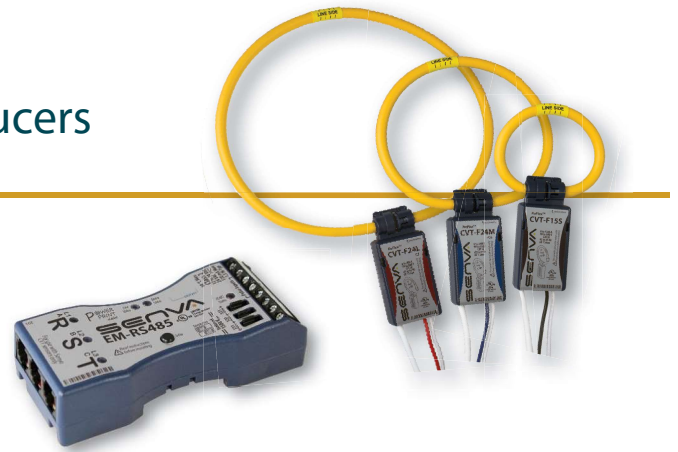


# INSTALLATION INSTRUCTIONS

## Protocol Energy Meter

### EM-RS485 and Current/Voltage Transducers



The EM-RS485 is a three channel meter, capable of monitoring single-phase, two-phase and three-phase systems, as well as 3 independent single-phase systems with one meter. The EM-RS485 meter offers BACnet MS/TP and Modbus RTU protocols and 2 pulse inputs to maintain flexibility during installation and operation. The EM-RS485 is compatible with all sizes of current/voltage transducers (CVTs). With the EM-RS485 intelligent meter technology, the device self-configures baud rate, serial format, protocol, and address (BACnet only) - eliminating additional configuration steps.

Each CVT is independently calibrated to measure and digitally communicate power values to the meter. The CVT's flexible Rogowski coil makes installations less burdensome. The voltage connections are made directly into each CVT - keeping all high voltage away from the meter. Each CVT is rated from 90 to 600VAC.

## DANGER

### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

**Failure to follow these instructions may cause serious injury or death**

- Read, understand and follow the instructions before installing this product.
- The high voltage CVTs of this product must be mounted inside a suitable fire and electrical enclosure. Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel having the skills and knowledge related to the construction and operation of this electrical equipment and installation, and has received safety training to recognize and avoid the hazards involved. NEC Article 100.
- Do not use this product for life or safety applications.
- Do not install this product in hazardous or classified locations.
- Product may use multiple voltage/power sources. Disconnect ALL sources before servicing.
- Use a properly rated voltage sensing device to confirm that power is off. DO NOT depend on this product for voltage indication.
- Replace all doors, covers and protective devices before powering the equipment.
- The installer is responsible for conformance to all applicable codes.

## WARNING

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

- The EM-RS485 and CVT sensors are designed to be used as a system. DO NOT connect anything other than a Senva CVT sensor to the RJ-11 jacks on the meter base.
- If product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

## WARRANTY DISCLAIMER

DO NOT modify the length of the CVT Data Communication Cable. Field modifications to the CVT Data Communication Cable will void factory warranty.

### LET'S GET STARTED!

#### Product Descriptions (page 2)

- EM-RS485 product diagram
- Current/Voltage Transducer (CVT) diagram

#### Mounting (page 2)

- Mounting options for EM-RS485
- Recommended mounting for maximum CVT accuracy

#### Wiring (page 3)

- Typical single-phase and three-phase systems
- Communication wiring options
- Input wiring options

#### Normal Operation (page 4)

- LED indicators for Normal, Warning, and Error conditions
- Restore Factory Default Settings

#### Diagnostics (page 4)

- Diagnostic Mode and Diagnostic Codes

#### Network Connectivity (pages 5-6)

#### Configuration Settings (page 7)

- Address Assignment
- Protocol Type Configuration
- Baud Rate Configuration
- Serial Format Configuration
- PowerPrint Power Quality Alarm

#### View and Edit Settings (pages 8-9)

- View Settings Mode
- Edit Settings Mode

#### Specifications (page 10)

### SUPPORTING DOCUMENTS

#### EM BACnet Protocol Guide

- [www.senvainc.com/emrs485bn](http://www.senvainc.com/emrs485bn)



#### EM Modbus Protocol Guide

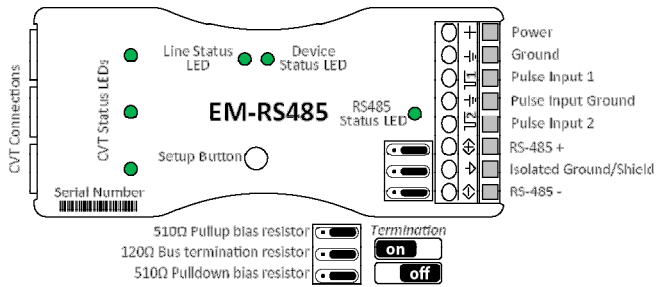
- [www.senvainc.com/emrs485mb](http://www.senvainc.com/emrs485mb)



# ① Description

## EM-RS485

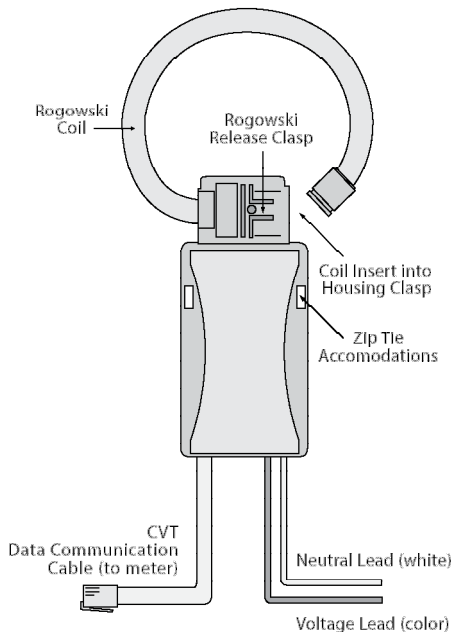
The EM-RS485 is a 3 channel energy meter which supports both BACnet MS/TP and Modbus RTU protocols. The meter also includes 2 pulse inputs that can connect to a variety of secondary pulse output meters (water, gas, steam, etc). The EM-RS485 supports the use of all Senva CVT sensors, interchangeably. The EM-RS485 meter base is a class 2 low voltage device for mounting flexibility. See *Section 9 - Specifications* for recommended conductor gauge and terminal tightening torque.



