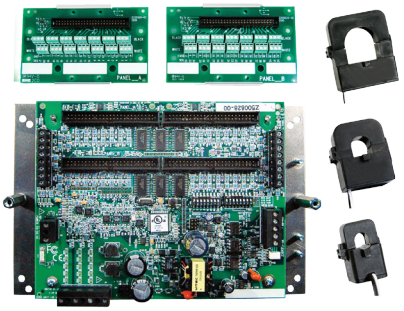


*The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

E31 Series

Branch Circuit Power Meter with Split-Core CTs

Product Overview

The E31 Series Branch Circuit Power Meter is designed to measure the current, and on some models, voltage and energy consumption of up to 92 circuits (84 branch circuits, 2 3-phase mains, 2 neutrals) on a single board. One E31 can monitor up to two panels.

The E31 consists of a data acquisition board and up to 84 split-core current sensors (50 A, 100 A, or 200 A), with eight auxiliary inputs. Each conductor passes through a current sensor and terminates at the breaker. Each sensor transmits the current data to the data acquisition board.

Data is transmitted using an RS-485 Modbus protocol. Each data acquisition board requires two addresses, one for each set of 42 current sensors and four auxiliary inputs. Data is updated roughly every two seconds. As a circuit approaches the user-defined threshold, the E31 activates the alarm indicators. The E31 can easily accommodate different panel configurations, including any combination of multi-phase breaker positions, voltage phase mapping, and breaker sizes. To configure the E31 for operation, download the NetConfig configuration software tool and the E3x Commissioning Guide from the Veris website at www.veris.com/modbus_downloads.

The E31A measures both current and power for the mains and branch circuits. The E31B measures both current and power for the mains, and current only in each circuit. The E31C measures current only for the mains and branch circuits.

Product Identification

	Description	*# of CTs*
E31	☐	☐
	A = Advanced board	002 = 2 adapter boards, no CTs, no cables
	B = Intermediate board	004 = 4 adapter boards, no CTs, no cables
	C = Basic board	42 = 2 adapter boards, 42 50A CTs, 2 4 ft. round ribbon cables
		84 = 4 adapter boards, 84 50A CTs, 4 4 ft. round ribbon cables

Regulatory Information

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This product must be installed inside a suitable fire and electrical enclosure.
- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Do not use this product for life or safety applications.
- Do not install this product in hazardous or classified locations.
- Read, understand and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Product may use multiple voltage/power sources. Disconnect ALL sources before servicing.
- Use a properly rated voltage sensing device to confirm that power is off. DO NOT depend on this product for voltage indication.
- Current transformer secondaries (current mode) must be shorted or connected to a burden at all times.
- Products rated only for basic insulation must be installed on insulated conductors.
- Replace all doors, covers and protective devices before powering the equipment.
- The installer is responsible for conformance to all applicable codes.

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 the manufacturer for any consequences arising out of the use of this material.

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.

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.

FCC PART 15 INFORMATION

NOTE: This equipment has been tested by the manufacturer and found to comply with the limits for a class B 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 residential 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. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications to this product without the express authorization of the manufacturer nullify this statement.

This symbol indicates an electrical shock hazard exists.

Documentation must be consulted where this symbol is used on the product.

Specifications

VOLTAGE INPUTS	
Measurement Voltage	90 to 300 Vac line-to-neutral, 50/60 Hz
Control Power	90 to 277 Vac line-to-neutral, 50/60 Hz
ACCURACY	
Power/Energy	IEC 62053-21 Class 1, ANSI C12.1-2008 system accuracy (including 50 A or 100 A branch CTs)
Voltage	±0.5% of reading 90 to 277 V line-to-neutral
OPERATION	
Sampling Frequency	2560 Hz
Update Rate	1.8 seconds (both panels)
Overload Capability	22 kAIC
OUTPUTS	
Type	Modbus RTU
Connection	DIP switch-selectable 2-wire or 4-wire, RS-485
Address	DIP switch-selectable address 1 to 247 (in pairs of 2)*
Baud Rate	DIP switch-selectable 9600, 19200, 38400
Parity	DIP switch-selectable NONE, ODD, EVEN
Communication Format	8 data bits, 1 start bit, 1 stop bit
Termination	5-position depluggable connector (TX+ TX- SHIELD TX+/RX+ TX-/RX-)
WIRE SIZE RANGE	
Aux CT Terminals on Main Board	24 to 14 AWG
Removable Connectors on Main Board	22 to 12 AWG
Terminals on CT Adapter Boards	26 to 16 AWG
TERMINAL BLOCK TORQUE	
Aux CT Terminals on Main Board	3.5 to 4.4 in-lb (0.4 to 0.5 N-m)
Removable Connectors on Main Board	4.4 to 5.3 in-lb (0.5 to 0.6 N-m)
Terminals on Branch CT Adapter Boards	1.9 to 2.2 in-lb (0.22 to 0.26 N-m)
MECHANICAL	
Ribbon Cable Support	4 ft. (0.9 m) round ribbon cable ships standard; up to 20 ft. (6 m) flat or round available
OPERATING CONDITIONS	
Operating Temperature Range	0 to 60 °C (32 to 140 °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***
Conducted and Radiated Emissions	FCC part 15 Class B, EN55011/EN61000-6-3 Class B (residential and light industrial)
Conducted and Radiated Immunity	EN 61000-6-2 and EN 61326-1

** See Configuration section for details.*

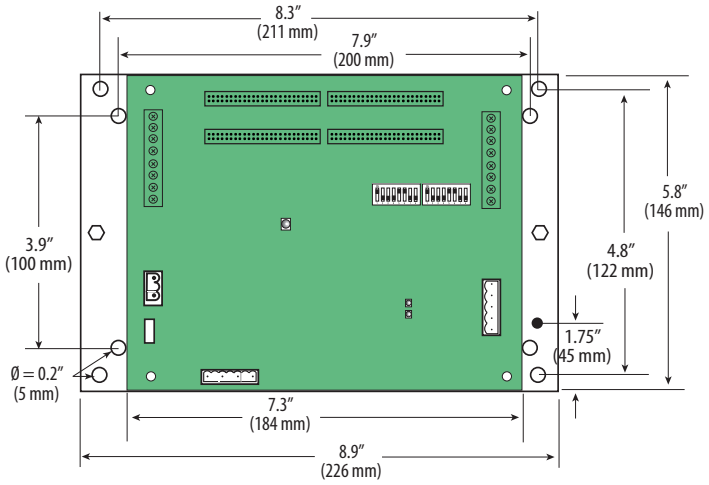
***The E31 must be installed in an appropriate electrical and fire enclosure per local regulations. If Veris E31 products are used in installations with circuits higher than the product ratings, the circuits must be kept segregated per UL508A Sec. 17.5. Note: E31 internal circuitry (cables and CTs) are not circuits as defined by UL508A, as they do not extend beyond the E31 itself without further safety/fire isolation.*

