EA10 SERIES

EA10 SERIES
DC String Monitor

RoHS Compliant   CE   c**RU**us   SUNSPEC ALLIANCE

⚠ 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.

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.

NOTICE
DISCONNECT ALL POWER TO THIS UNIT BEFORE CONNECTING
   OR DISCONNECTING SENSOR MODULES
**Failure to disconnect power will result in permanant
   equipment damage.**

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. Operation of this equipment in a residential area may 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.

For use in a Pollution Degree 3 or better environment only. A Pollution Degree 3 environment has conductive pollution or dry nonconductive pollution that becomes conductive due to condensation. Consider the enclosure, the correct use of ventilation, thermal properties of the equipment, and the relationship with the environment. Installation category: CAT IV

Installer's Specifications

Inputs:

Control Power	Class 2/SELV 24 VDC to 42 VDC
Maximum Power Consumption	7 W at 32 channels
Current Sensing Range	0.1 A to 20 A (+20% over)

Accuracy:

Current	±0.5% full scale (combined linearity, hysteresis, and repeatability)

Outputs:

Communication	2-wire RS-485, 1200 to 38400 baud, Modbus RTU
Available Information	Current per point, both instantaneous amps and cumulative amp-hours, events
Update Rate	2 sec
Maximum Measurement Points	8, 16, 24, or 32

Mechanical:

Mounting	T35 (35 mm) DIN Rail per EN50022
Terminal Block Screw Torque	0.37 ft-lb (0.5 N·m) nominal/0.44 ft-lb (0.6 N·m) max.
Terminal Block Wire Size	24 to 12 AWG (0.205 to 3.31 mm2)
Stop Clip Screw Torque	0.37 to 0.59 ft-lb (0.5 to 0.8 N·m)
Sensed Wire Diameter	0.31" (8 mm) max.

Environmental:

Operating Temperature Range	-30° to 75°C (-22° to 167°F)
Storage Temperature Range	-40° to 85°C (-40° to 185°F)
Humidity Range	<95% RH noncondensing
Altitude of Operation	3 km

Agency Approvals:

US and Canada Recognized (cRUus)	UL61010-1, Acceptable in UL1741 Combiner Box
Europe (CE)	EN61010-1
Insulation (from current sensor to control power or RS-485 interface)	Up to 1000 VDC (insulated conductor)
Dielectric Strength	10000 VDC
Installation Category	Cat. IV, pollution degree 3

EMC:

Conducted and Radiated Emissions	FCC part 15 Class B, EN55011 / EN61000 Class B (residential and light industrial)
Conducted and Radiated Immunity	EN61000 Class A (heavy industrial)

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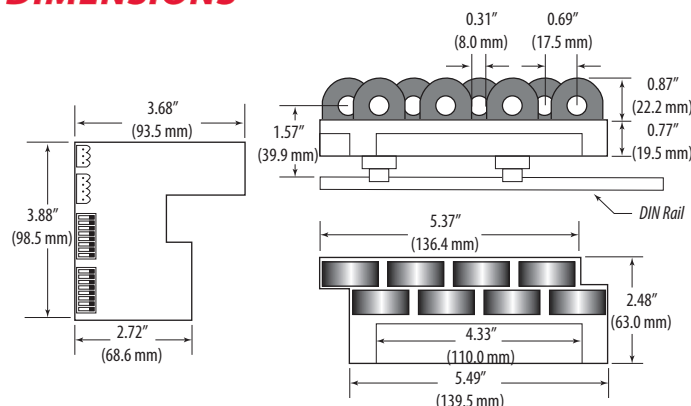⚡ This symbol indicates an electrical shock hazard exists.

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

PRODUCT IDENTIFICATION

Model	Description	Amperage Range	Output
EA10DD08B	DC current sensing module with 8 strings, encapsulated	Up to 20A per CT	
EA10HC1AB	Communications unit, Modbus RTU, encapsulated, 24 VDC, supports up to four EA10DD08B units (up to 32 strings per communication unit)		Modbus RTU

DIMENSIONS

3.68" (93.5 mm)
3.88" (98.5 mm)
2.72" (68.6 mm)
0.31" (8.0 mm)
0.69" (17.5 mm)
0.87" (22.2 mm)
1.57" (39.9 mm)
0.77" (19.5 mm)
DIN Rail
5.37" (136.4 mm)
2.48" (63.0 mm)
4.33" (110.0 mm)
5.49" (139.5 mm)

OPERATION

The EA10 DC string monitoring system measures current in combiner boxes or other DC applications. The system includes a communications unit that supplies power to the DC current sensing modules and provides Modbus RTU communication. Up to four DC current sensing modules connect serially to one communications unit, each with eight DC current sensors, to monitor a total of 32 strings (channels) per communications unit. Connect up to 63 communications units in a daisy chain for large system monitoring. All boards can be mounted on standard 35 mm DIN rail for easy installation. Pulse Reset Technology in the current sensor offers protection against output drift and immunity to power spikes and surges up to 20 kA. All components are fully encapsulated to protect from moisture and other environmental conditions

