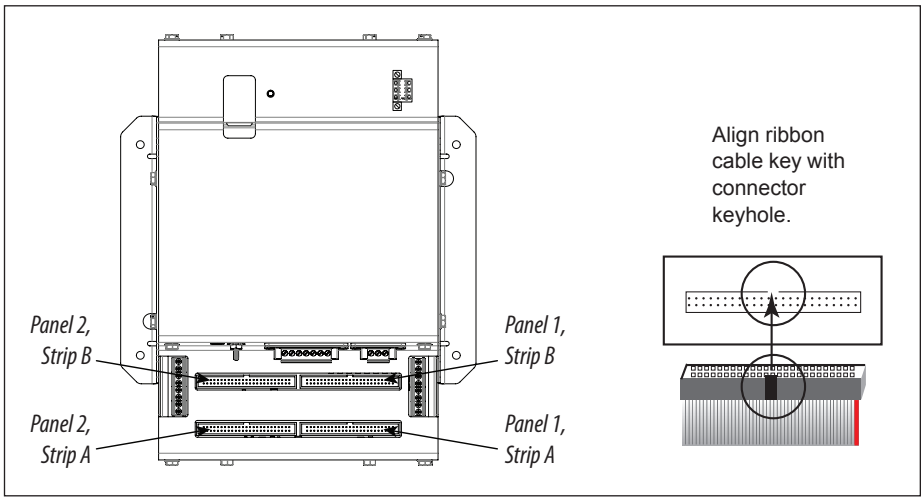
Figure 7 Current sensor strip configuration selections (must be set during commissioning - default is "Top Feed")



4. Verify that the serial numbers printed on the branch current sensor strips and on the BCPME match. The board and the strips are sold as a calibrated set.

5. Connect the current sensor ribbon cables to the 50-pin connectors on the BCPME. The label on the strip indicates which connector to use (e.g. connect the strip labeled “Panel 1A” to the bottom right connector on the board). Orient the cables so that the plastic key on the BCPME connector aligns with the keyhole cutout on the ribbon cable connector, as shown below.

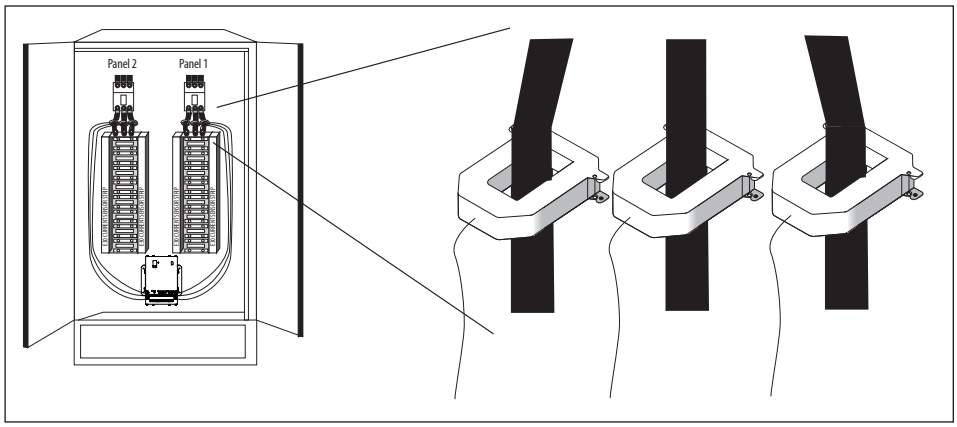
Figure 8 Connector orientation



Aux CT Installation

1. Connect 0.333 Vac current transformers (CTs) to the mains or other conductors, observing local codes regarding bending radius. Refer to the appropriate CT installation instructions for further information.

Figure 9 CT connection



NOTE: The BCPME measures and reports the phase angle of each voltage input and each CT (when there is active current through the primary of that CT).

Wiring

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

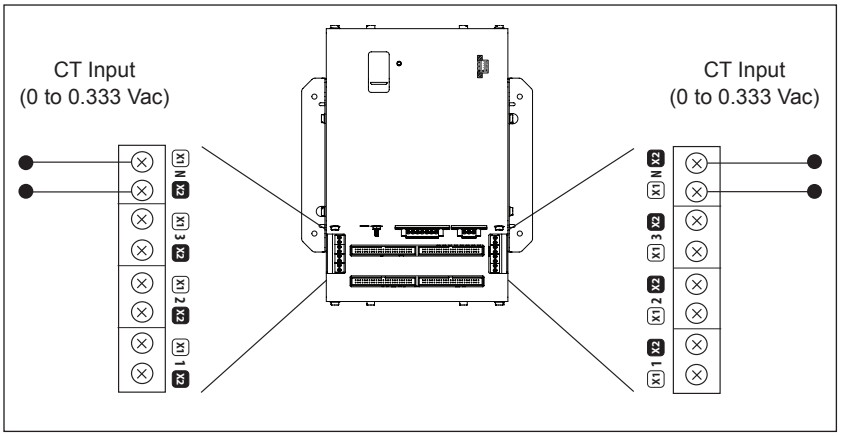
- While removing or installing panels and covers, assure that they do not contact an energized bus.
- NEVER bypass external fusing.
- NEVER short the secondary of a potential transformer.
- Before closing covers and doors, carefully inspect the work area and remove any tools, wire scraps or other objects that may have been left inside the equipment.

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

NOTE: For all steps in this section, when tightening terminals, apply the correct torque: Aux Inputs: 3.5 to 4.4 in-lb (0.4 to 0.5 N-m); all other terminals: 4.4 to 5.3 in-lb (0.5 to 0.6 N-m).

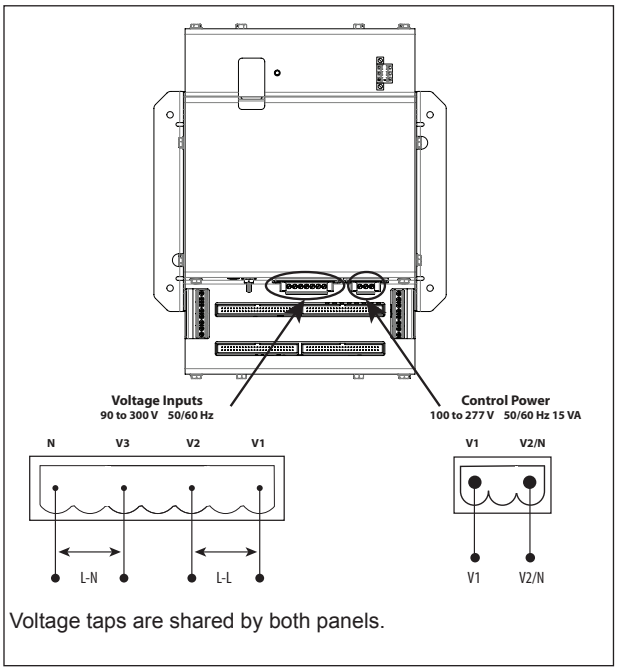
1. Wire the (optional) 0.333 V Aux CTs to the BCPME (see Figure 10), observing local codes regarding bending radius. Refer to the appropriate CT installation instructions for further information.

Figure 10 Aux CT wiring



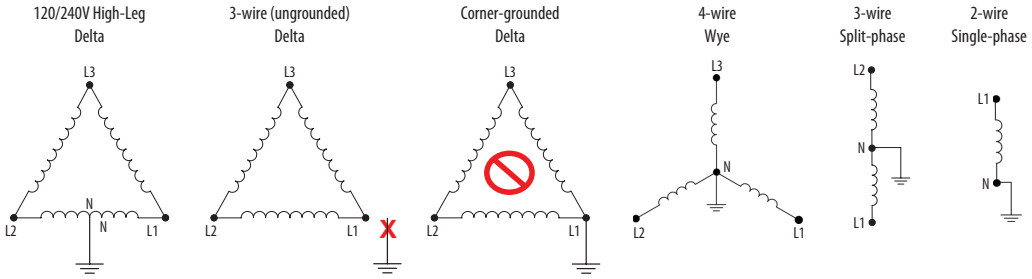
2. Connect 2-wire 100 to 277 Vac power to the control power terminals. Observe polarity. Connect voltage lines to the voltage inputs. Provide overcurrent protection and disconnecting means to protect the wiring. Use EMFP1, EMFP2, EMFP3 fuse packs, or equivalent. Suggested: 0.5 A, time delay fuses.

Figure 11 Connect to voltage inputs



Voltage taps are shared by both panels.

Figure 12 Wiring configurations



120 V/240 V Delta High Leg (where the center tap of one of the three phase-to-phase transformers is grounded): the BCPME supports these applications, as long as the line-to neutral voltage [especially of the High Leg] does not exceed 300 Vac (as in North American 120/240 V High Leg Delta configurations).

In 3-wire (ungrounded) Delta applications, the BCPME supports these applications with the following caveats:

Control Power for the meter cannot exceed 277 Vac. In applications where the L-L voltage is 277 Vac or less (e.g. 208 V line-to-line) it can be connected to two of the phases being monitored without exceeding the limit. For higher voltages (e.g. 480 V line-to-line), this must be supplied from a source that is 277 Vac or less. It could be a separate source or a transformer can be used to step it down from two of the phases being measured.

All of the CT inputs (both branches and Aux inputs) are neutral-referenced. One side of each CT is essentially connected directly to the neutral voltage input. If this is left floating, the solid-core CT strips, split-core CT adapter boards and all CTs will float at the same potential (while the panel is energized). This does not present a risk to the equipment as long as it is within 300 V of ground, but should be considered from a safety perspective in the overall application. The BCPME will provide measurements in this application with the accuracy specified, with the exception of line-to-neutral

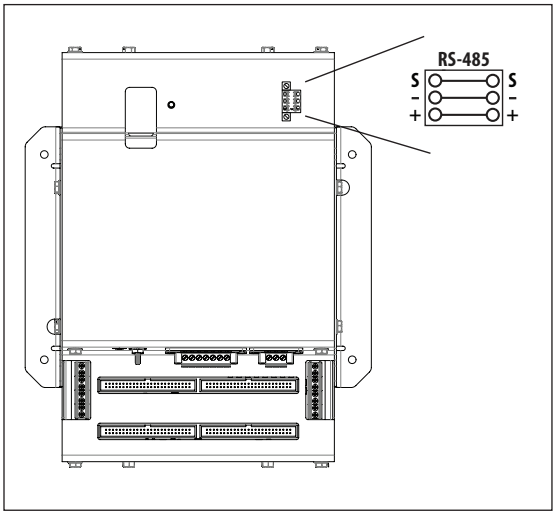
voltages, which will be calculated and reported, based on a derived virtual neutral voltage, even though they are not relevant.

Corner-grounded delta: the BCPME does not support these applications at any voltage level.

The BCPME supports measurement of all 4-wire Wye, 3-wire split-phase and 2-wire single phase and configurations that operate between 90 and 300 Vac line-to neutral.

3. Connect the 2-wire Modbus RS-485 network.

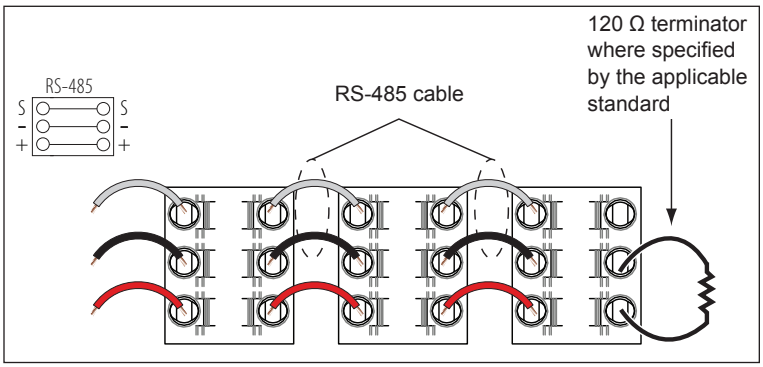
Figure 13 RS-485 connection



4. Mechanically secure the RS-485 cable(s) where they enter the electrical panel.

5. If using Modbus RTU or BACnet MS/TP protocol, connect a serial cable(s) from the RS-485 loop to the serial connector on the BCPME. Connect all RS-485 devices in a daisy-chain, and properly terminate the chain.

Figure 14 Daisy chain connection



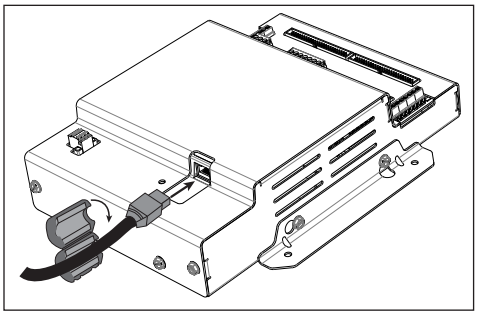
Two sets of connections are provided to simplify daisy-chain connections and enable retention of each wire.

Follow all applicable wiring and termination connection guidelines for the standard in use. Note that while both the Modbus RTU and BACnet MS/TP standards identify requirements for RS-485 line polarization/bias and

termination, the value and placement of these resistors varies for each standard. The BCPME does not implement any RS-485 line polarization/ bias or termination internally. Shield the RS-485 cable using twisted-pair wire. Use cable that is voltage-rated for the installation. The shield is not internally connected to Earth Ground. Connect the shield to Earth Ground somewhere on the RS-485 bus (single point connection only).

6. Connect an Ethernet cable to a local PC. Secure a ferrite filter (included) around the Ethernet cable to ensure the device meets emission requirements. Use the PC to configure the gateway (next section of this document). Note: 100 to 277 Vac must be added to control power inputs to supply power to the gateway during configuration.

Figure 15 Ethernet port location



7. Once configured, disconnect the local PC. If desired (and the device is configured for operation on the network), connect the BCPME directly to the network for ongoing access to the GUI even if primarily using a serial protocol to access and control the BCPME.

Gateway Configuration

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462 in Canada, or applicable local codes.
- Read and understand the instructions before installing the product. Follow the instructions during installation.
- Installation, wiring, testing or service must be performed only by qualified persons in accordance with all applicable codes and regulations.
- Install the product in an appropriate electrical and fire enclosure per local regulations.
- Do not use the product for life or safety applications.
- Do not install the product in hazardous or classified locations.
- Do not exceed the product's ratings or maximum limits.
- The product may use multiple voltage/power sources.
- Turn off ALL power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm that all power is off.
- Do NOT depend on the product for voltage indication.
- Products rated only for basic insulation must be installed on insulated conductors.
- Current transformer secondaries (current mode) must be shorted or connected to a burden at all times.
- Remove all wire scraps and tools, replace all doors, covers and protective devices before powering the equipment.

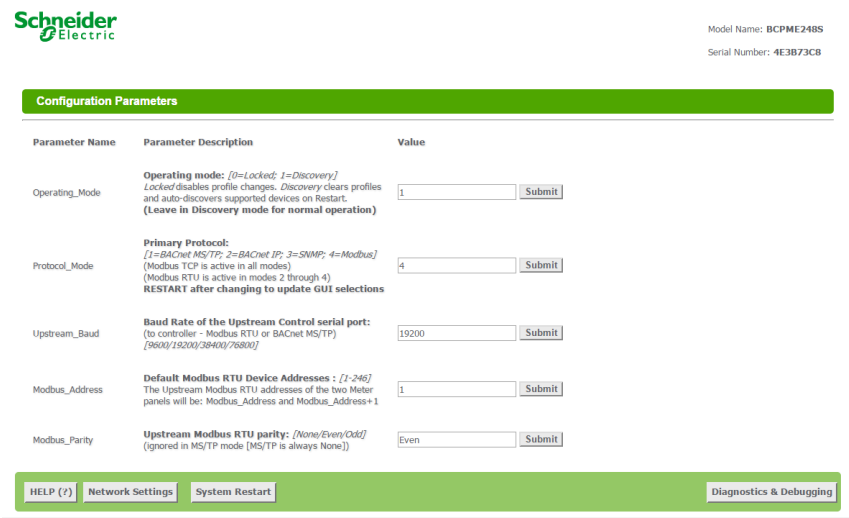
Failure to follow these instructions will result in death or serious injury.

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. NEC Article 100

If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

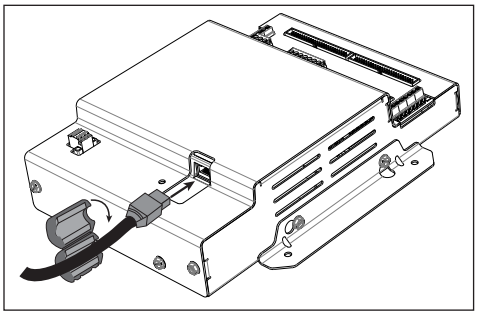
Accessing the Graphical User Interface (GUI)

If the BCPME IP address parameters are already configured to work on the network and is being accessed from a PC on that same network, then open a web browser and enter the IP address of the BCPME into the address/URL field on the browser. Press enter. The GUI launches and appears, as shown, in the browser window. Note: The screen captures in this example were taken using Windows 7; other operating systems will look different.



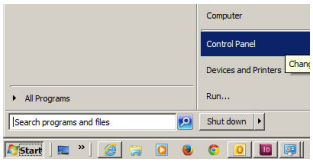
If the IP address parameters are not configured for the network, connect a PC directly and access the GUI from it as follows:

1. Connect a standard Ethernet cable between a PC and BCPME if not already connected. Secure a ferrite filter (included) around the Ethernet cable to ensure the device meets emission requirements.



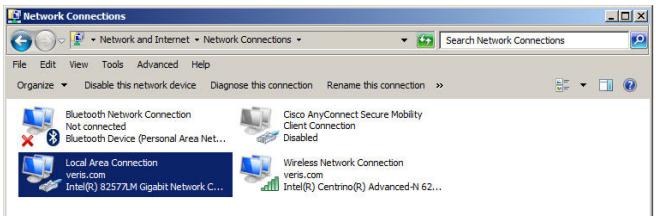
2. Temporarily change the IP address of the PC to a static value on the same subnet as the BCPME. For example: If the BCPME is set to its factory default IP address of 192.168.1.24, set the PC to an unused static IP address on the 192.168.1.xxx subnet (where xxx is any value between 1 and 255, except 24). Set the subnet mask to 255.255.255.0.

a. Open the Control Panel:

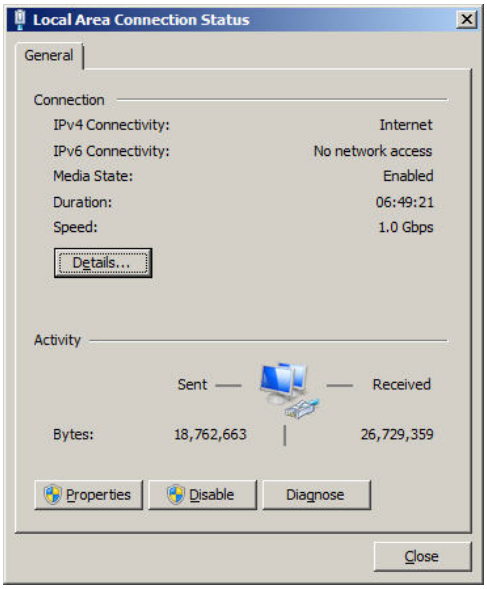


b. In the Control Panel, select Network and Sharing Center. In the Sharing Center, select Change Adapter Settings in the list at the upper left corner.