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

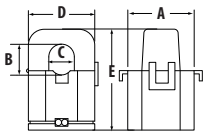
Table of Contents

Dimensions

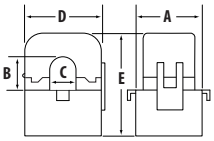
Circuit Board and Mounting Bracket



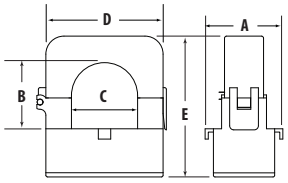
Current Sensors



E31CT0 50 Amp
A = 1.0″ (26 mm)
B = 0.5″ (11 mm)
C = 0.4″ (10 mm)
D = 0.9″ (23 mm)
E = 1.6″ (40 mm)

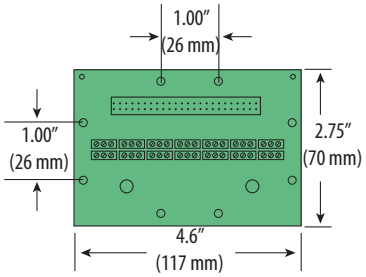


E31CT1 100 Amp
A = 1.5″ (37.5 mm)
B = 0.6″ (16 mm)
C = 0.6″ (16 mm)
D = 1.85″ (47 mm)
E = 2.1″ (53 mm)

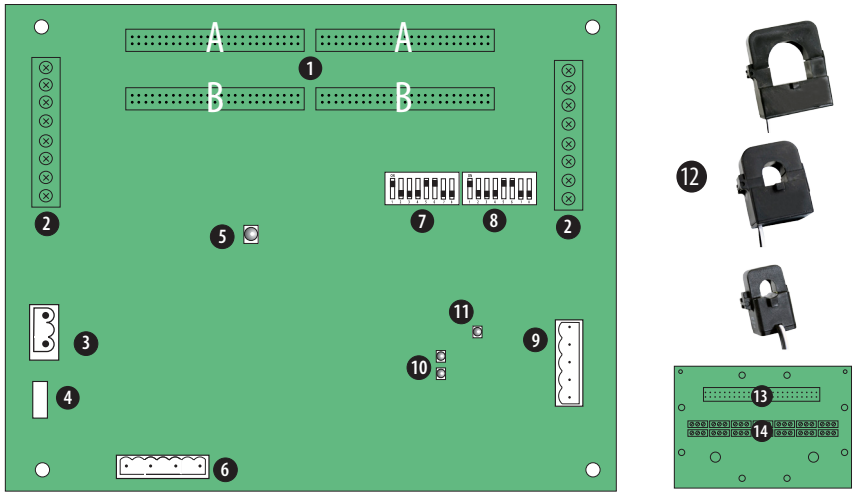


E31CT3 200 Amp
A = 1.5″ (39 mm)
B = 1.25″ (32 mm)
C = 1.25″ (32 mm)
D = 2.5″ (64 mm)
E = 2.8″ (71 mm)

Adapter Board



Product Diagram



1. 50-Pin Ribbon Cable Connectors: Ribbon cables attach here for easy connection of adapter boards to the data acquisition board. The two connectors on the left are for panelboard 1; the two on the right are for panelboard 2.

   Note: Connect Adapter Boards A and B to the correct ribbon cable connectors for each panel. The top connector is for Adapter Board A, and the bottom connector is for Adapter Board B.

   Note: Ribbon Cable is not included with all E31 models. For ribbon cable options, see the Recommended Accessories section.

2. 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 1; inputs on the right are for panelboard 2.
3. Control Power Connection: Provides power to operate the meter.
4. Control Power Fuse: 600 Vac, 500 mA time lag, factory-replaceable.
5. Alive LED: Red/green/amber LEDs. Blink codes are described in the Blink Codes for Status LED section of this document.
6. Voltage Taps: 1, 2, or 3 phase plus neutral connections. For voltage sensing and power calculations (no voltage taps on the E31C). Voltage taps are shared by both panels.
7. Communications Address DIP Switch: Each Modbus device must have a unique address. Switches are binary weighted. Left-most switch has a value of 1; right-most switch has a value of 128. Note: switches set the address for panel 1; panel 2 is automatically set to (Panel 1 address + 1). See Configuration section for details.
8. Communications Settings DIP Switch: Configures baud rate, parity, 2- or 4-wire communications.
9. RS-485 Connection: Used for Modbus serial communications. The Universal plug accommodates 2 or 4 wire connections.
10. RS-485 LEDs: The RX LED (closest to DIP switches) indicates the RS-485 is receiving information; the TX LED indicates transmission of information.
11. Power LED: Indicates power to main board
12. Branch Current Sensors: Each split-core current sensor is capable of monitoring conductors rated up to a maximum of 50, 100, or 200 amps. Up to 84 sensors can be purchased with the E31 (see the Recommended Accessories section). One of each style is pictured here.
13. Ribbon Cable Connection
14. CT Terminal Connections

Data Outputs

The E31 provides several types of measurements that give a comprehensive view of power consumption for every load on the panel (the table below shows which measurements are offered on each model):

- 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 six 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.
- 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 alarms. Alarms are reported as both non-latched vents and latched events. Non-latching alarms are active while the current exceeds the threshold, but go inactive if the current returns to a level within the specific thresholds. Latching alarms 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.
- Alarm status can be polled via Modbus.

Advanced Features - Some models, especially the E31A support a number of advanced features. Some are always active, and others are configured manually via Modbus register 62017). For models with 42 channels or more, these features are configured independently for each panel.

- Logical meter support: The E31 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 E31 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 E3x 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 E31 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 E31 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 E31 in non-volatile memory.
- Phase angle reference: The E31 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.
- Signed power: Users can configure the E31 to report power as a signed value indicating whether the power is currently being delivered (imported from the grid) or received (exported to the grid) for channels with generation sources or bi-directional (regenerative) loads. When signed power is disabled, the energy accumulators include all energy measured, regardless of direction. When signed power is enabled, the energy accumulators only include all energy delivered (imported from the grid).

Data Outputs (cont.)

