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E3OE Series
Solid-Core Panelboard Monitoring System

Product Overview

The E30E Series panelboard monitoring system 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.

The E30E consists of a data acquisition module and up to four branch 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 E30E measures both current and power for the mains and branch circuits. The E30E can easily accommodate different panel configurations, including any combination of multi-phase breaker positions, voltage phase mapping, and breaker sizes. To configure the E30E for operation, download the E3x Configuration Tool and the E3x Commissioning Guide from www.veris.com.

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 (2-strip models only require one Modbus address). Data is updated roughly every two seconds. When a circuit exceeds the user-defined thresholds, the E30E activates the alarm indicators. The communication interfaces and protocols require some configuration at the time of installation.

Product Identification

E30E	*CT Option*	*# of CTs*
	☐	☐

CT Option
0 = 100A, ¾" spacing
1 = 100A, 1" spacing
2 = 100A, 18 mm spacing

# of CTs
24 = 2 strips with 12 sensors each, with two 4 ft (1.2 m) ribbon cables *
36 = 2 strips with 18 sensors each, with two 4 ft (1.2 m) ribbon cables *
42 = 2 strips with 21 sensors each, with two 4 ft (1.2 m) ribbon cables
48 = 4 strips with 12 sensors each, with four 4 ft (1.2 m) ribbon cables *
72 = 4 strips with 18 sensors each, with four 4 ft (1.2 m) ribbon cables *
84 = 4 strips with 21 sensors each, with four 4 ft (1.2 m) ribbon cables

* This option available with 18 mm spacing only.

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⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
- 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.
- 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. Be sure all sources of power have been disconnected before servicing.
- Use a properly rated voltage sensing device to confirm power is off.
  DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION
- Only install this product on insulated conductors.

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 the installation, and has received safety training to recognize and avoid the hazards involved.   NEC2011 Article 100

No responsibility is assumed by Veris Industries for any consequences arising out of the use of this material.

NOTICE
- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- The installer is responsible for conformance to all applicable codes.
- Mount this product inside a suitable fire and electrical enclosure.

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 Veris Industries nullify this statement.

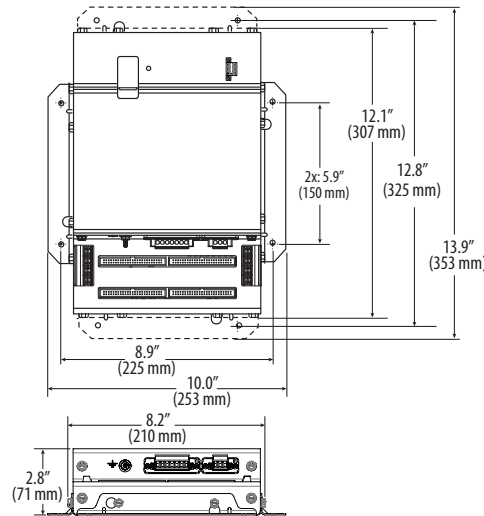This Class A digital apparatus complies with Canadian ICES-003.)

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Specifications

INPUTS	
Input Power	100-277VAC, 50/60 Hz, 15VA max.
Terminal Block Torque	4.4 to 5.3 in-lb (0.5 to 0.6 N-m)
Wire Size	up to 12 AWG
AUXILIARY INPUTS	
Terminal Block Torque	3.5 to 4.4 in-lb (0.4 to 0.5 N-m)
Wire Size	up to 14 AWG
ACCURACY	
Power/Energy	IEC 62053-21 Class 1, ANSI C12.1-2008
	(1% system accuracy includes both the E30E main unit and branch CTs)
Voltage	±0.5% of reading 90-277VAC line-to-neutral
Current	±0.5% of reading
Minimum ON current	50mA
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 MSTP
Address Range	Fixed at address 1 and 2 for Modbus RTU; 0-127 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
Terminal Block Torque	4.4 to 5.3 in-lb (0.5 to 0.6 N-m)
Wire Size	up to 16 AWG
MECHANICAL	
Ribbon Cable Support	4 ft. (1.2 m) flat ribbon cable ships standard;
	up to 20 ft. (6 m) available
OPERATING CONDITIONS	
Operating Temperature Range	0° to 60°C (32° to 140°F) (<95% RH noncondensing)
Storage Temperature Range	-40° to 70°C (-40° to 158°F)
Altitude of Operation	3000 m max.
COMPLIANCE INFORMATION	
Approvals	UL508, EN61010-1

