

ReliaGear™ lighting panelboards — Branch circuit monitoring

Installation and commissioning instructions

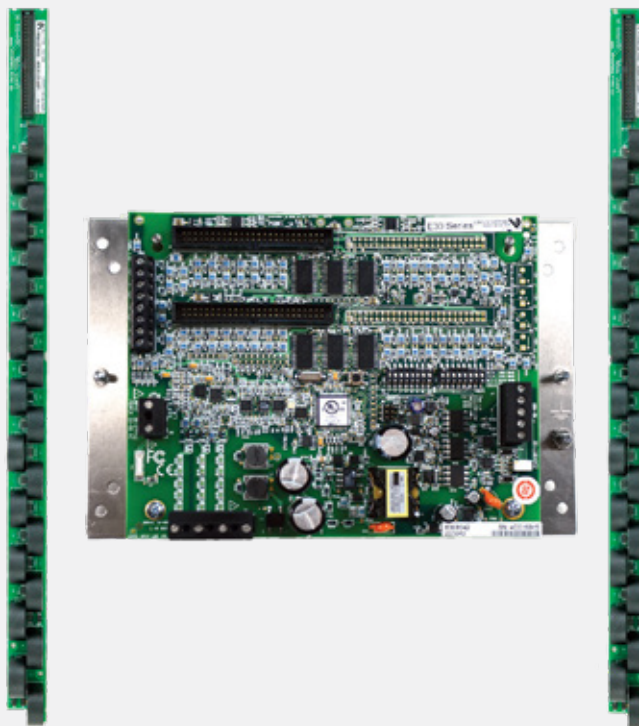


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ASPMETER solid core

Safety

If ASPMETER products are used in installations with circuits higher than the product ratings, the circuits must be kept segregated per UL 508A Sec. 17.5.

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

NOTE: ASPMETER internal circuitry (cables and CTs) are not circuits as defined by UL 508A, because they do not extend beyond the ASPMETER itself without further safety/fire isolation.

- UL listed under UL 508 as an “open-type device.”
- Maximum ambient air temperature for use is 60 °C.
- Installation category: CAT III
- The ASPMETER series must be installed in an appropriate electrical and fire enclosure per local regulations.

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.

DANGER: Hazard of electric shock, explosion or arc flash. Failure to follow these instructions will result in death or serious injury.

- 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.

NOTICE:

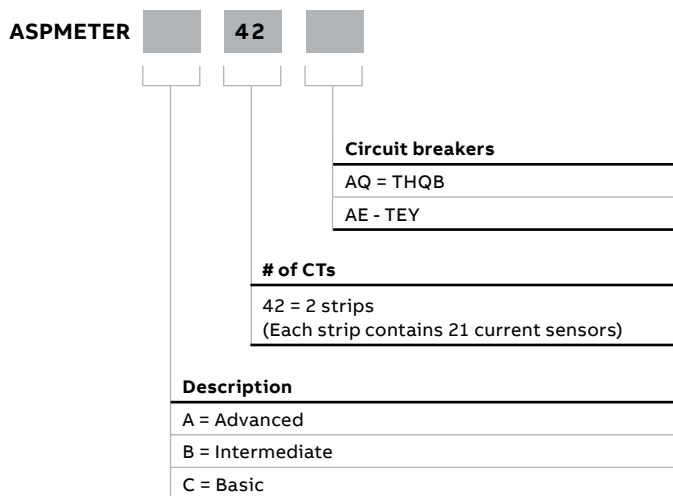
- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- The installer is responsible for conformance with all applicable codes
- Mount this product inside a suitable fire and electrical enclosure.

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 the manufacturer nullify this statement.

Installer's specifications

Inputs	
Input power	50/60 Hz, 90–277 V AC
Accuracy	
Power/energy	IEC 62053-21 Class 1, ANSI C12.1-2008
Voltage	±0.5% of reading 90–277 V line-to-neutral
Current	±5% of reading
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-)
Mechanical	
Ribbon cable support	18" round ribbon cable 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 °C to 70 °C (-40 °F to 158 °F)
Agency approvals	UL 508, EN61010

Product identification



Quick install

1. Disconnect and lock out power. Use a properly rated voltage-sensing device to confirm power is off.
2. Mount current sensor strips adjacent to breaker terminations.
3. **Verify that the serial numbers on the CTs match that on the board.**
4. Configure communication and addressing parameters using DIP switches.
5. Mount the main acquisition board in the electrical enclosure.
6. Connect current sensor strip cables to the main board, observing the 2-strip setup and their orientation (A or B) within the panel.
7. Wire RS-485 communications.
8. Connect CTs to the auxiliary inputs and connect them onto the main conductors in the enclosure (optional).
9. Wire control power and voltage taps (ASPMETERA and ASPMETERB only).
10. Download the free configuration tool “NetConfig” from www.veris.com/modbus_downloads.aspx to commission the device for operation.

ASPMETER solid core

Operations

The ASPMETER series branch current monitor is a device designed to measure the current, voltage and energy consumption of up to 46 circuits (42 branch circuits, one 3-phase main and one neutral).

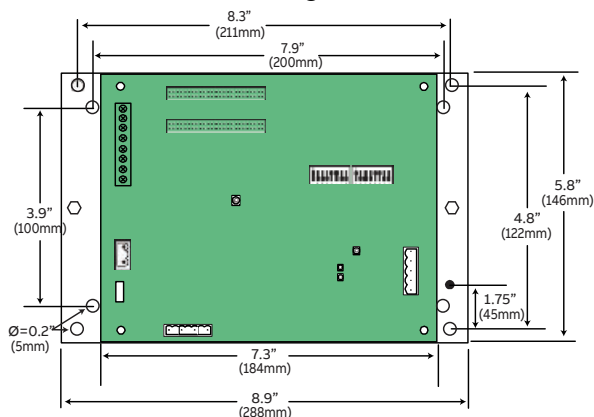
The ASPMETER consists of a data acquisition board and two 21-unit current sensor strips, with four auxiliary inputs. The strips are mounted on each side of the panelboard along the termination points of each breaker. The conductor passes through the appropriate current sensor before terminating at the 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 one Modbus address for the set of two current sensors and four auxiliary inputs. Data is updated roughly every two seconds. As a circuit approaches the user-defined threshold, the ASPMETER activates the alarm indicators.

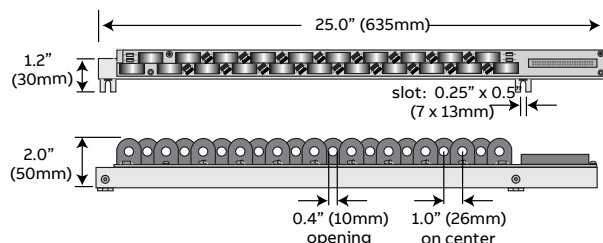
The ASPMETERA measures both current and power for the mains and branch circuits. The ASPMETERB measures both current and power for the mains, and current only in each circuit. The ASPMETERC measures current only for the mains and branch circuits.

Dimensions

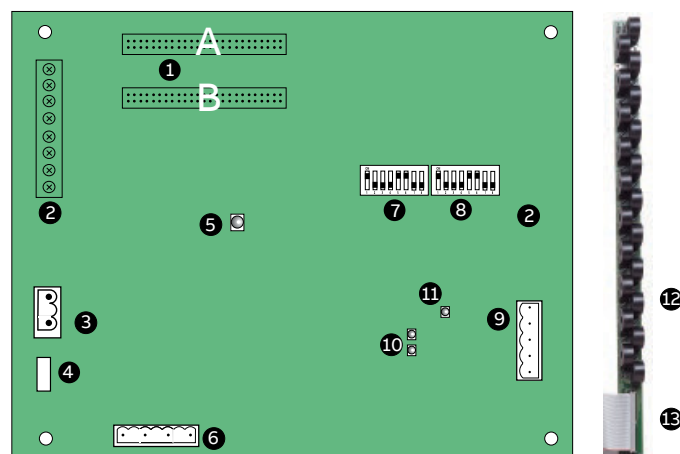
Circuit board and mounting bracket



Solid-core CT strips



Product diagrams



- 50-pin ribbon cable connectors (data acquisition board):** 18 inch (457 mm) ribbon cables are provided for easy connection of current sensor strips to this point of the data acquisition board.

NOTE: Connect CT 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.

- Auxiliary inputs:** These 0.333 V AC inputs are used for monitoring the main breaker or other high amperage source.
- Control (mains) power connection:** Easy 2-wire 90–277 V AC 50/60 Hz connection.
- Control power fuse:** 600 V AC, 500 mA time lag, factory-replaceable.
- Alive LED:** Red/green/amber LEDs. Blink codes are on page 7.
- Voltage taps:** 1, 2 or 3 phase plus neutral connections. For voltage sensing and power calculations (no voltage taps on the ASPMETERC).
- 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.
- Communications settings DIP switch:** Configures baud rate, parity, 2-/4-wire communications.
- RS-485 2 connection:** Used for Modbus serial communications. The universal plug accommodates 2- or 4-wire connections.
- 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.
- Power LED:** Indicates power to main board
- Current sensors:** Each current sensor is capable of monitoring conductors rated up to a maximum of 100 amps.
- 50-pin ribbon cable connectors (current sensor strips):** Connects current signal from the sensor strip to the main board via the ribbon connectors.

ASPMETER solid core

Data output

Monitoring at mains	ASPMETERA	ASPMETERB	ASPMETERC
Current per phase	•	•	•
Max. current per phase	•	•	•
Current demand per phase	•	•	•
Max. current demand per phase	•	•	•
Current phase angle	•	•	–
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	•	•	•
Current phase angle	•	•	–
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 code

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	Device failure

Commissioning

1. Install according to instructions in mechanical installation.
2. Provide control power to main circuit board.
3. Configure installation mode using Modbus register 6.
4. Configure CT scaling.
5. Configure alarms.
6. Configure demand.

Download the free configuration tool “NetConfig” from www.veris.com/modbus_downloads.aspx to commission the ASPMETER for operation.

ASPMETER solid core

Wiring



Power must be disconnected and locked out before making any wiring connections.

Connect 2-wire or 4-wire Modbus RS-485 daisy chain network (Figures 1 and 2).

Figure 1.

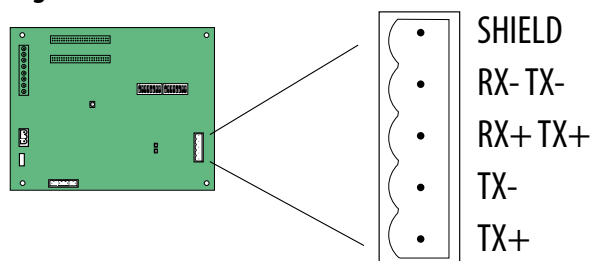
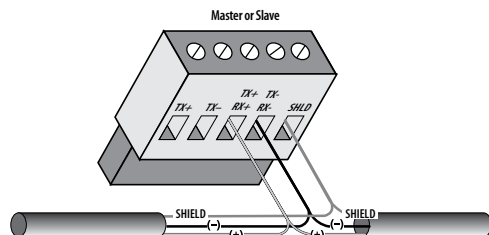
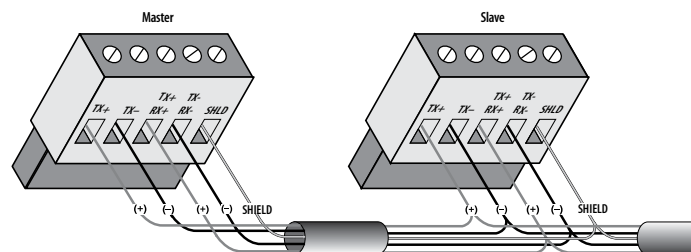


Figure 2.

2-wire



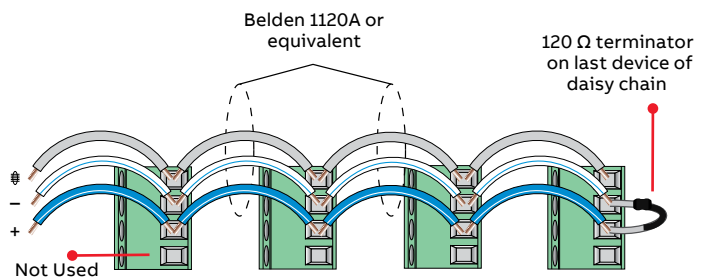
4-wire



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 3).

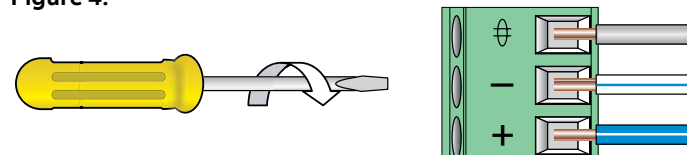
Figure 3.

2-wire example



3. Shield the RS-485 cable using twisted-pair wire, such as Belden 1120A. The cable must be 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 connectors on main board, 0.22 to 0.26 N·m (0.16 to 0.19 ft·lb) for connectors on adapter boards (Figure 4).

Figure 4.



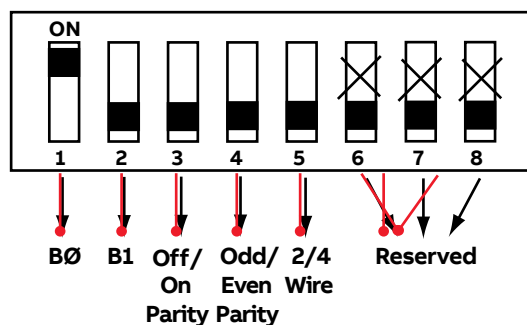
WARNING: After wiring the RS-485 cable, remove all scraps of wire or foil shield from the electrical panel. Wire scraps coming into contact with high voltage conductors could be DANGEROUS!