- Signed power factor: By default the E31 reports power factor as an unsigned value. The user can set it to report as a signed value, where the sign indicates whether the current phase angle leads or lags the corresponding voltage phase.
- Demand/snapshot time interval source: The E31 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).

Monitoring of Mains		E31A	E31B	E31C
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 Alarms				
Alarms	Voltage over/under	■	■	
	Branch current over/under	■	■	■
	Mains current over/under	■	■	

Blink Codes for Status LED

Color and Pattern	Status Description
Green, once per second	Normal operation
Amber, once per second	Volts or Amps clipping
Amber, twice per second	Invalid firmware image
Red, solid or blink	Diagnostic event detected

Split-Core CT Specifications

	50 A Split-Core CT	100 A Split-Core CT	200 A Split-Core CT
Voltage Rating	300 Vac	300 Vac (CE), 600 Vac (UL)	300 Vac (CE), 600 Vac (UL)
Measurement Range	60 A*	120 A*	240 A*
Temperature	0 to 60 °C	0 to 60 °C	0 to 60 °C
Agency	UL508 Recognized, EN61010-1	UL508 Recognized, EN61010-1	UL508 Recognized, EN61010-1

** Momentary.*

Installation

Observe handling precautions for static sensitive devices to avoid damage to the circuitry which would not be covered under the factory warranty.

Disconnect and lock out power to the electrical panel.

1. Install the acquisition board mounting bracket in the panel. Panels can be oriented side-by-side (Figure 1A) or vertically (Figure 1B). A grounding connection is located on the mounting bracket, near the lower right corner.

The protective ground connection on the mounting bracket should be used if the E31 will not be mounted to a suitably grounded surface. Assure conductivity to the protective ground.

Figure 1A

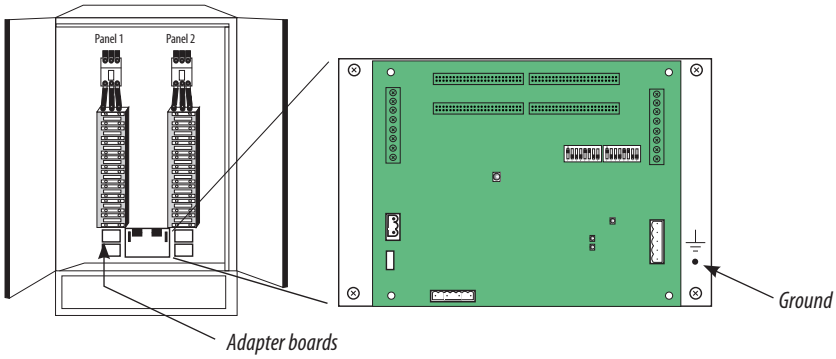
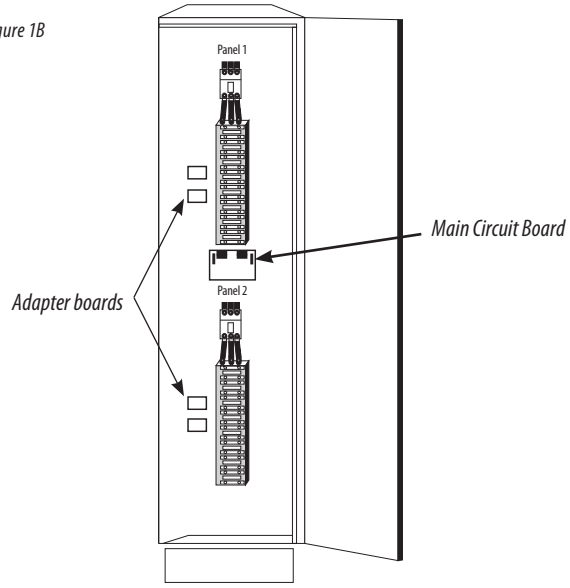


Figure 1B



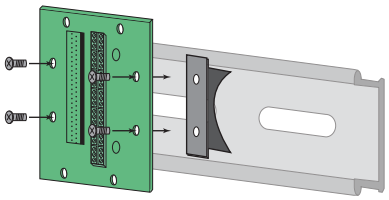
Installation (cont.)

2. Mount the adapter boards to either DIN rail or SNAPTRACK.

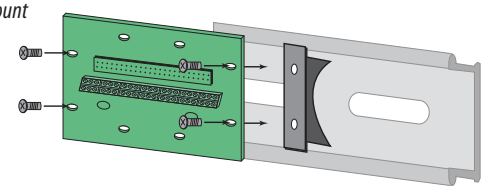
   A. DIN Rail: Use the supplied screws to secure the plastic DIN clips to the adapter board. Affix the clips to the DIN rail (Figure 2).

Figure 2

DIN Option 1: Vertical Mount

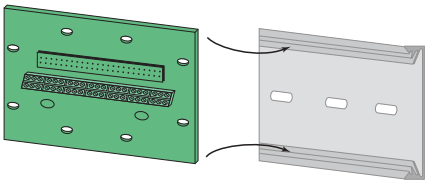


DIN Option 2: Horizontal Mount



   B. SNAPTRACK: Secure the SNAPTRACK to the mounting surface. Click the adapter board into place (Figure 3).

Figure 3

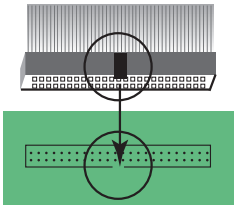


3. Connect adapter boards to the main board using ribbon cable (Figure 4). Ribbon cables are keyed to ensure proper installation.

   Note: Flat and round ribbon cable are available from Veris. See Recommended Accessories.