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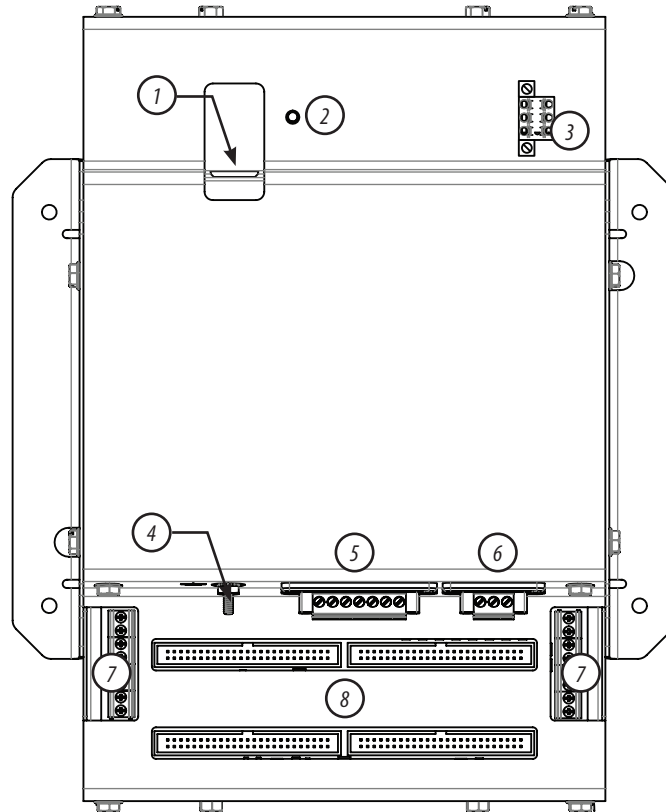## Dimensions

Current Sensor Strips

Note: The dotted lines indicate dimensions if the brackets are placed for horizontal mounting. At the factory, the brackets are placed for vertical mounting. See Installation section for more information.

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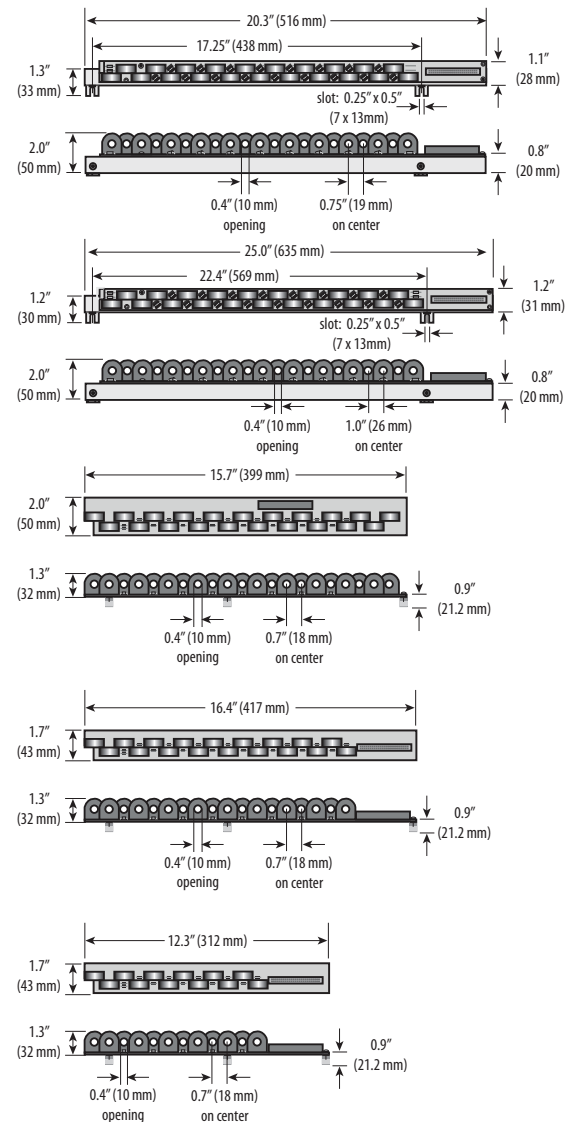
Product Diagram

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

4. Grounding post

5. Voltage Taps: 1, 2, or 3 phase plus neutral connections. For voltage sensing and power calculations

6. Control (Mains) Power Connection: Easy 2-wire 100-277 VAC, 50/60 Hz connection.

7. Auxiliary 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 conectors are for the strip labeled Panel A.

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Data Outputs

The E30E 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.
- 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 events 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 any protocol. Via BACnet, Subscribe_COV can be used to generate alarm notifications. Via SNMP, alarms drive SNMP event notifications.

Advanced Features - The E30E supports a number of 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 .4.1.40845.1.30.1.1.6.3.4.0). For models with 42 channels or more, these features are configured independently for each panel.

- Logical Circuit support: The E30E can be configured to map any set of 1, 2 or 3 channels that are adjacent in the panel to 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 E30E 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 older E3x models 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 E30E 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 E30E 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 E30E in non-volatile memory.
- Phase angle reference: The E30E 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 factor: By default the E30E 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.

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Data Outputs (cont.)

- Demand/snapshot time interval source: The E30E 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	
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

Solid-Core Current Sensors

100 A Solid-Core Current Sensor	
Voltage Rating	300 VAC
Temperature	0° to 60°C
Agency	EN61010-1

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Installation

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

⚠ Disconnect power to the panel before beginning the installation.

