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

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

EM Modbus Protocol Guide
- 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 II low voltage device for mounting flexibility. See *Section 9 - Specifications* for recommended conductor gauge and terminal tightening torque.
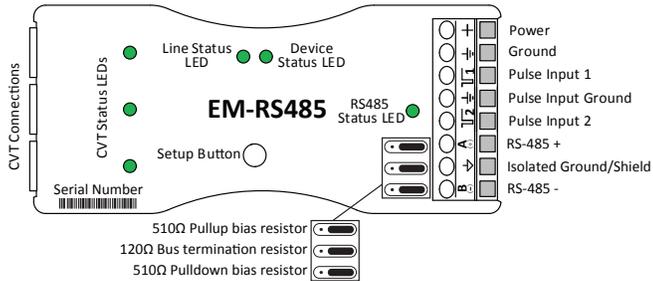
Current/Voltage Transducer (CVT)

The Current/Voltage Transducer (CVT) sensor senses both current and voltage. Each CVT sensor is independently calibrated and uses digital communication with the meter for superior noise immunity and superior accuracy. Each CVT sensor 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.
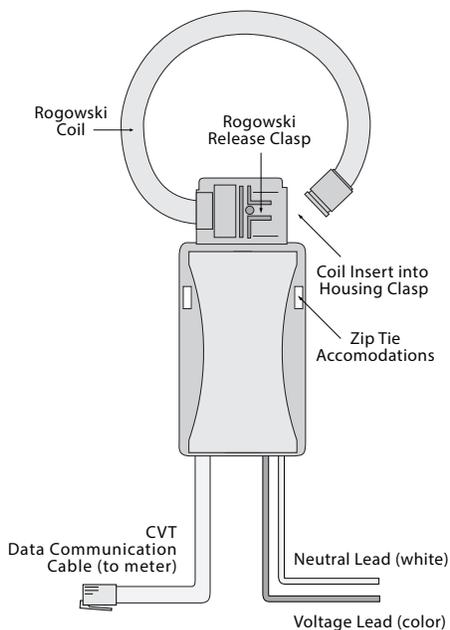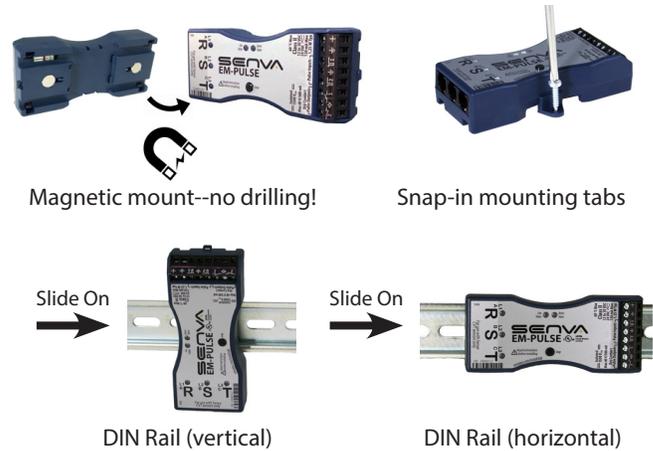

Opening the CVT Clasp

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.

Magnetic mount--no drilling!   Snap-in mounting tabs

Slide On   Slide On

DIN Rail (vertical)   DIN Rail (horizontal)

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.

Wire tie

Label Facing Out
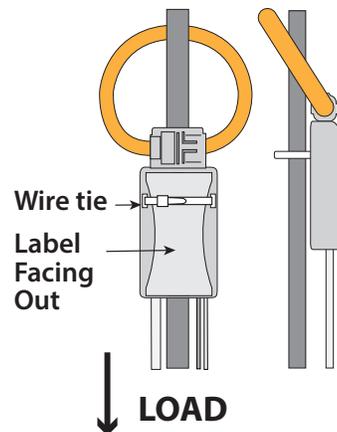
LOAD

❗ 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 II 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

Provide a disconnect method to disconnect the meter from the supply source. In the U.S. and Canada, disconnecting fuse holders can be used. Place this device in close proximity to the meter 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.