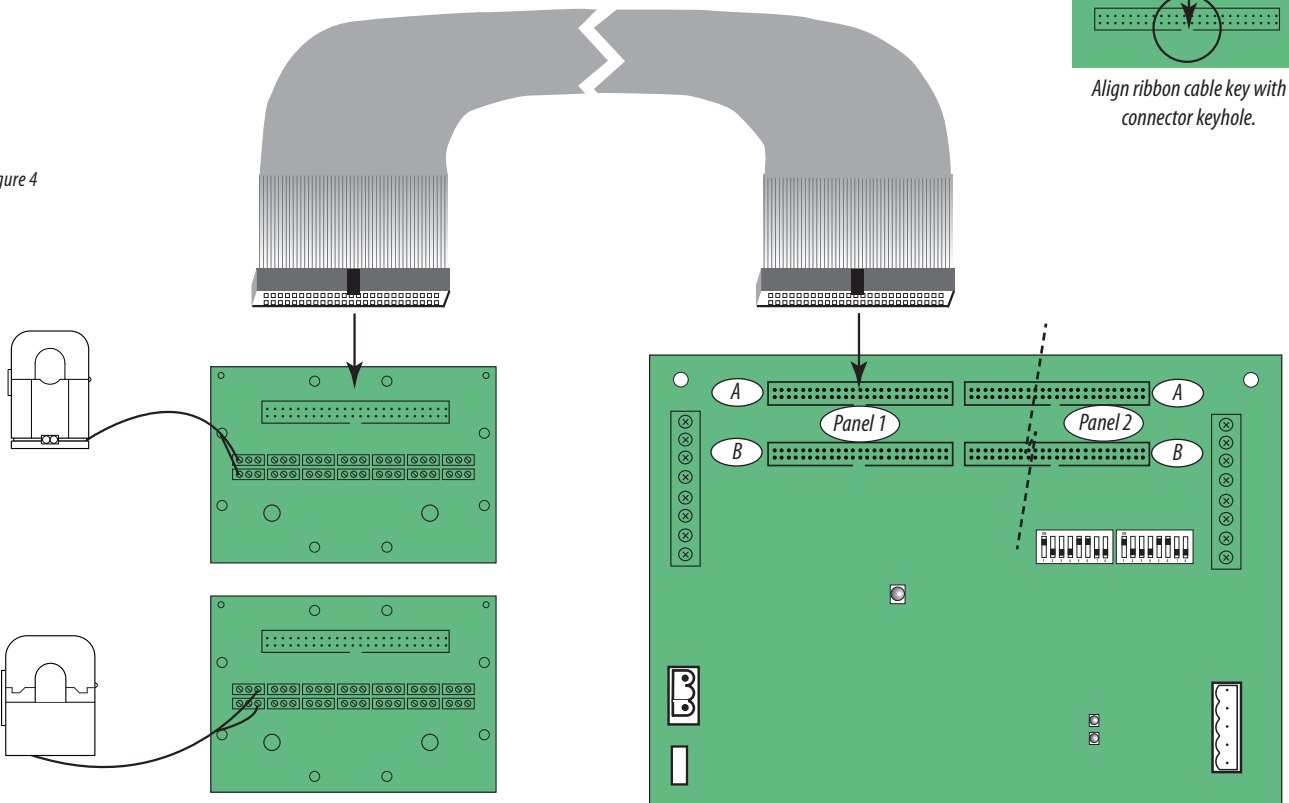
Installation (cont.)

4. Connect current sensors to the terminals on the adapter boards (Figure 4).



Align ribbon cable key with connector keyhole.

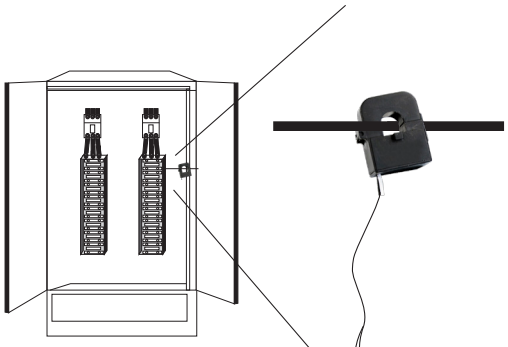
Figure 4



Note: If the signed power factor feature is NOT enabled, then the current sensor orientation does not affect meter behavior. If this feature IS enabled, orient the current sensors so that the arrow points toward the load for proper operation.

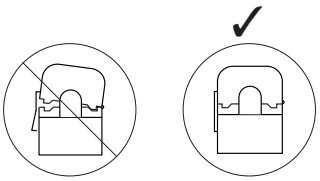
5. Install the current sensors onto the conductors to be monitored (Figure 5). Note: Clean split-core contacts before closing. The hinge can detach, allowing the base and the top to separate for easier cleaning and installation.

Figure 5



The 50 A CT accepts a maximum #2 AWG (0.384" O.D.) wire with THHN insulation.
The 100A CT accepts a maximum 3/0 AWG (0.584" O.D.) wire with THHN insulation.
The 200A CT accepts a maximum of 350 MCM wire with THHN insulation.
Use this gauge wire or smaller for each circuit.

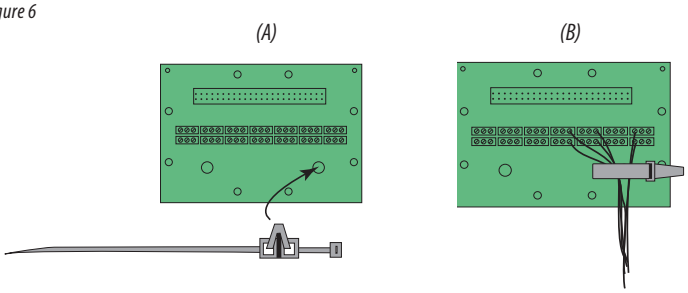
Close CTs until the clasp clicks into place to ensure that contact surfaces are firmly seated.



Installation (cont.)

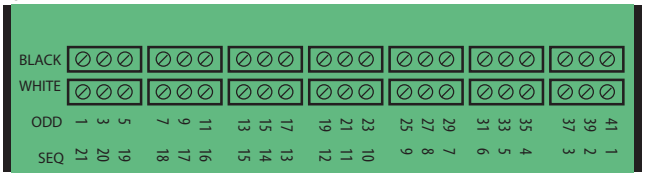
6. Plastic cable ties are included with the product for strain relief. Insert the strain relief device into one of the available holes on the adapter board (Figure 6A). Gather all current sensor wires connected to that adapter board and secure the cable tie around them (Figure 6B).

Figure 6



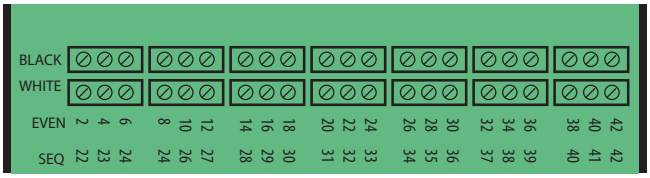
7. The adapter boards are silk screened with two rows of numbers. For applications that require odd/even branch circuit numbering, use the row designated ODD or EVEN. For applications that require sequential numbering, use the number row marked SEQ (Figure 7, 8).