1. Locate a surface inside the electrical enclosure to mount the E30E. Decide whether to mount the E30E vertically or horizontally. The E30E is shipped with the brackets placed for vertical mounting. If mounting horizontally, loosen the screws on the sides of the E30E that hold the brackets in place (do not fully remove the screws from the E30E housing). Loosen the screws on the other two sides of the housing (do not fully remove the screws from the E30E housing), and set the brackets into their new positions. Tighten all screws.
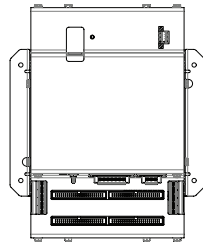
Vertical Mounting *Horizontal Mounting*
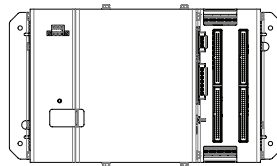
2. Install the current sensor strips into the panel. Arrange the sensor strips in one of the four configurations shown below. Adjust orientation of the circuit numbers in the field during commissioning by writing to Modbus Register 6 or use the free configuration software at www.veris.com. The examples in this graphic show the 21 current sensor strips. The same configuration options are available for the 18 and 12 current sensor strips.

Top Feed

Register 6
Value = 0
(Default)

Bottom Feed

Register 6
Value = 1

Single Row: Sequential

Register 6
Value = 2

Single Row: Odd/Even

Register 6
Value = 3

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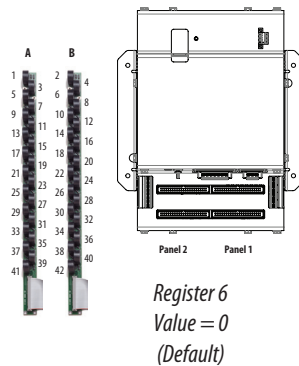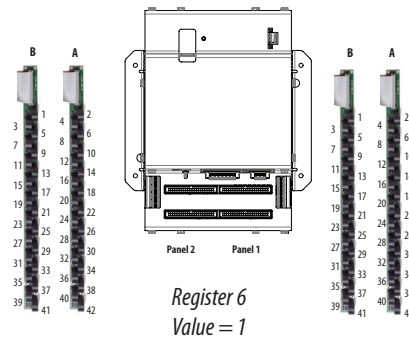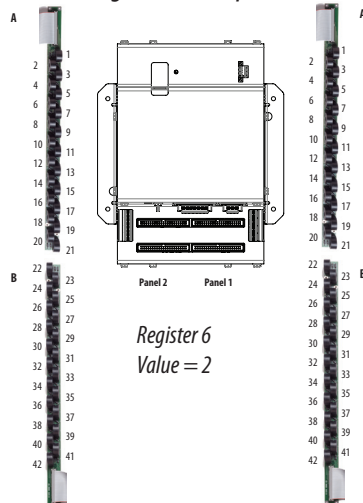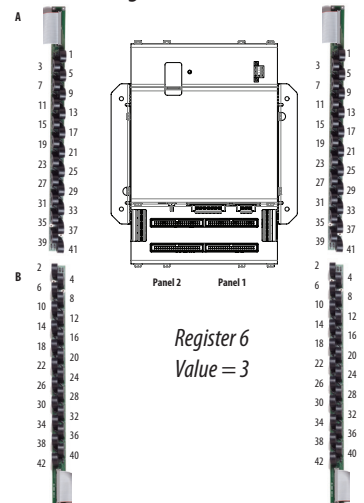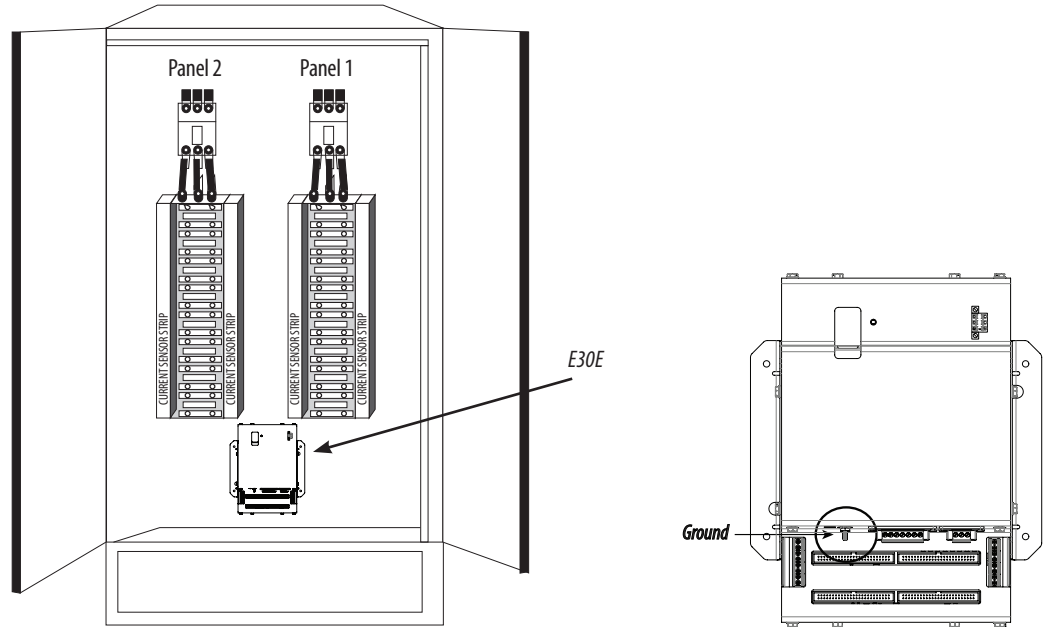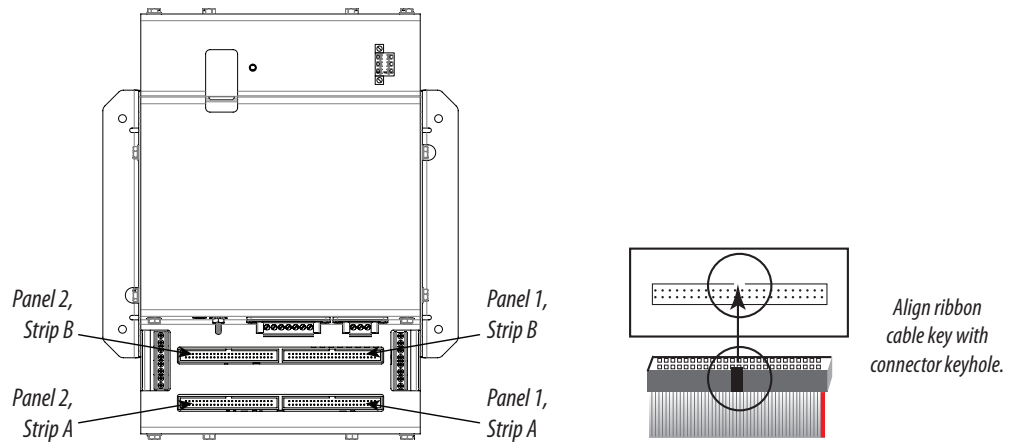
Installation (cont.)