ASPMETER solid core

Configuration

- Communications configuration:** Communications parameters for the ASPMETER series are field-selectable for your convenience. Please see the product diagrams section (page 6) for selector location. The following parameters are configurable:

- Baud rate: 9600, 19200 or 38400
- Parity: on or off
- Parity: odd or even
- Wiring: two or four

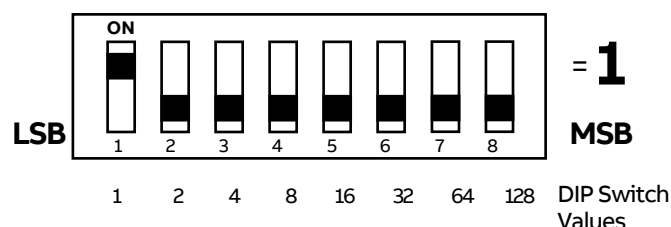


Example: 2-wire 19200 baud, no parity (default only)

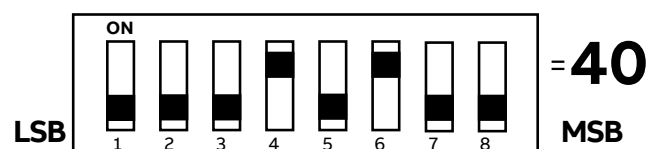
1	2	3	4	5	6	7	8	
Off	Off				X	X	X	9600
On	Off				X	X	X	19200
Off	On				X	X	X	38400
On	On				X	X	X	Reserved
		Off	Off		X	X	X	No parity
		On	Off		X	X	X	Odd parity
		Off	On		X	X	X	No parity
		On	On		X	X	X	Even parity
				On	X	X	X	4-wire RS-485
				Off	X	X	X	2-wire RS-485

- 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 that conflicts with that of another device is selected, neither device will be able to communicate.

- Address the ASPMETER as any whole number between and including 1–246. Each unit is equipped with a set of eight DIP switches for addressing. See below.



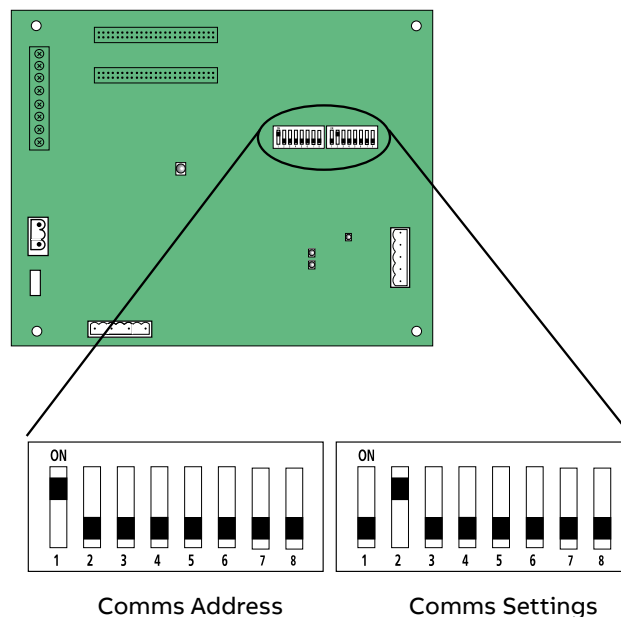
- To determine an address, simply add the values of any switch that is on. For example:



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 the ASPMETER is 40. See the address setup section (page 10) for a pictorial listing of the first 63 switch positions.

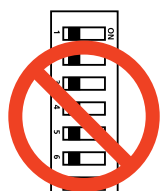
Default DIP switch settings

The ASPMETER includes two DIP switch blocks, as shown below. Switches are shown in their default positions.

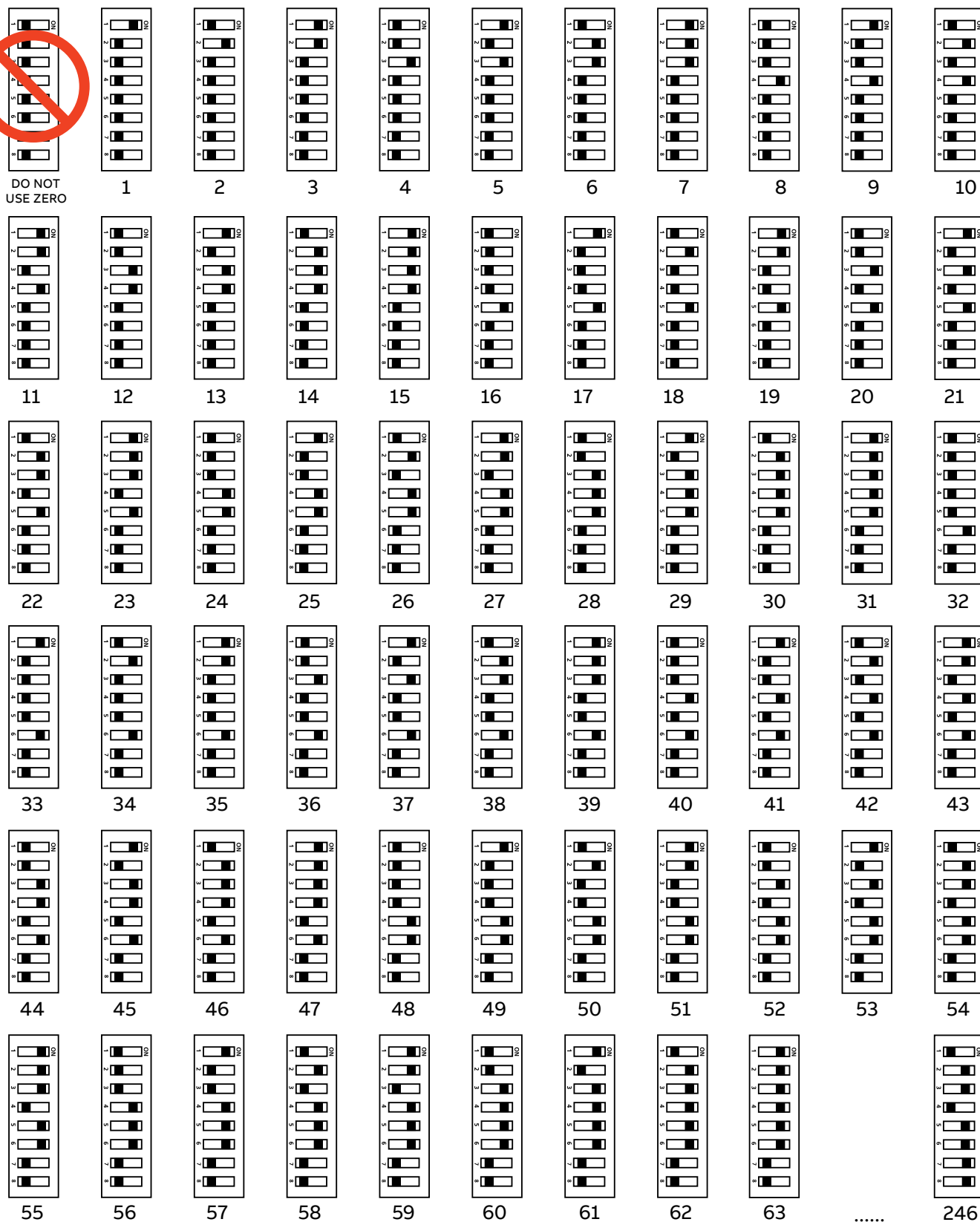


ASPMETER solid core

Address setup



DO NOT
USE ZERO



ASPMETER solid core

Mechanical installation



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



Disconnect power to the electrical panel and lock it out.

1. Install the current sensor strips in the panel (Figure 5).
2. Arrange the sensor strips in one of the four configurations shown in Figure 6. Adjust orientation of the circuit numbers in the field during commissioning by writing to Modbus register 6 or use free configuration software.

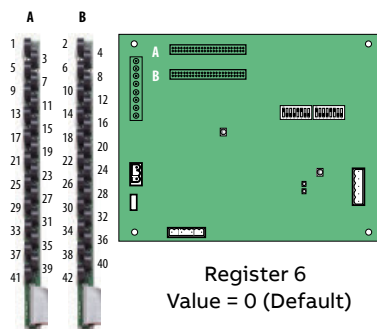
Figure 5.

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

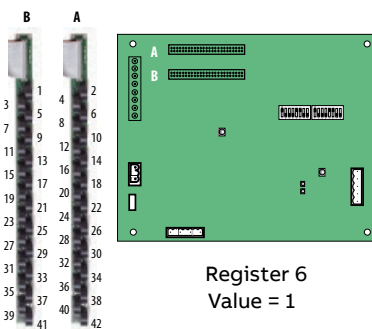


Figure 6.

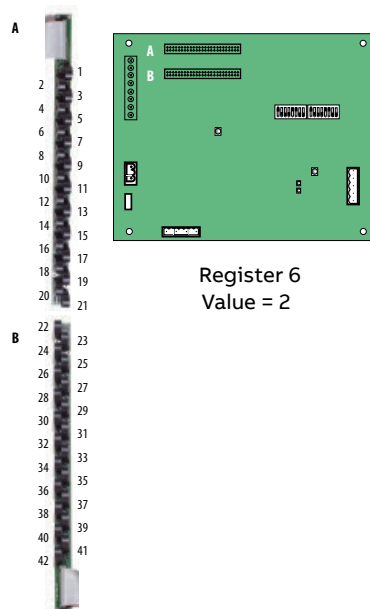
Top feed



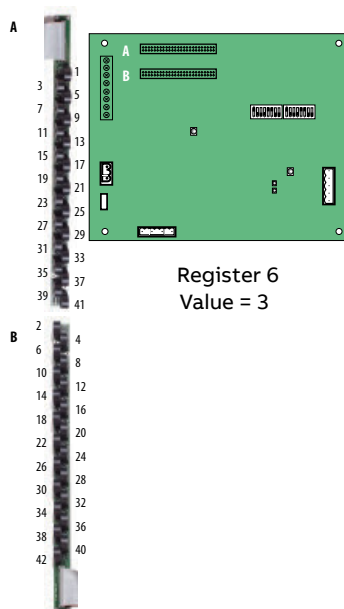
Bottom feed



Single row — sequential



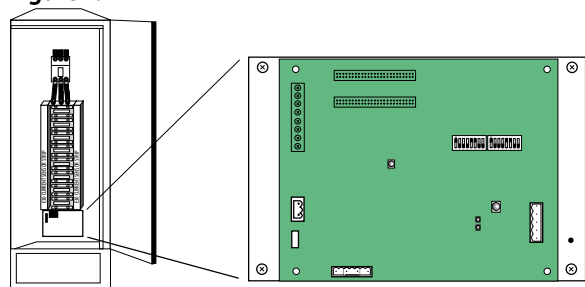
Single row — odd/even



ASPMETER solid core

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. See the configuration section for more information.
5. Install the ASPMETER acquisition board mounting bracket in the panel using screws and bolts provided (Figure 7). The 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 plastic surface.

Figure 7.



6. Connect current sensor ribbon cables to the 50-pin connectors on the main board (Figures 8 and 9). Orient cables so that the red stripe is on the left.

Figure 8.

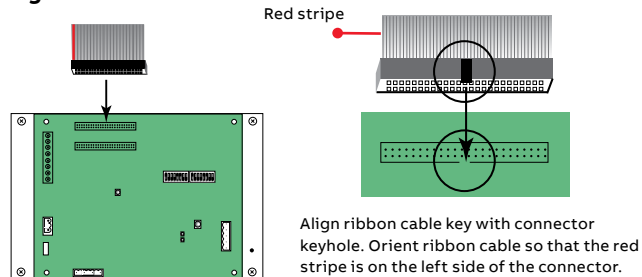
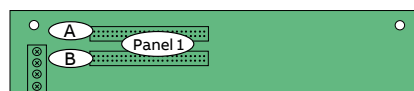


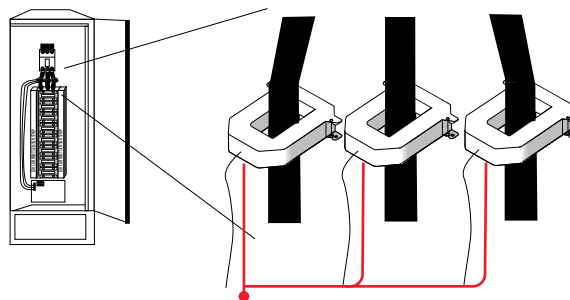
Figure 9.



7. Wire RS-485 communications (see diagrams in wiring section (page 8)).

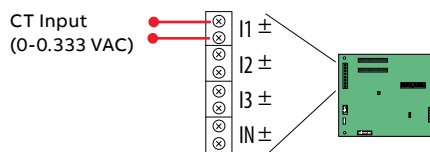
8. Connect 0.333 V AC CTs to the main conductors by snapping CTs around lines, observing local codes regarding bending radius (optional; Figure 10).

Figure 10.



Recommended CT: AMP1 series available in 100 A max. to 2000 A max.
Contact your local ABB sales rep for recommended CT amperages or
if higher amperages are required.

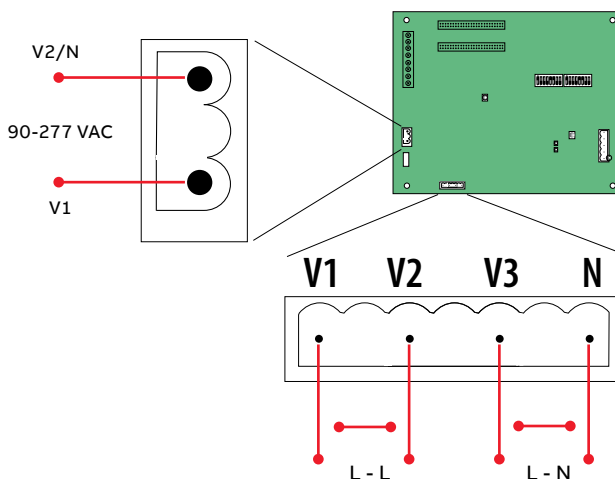
Figure 11.



Set up Modbus registers 115–118 for CT scaling.

9. Connect 2-wire 90–277 V AC power to main power terminals. Observe polarity. For the ASPMETERA and ASPMETERB, connect lines to the voltage taps (Figure 12). Equip voltage lines with fuses.

Figure 12.



Line to line (L-L) voltage: 150 to 480 V AC
Line to neutral (L-N) voltage: 90 to 277 V AC

ASPMETER solid core

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 communications. • 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 product installation). • 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 has 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.
Configuration tool “NetConfig” returns Modbus error on read/write	<ul style="list-style-type: none"> • Verify use of the latest release of configuration tool “NetConfig” because older versions may not support all features in current product firmware. Latest version is available on the website http://www.veris.com/modbus_downloads.aspx

ASPMETER split core

Safety

FCC Part 15 information note: This equipment has been tested by the manufacturer and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

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

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.

NEC 2011 Article 100: No responsibility is assumed by manufacturer for any consequences arising out of the use of this material.

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



This symbol indicates an electrical shock hazard exists.



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



DANGER: Hazard of electric shock, explosion or arc flash. Failure to follow these instructions will result in death or serious injury.

- 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.



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.