## Current/Voltage Transducer (CVT)

The Current/Voltage Transducer (CVT) senses both current and voltage. Each CVT is independently calibrated and uses digital communication with the meter for superior noise immunity and accuracy. Each CVT will automatically configure with the meter during installation, eliminating the need for manual configuration.

DO NOT modify the length of the CVT Data Communication Cable. Field modifications to the CVT Data Communication Cable will void factory warranty.

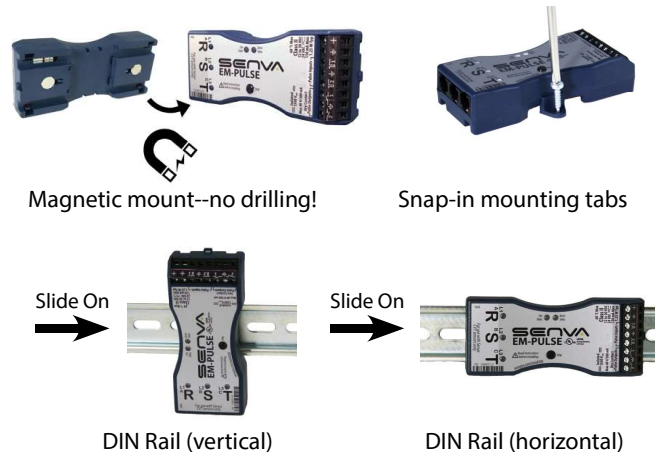


Opening the CVT Clasp

# ② Mounting

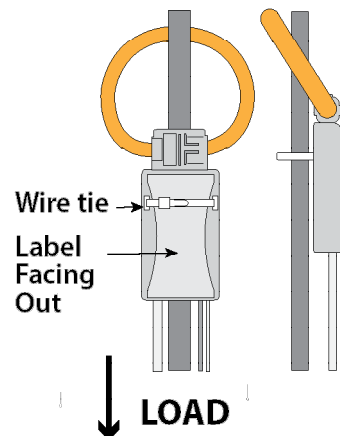
## Meter Mounting Options

The EM-RS485 features four mounting options for convenience: rare-earth magnets, mounting tabs, horizontal DIN rail and vertical DIN rail.



## Current/Voltage Transducer (CVT) Mounting

The CVT sensors have a preferred mounting angle relative to the conductor that will help maintain maximum accuracy. See below for instructions.



**!** Ensure orientation of CVT to load is as shown.

## Installation Environment

This product is intended for environments which control conductive pollution and the possibility of condensation or high humidity (Pollution level 2). High voltage components shall be mounted in an appropriate electrical enclosure. Meter base is class 2 device.

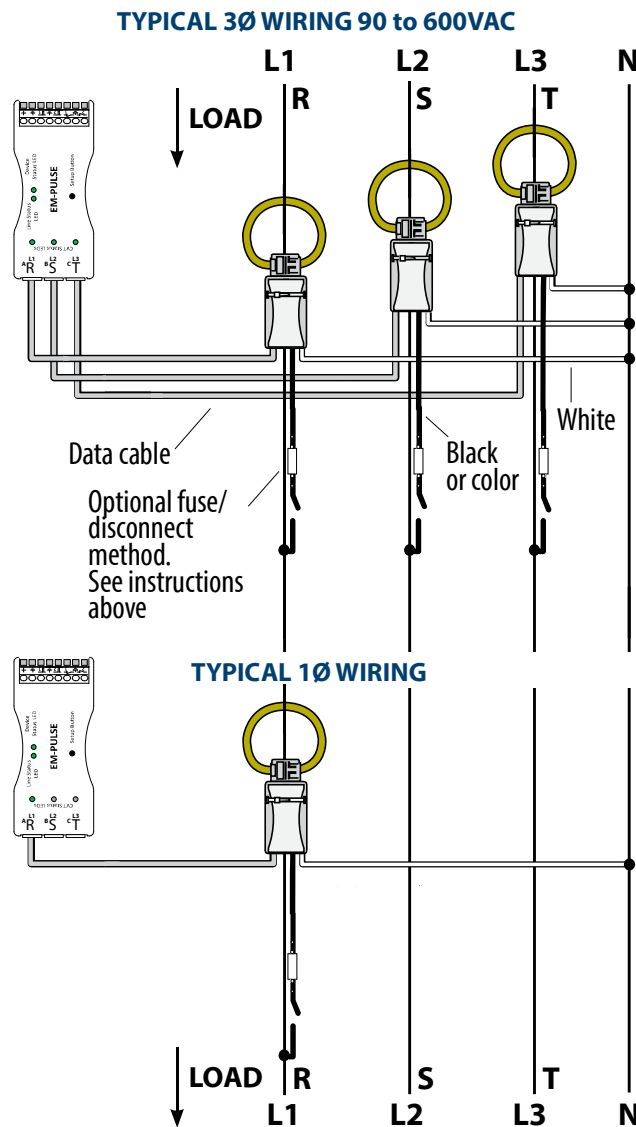
CVTs may not be installed in a panel where they exceed 75% of the wiring space of any cross-sectional area within the panel. Meter shall be enclosed in a certified enclosure.

### ③ Wiring

UL 240.21 code permits qualified installers to forgo use of a disconnect device (fuses or circuit breakers) when connecting the voltage reference of the CVT, as long as the tap does not exceed 10 feet and complies with additional guidelines regarding ampacity rating, enclosure spacing and point of connection. It is the responsibility of the installer to ensure the system meets the requirements of the UL 240.21 code.

If the installation does not conform with the UL 240.21 code or the voltage reference must be extended beyond 10 feet, proper use of over current protection is required (i.e. fusing or circuit breakers.)

In the U.S. and Canada, disconnecting fuse holders or circuit breakers can be used. Place this device in close proximity to the CVT and within easy reach of the operator, and mark it as the disconnecting method. The disconnect shall meet the relevant requirements of IEC 60947-1 and IEC 60947-3 and shall be suitable for the application. Provide overcurrent protection and disconnecting method for supply conductors with approved current limiting devices suitable for protecting the wiring.



For 3Ø  $\Delta$  connections with no neutral, cap each CVT's neutral (white) wire.