Figure 7



Adapter Board A numbering:

ODD	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41
SEQ	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

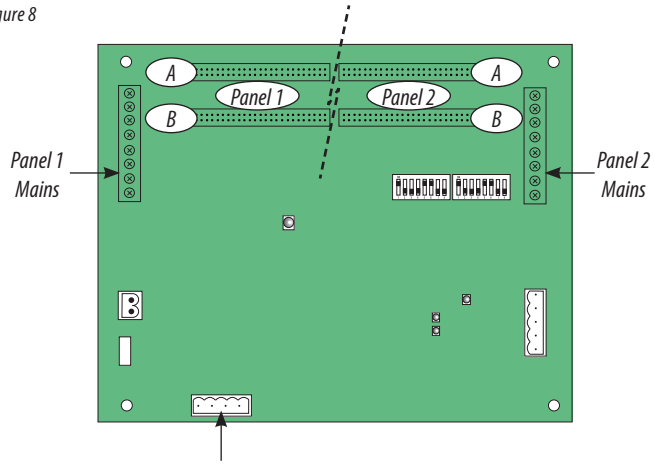


Adapter Board B numbering:

EVEN	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
SEQ	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

Installation (cont.)

Figure 8



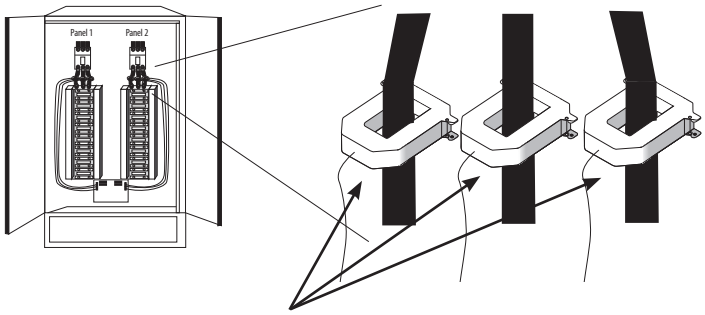
Panel 1 uses base Modbus address as set by DIP switches.
Panel 2 uses base + 1 Modbus address as set by DIP switches.

8. Configure communication and addressing parameters using DIP switches. The E31 requires two addresses, one for each set of 42 current sensors and four auxiliary inputs. See the Configuration section for more information.

Aux CT Installation

1. Connect 0.333 Vac current transducers (CTs) to the mains or other conductors, observing local codes regarding bending radius (optional; Figures 9, 10). Refer to the appropriate CT installation instructions for further information.

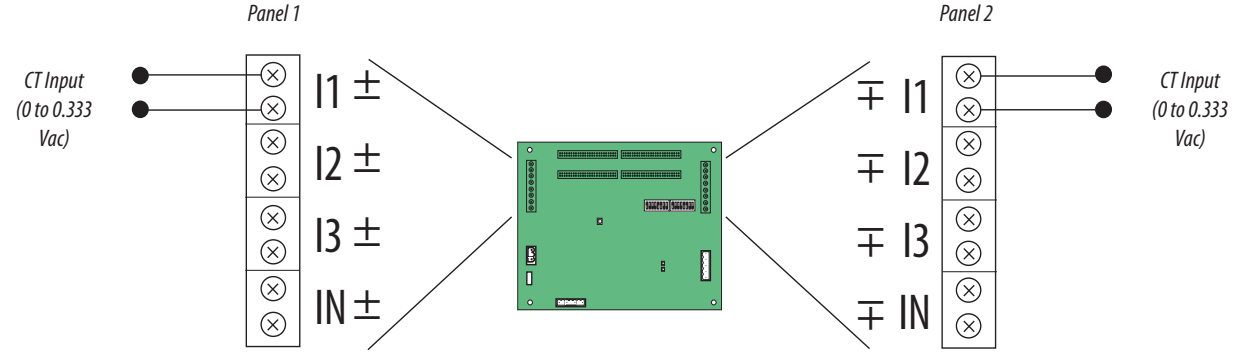
Figure 9



Recommended CT:
Veris Industries H6810, H6811, H6812 Series with 0.333 Vac output.
Available in 100 A max. to 2400 A max.
Call a Veris sales rep if higher amperages are required.

Installation (cont.)

Figure 10



Set up Modbus registers 115-118 for CT scaling.
Use base + 1 address for Panel 2 setup.
Note: (+) represents black, (-) represents white

Wiring

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

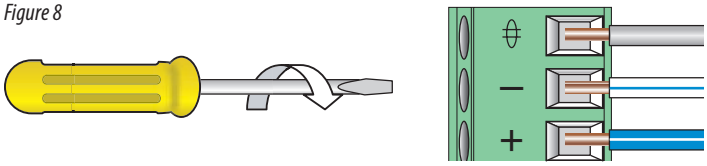
- **While removing or installing panels and covers, assure that they do not contact an energized bus.**
- **NEVER bypass external fusing.**
- **NEVER short the secondary of a potential transformer.**
- **Before closing covers and doors, carefully inspect the work area and remove any tools, wire scraps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

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

For all steps in this section, when tightening terminals, apply the correct torque.

Aux CT inputs on main board: 3.5 to 4.4 in-lb (0.4 to 0.5 N-m); removable connectors on main board: 4.4 to 5.3 in-lb (0.5 to 0.6 N-m); terminals on Branch CT adapter boards: 1.9 to 2.2 in-lb (0.22 to 0.26 N-m).

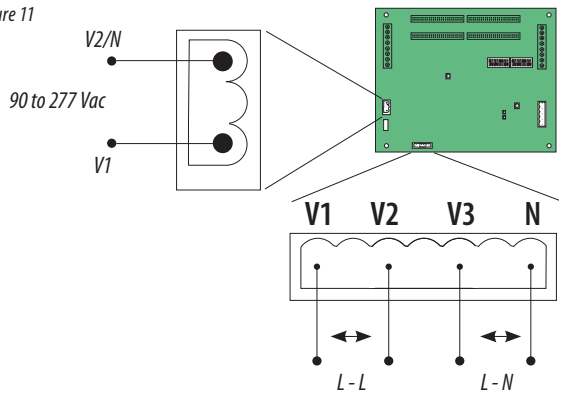
Figure 8



1. Connect 2-wire 90 to 277 Vac power to the main power terminals. Observe polarity. For the E30A and E30B, connect voltage lines to the voltage taps (Figure 9). Provide overcurrent protection and disconnecting means to protect the wiring. Use Veris AH02, AH03, AH04, or equivalent. Suggested: 0.5 A, time delay fuses.