3. Verify that the serial numbers printed on the current sensor strips and on the E30E match. The board and the strips are sold as a calibrated set.

4. Install the E30E in the panel (hardware not provided). A grounding connection is located on the housing (see below). Use this stud to ground the device when it is mounted on a nonconductive surface.

5. Connect the current sensor ribbon cables to the 50-pin connectors on the E30E. The label on the strip indicates which connector to use on the E30E (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 E30E connector aligns with the keyhole cutout on the ribbon cable connector, as shown below.

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Installation (cont.)

6. Connect 0.333 VAC current transformers (CTs) to the conductors to be monitored by snapping the CTs around the lines, observing local codes regarding bending radius.
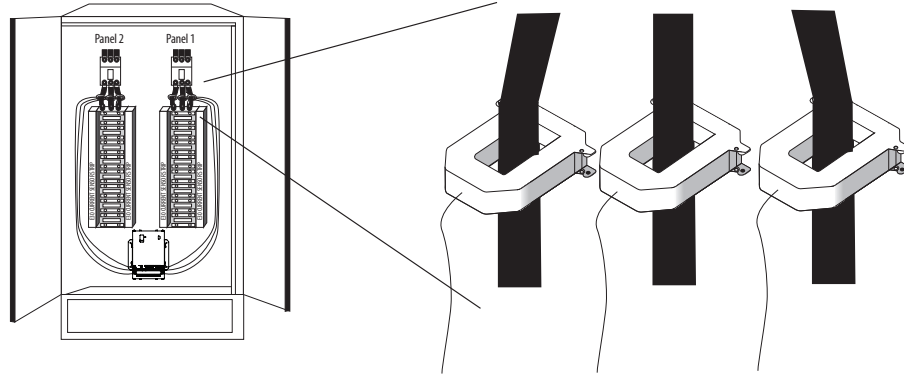
Note: The E30E measures and reports the phase angle of each voltage input and each CT (when there is active current through the primary of that CT). Use the E3x Configuration Tool to view the phase angles of active circuits to help verify that those circuits are connected to and mapped to the proper voltage phases. See the E3x Commissioning Guide (www.veris.com) for instructions on how to download and operate the tool from a PC.