WARNING: Loss of control

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

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

For troubleshooting or service-related questions, contact ABB at 800-782-8061 or at epis.component.support@abb.com

Save these instructions

ASPMETER split core

Specifications

Inputs	
Input power	90–277 V AC, 50/60 Hz
Accuracy	
Power/energy	IEC 62053-21 Class 1, ANSI C12.1-2008
Voltage	±0.5% of reading 90–277 V line-to-neutral
Current	±5% of reading
Operation	
Sampling frequency	2560 Hz
Update rate	1.8 seconds (both panels)
Overload capability	22 kAIC
Outputs	
Type	Modbus RTU
Connection	DIP switch-selectable 2-wire or 4-wire, RS-485
Address	DIP switch-selectable address 1 to 247 (in pairs of 2) ¹
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
Operating conditions	
Operating temp range	0 °C to 60 °C (32 °F to 140 °F); <95% RH, non-condensing
Storage temp range	-40 °C to 70 °C (-40 °F to 158 °F)
Altitude of operation	3000 m
Compliance	
Agency approvals	UL 508 open-type device, EN61010-1
Installation category	Cat III, pollution degree 2

¹ See configuration section for details.

Notes:

- If ASPMETER products are used in installations with circuits higher than the product ratings, the circuits must be kept segregated per UL 508A Sec. 17.5.
- 277/480 V AC wye-connected (center-grounded) power systems operate within the 300 V AC line to neutral safety rating of the ASPMETER series, and the operational voltage limit (single-phase connection) as the line to neutral voltage is 277 V AC in such power systems. Corner-grounded delta 480 V AC systems would not qualify, because the actual line to earth voltage is 480 V AC on each leg, exceeding the ASPMETER ratings.
- ASPMETER internal circuitry (cables and CTs) are not circuits as defined by UL 508A, because they do not extend beyond the ASPMETER itself without further safety/fire isolation.

Product overview

The ASPMETER 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) on a single board. One ASPMETER can monitor up to two panels.

The ASPMETER consists of a data acquisition board and up to 84 split-core current sensors (50 A, 100 A or 200 A), with eight auxiliary inputs. Each conductor passes through a current sensor and terminates at the breaker. Each sensor transmits the current data to the data acquisition board. Data is transmitted using an RS-485 Modbus protocol. Each data acquisition board requires two addresses, one for each set of 42 current sensors and four auxiliary inputs. Data is updated roughly every two seconds. As a circuit approaches the user-defined threshold, the ASPMETER activates the alarm indicators.

The ASPMETER-A measures both current and power for the mains and branch circuits. The ASPMETER-B measures both current and power for the mains, and current only in each circuit. The ASPMETER-C measures current only for the mains and branch circuits.

Product identification

ASPMETER



of CTs

002 = 2 adapter boards, no CTs, no cables

004 = 4 adapter boards, no CTs, no cables

42 = 2 adapter boards, (42) 50 A CTs,
(2) 4 ft. round ribbon cables

84 = 4 adapter boards, (84) 50 A CTs,
(4) 4 ft. round ribbon cables

Description

A = Advanced board

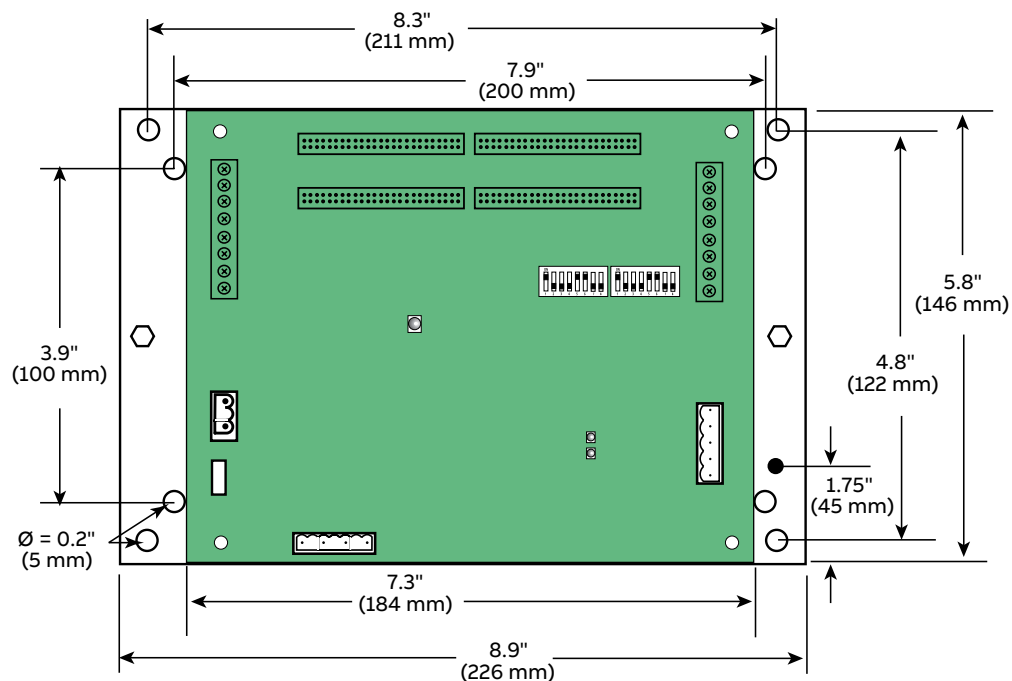
B = Intermediate board

C = Basic board

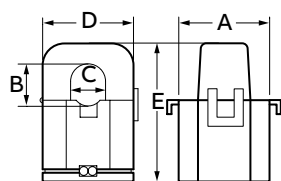
ASPMETER split core

Dimensions

Circuit board and mounting bracket

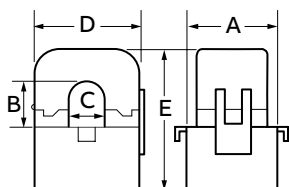


Current sensors



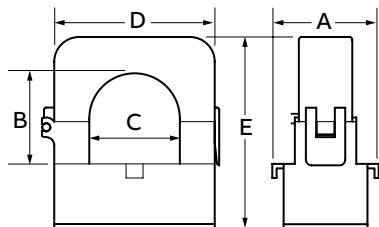
ASPCT0 50 amp

- A = 1.0" (26 mm)
- B = 0.5" (11 mm)
- C = 0.4" (10 mm)
- D = 0.9" (23 mm)
- E = 1.6" (40 mm)



ASPCT1 100 amp

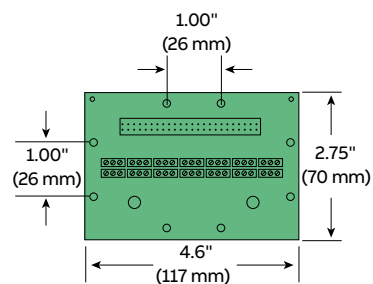
- A = 1.5" (37.5 mm)
- B = 0.6" (16 mm)
- C = 0.6" (16 mm)
- D = 1.85" (47 mm)
- E = 2.1" (53 mm)



ASPCT3 200 amp

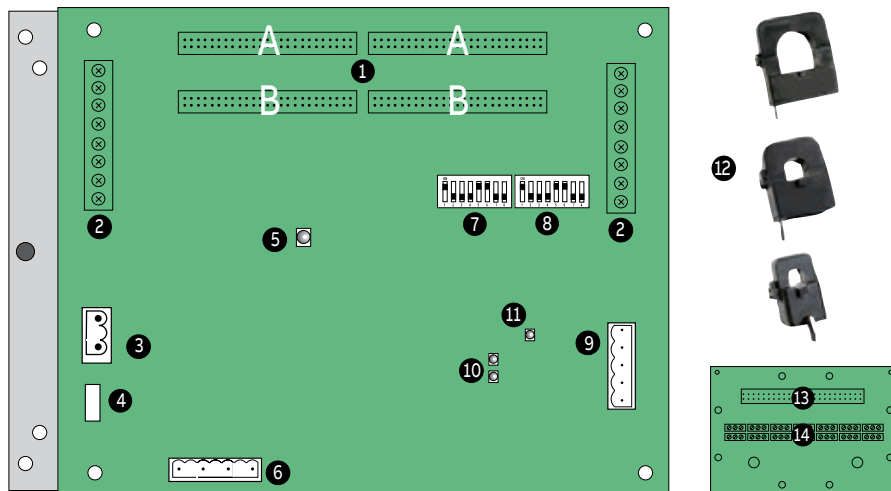
- A = 1.5" (39 mm)
- B = 1.25" (32 mm)
- C = 1.25" (32 mm)
- D = 2.5" (64 mm)
- E = 2.8" (71 mm)

Adapter board



ASPMETER split core

Product diagrams



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

Note: Connect adapter boards A and B to the correct ribbon cable connectors for each panel. The top connector is for adapter board A, and the bottom connector is for adapter board B.

Note: Ribbon cable is not included with all ASPMETER models. For ribbon cable options, see recommended accessories on page 25.

2. **Auxiliary inputs:** These 0.333 V AC 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 V AC 50/60 Hz connection.
4. **Control power fuse:** 600 V AC, 500 mA time lag, factory-replaceable.
5. **Alive LED:** Red/green/amber LEDs. Blink codes on page 18.
6. **Voltage taps:** 1, 2 or 3 phase plus neutral connections. For voltage sensing and power calculations (no voltage taps on the ASPMETER-C). Voltage taps are shared by both panels.
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: Switches set the address for panel 1; panel 2 is automatically set to (panel 1 address + 1). See configuration section for details.

8. **Communications settings DIP switch:** Configures baud rate, parity and 2-/4-wire communications.

9. **RS-485 connection:** Used for Modbus serial communications. The universal plug accommodates 2- or 4-wire connections.

10. **RS-485 LEDs:** The RX LED (closest to DIP switches) indicates the RS-485 is receiving information; the TX LED (farthest from DIP switches) indicates transmission of information.

11. **Power LED:** Indicates power to main board .

12. **Branch current sensors:** Each split-core current sensor is capable of monitoring conductors rated up to a maximum of 50, 100 or 200 amps. Up to 84 sensors can be purchased with the ASPMETER (see recommended accessories on page 25). One of each style is pictured here.

13. **Ribbon cable connectors**

14. **CT terminal connectors**

ASPMETER split core

Data output

Monitoring at mains	ASPMETER-A	ASPMETER-B	ASPMETER-C
Current per phase	•	•	•
Max. current per phase	•	•	•
Current demand per phase	•	•	•
Max. current demand per phase	•	•	•
Current phase angle	•	•	–
Energy (kWh) per phase	•	•	–
Real power (kW) per phase	•	•	–
Apparent power (kVA)	•	•	–
Power factor total *	•	•	–
Power factor per phase	•	•	–
Voltage L-L and average of 3 phases	•	•	–
Voltage L-N and average of 3 phases	•	•	–
Voltage L-N and per phase	•	•	–
Frequency (phase A)	•	•	–
Monitoring at branch circuit			
Current	•	•	•
Max. current	•	•	•
Current demand	•	•	•
Max. current demand	•	•	•
Current phase angle	•	•	–
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 code for status LED

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

Split-core CT accuracy

Description	Split-core CT		
	50 A	100 A	200 A
Voltage rating	300 V AC	300 V AC (CE), 600 V AC (UL)	300 V AC (CE), 600 V AC (UL)
Accuracy	±1%	±0.5%	±1%
Temperature	0 °C to 60 °C		
Agency	UL 508 recognized, EN61010-1		

Commissioning

1. Install according to instructions in mechanical installation.
2. Provide control power to panel.
3. Configure installation mode using Modbus register 6.
4. Configure CT scaling.
5. Configure alarms.
6. Configure demand.

Download the free configuration tool “NetConfig” from www.veris.com/modbus_downloads.aspx to commission the E3x for operation.

ASPMETER split core

Wiring



Power must be disconnected and locked out before making any wiring connections.

Connect 2-wire or 4-wire Modbus RS-485 daisy chain network (Figures 1 and 2).

Figure 1.

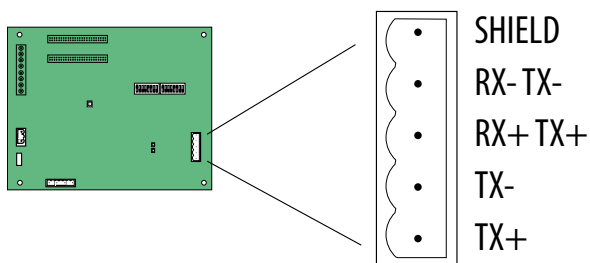
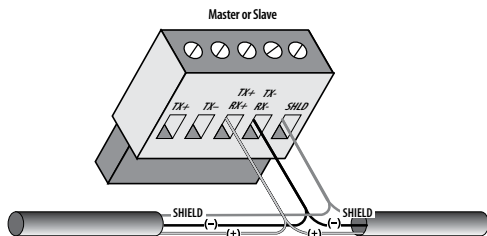
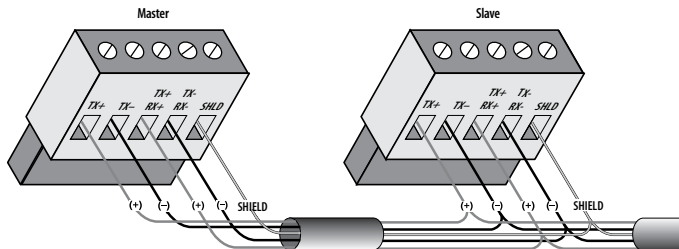


Figure 2.

2-wire



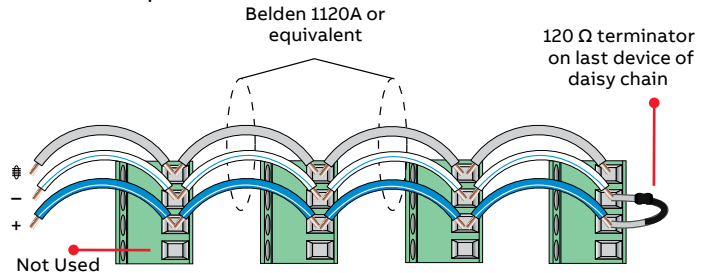
4-wire



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 3).

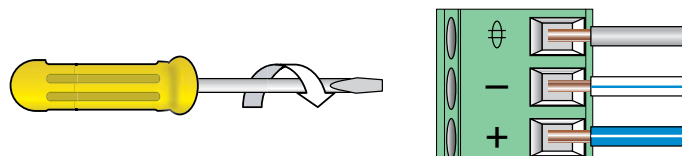
Figure 3.