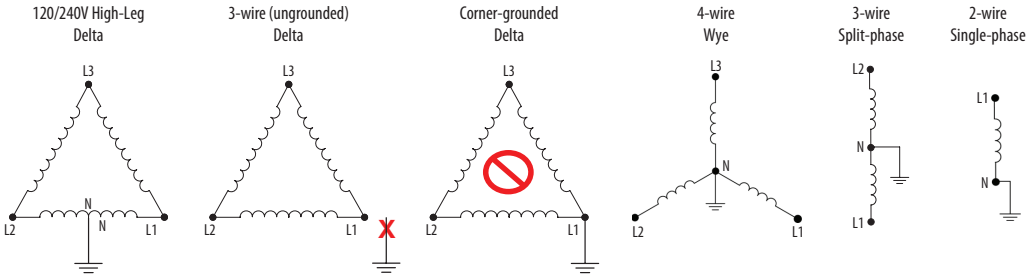
Wiring (cont.)

Figure 11



Line to Line (L-L) Voltage: 150 to 480 Vac, nominal
Line to Neutral (L-N) voltage: 90 to 300 Vac
Voltage taps are shared by both panels.

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 E3x 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 E3x 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 E3x 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 E3x does not support these applications at any voltage level.

The E3x 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.

Wiring (cont.)

Observe handling precautions for static sensitive devices to avoid damage to the circuitry which would not be covered under the factory warranty.

Disconnect and lock out power to the electrical panel.

2. Connect 2-wire or 4-wire Modbus RS-485 daisy chain network (Figures 12 and 13).

Figure 12

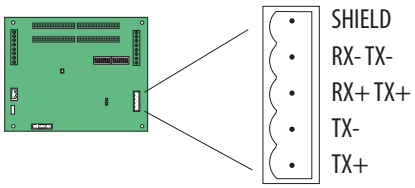
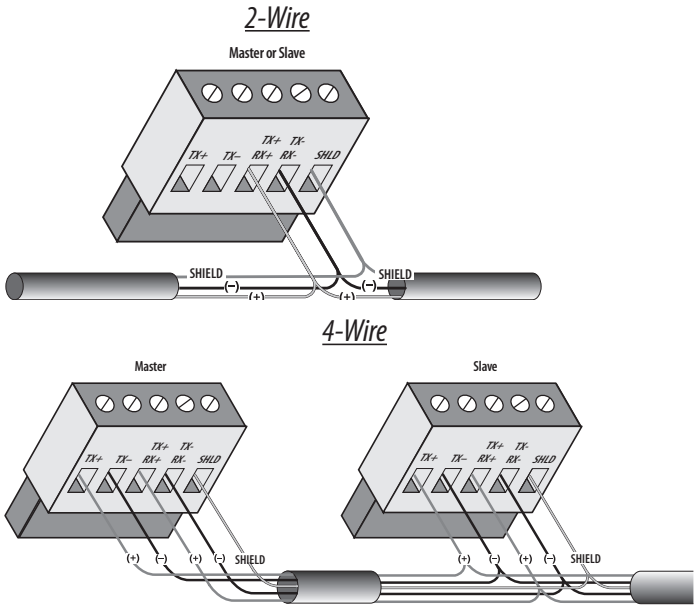


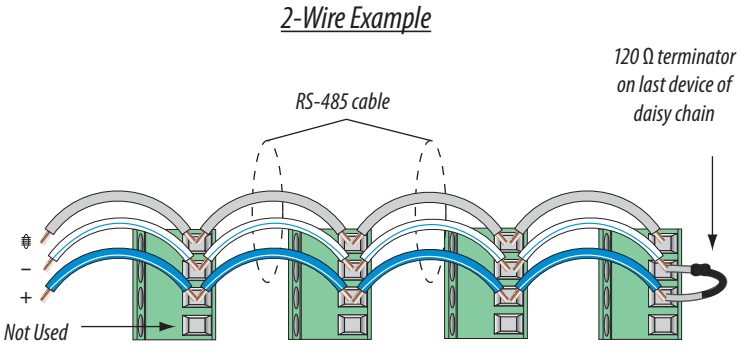
Figure 13



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

4. Connect all RS-485 devices in a daisy-chain fashion, and properly terminate the chain (Figure 14).

Figure 14



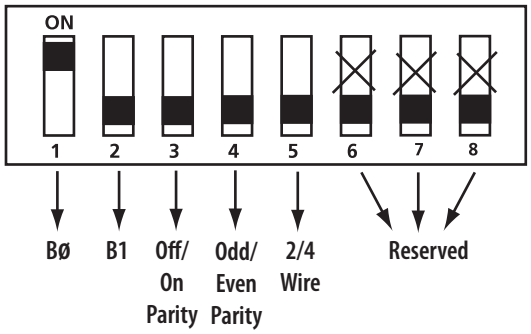
5. Shield the RS-485 cable using twisted-pair wire. The cable must be voltage-rated for the installation.

Configuration

1. Communications Configuration: Communications parameters for the E31 series are field selectable for your convenience. Please see the Product Diagram section (page 2) for selector location. The following parameters are configurable:

   - Baud Rate: 9600, 19200, 38400
   - Parity On or Off
   - Parity: odd or even
   - Wiring: 2 or 4

Example: 2-wire 19200 Baud No Parity

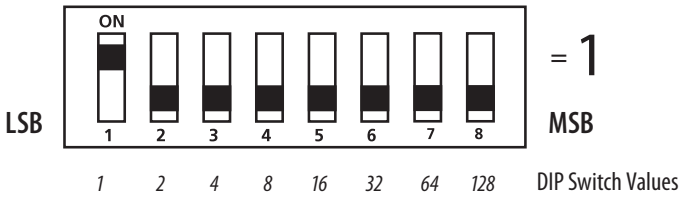


1	2	3	4	5	6	7	8	
off	off				X	X	X	9600
on	off				X	X	X	19200
off	on				X	X	X	38400
on	on				X	X	X	Reserved
		off	off		X	X	X	No Parity
		on	off		X	X	X	Odd Parity
		off	on		X	X	X	No Parity
		on	on		X	X	X	Even Parity
				on	X	X	X	4-wire RS-485
				off	X	X	X	2-wire RS-485

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

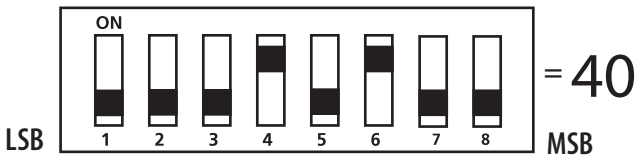
Configuration (cont.)

3. The E31 uses two logical addresses. Panel 1 uses the base address as set on the DIP switches, and Panel 2 uses this base address + 1. Address the E31 as any whole number between and including 1-246. Each unit is equipped with a set of 8 DIP switches for addressing. See below.