Wiring

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 Aux input CTs to the E30E. Note: For Veris CTs, X1 is the white lead, X2 is the black lead.
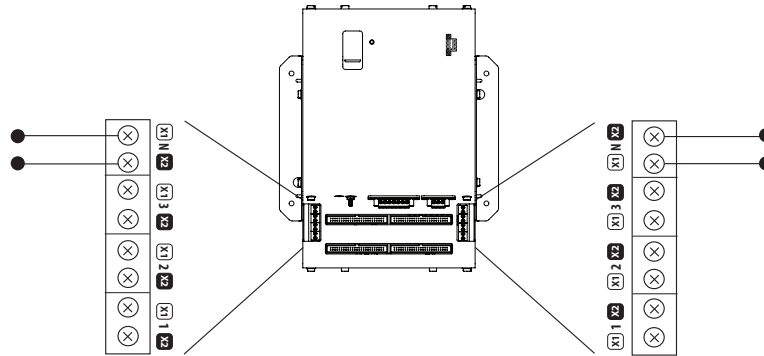
2. Connect 2-wire 100-277 VAC power to the control power terminals. Observe polarity. Connect voltage lines to the voltage taps. Equip voltage lines with fuses and disconnects as required.
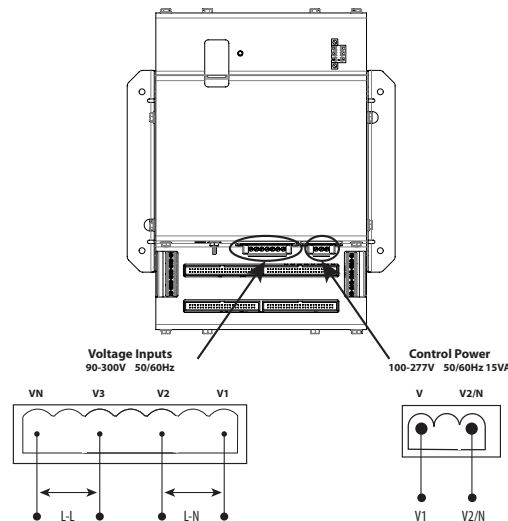
*Voltage taps are shared by both panels.*

Wiring (cont.)

3. Connect the 2-wire Modbus RS-485 network.
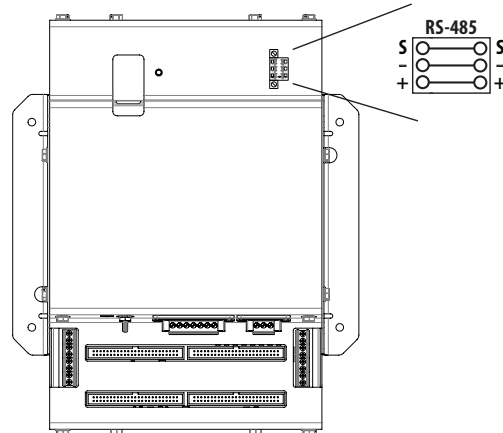
4. Mechanically secure the RS-485 cable where it enters the electrical panel.

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 E30E. Connect all RS-485 devices in a daisy-chain, and properly terminate the chain. 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 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 E30E does not implement any RS-485 line polarization/bias or termination internally. For the RS-485 cable, use shielded, twisted-pair wire, such as Belden 1120A, 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).

120 Ω terminator where specified by the applicable standard

Belden 1120A or equivalent
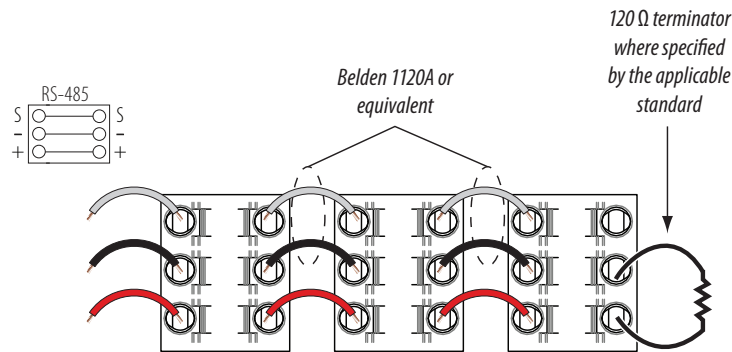
⚠ **WARNING: After wiring the RS-485 cable, remove all scraps of wire or foil shield from the electrical panel. Wire scraps coming into contact with high voltage conductors could be DANGEROUS!**

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).
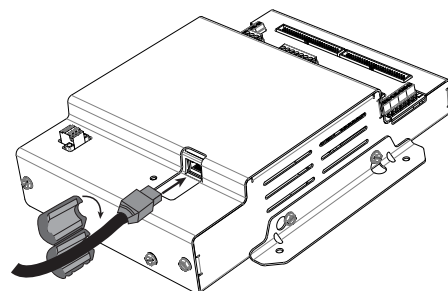
7. Once configured, disconnect the local PC. If desired (and the device is configured for operation on the network), connect the E30E directly to the network for ongoing access to the GUI even if primarily using a serial protocol to access and control the E30E.

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Gateway Configuration

### *Accessing the Graphical User Interface (GUI)*

If the E30E IP address parameters are already configured to work on the network and is being accessed from a PC on that same network, open a web browser and enter the IP address of the E30E into the address/URL field on the browser. Press enter. The GUI launches and appears, as shown, in the browser window.