2-wire example



3. Shield the RS-485 cable using twisted-pair wire, such as Belden 1120A. The cable must be 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 connectors on main board, 0.22 to 0.26 N·m (0.16 to 0.19 ft·lb) for connectors on adapter boards (Figure 4).

Figure 4.



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!

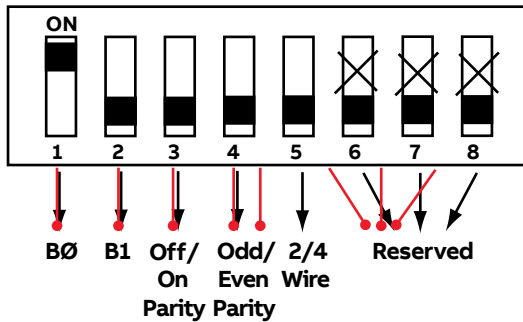
ASPMETER split core

Configuration

1. **Communications configuration:** Communications parameters for the ASPMETER series are field-selectable for your convenience. Please see the product diagrams section (page 17) for selector location. The following parameters are configurable:

- Baud rate: 9600, 19200 or 38400
- Parity: on or off
- Parity: odd or even
- Wiring: two or four

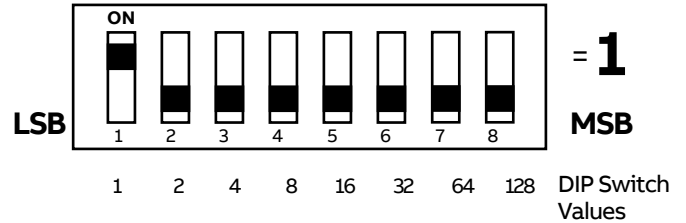
Example: 2-wire 19200 baud, no parity (default only)



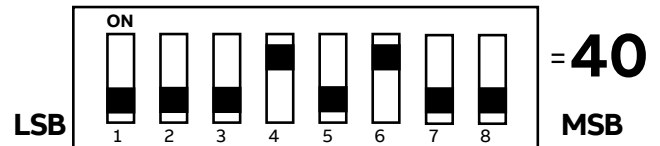
1	2	3	4	5	6	7	8	
Off	Off				X	X	X	9600
On	Off				X	X	X	19200
Off	On				X	X	X	38400
On	On				X	X	X	Reserved
		Off	Off		X	X	X	No parity
		On	Off		X	X	X	Odd parity
		Off	On		X	X	X	No parity
		On	On		X	X	X	Even parity
				On	X	X	X	4-wire RS-485
				Off	X	X	X	2-wire RS-485

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 that conflicts with that of another is selected, neither device will be able to communicate.

3. The ASPMETER 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 ASPMETER as any whole number between and including 1–246. Each unit is equipped with a set of eight DIP switches for addressing. See below.



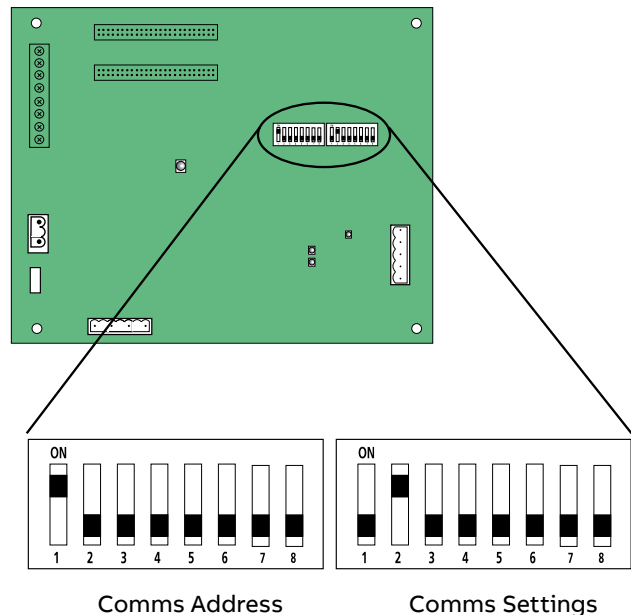
4. To determine an address, simply add the values of any switch that is on. For example:



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 21) for a pictorial listing of the first 63 switch positions.

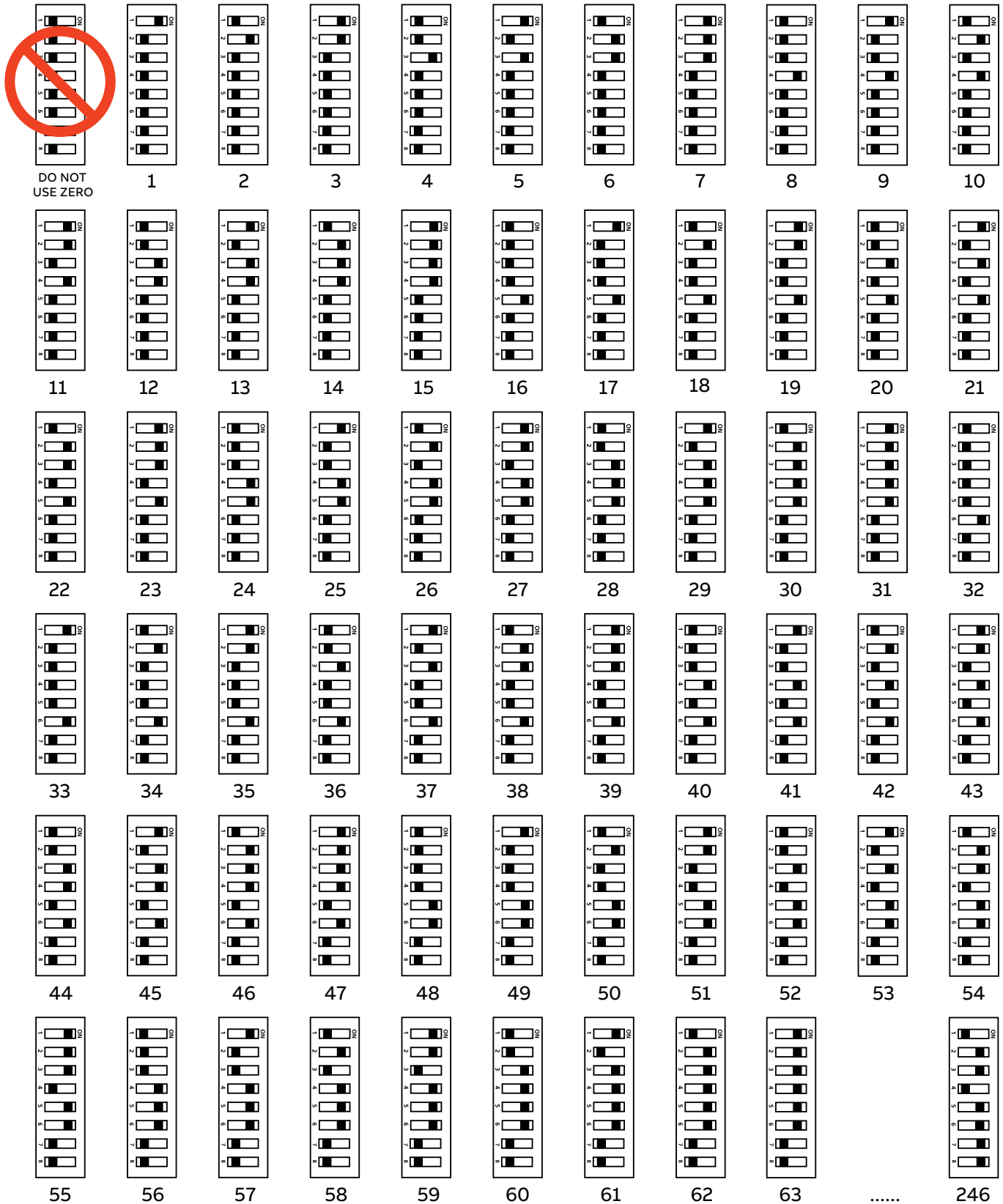
Default DIP switch settings

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



ASPMETER split core

Address setup



ASPMETER split core

Mechanical installation



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



Disconnect power to the electrical panel and lock it out.

1. Install the acquisition board mounting bracket in the panel using screws and bolts provided. Panels can be oriented side-by-side (Figure 5A) or vertically (Figure 5B). The grounding connection is located on the mounting bracket, near the lower right corner. Use this stud to ground the bracket when mounting on a non-conductive surface.

Figure 5A.
Side-by-side

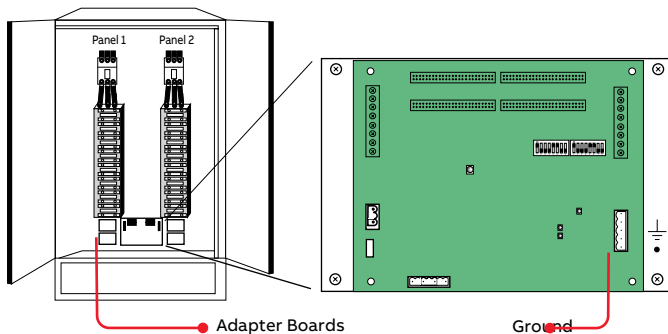
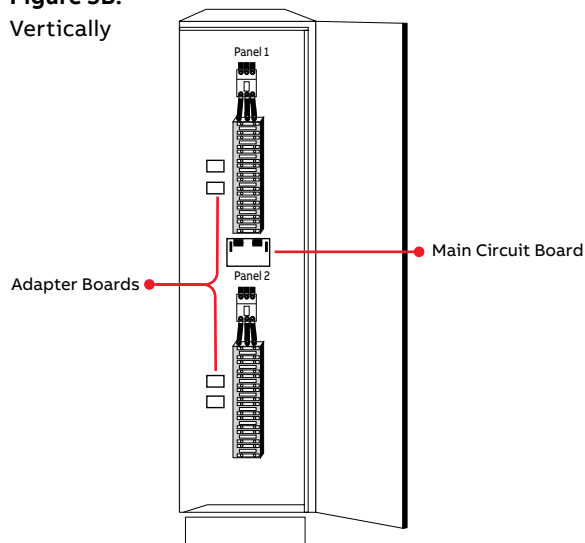
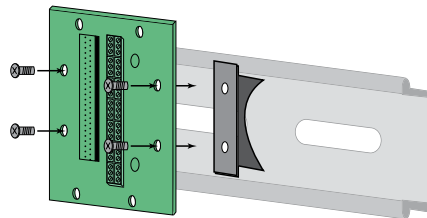


Figure 5B.
Vertically



2. Mount the adapter boards to either DIN rail or SNAPTRACK.
 - **DIN rail:** Use the supplied screws to secure the plastic DIN clip to the adapter board. Affix the clip to the DIN rail (Figure 6).
 - **SNAPTRACK:** Secure the SNAPTRACK to the mounting surface. Click the adapter board into place (Figure 7).

Figure 6.
DIN option — vertical mount



DIN option — horizontal mount

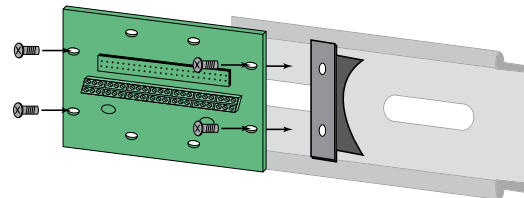
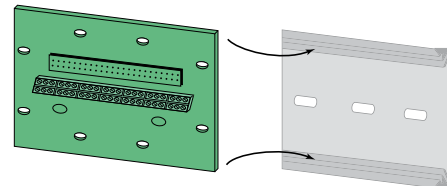


Figure 7.
SNAPTRACK



ASPMETER split core

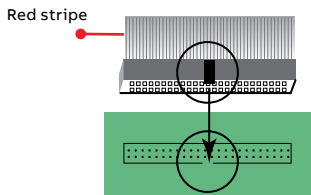
3. Connect adapter boards to the main board using ribbon cable (Figure 8). Ribbon cables are keyed to ensure proper installation.

Orient cables so that the red stripe is on the left.

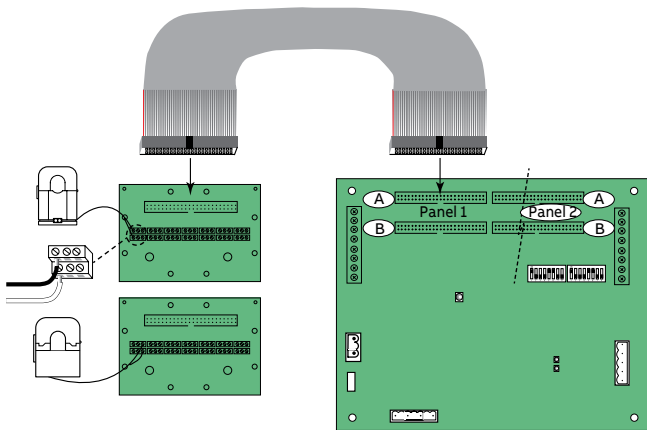
NOTE: Flat and round ribbon cables are available. See recommended accessories.

4. Connect current sensors to the terminals on the adapter boards (Figure 8).

Figure 8.



Align ribbon cable key with connector keyhole. Orient ribbon cable so that the red stripe is on the left side of the connector.

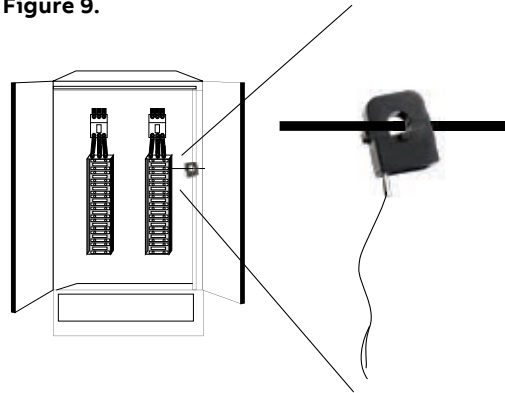


If the signed power factor feature is NOT enabled, the current sensor orientation does not affect meter behavior. If this feature IS enabled, orient the current sensors so that the arrow points toward the load for proper operation.

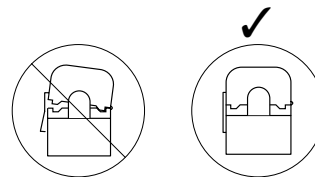
5. Install the current sensors onto the conductors to be monitored (Figure 9). Sensors can be mounted facing either direction; orientation does not affect meter accuracy.

Note: Clean split-core contacts before closing. The hinge can detach, allowing the base and the top to separate for easier cleaning and installation.