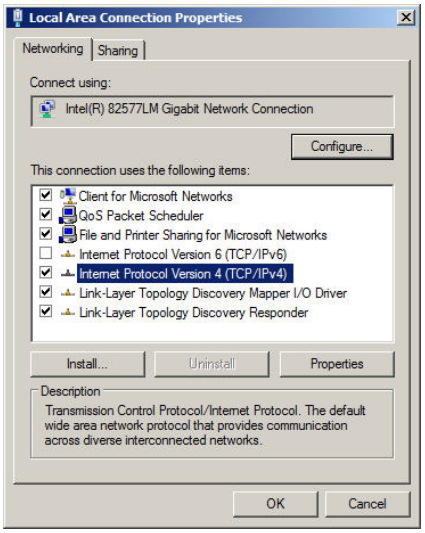
c. Select the connection for the network that the BCPME is connected to.



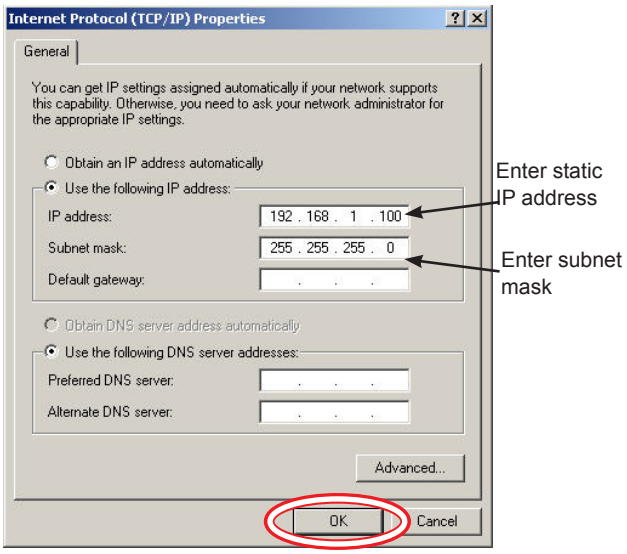
When the Local Area Connection Status dialog box appears, click on Properties.



d. Highlight Internet Protocol Version 4 (TCP/IPv4), and click OK.



e. Select <Use the following IP Address>. Make note of the IP address that appears, then enter the static IP address (e.g. if the BCPME is still set to its default address of 192.168.1.24, then change it to 192.168.1.100). Enter 255.255.255.0 for the subnet mask. Click OK.



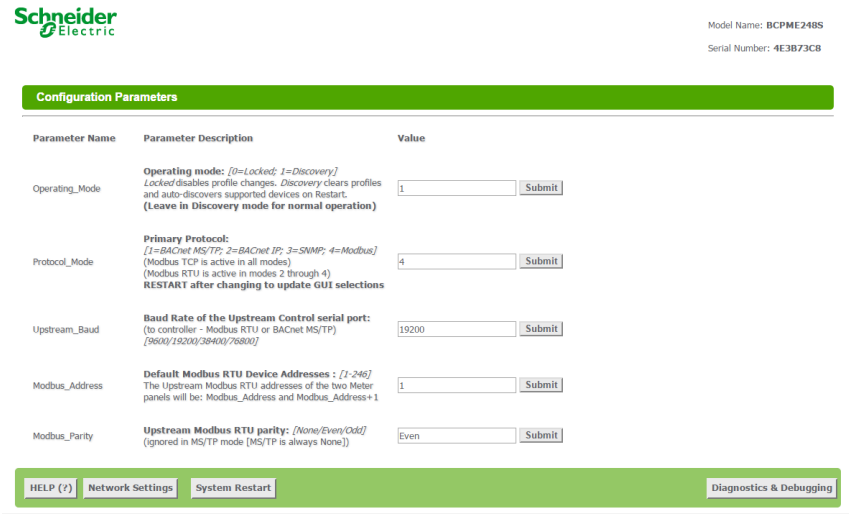
e. Click OK.

3. Open a PC web browser and enter the IP address of the BCPME (default address is 192.168.1.24) to access the GUI. The GUI launches and appears in the browser window.

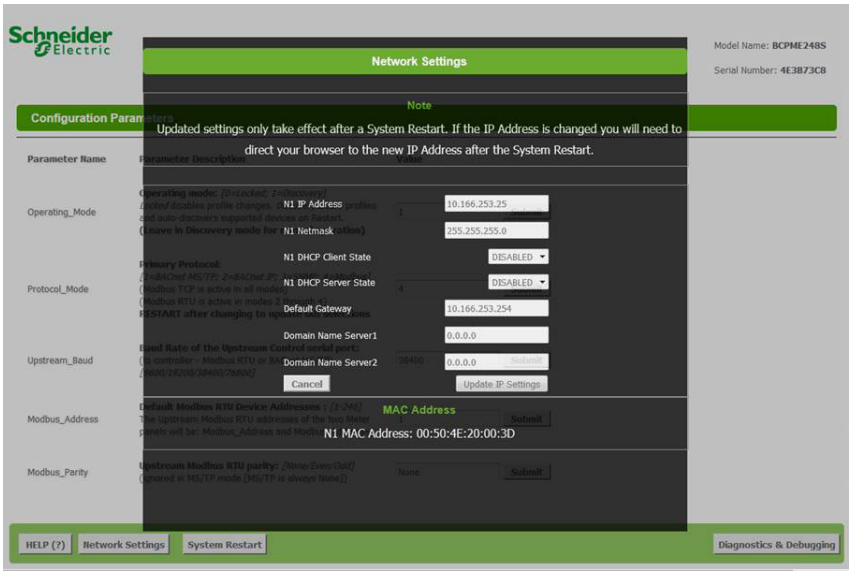
4. When finished using the GUI, unplug the Ethernet cable from the PC and restore the IP settings as needed.

Using the GUI to set up the IP address

1. Access the GUI according the instructions in the “Accessing the Graphical User Interface (GUI)” section. To set IP address parameters, click the button labeled “Network Settings.”



The Network Settings screen appears.



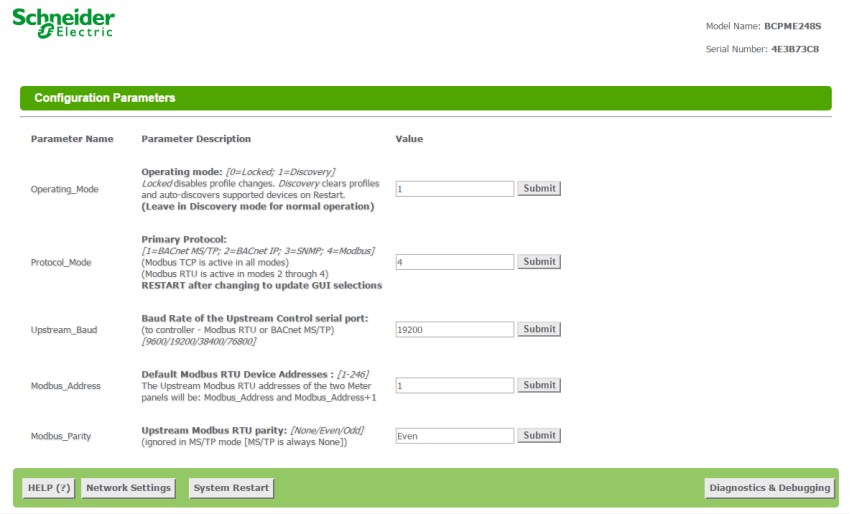
Have the desired IP settings ready in advance (contact the system administrator). IP parameters for use with BACnet IP are static, not dynamic.

2. Set the IP address for use on the BACnet/IP network:

   a. Enter the desired IP address in the N1_IP_Address field (in the format xxx.xxx.xxx.xxx)
   b. If necessary, change the Subnet Mask by entering the appropriate new value in the N1_Netmask field
   c. If the BCPME is connected to an Ethernet gateway, enter its IP address in the Default Gateway field. This is especially critical if the BCPME will be used as a BACnet BBMD device.
   d. Click the Update IP settings button. The BCPME changes its settings.
   e. Click the System Restart button and wait for the BCPME to fully initialize. The GUI will connect when the BCPME is installed on a network that matches the settings and the new IP address is entered into a web browser on a PC properly configured for the network.

Using the GUI to Configure the Communication Protocols

Access the GUI according the instructions in the “Accessing the Graphical User Interface (GUI)” section.



The home screen on the GUI provides fields for configuration of the BCPME. The BCPME has four primary modes of operation, each of which support a different combination of protocols. Each option field has a Submit button to the right. When changing the value in any field, click Submit to store the new value. The GUI prompts the user to restart the system. If multiple values are changed, it is easiest to submit all changes and restart only once when finished with the whole screen. To restart, click the System Restart button in the row at the bottom of the screen. The restart takes several seconds, during which the server may lose its connection. Messages appear at the top of the screen indicating current status, but do not perform any actions. Simply allow the tool to complete the restart cycle.

The first selection in the GUI is Operating_Mode, which has two choices:

a. Locked: used for all normal product operation. It is provided as a tool for high-level technical support. The gateway retains its current profile configuration when powered.
b. Discovery mode (default): deletes profiles and rediscovers them when the device is powered again. The results are the same, unless the profile configuration is intentionally altered. Profile selection and discovery are especially important when using BACnet or SNMP protocols. For normal operation, always use discovery mode.

The second selection in the GUI is Protocol_Mode, used to select the combination of protocols the product communicates with. The BCPME supports five protocols, some of which can operate simultaneously. The table below shows what protocols are supported in each mode.

Protocol Mode	Primary Protocol	Ethernet Protocol	RS-485 Protocol
1	BACnet MS/TP	Modbus TCP	BACnet MS/TP
2	BACnet IP	BACnet IP/Modbus TCP	Modbus RTU
3	SNMP	SNMP/Modbus TCP	Modbus RTU
4	Modbus	Modbus TCP	Modbus RTU

To select a primary protocol mode, enter the corresponding number into the text field adjacent to the Primary Protocol option and click the Submit button to the right of the text field. A prompt appears at the top of the screen instructing the user to restart the system. When finished, the screen refreshes itself with the appropriate fields for the selected mode.

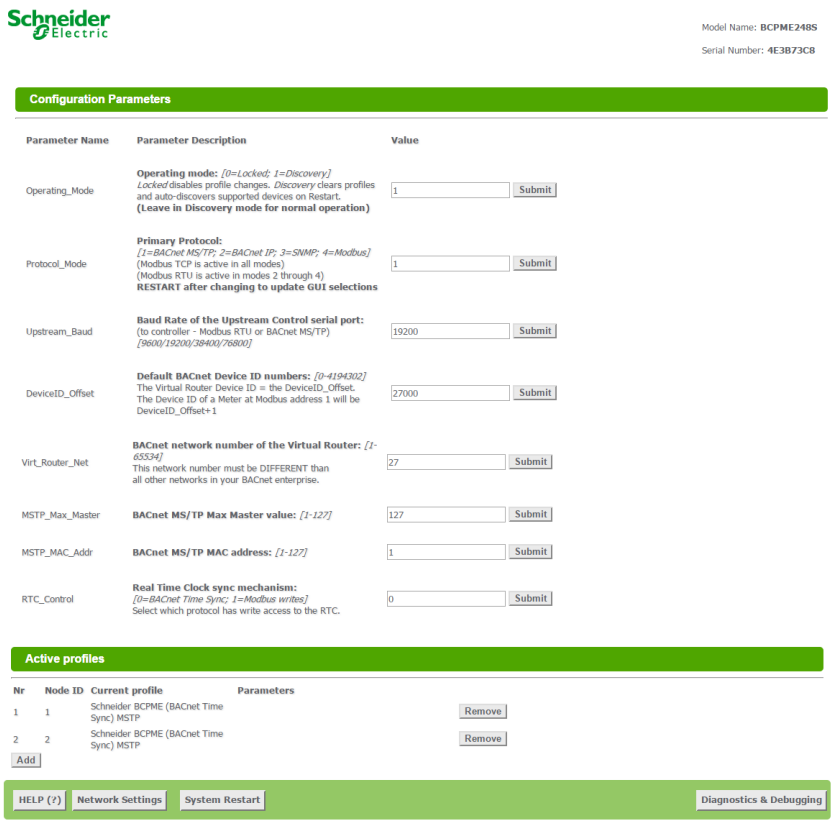
The next GUI selection, in any protocol mode, is the Upstream_Baud rate selection. If you have selected BACnet MS/TP (mode 1) as the primary protocol mode, this value sets the MS/TP baud rate. If you have selected modes 2 or 3 as the primary protocol mode, you may not be using the RS-485 interface at all. If so, this setting can be ignored.

If you have selected BACnet IP, SNMP or Modbus mode, the next selection is Modbus_Address, which sets the Modbus address(es) for the BCPME when access with Modbus RTU with the RS-485 serial connection.

The next selection (in BACnet IP, SNMP or Modbus modes) is Modbus_Parity, which sets the parity of the upstream serial connection. If using Modbus RTU protocol, set this to match your Modbus master. If not, ignore this field.

The following sections show the field selections (with factory default values) specific to each of the four Protocol_Modes.

1. BACnet MS/TP mode



The first three options are discussed previously.

The DeviceID_Offset parameter is used to assign Device_IDs on power-up or on restart until they have been overwritten via BACnet. Enter your desired value here and click submit. The new value is first used at the next power-up or system restart. Valid Device_ID numbers range from 1 to 4194303. Since the numbers assigned during discovery are the sum of the Offset and the Modbus address (which can be any value from 1 to 247), the Offset values entered in the GUI must be no larger than 4194057.

The BCPME gateway creates a BACnet virtual router and separate BACnet devices for each 42-channel meter panel behind this virtual router, allowing the devices to be discoverable and independently accessed via BACnet, even if the virtual router is connected by MS/TP, using a single MAC address. To use this product with MS/TP, the BACnet system must support the discovery and use of a BACnet router on the MS/TP trunk and any devices beyond it. This virtual router creates an exclusive BACnet network on which the meter's BACnet devices reside. This network must have a BACnet network number that is different from any other networks in the entire BACnet enterprise. When multiple BCPME products are added anywhere in the enterprise, each one must have a unique network number. Failure to set an exclusive value in this field causes communication conflicts in the BACnet system.

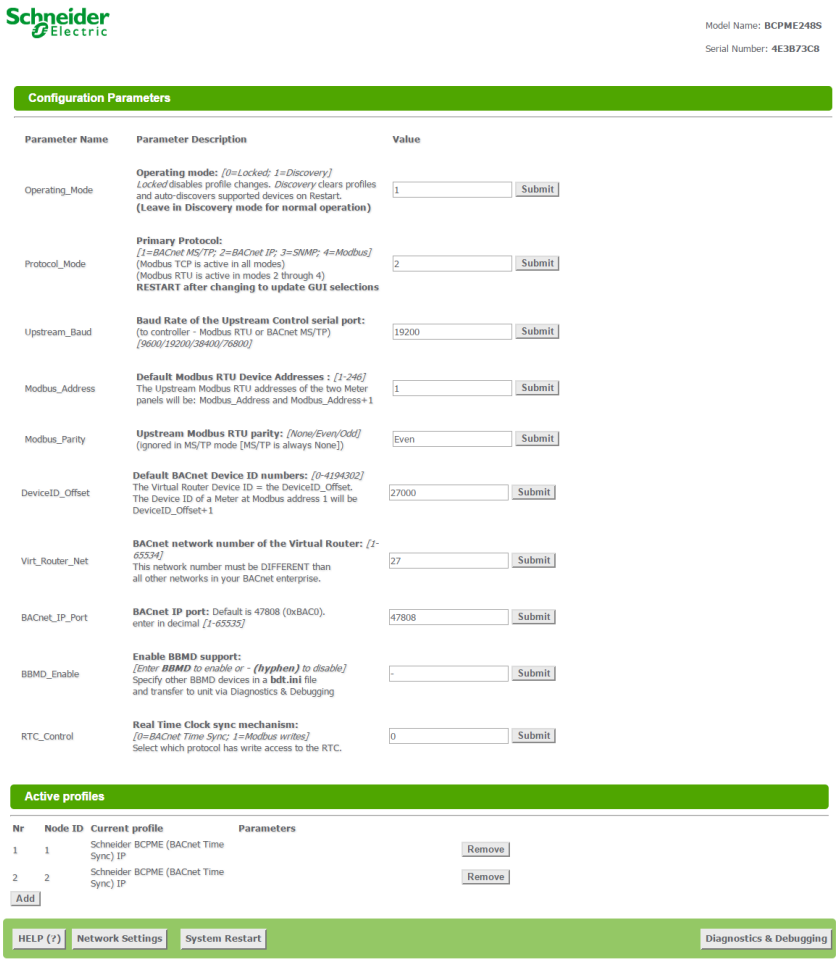
Enter a non-conflicting value here and click submit. Valid network numbers range from 1 to 65534; if other values are entered, the network number defaults to 5. The new value is first used at the next power-up or system restart. If using an external BACnet router to connect the BCPME as an MS/TP device, it is recommended that the router also be restarted after the BCPME has completed discovery, when the network number is changed.

The next field for the BACnet MS/TP protocol mode is the MSTP_Max_Master, which allows this value to be set prior to using BACnet software to access the BCPME. The default value of 127 works regardless of the addresses the MS/TP network uses, but selecting a lower value may optimize the network. Do not set this value lower than the highest address on the network. To set this value via BACnet, write to the Max_Master property of the device object for the BCPME's virtual router.