TYPICAL 3Ø WIRING 90 to 600VAC
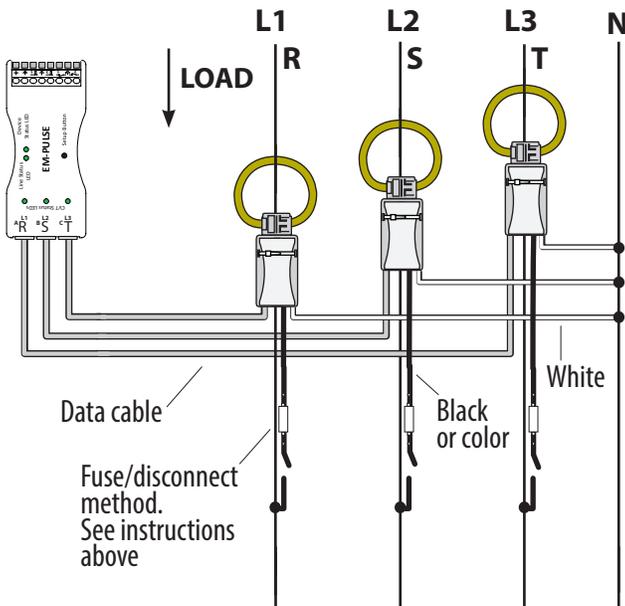
TYPICAL 1Ø WIRING
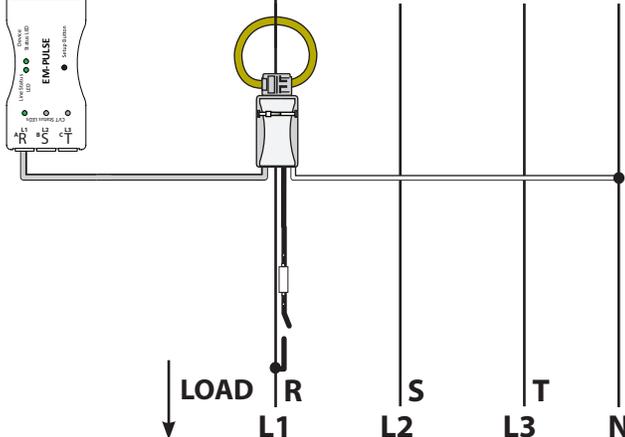
If no neutral is present, clip and cap each CVT sensor's neutral (white) wire.

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 requirments. See illustration below which shows locations of jumpers and values.

RS485 WIRING CONNECTIONS
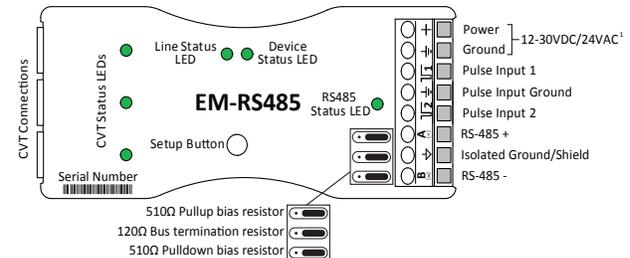
[1] One side of transformer secondary is connected to signal common. Dedicated transformer is recommended

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
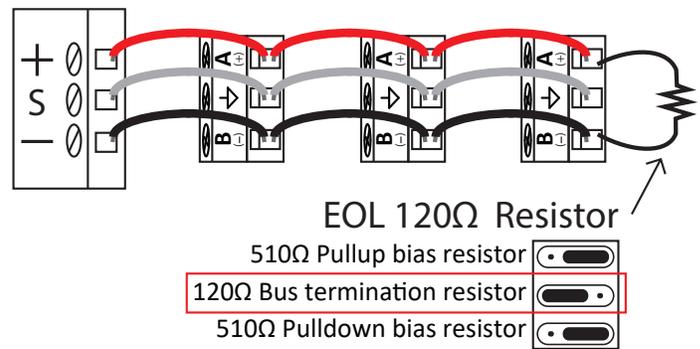
PULSE INPUT WIRING