Figure 9.



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



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

6. Plastic cable ties are included with the product for strain relief. Insert the strain relief device into one of the available holes on the adapter board (Figure 10A). Gather all current sensor wires connected to that adapter board and secure the cable tie around them (Figure 10B).

Figure 10A.

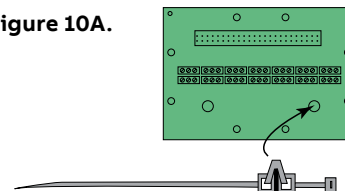
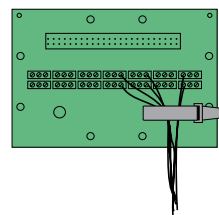


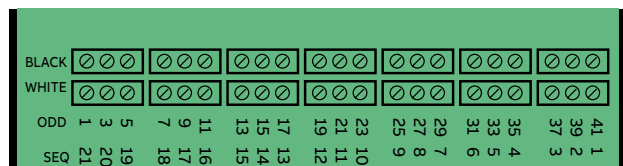
Figure 10B.



ASPMETER split core

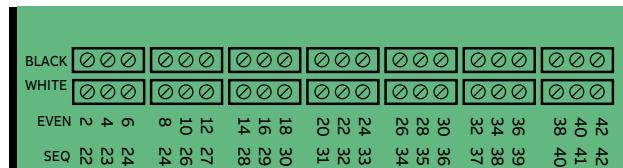
7. The adapter boards are silk screened with two rows of numbers. For applications that require odd/even branch circuit numbering, use the row designated ODD or EVEN. For applications that require sequential numbering, use the number row marked SEQ (Figures 11 and 12).

Figure 11.



Numbering – Adapter Board A:

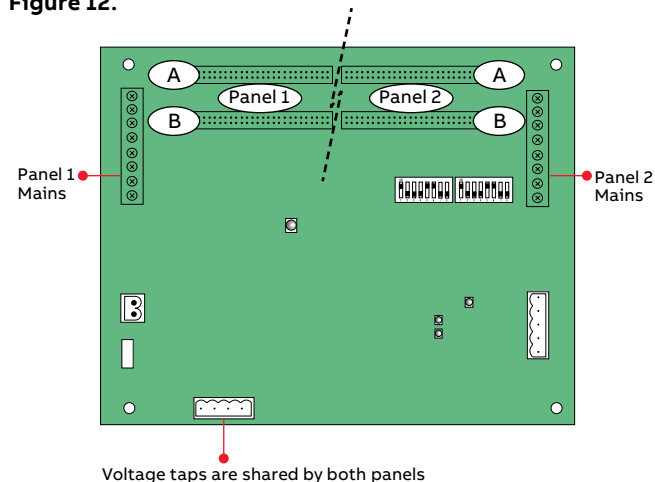
ODD 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41
 SEQ 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1



Numbering – Adapter Board B:

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

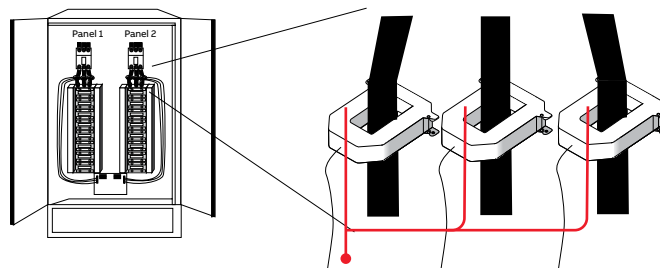
Figure 12.



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

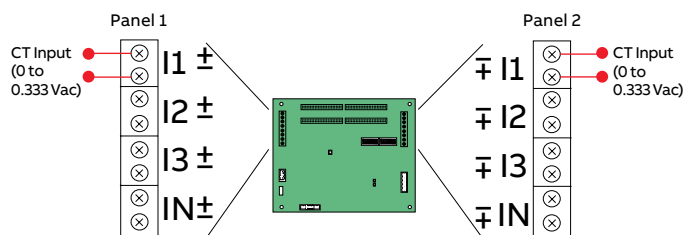
8. Configure communication and addressing parameters using DIP switches. The ASPMETER requires two addresses, one for each set of 42 current sensors and four auxiliary inputs. See the configuration section for more information.
9. Wire RS-485 communications (see diagrams in wiring section).
10. Connect 0.333 V AC current transducers (CTs) to the main conductors by snapping CTs around lines, observing local codes regarding bending radius (optional; Figures 13 and 14).

Figure 13.



Recommended CT: AMP1 series available in 100 A max. to 2000 A max. Contact your local ABB sales rep for recommended CTs amperages or if higher amperages are required.

Figure 14.



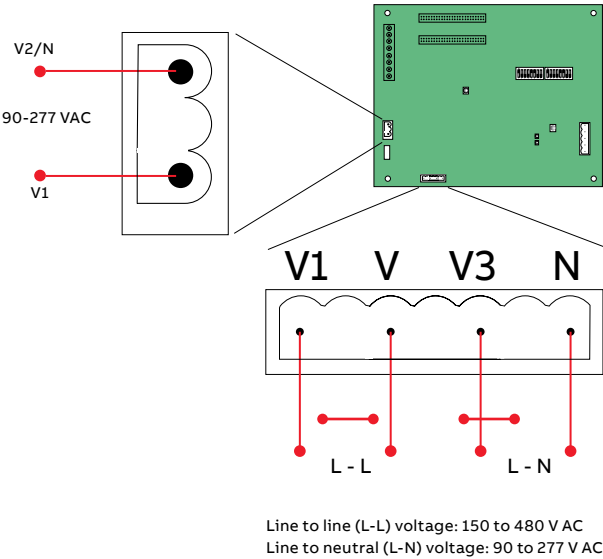
Set up Modbus registers 115–118 for CT scaling.
 Use base + 1 address for panel 2 setup.

Note: (+) represents black, (-) represents white

ASPMETER split core

11. Connect 2-wire 90–277 V AC power to main power terminals. Observe polarity. For the ASPMETER-A and ASPMETER-B, connect voltage lines to the voltage taps (Figure 15). Equip voltage lines with fuses.

Figure 15.



Recommended accessories

Catalog number	Description
ASPCT0	Six-pack 50 A CT, 6 ft. (1.8 m) lead
ASPCT1	Six-pack 100 A CT, 6 ft. (1.8 m) lead
ASPCT2	Single 200 A CT, 6 ft. (1.8 m) lead

ASPMETER split core

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 communications. • 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"> • Verify ribbon cable connectors are inserted in the correct orientation. • If cables are correct, reset main board to re-initialize product.
The main board has a slow flashing amber light	<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 has 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.
Split-core product is reading zero for some values	<ul style="list-style-type: none"> • Device was unable to read split-core adapter boards on power up. Verify adapter boards are connected. • Verify ribbon cable connectors are inserted in the correct orientation. • Reset main board to re-initialize product.
Power factor reading is not as expected	<ul style="list-style-type: none"> • Verify voltage taps are connected in appropriate phase rotation. • Verify phase rotation of breakers (firmware rev. 1.012 or higher allows for custom rotation if needed).
Current reading is not as expected, or reading is on different CT number than expected	<ul style="list-style-type: none"> • 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.
Configuration tool “NetConfig” returns Modbus error on read/write	<ul style="list-style-type: none"> • Verify use of the latest release of configuration tool “NetConfig” because older versions may not support all features in current product firmware. Latest version is available on the website http://www.veris.com/modbus_downloads.aspx

ASPMETER commissioning

Safety

FCC Part 15 information note: This equipment has been tested by the manufacturer and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

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

This guide is intended to help the user commission the ASPMETER panelboard monitoring system for operation. It is assumed that the user has already installed the meter according to the instructions in the ASPMETER installation guide.



This symbol indicates an electrical shock hazard exists.



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

DANGER: Hazard of electric shock, explosion or arc flash. Failure to follow these instructions will result in death or serious injury.

- 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.

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.

For troubleshooting or service-related questions, contact ABB at 800-782-8061 or at epis.component.support@abb.com

Save these instructions

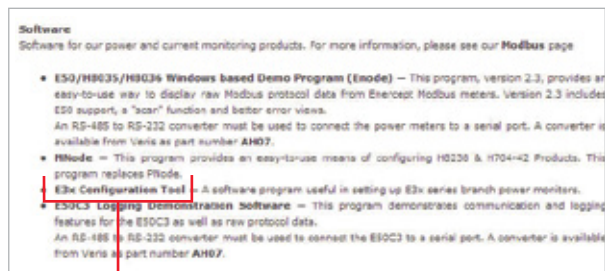
ASPMETER commissioning

Downloading the configuration tool

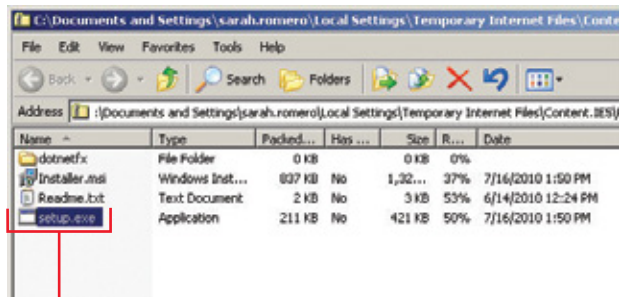
1. Go to the Veris Industries website (www.veris.com). Click on design resources and navigate to the software option.



2. Choose the E3x configuration tool from the list of available software.



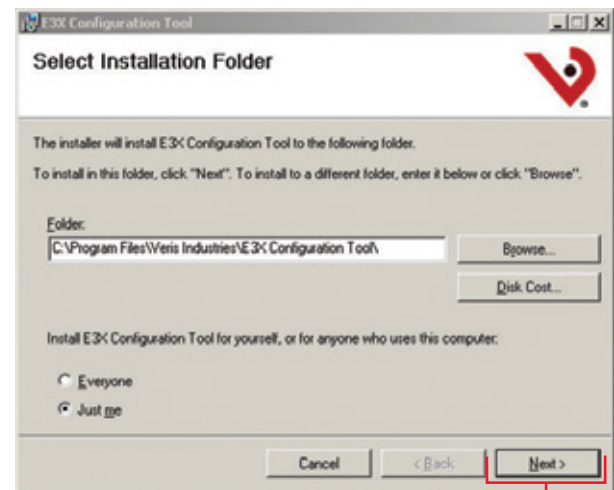
3. Open the executable file.



4. The configuration tool welcome window appears. Choose next.

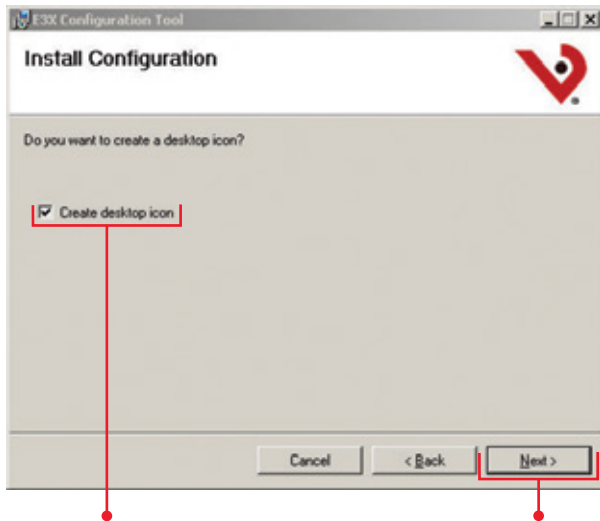


5. Select a destination on the computer to store the configuration tool. Click next.

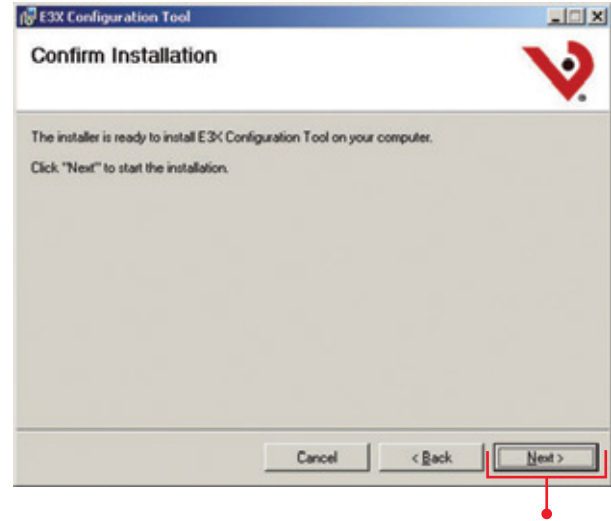


ASPMETER commissioning

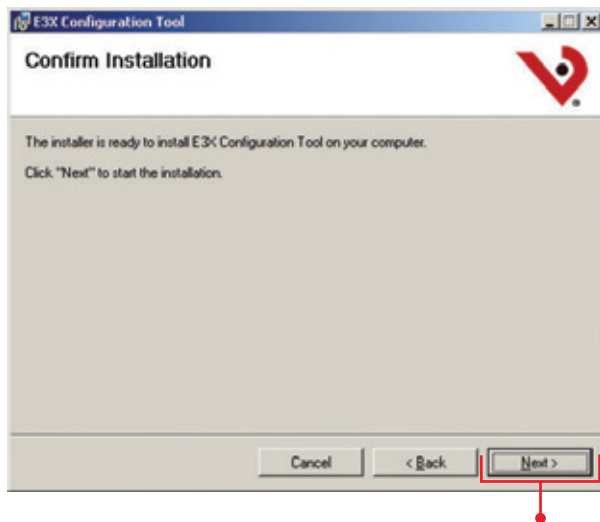
6. If desired, check the option to create a desktop shortcut to open the configuration tool. Then click next.