The next field for the BACnet MS/TP protocol mode is the MSTP_MAC_Addr, which sets the MAC address for the virtual router. The BCPME panel(s) are devices on the internal BACnet network and are not directly addressable as MAC addresses on the MS/TP network.

The final field for the BACnet MS/TP mode is RTC_Control, which selects which protocol (BACnet or Modbus) has write access to the RTC. If 0 (BACnet) is selected, the RTC is set using the BACnet Time Synchronization service. If 1 (Modbus) is selected, the RTC is set by writing to the appropriate Modbus registers.

2. BACnet IP mode

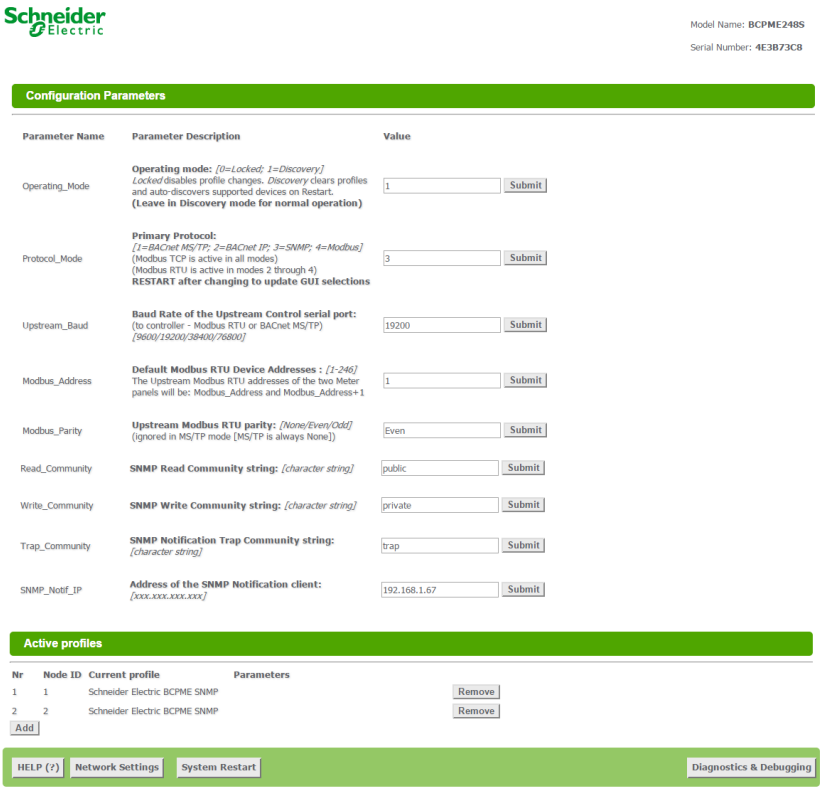


BACnet IP mode uses the same DeviceID_Offset, Virt_Router_Net and RTC_Control parameters described above for BACnet MS/TP mode. One additional parameter, BACnet_IP_Port, is used to set the UDP port. Most BACnet systems use the default port (47808 decimal, 0xBAC0 hex) that is recommended in the

BACnet standard as the only UDP port. Some large systems need to segment the enterprise and use more than port. If so, enter the number of the port you need to use to access this device. BACnet IP mode does not use MSTP_Max_Master or MSTP_MAC_Addr.

BACnet IP mode adds another field called BBMD_Enable. See the section BBMD Support for a full description of how to enable and use BBMD support.

3. SNMP mode



SNMP mode uses four unique parameters. SNMP community strings are used to control access to the device. Whatever values are entered here must be used in the MIB browser or SNMP access software to communicate with this device. The Read_Community string is used to enable reading data. The Write_Community string is used to enable writing data. The Trap_Community string is used to enable the receipt of event notifications.

The last parameter, SNMP_Notif_IP is used to set the IP address of the client that will be used to receive SNMP event notifications for over-threshold events.

Operating the BCPME

Restart the BCPME by using the button at the bottom of the GUI or by cycling the power. It takes about 30 seconds to initialize completely and be ready for external communication.

Commissioning

Commission the BCPME for operation using ION Setup software. See the ION Setup Configuration Guide for instructions.

BACnet Network Management

BACnet configuration uses two default settings that might need to be changed, depending on the application.

a. Virtual router network ID number. Every logical network segment (IP subnet, MS/TP trunk, etc.) in an entire system must have a (16-bit) network ID number that is unique from all other BACnet networks in the enterprise. The BACnet network administrator assigns this network ID so that no two ID numbers conflict (whether using BACnet/IP or MS/TP). Within each segment, every device is physically identified by the combination of its 8-bit MAC address and the 16-bit network ID number.
To support multiple meter panels (panel 1 and panel 2 are separate) with a single gateway, the BCPME creates a virtual BACnet router that presents multiple BACnet devices using a single (its own) MS/TP MAC address. Each BCPME must have its own (internal) network ID, and it creates a device object for itself and one for each Modbus address discovered.
The factory default network address is 50 (decimal). If that number is already in use in the system, assign a unique address using the graphical user interface (GUI) on the built-in web server (this requires an Ethernet connection to a web browser; see BACnet/IP Setup section for instructions on changing configuration settings using the GUI). Valid network numbers range from 1 to 65534; if other values are entered, the network number defaults to 5.

b. Device_ID Offset. Every BACnet device must have a BACnet Device_ID number that is unique throughout the entire enterprise. Since the BCPME presents every Modbus meter as a BACnet device, each connected meter that has a Modbus address must have a BACnet Device_ ID.
By default, each device discovered receives a Device_ID number that is the sum of an offset value (default is 50000) and the Modbus address of the device. If these Device_ID numbers cause a conflict with existing devices in the system, or if the system includes multiple BCPMEs, change the Device_ID numbers before connecting the BCPME to the system. This can be managed one of two ways:

i. Connect to the BCPME directly (offline from the system) with the devices (meters). After the BCPME discovers the devices and assigns their default ID numbers, the user can choose new Device_ID values and write these to each device using BACnet software. Subsequent discoveries will not overwrite these values with defaults even if the BCPME is then set to Discovery mode.

ii. Use the GUI on the built-in web server to modify the offset value used to calculate default Device_IDs in the discovery process (this requires an Ethernet connection to a web browser; see BACnet/IP Setup section for instructions on changing configuration settings using the GUI). The BCPME retains this offset value and uses it to assign Device_ID numbers every time power is cycled if the BCPME is in Discovery mode. Valid Device_ID numbers range from 1 to 4194303. Since the numbers assigned during discovery are the sum of the Offset and the Modbus address (which can be any value from 1-247), any Offset values entered in the GUI must be less than 4194057.

BACnet PICS (Protocol Implementation Conformance Statement)

Vendor Name: Schneider Electric

BACnet Vendor ID 335

Product Name: BCPME Series Branch Circuit Monitor

Product Model Number: <Model Number>

Product Description: Branch Circuit Monitor

BACnet Protocol Version: Version 1 Revision 12

BACnet Standardized Device Profile (Annex L) – [Note: BCPME incorporates a gateway device]

- BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K):

- K.1.2 BIBB - Data Sharing - ReadProperty-B (DS-RP-B)
- K.1.4 BIBB - Data Sharing - ReadPropertyMultiple-B (DS-RPM-B)
- K.1.8 BIBB - Data Sharing - WriteProperty-B (DS-WP-B)
- K.1.10 BIBB - Data Sharing - WritePropertyMultiple-B (DS-WPM-B)
- K.1.12 BIBB - Data Sharing - COV-B (DS-COV-B)
- K.2.2 BIBB - Alarm and Event-Notification Internal-B (AE-N-I-B)
- K.2.5 BIBB - Alarm and Event-ACK-B (AE-ACK-B)
- K.2.11 BIBB - Alarm and Event-Information-B (AE-INFO-B)
- K.5.2 BIBB - Device Management - Dynamic Device Binding-B (DM-DDB-B)
- K.5.4 BIBB - Device Management - Dynamic Object Binding-B (DM-DOB-B)
- K.5.6 BIBB - Device Management - DeviceCommunicationControl-B (DM-DCC-B)
- K.5.12 BIBB - Device Management - TimeSyncronization-B (DM-TS-B)
- K.5.22 BIBB - Device Management – List Manipulation-B (DM-LM-B)

Standard Object Types Supported

- Device Object
- Analog Input
- Analog Output
- Analog Value

Unsupported Properties and Restrictions

- Does not support BACnet CreateObject
- Does not support BACnet DeleteObject
- Does not support any proprietary properties
- No proprietary properties exist
- No range restrictions exist
- Max_Master is writable

Data Link Layer Options

- BACnet IP, (Annex J)
- MS/TP master (Clause 9), baud rate up to 76.8 kbps

Networking Options

- BACnet/IP Broadcast Management Device (BBMD)
- Registrations by Foreign Devices

Character Sets Supported

- ISO 10646 (UTF-8) / ANSI X3.4

General BACnet Programming Information

The BCPME consists of a BACnet virtual router and one or two 42-channel branch circuit meters. The BACnet virtual router has its own device object and an internal BACnet network. The branch circuit monitors have their own device objects that are logical devices on the network internal to (beneath) the virtual router. It is critical that the network number of the virtual router's internal network be different than any other network number in your entire BACnet system. The network number is set to 50 at the factory, but can be changed in the GUI or by writing to the Present_Value of the AV2 data object associated with that device. Changes to the network number do not take effect until the BCPME is re-started, either from the GUI or by cycling the power.

The default Device ID of the virtual router is the Device_Offset parameter, which is set to 5000 at the factory, but can be changed in the GUI or by writing to Present_Value of the AV1 data object associated with that device. Changes to the network number do not take affect until the BCPME is re-started, either from the GUI or by cycling the power. The default Device IDs are numbered to consecutively follow the Device ID of the virtual router (e.g. if the Device_Offset parameter is 50000, the virtual router has a Device_ID of 50000, the branch circuit monitor called Panel 1 has a Device_ID of 50001 and the branch circuit monitor called Panel 2 (if present) has a Device_ID of 50002.

All Device_IDs are writable. Once a device's Object_Identifier is overwritten, changes to the ID Offset no longer affect that Object_Identifier, even in Discovery mode. Make further changes to the value by writing the Object_ Identifier property.

The default Object_Name property value of each device object is an abbreviated name of the meter series discovered with an underscore and the Modbus address of the meter appended to it. The Object_Name is a writable property. Once a device's Object_Name is overwritten, the Object_Name does not revert to the initial default, even in Discovery mode. Make further changes to the value by writing the Object_Name property.

The BCPME supports Subscribe_COV, with default COV increment values assigned as shown in the data object tables. If these values are not appropriate for a specific application, write them as needed when they are subscribed. On subsequent power cycles, no subscriptions are active and the COV increments return to their default values.

With few exceptions, any data values written to AV objects are accepted (without error) by the data object and passed through to the corresponding Modbus register. There is no direct indication via the BACnet protocol if invalid values are rejected. After an invalid value is written to the Present_Value of an AV, subsequent reads of that property return the new (invalid) value until the next time the BCPME refreshes its data (this may take several seconds).

BBMD Support

When the BCPME is in BACnet IP mode, it can be configured as a BACnet Broadcast Management Device (BBMD) by entering "BBMD" in the Enable BBMD Support field in the GUI, adding devices to a comma separated value text file named bdt.ini, and loading it onto the device. The example below shows the syntax required for the bdt.ini file. All lines beginning with two forward slashes are interpreted as comments. Use exactly one line per device

added, separated by commas (no spaces). The file must include an entry (line) for each BBMD device in the BAcnet enterprise, including the BCPME itself. Note: the default gateway address in the network setup must be correct for BBMD support to operate correctly. Once edited, upload the btd.ini file to the gateway through the GUI. Click the <Diagnostics and Debugging> button in the lower right corner of the GUI and follow the folder tree under Navigation to the following folder: “Schneider Electric BCPM Series Gateway/ Setup/File Transfer.” Select the “General” tab (this is important - using the wrong tab can overwrite critical files). Click the <Browse> button and select your bdt.ini file. Then click <Submit>. The GUI quickly indicates “The file was updated successfully.” Click the <System Restart> button, click <OK> on the confirmation dialog and wait for the gateway to reinitialize (takes about 30 seconds). BBMD changes are made by uploading a new btd.ini file. After setting the GUI to enable BBMD support and transferring a new or revised bdt.ini file, restart the BCPME to load the file. BBMD support can be disabled in the GUI by entering “-” (a hyphen) in the Enable BBMD Support field in the GUI.

```
// Bdt.ini
// The format of this table must be (without the forward slashes - they are
comment indicators):
//
//BBMD IP_Address , BBMD port , BBMD subnet Mask
//
147.26.116.217,47808,255.255.255.255
172.16.17.198,47808,255.255.255.255
```

General SNMP Programming Information

The BCPMSCE can be configured to support the SNMP V2c protocol over Ethernet. The SNMP community string and the IP address for the client receiving SNMP V2c event notifications can be set via the GUI. MIB files are available for download from the BCPM Downloads and Documents page at www.schneider-electric.com to enable accessing the BCPMSCE from an MIB browser.

The BCPME OID structure organizes the data under two “panels” representing the two breaker panels that can be monitored by a fully populated BCPME. Panel 1 corresponds to the branch current sensor strips connected to the “Panel 1A” and “Panel 1B” connectors and to the data set under Modbus address 1 or BACnet device identified as Node_1 in the GUI. Panel 2 corresponds to the branch current sensor strips connected to the “Panel 2A” and “Panel 2B” connectors and to the data set under Modbus address 2 or BACnet device identified as Node_2 in the GUI.

For each panel, data is arranged under six tree branches.

- The Configuration branch contains all writable configuration parameters.
- The Alarms branch contains all the event notification traps, the global event status registers and counters and tables of the event status indicators.
- The Voltage Inputs branch contains all data measurements pertaining to the voltage inputs.
- The Auxiliary Inputs branch contains all data measurements pertaining to the aux inputs other than voltage-related.
- The Branch Inputs branch contains all data measurements to the branch inputs in table format.
- The Flex Circuits branch contains all data measurements to the logical meter summaries in table format.

Troubleshooting

Table 5: Troubleshooting guide

Problem	Solution
Product is not communicating over Modbus daisy chain	• Check the unit Modbus address to ensure that each device on the daisy chain has a unique address. • Check Parity. • Check the communications wiring. • Check that the daisy chain is properly terminated.
Power factor reading is not as expected	• Verify voltage taps are connected in appropriate phase rotation. • Verify strip configuration register matches actual strip installation. • Verify phase rotation of breakers (firmware rev. 1.012 or higher allows for custom rotation if needed).
Current reading is not as expected, or reading is on different CT number than expected	• Verify strip configuration register matches actual strip installation. • Verify ribbon cable is fully seated and in the correct orientation.
Current is reading zero, even when small currents are still flowing through circuit	• The product does not register currents below 50 mA, and will set the reporting register to 0 mA for currents near or below this range.

China RoHS Compliance Information

Table 6: EFUP Table

部件名称	产品中有毒有害物质或元素的名称及含量Substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯(PBB)	多溴二苯醚(PBDE)
电子线路板	X	0	0	0	0	0
0 = 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下. X = 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求.						
Z000057-0A						

Appendix: Panel Configuration Diagrams and Selection Matrix

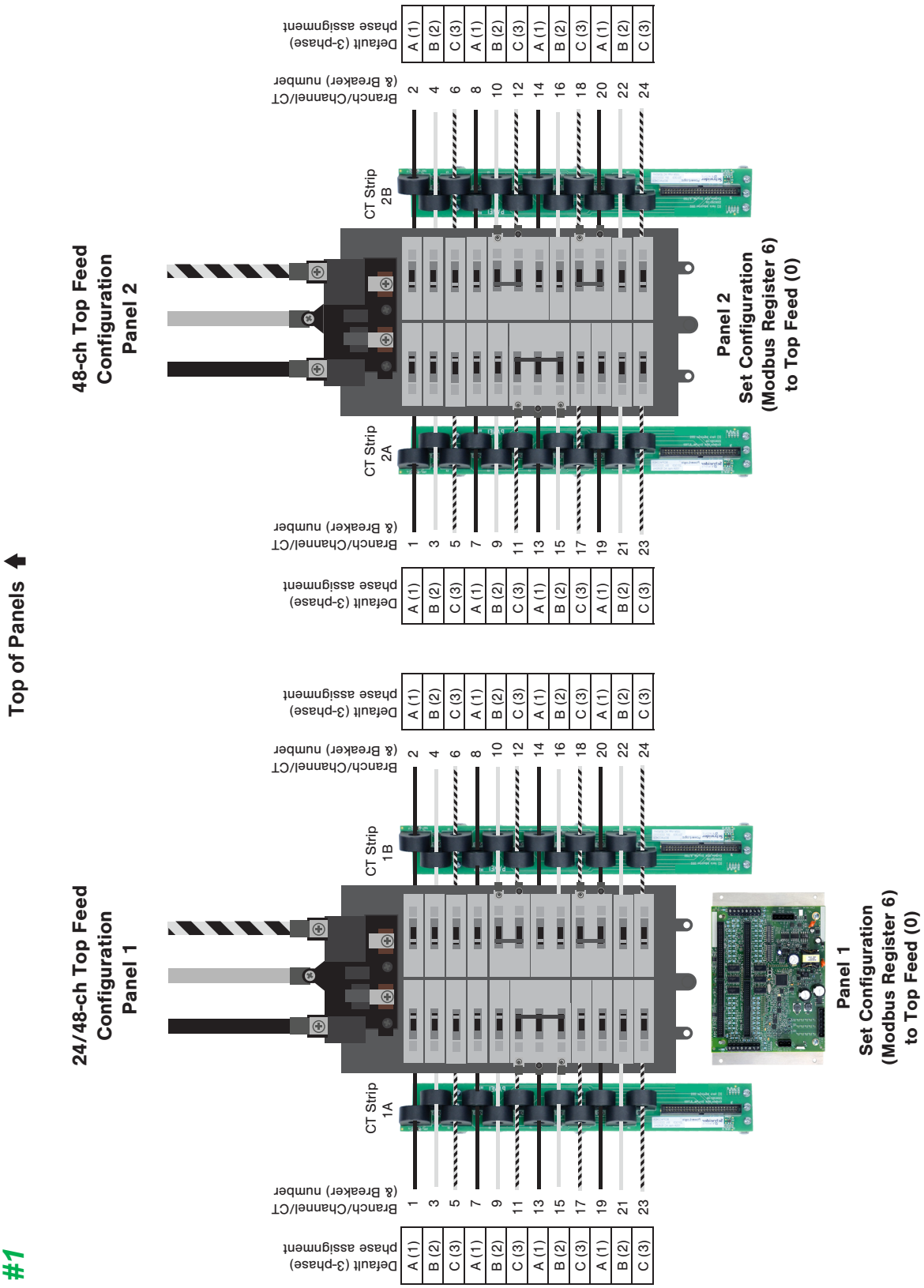
To determine which installation drawing applies and which configuration to select for each logical panel of the BCPME, answer the following questions about your application and look up the corresponding information on the selection table below:

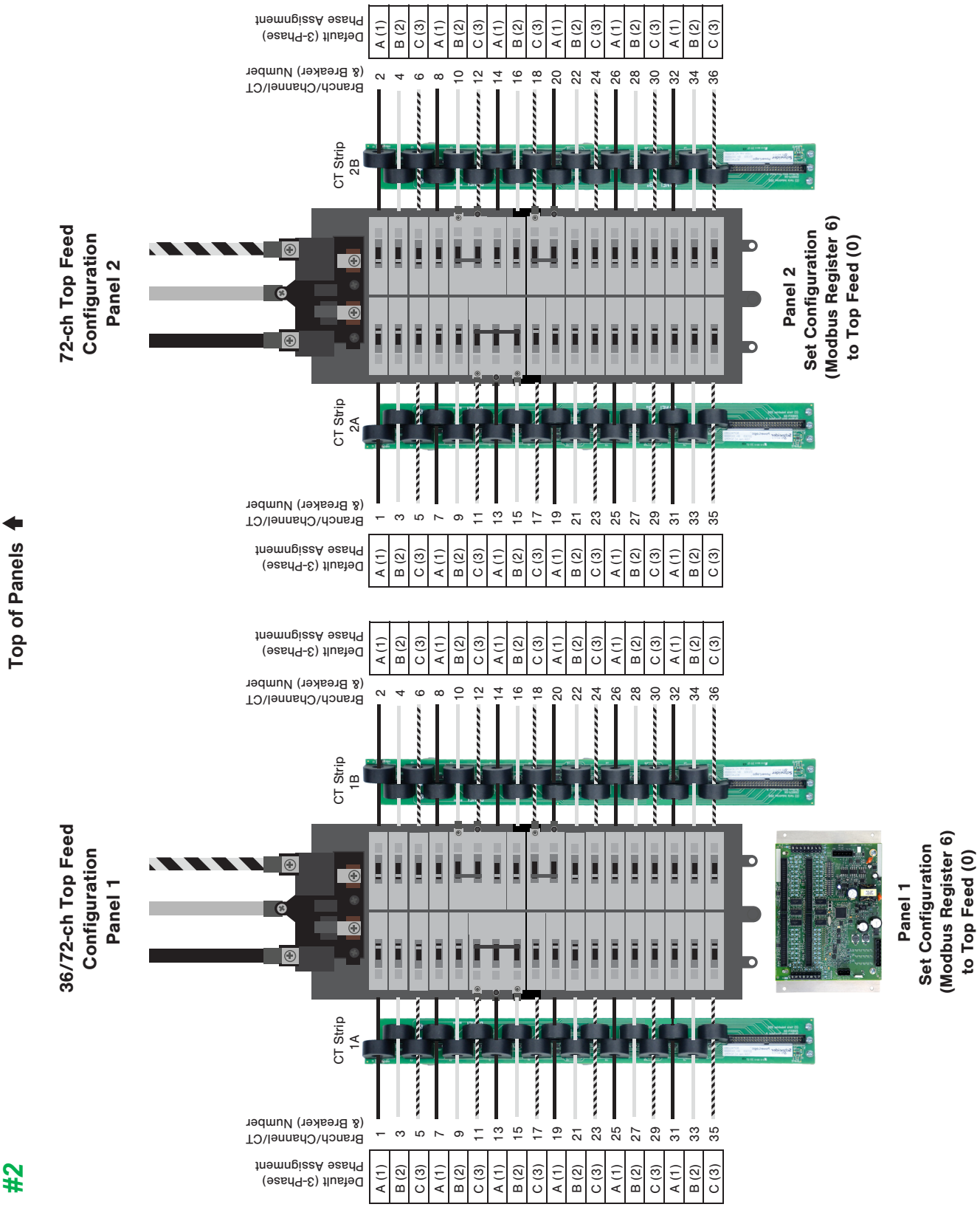
1. Are the rows of circuit breakers in your panelboard vertical (like most North American panels) or horizontal (like many European panels)?
2. Are the breakers arranged in a single row, in two rows, or in two separate panels, each with two rows?
3. If there are two rows of breakers, are the breakers/circuits in each row number sequentially, or are the odd numbers in one row and the even numbers in the other?
4. How many channels (branch CTs) does your BCPME have?
5. For vertical dual-row panels with odd/even numbering, do the main feeds come in at the top or the bottom of the chassis?

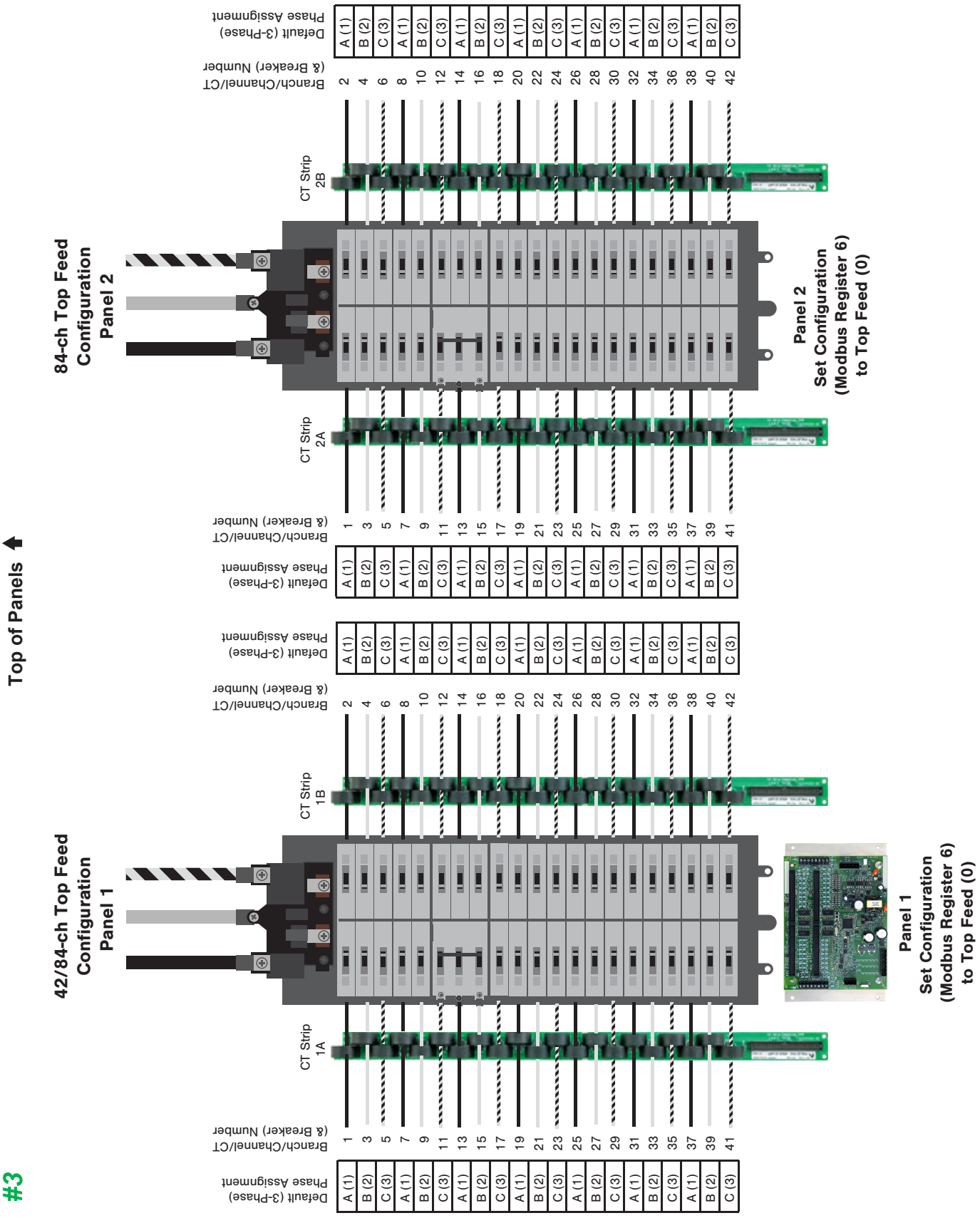
Orientation of circuit breaker rows:	*Breaker Numbering within Panel:*		*Single Panelboard*						*Two Panelboards (or Dual-Panel PDU/RPP)*		
			Single Panel <=24 Breakers	Single Panel <=36 Breakers	Single Panel <=42 Breakers	Single Panel <=48 Breakers	Single Panel <=72 Breakers	Single Panel <=84 Breakers	Two Panels <=24 Breakers each	Two Panels <=36 Breakers each	Two Panels <=42 Breakers each
		number of E30 channels:	24	36	42	48	72	84	48	72	84
Vertical	*Dual Row - Top Feed (with Odd/Even numbering)*	Installation Diagram to use:	1	2	3	7	8	9	1	2	3
		Panel 1 Confguration setting:	Top Feed	Top Feed	Top Feed	Bottom Feed	Bottom Feed	Bottom Feed	Top Feed	Top Feed	Top Feed
		Panel 2 Confguration setting:				Top Feed	Top Feed	Top Feed	Top Feed	Top Feed	Top Feed
	Dual Row - Bottom Feed (with Odd/Even numbering)	Installation Diagram to use:	4	5	6	7	8	9	4	5	6
		Panel 1 Confguration setting:	Bottom Feed	Bottom Feed	Bottom Feed	Bottom Feed	Bottom Feed	Bottom Feed	Bottom Feed	Bottom Feed	Bottom Feed
		Panel 2 Confguration setting:				Top Feed	Top Feed	Top Feed	Bottom Feed	Bottom Feed	Bottom Feed
	Dual Row -Top Feed (with Sequential numbering)	Installation Diagram to use:	10	11	12	13	14	15	10	11	12
		Panel 1 Confguration setting:	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential
		Panel 2 Confguration setting:				Sequential	Sequential	Sequential	Sequential	Sequential	Sequential
	Dual Row - Bottom Feed (with Sequential numbering)	Installation Diagram to use:	10	11	12	13	14	15	10	11	12
		Panel 1 Confguration setting:	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential
		Panel 2 Confguration setting:				Sequential	Sequential	Sequential	Sequential	Sequential	Sequential
	Single Row Veritcal (with Sequential numbering)	Installation Diagram to use:	16	17	18						
		Panel 1 Confguration setting:	Sequential	Sequential	Sequential						
		Panel 2 Confguration setting:									
	Dual Row - Any Feed (with Odd/Even numbering alternate strip mounting)*	Installation Diagram to use:			19*						
		Panel 1 Confguration setting:			Odd/Even						
		Panel 2 Confguration setting:									

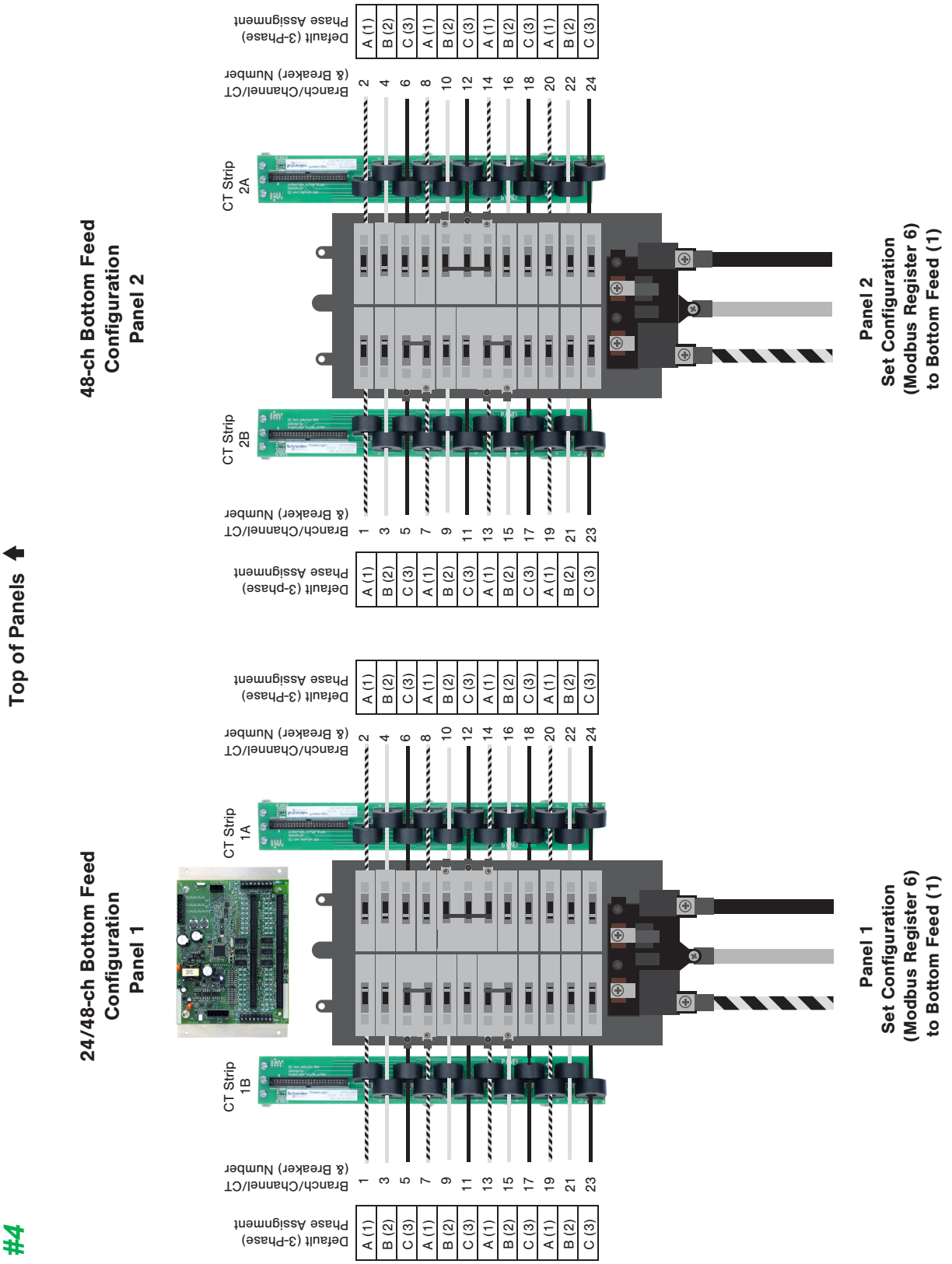
** this configuration is used in rare circumstances where both strips don't fit in the same orientation*

Orientation of circuit breaker rows:	*Rows of Circuit Breakers:*		*Single Row of Breakers*			*Two Rows of Breakers*		
			<=24 Breakers	<=36 Breakers	<=42 Breakers	<=24 Breakers per row	<=36 Breakers per row	<=42 Breakers per row
		number of E30 channels:	24	36	42	48	72	84
Horizontal	*Single Row (with Sequential numbering)*	Installation Diagram to use:	20	21	22			
		Panel 1 Confguration setting:	Sequential	Sequential	Sequential			
		Panel 2 Confguration setting:						
	Dual Row (with Sequential numbering)	Installation Diagram to use:	23	24	25	26	27	28
		Panel 1 Confguration setting:	Sequential	Sequential	Sequential	Sequential	Sequential	Sequential
		Panel 2 Confguration setting:				Sequential	Sequential	Sequential