INSTALLATION EXAMPLE

Fuse Block
EA10 DC Current Sensing Module
EA10 Communications Unit
Summing Block

PRODUCT DIAGRAM

Communications Unit
Current Sensing Module
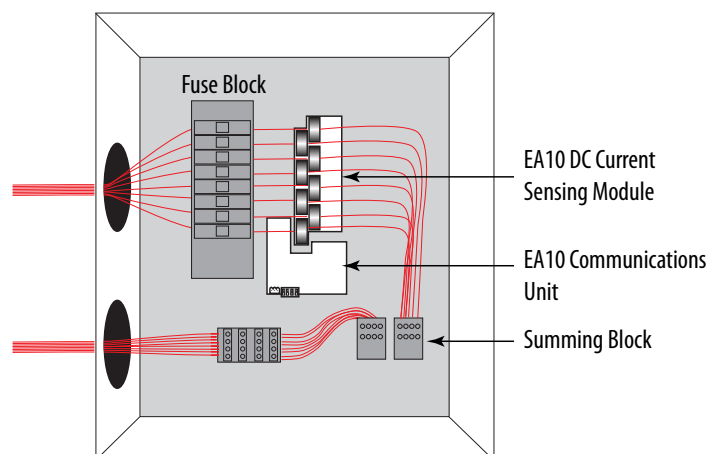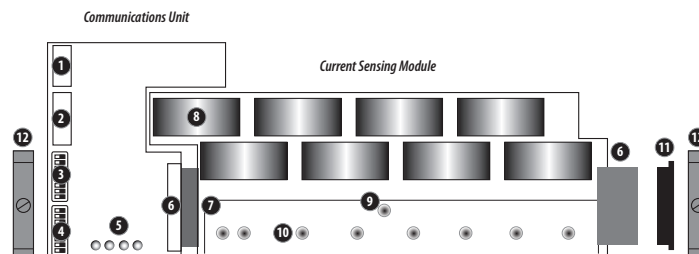
1. **RS-485 Connection:** The communications unit provides an RS-485 2-wire (+ shield) serial interface that supports Modbus RTU to 38.4 kb/s. Used for Modbus serial communications. **Connect Shield (S) to ground at a single point on the RS-485 bus.**

2. **Control Power Connection:** The communications unit requires user-supplied 24 to 42 VDC, 7 W (must be safety isolated, non-hazardous, limited power source (LPS), Class 2 source or better).

3. **Communications Setting DIP Switches:** configures baud rate and parity.

4. **Communications Address DIP Switches:** configures Modbus address. Each Modbus device must have a unique address.

5. **Communications Unit LEDs:** Status, TX, RX, and Power. See LED Indicators section, page 6.

6. **Male 20-Pin Connector:** for connection to current sensing modules. Confirm that the o-ring is installed to ensure a proper seal for the product's environmental ratings.

    Note: Disconnect power to panel and strings before connecting or disconnecting current sensing modules.

7. **Female 20-Pin Connector:** provides a connection between the communications unit and successive current sensing modules.

8. **Current Sensor:** 8 sensors per sensing module. Each current sensor is capable of monitoring conductors with a maximum outer diameter of 0.31" (8 mm) and 0.1 A to 20 A (+20% over) the current sensing range.

9. **Current Sensing Module Status LED:** indicates status of the sensing module. See LED Indicators section, page 6.

10. **Current Sensor LED:** one LED for each of the eight sensors on the module. See LED Indicators section, page 6.

11. **End Cap:** environmentally seals the female 20-pin connector on the last current sensing module. Confirm that the o-ring is installed on the end cap to ensure a proper seal for the product environmental ratings. The end cap ships installed on the communications unit.

12. **DIN Stop Clips:** Install stop clips in front of the communications unit and after the last current sensing module to ensure a snug fit. Two DIN stop clips are included with the communications unit. Additional stop clips are available from Veris (model number AV02).

INSTALLATION

⚡ **Disconnect and lock out power to panel or combiner box, including power to all strings.**

1. Select a location in a panel, adjacent to the fuse block to be monitored.

2. Install and tighten a DIN rail stop clip (included) near the end of the 35 mm DIN rail (sold separately) in the panel or combiner box. Apply the correct torque to the stop clip screw: 0.37 to 0.59 ft-lb (0.5 to 0.8 N·m).

3. Mount the communications unit onto the DIN rail and slide it up against the stop clip.

4. Remove the end cap from the communications unit 20-pin connector. **Retain for later use.**

5. Mount DC current sensing module(s) onto the DIN rail. Connect the first current sensing module to the communications unit via the 20-pin connector plug. Confirm that the o-ring is installed in the plug to ensure a tight fit.

    Note: Disconnect power to panel and strings before connecting or disconnecting current sensing modules.

6. Connect up to three additional current sensing modules, as needed, to produce one continuous string of up to four modules per communications unit. For each module, confirm that the o-ring is installed in the plug.
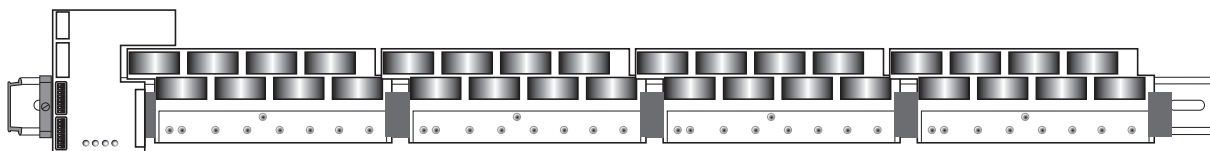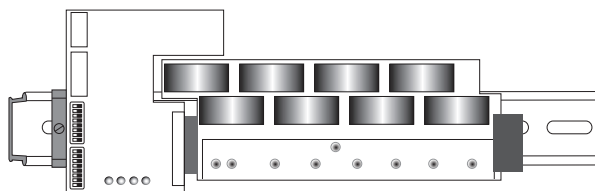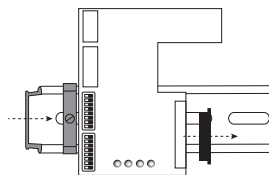
7. Place the end cap on the open 20-pin connector on the last DC current sensing module. Confirm that the o-ring is installed in the end cap to ensure a tight fit.
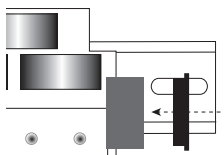
8. Install and tighten the second DIN stop clip (included) to the end of of the assembled EA10 DC String Monitoring System to prevent movement over time.
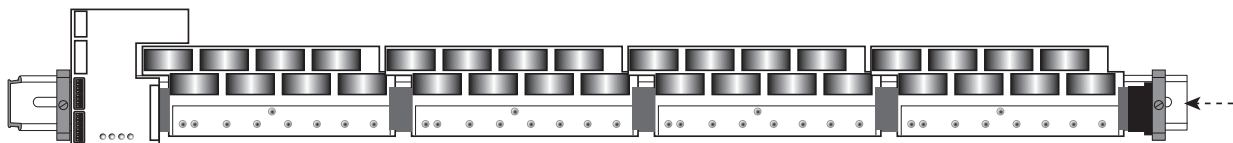
9. Configure communications unit using DIP switches (see page 5 to set the DIP Switches).

