STARLINE M70

Critical Power Monitor

User Manual

Starline®

A brand of legrand®

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Changelog

REV	DESCRIPTION	DATE
1.03	Initial Release	July 2024
1.04	1.04 Manual Release	Feb 2025

Introduction AC Meters

The STARLINE CPM M70 series is an electrical energy meter compatible with three phase delta or wye power distribution systems. The STARLINE CPM is integrated into plug-in units for the STARLINE Track Busway electrical distribution system, and provides an easy, effective way to monitor electrical parameters throughout the system.

This manual discusses the features, installation, setup, and maintenance of the STARLINE CPM M70 series. Throughout this document, the term “meter” and STARLINE CPM may be used to identify the STARLINE M70 Series of meters.

As the meter is a device integrated into many different variations of distribution hardware, this manual does not provide hardware-specific instructions for all installations of the meter.

This manual pertains to firmware version 1.03.

Hazards

Read these instructions thoroughly before attempting to install, operate, service, or maintain the STARLINE CPM. Electrical equipment should be installed, operated, serviced, and maintained by trained and qualified electrical technicians. Starline assumes no responsibility for the misuse or mishandling of electrical equipment.

Electrical specifications

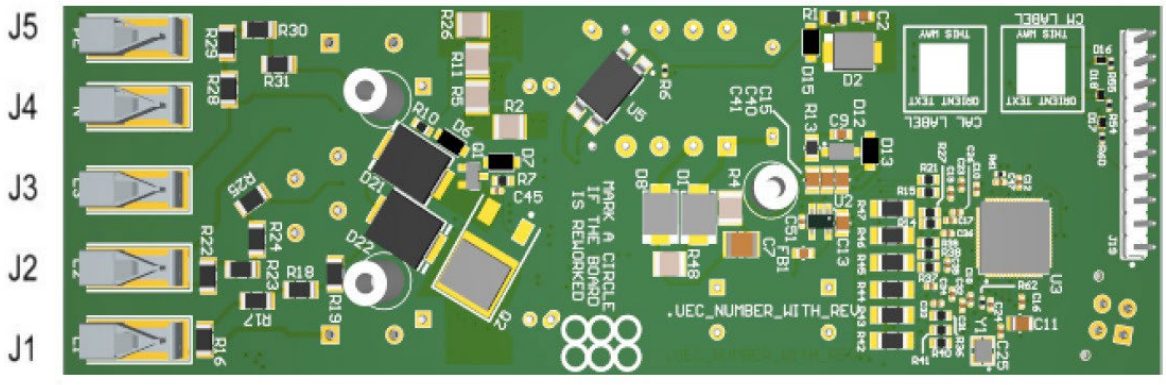
The STARLINE CPM can provide revenue grade energy metering in three phase delta or wye power distribution systems.

Parameters

- 3 Line currents per system input or “feed”
- Neutral current
- Line-line and Line-neutral voltages
- Feed active power per phase
- Feed total active power
- Feed apparent power per phase
- Feed total apparent power
- Feed power factor
- Frequency
- Feed energy per phase
- Feed total energy
- Up to 3-line currents per system output or “outlet”
- Outlet neutral current
- Outlet total active power
- Outlet total apparent power
- Outlet power factor
- Outlet total energy

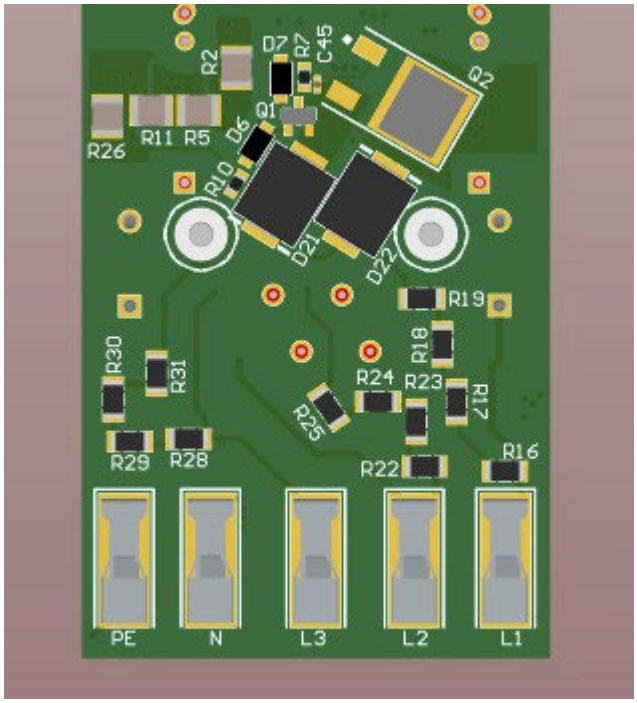
Input Ratings

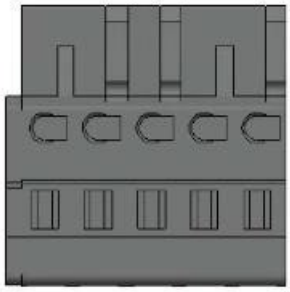
- Voltage Input Minimum (Line): 120 - 20% VAC (1Ø), 50/60Hz, 12VA
- Voltage Input Maximum (Line): 480 + 10% VAC (3Ø), 50/60Hz, 12VA
- Current Measuring Input (J2 input): ±0.25 VPeak (To be customized according to Current Transformer rating and selected burden resistor)
- Pollution Degree 2
- UL/IEC 61010-1:
  - Overvoltage Category III
  - Measurement Category III



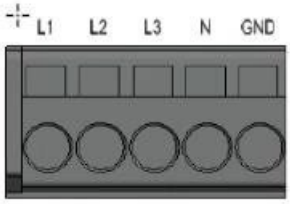
Connector Pinout

Voltage Pinout (Left) & Female Connector Diagram (Right)



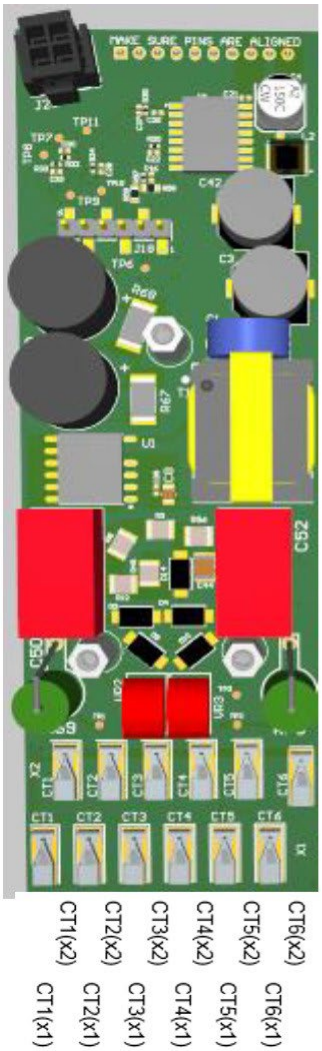


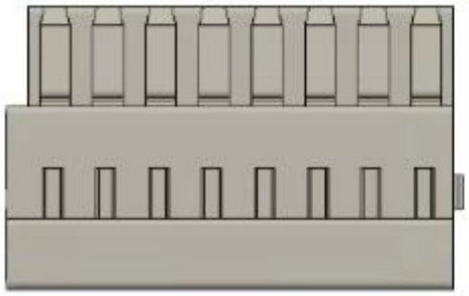
TOP VIEW



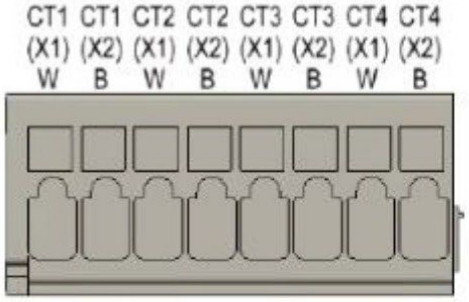
FRONT VIEW

Current Input Pinout (Left) & Female Connector Diagram (Right)





TOP VIEW



FRONT VIEW

Accuracy

- Line-neutral voltage: 0.5% reading
- Line-line voltage: 0.5% reading
- Frequency: ± 0.1 Hz
- Current: 0.5% reading.[1]
- Power factor: 1.0% reading
- Power and energy measurements: (kW, kVA, kVAR, kWh) ANSI C12.20 Class 0.5

Operating Conditions

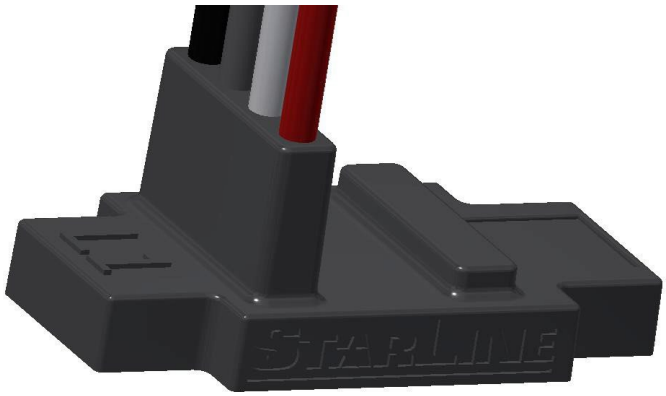
- Operating temperature range.[2]: 0 °C – 70 °C (32 °F – 158 °F)
- Storage temperature range: -40 °C – 85 °C (-40 °F – 185 °F)
- Humidity: 5% - 95% non-condensing

CPM Temperature Monitor

The STARLINE CPM can provide end feed temperature measurements for phases, neutral and the end feed enclosure; this feature is only available for end feeds.

Input Rating

+ 12 VDC (provided by the M70 CPM)



Accuracy

Temperature accuracy: ± 1.5 °C

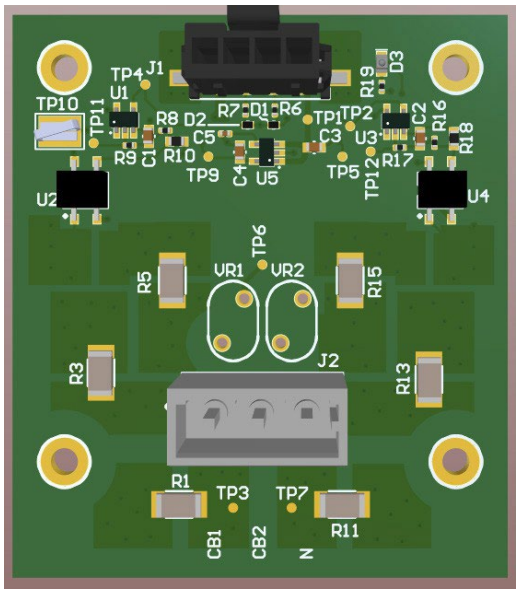
Breaker Status Monitoring, Two-Outlet

The STARLINE CPM can provide breaker status monitoring for up to two outlets. Breaker status monitoring is only available on M70 CPM in tap box units.

[1] The STARLINE CPM provides a calculated neutral value that may have an error in excess of 0.5% for high harmonic systems. The measured values, those obtained with current transformers, remain accurate in high harmonic systems.
[2] This temperature range is for the core CPM, accessories will have different operating temperatures (e.g. temperature sensors)

Input Ratings

- Voltage Input Minimum (Line): 120/208V - 20% VAC (1Ø), 50/60Hz, 1.25 VA
- Voltage Input Maximum (Line): 277/480V + 10% VAC (1Ø), 50/60Hz, 1.25 VA
  - This accessory does not support delta systems (system must have a neutral)
- Overvoltage Category III
- Pollution Degree 2



Connector Pinout

Voltage Input:

J2, CB1 (Overcurrent Protection Device Input #1)

J2, CB2 (Overcurrent Protection Device Input #2)

J2, N

Introduction DC Meters

The STARLINE CPM M70 series is a DC electrical energy meter compatible with DC power distribution systems. The STARLINE CPM is integrated into plug-in units for the STARLINE Track Busway electrical distribution system, and provides an easy, effective way to monitor electrical parameters throughout the system.

This manual discusses the features, installation, setup, and maintenance of the STARLINE CPM M70 series. Throughout this document, the term “meter” and STARLINE CPM may be used to identify the STARLINE CPM M70 series of meters. As the meter is a device integrated into many different variations of distribution hardware, this manual does not provide hardware-specific instructions for all installations of the meter.

Hazards

Read these instructions thoroughly before attempting to install, operate, service or maintain the M70 STARLINE CPM. Electrical equipment should be installed, operated, serviced, and maintained by trained and qualified electrical technicians. Universal Electric Corp. assumes no responsibility for the misuse or mishandling of electrical equipment.

Electrical specifications

The M60 STARLINE CPM can provide highly accurate energy metering in DC power distribution systems.

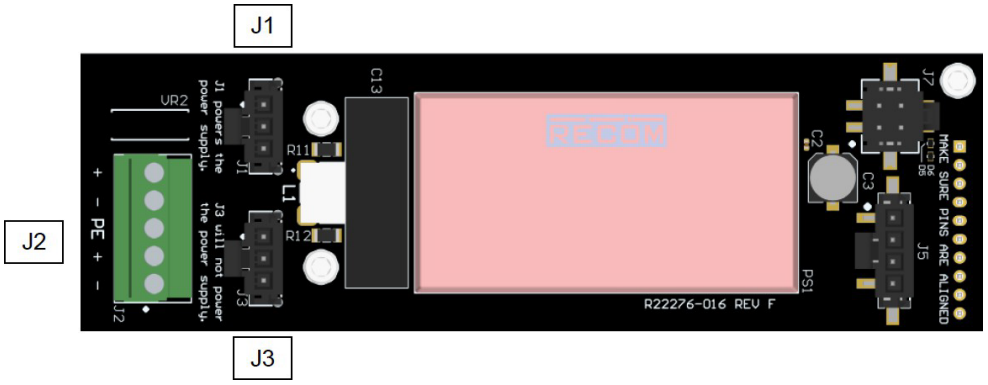
Parameters

- Power of each independent circuit (“1” and “2”)
- The total power of both circuits combined
- Power of each outlet, up to 4 outlets.
- Energy of each independent circuit (“1” and “2”)
- The total energy of both circuits combined
- Energy of each outlet, up to 4 outlets.
- Demand – current and power

Input Ratings

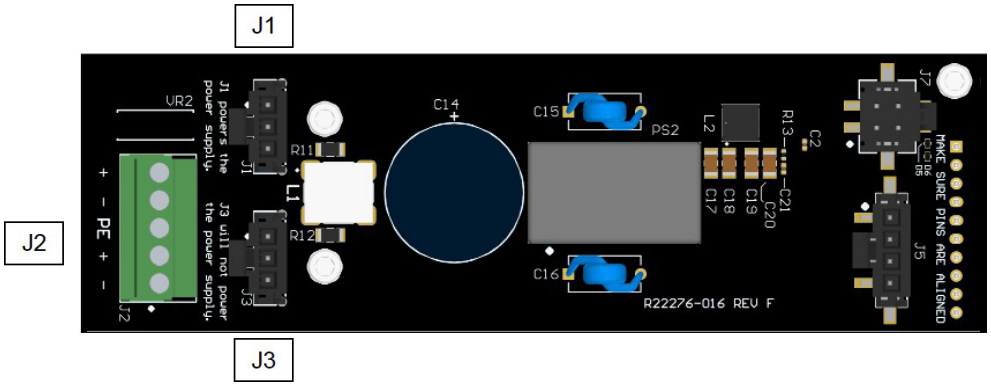
Control input – Power Supply Board (High Voltage):

- The control input is on the Power Supply Board (J2 connector shown below). There are two different voltage applications that the M70 can support:
  - Single phase: 120Vdc-300Vdc, 8VA
  - Split phase: 120Vdc-380Vdc Line to line (+/-190V line to ground), 8VA



Control input – Power Supply Board (48Vdc):

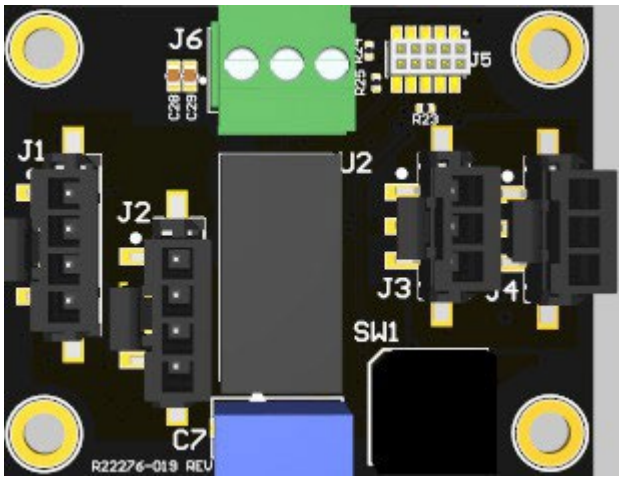
- The control input is on the Power Supply Board (J2 connector shown below). This design can support 48Vdc, 10VA.