If the E30E 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 CAT5 ethernet cable between a PC and E30E. Secure a ferrite filter (included) around the ethernet cable to ensure the device meets emission requirements. If the user followed the Installation procedure in this document, then this cable is already in place.
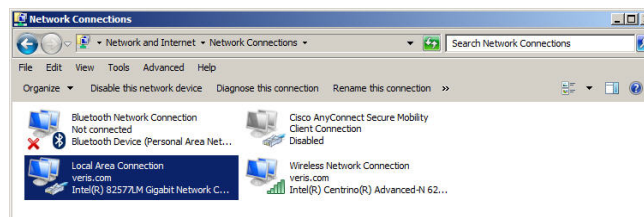
1.800.561.8187   www.itm.com   information@itm.com
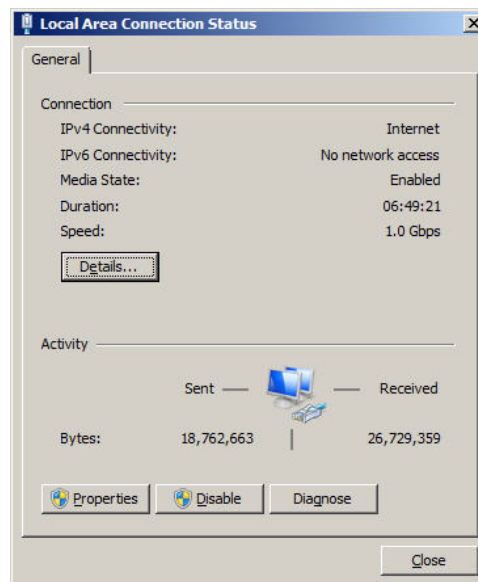
VERIS INDUSTRIES™
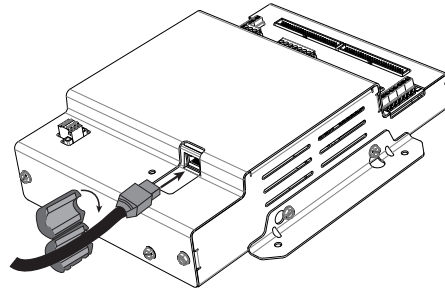
Gateway Configuration (cont.)

2. Temporarily change the IP address of the PC to a static value on the same subnet as the E30E. For example: If the E30E 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 (the screen captures in this example were taken using Windows 7; other operating systems will look different).
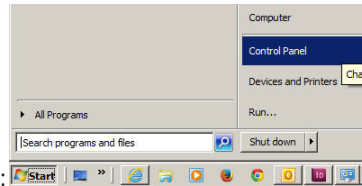
a. Open the Control Panel:

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.

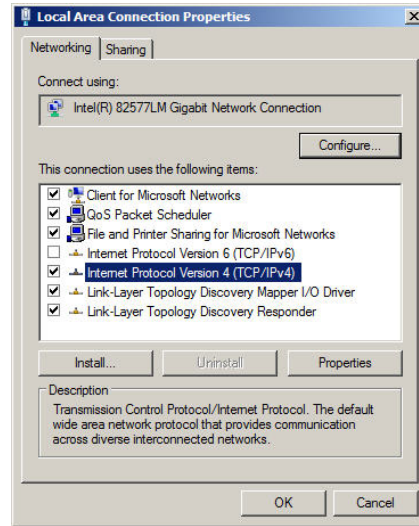c. Select the connection for the setwork that the E30E is included on.

When the Local Area Connection Status windo appears, click on Properties

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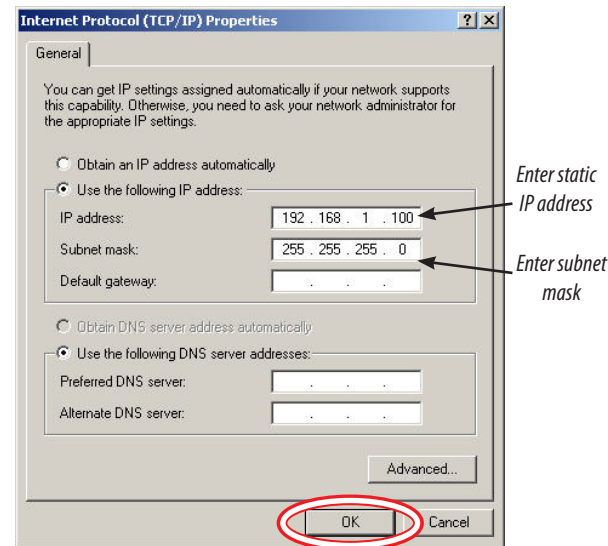
Gateway
Configuration (cont.)

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 E30E Series is still set to its default address of 192.168.1.24, then change it to 192.168.1.100). Enter for the 255.255.255.0 subnet mask. Click OK.

Enter static IP address

Enter subnet mask

e. Click Close.

3. Open a PC web browser and enter the IP address of the E30E (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.
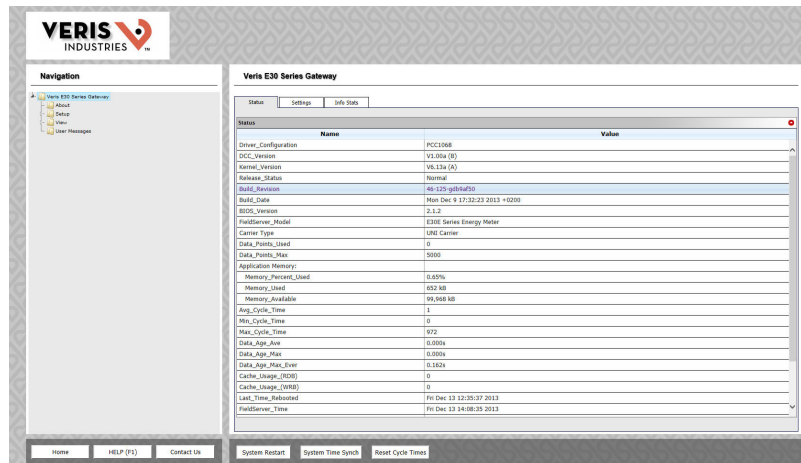
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Gateway Configuration (cont.)