8. When installation is complete, choose close to exit the software.



7. The tool is now ready to install on the computer. Choose next to confirm installation.



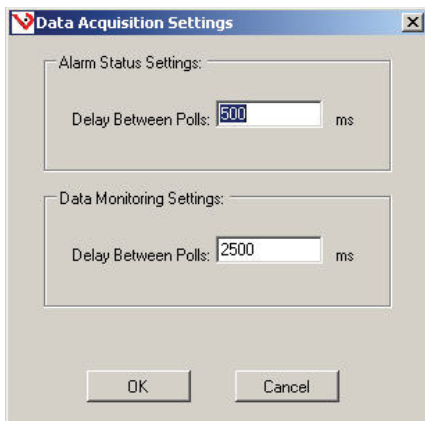
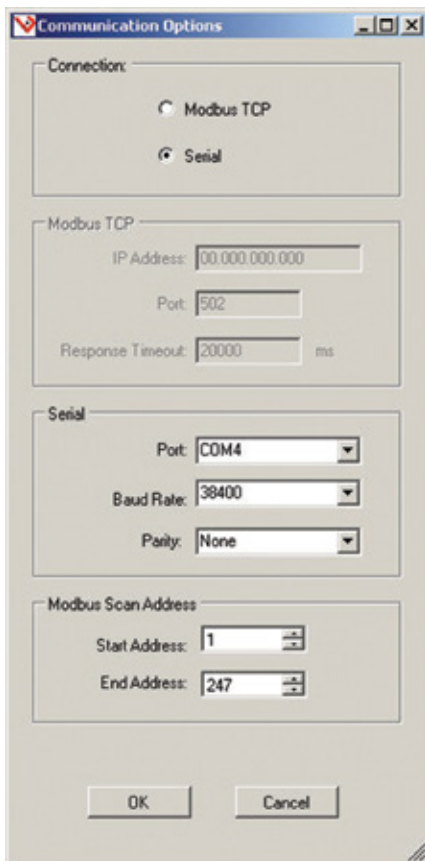
The E3x configuration is now successfully installed on your computer. You are ready to begin commissioning the ASPMETER panelboard monitoring system for operation.

ASPMETER commissioning

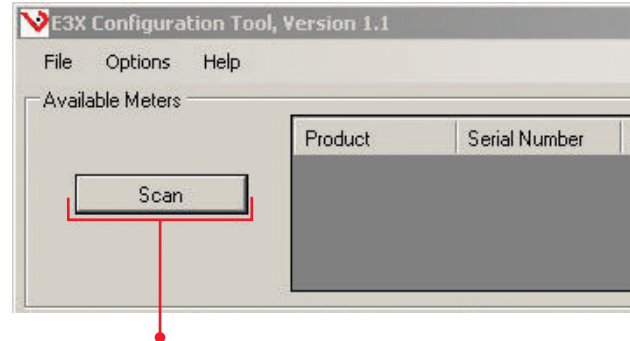
Using the configuration software

Open the software using either the desktop icon (if selected) or by navigating to the location chosen previously.

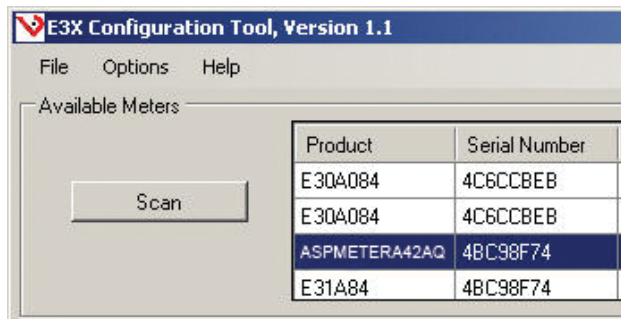
In the toolbar at the top of the window, use the options button to adjust your communication and data acquisition settings. Default settings appear in the window; change these as needed.



Click the scan button to have the software locate available devices on the system.



All devices located in the scan will appear in the box adjacent to the scan button. Click on the device you wish to configure.



Each main board with four ribbon cable connections uses two Modbus addresses.

Below the scan window is a row of buttons: Configure device, global resets, alarm status, and data monitoring.

When each button is selected, a unique row of tabs appears below (Figure 1). The information in these tabs must be configured to the system requirements. Every setting has a default value programmed in. The next sections describe the settings found within each tab.

Figure 1.



ASPMETER commissioning

Configure device button

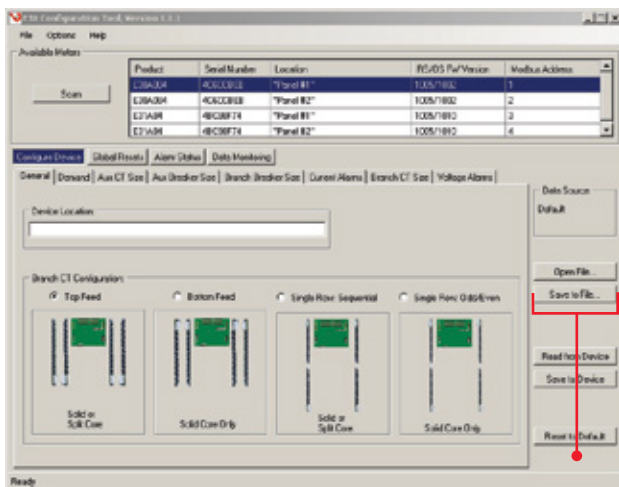
After scanning for devices, the tool locates all E3x and ASPMETER devices connected to the system. Select a meter from the list and click the read from device button to configure.

1. General

Select the CT configuration used in the installation. This tab looks different for the ASPMETER (E30) solid-core and E31 split-core devices with only the options for the selected device appearing as options. The device location is an optional description the installer can enter to specify the location of each device on the network.

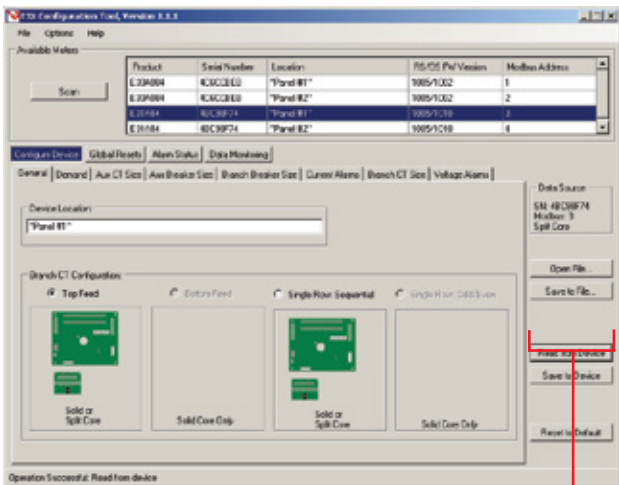
Note: If the configuration tool is opened on a computer not connected to a meter, the tool defaults to the E30 general tab.

E30 general tab (Use for ASPMETER)¹



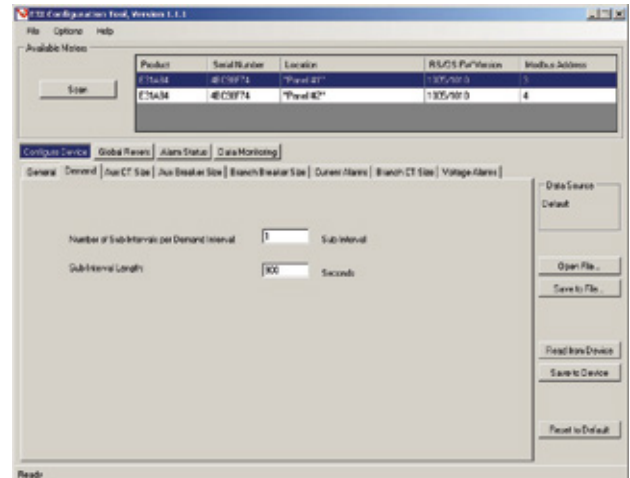
¹ Note: The ASPMETER is only available as a solid-core product.

E31 general tab



2. Demand

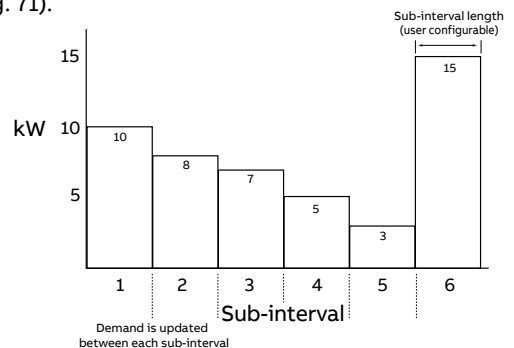
Select the number of sub-intervals and the sub-interval length to be used in data collection.



These settings apply to current demand (registers 269–272, 1462–1503) and power demand (registers 277, 1378–1419). Configure the number of sub-intervals. The default is 1, but it can be set for 1–6 sub-interval windows.

Configure sub-interval length (register 72). The default is 900 sec. (15 minutes), but it can be set from 10–32767 (in seconds). For sync to comms, set to 0. Sync to comms mode will start demand calculations based on writes to Modbus register 295 with a value of 26012 (decimal).

Calculate demand by continuously summing the sub-interval averages and dividing by the number of sub-intervals. The sub-interval average is recalculated every second from the RMS values for current and power. The demand register will update at the end of each sub-interval. See the example below. For block mode, set the number of sub-intervals to 1 (reg. 71).



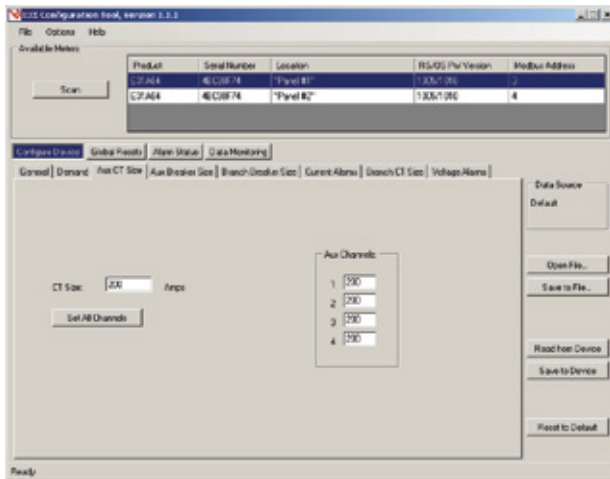
$$\text{Demand} = \frac{\sum_{n=1}^6 \text{subinterval average (N) (kW)}}{6}$$

$$8 \text{ kW} = \frac{10}{6} + \frac{8}{6} + \frac{7}{6} + \frac{5}{6} + \frac{3}{6} + \frac{15}{6}$$

ASPMETER commissioning

3. Auxiliary CT size

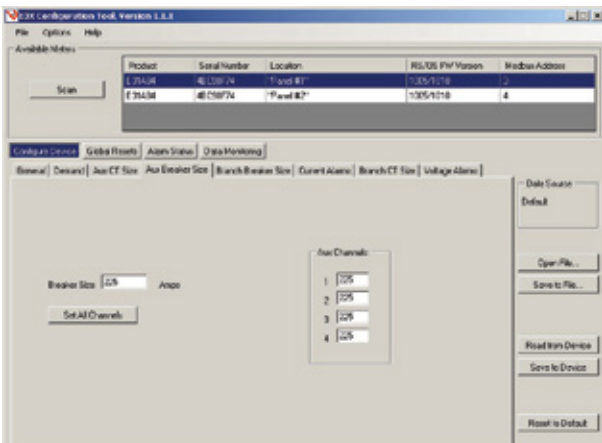
Set the CT size for each channel. Enter the value for each channel separately, or enter one value and click set all channels. Auxiliary #1 (register 115) to auxiliary #4 (register 118) define the auxiliary or “mains” CT size (typically 200 A). Type the appropriate numeric value for each auxiliary CT installed in the panel. CT size must be 1–32,767. Set this value for each panel on the E3x.



4. Auxiliary breaker size

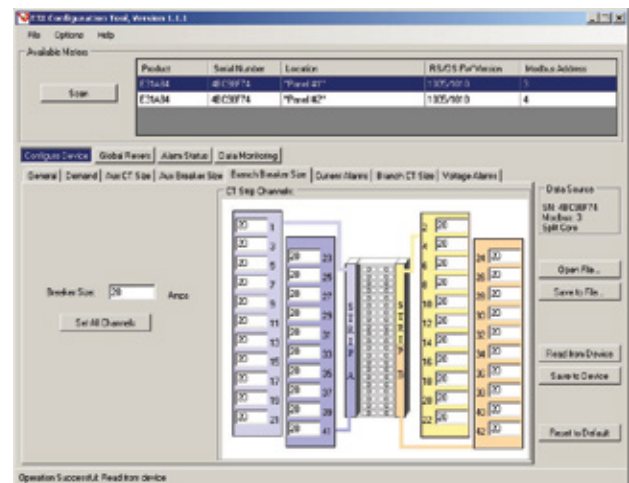
Set the breaker size for each channel. This value is used for alarm calculations. Enter the value for each channel separately, or enter one value and click set all channels.

Auxiliary #1 (register 161) to auxiliary #4 (register 164) define the auxiliary or “mains” breaker size (typically 225 A). Type the appropriate numeric value for each auxiliary breaker in the panel. For unused breakers, set the value to zero to disable alarms for those channels. Set this value for each panel on the E3x [i.e., 225 (decimal) = 225 A; range 0–32,767].



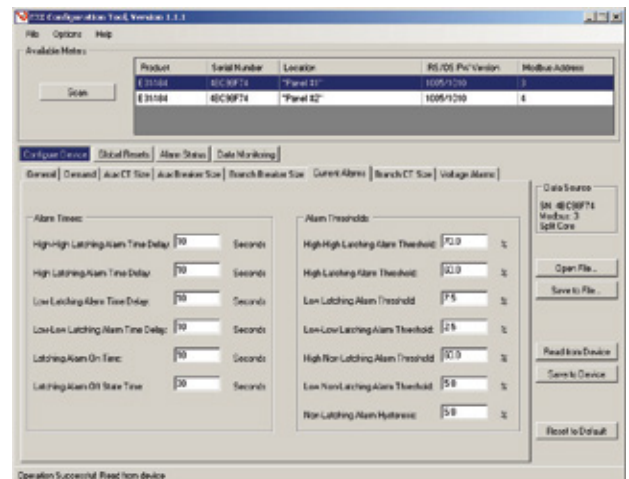
5. Branch breaker size

Set the size of each branch circuit breaker. The default for each circuit is 20 amps. The breaker size box and the set all channels button can be used to set all circuits to the same value, or each circuit can be set separately to the necessary value. Channel #1 (register 119) to channel #42 (register 160) define the channel or “branch” breaker size (typically 20 A). Type the appropriate numeric value for each channel breaker in the panel. **For unused breakers, set the value to zero to disable alarms for those channels.**



6. Current alarms

The instantaneous current alarm setup parameters define the maximum (high alarm) and minimum (low alarm) limits for all branch and main circuits monitored by the ASPMETER. Instantaneous current alarms are ON only if the alarm conditions are met. These alarms are reset automatically (alarm is turned OFF or cleared when circuit current is within the normal range).



ASPMEETER commissioning

High alarm thresholds

Type the instantaneous current value, expressed as a percentage of the breaker size (default = 60%). When the circuit current exceeds that value, the high current alarm is activated. To disable any alarms, set the specific high alarm threshold to zero.