Measuring Inputs – Sensor Board:

- The current and voltage measurements are taken on a secondary PCB (shown below):
  - Current measuring input – J6 input shown below: +/-0.25Vpeak (To be customized according to Current Transformer rating)
  - Voltage measuring input –J3 or J4 input shown below.

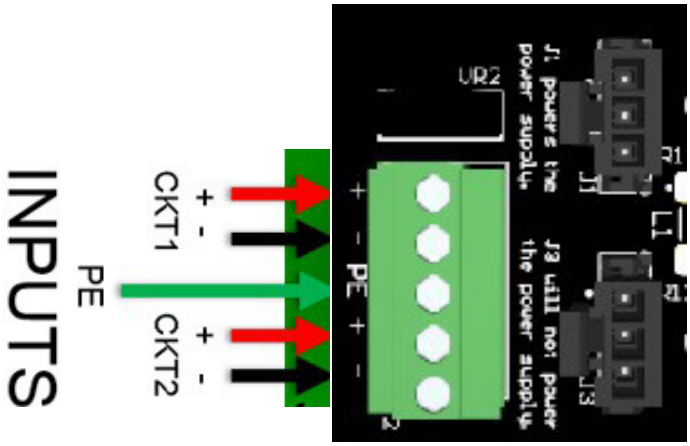
J6



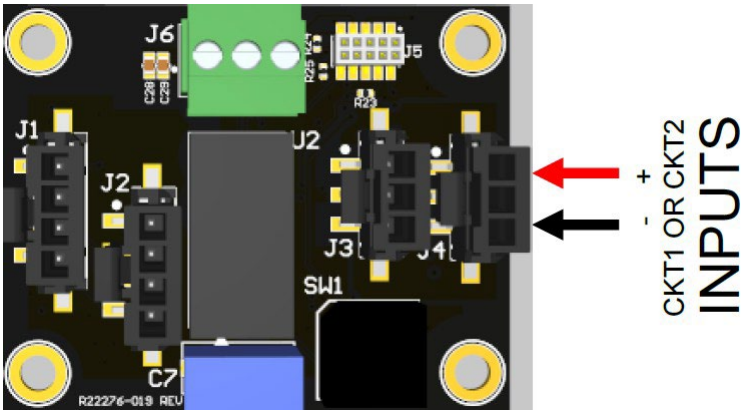
J3 OR J4

Connector Pinout

- Control input:
  - J2.1, CIRCUIT 1 +
  - J2.2, CIRCUIT 1 -
  - J2.3, PROTECTIVE EARTH
  - J2.4, CIRCUIT 2 +
  - J2.5, CIRCUIT 2 –

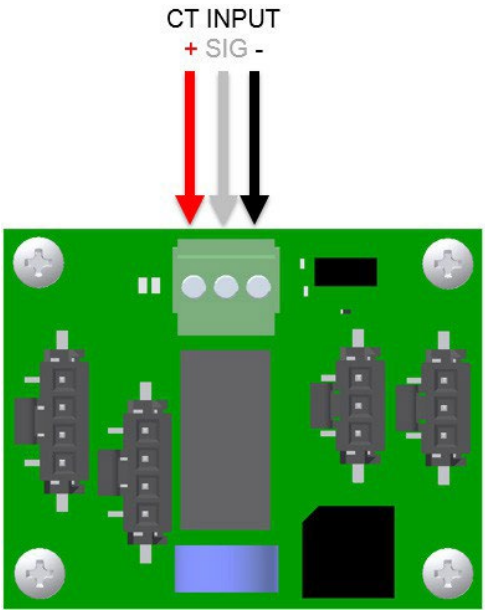


- Voltage measuring input:
  - J3.1 OR J4.1, CIRCUIT 1/CIRCUIT 2 +
  - J3.2 OR J.4.2, NC
  - J3.3 OR J4.3, CIRCUIT 1/CIRCUIT 2 –



Current measuring input:

- J6.1, CT + INPUT
- J6.2, CT SIGNAL INPUT
- J6.3, CT - INPUT



Accuracy

- Energy Accuracy 1%
- Power and energy measurements: (kW, kWh)

Operating Conditions

- Operating temperature range: 0 °C – 70 °C (32 °F – 158 °F)
- Storage temperature range: -40 °C – 85 °C (-40 °F – 185 °F)
- Humidity: 5% - 95% non-condensing

Meter Certifications

The STARLINE CPM bears the following certification marks and complies with all requirements necessary to bear them.

For additional information on Environmental Material or Hazardous Substance Regulations, please contact Starlinesustainability@legrand.com.

FCC Compliance Statement

The STARLINE CPM complies with part 15 of the Federal Communication Commission (FCC) rules. Operation is subject to the following two conditions:

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

Declaration of Conformity

A copy of the original CE Declaration of Conformity is on file at the Starline office and is available upon request. To receive a copy of a Declaration, contact your Starline representative.

EMC Emission Testing

- Conducted Emissions, EN 61000-6-4:2018 and ICES-003 and EN 55022/CISPR 22 and FCC Part 15 Subpart B, Class A, 150kHz-30MHz.
- Radiated Emissions, EN 61000-6-4:2018 and ICES-003 and EN 55022/CISPR 22 and FCC Part 15 Subpart B, Class A, 30MHz-1GHz
- Harmonic Current Emissions, EN 61000-3-2:2006, AC Input ≤ 16Amps
- Voltage Fluctuations & Flicker, EN 61000-3-3:2008, AC Input ≤ 16Amps

EMC Immunity Testing

- Electrostatic Discharge Immunity, EN 61000-4-2:1995, ± 4KV contact, ± 8KV air
- Radiated Electromagnetic Field Immunity, EN 61000-4-3:2006, 10V/m (80MHz-1GHz); 3V/m (1.4GHz- 2GHz); 1V/m (2-2.7GHz)
- Fast Transient/Burst Immunity, EN 61000-4-4:2004, ± 2kV AC Inputs; ±2kV DC Inputs; ± 1kV I/O Ports
- Surge Immunity, EN 61000-4-5:2006, ± 3kV (L-PE), ± 3kV(L-L) – AC Inputs; ±2kV (L-PE), ±2kV (L-L) – DC Inputs
- Conducted RF Immunity, EN 61000-4-6:2009, 10Vrms – AC supply, DC supply, & I/O Ports (>3m in Length)
- Magnetic Field Immunity, EN 61000-4-8:2010, 30A/m @ 50Hz & 60 Hz
- Voltage Dips, Short Interruptions & Variations, EN 61000-4-11:2004, 0% during 1 Cycle; 40% during 10 Cycles; 70% during 25 Cycles; 0% during 250 Cycles

Safety Testing

- STARLINE CPM is a UL Recognized Component.
- Busway devices that utilize the STARLINE CPM are ETL Listed.
- IEC 61010-1 Electrical Equipment for Measurement, Control, and Laboratory Use, Edition 3 (2010-06)+AMD1 (2016-12).
- ANSI/UL/IEC EN 61010-1 Edition 3 with revisions through July 19, 2019.
- CSA-C22.2 No. 61010-1 Edition 3 with revisions through 11-2018.
- IEC 61010-2-030 Testing and Measuring Circuits (2017-01).

Warranty Information

The following warranty is provided for the STARLINE CPM.

Statement

Starline hereby represents and warrants original items manufactured by Starline and supplied to Customer for use, hereafter known as “Product,” shall be free from significant defects in material and workmanship and will reasonably conform to applicable specifications and drawings, each subject to normal use and service as set forth in this agreement. This Warranty is applicable when Product is installed and used under normal conditions and in accordance with the operating instructions, pursuant to the Terms and Conditions set herein. The sole and exclusive remedy of Customer for a breach of any of the foregoing warranties shall be limited, at the option of Starline, to either the repair or replace any defective or non-conforming component of the Products. Replacement Products or parts may be new or reconditioned. Such remedies shall be available to Customer only if Starline is notified in writing (can be email) within the applicable Warranty Period and is provided with a reasonable opportunity to cure such breach.

Products under warranty will be repaired or replaced at no charge to Customer with the exception of any issues or damage caused by the unauthorized repair by any and all third-party repair houses which will be subject to repair or replacement charges as determined by Starline Products repaired or replaced while under warranty are warranted for the remainder of the original Product warranty or 30 days from the date of repair or the date of return shipment to Customer, whichever is longer.

Warranty period

Products manufactured by Starline are protected under warranty for one year from the day of the shipment of the product.

Contact and support

Any questions or concerns about your STARLINE CPM should be directed to Starline below:

Starline 168 Georgetown Rd. Canonsburg, PA 15317
Phone: (724) 597-7800
Toll free: (800) 245-6378
Fax: (724) 926-2221
info@Starlinepower.com

Feature Guide

This section describes the basic features of the STARLINE CPM. The meters have several features which are useful for automated monitoring and alerting for electrical distribution systems.

First Time Setup

Each M70 can be configured through the embedded webpage or via SSH. The following sections describe how to setup the device through both interfaces.

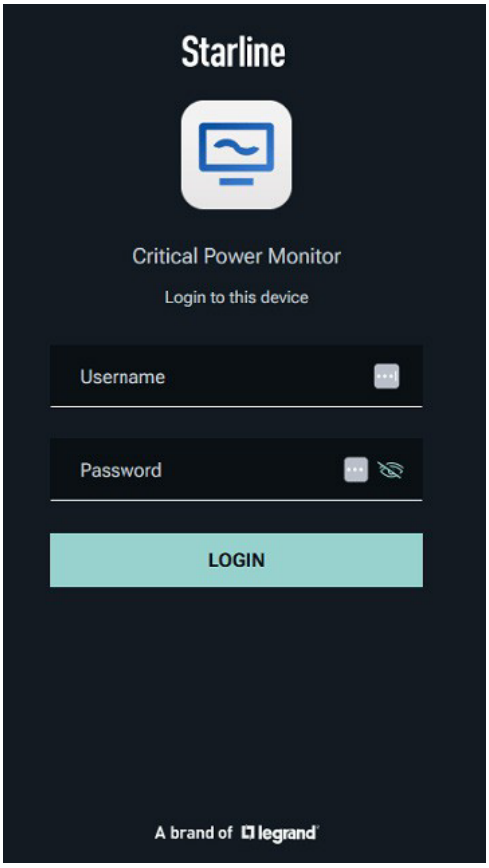
Restricted Mode

The M70 operates in a restricted mode if the meter has not been initially logged into or the admin credentials are reset (ie. hard reset). This mode will request the user to enter to enter default credentials and ask to put in a unique set of credentials. In this mode, the meter LED will flash green and red until the user logins for the first time.

Webpage

Walk thru webpage:

- For first time setup on Static IPv4 go to 192.168.1.99.
- For first time setup on IPv6 refer to Link Local Address. See **Quick start guide: Ethernet**
- Once at the login form use
  - Username: admin
  - Password: admin
  - NOTE: Credentials are case sensitive.

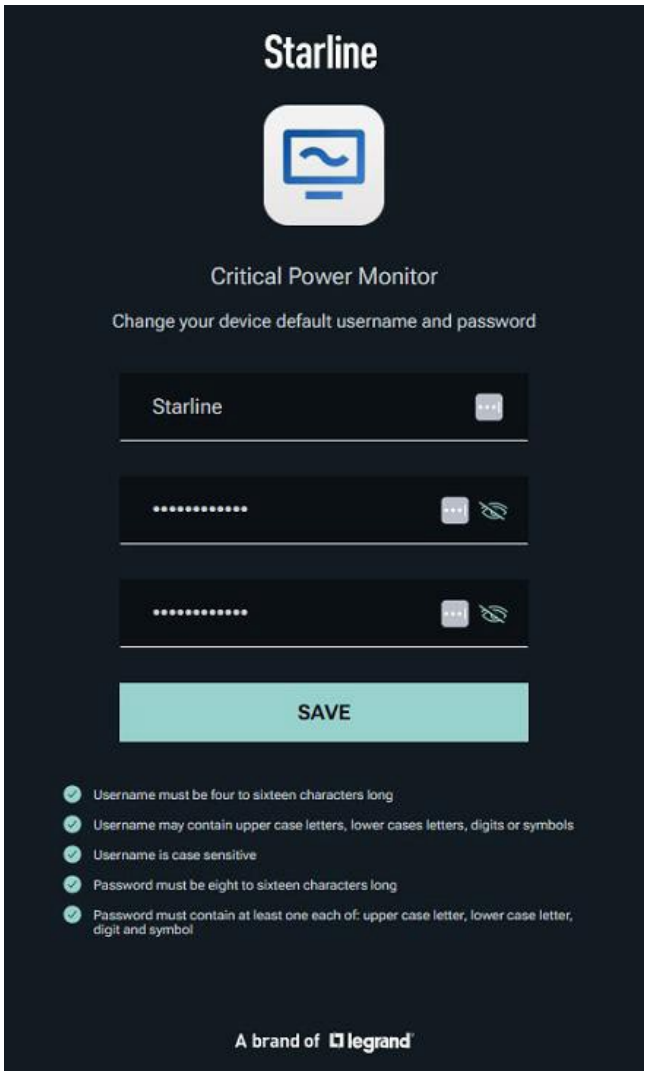


You will then be directed to create your own unique username and password

- Username must be four to sixteen characters long
- Username may contain upper case letters, lower case letters, digits or symbols
- Username is case sensitive

Password must be eight to sixteen characters long

Password must contain at least one each of upper case letter, lower case letter, digit and symbol

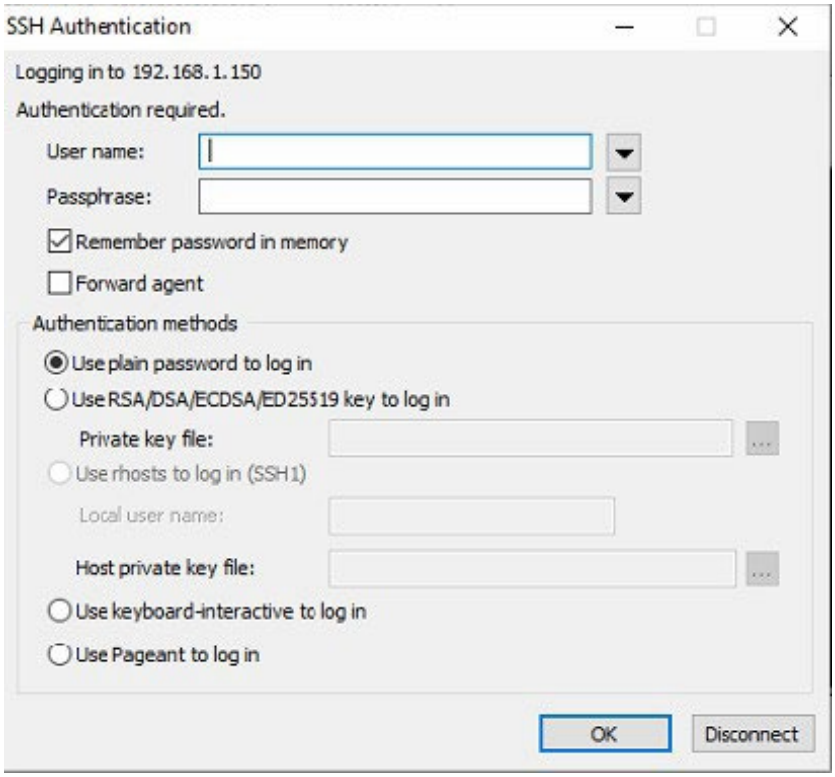


You will then be redirected to the login page again where you will be able to login with your unique username and password.

