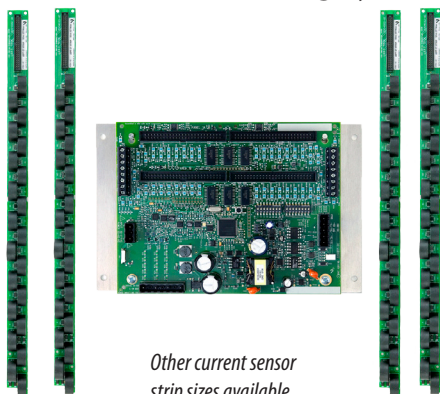


E30

Panelboard Monitoring System



Other current sensor strip sizes available.



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.
- 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. NEC2009 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.

SPECIFICATIONS

Inputs:

Input Power 90-277VAC, 50/60 Hz

Accuracy:

Power/Energy IEC 62053-21 Class 1, ANSI C12.1-2008
Voltage $\pm 0.5\%$ of reading 90-277V line-to-neutral

Operation:

Sampling Frequency 2560 Hz
Update Rate 1.8 seconds (both panels)

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-)
Terminal Block Torque 4.4 to 5.3 in-lb (0.5 to 0.6 N-m)

Mechanical:

Ribbon Cable Support 4 ft. (0.9 m) flat ribbon cable ships standard; up to 20 ft. (6 m) available

Environmental:

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
Agency Approvals UL508, EN61010

* See Configuration section for details.

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PRODUCT IDENTIFICATION

Description	CT Option	# of CTs
E30		
A = Advanced	0 = 100A, 3/4" spacing	24 = 2 strips with 12 sensors each*
B = Intermediate	1 = 100A, 1" spacing	36 = 2 strips with 18 sensors each*
C = Basic	2 = 100A, 18 mm spacing	42 = 2 strips with 21 sensors each
		48 = 4 strips with 12 sensors each*
		72 = 4 strips with 18 sensors each*
		84 = 4 strips with 21 sensors each

* This option available with 18 mm spacing only.

QUICK INSTALL



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



Disconnect and lock out power. Use a properly rated voltage sensing device to confirm the power is off.

1. Mount the current sensor strips adjacent to the breaker terminations.
2. **Verify that the serial numbers on the current sensor strips match the serial number on the data acquisition board.**
3. Configure communication and addressing parameters using the DIP switches.
4. Mount the data acquisition board in the electrical enclosure.
5. Connect the current sensor strip cables to the main board, observing the 2-strip or 4-strip setup and their orientation (A or B) within the panel.
6. Wire the RS-485 communications.
7. Connect the CTs to the auxiliary inputs and connect them to the main conductors in the enclosure (optional).
8. Wire the control power and voltage taps (E30A and E30B only).
9. Download the free E3x configuration tool from www.veris.com to commission the device for operation.

PRODUCT OVERVIEW

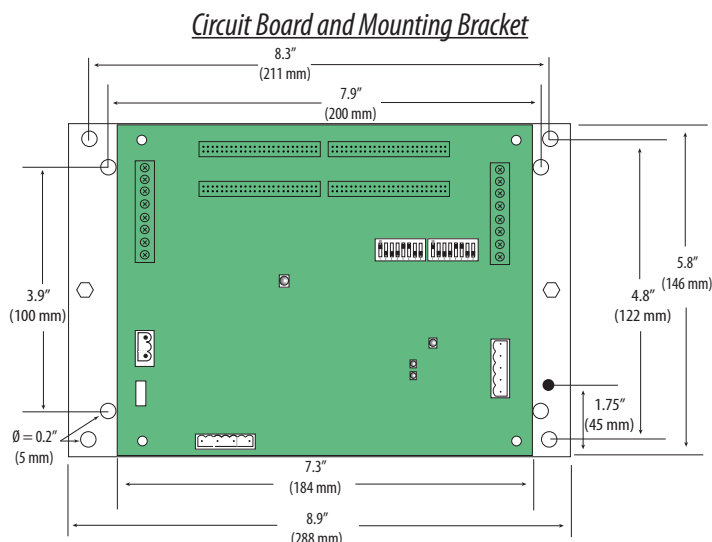
The E30 Series Branch Current Monitor is a device designed to measure the current, voltage, and energy consumption of up to 92 circuits (84 branch circuits, 2 3-phase mains, 2 neutrals) on a single board. It increases the board's current monitoring capability by combining the functions of two boards into one device.

The E30 consists of a data acquisition board and up to four 21-unit current sensor strips, with eight auxiliary inputs. The strips 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.