Using the GUI to set up the IP address for use on your network

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 "Diagnostics and Debugging."
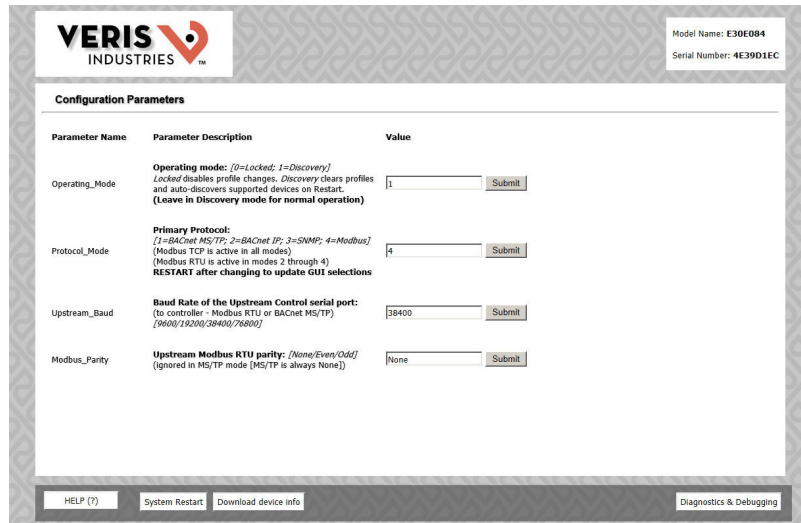

The Diagnostics screen appears.

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

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Gateway Configuration (cont.)

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

a. From the navigation tree (left column) on the GUI, click on Setup and then Network Settings to enter the Edit IP Address Settings menu.
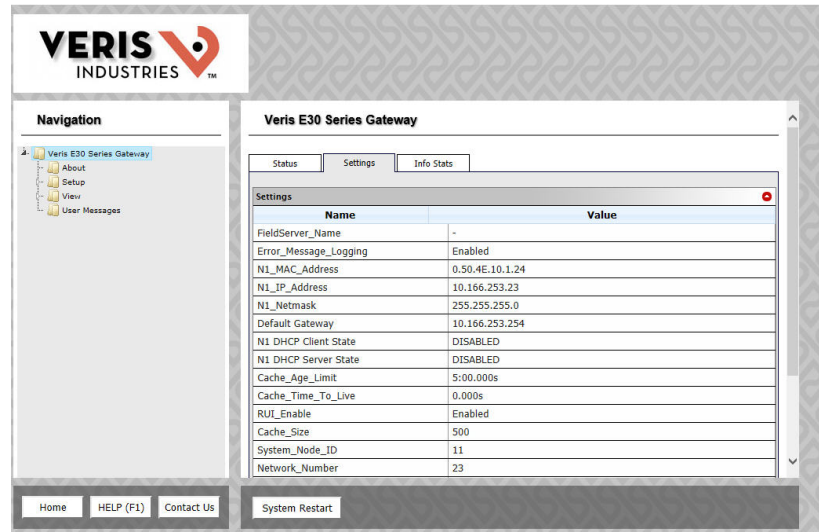
b. Enter the desired IP address in the N1_IP_Address field (in the format xxx.xxx.xxx.xxx)

c. If necessary, change the Subnet Mask by entering the appropriate new value in the N1_Netmask field

d. If the E30E is connected to an ethernet gateway, enter its IP address in the Default Gateway field. This is especially critical if the E30E will be used as a BACnet BBMD device.

e. Click the Update IP settings button. The E30E changes its settings and restarts. The GUI does not connect again until the E30E is installed on the network that matches those settings and the new IP address is entered into a web browser on a PC properly configured for that network.

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Gateway Configuration (cont.)

Using the GUI to Set the Configuration Parameters for the Communication Protocols