### CONNECTING TO RS485 BACNET OR MODBUS NETWORKS

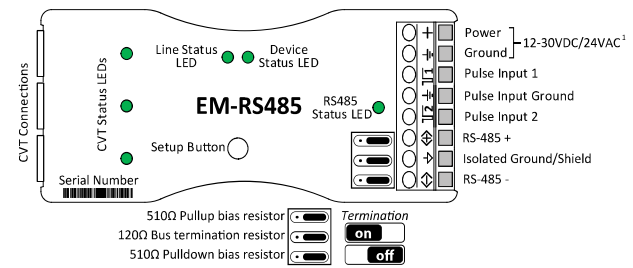
The Senva EM-RS485 protocol meter can be used on both BACnet and Modbus networks. The default settings on the meter includes auto-detection of protocol type, device address (BACnet only), serial format and baud rate. Each meter ships with a default Modbus address. This process is further detailed in Section 6 - Network Connectivity.

### BIASING AND TERMINATION

Depending on the network configuration, it may be necessary to use the built in EOL (end-of-line) termination or biasing resistors on the EM-RS485.

Use the jumpers to select the 120 ohm EOL resistor if the Senva EM-RS485 meter is the *last* device in your network. If the meter is being installed within a network of other existing RS485 devices, it may be necessary to use the 510 ohm biasing resistors based on your network or hardware requirements. See illustration below which shows locations of jumpers and values.

### RS485 WIRING CONNECTIONS

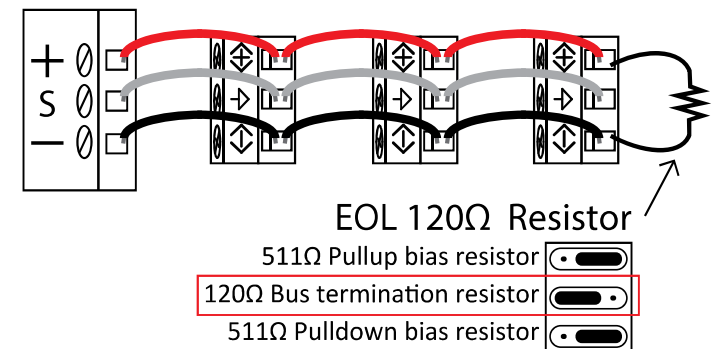


<sup>1</sup> One side of transformer secondary is connected to signal common. Dedicated transformer is recommended

### RS485 WIRING BEST PRACTICES

Use of appropriate shielded twisted pair wire (14-26 AWG) is recommended, per protocol specifications. Total wiring runs should not exceed 4000 feet, with a maximum of 128 devices (BACnet) or 32 devices (Modbus) in a single daisy chain.

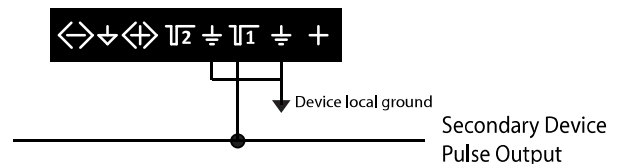
### DAISY CHAIN WIRING EXAMPLE



### PULSE INPUT WIRING

The EM-RS485 is capable of accepting dry pulse (outputs) from other devices and meters (water, gas, steam, etc). It will count the pulses and report them in Modbus registers and/or BACnet Objects. These discrete registers reported as Pulse 1 and Pulse 2 can then be 'mapped' in your controller or software to the engineering unit being monitored i.e. GPM, BTU, CFM, etc.

When connecting 3rd party outputs to the EM-RS485, it is important to ensure the pulse rating of the outputs do not exceed rating of the meter. (See Section 9 - Specifications)

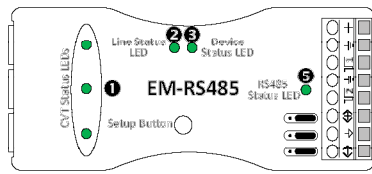


## ④ Normal Operation Mode

When powered, the EM-RS485 will start up in Normal Operation Mode. The meter will always return to Normal Operation Mode after 60 seconds of inactivity in any of the setting menus.

In Normal Operation Mode, there are 4 sets of LEDs that provide status indications:

- ❶ CVT Status LEDs
- ❷ Line Status LED
- ❸ Device Status LED
- ❹ RS485 Status LED



The color of each LED will indicate conditions of the system:

- Green = Normal
- Yellow = Warning: See Diagnostic Mode
- Red = Error: See Diagnostic Mode

If one or more of your LEDs is blinking:

- CVT LEDs ❶ will blink when no load is present
- Device LED ❸ will blink when a non-factory default setting has been selected
- RS485 LED ❹ will blink to indicate network traffic

If LEDs ❶❷❸ are green ● (blinking or solid), then there are no conditions that require diagnostics. Proceed to *Section 6 - Network Connectivity*, to finalize your installation.

If any of LEDs ❶❷❸ are yellow ● or red ● (blinking or solid) proceed to *Section 5 - Diagnostics*.

### To Restore Factory Default Settings

*Caution: Restoring factory default settings will revert device to settings listed above. Any manual configurations will be reset.*

1. Hold setup button down until all LEDs blink red (approximately 30 seconds) and release.
2. Momentarily press the setup button again within 5 seconds of the first release.
3. The LEDs will stop blinking and remain solid red for about 1 second.
4. Meter is now reset to factory default settings.

## ⑤ Diagnostics Mode

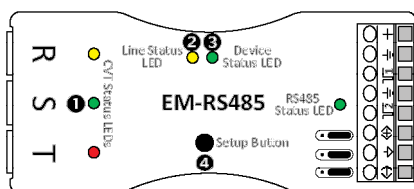
In Normal Operation Mode, LEDs ❶❷❸ indicate conditions of the system using colors green ●, yellow ● and red ●. The Diagnostics Mode identifies and displays potential issues causing one or more of the LEDs ❶❷❸ to appear yellow ● or red ●. Utilize the *Diagnostic Mode Navigation* along with *Table 1. Diagnostic Codes* to determine underlying conditions.

If all LEDs appear green ●, proceed to *Section 6 - Network Connectivity*.