10. Wire RS-485 communications to communications unit using the 3-pin connector provided.

11. Wire 24 to 42 VDC control power to the communications unit using the 4-pin connector provided.

Caution: Do not apply control power to the 3-pin RS-485 connector.

12. Wire the communications unit to the enclosure's chassis ground using the 4-pin connector. Ensure that the enclosure's chassis ground is tied to earth ground.

*Wiring for RS-485 and Control Power Connectors*

DIP switches
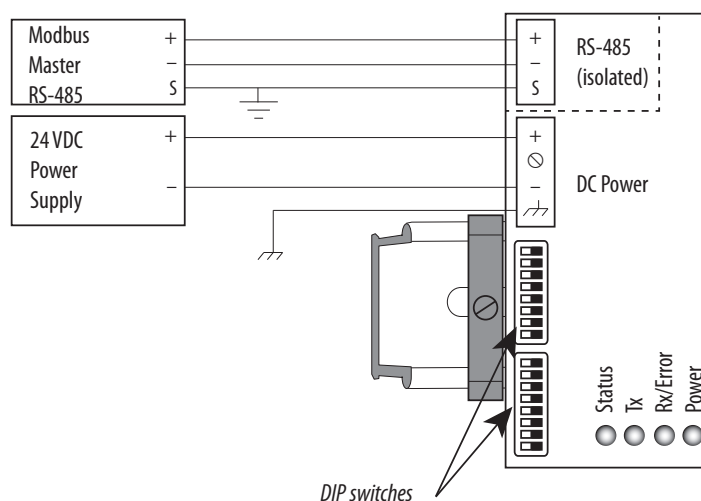
13. Route each insulated conductor through a DC current sensor.
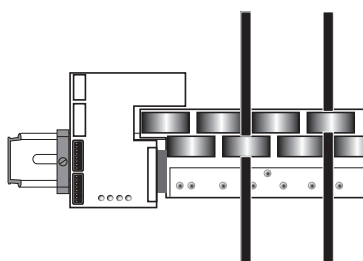
14. Restore power to the panel and commission the device for operation.

## Connecting Multiple Communications Units in a Daisy Chain

The RS-485 slave port allows connection of multiple EA10 communications units in a daisy chain with up to 63 2-wire devices.

120 Ω terminator on the first and last device of the daisy chain

Shield wire
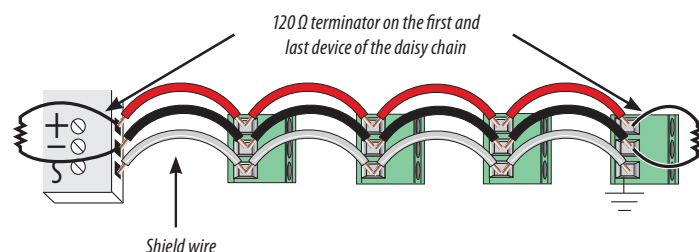
• The terminal's voltage and current ratings are compliant with the requirements of the EIA RS-485 communications standard.
• The RS-485 transceivers are ¼ unit load or less.
• RS-485+ has a 47 kΩ pull up to +5V, and RS-485- has a 47 kΩ pull down to Shield (RS-485 signal ground).
• Wire the RS-485 bus as a daisy chain from device to device, without any stubs. Use 120 Ω termination resistors at each end of the bus (not included).
• Shield is not internally connected to earth ground.
• Connect Shield to earth ground somewhere on the RS-485 bus.

For all terminals on EA10 devices:
• When tightening terminals, apply the correct torque: 0.37-0.44 ft·lb (0.5-0.6 N·m).
• Use 12-24 gauge wire.

*0.37–0.44 ft•lb (0.5–0.6 N•m)*
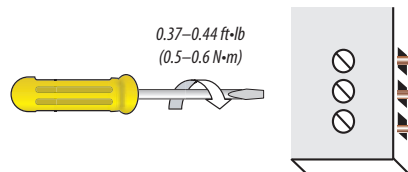
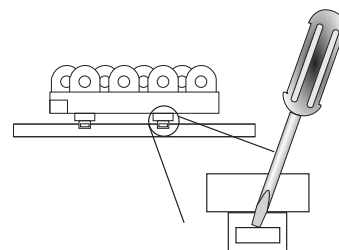## To Remove Sensing Modules and Communications Unit From DIN Rail

⚡ **Disconnect and lock out power to panel or combiner box, including power to all strings.**

1. Unplug the RS-485 and control power connectors from the communications unit. Disconnect strings and remove them from the current sensing module(s).

2. Loosen or remove the DIN stop clips. Separate the EA10 components by sliding them apart along the DIN rail. Ensure that the current sensing modules are fully disconnected from adjacent modules and from the communications unit.
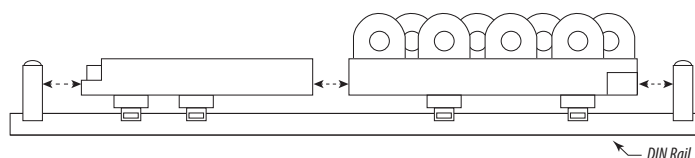
DIN Rail

3. If there is sufficient space on one end of the DIN rail, continue sliding each component along the rail until they slide off one end.

4. If space is limited, and step 3 is not possible, then insert a screwdriver into the groove on the DIN rail clips on one side of a current sensing module. Use the screwdriver to pry the clip away from the DIN rail. Repeat with the second clip on the same module. The current sensing module lifts off of the DIN rail when both clips are loosened.