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)*
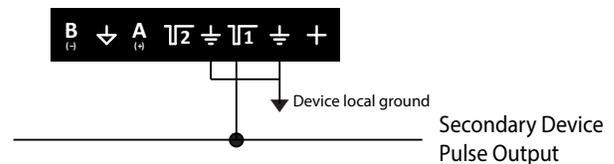
④ Normal Operation Mode

When powered, the EM-RS485 meter will begin Normal Operation Mode. 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
- ❺ RS485 Status LED
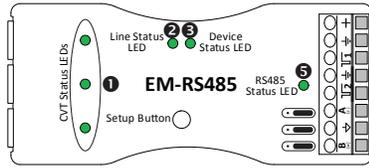
The color of each LED will indicate conditions of the system:

- 🟢 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 ❺ 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 appear yellow 🟡 or red 🔴 (blinking or solid) proceed to *Section 5 - Diagnostics*.

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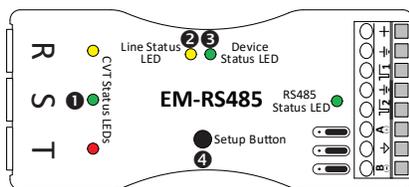
Diagnostic Mode is only available if any LEDs ❶❷❸ display yellow 🟡 or red 🔴 in Normal Operation Mode.

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

1. To enter Diagnostic Mode, press 🄿 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 🄿 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

NORMAL MODE

Normal Operation Mode: If any LEDs display yellow or red, a diagnostic code is present

🄿 2s

Enter Mode: Press 🄿 Setup Button ❹

VIEW DIAGNOSTICS MODE

Exit Mode: Press for 2 seconds 2s

Code

🄿 To view if any additional codes are present, press 🄿 Setup Button ❹ to advance.

Code *(if present)*

🄿 All LEDs ❶❷❸ may display appropriate codes. Match the LED location, color and blink pattern to a condition in Table 1, Diagnostic codes.

Last Code *(if present)*

🄿
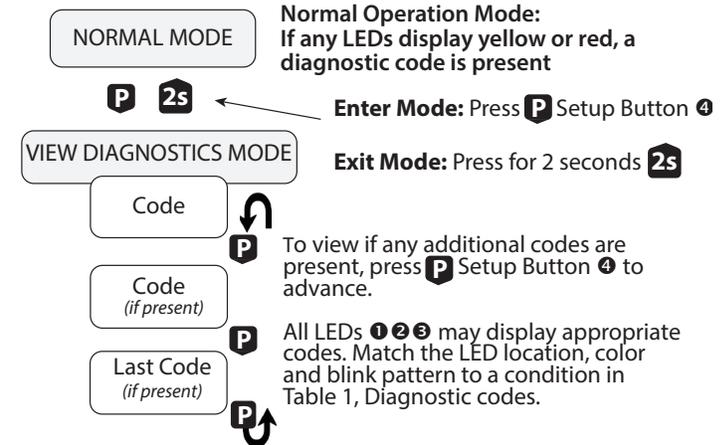
Table 1. Diagnostic Codes		
❶ **CVT LEDs**	**Indication**	**Corrective Action**
🟨🟨🟨	Low power factor (<0.5)	If not low PF, ensure voltage legs match with CVTs
🟨 🟨	Phase Loss	Check phase voltage and current
🟨	Negative power	Verify CVT orientation toward load
🟨🟨🟨	Over voltage	Ensure system voltage does not exceed 600VAC
🟨🟨🟨	Over current	The amperage measurement of the CVT has exceeded the threshold for maximum accuracy

❷ **Line LED**	**Indication**	**Corrective Action**
🟨🟨🟨	Not a three phase system	Verify system type
🟨🟨🟨	Reversed Phase Order	Swap any two CVT meter inputs if not intentional
🟨🟨🟨	Mismatched voltages on power sensors	Ensure desired voltages are being monitored

❸ **Device LED**	**Indication**	**Corrective Action**
🟨🟨	Low supply voltage	Ensure voltage to meter is 12-30VDC/24VAC
🟨🟨🟨🟨	Temperature warning	Relocate meter to suitable environment

For diagnostic conditions that do not match a blink pattern in the table above, please contact Senva support for additional assistance.