Access the GUI according the instructions in the "Accessing the Graphical User Interface (GUI)" section.
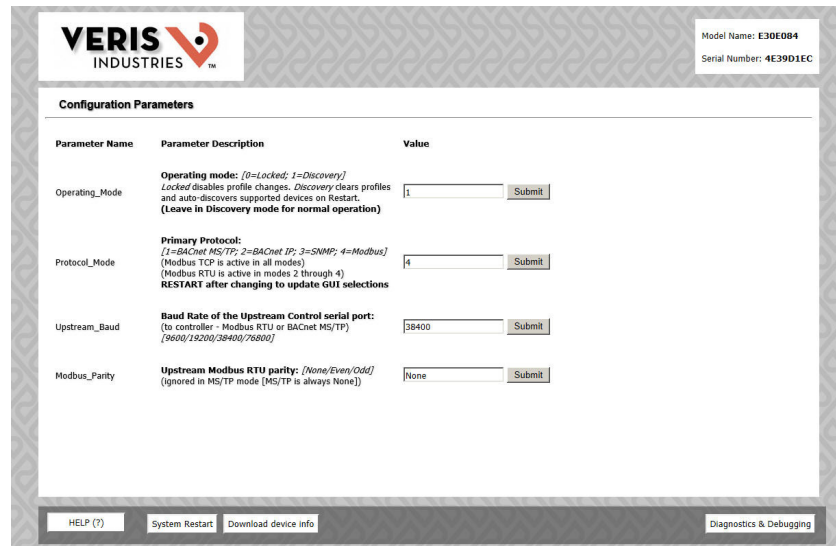
The home screen on the GUI provides fields for configuration of the E30E. The E30E has four primary modes of operation, each of which support a different combination of protocols. Each option field has a Submit button to the right. When changing the value in any field, click Submit to store the new value. 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:

1. 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.

2. 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 E30E 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 left 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_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.

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Gateway Configuration (cont.)

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 a different 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 1-255), the Offset values entered in the GUI must be no larger than 4194055.

The E30E 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 E30E 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 E30E as an MS/TP device, it is recommended that the router also be restarted after the E30E 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 E30E. 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 E30E's virtual router.

The final field is the MSTP_MAC_Addr, which sets the MAC address for the virtual router. The E30E panel(s) are devices on the internal BACnet network and are not directly addressable as MAC addresses on the MS/TP network.

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Gateway Configuration (cont.)

2. BACnet IP mode

BACnet IP mode uses the same DeviceID_Offset and Virt_Router_Net 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.

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Gateway Configuration (cont.)

3. SNMP mode

Configuration Parameters

Parameter Name	Parameter Description	Value
Operating_Mode	**Operating mode:** *[0=Locked; 1=Discovery]* *Locked* disables profile changes. *Discovery* clears profiles and auto-discovers supported devices on Restart. **(Leave in Discovery mode for normal operation)**	1 [Submit]
Protocol_Mode	**Primary Protocol:** *[1=BACnet MS/TP; 2=BACnet IP; 3=SNMP; 4=Modbus]* (Modbus TCP is active in all modes) (Modbus RTU is active in modes 2 through 4) **RESTART after changing to update GUI selections**	3 [Submit]
Upstream_Baud	**Baud Rate of the Upstream Control serial port:** (to controller - Modbus RTU or BACnet MS/TP) *[9600/19200/38400/76800]*	38400 [Submit]
Modbus_Parity	**Upstream Modbus RTU parity:** *[None/Even/Odd]* (ignored in MS/TP mode [MS/TP is always None])	None [Submit]
SNMP_Community	**SNMP Community string:** *[character string]*	Veris [Submit]
SNMP_Notif_IP	**Address of the SNMP Notification client:** *[xxx.xxx.xxx.xxx]*	192.168.1.67 [Submit]

SNMP mode uses two unique parameters. The SNMP_Community string is used to control access to the device. Whatever value entered must be used in the MIB browser or SNMP access software to communicate with this device.

The last parameter, SNMP_Notif_IP is used to set the IP address of the client that used to receive SNMP event notifications, such as alarms.

Operating the E30E

Restart the E30E 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.

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Gateway Configuration (cont.)

BACnet Network Management – Important Steps to Avoid Conflicts

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 E30E creates a virtual BACnet router that presents multiple BACnet devices using a single (its own) MS/TP MAC address. Each E30E 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 E30E 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 E30E Series, change the Device_ID numbers before connecting the E30E to the system. This can be managed one of two ways:

    i.   Connect to the E30E directly (offline from the system) with the devices (meters). After the E30E 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 E30E 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 E30E retains this offset value and uses it to assign Device_ID numbers every time power is cycled if the E30E 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 1-255), any Offset values entered in the GUI must be less than 4194055.

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BACnet PICS

BACnet PICS (Protocol Implementation Conformance Statement)

Vendor Name: Veris Industries
BACnet Vendor ID 133
Product Name: E30E 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: E30E 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

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General BACnet Programming Information

The E30E 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 affect until the E30E 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 the AV1 data object associated with that device. Changes to the network number do not take affect until the E30E 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 E30E 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 E30E refreshes its data (this may take several seconds).

BBMD Support

When the E30E is in BACnet IP mode, it can be configured as a BBMD device 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 E30E 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: "Veris Industries E3x 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 E30E to load the file. BBMD support can be disabled in the GUI by entering "-" (a hyphen) in the Enable BBMD Supprt filed 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
```

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General SNMP Programming Information

The E30E 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 at http://www.veris.com/SNMP.aspx to enable accessing the E30E from an MIB browser.

The E30E OID structure organizes the data under two "panels" representing the two breaker panels that can be monitored by a fully populated E30E. 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 alarm notification traps, the global alarm status registers and counters and tables of the alarm 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.

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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.
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 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	O	O	O	O	O

O = 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.

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