SSH

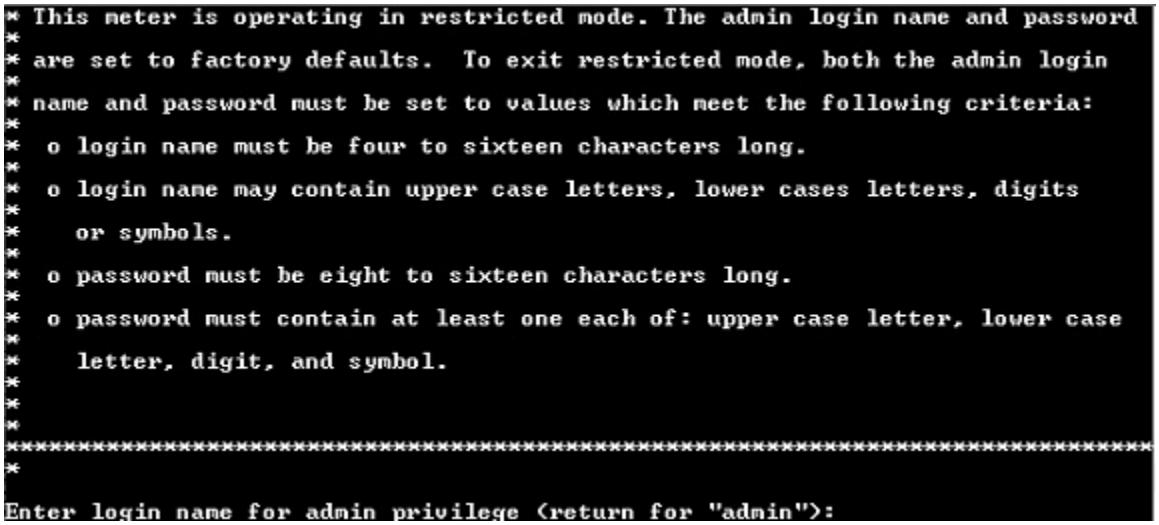
Walk thru SSH:

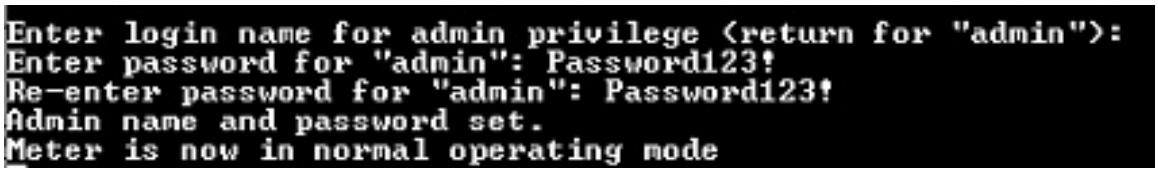
- For first time setup go to 192.168.1.99
- Once at the login form use
  - Username: admin
  - Password: admin
  - NOTE: Credentials are case sensitive.



You will then be directed to create your own unique username and password

- Username must be four to sixteen characters long
- Username may contain upper case letters, lower case letters, digits or symbols
- Username is case sensitive
- Password must be eight to sixteen characters long
- Password must contain at least one each of upper case letter, lower case letter, digit and symbol


* This meter is operating in restricted mode. The admin login name and password
* are set to factory defaults. To exit restricted mode, both the admin login
* name and password must be set to values which meet the following criteria:
* o login name must be four to sixteen characters long.
* o login name may contain upper case letters, lower cases letters, digits
* or symbols.
* o password must be eight to sixteen characters long.
* o password must contain at least one each of: upper case letter, lower case
* letter, digit, and symbol.
Enter login name for admin privilege (return for "admin"):


Enter login name for admin privilege (return for "admin"):
Enter password for "admin": Password123!
Re-enter password for "admin": Password123!
Admin name and password set.
Meter is now in normal operating mode

M70 Identification

The M70 series provides a variety of features and communication interfaces dependent on customer needs. The table below highlights the differences between the M70 AC and DC configuration offerings. Additionally, there are optional features not displayed in the table below (ie. breaker sense, temperature monitoring, etc..). For complete catalog numbers, please refer to Busway Product Selection Guide.

	Meter Number	RJ11	RJ45[1] (Ethernet)	Wireless	Supported Display[2]	48VDC[3]	400VDC[3]	VAC
M70 Series	M73	x2	x2		LCD			✓
	M76	x2	x2	✓	LCD			✓
	M7C	x2	x2		LCD	✓		
	M7F	x2	x2	✓	LCD	✓		
	M7J	x2	x2		LCD		✓	
	M7M	x2	x2	✓	LCD		✓	
V70 Series	V71	x2	x2		None			✓
	V72	x2	x2		LED			✓
	V74	x2	x2	✓	N/A			✓
	V75	x2	x2	✓	LED			✓
	V7A	x2	x2		None	✓		
	V7B	x2	x2		LED	✓		
	V7D	x2	x2	✓	None	✓		
	V7E	x2	x2	✓	LED	✓		
	V7H	x2	x2		None		✓	
	V7I	x2	x2		LED		✓	
	V7K	x2	x2	✓	None		✓	
	V7L	x2	x2	✓	LED		✓	

1. Two RJ45 ports will provide daisy-chain Ethernet capabilities, allowing a single switch port to route traffic to multiple CPMs
2. Displays are considered an add-on accessory for tapbox M70 and will change the catalog numbering. Refer to Busway Product Selection Guide for complete catalog numbers and accessories.
3. DC Meters available post-launch, reach out to your local Starline representative for details.

The ‘M’ configuration of the meter is intended for end feeds; whereas the ‘V’ configuration is exclusively for tap boxes. Furthermore, the ‘M’ meters use current transformers (CTs) at the infeed of the box, while ‘V’ meters will have CTs on every outlet line. Because the physical hardware of the meter remains the same, the remainder of this manual will only refer to ‘M’ versions of the meter but will be applicable to both meter versions. The other major difference not listed in the table is the M70 series physical form factors. The M70 end feed meters are approximately 5.2” x 6.75” and the M70 tapbox meters are approximately 2” x 5.5” .

LEDs

M70 LED bar is a feature of both the Tap off and Feed meters.

There are informational LEDs on the lower middle portion of the meter. These LEDs will either be off (black) or in some state. The following table shows the color and meaning of each LED:

Function	Color	Description
Status	Green	Meter is operating normally
	Black	Meter is not powered
	Red	Alarm
	Yellow	Firmware update in progress
Reset	White	All network settings
	Red	Admin credentials
	Yellow	Factory default
	Black	Reset button is being held

When unit is powered on and the login credentials are at their factory setting, the LEDs will flash red and green. When unit is powered on and the credentials are set, the LEDs will be solid green. If Modbus RTU communication is active, then the LEDs will blink green. If an alarm is triggered, the LED will become solid red. If the unit is in ring mode and is the “Root” then the LEDs will be solid blue. If Modbus RTU communication is active and the unit is the “Root” then the LEDs will blink blue. If an alarm is going off and the unit is in ring mode, the LEDs will blink red.

While pressing and holding the reset button for about 1, 10, 15, and 20 seconds, the LEDs will change as follows:

- Quick press: The LEDs turn off momentarily
  - The unit is doing a reboot. No settings changed.
- ~10 second hold: The LEDs blink white
  - The unit has erased all network settings and reset to default
- ~15 second hold: The LEDs blink red
  - The unit has erased all network/admin credentials and reset to default.
- ~20 second hold: The LEDs blink yellow
  - The unit has been restored to factory conditions.

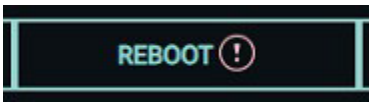
Additionally, the meter’s Ethernet port(s) has two LEDs. The green LED on the left represents connectivity (device is connected when illuminated); the orange LED on the right is the activity monitor which blinks when network information is sent or received.

Physical Reset

Approximate Press Time in seconds	LED color indicator	Function
1	LED Off (black)	Power cycles the unit
10	LED Blinking white	Resets all network settings
15	LED Blinking Red	Resets all admin credentials
20	LED Blinking Yellow	Resets unit to factory settings

Software Reset

There is a reboot option on the webpage that appears when making changes to the unit via the webpage. This reboot will only power cycle the unit. When making certain changes to the unit on the webpage, the reboot button on the webpage will be followed by an "!" as shown here. This reboot is required and will not apply the changes made on the webpage to the unit until it is clicked.

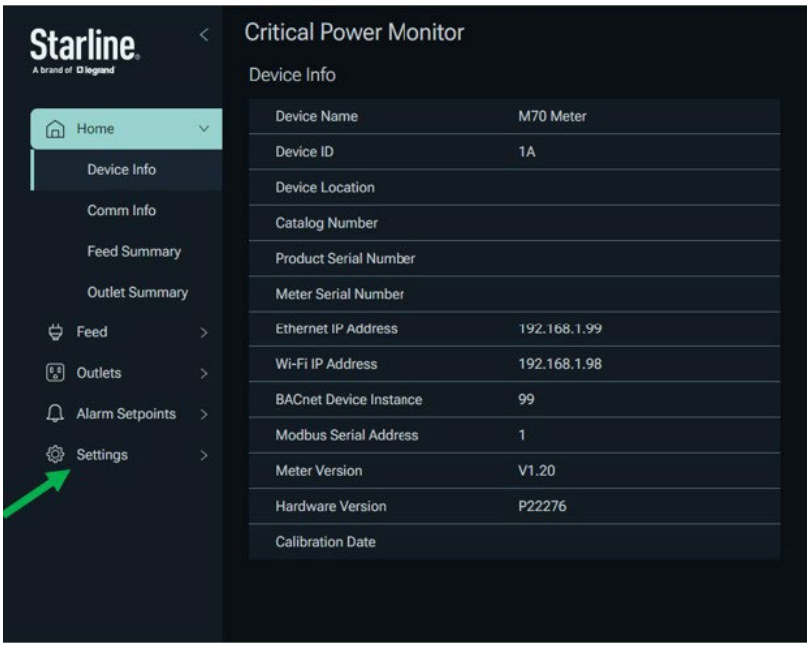


Lastly, there is always a reboot button shown on the admin page if the user wants to reboot for any reason.

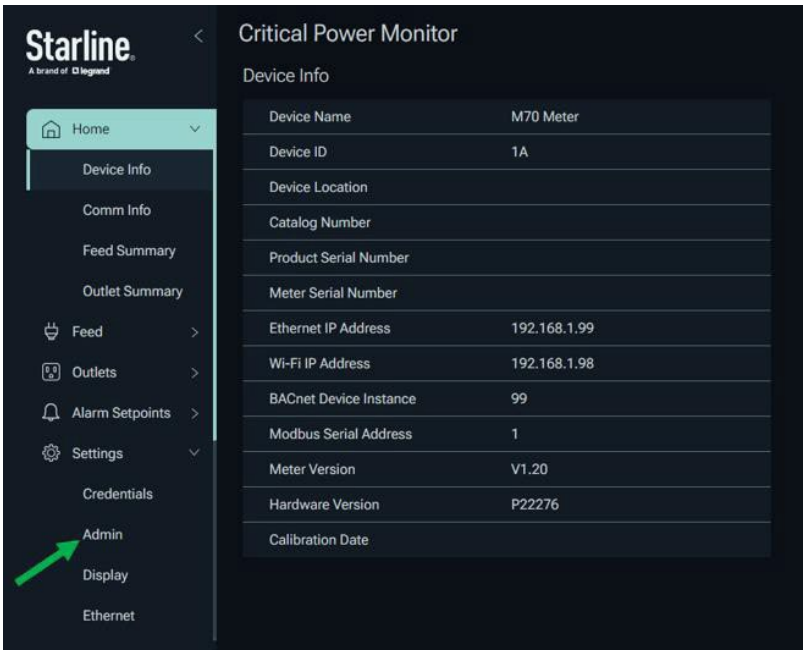
Log and Diagnostic File

The Log and diagnostic files are used to assist with troubleshooting customer issues. These files are found from the admin page of the unit's webpage.

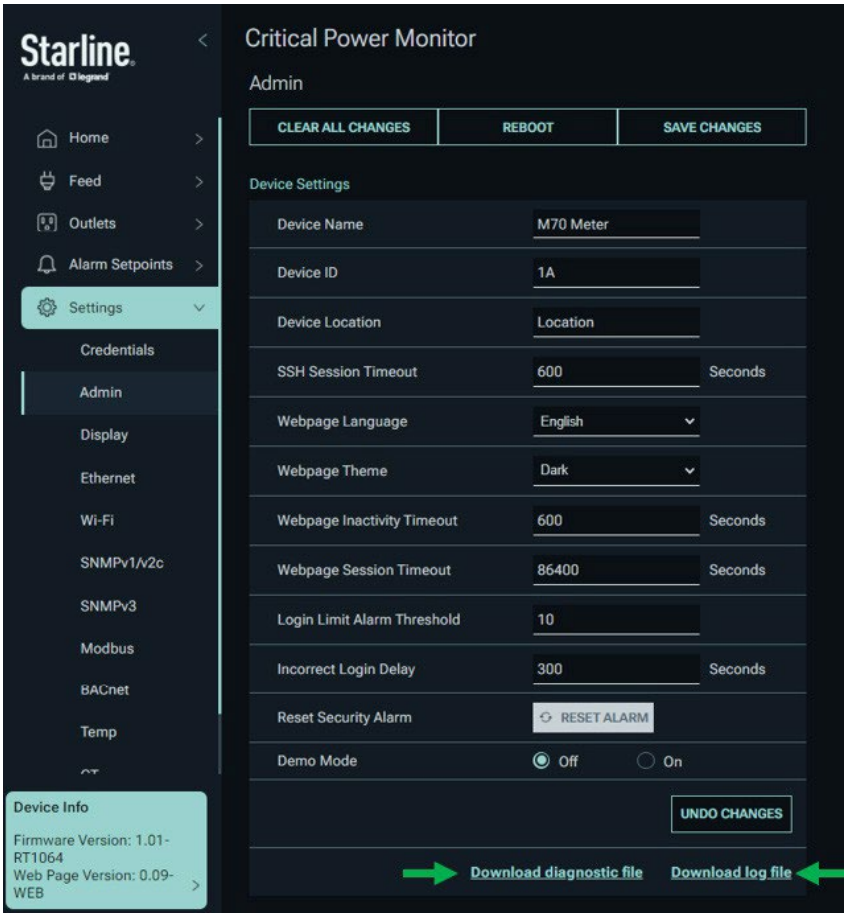
Home Page, navigate to Settings:



Select admin:



Download Log File & Diagnostic File (config):



LOG

The log file will download as a text file and contains a set of commands that the unit completed or attempted to complete with a time stamp from when the device was last rebooted. Used to troubleshoot and find where the fault took place.