For RS485 LED ❺ diagnostics see 'Section 6 - Network Connectivity'

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 and begin auto-configuration. The EM-RS485 will detect and match baud rate, parity, stop bits and identify the first available 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 ❺ should display approximately 15-30 seconds of blinking activity in yellow 🟡 while the meter configures itself to the network.
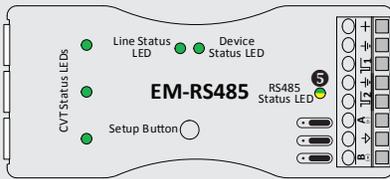
4. The RS485 LED ❺ will appear green 🟢 after the meter has discovered the protocol type, baud rate, serial format, and assigned an available MAC address. If the RS485 LED does not appear green, see the *Network Activity* subsection.

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 ❺ should display approximately 15-30 seconds of blinking activity in yellow 🟡 while the meter configures itself to the network.
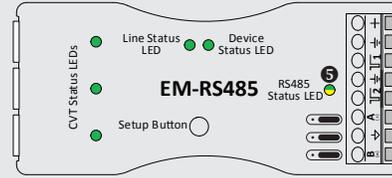
4. The RS485 LED ❺ will appear green 🟢 after the meter has discovered and set the protocol type, baud rate and serial format. If the RS485 LED does not appear green, see the *Network Activity* subsection.

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 utilzing 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 ❺ will blink steadily green ●. 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:

❹ Setup Button

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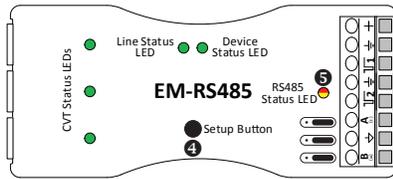
(*Note: This section only applies to the RS485 LED ❺. If a diagnostic code appears on any other LED ❶❷❸, continue to press the setup button until the RS485 LED is providing a Network Diagnostic Code and all other LEDs are dark.*)

1. To enter Diagnostic Mode, press 🅿 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 2. Network Diagnotic Codes for the RS485 LED ❺. (If the diagnostic code appears on LEDs ❶❷❸, see Table 1. Diagnostic Codes for condition).

3. Press 🅿 Setup Button ❹ 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 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

Normal Operation Mode:
If any LEDs display yellow or red, a diagnostic code is present

Enter Mode: Press 🅿 Setup Button ❹

Exit Mode: Press for 2 seconds 2s

To view if any additional codes are present, press 🅿 Setup Button ❹ to advance.

Match the LED location, color and blink pattern to a condition.

Table 1, Diagnostic Codes applies to LEDs ❶❷❸.

Table 2, Network Diagnostic Codes applies to LED ❺.
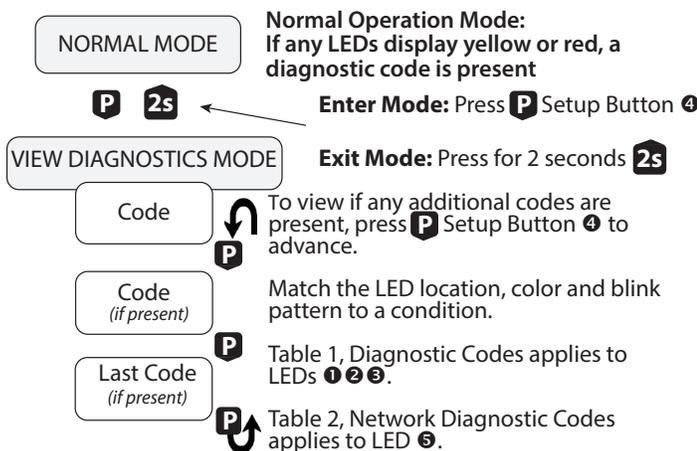
❺ RS485 LED	Indication	Corrective Action
Table 2. Network Diagnostic Codes		
	Noise Warning	Check line terminations, baud rate settings
	No RS485 Traffic	Ensure device is on active network
	Detecting Baud Rate	Wait for enough network traffic to auto-detect or manually set using Edit Settings
	Detecting 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 *(BACnet Only)*
	Lost Next Master	Allow device to continue network analysis. Confirm other devices on network are communicating properly *(BACnet Only)*
	Dropped I-HAVE reply	Allow more time between WHO-HAS queries *(BACnet Only)*
	Parity Error	Check connection settings (protocol, baud rate, serial format, address)
	Framing Error	Check serial formats and baud rate
	Address Collision	One or more devices have duplicated addresses
	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*):