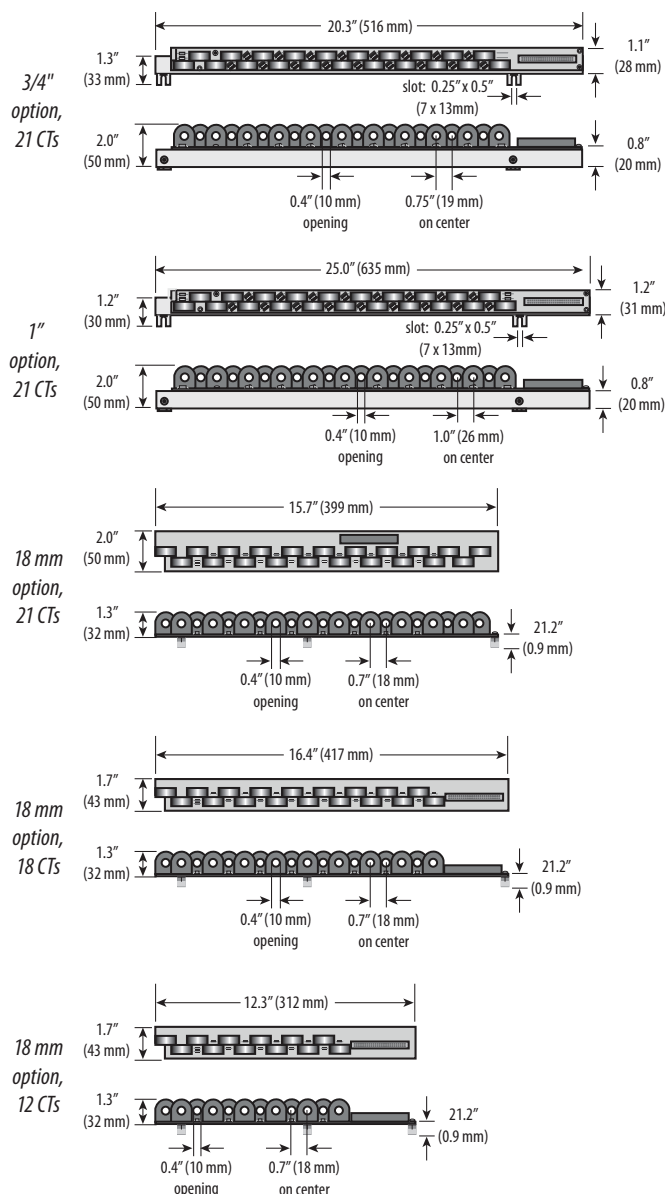
Data is transmitted using an RS-485 Modbus protocol. Each data acquisition board requires two addresses, one for each set of two current sensor strips and four auxiliary inputs. Data is updated roughly every two seconds. As a circuit approaches the user-defined threshold, the E30 activates the alarm indicators.

The E30A measures both current and power for the mains and branch circuits. The E30B measures both current and power for the mains, and current only in each circuit. The E30C measures current only for the mains and branch circuits.

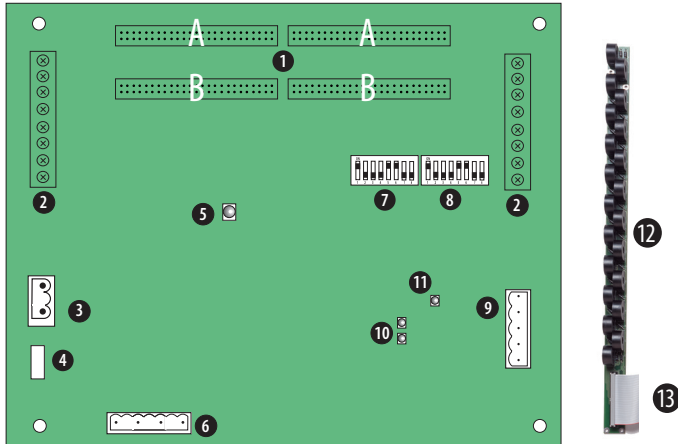
DIMENSIONS



Solid-Core Current Sensor Strips



PRODUCT DIAGRAM



1. **50-Pin Ribbon Cable Connectors (Data Acquisition Board):** 48-inch (1220 mm) ribbon cables are provided for easy connection of current sensor strips to this point of the data acquisition board. The two connectors on the left are for panelboard 1; the two on the right are for panelboard 2.

Connect current sensor strips to the correct ribbon cable connectors for each panel. The top connector is for Strip A, and the bottom connector is for Strip B.