Example: If the threshold is set to 60%, the high alarm would be activated when instantaneous current for a 20 A breaker exceeds 12 A (i.e., $20 \text{ A} \times 0.60$).

Low alarm thresholds

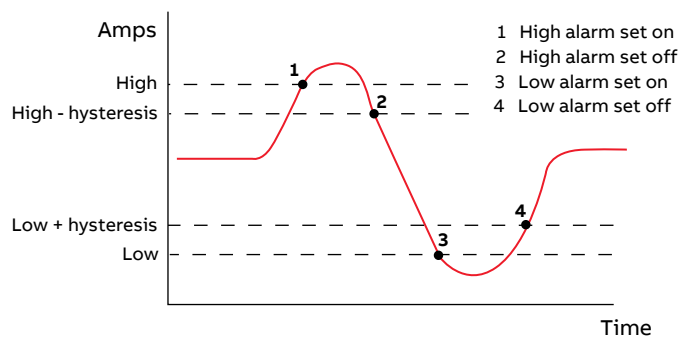
Type the instantaneous current value, expressed as a percentage of the breaker size (default = 5%). When the circuit current falls below that value, the low current alarm is activated. To disable any alarms, set the specific low alarm threshold to zero.

Example: If the threshold is set to 5%, the low alarm would be activated when instantaneous current for a 20 A breaker drops below 1 A (i.e., $20 \text{ A} \times 0.05$).

Hysteresis

Type the value, expressed as a percentage of the alarm threshold, that defines how much the circuit current must fall below the high alarm threshold or rise above the low alarm threshold, to determine the alarm's OFF state (default = 5%; non-latching only).

Example: If hysteresis is set to 5%, the OFF state for a high alarm threshold of 12 A would be at 11.4 A and below [i.e., 12 A minus ($12 \text{ A} \times 0.05$)], while the OFF state for a low alarm threshold of 1 A would be at 1.05 A and above [i.e., 1 A plus ($1 \text{ A} \times 0.05$)].



There are two types of alarms: Latching and non-latching.

Latching alarm settings defined

High-high alarm delay(s): Number of seconds the current in a circuit needs to be continuously above the high-high alarm threshold before the high-high alarm is activated (default = 10 s).

High alarm delay(s): Number of seconds the current in a circuit needs to be continuously above the high alarm threshold before the high alarm is activated (default = 10 s).

Low alarm delay(s): Number of seconds the current in a circuit needs to be continuously below the low alarm threshold before the low alarm is activated (default = 10 s).

Low-low alarm delay(s): Number of seconds the current in a circuit needs to be continuously below the low-low alarm threshold before the low-low alarm is activated (default = 10 s).

Latching alarm ON time(s): Number of seconds the current in a circuit needs to stay above the low-low alarm threshold level before the latching alarms are armed/enabled for that channel (default = 10 s).

Latching alarm OFF time(s): Number of seconds the current in a circuit needs to be below the low-low alarm threshold level before the latching alarm is de-activated (default = 30 s). After this point, all latching alarms are disabled on this channel.

High-high alarm threshold (%): Limit for the high-high current alarm state, expressed as a percentage of the breaker size (default = 70%). For example, the high-high alarm threshold for a 20 A breaker is 14 A (i.e., 20×0.70). To disable this alarm (for all channels), set its threshold value to 0%.

High alarm threshold (%): Limit for the high current alarm state, expressed as a percentage of the breaker size (default = 60%). For example, the high alarm threshold for a 20 A breaker is 12 A (i.e., 20×0.60). To disable this alarm (for all channels), set its threshold value to 0%.

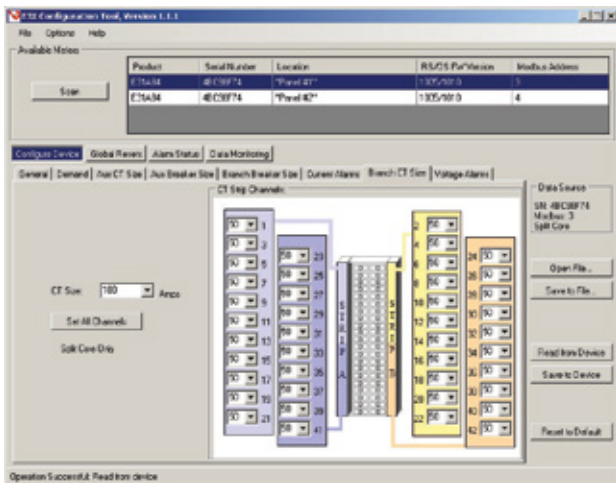
Low alarm threshold (%): Limit for the low current alarm state, expressed as a percentage of the breaker size (default = 7.5%). For example, the low alarm threshold for a 20 A breaker is 1.5 A (i.e., 20×0.075). To disable this alarm (for all channels), set its threshold value to 0%.

Low-low alarm threshold (%): Limit for the low-low current alarm state, expressed as a percentage of the breaker size (default = 2.5%). For example, the low-low alarm threshold for a 20 A breaker is 0.5 A (i.e., 20×0.025). To disable this alarm (for all channels), set its threshold value to 0%.

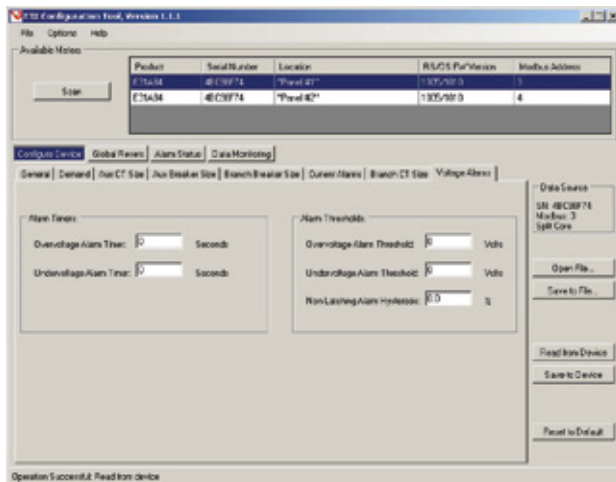
ASPMETER commissioning

7. Branch CT size

Set the size of each CT monitoring the branch circuit breakers. For the ASPMETER (E30) solid-core products, the CT size for each branch circuit is automatically set and locked at 100 amps. For the E31 split-core products, select the appropriate CT size per channel from the drop-down menu. If all channels must be set to the same CT size, the set all channels button may be used for convenience.



8. Voltage alarms



Line-to-line voltage alarms defined

The voltage alarm setup parameters define the alarm delay (timer) and threshold (limit) for the voltage inputs monitored by the ASPMETER and E3x (model A and B only). Voltage alarms are global; settings and alarms are shared between both panels for main boards with four ribbon cable connections.

The alarm timer settings define the length of time that a voltage input must be in an alarm state (i.e., exceeds the overvoltage alarm threshold or falls below the undervoltage alarm threshold) before activating the latching alarm. A return to normal (non-alarm) state is instantaneous, so the alarm timer is reset if the voltage returns to the normal state before the timer expires. The voltage alarms are always enabled unless the threshold is set to zero; unlike the current alarms, there is no on-time delay.

The latching and non-latching voltage alarms share overvoltage and undervoltage thresholds.

The non-latching voltage alarm is set as soon as the voltage inputs are in an alarm state (i.e., exceeds the overvoltage alarm threshold or falls below the undervoltage alarm threshold) and are cleared as soon as the voltage inputs are out of an alarm state plus the hysteresis setting (i.e., below the overvoltage alarm threshold minus hysteresis or exceeds the undervoltage alarm threshold plus hysteresis).

Overvoltage alarm timer: Enter the number of seconds the voltage can exceed overvoltage threshold level before activating the overvoltage latching alarm.

Undervoltage alarm timer: Enter the number of seconds the voltage can drop below the undervoltage threshold level before activating the undervoltage latching alarm.

Overvoltage alarm threshold (V): Type the limit for the overvoltage alarm state in volts. To disable this alarm (for all voltage inputs), set its threshold value to 0 volts. Threshold for both latching and non-latching alarm.

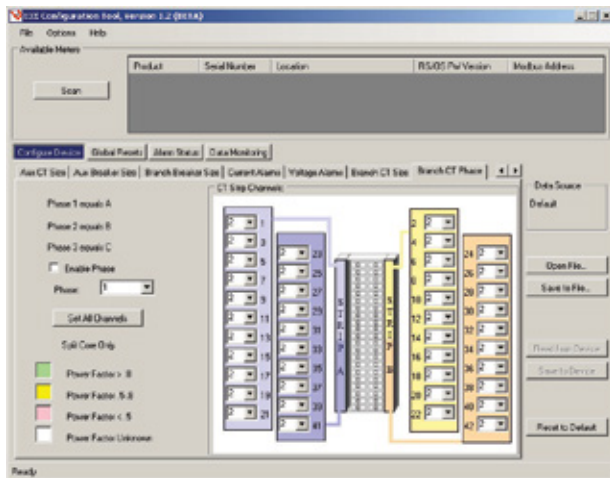
Undervoltage alarm threshold (V): Type the limit for the under voltage alarm state in volts. To disable this alarm (for all voltage inputs) set its threshold value to 0 volts. Threshold for both latching and non-latching alarm.

Non-latching alarm hysteresis (%): Type the value, expressed as a percentage of the alarm threshold, that defines how much the voltage must fall below the overvoltage threshold or rise above the undervoltage threshold to determine the alarm's OFF state.

ASPMETER commissioning

9. Branch CT phase

Use this tab to set the phase per channel. The standard product default setting is an A, B, C phase rotation. The default setting for the Y60 single-phase/split-phase version of the product is A, B, A, B.

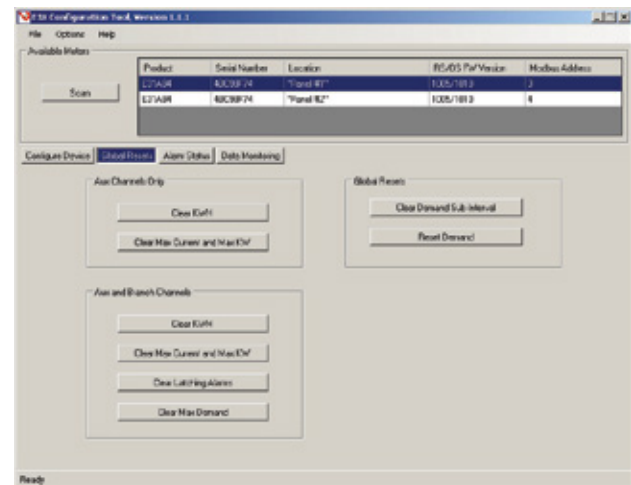


Global resets button

This section is used to reset data values. Resets are for each individual panel.



WARNING: Data will be deleted and counters will return to a value of zero.

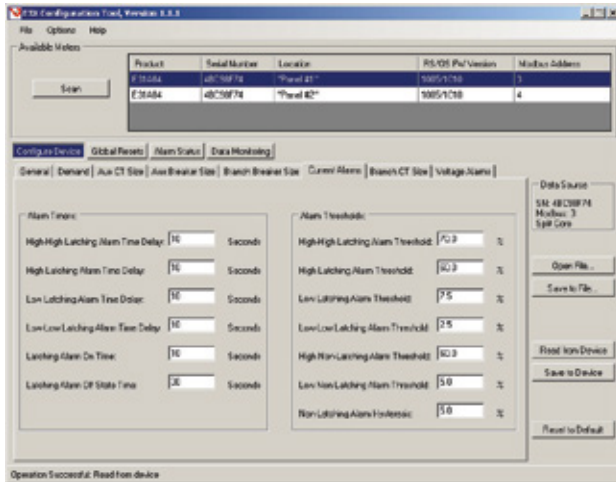


ASPMETER commissioning

Alarm status button

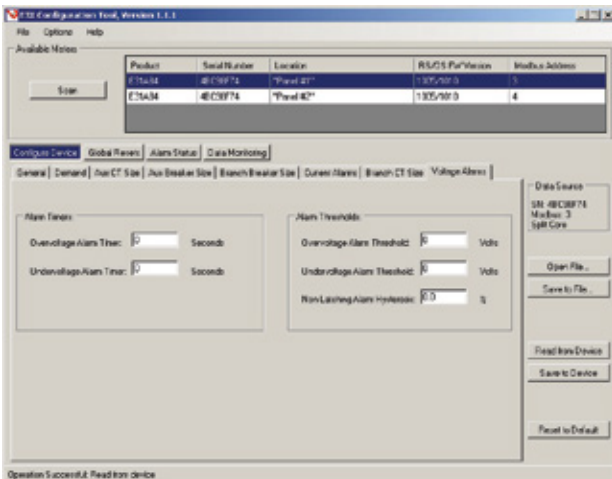
1. Current alarms tab

Choose a channel from the numbered buttons in the center of the window. The data values at the left will update to show current alarm status. A red box next to the channel number indicates an alarm



2. Voltage alarms tab

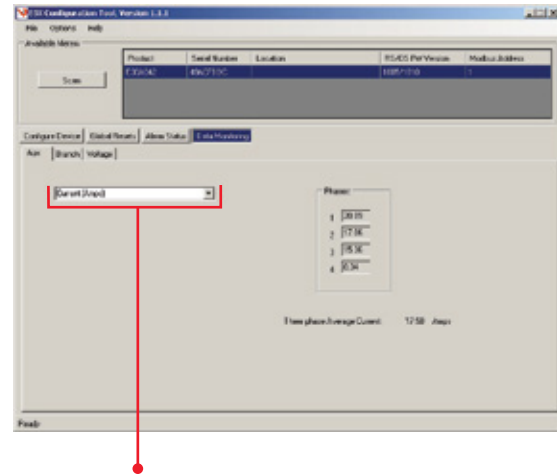
Choose a channel from the numbered buttons in the center of the window. The data values at the left will update to show current alarm status. A red box next to the channel number indicates an alarm condition.



Data monitoring button

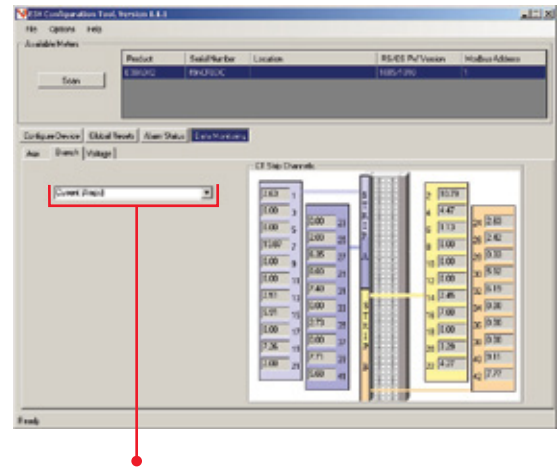
1. Aux tab

Use the drop-down button to choose a data value. The selected data type appears to the right.