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[2]
Surge voltage	Voltage > 10% from saved voltage[2]
Frequency drift[1]	Frequency not within +/-0.2Hz from saved frequency[2]
Phase drift	Phase voltage angle variance > +/-30° from saved angle[2]

[1]PowerPrint will not monitor frequency variance if system frequency is not 50 or 60Hz when PowerPrint is saved.

[2]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		
❶ 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

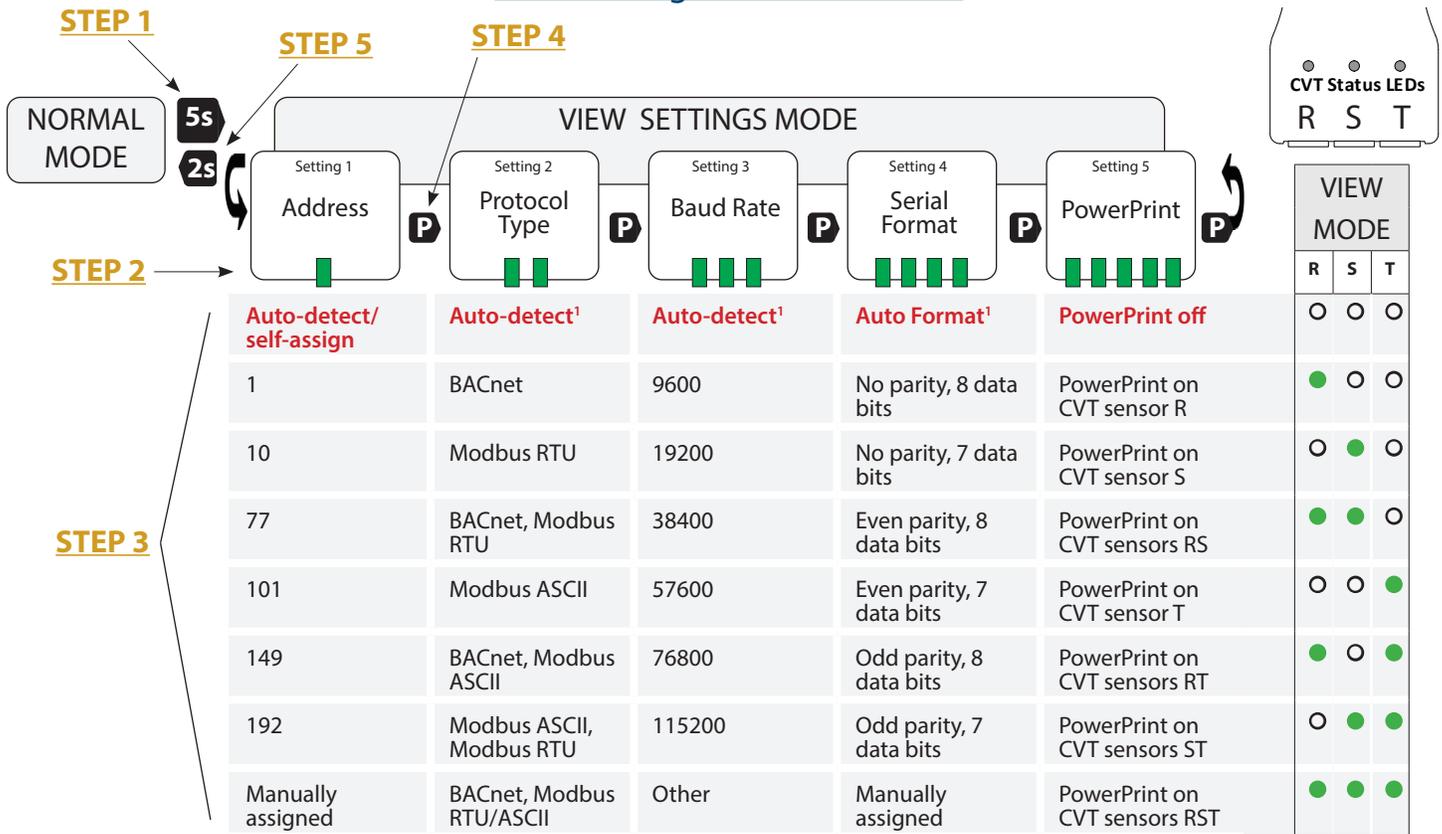| ❷ Line LED	Indication	Corrective Action
🟨🟨🟨🟨	Frequency drift	Verify system voltage
🟨🟨🟨🟨	Phase drift	Verify system voltage