Verify that the serial numbers on the current sensor strips match the serial number on the data acquisition board.
2. **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 1; inputs on the right are for panelboard 2.
3. **Control (Mains) Power Connection:** Easy 2-wire 90-277 VAC 50/60 Hz connection.
4. **Control Power Fuse:** 600 VAC, 500 mA time lag, factory-replaceable.
5. **Alive LED:** Red/green/amber LEDs. Blink codes are on page 3.
6. **Voltage Taps:** 1, 2, or 3 phase plus neutral connections. For voltage sensing and power calculations (no voltage taps on the E30C).
7. **Communications Address DIP Switches:** 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: the 4-strip model uses 2 addresses.
8. **Communications Settings DIP Switch:** Configures baud rate, parity, 2/4 wire communications.
9. **RS-485 2 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 (farthest from DIP switches) indicates transmission of information.
11. **Power LED:** Indicates power to main board
12. **Current Sensors:** Each current sensor is capable of monitoring conductors rated up to a maximum of 100 amps.
13. **50 Pin Ribbon Cable Connectors (Current Sensor Strips):** Connects current signal from the sensor strip to the main board via the ribbon connectors.

DATA OUTPUT

Monitoring at Mains	E30A	E30B	E30C
Current per phase	■	■	■
Max. current per phase	■	■	■
Current demand per phase	■	■	■
Max. current demand per phase	■	■	■
Energy (kWh) per phase	■	■	
Real Power (kW) per phase	■	■	
Apparent Power (kVA)	■	■	
Power factor total *	■	■	
Power factor per phase	■	■	
Voltage - L-L and average	■	■	
Voltage - L-N and average	■	■	
Frequency (phase A)	■	■	
Monitoring at Branch Circuit			
Current	■	■	■
Max. current	■	■	■
Current demand	■	■	■
Max. current demand	■	■	■
Real power (kW)	■		
Real power (kW) demand	■		
Real power (kW) demand max.	■		
Energy (kWh) per circuit	■		
Power factor	■		
Apparent Power (kVA)	■		
Modbus Alarms			
Voltage over/under	■	■	
Current over/under	■	■	■

* Based on a 3-phase breaker rotation.

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
Amber, three per second	Incorrect strips or strip order
Red, solid or blink	Diagnostic event detected

SOLID-CORE CURRENT SENSOR ACCURACY

	100A Solid-Core CT
Voltage Rating	300 VAC
Accuracy	±0.5%
Temperature	0° to 60°C
Agency	UL508 recognized, EN61010

INSTALLATION



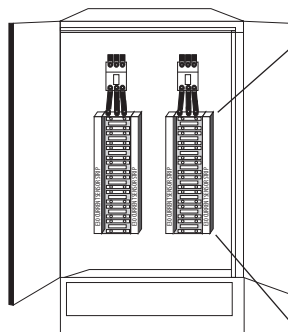
Observe precautions for handling static sensitive devices to avoid damage to the circuitry that is not covered under the factory warranty.



Disconnect and lock out power to the electrical panel.

1. Install the current sensor strips in the panel (Figure 1).
2. Arrange the sensor strips in one of the four configurations shown in Figure 2. Adjust orientation of the circuit numbers in the field during commissioning by writing to Modbus Register 6 or use free configuration software at www.veris.com.

Figure 1



Current sensors accept a maximum #2 AWG (0.384" O.D.) wire with THHN insulation. Use this gauge wire or smaller for 100 A circuits.