5. Repeat with any other current sensing modules on the rail.

6. To remove the communications unit, turn the screwdriver so that it is parallel to the DIN rail and insert it between the clip and the DIN rail. Pry the clip away from the DIN rail. Repeat with the second clip on the unit. The communications unit lifts off the DIN rail when both clips are loosened.
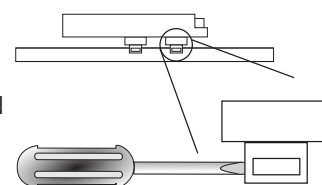
DIP SWITCH SETTINGS

The communications unit serial interface can be configured for Modbus address, baud rate, and parity. No other configuration is supported.

LSB ... MSB

Address

Baud ... Parity

How to Set Address DIP Switches

Each DIP switch has a numerical value as shown below. The EA10 default address is 1, as illustrated below.

1 2 4 8 16 32 64 128   (DIP Switch Values)

To determine an address, add the values of any switch that is in the ON position.
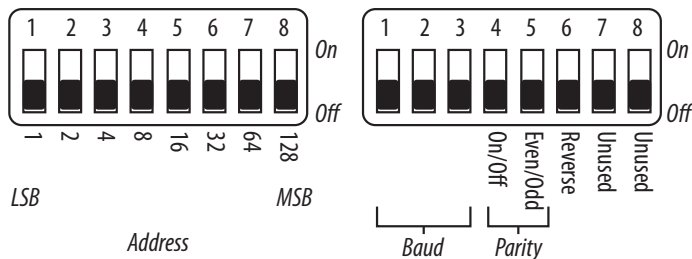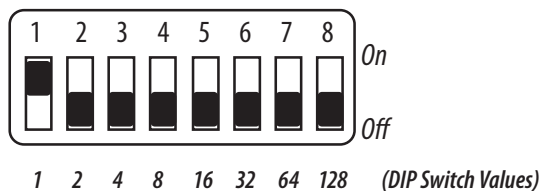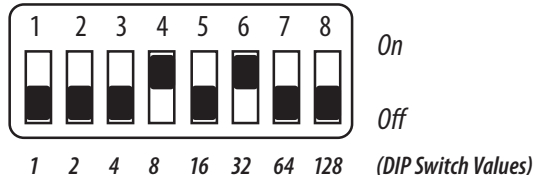
For example:

1 2 4 8 16 32 64 128   (DIP Switch Values)

Switches 4 and 6 are in the ON position, with values of 8 and 32, respectively.

8 + 32 = 40, so the EA10 address is 40.

Communications and Parity DIP Switches

Switch Function	1	2	3	4	5	6	7	8
	Baud			Parity		Reverse	Not Used	
1200 Baud	OFF	OFF	OFF				X	X
2400	ON	OFF	OFF				X	X
4800	OFF	ON	OFF				X	X
9600	ON	ON	OFF				X	X
19200	OFF	OFF	ON				X	X
38400	ON	OFF	ON				X	X
No Parity				OFF	X		X	X
Odd Parity				ON	OFF		X	X
Even Parity				ON	ON		X	X
Current Flow ⇐						OFF	X	X
Current Flow ⇒						ON	X	X

Reverse Current Switch

The reverse current switch allows the user to define the polarity of the instantaneous current reported by the unit. In the default Off position, the unit reports positive current when the conductor is routed through the CT with current flowing towards the DC current sensing module LEDs (see drawing below). Negative current flows away from LEDs towards the CT, indicating a diagnostic event. When the reverse current switch is On, the opposite is true (see drawing below). This feature allows the product to be installed in a variety of configurations.

The state of the reverse current switch can be overridden by writing to the configuration register via Modbus (see EA10 Modbus Point Map, System Configuration Register 40357). To reactivate the switch, clear the Modbus register.

Reverse Off,
Unit reports positive current

Reverse On,
Unit reports positive current
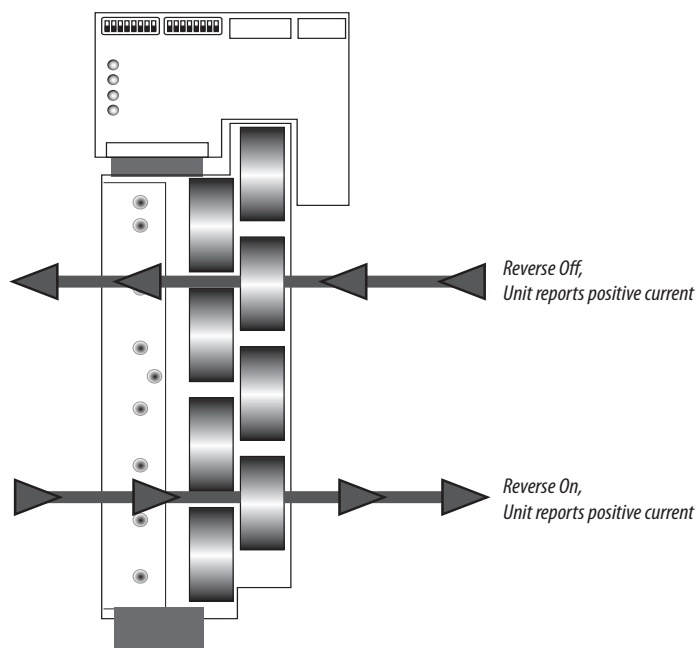
LED INDICATORS

LED Locations on Communications Unit and Current Sensing Module

Communications Unit

Current Sensing Module
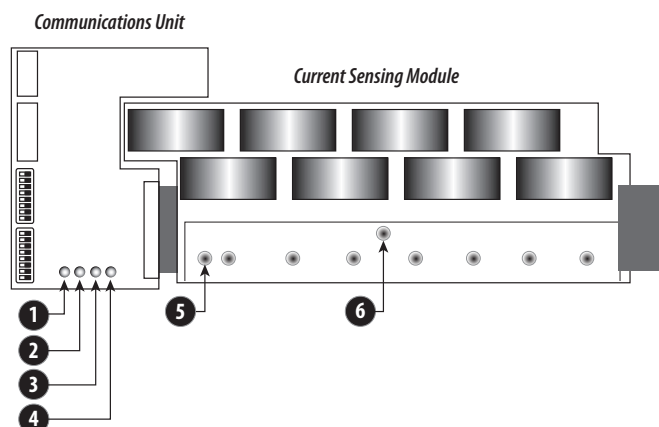
LED Descriptions

1. **Communications Unit Status LED:** Bi-color LED (red/green) displays system status.