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.
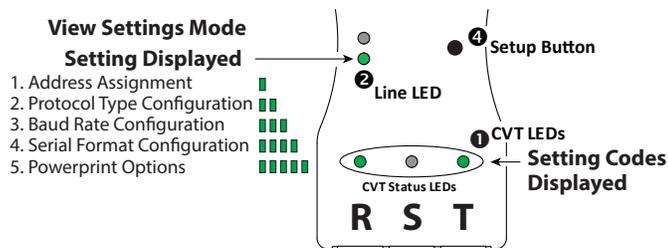
View Settings Mode Flowchart

STEP 1 **STEP 5** **STEP 4**

NORMAL MODE — 5s / 2s — VIEW SETTINGS MODE

CVT Status LEDs
R S T

	Setting 1 Address	Setting 2 Protocol Type	Setting 3 Baud Rate	Setting 4 Serial Format	Setting 5 PowerPrint	VIEW MODE R	S	T
	Auto-detect/ self-assign	**Auto-detect[1]**	**Auto-detect[1]**	**Auto Format[1]**	**PowerPrint off**	○	○	○
	1	BACnet	9600	No parity, 8 data bits	PowerPrint on CVT sensor R	●	○	○
	10	Modbus RTU	19200	No parity, 7 data bits	PowerPrint on CVT sensor S	○	●	○
	77	BACnet, Modbus RTU	38400	Even parity, 8 data bits	PowerPrint on CVT sensors RS	●	●	○
	101	Modbus ASCII	57600	Even parity, 7 data bits	PowerPrint on CVT sensor T	○	○	●
	149	BACnet, Modbus ASCII	76800	Odd parity, 8 data bits	PowerPrint on CVT sensors RT	●	○	●
	192	Modbus ASCII, Modbus RTU	115200	Odd parity, 7 data bits	PowerPrint on CVT sensors ST	○	●	●
	Manually assigned	BACnet, Modbus RTU/ASCII	Other	Manually assigned	PowerPrint on CVT sensors RST	●	●	●

Red denotes default settings.

[1]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 ❷ will indicate which Setting Group is being viewed with green blinks and the CVT LEDs ❶ 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:

View Settings Mode Setting Displayed
1. Address Assignment
2. Protocol Type Configuration
3. Baud Rate Configuration
4. Serial Format Configuration
5. Powerprint Options

❹ Setup Button
❷ Line LED
❶ CVT LEDs
Setting Codes Displayed
CVT Status LEDs
R S T

STEP 1 Enter View Settings Mode

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

STEP 2 Setting Group Identification

Line LED ❷ 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 ❶ pattern you see 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 ❹. Line LED ❷ 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 ❹ until Line LED ❷ 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

Flowchart showing STEP 1 through STEP 6, NORMAL MODE (5s / 2s), VIEW SETTINGS MODE with Setting 1 Address, Setting 2 Protocol Type, Setting 3 Baud Rate, Setting 4 Serial Format, Setting 5 PowerPrint (each followed by P, with 5s and 2s); EDIT SETTINGS MODE with Setting 1 Address, Setting 2 Protocol, Setting 3 Baud Rate, Setting 4 Serial Format, Setting 5 PowerPrint; CVT Status LEDs R S T.