Diagnostic

The diagnostic contains the information of the unit's current settings and credentials.

Liquid Crystal Display

The Liquid Crystal Display (LCD) is available as an option for the M70 series meters.

The front panel display of the STARLINE CPM provides a real-time summary of the meter, as well as device information, networking status, and alarms. The front panel display can provide on-site information while networked monitoring occurs. The front panel display is touch responsive for user simplification. The information displayed can be configured on the panel, but device setup must be performed using a networked computer. Not all configurations of the STARLINE CPM include a front panel display.

By default, the display cycles through summary screens of useful electrical parameters. The upper center of the display shows the parameter that is being displayed or the setting that is being adjusted.

Swipe/press functionalities

The swipe and press functionalities are used exclusively for working with the LCD and therefore are exclusive to the Feeds.

There are four swipe and press functionalities that can be used with the LCD. These swipe functionalities will change what is being displayed on the screen. The following table shows the swipe functionalities and their meanings.

Action	Function
Swipe Left/Right	Manually transition between screens
Press & Hold	Pause the display. After holding for 2 seconds, a pause icon will appear in the top left corner of the display. This will allow the user to stop holding the screen while continuing to stay paused. Tap the screen again to un-pause
Swipe Down	Settings pages
Swipe Up	Return to the normal pages
Tap	When on a settings page, edit the setting in increments

Adjusting Settings

These settings are exclusive to the feeds with optional front panel display.

There are three settings for the front panel display which can be adjusted on the meter. All settings take effect immediately.

Information about the specific hardware revision and the loaded firmware can also be viewed from the settings screen.

Adjusting the rate of display cycle

Swipe from the top of the display to the bottom to open the settings
Swipe left or right until the title of the display reads “Settings: Scroll Speed”
Tap the screen to increment the rate at which the screens scroll
Max 30 seconds, min 2 seconds
Can turn scroll option off
Swipe from the bottom of the display to the top to save and return to the informational screens

Adjusting the brightness of the display

Swipe from the top of the display to the bottom to open the settings
Swipe left or right until the title of the display reads “Settings: Brightness”
Tap the screen to increment the brightness level of the screen
Increments of 10%
Max at 100%, min at 10%
Swipe from the bottom of the display to the top to save and return to the informational screens

Adjusting the backlight timeout

Swipe from the top of the display to the bottom to open the settings
Swipe left or right until the title of the display reads “Settings: Backlight Timeout”
Tap the screen to increment the time until the display timeouts
Max 8 hours, min 15 seconds
Can turn backlight timeout off
Swipe from the bottom of the display to the top to save and return to the informational screens

Viewing hardware revision and firmware version information

Swipe from the top of the display to the bottom to open the settings
FW tells which firmware version is installed on the unit
Display tells which display version is installed on the unit
Web tells which webpage version is installed on the unit
WiFi tells which WiFi version is installed on the unit

3-Digit LED Display

The 3-digit, 7-segment LED display is available as an option exclusively for the M70 series tapbox meters.

The LED display offers the ability to display infeed voltage, current, and power factor in real time. The specific values displayed can be configured through the embedded webpage or through a Telnet session. Please see the display configuration register (DCR) command in the Telnet command list document to make changes through a Telnet session.

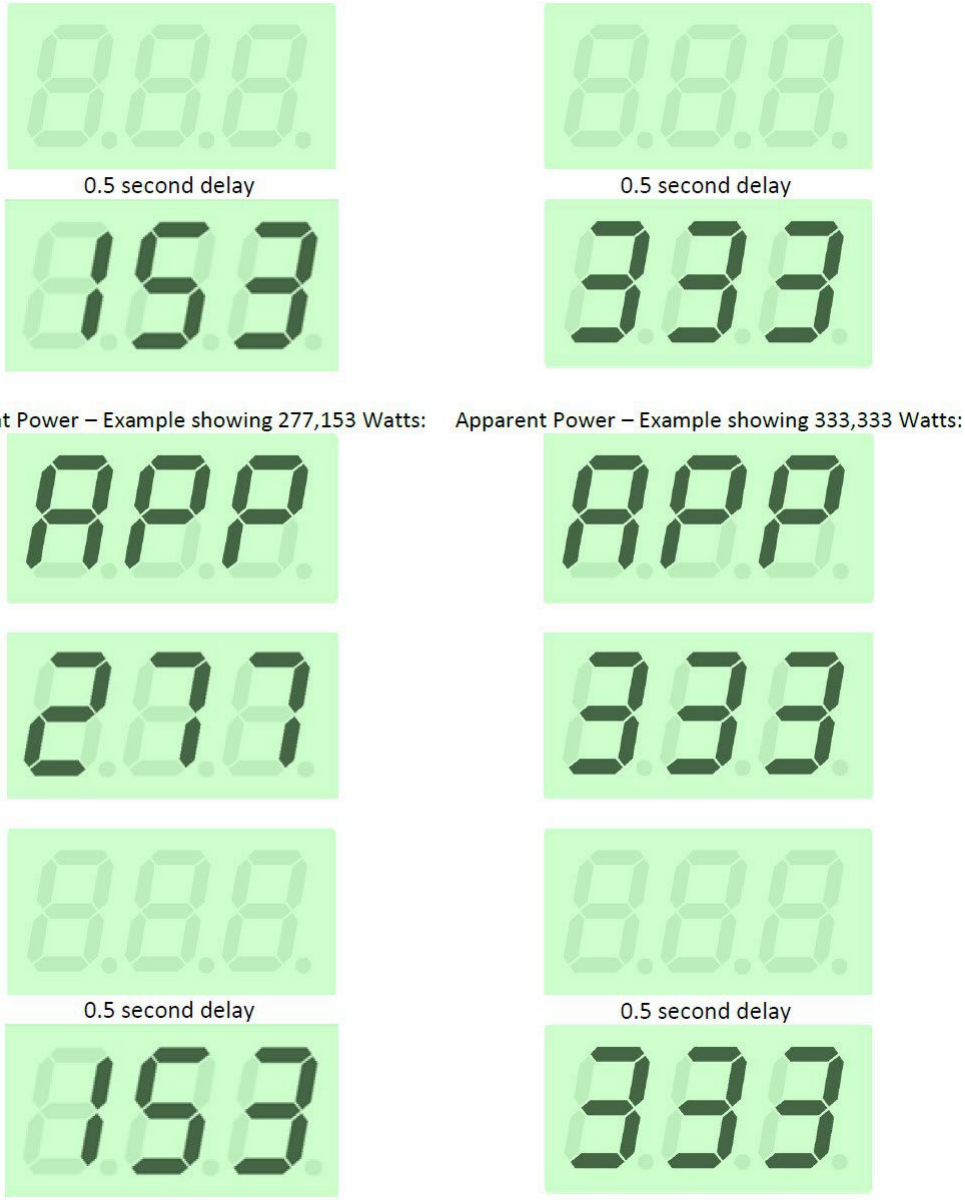
Due to digit limitations, the display will cycle through a value label and then display the measured value. For example, the display will show "L1n" to indicate that the next value displayed is line 1 to neutral voltage. The table below shows all possible displayed values, the associated label, and the units (which will not be displayed):

	3-Digit LED Display (AC)	
Name	Label Display	Unit
L1 to Neutral Voltage	"L1n"	Volts (V)
L2 to Neutral Voltage	"L2n"	Volts (V)
L3 to Neutral Voltage	"L3n"	Volts (V)
L1 to L2 Voltage	"PhA"	Volts (V)
L2 to L3 Voltage	"Phb"	Volts (V)
L3 to L1 Voltage	"PhC"	Volts (V)
L1 Current	"I1"	Amps (A)
L2 Current	"I2"	Amps (A)
L3 Current	"I3"	Amps (A)
Measure Neutral Current	"I4"	Amps (A)
L1 Power Factor	"PF1"	N/A
L2 Power Factor	"PF2"	N/A
L3 Power Factor	"PF3"	N/A
Apparent Power	"APP"	Volt-amperes (VA)
Active Power	"ACP"	Watts (W)

Active and Apparent Power definition

Active Power – Example showing 277,153 Watts:

Active Power – Example showing 333,333 Watts:



The 3-digit, 7-segment LED display offers the ability to display infeed voltage and current in real time. The specific values displayed can be configured through the embedded webpage or through a Telnet session. Please see the display configuration register (DCR) command in Configuration Registers to make changes through a Telnet session.

Due to digit limitations the display will cycle through a value label and then display the measured value. For example, the display will show “U1” to indicate that the next value displayed is the Circuit 1 voltage. The table below shows all possible displayed values, the associated label, and the units (which will not be displayed):

3-Digit LED Display (DC)		
Name	Label Display	Unit
Circuit 1 Voltage	"U1"	Volts (V)
Circuit 2 Voltage	"U2"	Volts (V)
Circuit 1 Current	"I1"	Volts (A)
Circuit 2 Current	"I2"	Volts (A)

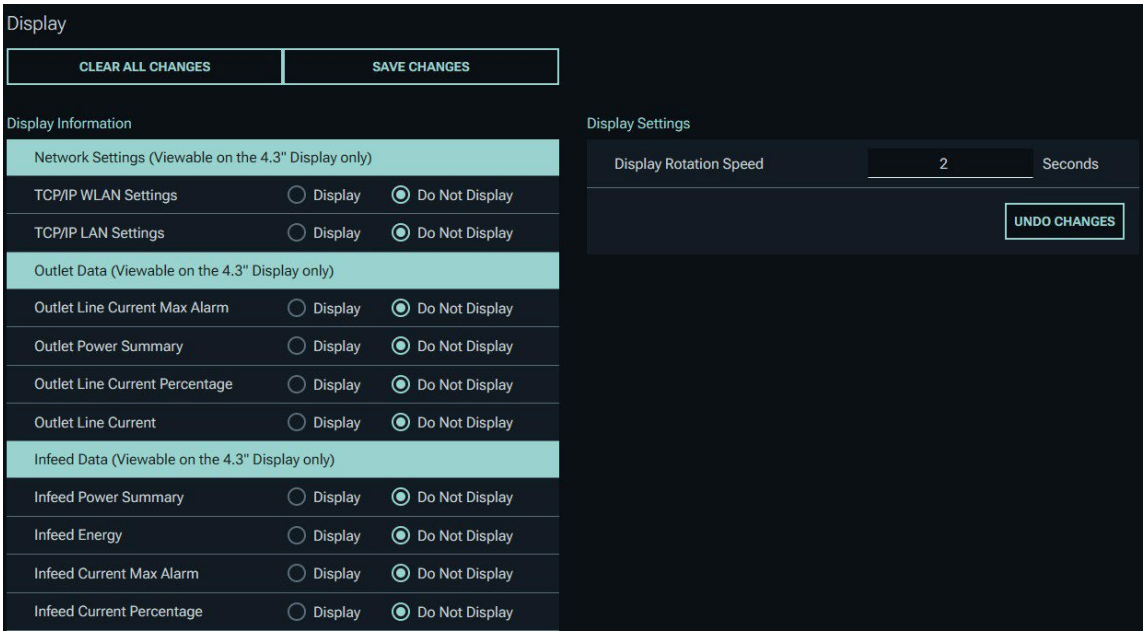
Adjusting the rate of display cycle

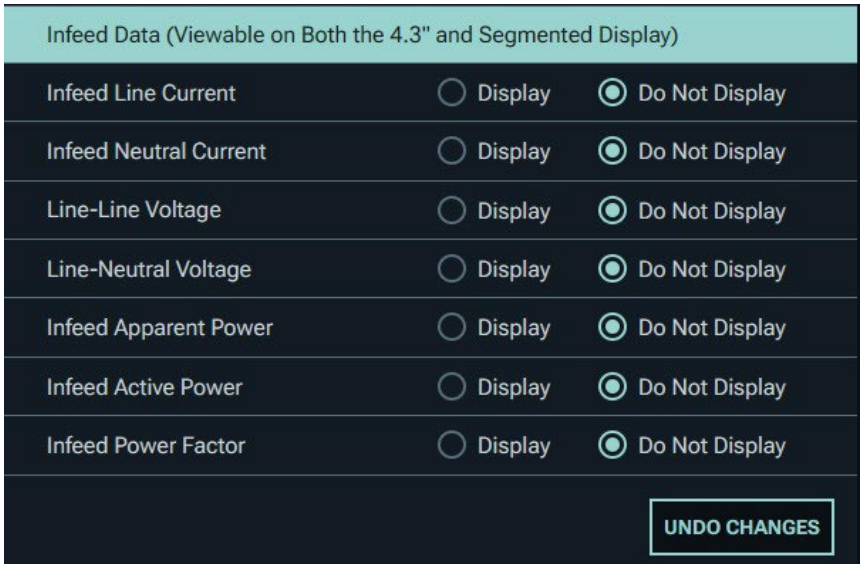
The scroll speed of the LED display may be changed through the embedded webpage or through SSH. The scroll speed value chosen will indicate how long between each value being displayed. For example, selecting a scroll speed of 1 (second) will cause the meter to display "L1n" for ½ second and "120" for ½ second. The SSH command for changing scroll speed is $LCDSS and may be found in SSH command list document.