LED	System Status
Green Blink	Successful communications with a sensing module
Red Blink	Interrupted communications with a sensing module. See Troubleshooting, section.
Red Steady	Diagnostic event detected. See Troubleshooting, section.

When the communications unit successfully polls a sensing module for data, the status LED blinks green. In normal operation, the status LED blinks once for every sensing module present, up to the maximum number of sensing modules allowed. If communications are interrupted, the status LED blinks red. If there are more sensing modules present than the communications unit can support, the status LED shows the normal green blinks, followed by a red blink. See registers 40354 and 40355 to diagnose.

2. **Tx:** Flashes green when the communications unit sends a data packet on the RS-485 port.

3. **Rx/Error:** Bi-color LED (red/green)

LED	System Status
Green Blink	Flashes green when the communications unit receives a usable data packet on the RS-485 port.
Red Blink	Flashes red if the communications unit receives an unusable data packet (e.g., wrong baud rate or polarity; illegal function code, address, or value; failed CRC check).

4. **Power:** Green when the communications unit has control power.

5. **Current Sensor LEDs** (8 per current sensing module):

These LEDs indicate both the direction (color) and amount (Off/On/Blink) of current flow on each current sensor. Configure the polarity (color) of the current measurement using the reverse switch (see DIP Switch Settings, page 5) or via the system configuration Modbus register. The current thresholds for On and Blink are set in the Sensor LED Blink Threshold and Sensor LED On Threshold registers. These registers can also be used to determine LED status if the hardware is installed in a location that makes visibility difficult.

LED		System Status
Positive (+)	Negative (-)	Direction of Current Flow
Off		Current below user configured On threshold.
Green Steady	Red Steady	Current in normal range.
Green Blink	Red Blink	Current above user configured Blink threshold (over-range).

6. **Current Sensing Module Status LED** (one per current sensing module):

LED	System Status
Red Steady	Diagnostic event detected. See Troubleshooting, section.
Red Blink	Not configured
Green Steady	Normal operations, configured, online, and sensing current
Green Blink	Communicating

These LEDs can be read remotely through the Modbus registers if the hardware is installed in a location that makes visibility difficult. Read the Sensor Unit ID registers for each current sensing module. If the registers returns a value of 1, then the module is active, so the user can assume the LED is green. If the register returns a value of 0, then the module is inactive, and the user can assume the LED is red.

COMMUNICATIONS UNIT MODBUS POINT MAP

The EA10 supports the SunSpec Common Model and Basic String Combiner maps. See www.sunspec.org for more information. A proprietary Veris point map (encoded in the SunSpec style) follows with configuration and status information not provided in SunSpec. The layout of these register blocks is as follows:

Register Block	Start	End
SunSpec Common Model	40001	40069
SunSpec Basic String Monitor – up to 32 channels	40070	40343
Veris Proprietary Status & Configuration	40344	40416
SunSpec Null Block	40417	40418

Current Sensing Module Mapping

When using multiple current sensing modules (up to 4 per communications unit), map the location of each individual current sensor. The table and diagram below show how each sensor is numbered. The current sensing module closest to the communications unit is module 1 and utilizes strings (channels) 1 through 8 (see the illustration below).
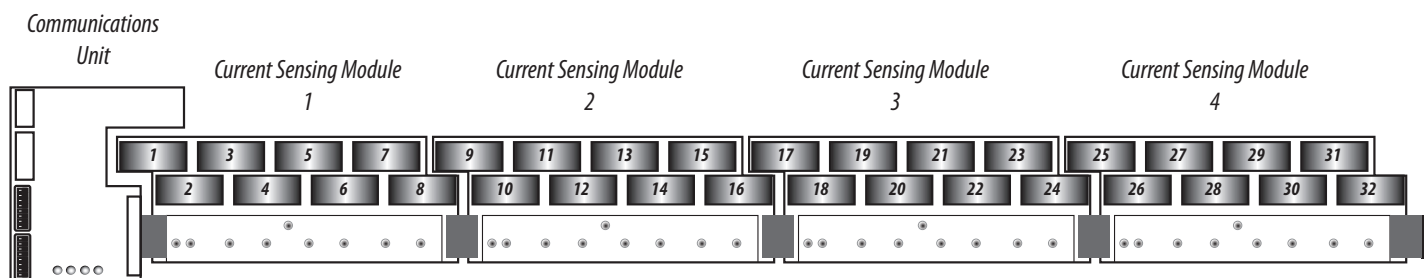
Common Modbus Model Point Map

Modbus maps are defined using this common table format. Register addresses are absolute using base 1 notation. This table has been modified from the original SunSpec relative addressing format to absolute addressing.

Start	End	#	R/W	SunSpec Name	Type	Units	Scale Factor	Contents	Description
40001	40002	2	R	C_SunSpec_ID	uint32	N/A	N/A	0x53756e53 (SunS)	Well-known value. Uniquely identifies this as a SunSpec Modbus map
40003	40003	1	R	C_SunSpec_DID	uint16	N/A	N/A	0x0001	Well-known value. Uniquely identifies this as a SunSpec Common Model block
40004	40004	1	R	C_SunSpec_Length	uint16	registers	N/A	65	Length of common model block
40005	40020	16	R	C_Manufacturer	String(32)	N/A	N/A	N/A	"Veris Industries"
40021	40036	16	R	C_Model	String(32)	N/A	N/A	N/A	"EA10HC1AB"
40037	40044	8	R	C_Options	String(16)	N/A	N/A	N/A	"Basic"
40045	40052	8	R	C_Version	String(16)	N/A)	N/A	N/A	Product version
40053	40068	16	R	C_SerialNumber	String(32)	N/A	N/A	N/A	Product serial number
40069	40069	1	R/W	C_DeviceAddress	uint16	N/A	N/A	N/A	Modbus ID
40070	40070	1	R	C_SunSpec_DID	uint16	N/A	N/A	Device ID	Start of next device
40071	40071	1	R	C_SunSpec_Length	unit16	N/A	N/A	Device Length	Device model block size