Address	Protocol	Baud Rate	Serial Format	PowerPrint	VIEW MODE R	S	T	EDIT MODE R	S	T
Auto-detect/ self-assign	Auto-detect	Auto-detect	Auto Format	PowerPrint off	⚪	⚪	⚪	⚪	⚪	⚪
1	BACnet	9600	No parity, 8 data bits	PowerPrint on CVT sensor R	🟢	⚪	⚪	🟡	⚪	⚪
10	Modbus RTU	19200	No parity, 7 data bits	PowerPrint on CVT sensor S	⚪	🟢	⚪	⚪	🟡	⚪
77	BACnet, Modbus RTU	38400	Even parity, 8 data bits	PowerPrint on CVT sensors RS	🟢	🟢	⚪	🟡	🟡	⚪
101	Modbus ASCII	57600	Even parity, 7 data bits	PowerPrint on CVT sensor T	⚪	⚪	🟢	⚪	⚪	🟡
149	BACnet, Modbus ASCII	76800	Odd parity, 8 data bits	PowerPrint on CVT sensors RT	🟢	⚪	🟢	🟡	⚪	🟡
192	Modbus ASCII, Modbus RTU	115200	Odd parity, 7 data bits	PowerPrint on CVT sensors ST	⚪	🟢	🟢	⚪	🟡	🟡
Manually assigned	BACnet, Modbus RTU/ASCII	Other	Manually assigned	PowerPrint on CVT sensors RST	🟢	🟢	🟢	🟡	🟡	🟡

Red denotes default settings.

EDIT SETTINGS MODE

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

Use the following diagram in conjuction with the View Settings section to assist in working through Steps 1-6 to navigate the Edit Settings Mode in the EM-RS485 meter. Ensure you can navigate the View Settings Mode before advancing:

Edit Settings Mode Setting Displayed
1. Address Assignment
2. Protocol Type Configuration
3. Baud Rate Configuration
4. Serial Format Configuration
5. Powerprint Options

❹ Setup Button
❷ Line LED
❶ CVT LEDs
Setting Codes Displayed
CVT Status LEDs R S T

STEP 1 Enter View Settings Mode

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

STEP 2 Setting Group Identification

Press **P** Setup Button ❹ until Setting Group that requires a setting change is displayed on the Line LED ❷.