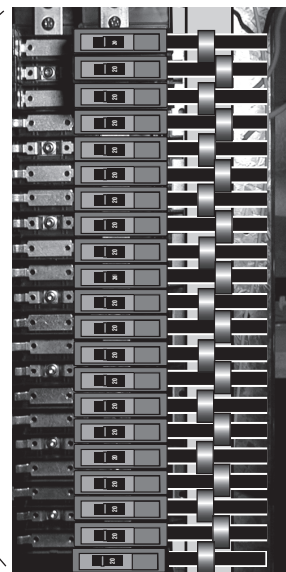
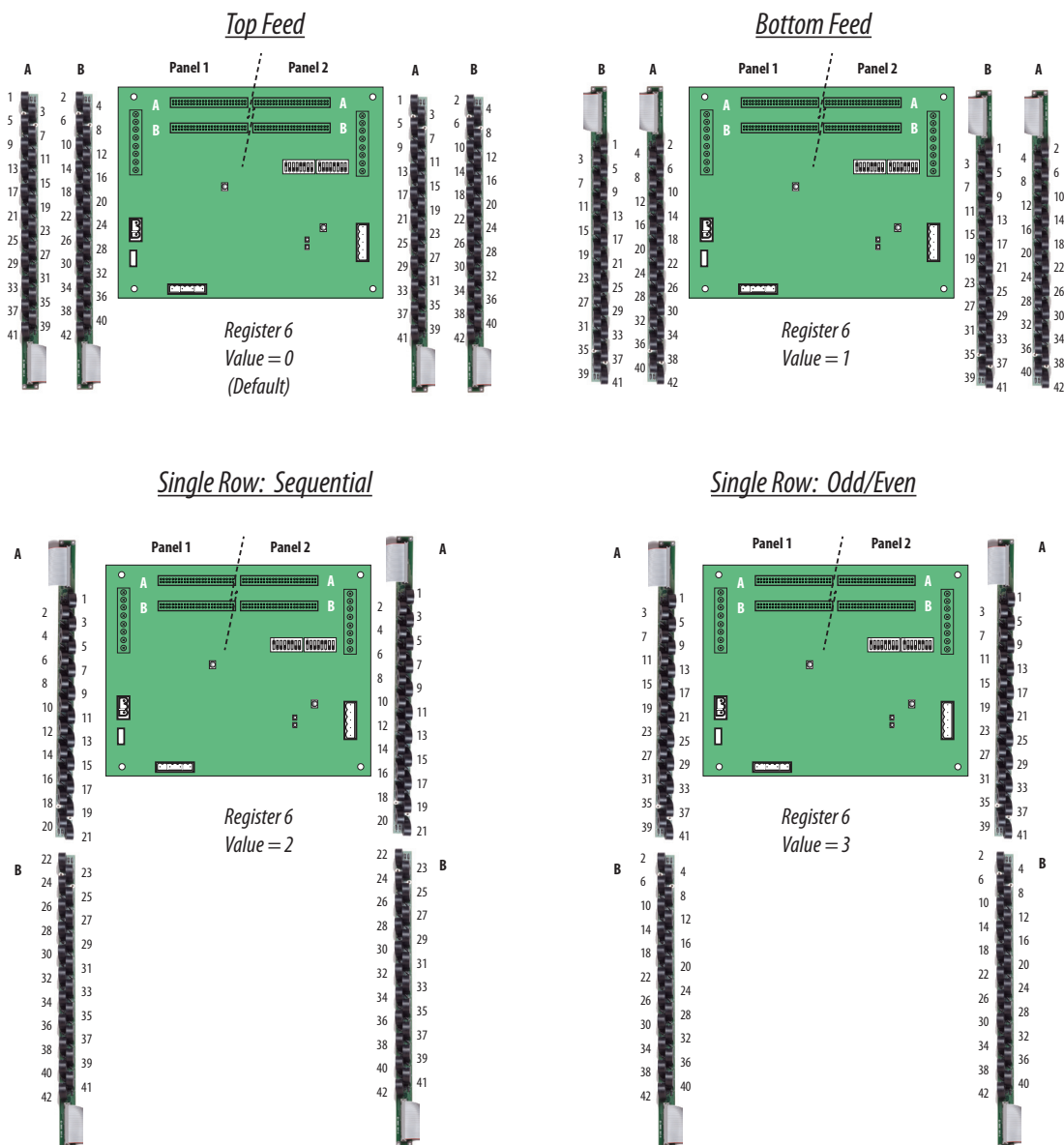


Figure 2

The examples in this graphic show the 21 current sensor strips. The same configuration options are available for the 18 and 12 strips.



3. Verify that the serial numbers printed on the current strip and on the data acquisition board match. **The board and the strip are sold as a calibrated set.**
4. Configure communication and addressing parameters using DIP switches. The E30 requires two addresses, one for each set of two current sensor strips and four auxiliary inputs. See the Configuration section on page 7 for more information.
5. Install the E30 acquisition board mounting bracket in the panel using screws and bolts provided (Figure 3). A grounding connection is located on the mounting bracket, near the lower right corner. Use this stud to ground the bracket when it is mounted on a nonconductive surface.
6. Check the labels on the current sensor strip and on the data acquisition board to make sure the serial numbers match. Additionally, the label indicates which connector to use on the data acquisition board (e.g. connect the strip labeled "Panel 1A" to the top left connector on the board; Figure 4). When the device is powered, if the current sensor strips are installed incorrectly, the Alive LED blinks amber, three times per second. Check the labels and correct the connections.

Figure 3

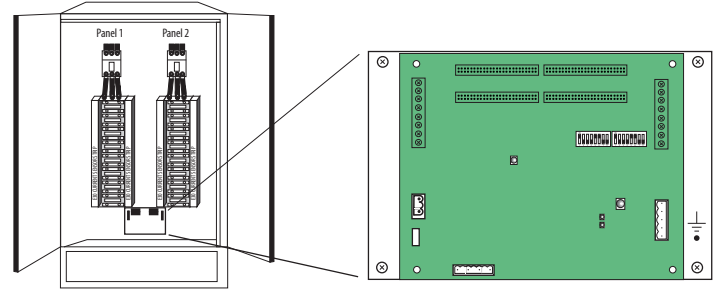
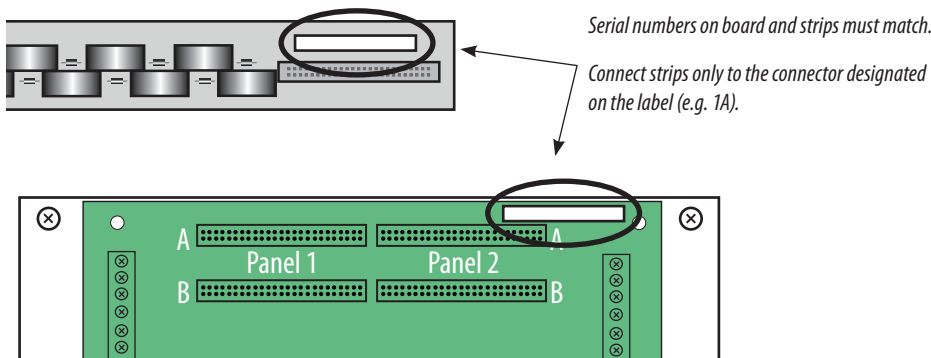