Basic String Combiner Modbus Register Map

The Basic String Combiner Modbus mapping allows a variable number of strings (8, 16, 24, or 32). **The Veris implementation is fixed at 32 strings for ease of integration with existing Modbus master devices.** As current sensing modules are added, the data from each CT appears, starting in the first block. **The CT closest to the communications unit is identified as String 1, and so on.** Any int16 values that are not supported return 0x8000. This table has been modified from the original SunSpec relative addressing format to absolute addressing. Combiner level readings provide combined values for current, amp-hours, voltage, status, and events. Individual string readings are provided for the current and events.

SunSpec Combiner and Input String Event Flag Values

The string combiner specific flags are defined here. Any number of events may be active at the same time, and as a result the SC_Event value is implemented as a bit-map. The bit-map values specifically called out as SC_EVENT_COMBINER_ only apply to the combiner unit as a whole.

Event Name	Flag Value	Description
SC_EVENT_CURRENT	0x00000008	Current out of range. Set threshold in Sensor LED Blink Threshold register.
SC_EVENT_REVERSED_POLARITY	0x00002000	Reversed polarity detected
SC_EVENT_COMM_ERROR	0x00008000	Subsystem Communication Error

Vendor Event Flags

The vendor specific string combiner flags are defined here. These flags are specific to the EA10 and are not specified by SunSpec. They appear in the SC_Event_Vendor (summary) and SC_Input_Event_Vendor (per string) registers. Any number of events can be active at the same time, and as a result the SC_Event_Vendor event value is implemented as a bit-map. The SC_Event_Vendor field applies to the combiner as a whole, while the SC_Input_Event_Vendor field applies to the specific string combiner input. An event in one or more of the SC_Input_Event_Vendor registers associated with each string activate the same event in the summary SC_Event_Vendor register. Users trigger on the combiner level SC_EVENT and then drill down to the SC_Input_Event_Vendor level to determine which string(s) are at fault. The bit-map values specifically called out as SC_EVENT_COMBINER_ only apply to the combiner unit as a whole.

The SC_EVENT_LED_ bits indicate the state of the LED indicators on both the sensing module and communications units. These are bi-color LEDs that can be off, red or green. When the indicator is on, it can either be on constantly or blinking. See LED Indicators section.

Event Name	Flag Value	Description
SC_EVENT_LED_GREEN	0x00000001	Positive current flow detected. Green LED on. Set threshold in configuration register 40359.
SC_EVENT_LED_RED	0x00000002	Negative current flow detected. Red LED on. Set threshold in configuration register 40359.
SC_EVENT_LED_BLINK	0x00000004	Over-range current. LED blinking red or green, depending on current flow direction. Set threshold in configuration register 40358.
Unused	0xFFFFFFF8	N/A

Start	End	N	R/W	Name	Type	Units	Scale Factor	Contents	Description
40070	40070	1	R	C_SunSpec_DID	uint16	N/A	N/A	403	Uniquely identifies this as a basic SunSpec String Combiner Modbus register map.
40071	40071	1	R	C_SunSpec_ Length	uint16	Registers	N/A	272	Variable model length block. The value is calculated according to the SunSpec formuls 16+N*8 , where 16=number of combiner registers, N=number of combiner inputs, and 8=length of combiner input block. For the EA10, N is fixed at 32.
40072	40072	1	R	SC_DC_Current_ SF	int16	SF	N/A	Configured	Combined DC current scale factor
40073	40073	1	R	SC_DC_AH_SF	int16	SF	N/A	Configured	Combined DC amp-hour scale factor
40074	40074	1	R	SC_DC_Voltage_ SF	int16	SF	N/A	Configured	DC voltage scale factor
40075	40075	1	R	SC_DC_Current_ Max	uint16	Amps	SC_DC_ Current_SF	Configured	Maximum DC Current Rating for the combiner
40076	40076	1	R	SC_Num_Inputs	uint16	N/A	N/A	Configured	(N) Number of string inputs to this combiner. This register must be supported but may have a zero value.
40077	40078	2	R	SC_Event	uint32	Bitfield	N/A	SC_EVENT_	SunSpec Combiner event code.
40079	40080	2	R	SC_Event_Vendor	uint32	Bitfield	N/A	SC_EVENT_	EA10 specific event code.

For SC_Event (40077):

Event Name	Flag Value	Description
SC_EVENT_ CURRENT	0x00000008	Current out of range. Set threshold in Sensor LED Blink Threshold register.
SC_EVENT_ REVERSED_ POLARITY	0x00002000	Reversed polarity detected
SC_EVENT_ COMM_ ERROR	0x00008000	Subsystem Communication Error

For SC_Event_Vendor (40079):

Event Name	Flag Value	Description
SC_EVENT_ LED_ GREEN	0x00000001	Positive current. Green LED on. Set threshold in register 40359.
SC_ EVENT_ LED_RED	0x00000002	Negative current. Red LED on. Set threshold in register 40359.
SC_ EVENT_ LED_BLINK	0x00000004	Over-range current. LED blinking red or green. Set threshold in configuration register 40358.
Unused	0xFFFFFFF8	N/A

Start	End	N	R/W	Name	Type	Units	Scale Factor	Contents	Description
40081	40081	1	R	SC_DC_Current	int16	Amps	SC_DC_Current_SF	Measured	Combined current value (sum of string amps)
40082	40083	2	R	SC_DC_AmpHour	uint32	AH	SC_DC_AH_SF	Metered	Accumulated amps supplied by combiner (sum of string amp-hours). Only positive (+) current flow is accumulated. Negative (-) current flow is not accumulated.
40084	40084	1	R	SC_DC_Voltage	int16	Volts	SC_DC_Voltage_SF	Measured	Combined voltage value (not supported)
40085	40085	1	R	SC_Internal_Temp	int16	°C	N/A	Measured	Internal temperature of the combiner (not supported)
40086	40086	1	R	SC_Input_DC_Current_SF	int16	SF	N/A	Configured	DC input current scale factor
40087	40087	1	R	SC_Input_DC_AH_SF	int16	SF	N/A	Configured	DC input amp-hour scale factor