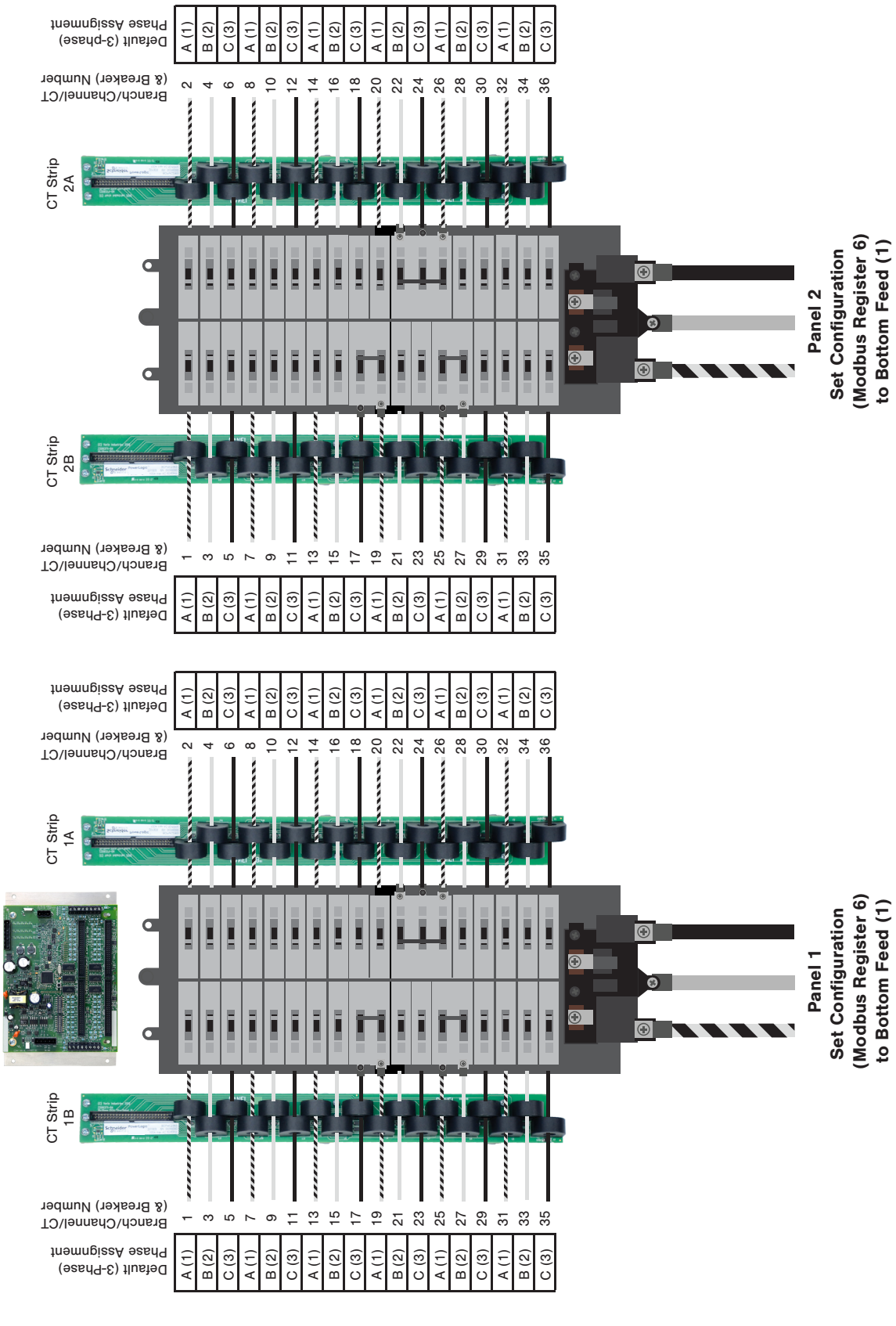


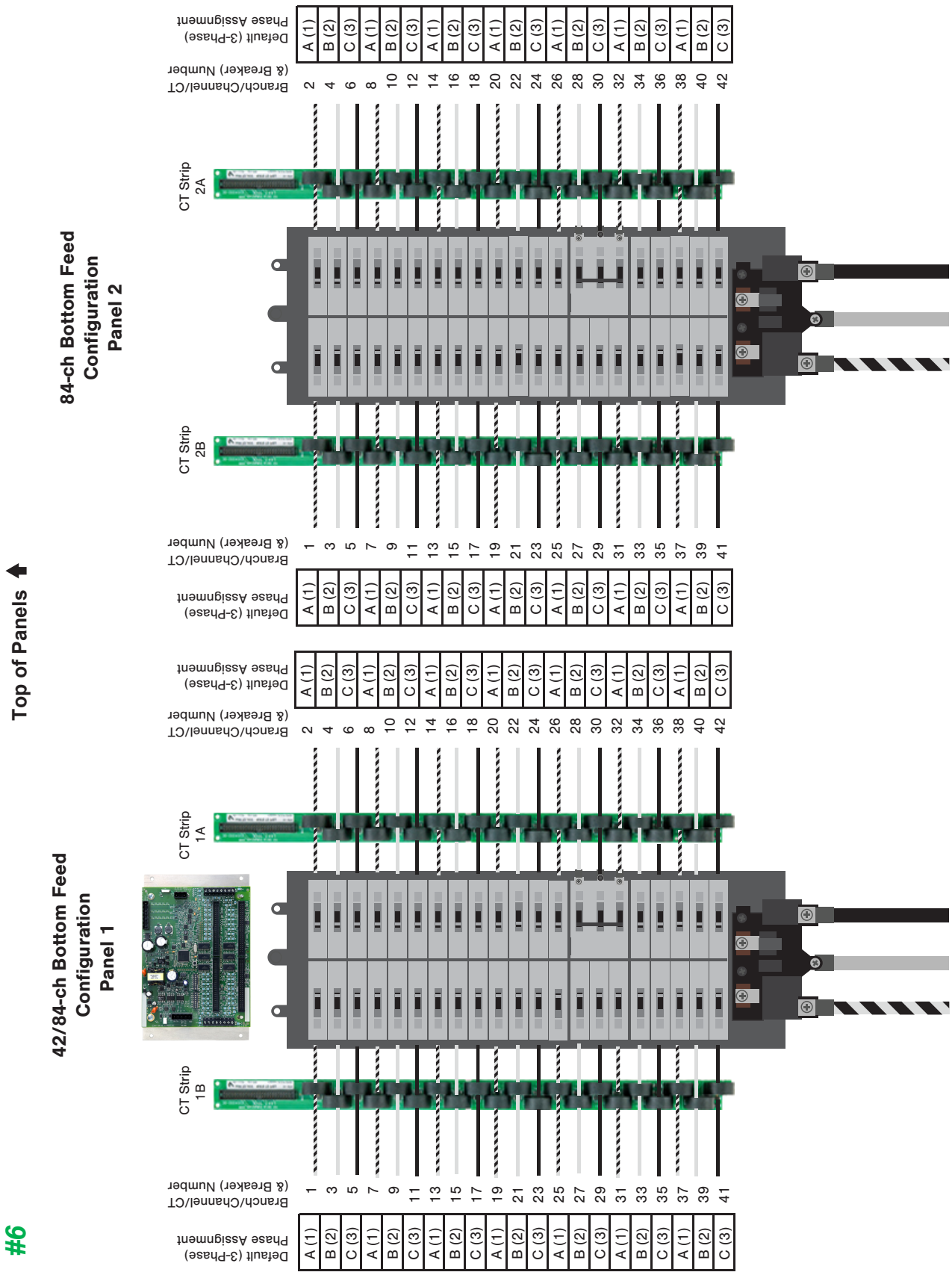
#5

Top of Panels

36/72-ch Bottom Feed Configuration Panel 1

72-ch Bottom Feed Configuration Panel 2





#7

Top of Panel

48-ch Large Panel Odd/Even Configuration

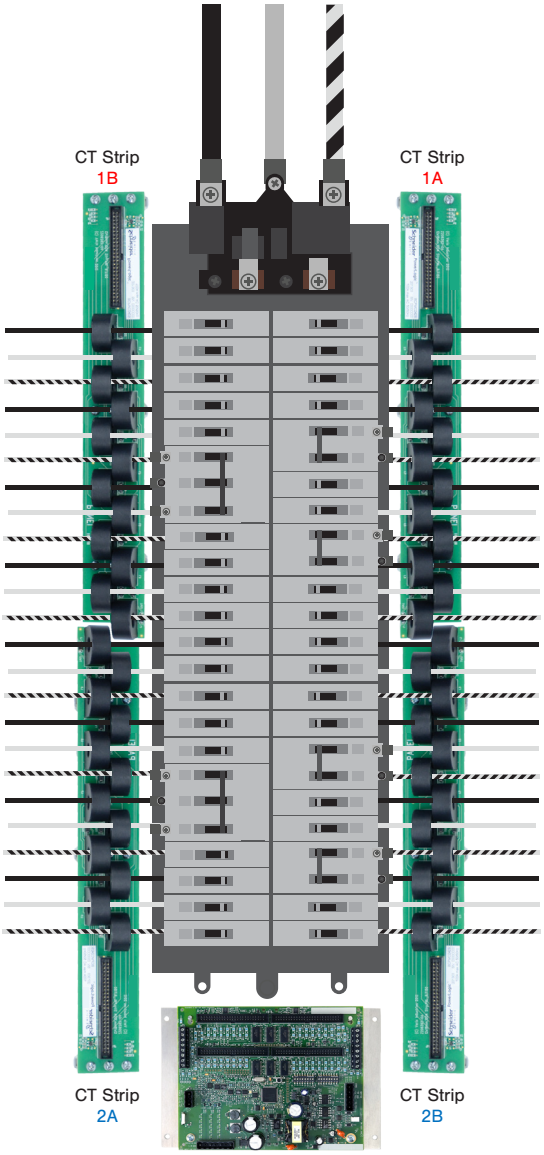
Note: This application does NOT use the Odd/Even configuration setting.

Panel 1 (Upper Half) Set Configuration (Modbus Register 6) to Bottom Feed (1)

Default (3-Phase) Phase Assignment	Branch/Channel/CT Number	Breaker Number
A (1)	1	1
B (2)	3	3
C (3)	5	5
A (1)	7	7
B (2)	9	9
C (3)	11	11
A (1)	13	13
B (2)	15	15
C (3)	17	17
A (1)	19	19
B (2)	21	21
C (3)	23	23

Panel 2 (Lower Half) Set Configuration (Modbus Register 6) to Top Feed (0)

Default (3-Phase) Phase Assignment	Branch/Channel/CT Number	Breaker Number
A (1)	1	25
B (2)	3	27
C (3)	5	29
A (1)	7	31
B (2)	9	33
C (3)	11	35
A (1)	13	37
B (2)	15	39
C (3)	17	41
A (1)	19	43
B (2)	21	45
C (3)	23	47



Panel 1 (Upper Half) Set Configuration (Modbus Register 6) to Bottom Feed (1)

Breaker Number	Branch/Channel/CT Number	Default (3-Phase) Phase Assignment
2	2	A (1)
4	4	B (2)
6	6	C (3)
8	8	A (1)
10	10	B (2)
12	12	C (3)
14	14	A (1)
16	16	B (2)
18	18	C (3)
20	20	A (1)
22	22	B (2)
24	24	C (3)

Panel 2 (Lower Half) Set Configuration (Modbus Register 6) to Top Feed (0)

Breaker Number	Branch/Channel/CT Number	Default (3-Phase) Phase Assignment
26	2	A (1)
28	4	B (2)
30	6	C (3)
32	8	A (1)
34	10	B (2)
36	12	C (3)
38	14	A (1)
40	16	B (2)
42	18	C (3)
44	20	A (1)
46	22	B (2)
48	24	C (3)

#8

Top of Panel

72-ch Large Panel Odd/Even Configuration

Note: This application does NOT use the Odd/Even configuration setting.

Panel 1 (Upper Half) Set Configuration (Modbus Register 6) to Bottom Feed (1)

Default (3-Phase) Phase Assignment	Branch/Channel/CT Number	Breaker Number
A (1)	1	1
B (2)	3	3
C (3)	5	5
A (1)	7	7
B (2)	9	9
C (3)	11	11
A (1)	13	13
B (2)	15	15
C (3)	17	17
A (1)	19	19
B (2)	21	21
C (3)	23	23
A (1)	25	25
B (2)	27	27
C (3)	29	29
A (1)	31	31
B (2)	33	33
C (3)	35	35

Panel 2 (Lower Half) Set Configuration (Modbus Register 6) to Top Feed (0)

Default (3-Phase) Phase Assignment	Branch/Channel/CT Number	Breaker Number
A (1)	1	37
B (2)	3	39
C (3)	5	41
A (1)	7	43
B (2)	9	45
C (3)	11	47
A (1)	13	49
B (2)	15	51
C (3)	17	53
A (1)	19	55
B (2)	21	57
C (3)	23	59
A (1)	25	61
B (2)	27	63
C (3)	29	65
A (1)	31	67
B (2)	33	69
C (3)	35	71

Panel 1 (Upper Half) Set Configuration (Modbus Register 6) to Bottom Feed (1)

Breaker Number	Branch/Channel/CT Number	Default (3-Phase) Phase Assignment
2	2	A (1)
4	4	B (2)
6	6	C (3)
8	8	A (1)
10	10	B (2)
12	12	C (3)
14	14	A (1)
16	16	B (2)
18	18	C (3)
20	20	A (1)
22	22	B (2)
24	24	C (3)
26	26	A (1)
28	28	B (2)
30	30	C (3)
32	32	A (1)
34	34	B (2)
36	36	C (3)

Panel 2 (Lower Half) Set Configuration (Modbus Register 6) to Top Feed (0)

Breaker Number	Branch/Channel/CT Number	Default (3-Phase) Phase Assignment
38	2	A (1)
40	4	B (2)
42	6	C (3)
44	8	A (1)
46	10	B (2)
48	12	C (3)
50	14	A (1)
52	16	B (2)
54	18	C (3)
56	20	A (1)
58	22	B (2)
60	24	C (3)
62	26	A (1)
64	28	B (2)
66	30	C (3)
68	32	A (1)
70	34	B (2)
72	36	C (3)

#9

Top of Panel

84-ch Large Panel Odd/Even Configuration

Note: This application does NOT use the Odd/Even configuration setting.

Panel 1 (Upper Half)
Set Configuration (Modbus Register 6)
to Bottom Feed (1)

Default (3-Phase) Phase Assignment	Branch/Channel/CT Number	Breaker Number
A (1)	1	1
B (2)	3	3
C (3)	5	5
A (1)	7	7
B (2)	9	9
C (3)	11	11
A (1)	13	13
B (2)	15	15
C (3)	17	17
A (1)	19	19
B (2)	21	21
C (3)	23	23
A (1)	25	25
B (2)	27	27
C (3)	29	29
A (1)	31	31
B (2)	33	33
C (3)	35	35
A (1)	37	37
B (2)	39	39
C (3)	41	41

Panel 2 (Upper Half)
Set Configuration (Modbus Register 6)
to Top Feed (0)

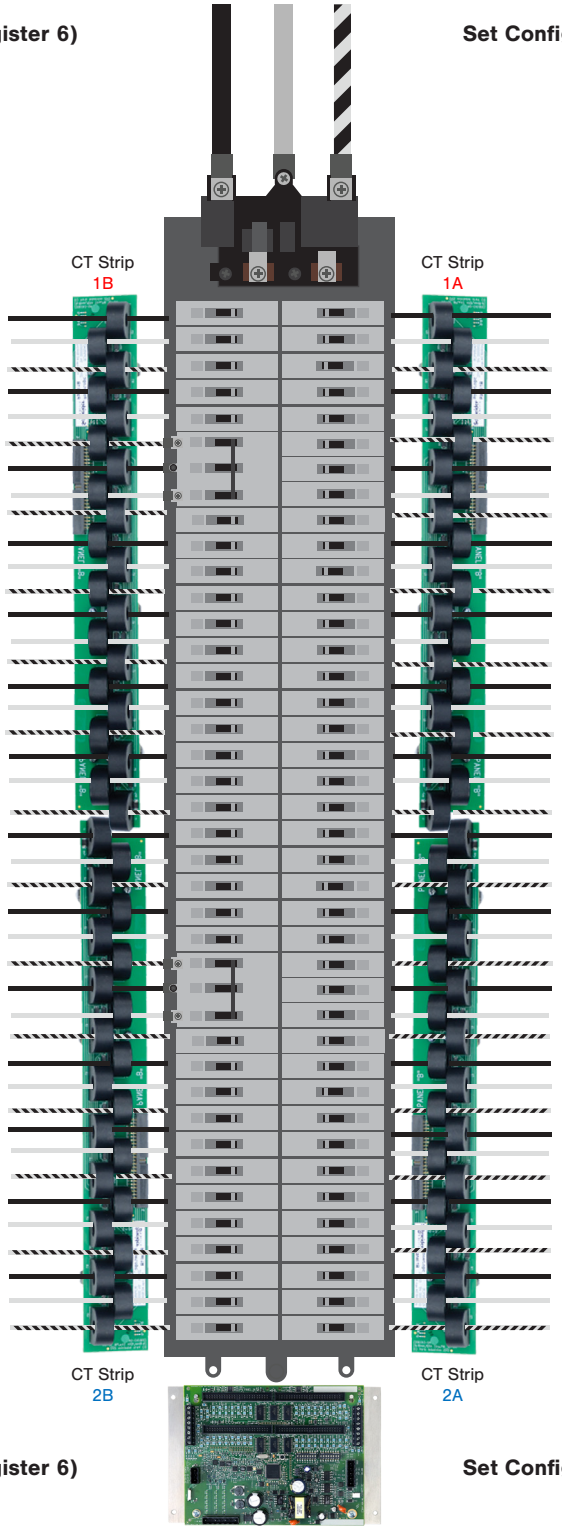
Default (3-Phase) Phase Assignment	Branch/Channel/CT Number	Breaker Number
A (1)	1	43
B (2)	3	45
C (3)	5	47
A (1)	7	49
B (2)	9	51
C (3)	11	53
A (1)	13	55
B (2)	15	57
C (3)	17	59
A (1)	19	61
B (2)	21	63
C (3)	23	65
A (1)	25	67
B (2)	27	69
C (3)	29	71
A (1)	31	73
B (2)	33	75
C (3)	35	77
A (1)	37	79
B (2)	39	81
C (3)	41	83