### Diagnostic Mode Navigation

In Diagnostic Mode, the 3 sets of LEDs ❶❷❸ provide status indications. The Setup Button ❹ is used for mode selection and navigation:

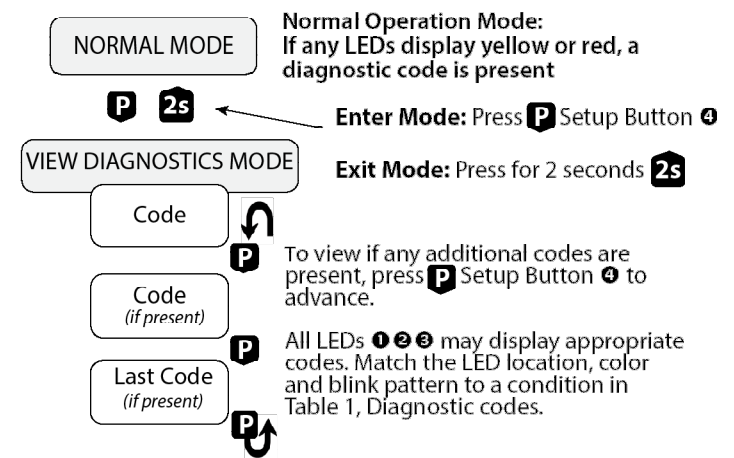
- ❶ CVT Status LEDs
- ❷ Line Status LED
- ❸ Device Status LED
- ❹ Setup Button



Diagnostic Mode is only available if any LEDs ❶❷❸ display yellow ● or red ● in Normal Operation Mode.

(Note: RS485 LED ❹ may appear green ●, yellow ●, or red ● at this stage of installation. The RS485 LED ❹ is addressed in *Section 6 - Network Connectivity*.)

1. To enter Diagnostic Mode, press **P** the Setup Button ❹. The first diagnostic code will be displayed on one of the LEDs, repeating every three seconds.
2. Match the LED location, color, and blink pattern to a condition in *Table 1. Diagnostic Codes*.  
*Note: The diagnostic blink pattern will apply to the specific channel (R, S or T) to which the condition is present.*
3. Press **P** Setup Button ❹ to view next code and repeat Step 2 to diagnose condition.
4. Continue to diagnose conditions until there are no new codes displayed (codes are repeated).
5. To exit Diagnostic Mode, hold Setup Button ❹ until all LEDs ❶❷❸ light up (approximately 2 second 2s hold) and release. After 60 seconds on inactivity, the device will revert back to Normal Operation Mode.



### Diagnostic Mode Navigation Flowchart

Table 1. Diagnostic Codes		
❶ CVT LEDs	Indication	Corrective Action
	Negative power	Verify CVT orientation toward load
	Phase Loss	Check phase voltage and current
	Low power factor (<0.5)	If not low PF, ensure voltage legs match with CVTs
	Frequency out of range	Frequency is below 38Hz or above 150Hz
	Over voltage	Ensure system voltage does not exceed 600VAC
	Over current	Replace with a larger amperage rated CVT
❷ Line LED	Indication	Corrective Action
	Mismatched voltages on power sensors	Ensure desired voltages are being monitored
	Not a three phase system	Verify system type
	Reversed Phase Order	Swap any two CVT meter inputs if not intentional
❸ Device LED	Indication	Corrective Action
	Low supply voltage	Ensure voltage to meter is 12-30VDC/24VAC
	Temperature warning	Relocate meter to suitable environment

If code is not shown in table above, please contact Senva technical support: support@senvainc.com or (866) 660-8864

## ⑥ Network Connectivity

 The EM-RS485 installs with minimal user configuration.

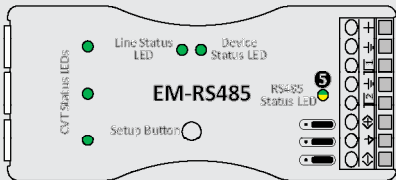
The EM-RS485 is designed for use on both BACnet and Modbus networks. The meter is designed to automatically identify the network baud rate, protocol type, serial formats and self-address (BACnet only) for quick startup.

The following details the steps required to add an EM-RS485 meter to an existing network. Separate steps are detailed based on the network protocol type (BACnet & Modbus).

### BACnet Network Connectivity


Once the meter has been connected to the RS-485 network, it will automatically detect BACnet traffic and begin auto-configuration. The EM-RS485 will detect and match baud rate, parity, stop bits and identify an unused master MAC address to occupy through the following steps:

1. Wire the EM-RS485 meter to an existing BACnet network utilizing the wiring diagrams in *Section 3 - Wiring*.
2. Apply power to the EM-RS485 meter.
3. The device will analyze the active network for the following parameters: baud rate, serial format, protocol and first available MAC address. During this configuration, the RS485 LED ⑤ should display approximately 15-30 seconds of blinking activity in yellow ● while the meter configures itself to the network.



4. The RS485 LED ⑤ will appear green ● after the meter has discovered the protocol type, baud rate, serial format, and assigned an available MAC address. If the RS485 LED does not appear green, see the *Network Activity* subsection.

For further details on MAC address and device ID reference the *EM BACnet Protocol Guide* document.

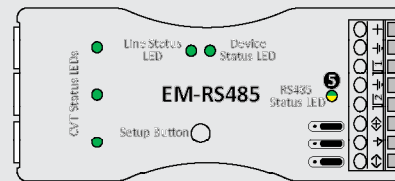
 Tip: Customizing the MAC address from the Senva default? Mark the new MAC address on the EM-RS485 label with a permanent marker for a quick reference point in the future:



### Modbus Network Connectivity

Once the meter has been connected to the RS-485 network, it will automatically detect Modbus traffic and begin auto-configuration. The EM-RS485 will detect and match baud rate, parity and stop bits. Connect the EM-RS485 to a Modbus network through the following steps:

1. Wire the EM-RS485 meter to an existing Modbus network utilizing the wiring diagrams in *Section 3 - Wiring*.
2. Apply power to the EM-RS485 meter.
3. The device will analyze the network traffic for the following parameters: baud rate, serial format and protocol. During this configuration, the RS485 LED ⑤ should display approximately 15-30 seconds of blinking activity in yellow ● while the meter configures itself to the network.



4. The RS485 LED ⑤ will appear green ● after the meter has discovered and set the protocol type, baud rate and serial format. If the RS485 LED does not appear green, see the *Network Activity* subsection.


5. The EM-RS485 ships with a default Modbus address. The default address will be between 100-199. To identify the default address, look at the serial number on the EM-RS485 label. The last two digits will form the default serial Modbus address.

See below label example for where to find your meter serial number:



Example: This meter shown would have a default Modbus address of 142, based on the serial number.