Start	End	N	R/W	Name	Type	Units	Scale Factor	Contents	Description
Input string values repeated for each string as configured by SC_Num_Inputs.									
These values are repeated for every string in the EA10 system. See below for register numbers for individual strings.		1	R	SC_Input_ID	uint16	N/A	N/A	Configured	The ID of String.
		2	R	SC_Input_Event	uint32	Bitfield	N/A	SC_EVENT_	String Sunspec input event flags. See SunSpec Event Flags registers 40077-40078.
		2	R	SC_Input_Event_ Vendor	uint32	Bitfield	N/A	SC_EVENT_	String vendor input event flags. EA10 specific. See Vendor Event Flags registers 40079-40080.
		1	R	SC_Input_DC_ Current	int16	Amps	SC_Input_DC_ Current_SF	Measured	String DC current value. May be negative due to ground fault.
		2	R	SC_Input_DC_ AmpHout	uint32	AH	SC_Input_DC_ AH_SF	Metered	Accumulated amps (amp-hours) for this string. Only positive (+) current flow is accumulated. Negative (-) current flow is not accumulated.
Each set of eight registers below represents one string. The eight registers are specified above.									
40088	40095	8	R	String 1					
40096	40103	8	R	String 2					
40104	40111	8	R	String 3					
40112	40119	8	R	String 4					
40120	40127	8	R	String 5					
40128	40135	8	R	String 6					
40136	40143	8	R	String 7					
40144	40151	8	R	String 8					
40152	40159	8	R	String 9					
40160	40167	8	R	String 10					
40168	40175	8	R	String 11					
40176	40183	8	R	String 12					
40184	40191	8	R	String 13					
40192	40199	8	R	String 14					
40200	40207	8	R	String 15					
40208	40215	8	R	String 16					String register blocks. Each set of eight registers represents the values described above for all strings in the system (up to 32 strings possible with one communications unit).
40216	40223	8	R	String 17					
40224	40231	8	R	String 18					
40232	40239	8	R	String 19					
40240	40247	8	R	String 20					
40248	40255	8	R	String 21					
40256	40263	8	R	String 22					
40264	40271	8	R	String 23					
40272	40279	8	R	String 24					
40280	40287	8	R	String 25					
40288	40295	8	R	String 26					
40296	40303	8	R	String 27					
40304	40311	8	R	String 28					
40312	40319	8	R	String 29					
40320	40327	8	R	String 30					
40328	40335	8	R	String 31					
40336	40343	8	R	String 32					

Status and Configuration Register Block

This block is implemented as a proprietary SunSpec device block. Register addresses are absolute in base 1 notation. Length is the number of 16 bit Modbus registers.

Start	End	Size	R/W	Name	Type	Units	SF	Contents	Description
40344	40344	1	R	C_SunSpec_DID	uint16	N/A	N/A	64001	Uniquely identifies this as a proprietary SunSpec format Modbus register map
40345	40345	1	R	C_SunSpec_Length	uint16	Registers	N/A	71	Block Length
40346	40346	1	R/W	Command Code	uint16	Code Word	N/A	0	Always returns 0x0000 on a read. Customer Command Codes: <table><tr><td>Dec</td><td>Hex</td><td>Description</td></tr><tr><td>30078</td><td>0x757E</td><td>Clear all accumulators to 0.</td></tr></table>
40347	40347	1	R	Hardware Revision	uint16		N/A	0	4 bit hardware revision: <table><tr><td>Bit</td><td>Description</td></tr><tr><td>0-3</td><td>Hardware Revision</td></tr><tr><td>4-15</td><td>unused</td></tr></table>
40348	40348	1	R	RS FW Revision	uint16		N/A		Reset System Firmware Version
40349	40349	1	R	OS FW Revision	uint16		N/A		Operating System Firmware Version
40350	40351	2	R	Product Revision	ASCII		N/A		Product Revision
40352	40352	1	R	Boot Count	uint16		N/A		Count of Boot Cycles
40353	40353	1	R	DIP Switches	uint16		N/A		All 16 DIP switches: <table><tr><td>Switch</td><td>Function</td></tr><tr><td>87654321</td><td>Address</td></tr><tr><td>87654321</td><td>Reverse, Parity, Baud Rate (see DIP Switch Settings, page 5)</td></tr></table>
40354	40354	1	R	# Detected current sensing modules	uint16		N/A	0 - 4+	Number of current sensing modules detected on the bus by analog measurement.
40355	40355	1	R	# Communicating current sensing modules	uint16		N/A	0 - 4	Number of current sensing modules that the communications unit is able to communicate with. If all modules are active and communicating, this number will match the previous register, and the user can assume all status LEDs are green. If one or more modules is not communicating, these values will not match, and the affected module status LED is red.
40356	40356	1	R	System Status	uint16		N/A	Bit Map	Status bit map: <table><tr><td>Bit</td><td>Hex</td><td>Description</td></tr><tr><td>0</td><td>0x0001</td><td>Actual state of amperage sign reversal and sensing module LED color state. Controlled by DIP switch if configuration register (next register) bit 1 is 0, or configuration register bit 0 if bit 1 is asserted.</td></tr><tr><td>1-15</td><td></td><td>unused</td></tr></table>
40357	40357	1	R/W	System Configuration	uint16		N/A		Configuration bit map: <table><tr><td>Bit</td><td>Hex</td><td>Description</td></tr><tr><td>0</td><td>0x0001</td><td>Reverse amp sign and sensing module LED color. Has no effect if bit below is 0.</td></tr><tr><td>1</td><td>0x0002</td><td>Override Reverse DIP Switch. If this bit is 0, the Reverse Current DIP switch on the communications unit controls the state of the reverse amp sign bit in the status register. If this bit is set to a 1, the state of the bit above controls sign reversal.</td></tr><tr><td>2-15</td><td></td><td>unused</td></tr></table>