CT Strip 1B

CT Strip 1A

CT Strip 2B

CT Strip 2A

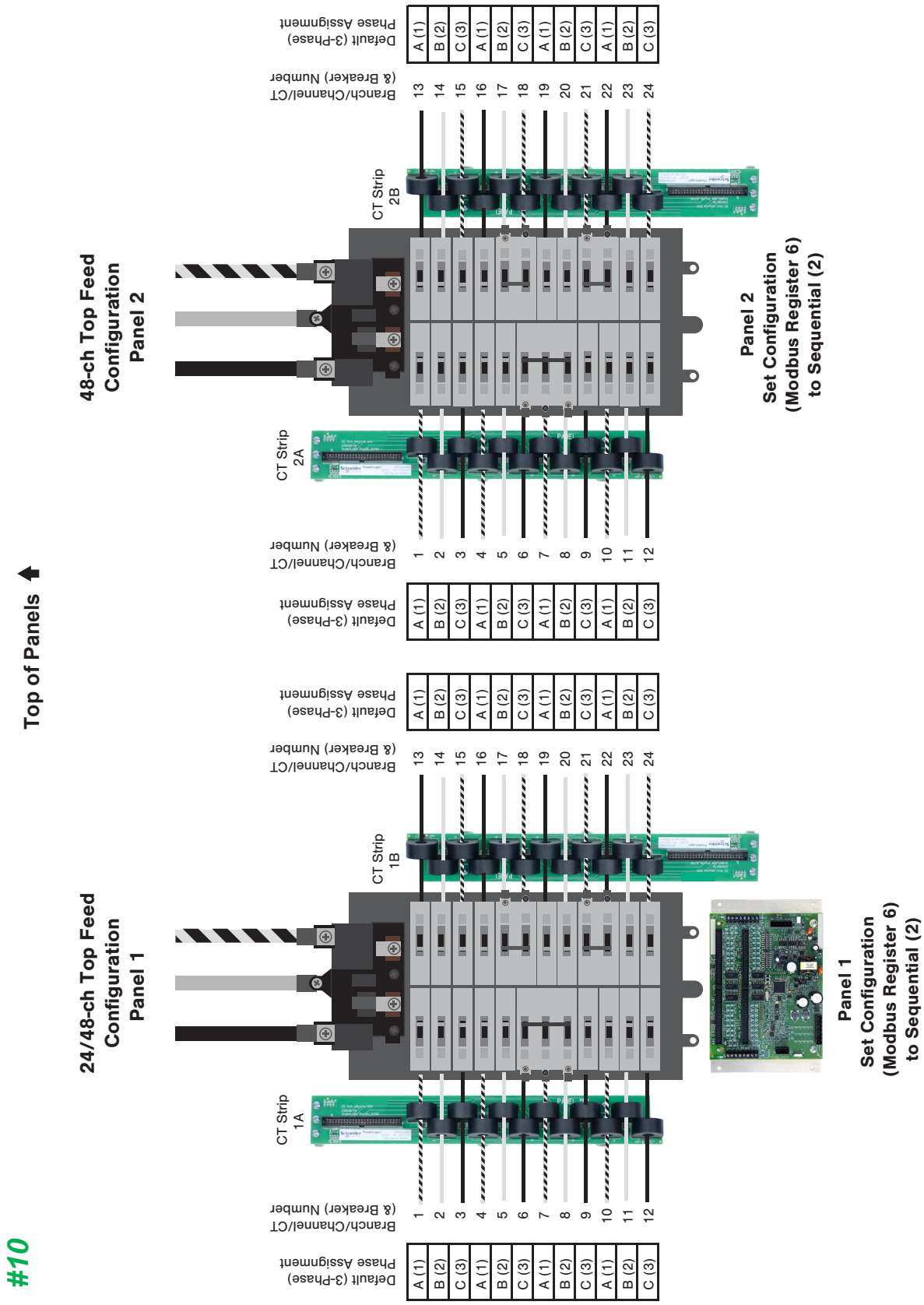


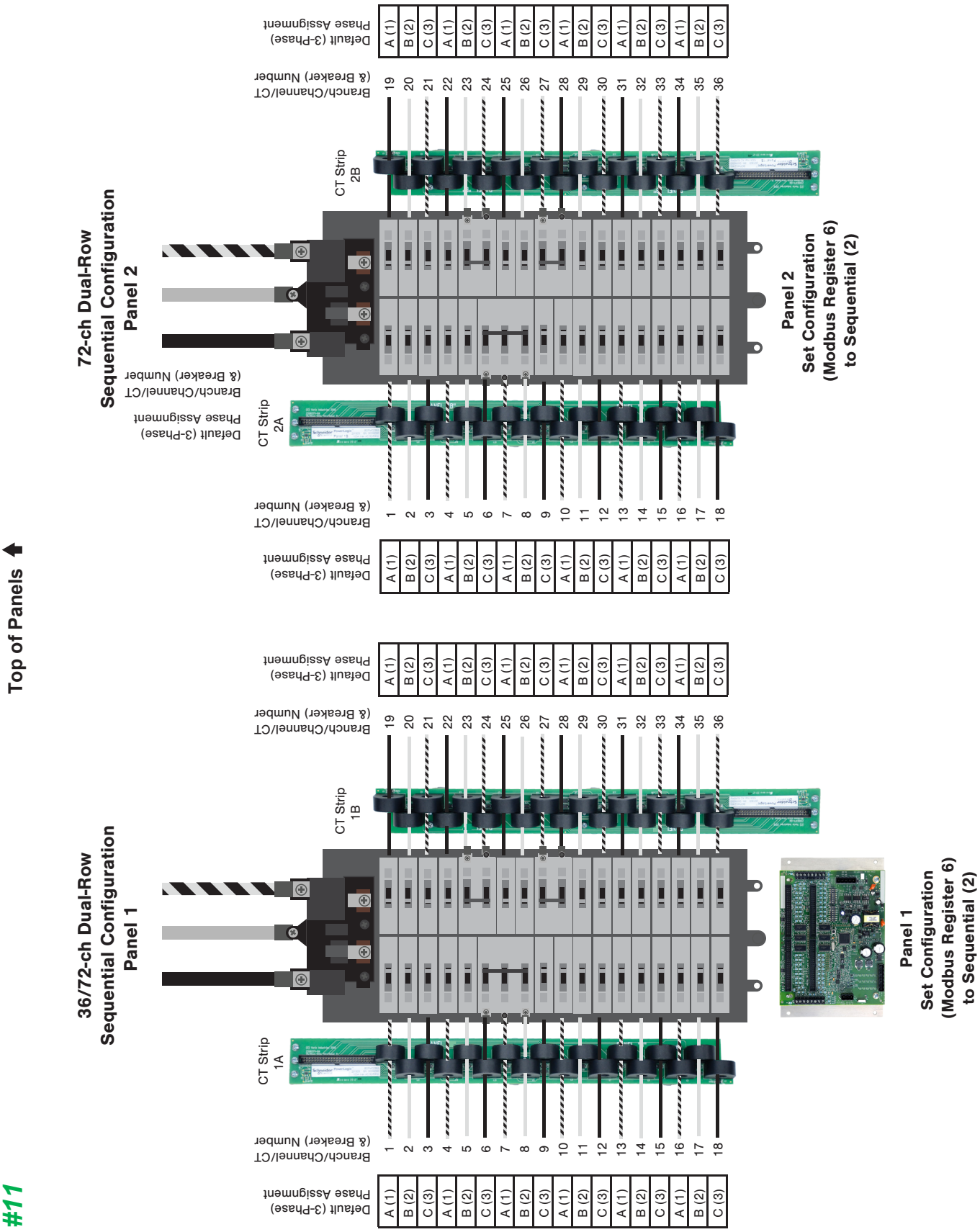
Panel 1 (Upper Half)
Set Configuration (Modbus Register 6)
to Bottom Feed (1)

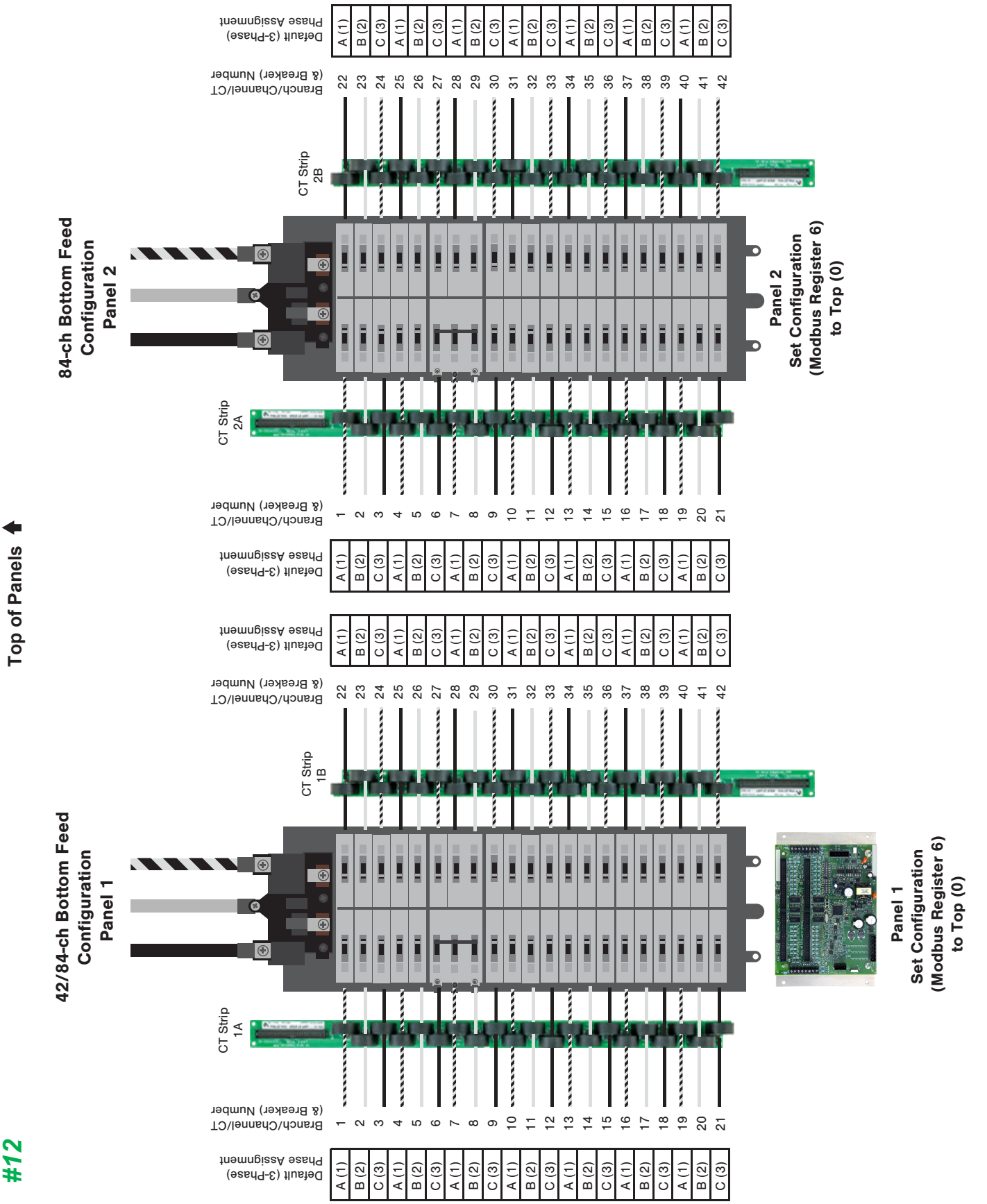
Breaker Number	Branch/Channel/CT Number	Default (3-Phase) Phase Assignment
2	2	A (1)
4	4	B (2)
6	6	C (3)
8	8	A (1)
10	10	B (2)
12	12	C (3)
14	14	A (1)
16	16	B (2)
18	18	C (3)
20	20	A (1)
22	22	B (2)
24	24	C (3)
26	26	A (1)
28	28	B (2)
30	30	C (3)
32	32	A (1)
34	34	B (2)
36	36	C (3)
38	38	A (1)
40	40	B (2)
42	42	C (3)

Panel 2 (Upper Half)
Set Configuration (Modbus Register 6)
to Top Feed (0)

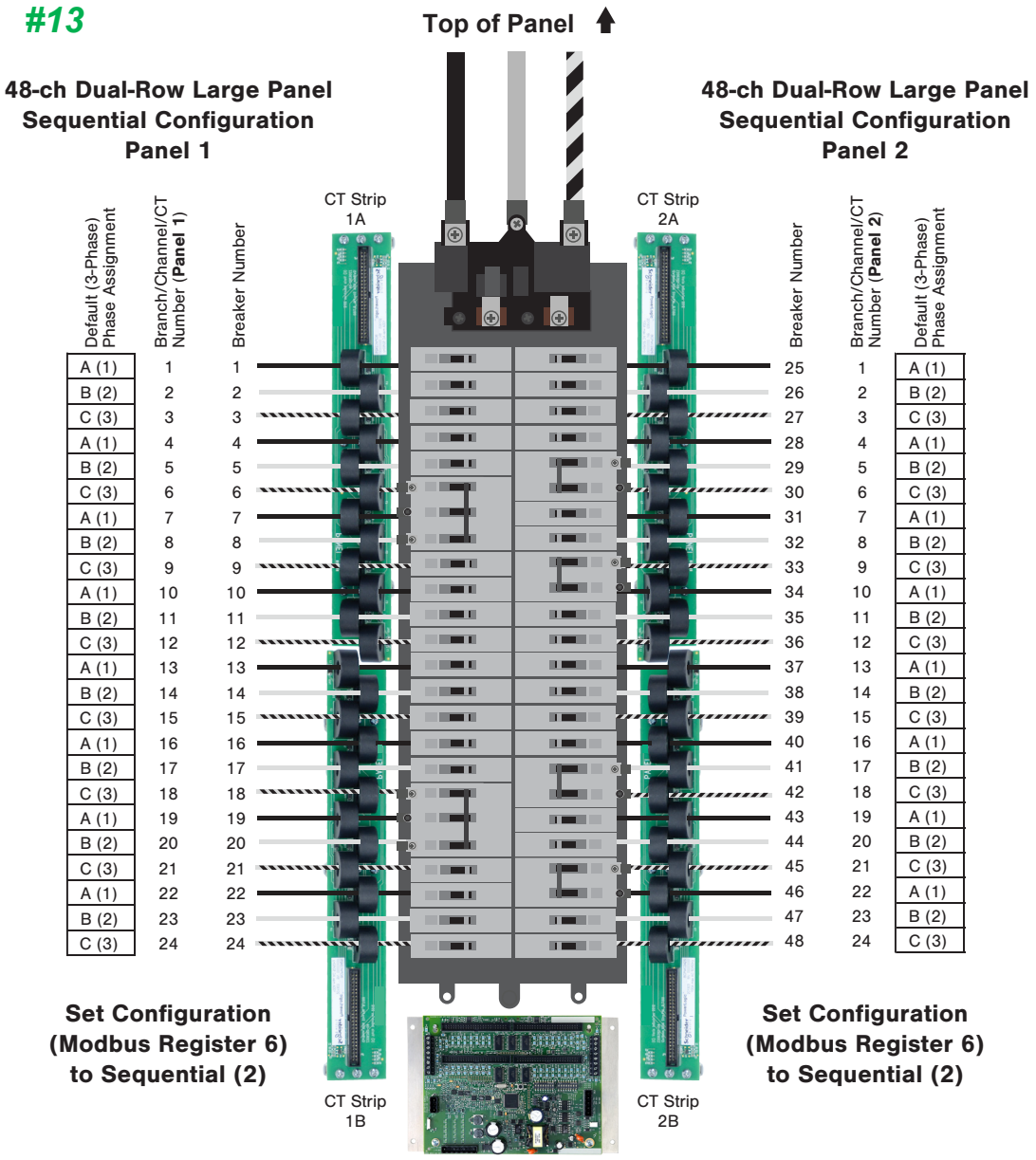
Breaker Number	Branch/Channel/CT Number	Default (3-Phase) Phase Assignment
44	2	A (1)
46	4	B (2)
48	6	C (3)
50	8	A (1)
52	10	B (2)
54	12	C (3)
56	14	A (1)
58	16	B (2)
60	18	C (3)
62	20	A (1)
64	22	B (2)
66	24	C (3)
68	26	A (1)
70	28	B (2)
72	30	C (3)
74	32	A (1)
76	34	B (2)
78	36	C (3)
80	38	A (1)
82	40	B (2)
84	42	C (3)