Alternative address assignment can be accomplished through manual configuration (See *Section 7 - Auto-Detection Settings - Setting 1. Address Assignment*) or by writing to the address register utilizing the *EM Modbus Protocol Guide* document.

 Tip: Customizing the Modbus address from the Senva default? Mark the newly assigned address on the EM-RS485 label with a permanent marker for a quick reference point in the future:



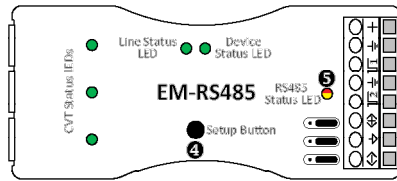
### Network Activity

Once the EM-RS485 meter is properly configured to a network, the RS485 LED 5 will blink remain blinking green ● in response to network activity. If the RS485 LED appears yellow ● or red ●, see the *Network Diagnostic Mode* subsection below.

### Network Diagnostic Mode

In Network Diagnostic Mode, the RS485 LED provides status indications and the Setup Button is used for mode selection and navigation:

- 4 Setup Button
- 5 RS485 Status LED



(Note: This section only applies to the RS485 LED 5. If a diagnostic code appears on any other LED 1 2 3, continue to press the setup button until the RS485 LED is providing a Network Diagnostic Code and all other LEDs are dark.)

1. To enter Diagnostic Mode, press **P** the Setup Button 4. The first diagnostic code will be displayed on one of the LEDs, repeating every three seconds.
2. Match the LED location, color, and blink pattern to a condition in Table 2. Network Diagnostic Codes for the RS485 LED 5. (If the diagnostic code appears on LEDs 1 2 3, see Table 1. Diagnostic Codes for condition).
3. Press **P** Setup Button 4 to view next code and repeat Step 2.
4. Continue to diagnose conditions until there are no new codes to diagnose (codes are repeated).
5. To exit Diagnostic Mode, hold Setup Button 4 until all LEDs 1 2 3 light up (approximately 2 second 2s hold) and release. After 60 seconds on inactivity, the device will revert back to Normal Operation Mode.

### Diagnostic Mode Navigation Flowchart

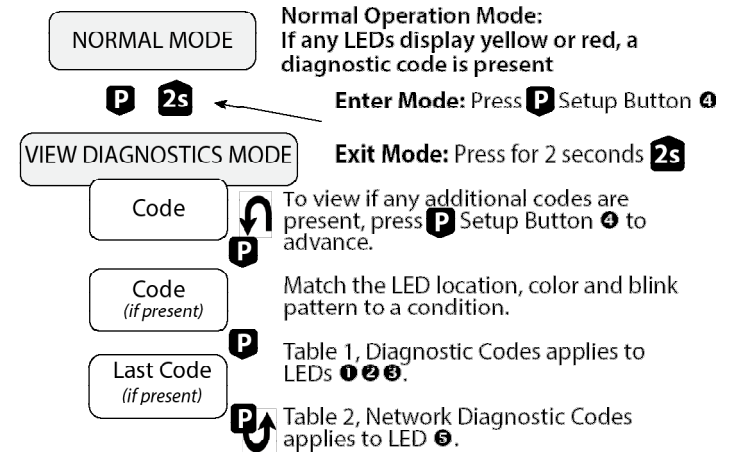


Table 2. Network Diagnostic Codes		
5 RS485 LED	Indication	Corrective Action
■	Noise Warning	Check line terminations, baud rate settings
■ ■	Lost Next Master	Allow device to continue network analysis. Confirm other devices on network are communicating properly ( <i>BACnet Only</i> )
■ ■ ■	No RS485 Traffic	Ensure device is on active network
■ ■ ■ ■	Dropped I-HAVE reply	Allow more time between WHO-HAS queries ( <i>BACnet Only</i> )
■ ■ ■ ■ ■	Detecting Baud Rate	Wait for enough network traffic to auto-detect or manually set using Edit Settings
■ ■ ■ ■ ■ ■	Detecting Protocol	Wait for enough network traffic to auto-detect or manually set using Edit Settings
■ ■ ■ ■ ■ ■ ■	Detecting Address	Ensure network has free MS/TP master addresses or manually set using Edit Settings ( <i>BACnet Only</i> )
■ ■ ■ ■ ■ ■ ■ ■	Address Collision	One or more devices have duplicated addresses
■ ■ ■ ■ ■ ■ ■ ■ ■	Parity Error	Check connection settings (protocol, baud rate, serial format, address)
■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Framing Error	Check serial formats and baud rate
■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Frame Too Large	Program controller for smaller frames

## ⑦ Configuration Settings

The EM-RS485 also allows for manual configuration of the following Setting Groups:

1. Address Assignment
2. Protocol Type Configuration
3. Baud Rate Configuration
4. Serial Format Configuration
5. PowerPrint 'Power Quality Alarm' Options

This section will further define the Auto-Detection Settings and detail alternative settings that can be manually selected in *Section 8 - View and Edit Settings*.

### Setting 1. Address Assignment

The EM-RS485 is designed to self-address without user configuration.

**BACnet:** If the EM-RS485 is connected to a BACnet network, the meter will analyze the network traffic to detect an unused MAC address. The device will self-assign that MAC address to the meter. (See *Section 6 - Network Connectivity*)

**Modbus:** If the EM-RS485 is connected to a Modbus network, the meter default address will be between 100-199, based on the last two digits of the serial number. (See *Section 6 - Network Connectivity*)

For manual configuration, the EM-RS485 address can be set through the network utilizing the *EM BACnet Protocol Guide* or *EM Modbus Protocol Guide* documents or on the meter via *Section 8 - View/Edit Settings*.

Manual configuration address options: 1, 10, 77, 101, 149, 192. If the meter displays 'Other' in the View/Edit Settings Mode, the address has been manually assigned via the network.

### Setting 2. Protocol Type Configuration

The EM-RS485 is designed to automatically detect and configure to a BACnet or Modbus protocol. If the meter is transferred to a new network while in the default Auto-detect setting, it will reconfigure the protocol type to match the new network. Manual configuration of the protocol type is available via *Section 8 - View/Edit Settings*.

Manual configuration protocol options: BACnet; Modbus RTU; BACnet, Modbus RTU; Modbus ASCII; BACnet, Modbus ASCII; Modbus ASCII, Modbus RTU; BACnet, Modbus RTU, Modbus ASCII.