Figure 4



7. Connect current sensor ribbon cables to the 50-pin connectors on the main board (Figures 5 and 6). **Orient cables so that the red stripe is on the left.**

Figure 5

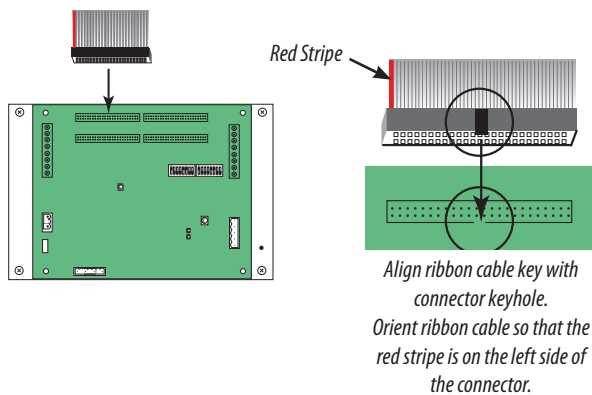
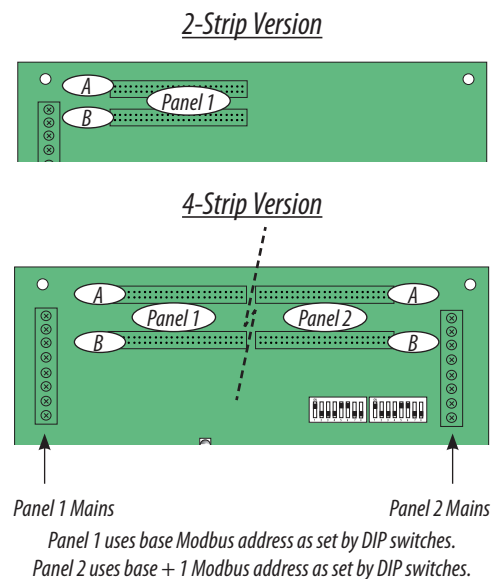
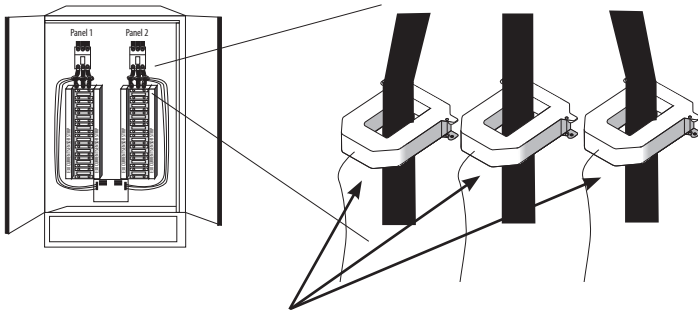


Figure 6



8. Wire RS-485 communications (see diagrams in Wiring section).
9. Connect 0.333VAC CTs to the main conductors by snapping CTs around lines, observing local codes regarding bending radius (optional; Figure 8).
10. Connect 2-wire 90-277VAC power to main power terminals. Observe polarity. For the E30A and E30B, connect voltage lines to the voltage taps (Figure 8). Equip voltage lines with fuses.

Figure 7



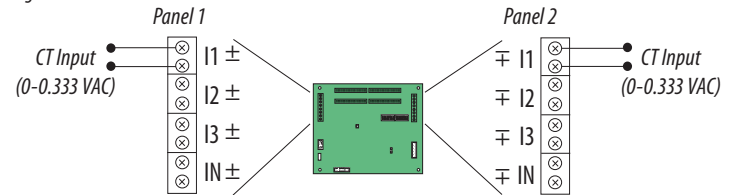
Recommended CT:

Veris Industries H6810, H6811, H6812 Series with 0.333VAC output.

Available in 100A max. to 2400A max.

Call a Veris sales rep if higher amperages are required.