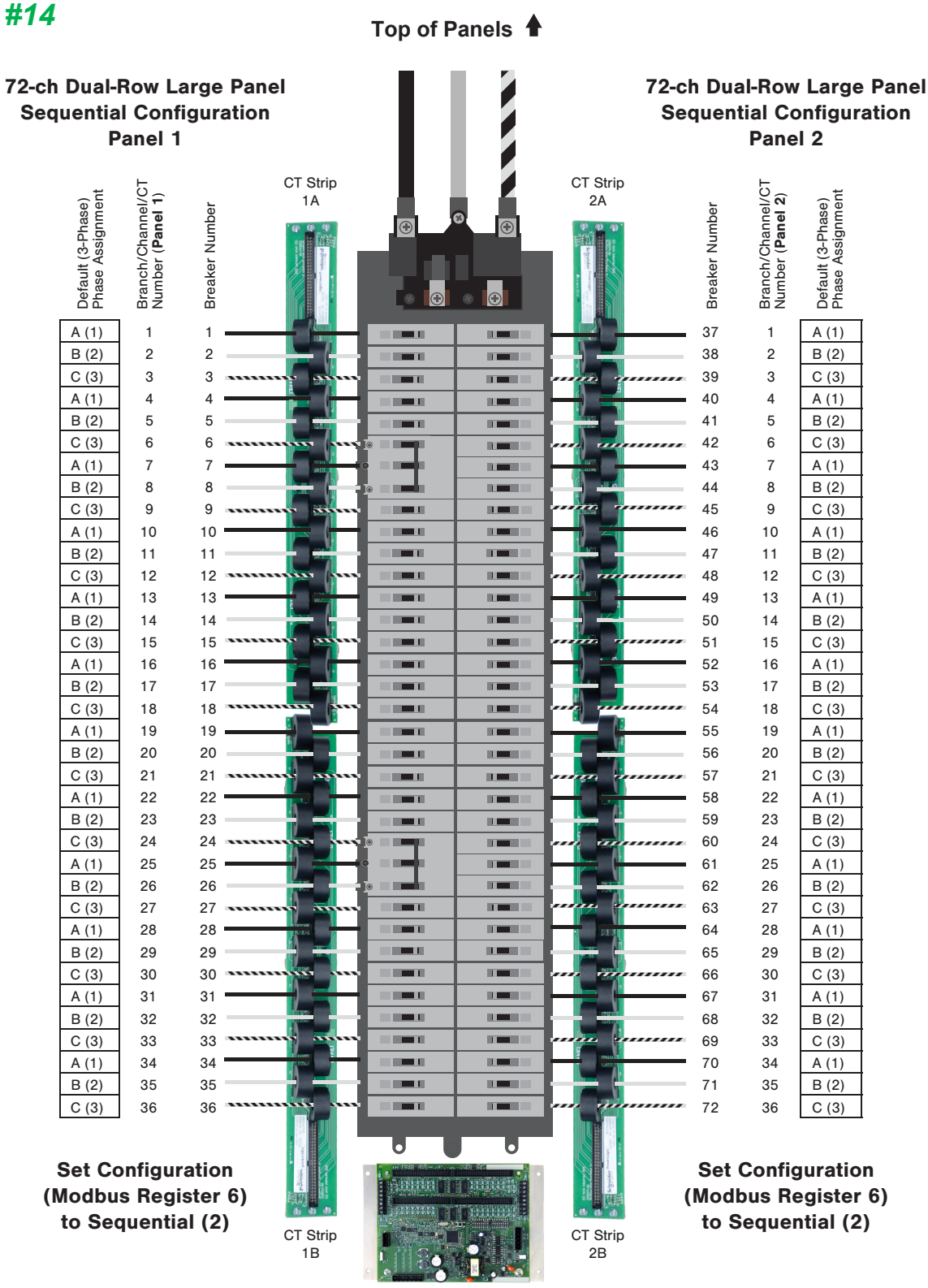




#13

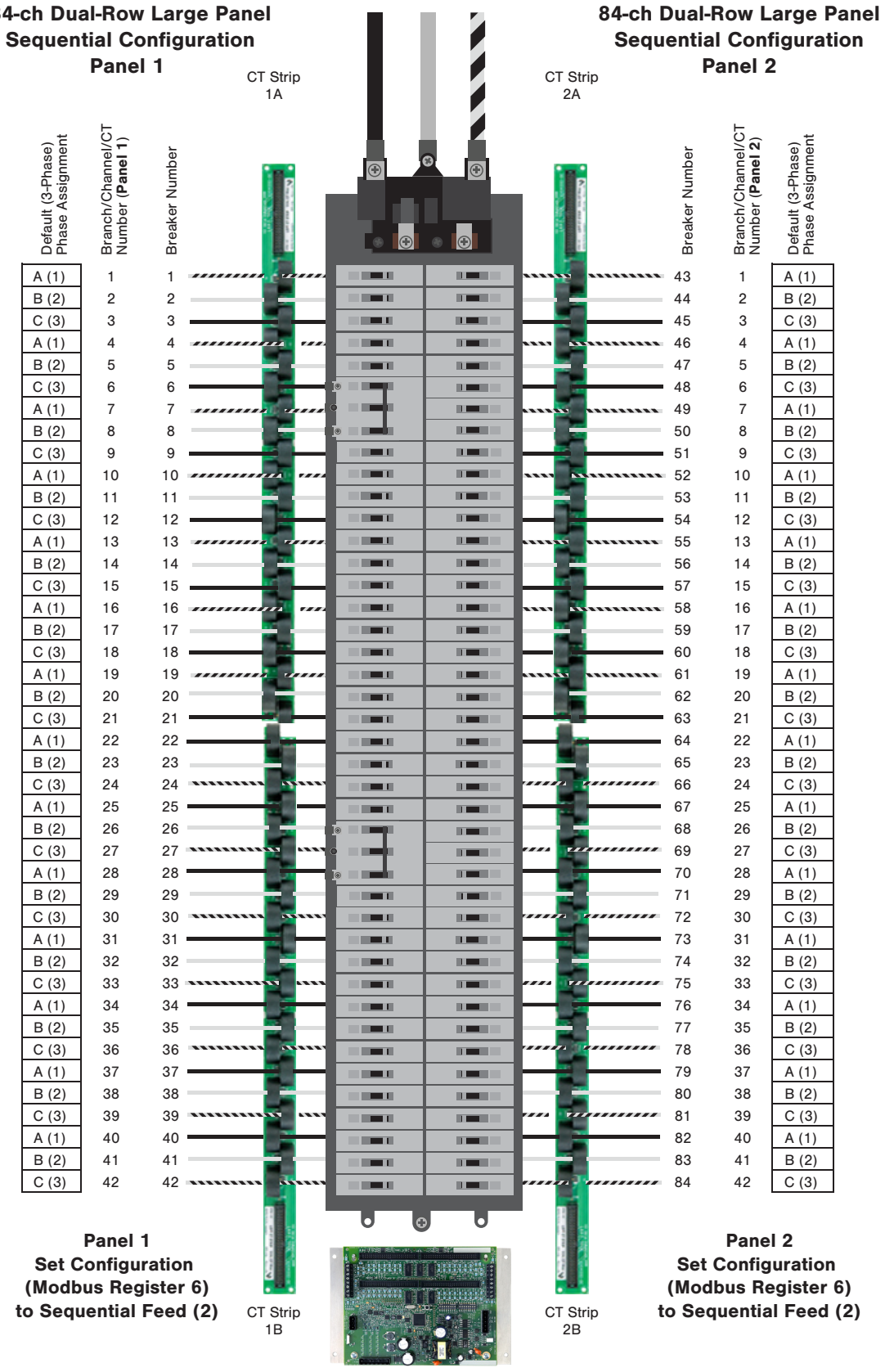


#14



#15

Top of Panel



Panel 1
Set Configuration
(Modbus Register 6)
to Sequential Feed (2)

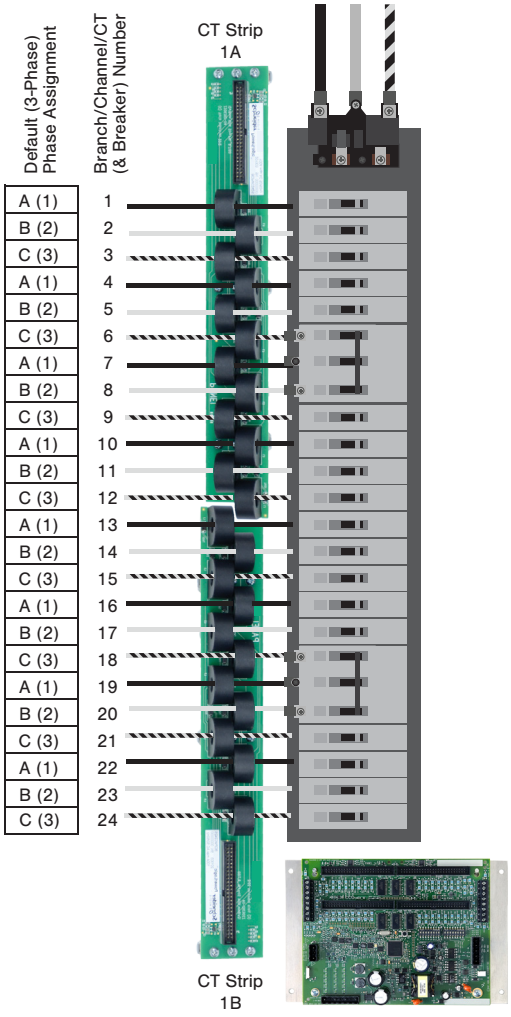
Panel 2
Set Configuration
(Modbus Register 6)
to Sequential Feed (2)

#16

Top of Panel

24-ch Single-Row
Sequential Configuration

Set Configuration
(Modbus Register 6)
to Sequential (2)

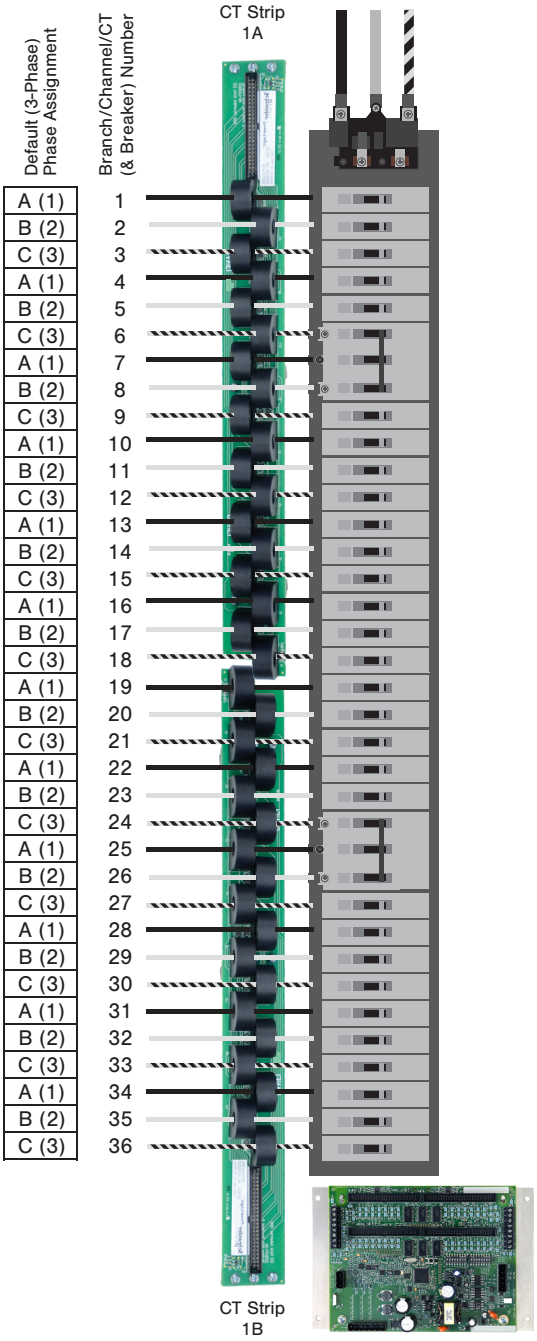


#17

Top of Panel ⬆

36-ch Single-Row
Sequential Configuration

Set Configuration
(Modbus Register 6)
to Sequential (2)

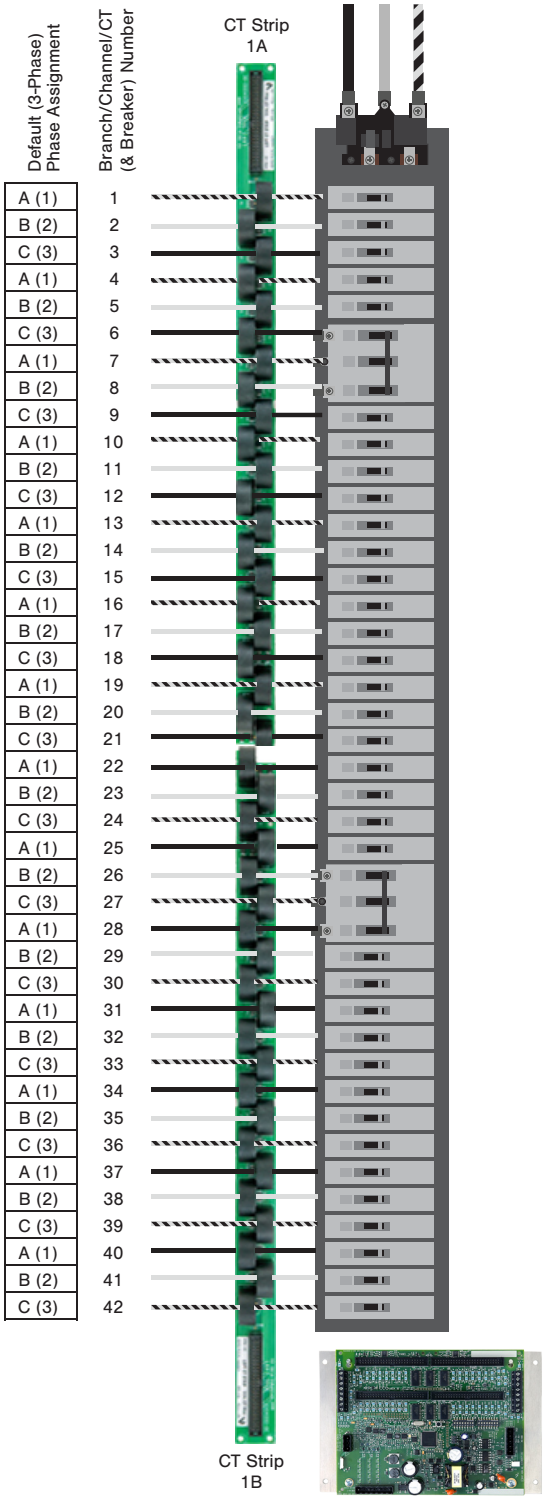


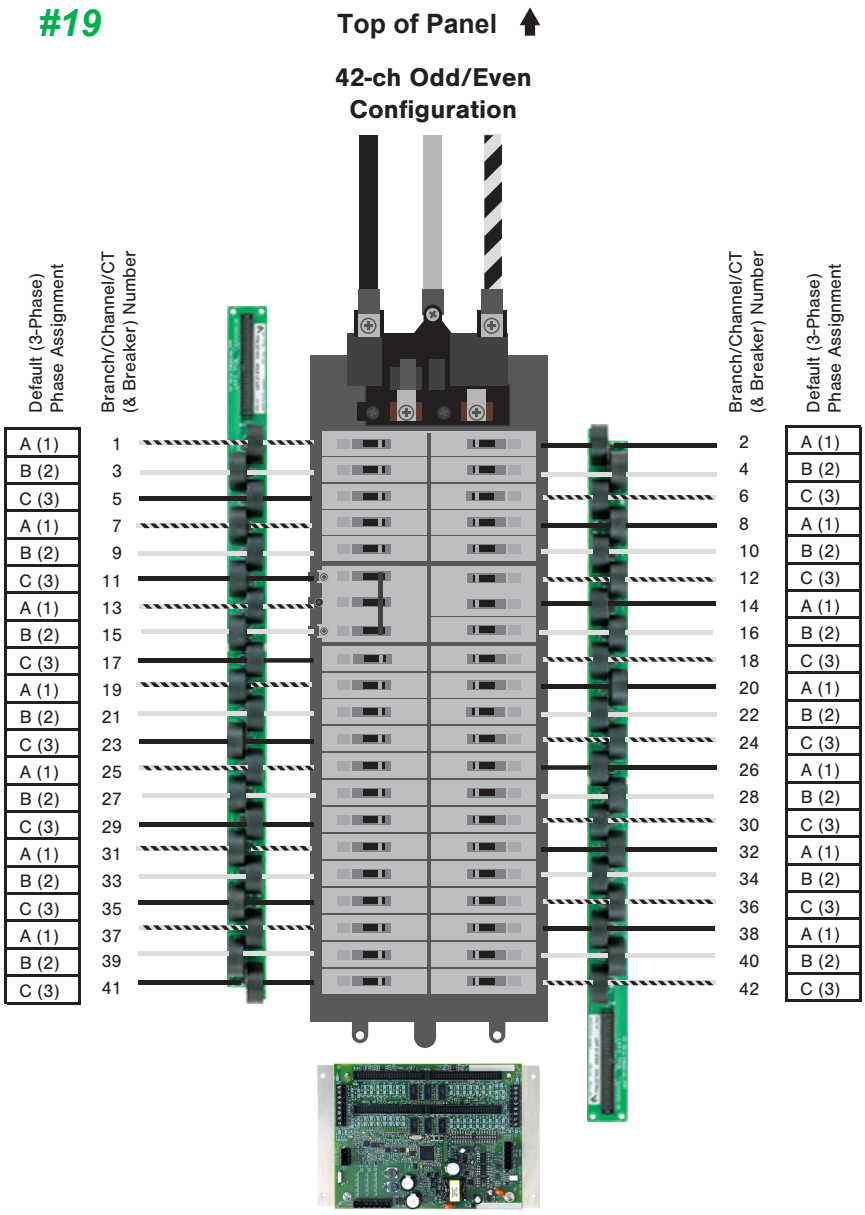
#18

Top of Panel

42-ch Single-Row
Sequential Configuration

Set Configuration
(Modbus Register 6)
to Sequential (2)



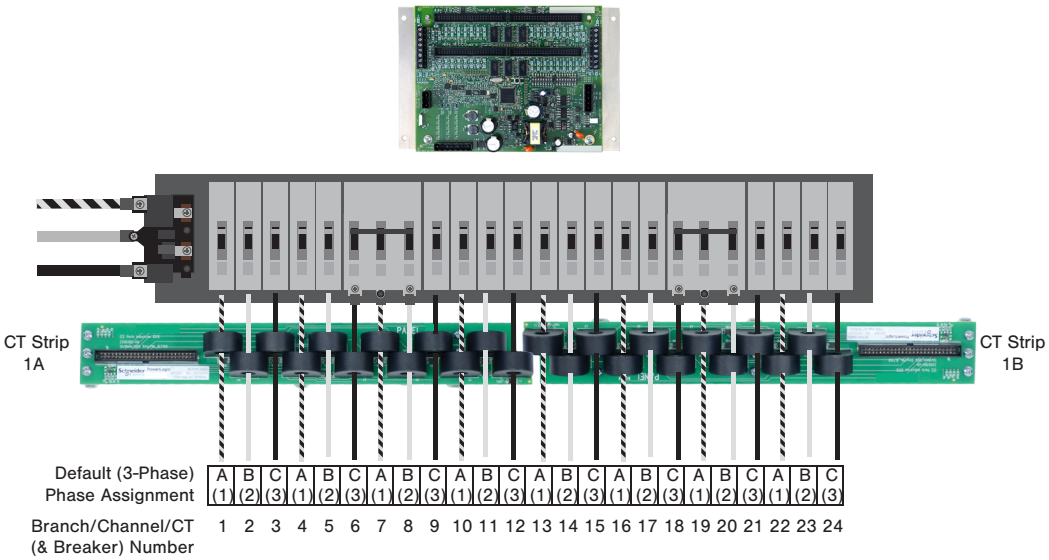


Panel 1
Set Configuration
(Modbus Register 6)
to Odd/Even (3)

#20

Top of Panel

24-ch Sequential Configuration

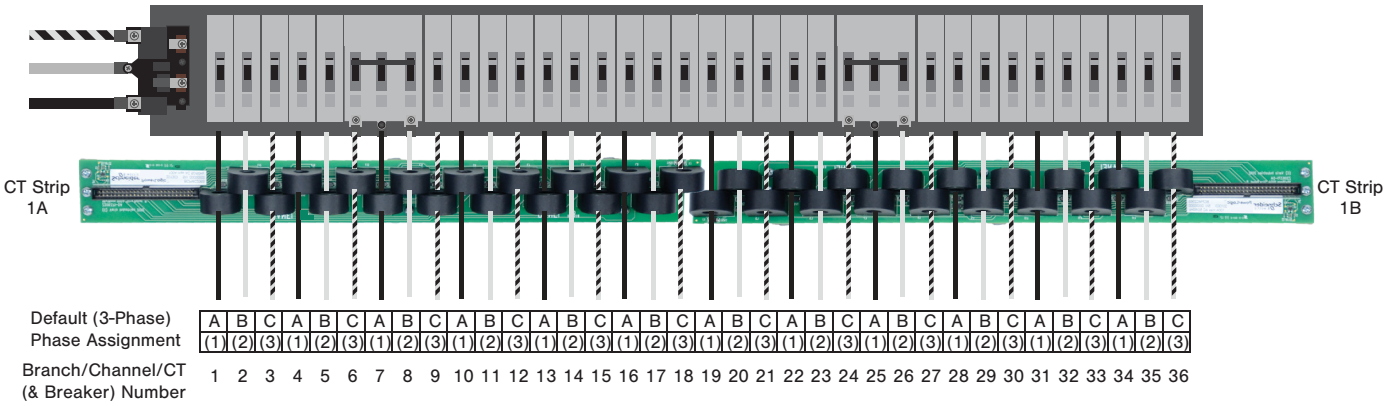


Panel 1
Set Configuration
(Modbus Register 6)
to Sequential (2)