### Setting 3. Baud Rate Configuration

The EM-RS485 is designed to automatically detect and configure baud rate. In addition to the default setting for auto-detection of the baud rate, manual configuration of the baud rate is available via *Section 8 - View/Edit Settings*.

Manual configuration baud rate options: 9600, 19200, 38400, 57600, 76800, 115200. If the meter displays 'Other' in the View/Edit Settings, the meter has detected or been manually assigned a baud rate that is not listed above.

### Setting 4. Serial Format Configuration

The EM-RS485 includes auto-detection of data bits and parity of the network. The device will auto format to the correct setting. Manual configuration of the serial format is also available via *Section 8 - View/Edit Settings*.

Manual configuration serial format options: No parity, 8 data bits (BACnet default); No parity, 7 data bits; Even parity, 8 data bits (Modbus RTU default); Even parity, 7 data bits (Modbus ASCII default); Odd parity, 8 data bits; Odd parity, 7 data bits.

If the meter displays 'Other' in the View/Edit Settings, the meter serial format has been manually assigned via the network.

### Setting 5. PowerPrint 'Power Quality Alarm' Options

PowerPrint is a power quality alarm that enables the meter to learn and save characteristics of the system being monitored. Based on recorded values, the meter can provide alarm conditions and allow user to evaluate system status at a later time. The PowerPrint setting is off by default. When PowerPrint is turned on, the meter identifies each CVT connection and saves settings on the following parameters:

1. Which channels have a CVT connected
2. Unique identity of each CVT
3. Phase voltage
4. System frequency
5. Phase voltage angle

PowerPrint can only learn and save characteristics for channels with a properly installed CVT. If the CVT is displaying a warning or error condition during Normal Operation, take the corrective action to resolve the installation error prior to enabling PowerPrint.

PowerPrint can be enabled through *Section 8 - View/Edit Settings* or through the network utilizing the *EM BACnet Protocol Guide* or *EM Modbus Protocol Guide* documents.

Once PowerPrint has been turned on and the system characteristics have been saved, the conditions below will be displayed on the meter LEDs as a warning or error during Normal Operation (See *Section 4 - Normal Operation Mode*):

Alarm Condition	Parameter
Missing sensor	CVT missing on one or more channels
Unexpected sensor	CVT identity does not match original CVT saved in Powerprint
Brown out voltage	Voltage < 10% from saved voltage <sup>2</sup>
Surge voltage	Voltage > 10% from saved voltage <sup>2</sup>
Frequency drift <sup>1</sup>	Frequency not within +/-0.2Hz from saved frequency <sup>2</sup>
Phase drift	Phase voltage angle variance > +/-30° from saved angle <sup>2</sup>

<sup>1</sup>PowerPrint will not monitor frequency variance if system frequency is not 50 or 60Hz when PowerPrint is saved.  
<sup>2</sup>Parameters are configurable via the network. See the *EM BACnet Protocol Guide* or *EM Modbus Protocol Guide* documents.

**PowerPrint Diagnostic Codes:** The following codes are provided in addition to *Table 1. Diagnostic Codes* in *Section 5 - Diagnostics* with PowerPrint On:

Table 3. PowerPrint Diagnostic Codes		
CVT LEDs	Indication	Corrective Action
	Missing sensor	Reconnect original CVT to meter
	Unexpected sensor	Reconnect original CVT to meter
	Brown out voltage	Verify system voltage
	Surge voltage	Verify system voltage
Line LED	Indication	Corrective Action
	Frequency drift	Verify system voltage
	Phase drift	Verify system voltage

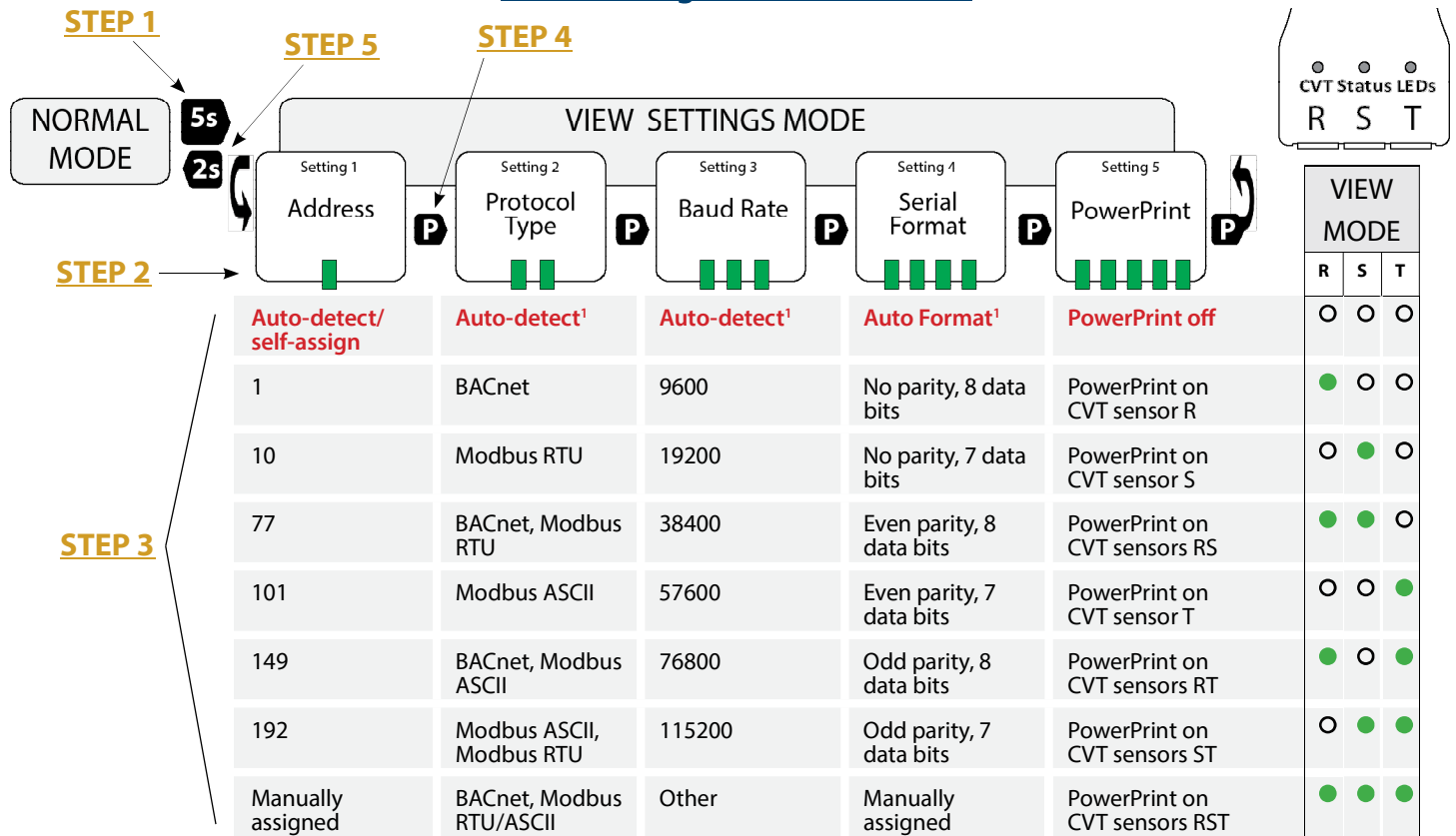
In addition to the LED indicators above, the PowerPrint can also be evaluated over the network. See the *EM BACnet Protocol Guide* or *EM Modbus Protocol Guide* documents.