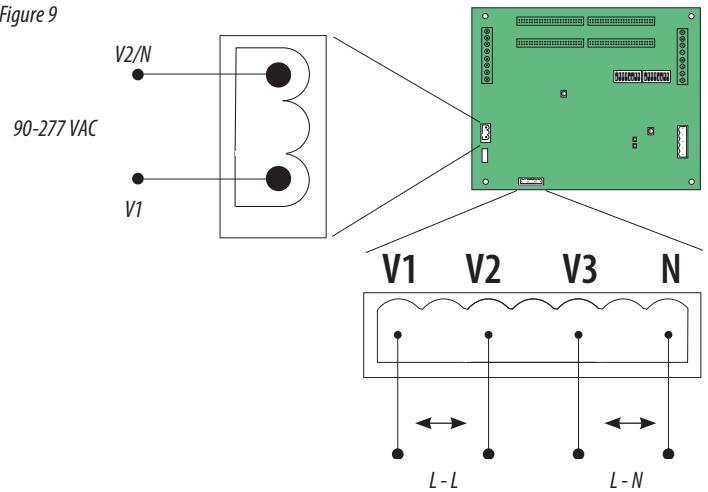
Figure 8



Set up Modbus registers 115-118 for CT scaling.

Use base + 1 address for Panel 2 setup.

Figure 9



Line to Line (L-L) Voltage: 150 to 480 VAC

Line to Neutral (L-N) voltage: 90 to 277 VAC

Voltage taps are shared by both panels.

WIRING



Disconnect and lock out power before making any wiring connections.

Connect 2-wire or 4-wire Modbus RS-485 daisy chain network (Figures 10 and 11).

Figure 10

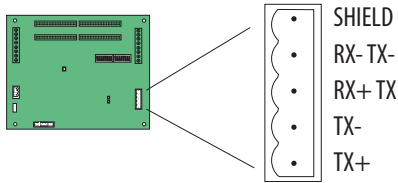
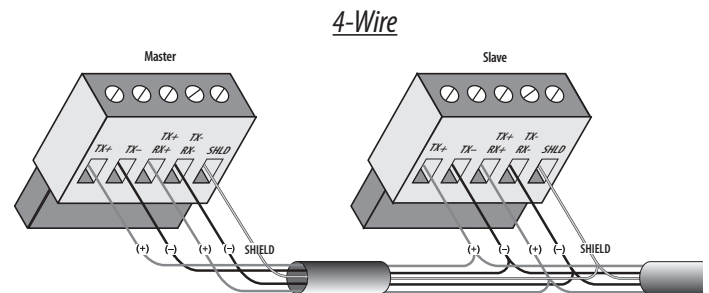
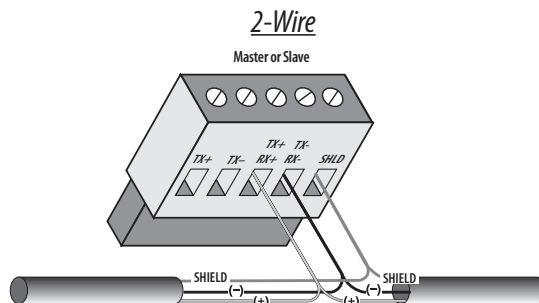


Figure 11



1. Mechanically secure the RS-485 cable where it enters the electrical panel.
2. Connect all RS-485 devices in a daisy-chain fashion, and properly terminate the chain (Figure 12).
3. Shield the RS-485 cable using twisted-pair wire, such as Belden 1120A. Use cable that is voltage-rated for the installation.
4. When tightening terminals, ensure that the correct torque is applied: 0.5 to 0.6 N-m (0.37 to 0.44 ft-lb) for the connectors on data acquisition board, 0.22 to 0.26 N-m (0.16 to 0.19 ft-lb) for the connectors on the adapter boards (Figure 13).

Figure 12

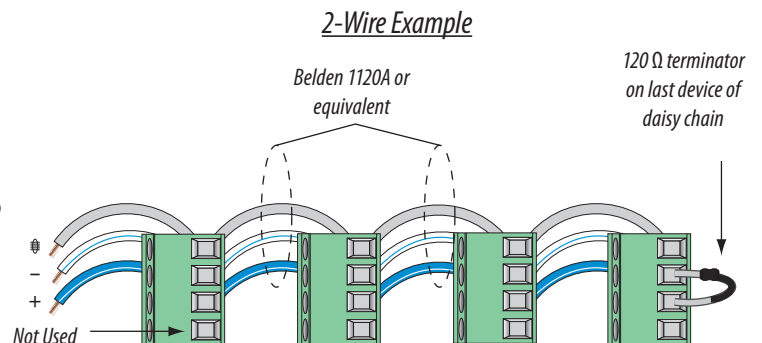
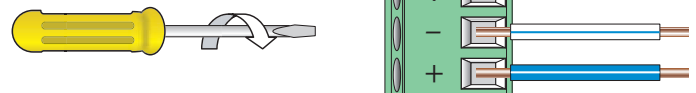