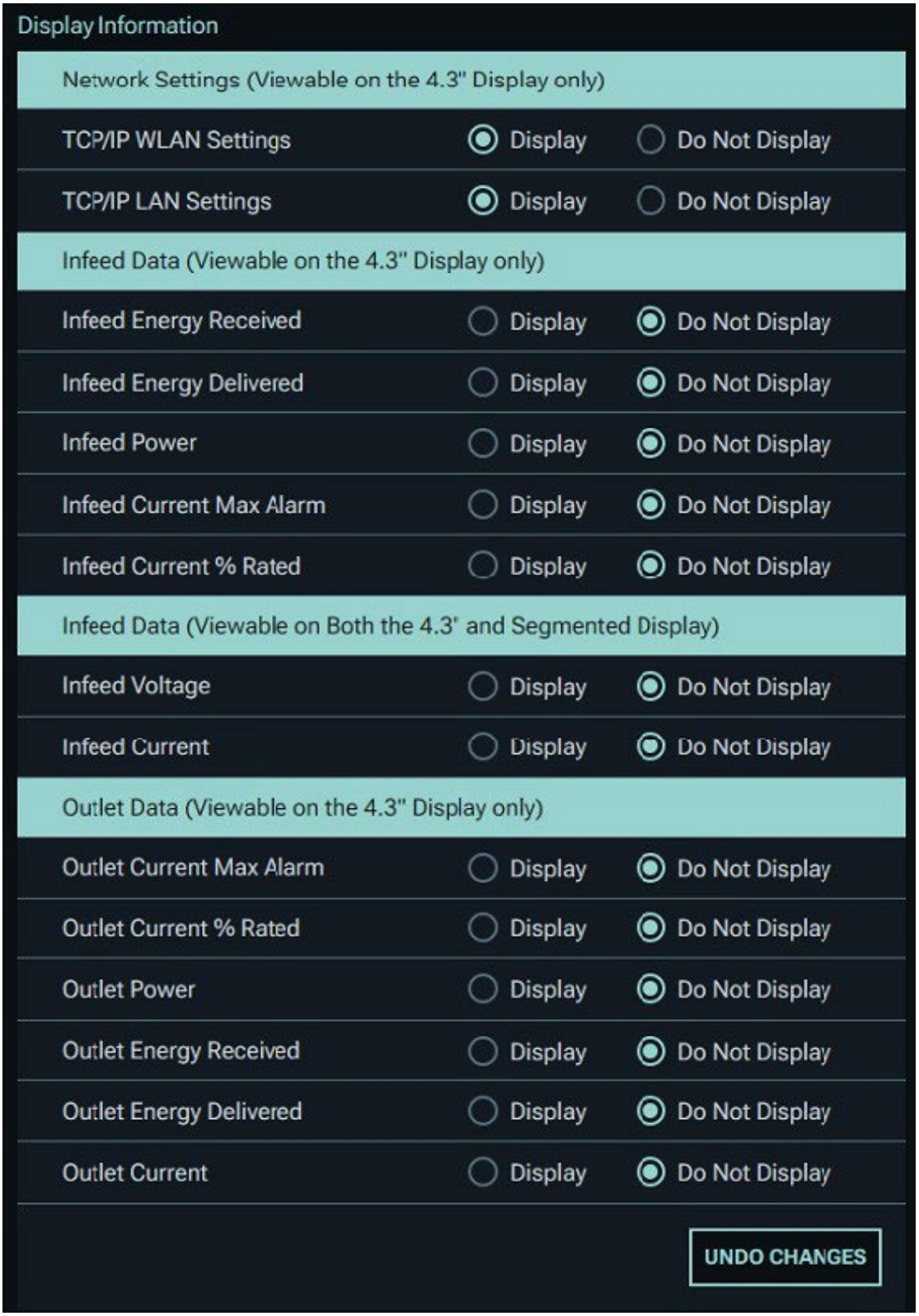
Configuring the display via the embedded webpage

It is possible to change both the displayed parameters and rate of display cycle through the embedded webpage. The figure below shows how changes to these configurations will be made through the "Settings/Display" tab. In this specific example, the meter will display all values EXCEPT the Line-Neutral Voltages and have a rotation speed of 1 second. Dissimilar to most other configurations on the meter, display settings will take effect immediately without requiring a reboot. For more information on how to navigate the webpage please see **HTTPS (Web Pages)**.

Starline
A brand of legrand
Home
Device Info
Comm Info
Feed Summary
Outlet Summary
Feed
Outlets
Alarm Setpoints
Settings
Credentials
Admin
Display
Ethernet
Wi-Fi
SNMPv1/v2c
Critical Power Monitor
Device Info
Device Name
Device ID
Device Location
Catalog Number
Product Serial Number
Meter Serial Number
Ethernet IP Address 192.168.1.99
Wi-Fi IP Address 192.168.1.98
BACnet Device Instance 99
Modbus Serial Address 1
Meter Version V1.20
Hardware Version P22276
Calibration Date


Display
CLEAR ALL CHANGES
SAVE CHANGES
Display Information
Network Settings (Viewable on the 4.3" Display only)
TCP/IP WLAN Settings Display Do Not Display
TCP/IP LAN Settings Display Do Not Display
Outlet Data (Viewable on the 4.3" Display only)
Outlet Line Current Max Alarm Display Do Not Display
Outlet Power Summary Display Do Not Display
Outlet Line Current Percentage Display Do Not Display
Outlet Line Current Display Do Not Display
Infeed Data (Viewable on the 4.3" Display only)
Infeed Power Summary Display Do Not Display
Infeed Energy Display Do Not Display
Infeed Current Max Alarm Display Do Not Display
Infeed Current Percentage Display Do Not Display
Display Settings
Display Rotation Speed 2 Seconds
UNDO CHANGES


Infeed Data (Viewable on Both the 4.3" and Segmented Display)
Infeed Line Current Display Do Not Display
Infeed Neutral Current Display Do Not Display
Line-Line Voltage Display Do Not Display
Line-Neutral Voltage Display Do Not Display
Infeed Apparent Power Display Do Not Display
Infeed Active Power Display Do Not Display
Infeed Power Factor Display Do Not Display
UNDO CHANGES

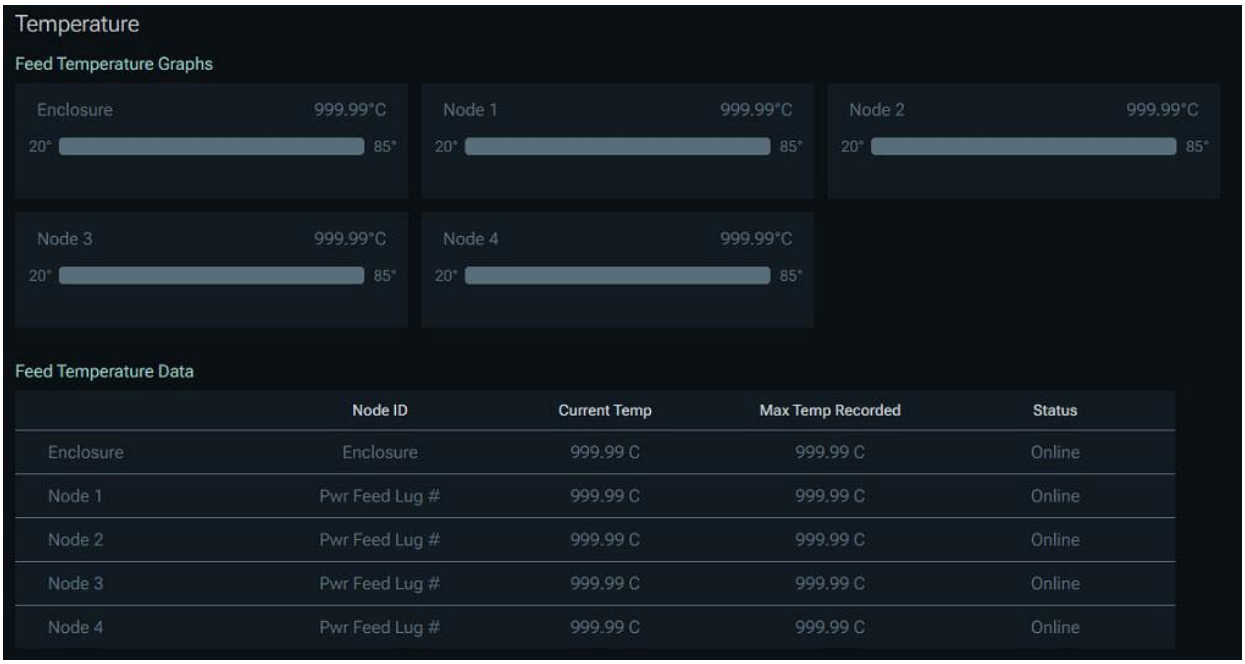

Display Information
Network Settings (Viewable on the 4.3" Display only)
TCP/IP WLAN Settings
Display
Do Not Display
TCP/IP LAN Settings
Display
Do Not Display
Infeed Data (Viewable on the 4.3" Display only)
Infeed Energy Received
Display
Do Not Display
Infeed Energy Delivered
Display
Do Not Display
Infeed Power
Display
Do Not Display
Infeed Current Max Alarm
Display
Do Not Display
Infeed Current % Rated
Display
Do Not Display
Infeed Data (Viewable on Both the 4.3" and Segmented Display)
Infeed Voltage
Display
Do Not Display
Infeed Current
Display
Do Not Display
Outlet Data (Viewable on the 4.3" Display only)
Outlet Current Max Alarm
Display
Do Not Display
Outlet Current % Rated
Display
Do Not Display
Outlet Power
Display
Do Not Display
Outlet Energy Received
Display
Do Not Display
Outlet Energy Delivered
Display
Do Not Display
Outlet Current
Display
Do Not Display
UNDO CHANGES

Feed Temperature Monitoring

The Feed Temperature Monitoring system is available as an option exclusively for the M70 series meters built into feeds.

The temperature monitor adds real time temperature data for the mechanical connections inside of the feed units to allow for better planning and control of maintenance cycles. The temperature sensors report data to the CPM, which can then be pulled through any of the standard communication protocols. This system also includes alarms for over temperature conditions, including a factory-set threshold based on the system, and a user settable alarm that can be tailored based on the specific application.

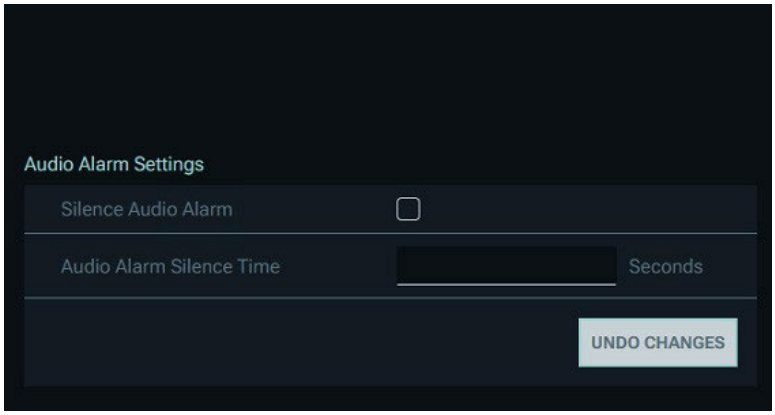
The temperature monitor system is comprised of four hard-wired temperature nodes, which are over-molded to provide electrical isolation from the lug. These nodes may be placed onto the lug of each phase (held magnetically) or wrapped down to any flat surface by using the built-in, zip tie cradle. Data is updated on a one-second interval.



Breaker Monitoring

The Breaker Monitoring system is available as an option exclusively for the M70 series meters (VAC Only).

The breaker sensing solution provides a real-time status check on the current state of a monitored circuit breaker (on/off). This system is also tied to the general alarm system for the meter and may be used to generate an email alarm or SNMP trap as desired by the user. The breaker sensing solution is available for up to 2 circuit breakers and is compatible with any voltage from 120/208V up to 277/480V . Systems without a neutral are not compatible with the beaker sensing solution.



Networking

The STARLINE CPM has a variety of networking options which allow for metering over a network. This section describes the types of networking available, as well as the configuration and monitoring web page.

Security

Starline M70 series meters comply with California (US) state law SB 327 and Oregon (US) state law HB 2395 for cyber security through the following features:

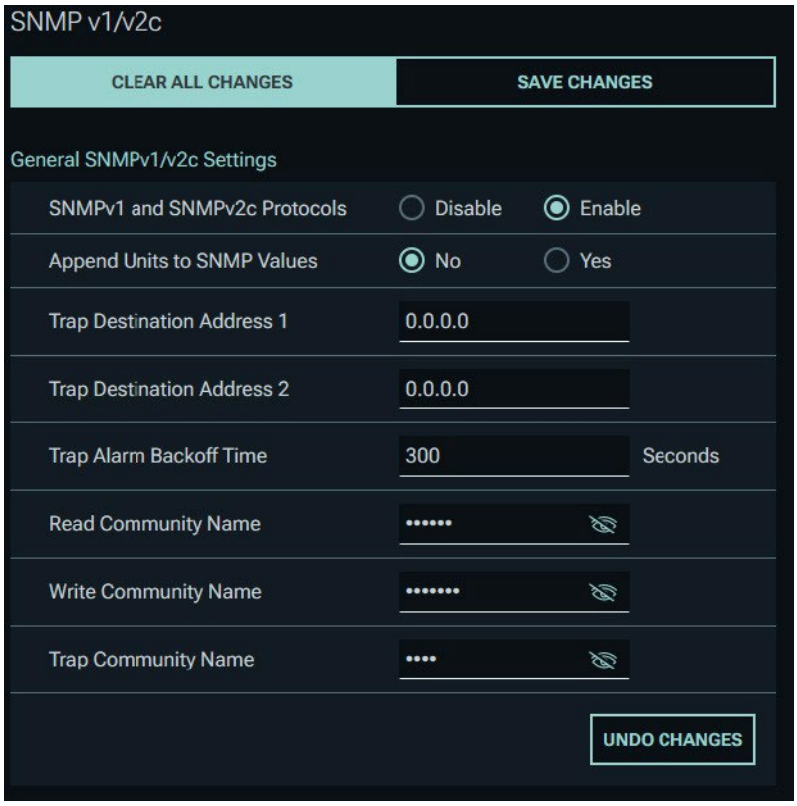
- The user will add their own Unique, strong passwords for each meter
- Non-secured communication protocols disabled when shipped from the factory
  - BACnet
  - SNMPv1, v2, v3
  - Modbus TCP
- Secure Protocols enabled as shipped
  - SSH
  - HTTPS
  - Modbus RTU

Additionally, passwords for SSH, HTTPS, and Shell are stored using a one-way cipher, and can't be retrieved from the unit. If a password is lost, an admin credential reset can be performed to update credentials to default. See Physical Reset section for more details.

Changing to unsecured protocol:

Should you wish to change to an unsecured protocol such as SNMPv1, SNMPv2, SNMPv3, Modbus TCP or BACnet, the easiest way to do so is through the embedded web page, shown below (example shows SNMPv1/v2c page):

1. Click on the 'Settings' tab
2. Click on the protocol you wish to enable
3. Click the radial button for 'Enable'
4. Save changes
5. Reboot



Default

Ethernet

The STARLINE CPM is equipped with a standard IEEE 802.3 Ethernet interface and can be configured to work with any TCP/IP network. For information on how to set up the STARLINE CPM using wired Ethernet, see **Quick start guide: Ethernet**.

Default Settings

The STARLINE CPM can be ordered out of the factory with either IPv4 or IPv6 networking support enabled as a default. While the STARLINE CPM supports both IPV4 and IPV6, the meter does not support IPV4 and IPV6 simultaneously.

The STARLINE CPM has the following default wired Ethernet settings when IPV4 is enabled:

- IP Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first startup.
- IPv6 Address is not set.

The STARLINE CPM has the following default wired Ethernet settings when IPV6 is enabled:

- IP Configuration: DHCP
- Link Local Address: fe80::/64 <Algorithmically created from device MAC address at run time>
- IP Address: Configured by DHCP
- Gateway: Configured by DHCP
- IPv4 is automatically disabled on first startup.
- IPv4 Address is not set.

Daisy-Chain Ethernet

This section contains information that only pertains to the M70 series meters.

The M70 is equipped with two standard IEEE 802.3 Ethernet interfaces and can be configured to work with any TCP/IP network. For information on how to set up the STARLINE CPM using daisy-chain Ethernet, see **Quick Start Guide: Daisy-Chain Ethernet**.

Ring-Mode Ethernet

This section contains information that only pertains to the M70 series meter.

Unlike RS-485 (for Modbus RTU), daisy-chain Ethernet is not a communication bus, but a series of point-to-point communications. This means that the daisy-chain Ethernet is inherently less tolerant to single-component failure because a single-unit in the chain that fails/loses power will prevent communication from all units downstream. To provide increased reliability, ring-mode Ethernet has been developed to allow a chain of CPM to be doubly connected to a network switch.

The User Configuration Register, discussed further down in the document, contains a settable bit to enable ring-mode on the CPM. This will allow the first and last unit of a daisy-chain to be connected to the same network switch without creating routing issues or broadcast storms. In this system, a single CPM failure will allow the communication to continue to downstream units because a valid path to the network still exists. Beyond that, if a single port on the network switch fails, then all units will still have a valid path through the other end of the chain.

Terminology

The following is the terminology used to explain the ring behavior.