4. To determine an address, simply add the values of any switch that is on.

For example:

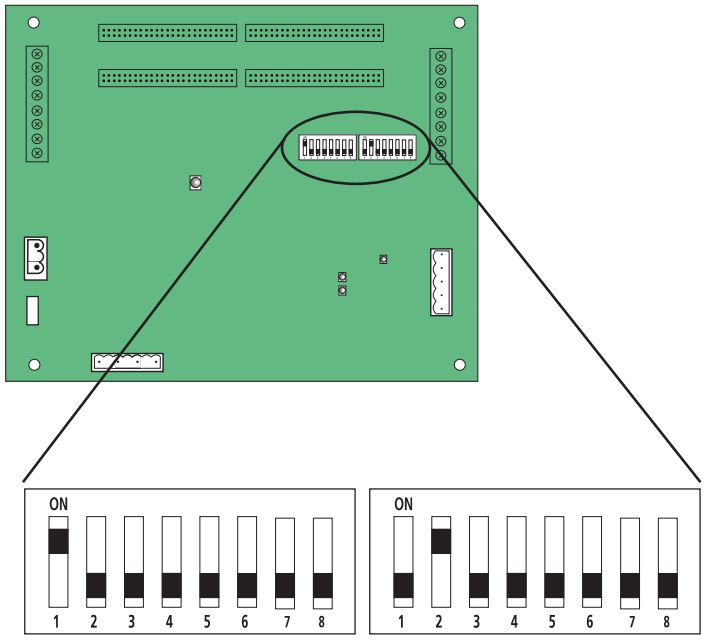


Switch number 4 has an ON Value of 8 and switch number 6 has an ON Value of 32. (8 + 32 = 40). Therefore, the address for Panel 1 is 40, and the address for Panel 2 is 41.

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

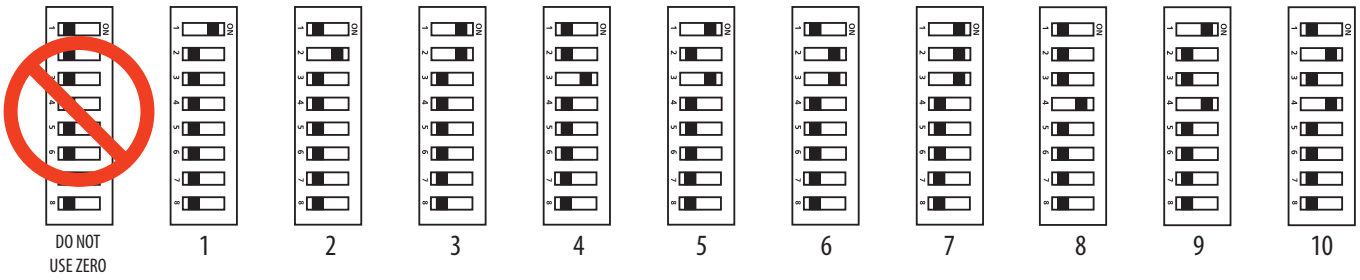
Default DIP Switch Settings

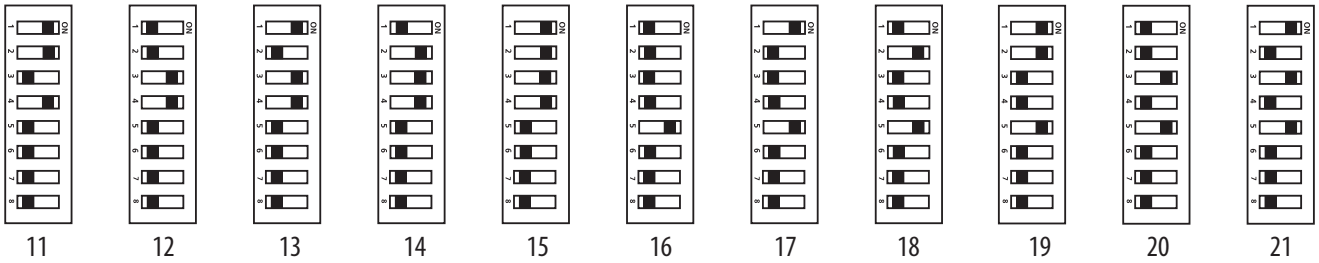
The E31 includes two DIP switches, as shown below. Switches are shown in their default positions.