Figure 13

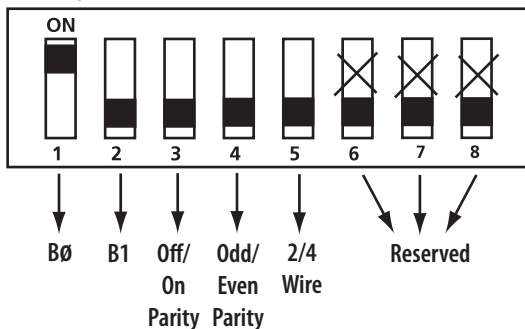


WARNING: After wiring the RS-485 cable, remove all scraps of wire or foil shield from the electrical panel. Wire scraps coming into contact with high voltage conductors could be **DANGEROUS!**

CONFIGURATION

1. Communications Configuration: Communications parameters for the E30 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: two or four

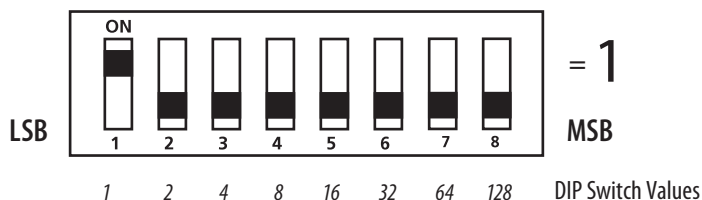


Example: 2-wire 19200 Baud No Parity (Default Only)

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

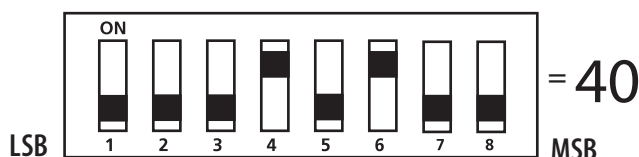
2. Address Configuration: Each Modbus device on a single network must have a unique address. Set the switch block to assign a unique address before the device is connected to the Modbus RS-485 network. If an address is selected that conflicts with another device, neither device will be able to communicate.

3. The E30 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 E30 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:



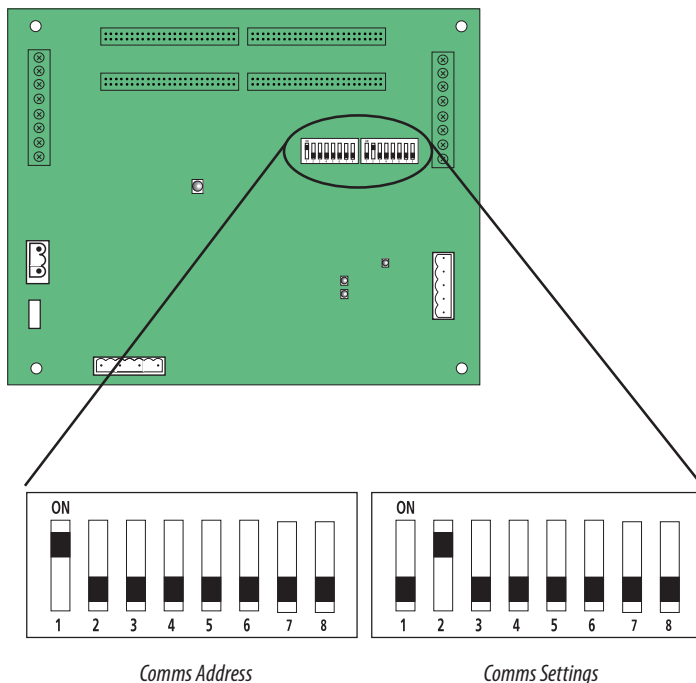
Switch number 4 has an ON Value of 8 and switch number 6 has an ON Value of 32.

(8 + 32 = 40). Therefore, the address for Panel 1 is 40, and the address for Panel 2 is 41.

See the Address Setup section (page 8) for a pictorial listing of the first 63 switch positions.

DEFAULT DIP SWITCH SETTINGS

The E30 includes two DIP switches, as shown below. Switches are shown in their default positions.



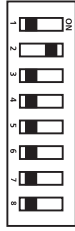
ADDRESS SETUP



DO NOT
USE ZERO



1



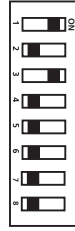
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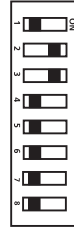
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4