- Root – the unit acting as the artificial break for the ring, this unit will use the right port as the primary
- Minion – any unit in a configured ring that is not a root
- Election Phase – the time when units are trading ring IDs to “elect” the root for the ring
    - When units are in the election phase, they will not respond to normal Ethernet traffic

LED Behavior

To assist in troubleshooting of ring-mode, any units in ring-mode will take control of the status LED to display their current state.

Status LED Color	Unit State
Blue (Flashing)	Root
Red/Green (Flashing)	Minion
Yellow	Election Phase

Basics

When a ring of CPM first comes online, the meters will reach out to each other to identify where an artificial break should be created. This artificial break is required to prevent broadcast storms from occurring through the ring of units. The break is selected based on each unit's ring ID, which is the concatenation of the unit's ring priority ($RNGPRI) parameter and the last three octets of the unit's LAN MAC address. The unit with the highest ring ID becomes the artificial break (called the root) for the chain. By default, the right port, when facing the unit, is the primary port and the root will send its traffic through the right port and "block"[3] the left port.

Fault Tolerance

When a ring is broken for any reason, every unit that no longer has a valid path to the network switch will enter the election phase to begin re-organizing the ring, which will be comprised of two independent daisy-chains at this juncture. The unit immediately next to where the ring was broken, will identify that it can only send traffic in a single direction and, through firmware, set its ring priority to 0xFF (the max value) to ensure that it will be elected the root. Each chain will have two root units (red status LED), found immediately next to where the break occurred, and all other units will enter the minion state (green status LED). When a ring is restored, the units will re-enter the election phase, identify a root, and regenerate the ring without any user input.

Important Details

Each dual Ethernet CPM has a three-port switch on the unit, which means all communication is true point-to-point Ethernet. The normal limitations for cable distance apply, but the number of units is only limited by what the network can tolerate in propagation delay as each unit will have to re-route a packet until it gets to its destination. This can be further assisted by setting the ring priority parameter on the unit located roughly in the center of the ring. By default, every unit has a value of 0 in this field, so setting it to any non-zero value will ensure that it is always elected the root for that ring.
The ring priority ($RNGPRI) field should only use values between 0x00 and 0xFE, as 0xFF is reserved for fault tolerance as mentioned above. The root unit should never be at the end of a ring (connected to the network switch), as it attempts to use the right port as the primary and will reject most packets from the left port. Some network switches are not tolerant of this behavior. If the election process chooses a unit next to the switch, use the ring priority parameter to artificially change which unit is the root or re-wire the chain. When a break occurs, the units are very quick to identify a root, and re-establish communication (~10 seconds). Forming/regenerating a ring takes more time (~30 seconds). The self-configuring nature of the ring-mode requires proprietary packets that may not be passed on by other switches or other devices with daisy-chain capabilities. It is always recommended to use only CPM in a ring and use the same network switch to connect to either side.

Wireless (Wi-Fi)

The STARLINE CPM may be optionally equipped with a standard 2.4GHz IEEE 802.11b/g/n wireless Ethernet interface. The CPM can only be used on 2.4GHz networks (5GHz is not supported).

[3] The root unit will block any broadcast packets to prevent broadcast storms but will still look for ring ID packets, which will occur if the chain is broken down stream

For information on how to set up the STARLINE CPM using Wi-Fi: **Quick start guide: Wireless**.
Note: The STARLINE CPM supports operating both wired Ethernet and Wi-Fi interfaces at the same time. The two interfaces must be configured for separate networks. Connecting both to the same network may lead to unreliable communication and is not supported.

Default Settings

The STARLINE CPM can be ordered out of the factory with either IPv4 or IPv6 networking support enabled as a default. While the STARLINE CPM supports both IPV4 and IPV6, the meter does not support IPV4 and IPV6 simultaneously.

The STARLINE CPM has the following default wired Ethernet settings when IPV4 is enabled:

- IP Configuration: Static
- IP Address: 192.168.1.98
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.

The STARLINE CPM has the following default wired Ethernet settings when IPV6 is enabled:

- IP Configuration: Static
- Link Local Address: fe80::/64 <Algorithmically created from device MAC address at run time>
- Static IPV6 Address: <Left Blank>
- DHCP IPV6 Address: <Left Blank>
- IPv4 is automatically disabled on first startup.
- IPv4 Address is not set.

Verifying the meter is connected to a wireless network

When the meter is properly connected to a wireless network, the icon will display in the top right corner of the front panel display (only on M70 series meters with optional display).

Modbus RTU

The STARLINE CPM supports (serial) Modbus RTU. For information on how to set up the STARLINE CPM using Modbus RTU, see **Quick start guide: Modbus RTU**.

Note: Energy values rollover at 9000000.000 kilowatt-hours. If Modbus is being used, and the data type is set to float and not double, you must read and reset the energy before it exceeds 6 significant digits, 999.999 kilowatt-hours.

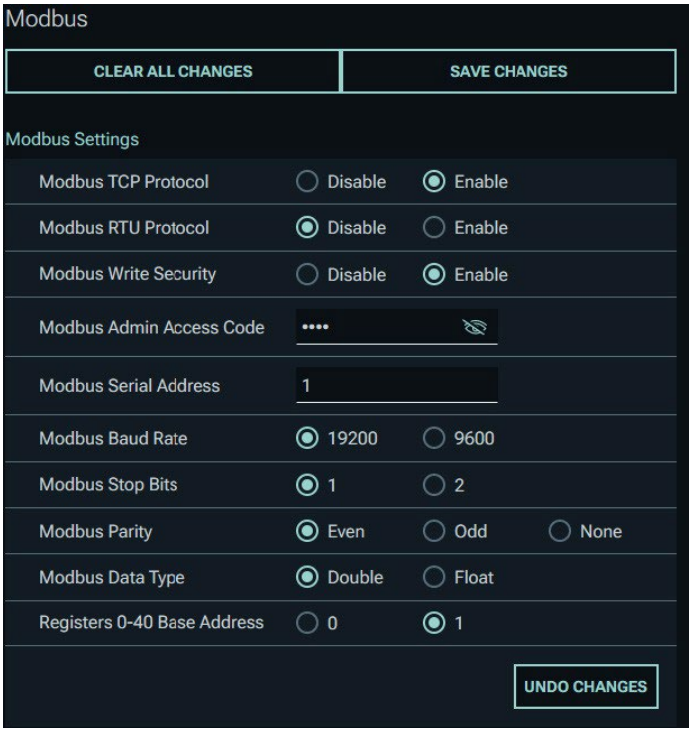
Default Settings

- Baud: 19200
- Stop bit: 1
- Address: 1

Changing RS-485 Modbus settings from the configuration webpage

Serial Modbus settings can be changed from the configuration webpage. For information on connecting to the configuration webpage from a host PC, see **Quick start guide: Ethernet**.

1. From the configuration webpage, click Settings.
2. Click Modbus to configure RS-485 Modbus settings.
3. Using the text box and radio buttons, enter the Modbus Serial Address, Modbus Baud Rate, Modbus Stop Bits, and Modbus Parity.



4. Click Save Changes. If prompted, enter your username and password and click OK.

Modbus register map explained

- "Base 0" and "Base 1" refer to the mode of the Modbus Master, the host processor connected to the meter. "M20 Base Address" refers to the mode of the meter itself.
- The Modbus register map is defined for a Modbus Master with "Base 0" numbering.
- If the Modbus Master is set to "Base 1" the defined addresses will have to be incremented by "1" to align with the register map.
- For new installations of the CPM meter it is recommended to use register addresses above 256.
- For more information, see the notes at the bottom of the Modbus map.

Modbus compatibility mode for M70 meter (register addresses 0 through 40)

- Addresses 0 through 40 of the Modbus register map are intended for backwards compatibility with the M70 meter.
- By default, the CPM will be received with the $MODM20BA (Modbus M20 Base Address) command set to "1" (M20 Mode). This setting will align the registers 1 thru 40 as defined on the map.
- The command $MODM20BA,S,0 will change the M20 Base Address to "0" (M5 Mode). This setting will decrement the map addresses by "1"; therefore, registers 1 - 40 become registers 0 - 39.

Communication Protocols

This section contains information on how to communicate over the network with your STARLINE CPM. Since the M70 series meter utilize the same communication protocols the entirety of this section will pertain to all STARLINE CPM.

The STARLINE CPM can communicate through the following standard protocols: HTTPS, SSH, SNMPv1, SNMPv2c, SNMPv3, BACnet, Modbus TCP, Modbus RTU, and Ethernet/IP[4]. All metered data points are available through all the protocols, except for the embedded webpage (HTTPS) which contains a small subset, but some configuration settings are only available through specific channels. Please refer to the corresponding map, command list, or MIB to determine the best way to configure/utilize the STARLINE CPM.

Note: The STARLINE CPM updates data once per second, polling data via the interfaces at a faster rate will not improve the data update time and is not recommended.

Note: The following characters are reserved characters and should not be used in any text string (e.g. Device Name or Device Location) as it will impact complete functionality:

- * (asterisk)
- , (comma)
- $ (dollar sign)

[4] Ethernet/IP require a protocol gateway, such as those provided by **RTA Automation**, which has already been tested and validated with the STARLINE CPM.

HTTPS (Web Pages)

Monitoring and configuring can be done through the embedded webserver in the STARLINE CPM. To conduct online monitoring, connect to the IP address of the STARLINE CPM using a computer with a web browser on the same network as the meter.

The default view of the configuration and monitoring web page is the summary view. All values are updated in real time. This page is a live summary of the status of the meter.

Note: 'https://' must be appended to the beginning of the IP address to connect to the embedded webpage. Example:

- If HTTPS is enabled then type https:// and the IP address into the web browser:
- **https://192.168.1.99**

Feed Summary

	Circuit 1	Circuit 2
Voltage	0.00 V	0.00 V
Voltage Minimum	0.00 V	0.00 V
Voltage Maximum	0.00 V	0.00 V
Feed Current	0.00 A	0.00 A
Feed Current Rated	0.00 A	0.00 A
Feed Current % Rated	9999.99 %	9999.99 %
Feed Current Demand	0.00 A	0.00 A
Feed Current Peak Demand	0.00 A	0.00 A
Feed Current Minimum	0.00 A	0.00 A
Feed Current Maximum	0.00 A	0.00 A
Feed Power	0.00 W	0.00 W
Feed Peak Power	0.00 W	0.00 W
Feed Energy Delivered	0.000 KWH	0.000 KWH
Feed Energy Received	0.000 KWH	0.000 KWH

Viewing device and firmware information

On the bottom left of the web page, click Device Info.

Viewing connectivity information

On the configuration and monitoring web page, click Home then Comm. Info.

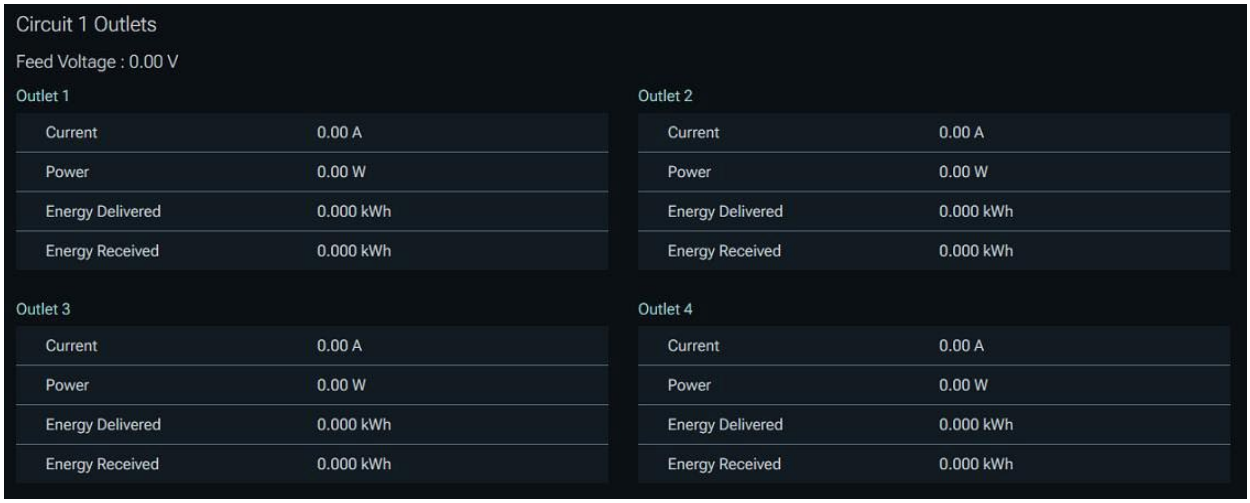
Viewing feed AC parameters

On the configuration and monitoring web page, click Feed. Select Voltage, Current, Power, Temperature, or Settings to view a live summary of these parameters.

Viewing AC outlet parameters

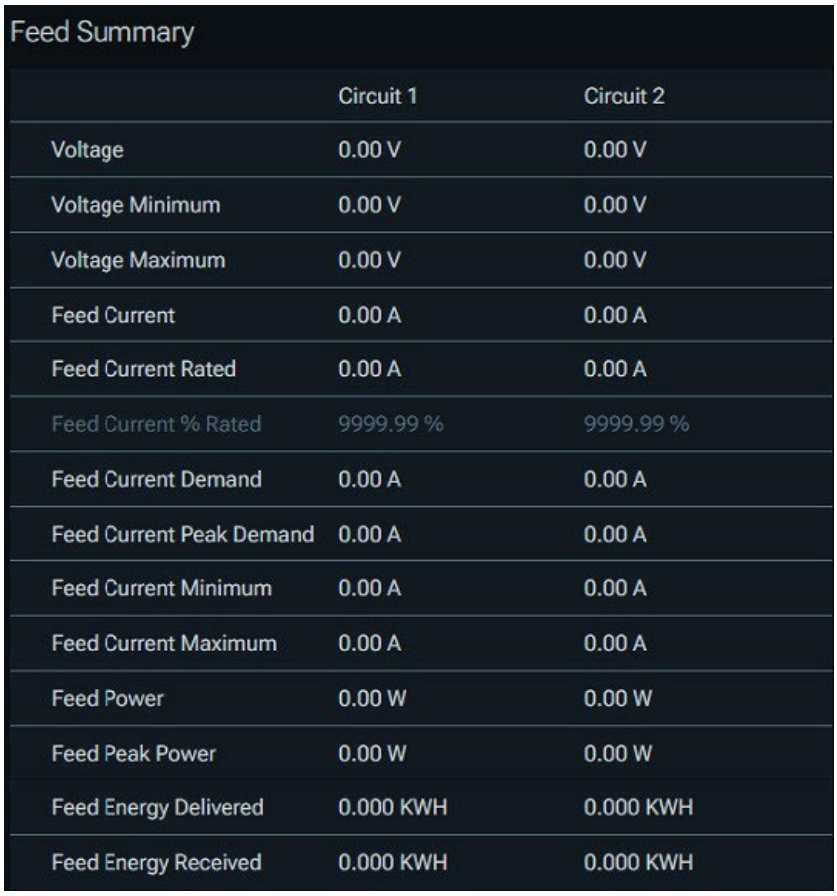
On the configuration and monitoring web page, click Outlet. Select any individual outlet to view parameters specific to that outlet.

Note: Any value displayed as all nines is a non-configured value. Either that outlet is not present, or not configured to be monitored. If you believe there is an error with the way your STARLINE CPM has been configured, contact your Starline representative.