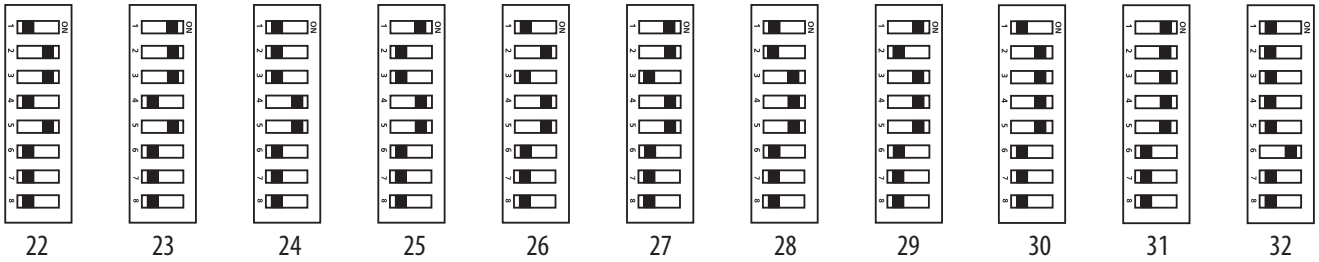


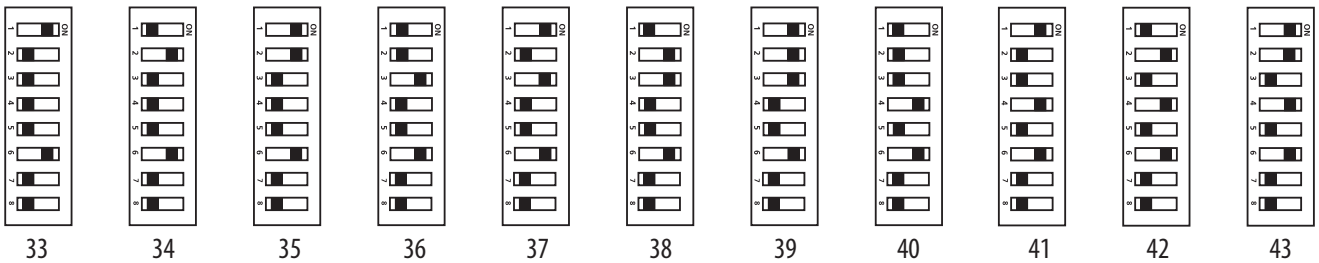
Comms Address *Comms Settings*

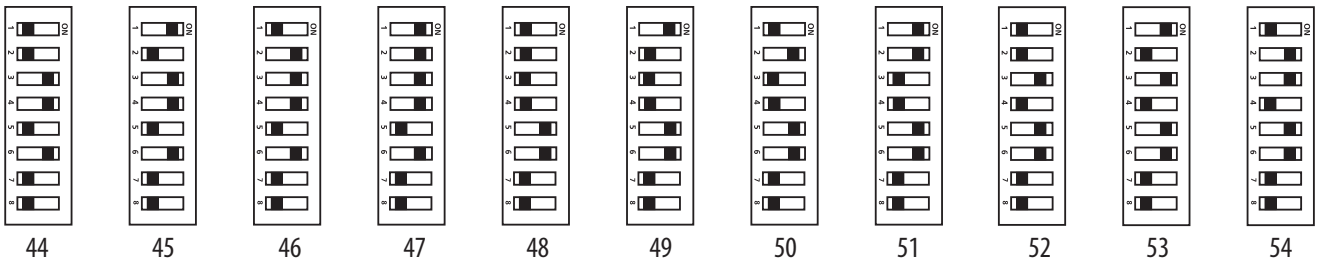
Address Selection

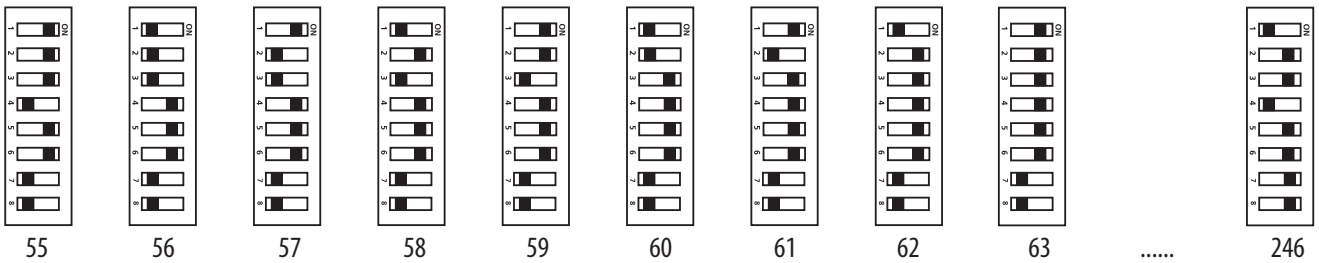












Commissioning

1. Reconnect power to the panel.
2. Configure installation mode using Modbus Register 6.
3. Configure CT scaling.
4. Configure alarms.
5. Configure demand.

Download the free E3x configuration tool from www.veris.com to commission the device for operation.

Recommended Accessories

Part ID	Description
CBL008	Flat ribbon cable, 50 x 28 AWG, 1.5 ft. (0.45 m)
CBL016	Flat ribbon cable, 50 x 28 AWG, 4 ft. (1.2 m)
CBL017	Flat ribbon cable, 50 x 28 AWG, 5 ft. (1.5 m)
CBL018	Flat ribbon cable, 50 x 28 AWG, 6 ft. (1.8 m)
CBL019	Flat ribbon cable, 50 x 28 AWG, 8 ft. (2.4 m)
CBL020	Flat ribbon cable, 50 x 28 AWG, 10 ft. (3.0 m)
CBL021	Flat ribbon cable, 50 x 28 AWG, 20 ft. (6.1 m)
CBL022	Round ribbon cable, 50 x 28 AWG, 4 ft. (1.2 m)
CBL023	Round ribbon cable, 50 x 28 AWG, 10 ft. (3 m)
CBL024	Round ribbon cable, 50 x 28 AWG, 20 ft. (6 m)
CBL025	Flat ribbon cable, 50 x 28 AWG, 2 m
CBL026	Flat ribbon cable, 50 x 28 AWG, 4 m
CBL027	Flat ribbon cable, 50 x 28 AWG, 6 m
CBL031	Round ribbon cable, 50 x 28 AWG, 1.5 ft. (0.45 m)
CBL032	Round ribbon cable, 50 x 28 AWG, 2.5 ft. (0.76 m)
E31CT0	Six-pack 50 A CT, 6 ft. (1.8 m) lead
E31CT0R20	Six-pack 50 A CT, 20 ft. (6 m) lead
E31CT1	Six-pack 100 A CT, 6 ft. (1.8 m) lead
E31CT1R20	Six-pack 100 A CT, 20 ft. (6 m) lead
E31CT3	Single 200A CT, 6ft (1.8m) lead
E31CT3R20	Single 200A CT, 20ft (6m) lead
E31CTDB	2 E31 Adapter boards
AE001	E3x MCB Cover
AV01	Veris DIN Rail

Troubleshooting

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.
RX LED is solid	• Check for reversed polarity on Modbus comms. • Check for sufficient biasing on the Modbus bus. Modbus physical specification calls for 450-650 Ω biasing. This is usually provided by the master.
The main board has a fast flashing amber light	• Verify ribbon cable connectors are inserted in the correct orientation. • If cables are correct, reset main board to re-initialize product.
The main board has a slow flashing amber light	• One or more channels is clipping. This can be caused by a signal greater than the split-core size or 277 V L-N, or by a signal with high THD near the gain stage switching points (1.5 A and 10 A).
The main board has a flashing green light	• Everything is wired properly and the main board has power.
The main board is a flashing or solid red light	• Light may be red briefly while device powers up. • If light is red for more the 60 sec. device has encountered a diagnostic event. Contact technical support.
Split-core product is reading zero for some values	• Device was unable to read split-core adapter boards on power up. Verify adapter boards are connected. • Verify ribbon cable connectors are inserted in the correct orientation. • Reset main board to re-initialize product.
Power factor reading is not as expected	• Verify voltage taps are connected in appropriate phase rotation. • 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 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 cuts off at 50 mA, and will set the reporting register to 0 mA for currents near or below this range.
E3x Config Tool returns Modbus error on read/write	• Verify using the latest release of E3x Config Tool as older versions may not support all features in current product firmware. Latest version is available on our website http://www.veris.com/modbus.aspx

China RoHS Compliance Information (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