#21

Top of Panel

36-ch Sequential Configuration

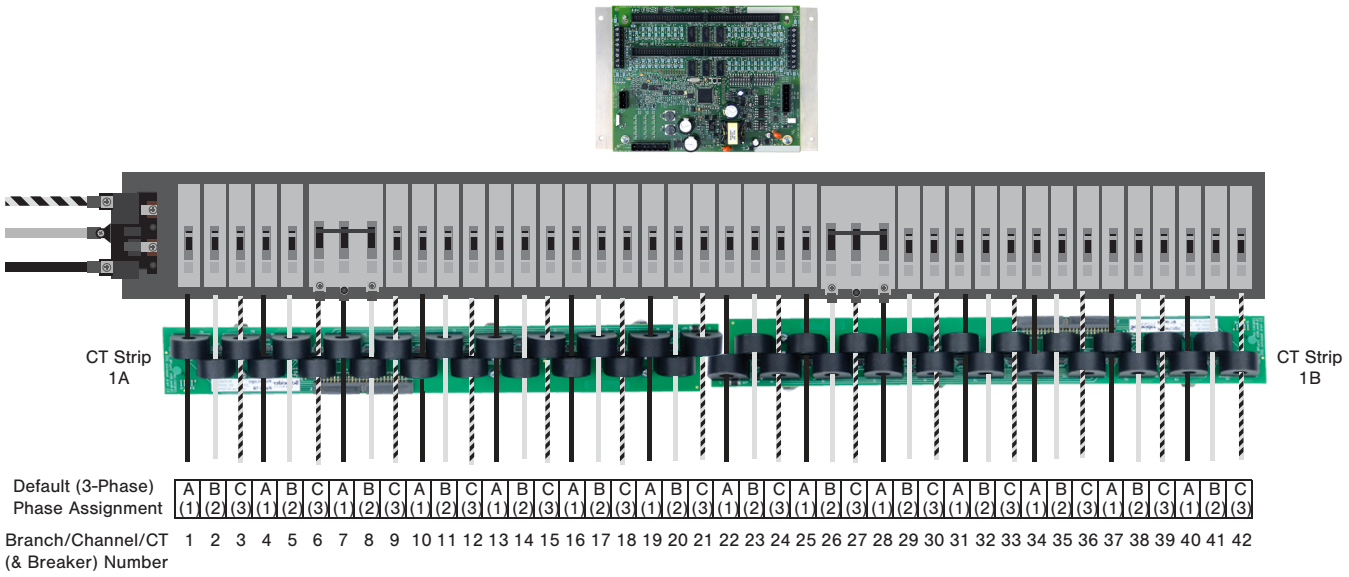


Panel 1
Set Configuration
(Modbus Register 6)
to Sequential (2)

#22

Top of Panel ⬆

42-ch Sequential Configuration

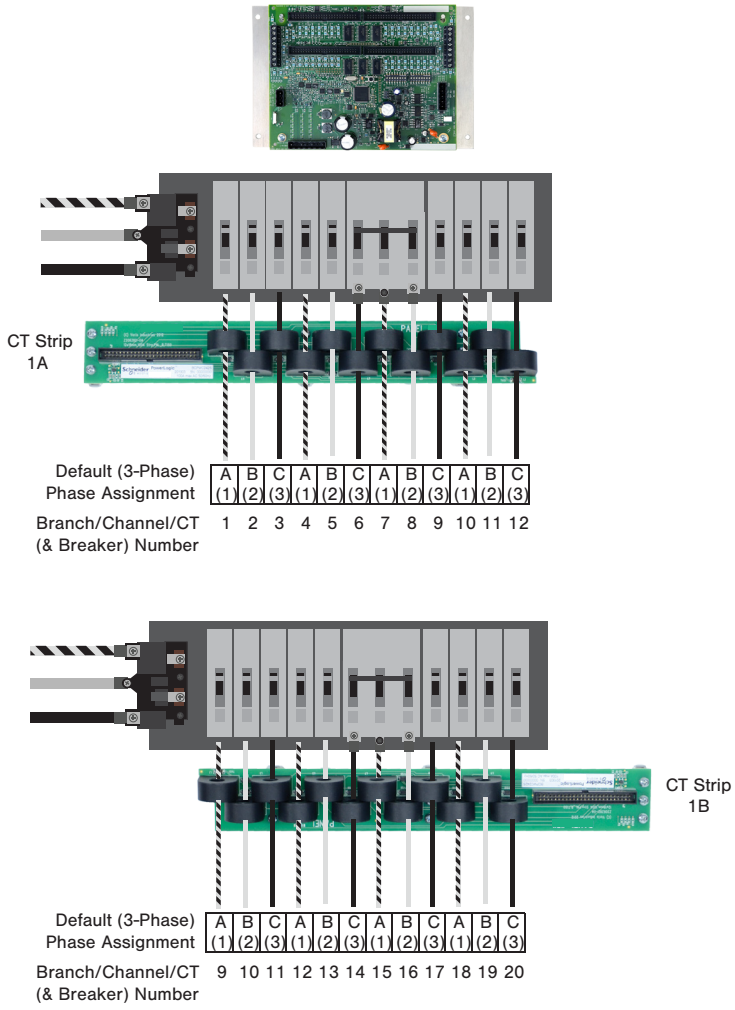


Panel 1 Set Configuration (Modbus Register 6) to Sequential (2)

#23

Top of Panels

24-ch Dual-Row Sequential Configuration

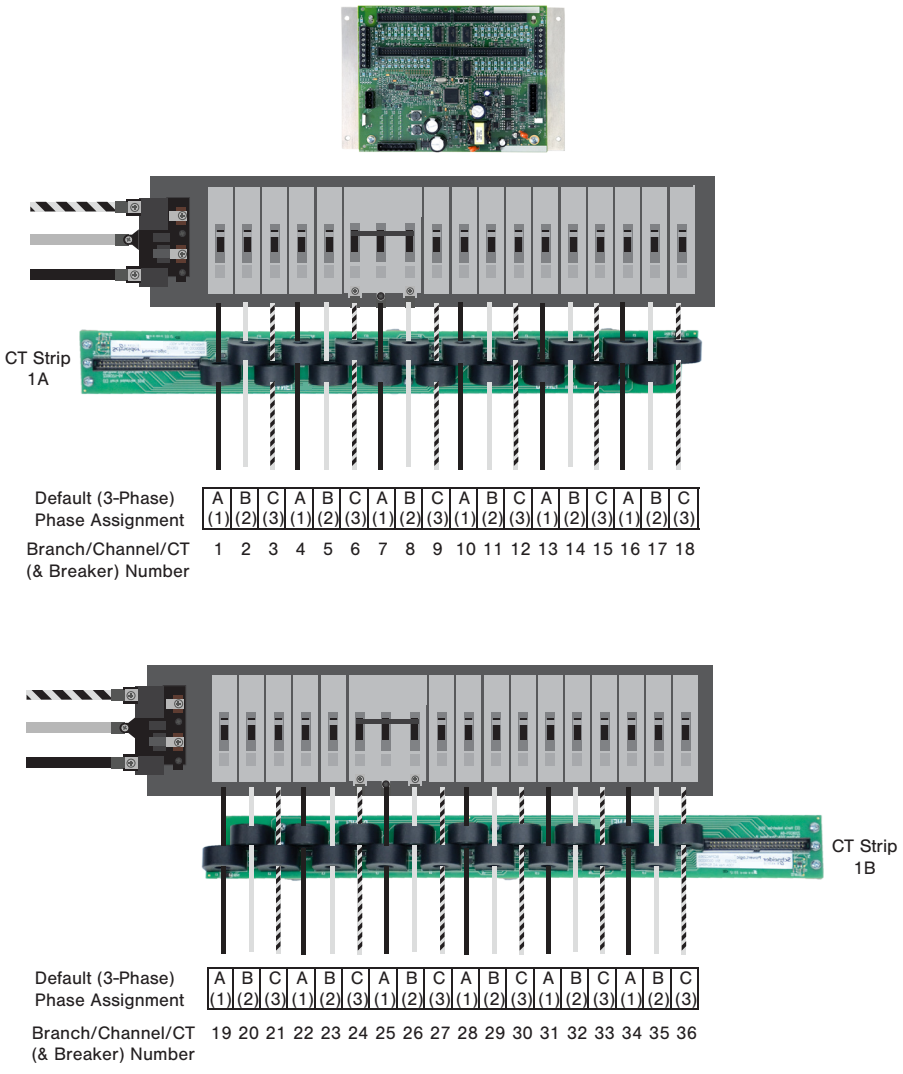


Panel 1 Set Configuration (Modbus Register 6) to Sequential (2)

#24

Top of Panels

36-ch Dual-Row
Sequential Configuration

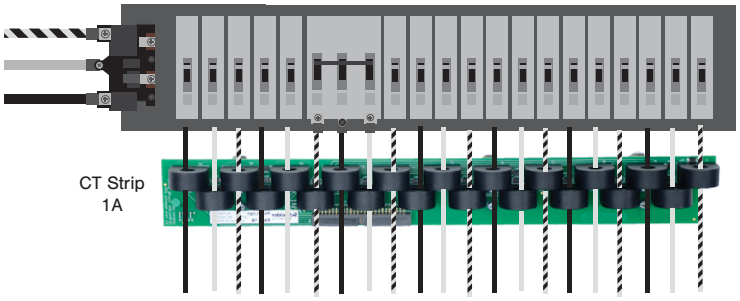


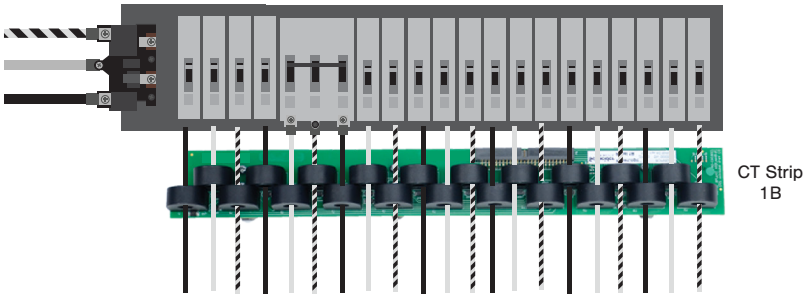
Panel 1
Set Configuration
(Modbus Register 6)
to Sequential (2)

#25

Top of Panels ⬆

42-ch Dual-Row
Sequential Configuration





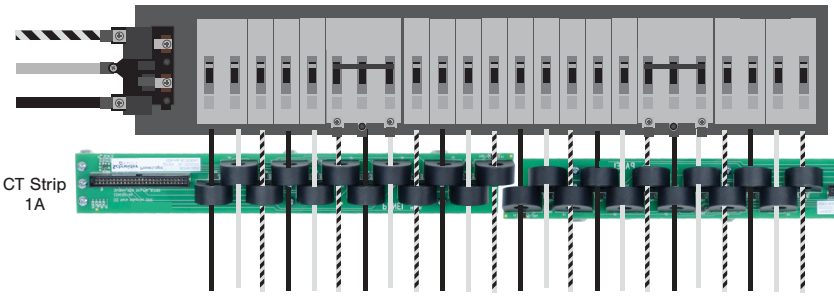
Panel 1
Set Configuration
(Modbus Register 6)
to Sequential (2)

#26

Top of Panels ⬆

48-ch Dual-Row Sequential Configuration

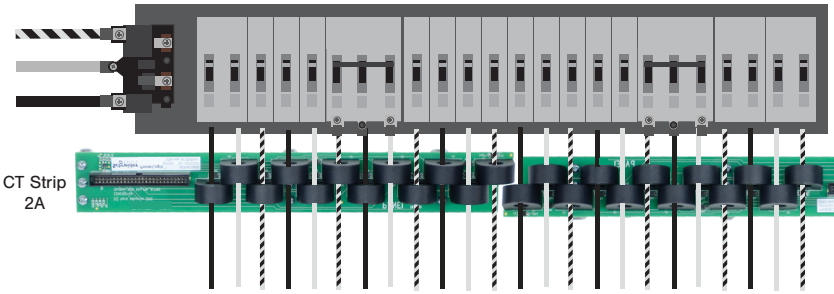
Panel 1



Panel 1 Set Configuration (Modbus Register 6) to Sequential (2)

Default (3-Phase) Phase Assignment	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)
Branch/Channel/CT Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Breaker Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Panel 2



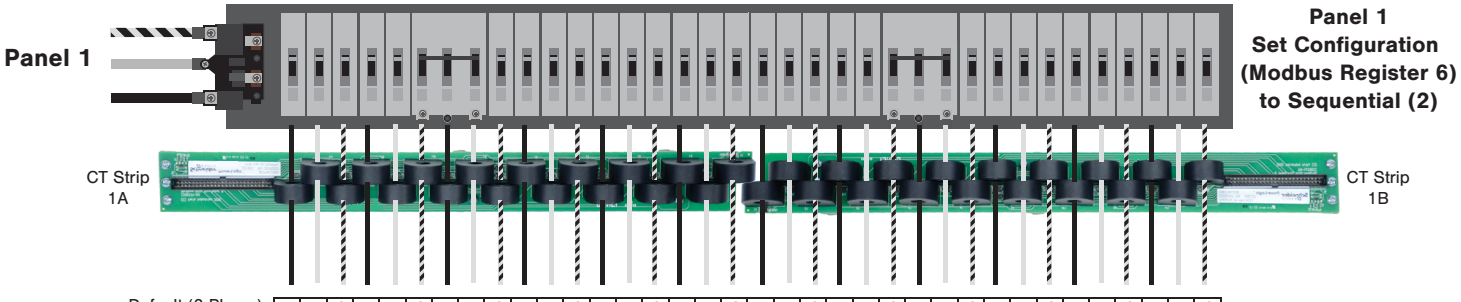
Panel 2 Set Configuration (Modbus Register 6) to Sequential (2)

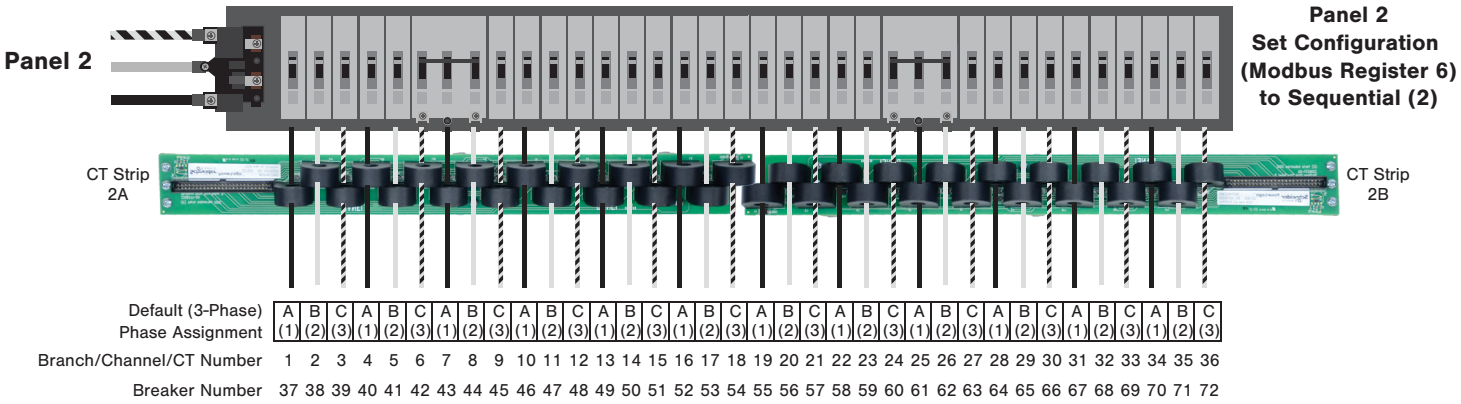
Default (3-Phase) Phase Assignment	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)
Branch/Channel/CT Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Breaker Number	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

#27

Top of Panels

72-ch Dual-Row
Sequential Configuration

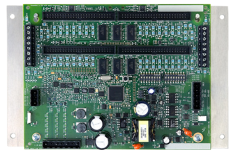




#28

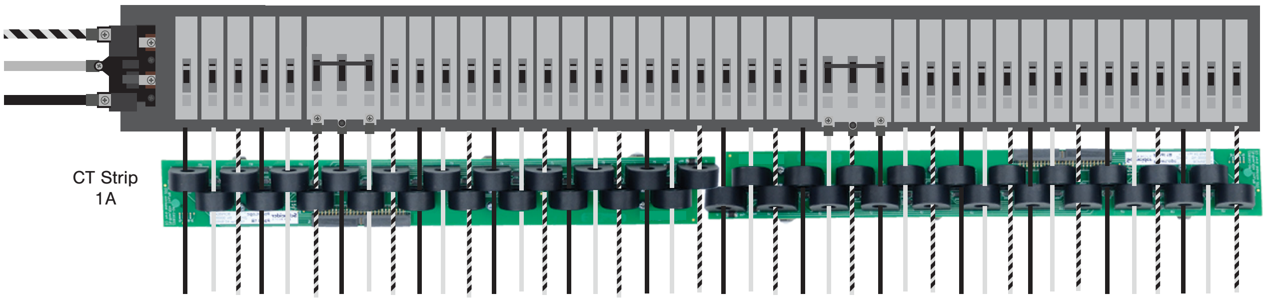
Top of Panels

84-ch Dual-Row Sequential Configuration



Panel 1 Set Configuration (Modbus Register 6) to Sequential (2)

Panel 1



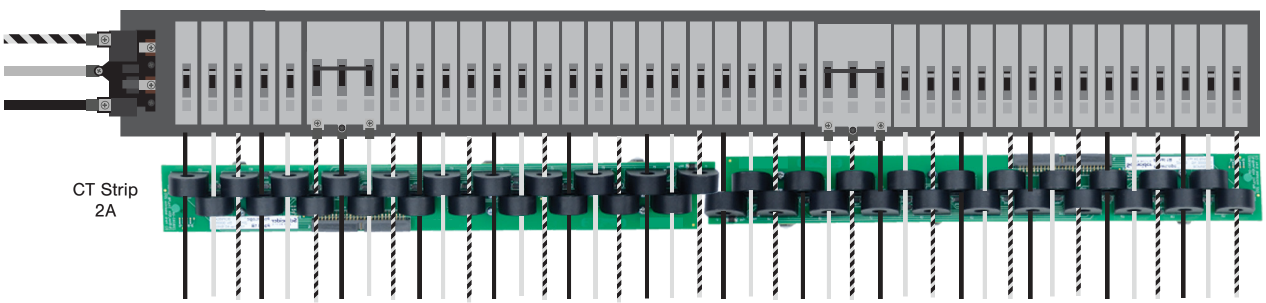
CT Strip 1A

CT Strip 1B

Default (3-Phase) Phase Assignment	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)
Branch/Channel/CT Number	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
Breaker Number	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

Panel 2 Set Configuration (Modbus Register 6) to Sequential (2)

Panel 2



CT Strip 2A

CT Strip 2B

Default (3-Phase) Phase Assignment	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)	A (1)	B (2)	C (3)
Branch/Channel/CT Number	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
Breaker Number	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

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As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this publication.

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