## ⑧ View and Edit Settings

To view and edit the settings on the EM-RS485 meter, proceed through the steps below for manual configuration with the setup button and LEDs. For more advanced configuration, refer to the *EM BACnet Protocol Guide* or *EM Modbus Protocol Guide* documents.

### View Settings Mode Flowchart



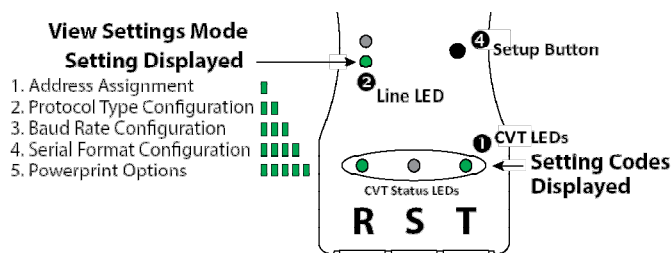
Red denotes default settings.

<sup>1</sup>Protocol Type, Baud rate and Serial Format auto-detection only displayed in Edit Settings Mode. In View Settings Mode, the detected baud rate that the meter has selected will be displayed.

### VIEW SETTINGS MODE

In View Settings Mode, Settings 1-5 will be accessible to view and confirm. The Line LED ② will indicate which Setting Group is being viewed with green ● blinks and the CVT LEDs ① will indicate the current setting in green. (Device will timeout and resume Normal Operation Mode after 60 seconds of no activity)

Use the following diagram and the View Settings Mode Flowchart to assist in working through Steps 1-5 to navigate the View Settings Mode in the EM-RS485 meter:



#### STEP 1 Enter View Settings Mode

From Normal Operation Mode, press and hold Setup Button ④ until Line LED ② rapidly blinks green ● (approximately 5 second 5s hold). Release and the meter is now in View Settings Mode.

#### STEP 2 Setting Group Identification

Line LED ② will blink green ● 1 to 5 times, repeating every 3 seconds, to indicate which Setting Group is being displayed in View Settings Mode. The column below each setting indicates all setting options.

#### STEP 3 Identify Current Setting

Match the CVT LED ① pattern on the meter to one of the options in the View Codes column to the far right. (The corresponding setting is listed in the same row under each Setting Group)

#### STEP 4 Advancing Through Function Groups

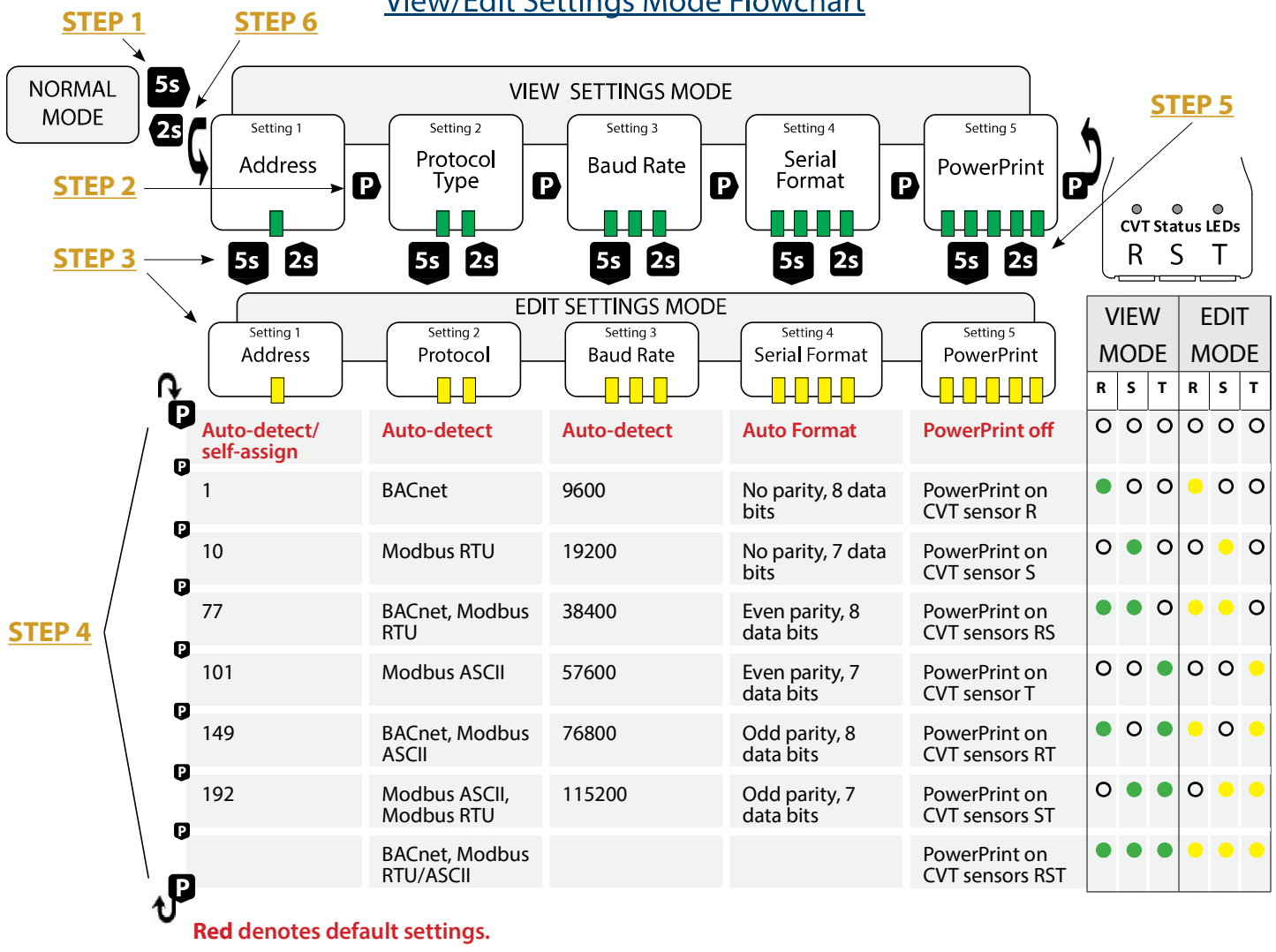
Press P the Setup Button ④. Line LED ② will blink green ● 1 to 5 times, repeating every 3 seconds, to indicate which Setting Group is being displayed.