Start	End	Size	R/W	Name	Type	Units	SF	Contents	Description
40358	40358	1	R/W	Sensor LED Blink Threshold	uint16	%		1 - 100	Current sensing module LED blink (over-range) threshold in percent of current sensing module CT current rating of 20 A. Currents at or above this threshold cause the current sensing module string LEDs to blink. Default is 100% (20 A).
40359	40359	1	R/W	Sensor LED On Threshold	uint16	%		1 - 100	Current sensing module LED on (current flowing) threshold in percent of current sensing module CT current rating of 20 A. Currents at or above this threshold cause the current sensing module string LEDs illuminate. LED states are reported in the SunSpec Basic String Combiner block, Vendor Event Flag Register. Default is 3% (0.6 A).
40360	40360	1	R	Reserved	uint16		N/A	0	Unused register location. Reserved for future use.
40361	40376	16	R/W	Location Text String	uint16	ASCII	N/A	Text	User writable string for storing the unit's location or other information about the unit. Up to 32 characters. Must be null terminated (unused bytes are all 0x00). This string is returned as part of the response to the Modbus slave ID command. Information on each of the attached current sensing modules.

Information for each of the current sensing modules.									
40377	40377	1	R	Sensor 1 Unit ID	uint16		N/A		Sensor Unit ID:
40378	40378	1	R	Address	uint16		N/A		Sensor address on the EA10's internal bus
40379	40379	1	R	OS Version	uint16		N/A		Sensor firmware version
40480	40481	2	R	Product Version	ASCII		N/A		Sensor product revision
40382	40386	5	R	Serial Number	ASCII		N/A	10 digit	Sensor serial number
40387	40387	1	R	Sensor 2 Unit ID	uint16		N/A		Sensor Unit ID:
40388	40388	1	R	Address	uint16		N/A		Sensor address on the EA10's internal bus
40389	40389	1	R	OS Version	uint16		N/A		Sensor firmware version
40390	40391	2	R	Product Version	ASCII		N/A		Sensor product revision
40392	40396	5	R	Serial Number	uint16		N/A	10 digit	Sensor serial number
40397	40397	1	R	Sensor 3 Unit ID	uint16		N/A		Sensor Unit ID:
40398	40398	1	R	Address	uint16		N/A		Sensor address on the EA10's internal bus
40399	40399	1	R	OS Version	uint16		N/A		Sensor firmware version
40400	40401	2	R	Product Version	ASCII		N/A		Sensor product revision
40402	40406	5	R	Serial Number	uint16		N/A	10 digit	Sensor serial number

Sensor 1 Unit ID (40377):

ID	Description
0	No unit detected or unit is not communicating. Module status LED is red.
1	8 channel, 20 A current sensor. Module status LED is green

Sensor 2 Unit ID (40387):

ID	Description
0	No unit detected or unit is not communicating. Module status LED is red.
1	8 channel, 20 A current sensor. Module status LED is green

Sensor 3 Unit ID (40397):

ID	Description
0	No unit detected or unit is not communicating. Module status LED is red.
1	8 channel, 20 A current sensor. Module status LED is green

Start	End	Size	R/W	Name	Type	Units	SF	Contents	Description
40407	40407	1	R	Sensor 4 Unit ID	uint16		N/A		Sensor Unit ID: | ID	Description
0	No unit detected or unit is not communicating. Module status LED is red.
1	8 channel, 20 A current sensor. Module status LED is green	
40408	40408	1	R	Address	uint16		N/A		Sensor address on the EA10's internal bus
40409	40409	1	R	OS Version	uint16		N/A		Sensor firmware version
40410	40411	2	R	Product Version	ASCII		N/A		Sensor product revision
40412	40416	5	R	Serial Number	uint16		N/A	10 digit	Sensor serial number
40417	40417	1	R	C_SunSpec_DID	uint16			Device ID	Start of next device (Null DID = 0xFFFF)
40418	40418	1	R	C_SunSpec_Length	uint16			Device Length	Device model block size (null length = 0x0000)

ACCESSORIES

Model	Description
AV02	DIN rail stop clip
EA10X01	Spare parts: end cap, o-rings, and connectors

TROUBLESHOOTING

Problem	Solution
Communications unit power LED is off.	Check that the control power wiring is connected and power is between 24 and 42 VDC.
Communications unit status LED blinks red.	Check all 20-pin connectors between the communications unit and each current sensing modules.
Communications unit status LED is steady red.	Contact Veris technical support.
Communications unit status LED blinks green once for each current sensing module, followed by one red blink.	The communications unit detects more than four current sensing modules connected. Turn off power to the device and strings, remove all sensing modules in excess of four, replace endcap on the last unit, and restore power.
Rx/Error LED is blinking red.	Communications unit received an unusable data packet. Check that the configuration of the communications unit DIP switches for baud rate and parity match that of the Modbus master. Check that the bus is terminated on both ends, with biasing pull-up and pull-down resistors.
Current sensing module status LED is steady red.	Contact Veris technical support.
Current sensing module status LED blinks red.	Not configured. Check all 20-pin connectors between the communications unit and each current sensing modules.
Number of detected current sensing modules (register 40354) does not match the number of communicating current sensing modules (register 40355).	Check all 20-pin connectors between the communications unit and each current sensing modules.

CHINA ROHS COMPLIANCE INFORMATION

部件名称	产品中有毒有害物质或元素的名称及含量Substances					
	铅 （Pb)	汞 （Hg)	镉 （Cd)	六价铬 （Cr(VI))	多溴联苯(PBB)	多溴二苯醚(PBDE)
电子线路板	X	O	O	O	O	O

O = 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下.

X = 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求.

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