Viewing feed DC parameters

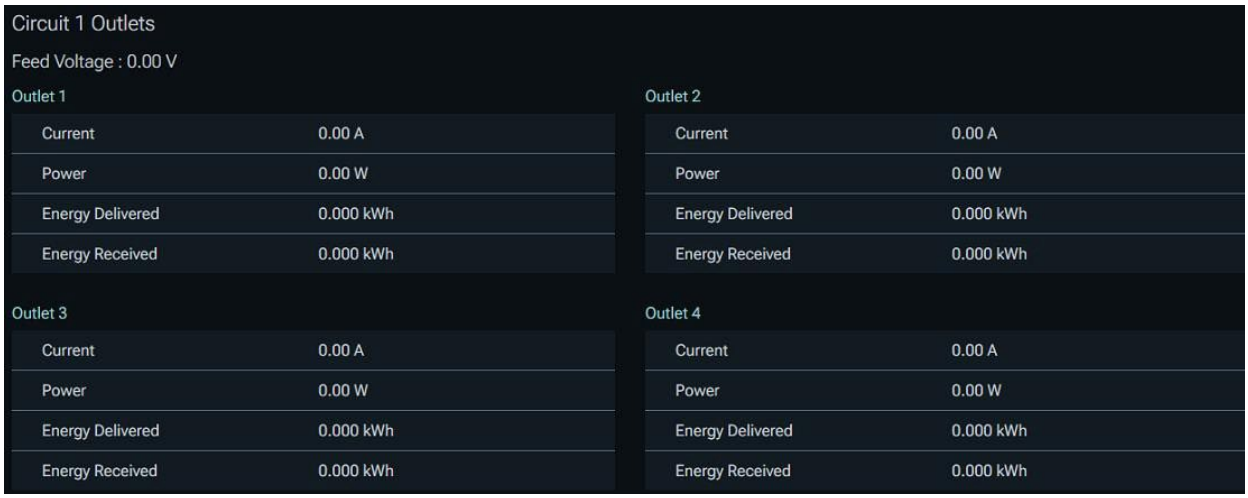
On the configuration and monitoring web page, click Feed. Select Feed Summary, Temperature, or Settings to view a live summary of these parameters.



Viewing DC outlet parameters

On the configuration and monitoring web page, click Outlet. Select any individual outlet to view parameters specific to that outlet.

Note: Any value displayed as all nines is a non-configured value. Either that outlet is not present, or not configured to be monitored. If you believe there is an error with the way your STARLINE CPM has been configured, contact your Starline representative.



Adjusting settings

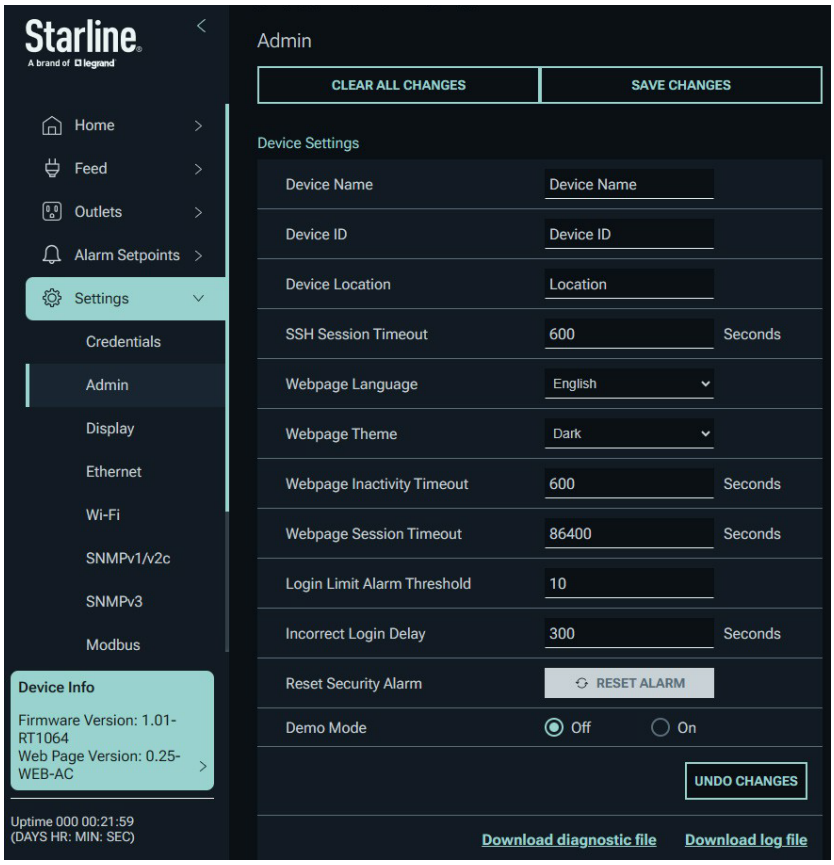
Common settings can be adjusted through the configuration and monitoring web page. This section describes the settings which can be changed through the web page. Settings which are not available on the web page can be configured by SSH. See **SSH** for more information.

Setting the device Name, ID, and location

On the configuration web page, click Settings then Admin.

Using the text boxes, enter the Device Name, Device ID, and Device Location.

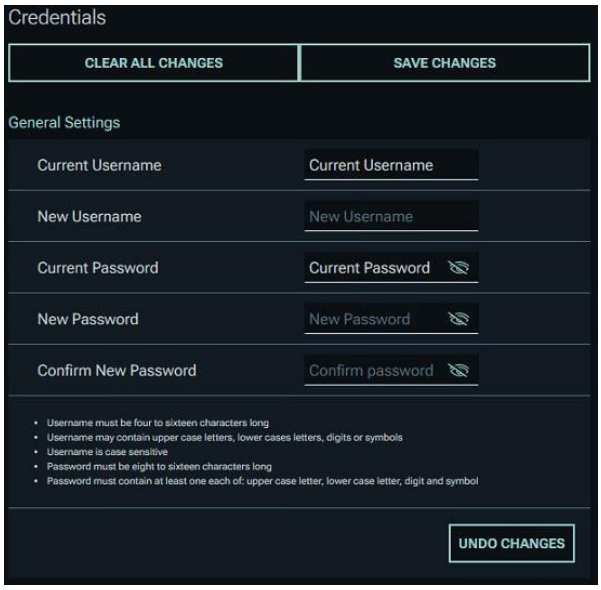
Click Save Changes. If prompted, enter your username and password and click OK.



Changing the admin account username and password

This step is recommended after initial log-in.

1. On the configuration web page, click Settings then Credentials.
2. Using the text boxes, enter the new Admin Password or User Password.

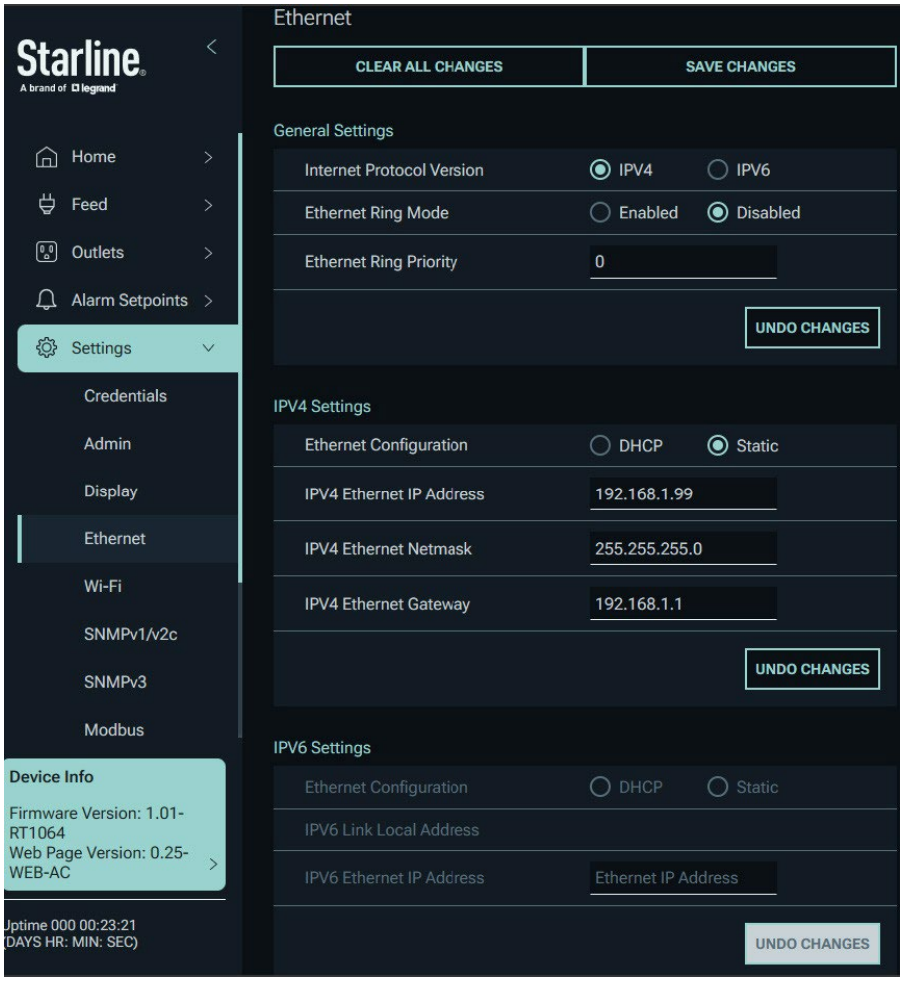


3. Click Save Changes. If prompted, enter your username and password and click OK.

Setting wired Ethernet configuration (IPV4)

Note: Perform this procedure last, as changing network settings will disconnect the host PC from the STARLINE CPM. This procedure requires you to know the network configuration of the local area network to which the STARLINE CPM will be connected.

1. On the configuration web page, click Settings.
2. Click Ethernet to configure the final network settings.
3. If your network uses DHCP to assign IP addresses (dynamic IPs) click the DHCP radio button.



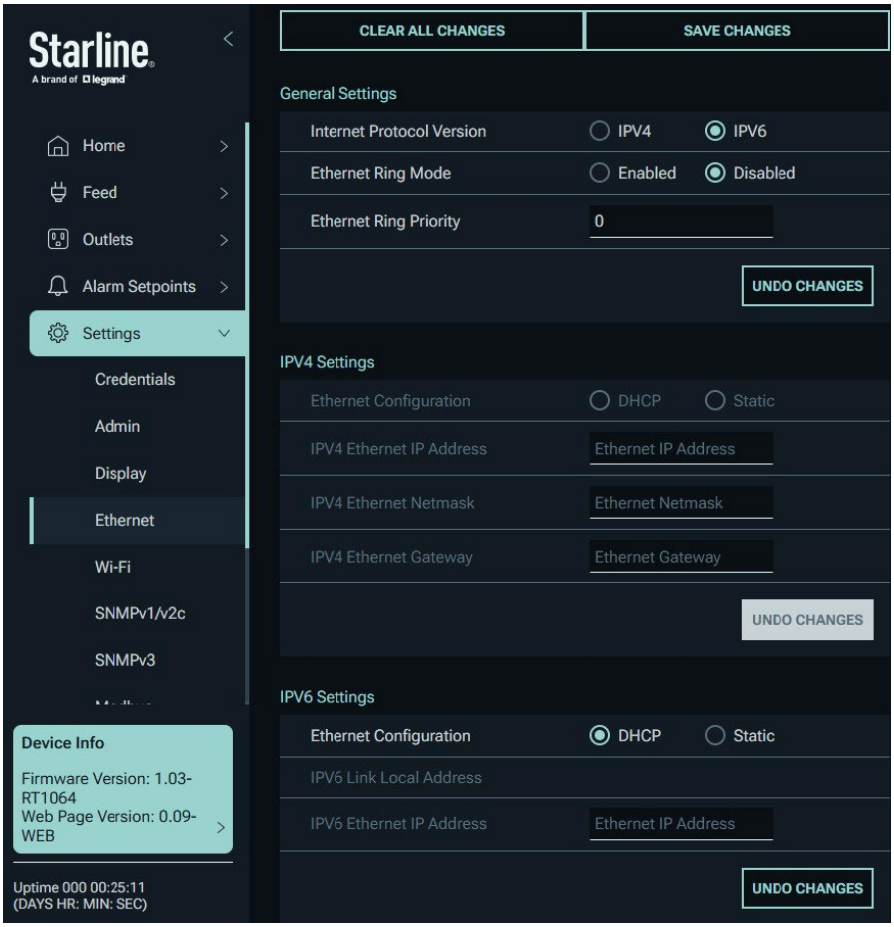
4. If your network uses static IP addresses, click the Static radio button, and enter the Ethernet IP Address, Ethernet Netmask, and Ethernet Gateway for the meter.
5. Click Save Changes. If prompted, enter your username and password and click OK.

Setting wired Ethernet configuration (IPV6)

Note: Perform this procedure last, as changing network settings will disconnect the host PC from the STARLINE CPM. This procedure requires you to know the network configuration of the local area network to which the STARLINE CPM will be connected.

1. On the configuration web page, click Settings.
2. Click Ethernet to configure the final network settings.

3. You are going to select the IPv6 radial button as well as in the IPv6 Settings make sure you have DHCP selected.

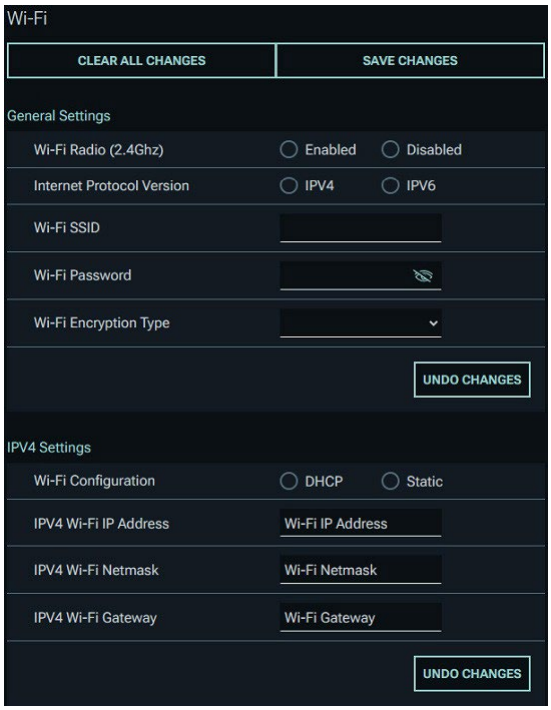


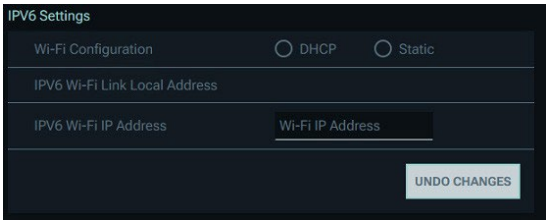
4. Click Save Changes and Reboot. If prompted, enter your username and password and click OK.
5. To find the IP address for your unit use your routers DHCP Status to search through the Status Table.

Setting wireless configuration

Note: This procedure requires you to know the network configuration of the local area network to which the STARLINE CPM will be connected.

1. On the configuration web page, click Settings.
2. Click Wi-Fi to configure the final wireless settings.
3. If your network uses DHCP to assign IP addresses (dynamic IPs) click the DHCP radio button and enter the Wi-Fi SSID and Wi-Fi Password.





4. If your network uses static IP addresses, click the Static radio button, and enter the Ethernet IP Address, Ethernet Netmask, and Ethernet Gateway for the meter, as well as the Wi-Fi SSID and the Wi-Fi Password.
5. Click Save Changes. If prompted, enter your username and password and click OK.