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6



7



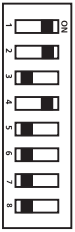
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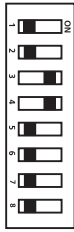
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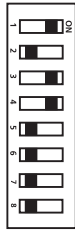
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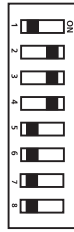
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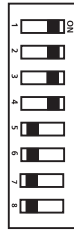
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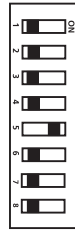
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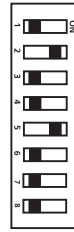
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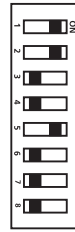
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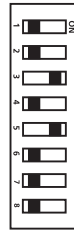
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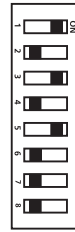
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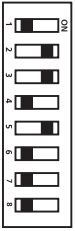
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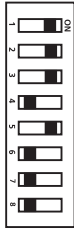
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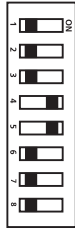
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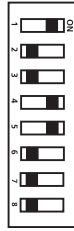
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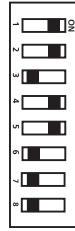
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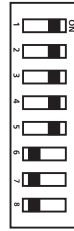
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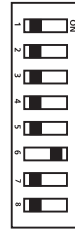
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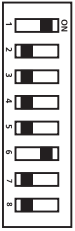
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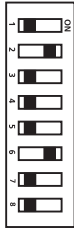
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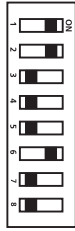
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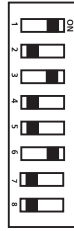
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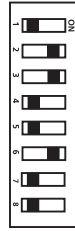
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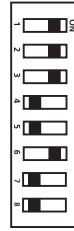
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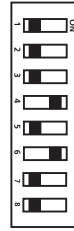
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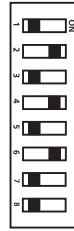
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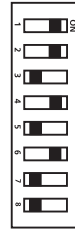
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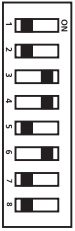
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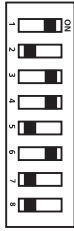
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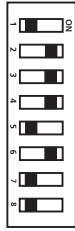
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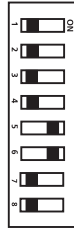
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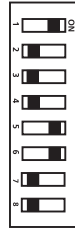
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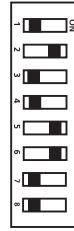
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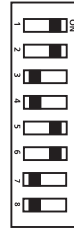
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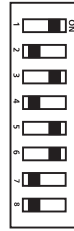
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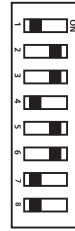
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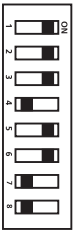
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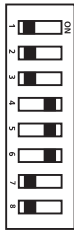
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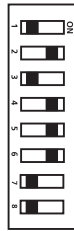
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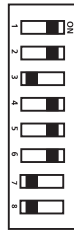
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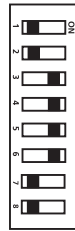
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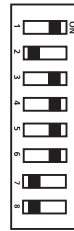
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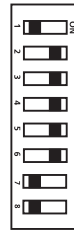
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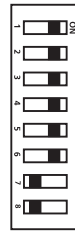
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COMMISSIONING

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)
AE001	E3x MCB cover
AE006	E30 CT repair kit
H8932/H8932	Network Display

SAFETY

If Veris E30 products are used in installations with circuits higher than the product ratings, the circuits must be kept segregated per UL508A Sec. 17.5.

Note: 277/480 VAC Wye connected (center grounded) power systems operate within the 300 VAC line to neutral safety rating of the E3x series, and the operational voltage limit (single-phase connection) as the line to neutral voltage is 277 VAC in such power systems. Corner-grounded delta 480 VAC systems would not qualify, as the actual line to earth voltage is 480 VAC on each leg, exceeding the E3x ratings.

Note: E3x internal circuitry (cables and CTs) are not circuits as defined by UL508A, as they do not extend beyond the E3x itself without further safety/fire isolation.

UL listed under standard 508 as an "open type device."

Maximum ambient air temperature for use is 60°C.

The E30 Series must be installed in an appropriate electrical and fire enclosure per local regulations.

Installation category: CAT III

For use in a Pollution Degree 2 or better environment only.

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

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.

IEC/EN 61010-1 



This symbol indicates an electrical shock hazard exists.



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

TROUBLESHOOTING

Problem	Solution
Product is not communicating over Modbus daisy chain	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Check that the 1A and 1B CT strips are connected to the left top and left bottom ribbon cable connections; 2A and 2B must be connected to the right top and right bottom ribbon cable connections (see illustrations in the product install). • Verify ribbon cable connectors are inserted in the correct orientation. • If cables are correct, reset main board to re-initialize product. • Verify serial number on strips matches serial number on main board.
The main board has a slow flashing amber light	<ul style="list-style-type: none"> • One or more channels is clipping. This can be caused by a signal greater than 100 A 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	<ul style="list-style-type: none"> • Everything is wired properly and the main board has power.
The main board is a flashing or solid red light	<ul style="list-style-type: none"> • 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.
Power factor reading is not as expected	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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						