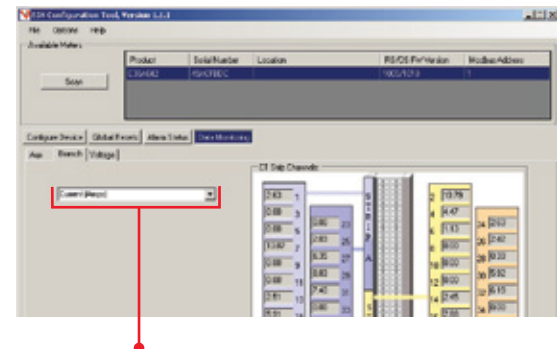
2. Branch tab

Use the drop-down button to choose a data value. The selected data type appears to the right.



3. Voltage tab

This tab has no drop-down list as all data values appear on a single screen.



ASPMETER commissioning

Configuring alarm registers

Latching alarms

Once the alarm threshold is crossed into an alarm state and after the associated alarm timer expires, the corresponding latching status bit is set and is not reset until the status bit is manually cleared by writing the alarm status register or resetting latching alarms, even if the signal is no longer in an alarm state. The alarm is also cleared if the threshold is changed.

Non-latching alarms

Once the alarm threshold is crossed into an alarm state, the corresponding non-latching status bit is set. The non-latching status bit is cleared once the signal crosses the threshold (plus hysteresis) out of an alarm state.

Alarm timers

These timers control entry into an alarm state. All channels use the same global per-panel timers; per-panel timers only apply to latching alarms.

Registers 165–170:

- High-high latching alarm time delay
- High latching alarm time delay
- Low latching alarm time delay
- Low-low latching alarm time delay
- Latching alarm ON time (when current is above low-low alarm, then ON state is declared)
- Latching alarm OFF state (current is below low-low alarm and ON state was declared)

Alarm thresholds

All values are expressed as a percentage of breaker size. All channels use the same global per-panel values. An entry of 0% will disable the alarm for that channel. Hysteresis only applies to non-latching alarms.

Registers 171–177:

- High-high latching alarm threshold
- High alarm latching alarm threshold
- Low alarm latching alarm threshold
- Low-low latching alarm threshold
- Non-latching high threshold
- Non-latching low threshold
- Hysteresis (0–100% percent of setpoint; non-latching alarms only)

Branch current alarms

Latching alarms are cleared by writing a 0 to its alarm bit. A write to a non-latching alarm is ignored.

Registers 178–219:

- Bit 0: High-high latching alarm
- Bit 1: High latching alarm
- Bit 2: Low latching alarm
- Bit 3: Low-low latching alarm
- Bit 4: Latching alarm OFF state declared
- Bit 5–7: Reserved for future use (reads 0)
- Bit 8: High non-latching alarm
- Bit 9: Low non-latching alarm
- Bit 10–15: Reserved for future use (reads 0)

AUX current alarms

Latching alarms are cleared by writing a 0 to its alarm bit.

Registers 220–223:

- Bit 0: High-high latching alarm
- Bit 1: High latching alarm
- Bit 2: Low latching alarm
- Bit 3: Low-low latching alarm
- Bit 4: Latching alarm OFF
- Bit 5–7: Reserved for future use (reads 0)
- Bit 8: High non-latching alarm
- Bit 9: Low non-latching alarm
- Bit 10–15: Reserved for future use (reads 0)

Line-to-line voltage alarm timers

These timers control entry into an alarm state. All channels use the same global per-panel channels. Voltage alarms are global; settings and alarms are shared between both panels for main boards with four ribbon cable connections.

Registers 236–237:

- Overvoltage alarm timer
- Undervoltage alarm timer

Line-to-line voltage alarm thresholds

Thresholds are expressed as volts. An entry of 0 disables that alarm for all channels.

Registers 238–240:

- Overvoltage alarm threshold
- Undervoltage alarm threshold
- Voltage alarm hysteresis (percentage of setpoint)

ASPMETER commissioning

Line-to-line voltage alarms

Registers 241–243:

- Latching alarms are cleared by writing a 0 to its alarm bit.
- Bit 0: High latching alarm
- Bit 1: Low latching alarm
- Bit 2–7: Reserved for future use (reads 0)
- Bit 8: High non-latching alarm
- Bit 9: Low non-latching alarm
- Bit 10–15: Reserved for future use (reads 0)

Global alarm registers (per panel)

Registers 224–227:

These registers provide a means of identifying alarm conditions without polling every alarm and inspecting all the bits. A global alarm register bit is set when a branch or auxiliary alarm channel activates. For example, if bit 2 in branch alarm status 38 is set, then bit 2 in the global latching alarm status will also be set. This allows the user to read the global alarms only in the event of an alarm condition, minimizing network traffic. Global most-recent latching alarm channel tells the user the number of the channel that has had the most recent alarm event. Note: Bits 0 to 4 in branch alarm status correspond to bits 0 to 4 in global alarm status; higher bits do not match directly. An excerpt from the Modbus point map appears below; see the full point map for more information.

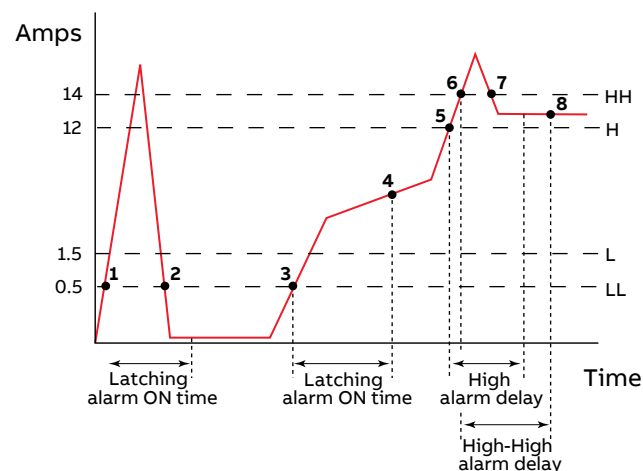
Alarm counters

The alarm counters measure the number of times an alarm has been set. On a multi-master system, these counters indicate whether an alarm went off and whether it was cleared afterward. It also allows one master to retain these records even if another master has cleared the alarm. When any of the 46 corresponding counters increment, the global variants of the latching alarm counters increment correspondingly.

Register	Description
224	Global latching alarm status
	Bit 0: High-high latching alarm
	Bit 1: High latching alarm
	Bit 2: Low latching alarm
	Bit 3: Low-low latching alarm
	Bit 4: Latching alarm OFF state declared (1=OFF; ON state must have been achieved prior)
	Bit 5–7: Reserved for future use (reads 0)
	Bit 8: High voltage latching alarm
	Bit 9: Low voltage latching alarm
	Bit 10–15: Reserved for future use (reads 0)
225	Global non-latching alarm status
	Bit 0: High non-latching alarm
	Bit 1: Low non-latching alarm
	Bit 2–7: Reserved for future use (reads 0)
	Bit 8: High voltage non-latching alarm
	Bit 9: Low voltage non-latching alarm
	Bit 10–15: Reserved for future use (reads 0)

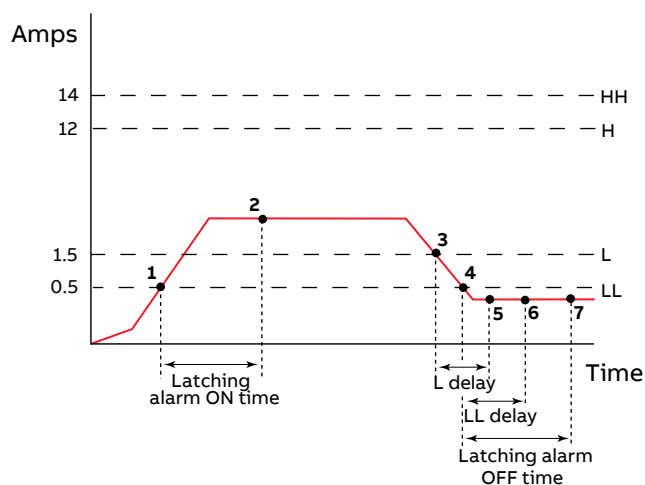
ASPMETER commissioning

Latching alarm examples



Example 1

1. Current rises above LL (low-low alarm threshold) — this starts the latching alarm ON timer.
2. Current drops below LL before the latching alarm ON time period ends, so alarming is not enabled. The latching alarm ON timer is reset.
3. Current rises above LL — this starts the latching alarm ON timer.
4. Current remains above the low-low alarm threshold, beyond the time period specified by the latching alarm ON time setting — this enables the latching alarm (all latching alarms for the specific channel are armed).
5. Current rises above H (high alarm threshold) — this starts the high alarm delay timer.
6. Current rises above HH (high-high alarm threshold) — this starts the high-high alarm delay timer.
7. Current drops below HH before the high-high alarm delay period ends, so the high-high alarm delay timer is reset.
8. High alarm is latched at the end of the high alarm delay time period.



Example 2

1. Current rises above LL (low-low alarm threshold) — this starts the latching alarm ON timer.
 2. Current remains above LL, beyond the time period specified by the latching alarm ON time setting — this enables the latching alarms (all latching alarms are armed).
 3. Current drops below L (low alarm threshold) — this starts the low alarm delay timer.
 4. Current drops below LL (low-low alarm threshold) — this starts the low-low alarm delay timer and the latching alarm delay timer.
- Note:** When the circuit current is continuously below the low-low alarm threshold (%) setting for the duration of the latching alarm OFF time period (and longer), the latching alarms for that channel are disarmed. At this point, the latched alarming feature is disabled (i.e., alarms disarmed), even though the low, low-low and latching alarms are latched.
5. Low alarm is latched at the end of the L delay (low alarm delay) time period.
 6. Low-low alarm is latched at the end of the L-L delay (low-low alarm delay) time period.
 7. Current remains below the low-low alarm threshold, beyond the time period specified in the latching alarm OFF time setting, thus setting the latching alarm OFF register for that channel.

ASPMETER commissioning

ASCII table

Char	Dec	Oct	Hex	Char	Dec	Oct	Hex	Char	Dec	Oct	Hex	Char	Dec	Oct	Hex
(nul)	0	0000	0x00	(sp)	32	0040	0x20	@	64	0100	0x40	`	96	0140	0x60
(soh)	1	0001	0x01	!	33	0041	0x21	A	65	0101	0x41	a	97	0141	0x61
(stx)	2	0002	0x02	"	34	0042	0x22	B	66	0102	0x42	b	98	0142	0x62
(etx)	3	0003	0x03	#	35	0043	0x23	C	67	0103	0x43	c	99	0143	0x63
(eot)	4	0004	0x04	\$	36	0044	0x24	D	68	0104	0x44	d	100	0144	0x64
(enq)	5	0005	0x05	%	37	0045	0x25	E	69	0105	0x45	e	101	0145	0x65
(ack)	6	0006	0x06	&	38	0046	0x26	F	70	0106	0x46	f	102	0146	0x66
(bel)	7	0007	0x07	'	39	0047	0x27	G	71	0107	0x47	g	103	0147	0x67
(bs)	8	0010	0x08	(	40	0050	0x28	H	72	0110	0x48	h	104	0150	0x68
(ht)	9	0011	0x09	)	41	0051	0x29	I	73	0111	0x49	i	105	0151	0x69
(nl)	10	0012	0x0a	*	42	0052	0x2a	J	74	0112	0x4a	j	106	0152	0x6a
(vt)	11	0013	0x0b	+	43	0053	0x2b	K	75	0113	0x4b	k	107	0153	0x6b
(np)	12	0014	0x0c	,	44	0054	0x2c	L	76	0114	0x4c	l	108	0154	0x6c
(cr)	13	0015	0x0d	-	45	0055	0x2d	M	77	0115	0x4d	m	109	0155	0x6d
(so)	14	0016	0x0e	.	46	0056	0x2e	N	78	0116	0x4e	n	110	0156	0x6e
(si)	15	0017	0x0f	/	47	0057	0x2f	O	79	0117	0x4f	o	111	0157	0x6f
(dle)	16	0020	0x10	0	48	0060	0x30	P	80	0120	0x50	p	112	0160	0x70
(dc1)	17	0021	0x11	1	49	0061	0x31	Q	81	0121	0x51	q	113	0161	0x71
(dc2)	18	0022	0x12	2	50	0062	0x32	R	82	0122	0x52	r	114	0162	0x72
(dc3)	19	0023	0x13	3	51	0063	0x33	S	83	0123	0x53	s	115	0163	0x73
(dc4)	20	0024	0x14	4	52	0064	0x34	T	84	0124	0x54	t	116	0164	0x74
(nak)	21	0025	0x15	5	53	0065	0x35	U	85	0125	0x55	u	117	0165	0x75
(syn)	22	0026	0x16	6	54	0066	0x36	V	86	0126	0x56	v	118	0166	0x76
(etb)	23	0027	0x17	7	55	0067	0x37	W	87	0127	0x57	w	119	0167	0x77
(can)	24	0030	0x18	8	56	0070	0x38	X	88	0130	0x58	x	120	0170	0x78
(em)	25	0031	0x19	9	57	0071	0x39	Y	89	0131	0x59	y	121	0171	0x79
(sub)	26	0032	0x1a	:	58	0072	0x3a	Z	90	0132	0x5a	z	122	0172	0x7a
(esc)	27	0033	0x1b	;	59	0073	0x3b	[	91	0133	0x5b	{	123	0173	0x7b
(fs)	28	0034	0x1c	<	60	0074	0x3c	\	92	0134	0x5c	|	124	0174	0x7c
(gs)	29	0035	0x1d	=	61	0075	0x3d	]	93	0135	0x5d	}	125	0175	0x7d
(rs)	30	0036	0x1e	>	62	0076	0x3e	^	94	0136	0x5e	~	126	0176	0x7e
(us)	31	0037	0x1f	?	63	0077	0x3f	_	95	0137	0x5f	(del)	127	0177	0x7f

Notes

ABB Inc.

305 Gregson Drive
Cary, NC 27511
United States

electrification.us.abb.com

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