STEP 3 Enter Edit Settings Mode

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

STEP 4 Edit Setting

The current setting will be displayed on the CVT LEDs ❶ in yellow (representing Edit Mode). Press **P** the Setup Button ❹ to match the CVT LED ❶ pattern you see on 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)
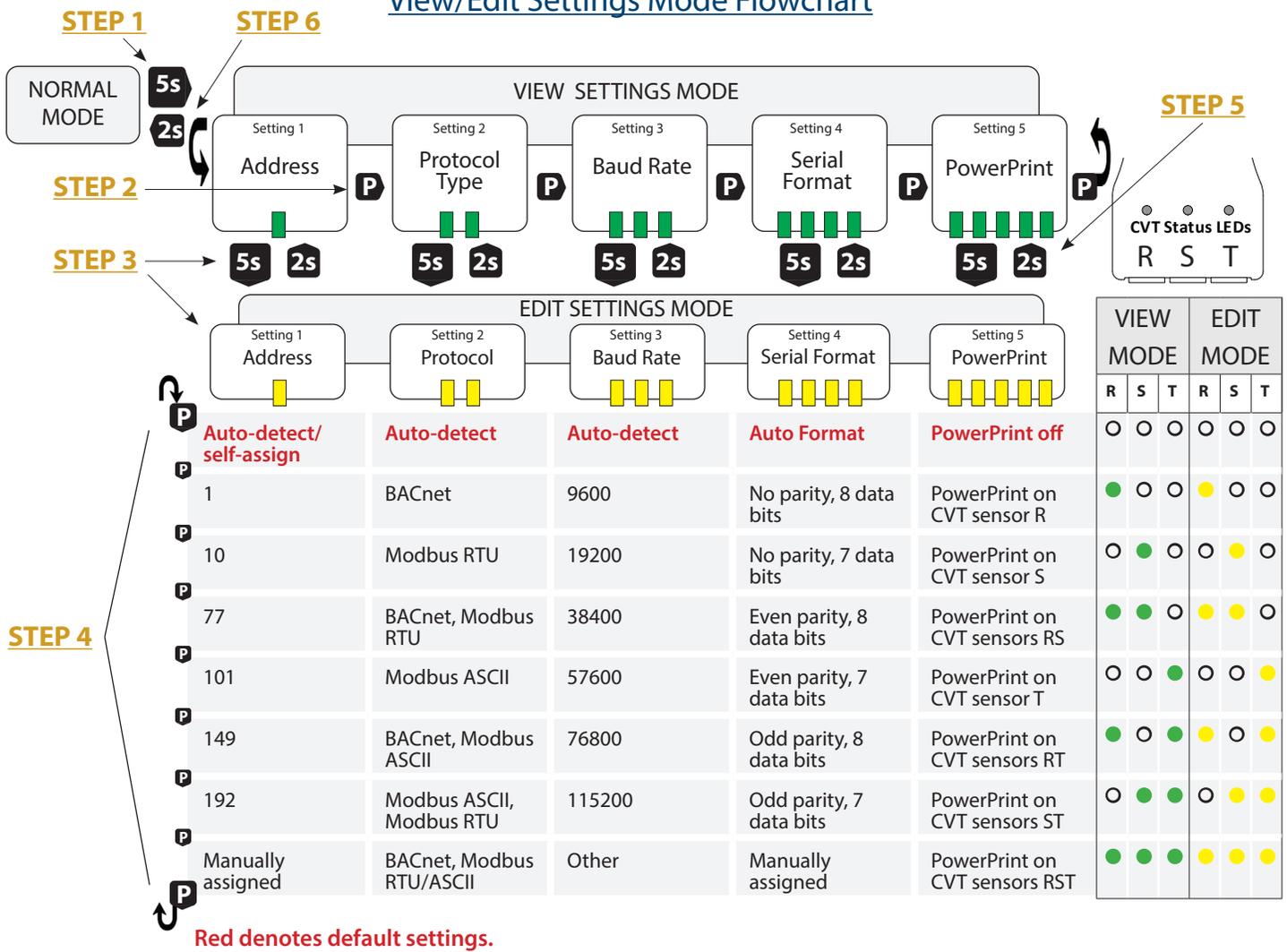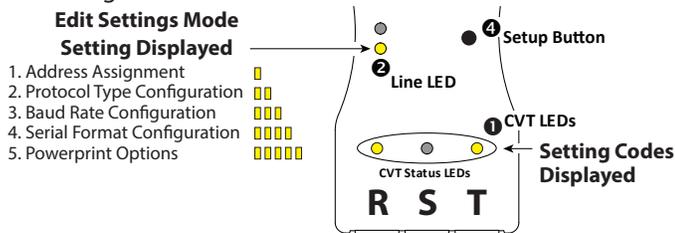
STEP 5 Save Selected Setting

With the desired setting displayed on the CVT LEDs ❶ in yellow, press and hold the Setup Button ❹ until the Line LED ❷ 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 ❹ until Line LED ❷ 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[1], 100mA max.
Output	RS-485	2-wire, BACnet MS/TP, Modbus RTU
	Baud Rates	9600, 19200, 38400, 57600, 76800, 115200
	RS-485 Loading	1/4 unit
Wiring Requirements	Conductor gauge	14-26 AWG
	Terminal torque rating	0.5 min, 0.6 max
Pulse Inputs	Dual Inputs	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	Accuracy	1% for V, A, kW, kVAR, kVA
Operating Environment	Temperature	32 to 140F (0 to 60C)
	Humidity	0-95% non-condensing
Meter Enclosure	Material	Polycarbonate/ABS
	Dimensions	4.1"h x 1.8"w x 0.9"d
Rogowski CVT™	Material	Polycarbonate/ABS
	Enclosure Dimensions	3.5"h x 1.6"w x 0.8"d
	Small Rope Circumference	9"
	Medium Rope Circumference	15"
	Large Rope Circumference	24"
	Grande Rope Circumference	36"
	Lead Lengths	3', 6' or 10'

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

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