#### STEP 5 Exit/Resume Normal Operation

Press and hold Setup Button ④ until Line LED ② rapidly blinks green ● (approximately 2 second 2s hold). Release to resume Normal Operation Mode. (Device will timeout and resume Normal Operation Mode after 60 seconds of no activity)



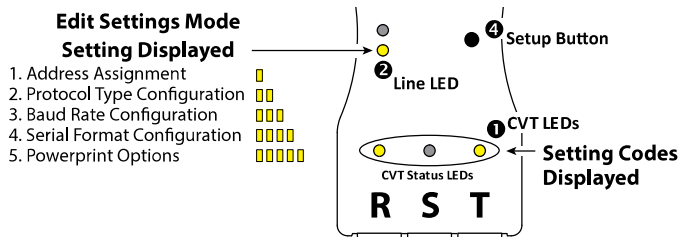
## View/Edit Settings Mode Flowchart



### EDIT SETTINGS MODE

In Edit Settings Mode, Setting Groups 1-5 can be modified. The Line LED 2 will indicate which Setting Group is being viewed with yellow blinks and the CVT LEDs 1 will indicate the current setting in yellow.

Use the following diagram in conjunction with the View Settings section to assist in working through Steps 1-6 to navigate the Edit Settings Mode in the EM-RS485 meter:



#### STEP 1 Enter View Settings Mode

Enter View Settings Mode from Normal Operation Mode. (Press and hold Setup Button 4 until Line LED 2 rapidly blinks green ● - approximately 5 second 5s hold)

#### STEP 2 Setting Group Identification

Press P Setup Button 4 until Setting Group that requires a setting change is displayed on the Line LED 2 in green ●.

#### STEP 3 Enter Edit Settings Mode

Press and hold Setup Button 4 until Line LED 2 appears solid yellow ● (approximately 5 second 5s hold). Release and meter is in Edit Settings Mode. (Confirm the Line LED 2 is blinking yellow ● 1 to 5 times, corresponding with the Setting Group you want to edit)

#### STEP 4 Edit Setting

The current setting will be displayed on the CVT LEDs 1 in yellow ● (representing Edit Mode). Press P the Setup Button 4 to match the CVT LED 1 pattern to the meter to one of the options in the Edit Codes column to the far right. (The corresponding setting is listed in the same row under each Setting Group)

#### STEP 5 Save Selected Setting

With the desired setting displayed on the CVT LEDs 1 in yellow ●, press and hold the Setup Button 4 until the Line LED 2 rapidly blinks green ● (approximately 2 second 2s hold). Release and you are returned to View Settings Mode with your new setting saved.

#### STEP 6 Exit/Resume Normal Operation Mode

From View Settings Mode, you may exit back to Normal Operation Mode (press and hold Setup Button 4 until Line LED 2 rapidly blinks green ●) or repeat actions from Step 2 to edit additional settings. (Device will timeout and resume Normal Operation Mode after 60 seconds of no activity)



## ⑨ Specifications

Power Supply Input		12-30VDC/24VAC <sup>(1)</sup> , 1.5W max, 100mA max.
Output	RS-485	2-wire, BACnet MS/TP, Modbus RTU, Modbus ASCII
	Baud Rates	9600, 19200, 38400, 57600, 76800, 115200
	RS-485 Loading	1/4 unit
Wiring Requirements	Conductor gauge	12-24 AWG
	Terminal torque rating	0.37 ft-lb (0.50 N•m)
Pulse Inputs	Input Rating	3.5 +/- 0.5 VDC, short circuit current is 10mA max
	Pulse Rate	50 Hz (default), configurable up to 500 Hz
	Pulse Active	<100 ohms
	Pulse Undefined	100-1000 ohms
	Pulse Idle	>1000 ohms
Service Types	Configurations	1Ph, 2Ph, 3Ph Wye (4-Wire), 3Ph Delta (3-Wire)
	Voltages	90VL-N through 600VL-L
	Frequency	45-65 Hz
Performance	Meter Accuracy	<b>0.2% (ANSI C12.20 Class 0.2 standards)</b>
	System Accuracy	<b>1% for V, A, kW, kVAR, kVA</b>
Current/Voltage Transducer™	Small Rope Circumference	9"
	Medium Rope Circumference	15"
	Large Rope Circumference	24"
	Grande Rope Circumference	36"
	300A Operating Range <sup>(2)</sup>	+/-1% 30-300A (+/-3% >10A)
	800A Operating Range <sup>(2)</sup>	+/-1% 30-800A (+/-3% >10A)
	1500A Operating Range <sup>(2)</sup>	+/-1% 30-1500A (+/-3% >10A)
2400A Operating Range <sup>(2)</sup>	+/-1% 50-2400A (+/-3% >15A)	
6000A Operating Range <sup>(2)</sup>	+/-1% 120-6000A (+/-3% >40A)	
Operating Environment	Temperature	-4 to 140F (-20 to 60C)
	Humidity	0-95% non-condensing
Meter Enclosure	Material	Polycarbonate/ABS
	Dimensions	4.1"h x 1.8"w x 0.9"d
CVT™ Enclosure	Material	Polycarbonate/ABS
	Enclosure Dimensions	3.5"h x 1.6"w x 0.8"d

(1) One side of transformer secondary is connected to signal common. Dedicated transformer is recommended.

(2) CVT™ Accuracy based on reading, not full scale.