Alarm

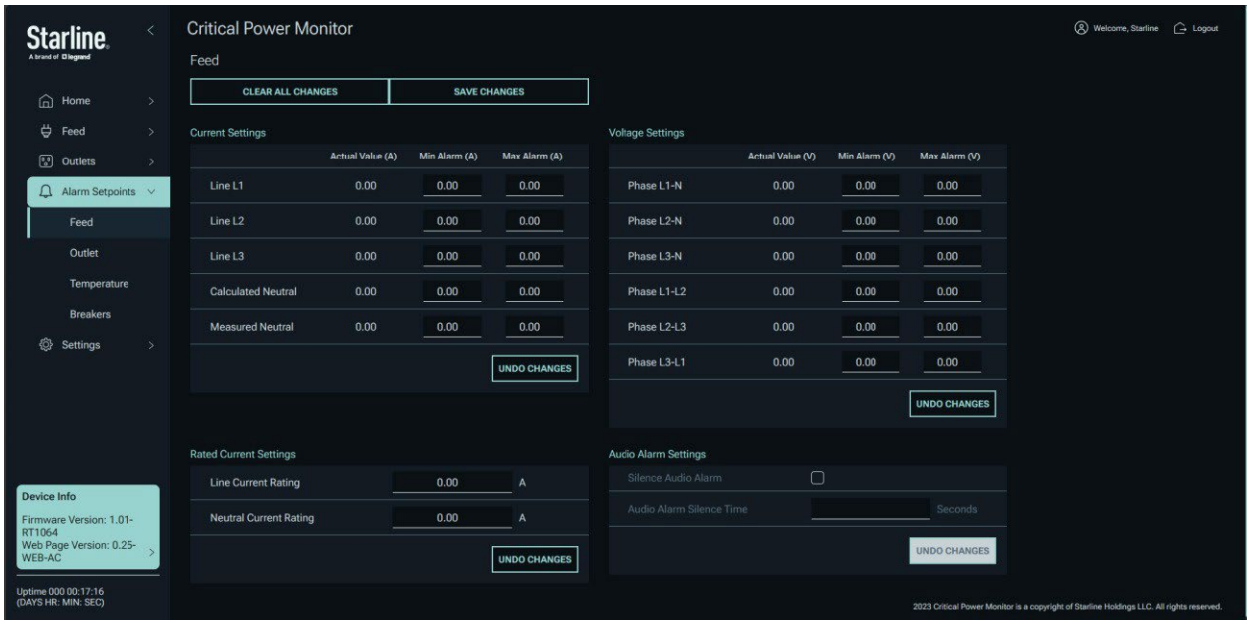
The STARLINE CPM has a configurable alarm feature which can alert the user in several ways. On the device, the STATUS LED will be lit red and the display will illustrate an exclamation point. An email alert can be sent to a preconfigured address as well as an SNMP trap. The alarm can be configured to trigger when any power line or the neutral line goes above or below a certain maximum or minimum current.

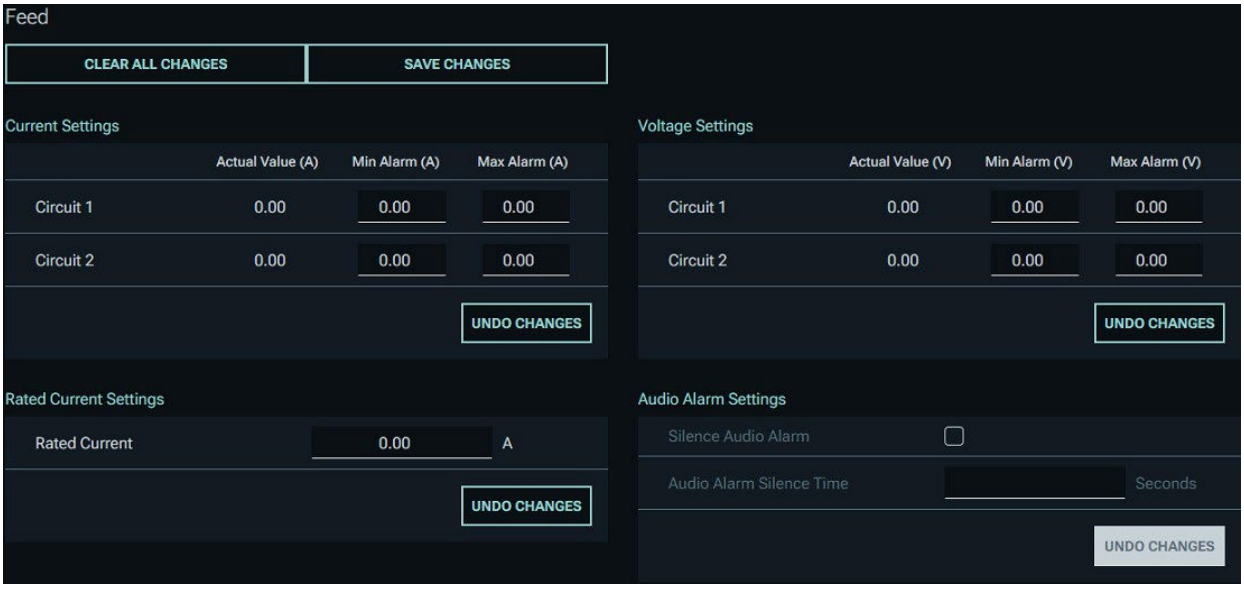
Setting the monitoring alarm

1. On the configuration web page, click Alarm Setpoints.
2. Select the Alarms you want to set

3. Using the text boxes, set the alarm thresholds

   Note: Alarms set at “0” are disabled





4. Click Save Changes. If prompted, enter your username and password and click OK.
5. The Rated Current is displayed to inform the remote user of the line’s rated ampacity.

SSH

The most common way to configure and communicate with the STARLINE CPM is by the SSH communication protocol over either wired or wireless Ethernet. To communicate with the meter, use a SSH client to connect to the IP address of the meter. If you do not have a SSH client installed on your host PC, Tera Term is a free and open source SSH client, available online (**Tera Term Link**).

Note: The SSH server is not verbose and does not echo typed characters back. It is recommended to enable local echo on the SSH client.

Syntax

Once connected to the meter, you may type commands through the SSH interface. You can also use a script file to automate a sequence of several commands. A valid command follows the format:

- $NAME[[,INDEX],INDEX|A][,OPERATOR][,VALUE]<CR><LF>
  Note: [ ] brackets enclose optional arguments, and the pipe symbol "I" is an abbreviation for "OR".

When a command is issued, a response is displayed in the following format:

- $NAME[[,INDEX,INDEX|A][,OPERATOR][,VALUE],OK|ERRxx*CHECKSUM<CR><LF>

The following table describes the elements of the standard command syntax for the meter:

Variable	Description
NAME	The command name is 2-10 ASCII characters which is descriptive of the action to perform or the parameters to get, set, or reset. This field is case sensitive.
INDEX	There are 1 or 2 indices for each command. The index is a single digit starting at 1. N is an alias for 4. The last index in 1 or 2 index commands may be A, which means "all".
OPERATOR	The operation to perform; G for get, S for set, and R for reset. If not specified, the default operator is G.
VALUE	The value to set. This field is only valid on commands with a set operator. This field is case insensitive for hexadecimal values. This field is case sensitive for string values.
CHECKSUM	The checksum is formed by XORing all bytes that are the ASCII characters between $ and *.

<CR> = Carriage Return (0D Hex, 13 Decimal)
<LF> = Line Feed (0A Hex, 10 Decimal)

If a command was successful, the argument in the response immediately before the CHECKSUM will be OK; otherwise it will be ERRxx, where xx is a 2-character error code. The following table describes the response error codes:

Error Code	Error	Description
ERR01	Incorrect number of arguments	The command has too many or too few arguments.
ERR02	Incorrect Sub Command	Subcommand is not valid. For parameters, operator is not one of G, S, or R. Check command help for valid sub command values.
ERR03	Incorrect index	The parameter index supplied is out of range. Must be 1..<max> or 'N' for Neutral , or 'A' for All.
ERR04	Index out of range	The index supplied is out of range. Must be 1..<max>.
ERR05	Incorrect Parameter	Incorrect parameter. The parameter supplied does not match the required criteria (for example, not a number, invalid register name, etc)
ERR06	Invalid All Parameter	'A' was used as the first index of a 2 index command.
ERR07	No Access	You are not logged in with the access rights to use this command.
ERR08	Error executing command	An error occurred executing the requested command.

Error Code	Error	Description
ERR09	Invalid Command	Command does not exist or is not available on this type of meter (AC/DC)
ERR10	Invalid value	Argument numeric value is out of range.
ERR11	Response too long	The response to the command was too long and was truncated.
ERR12	Unable to Reset Parameter	Failed to reset a parameter to its default value (using the 'R' subcommand)
ERR13	Unable to Reset All Parameters	Failed to reset all instances of a parameter to its default value (using the 'R' subcommand with 'A' index)
ERR14	Unable to Set Parameter	Failed to set a parameter to specified value (using the 'S' subcommand)
ERR15	Unable to Set All Parameters	Failed to set all instances of a parameter to specified value (using the 'S' subcommand with 'A' index)

Commands

The SSH command list document contains a complete list of available commands. When a SSH connection is made, you are automatically logged into the meter at the admin level. The default password is the same as the username. The login command format is:

$LOGIN,username,password

Examples that use the default passwords are listed below:

$LOGIN,admin,admin

Examples

The following examples are provided to demonstrate common procedures for the STARLINE CPM.

Configuring the wired Ethernet settings

$LOGIN,admin,admin	Login as admin
$LANSIP,S,192.168.1.99	LAN IP Address
$LANSMK,S,255.255.255.0	LAN Subnet Mask
$LANSGW,S,192.168.1.1	LAN Gateway
$LANDHCP,S,0	LAN DHCP turned off
$REBOOT	

Configuring the wireless Ethernet settings

$LOGIN,admin,admin	Login as admin
$WLANSSID,S,virgo	WLAN SSID
$WLANPWD,S,Starline	WLAN Password
$WLANENC,S,wpa2	WLAN Encryption Type
$WLANSIP,S,192.168.1.98	WLAN IP Address
$WLANSMK,S,255.255.255.0	WLAN Subnet Mask
$WLANSGW,S,192.168.1.1	WLAN Gateway
$WLANDHCP,S,0	WLAN DHCP turned off
$REBOOT	

Note: if you make a mistake configuring the Ethernet settings, the default values can be restored by pressing the reset button for 10 seconds. The default values are shown in the above examples. Also, you will have to disconnect and reconnect your SSH client because the SSH server will disconnect when the meter is rebooted.

Configuring Modbus

$LOGIN,admin,admin	Login as admin
$MODSA,S,1	Slave Address = 1
$MODBD,S,19200	Baud Rate = 19200
$MODST,S,1	Stop Bits = 1
$MODP,S,2	Parity = None
$MODM20BA,S,1	Don't shift registers 1-40 to 0-39
$MODAAC,S,2570	Admin Access Code = 2570 dec = 0A0A hex
$REBOOT	

Changing informative text strings

$LOGIN,admin,admin
$DEVLO,S,Row1 Col3
$ID,S,Tap Box 5
$OTLID,1,S,Device 1
$OTLID,2,S,Device 2
$OTLID,3,S,Device 3
$OTLID,4,S,Not Used
$OTLPID,1,1,S,Outlet1-L1
$OTLPID,1,2,S,Outlet1-L2
$OTLPID,1,3,S,Outlet1-L3
$OTLPID,1,4,S,Outlet1-N
$OTLPID,2,1,S,Outlet2-L1
$OTLPID,2,2,S,Outlet2-L2
$OTLPID,2,3,S,Outlet2-L3
$OTLPID,2,4,S,Outlet2-N
$OTLPID,3,1,S,Outlet3-L1
$OTLPID,3,2,S,Outlet3-L2
$OTLPID,3,3,S,Outlet3-L3
$OTLPID,3,4,S,Outlet3-N
$OTLPID,4,1,S,Outlet4-L1
$OTLPID,4,2,S,Outlet4-L2
$OTLPID,4,3,S,Outlet4-L3
$OTLPID,4,4,S,Outlet4-N

Resetting energy values

$LOGIN,admin,admin
$ENERGY,R

Resetting min and max values

$LOGIN,admin,admin
$LLVMN,A,R
$LLVMX,A,R
$INFLCMN,A,R
$INFLCMX,A,R
$OTLLCMN,1,A,R
$OTLLCMN,2,A,R
$OTLLCMN,3,A,R
$OTLLCMN,4,A,R
$OTLLCMX,1,A,R
$OTLLCMX,2,A,R
$OTLLCMX,3,A,R
$OTLLCMX,4,A,R

Resetting demand values

$LOGIN,admin,admin
$INFLCD,A,R
$INFLCPD,A,R
$INFCD,R
$INFCPD,R
$INFTACPD,R
$INFPTACPD,R
$INFTRACPD,R
$INFTAPPD,R
$OTLLCD,1,A,R
$OTLLCD,2,A,R
$OTLLCD,3,A,R
$OTLLCD,4,A,R
$OTLTLCD,A,R

Resetting peak demand values

$LOGIN,admin,admin
$INFPTACPD,R
$INFPTRACPD,R
$INFPTAPPD,R
$OTLLCPD,1,A,R
$OTLLCPD,2,A,R
$OTLLCPD,3,A,R
$OTLLCPD,4,A,R
$OTLTLCPD,A,R

Examples of changing the User Configuration Register (UCR)

$LOGIN,admin,admin
$CONFIG,UCR,G Returns the current value of the UCR
$CONFIG,UCR,SSH,ENABLE Enables SSH
$CONFIG,UCR,SSH,DISABLE Disables SSH
$REBOOT

Example of setting up IPv6

$LOGIN,admin,admin
$CONFIG,UCR,IPV6,ENABLE
$LANDHCP6,S,1
$REBOOT

Note: The User Configuration Register (UCR) is comprised of 8 hexadecimal digits or 32 individual bits. SSL and SSH disable/enable is written to bit 29, part of the most significant hexadecimal digit, and is therefore enabled by setting a 2 to the most significant digit. Modbus may use either double or float data types, which are controlled by bit 17, part of the fourth most significant hexadecimal digit. The other settings and corresponding bits may be found in Appendix C.

Examples of command and response

$LOGIN,admin,admin	
$LOGIN,admin,OK*28	
$ID,S,Tap Box 5	
$ID,S,Tap Box 5,OK*53	
$AAAA	
$AAAA,ERR09*60	Invalid command
$LNV,1	
$LNV,1,118.84,OK*57	
$LNV,4	
$LNV,4,ERR04*21	Index out of range; must be less than 4
$FRV,S,1.01	
$FRV,S,1.01,ERR07*61	Restricted Access

SNMP

The STARLINE CPM supports Simple Network Management Protocol (SNMP). This protocol allows network management systems to retrieve metering data and change configuration parameters. The meter supports SNMPv1 and SNMPv2c. SNMPv3. See the SNMP quick start guides for more details.

The MIB file and an OID list are available at the Starline Download Center:

https://downloads.Starlinepower.com/Starline/cpm/

The SNMP agent is configured via SSH. For more information, see **SSH** and **Appendix C: SSH command listing.**

Examples

The following is an example of a typical SNMP configuration:

$LOGIN,admin,admin	Login as admin
$SNMPTD1,S,192.168.1.10	Trap Destination Address 1
$SNMPTD2,R	Trap Destination Address 2 (reset to 0.0.0.0)
$SNMPRCN,S,public	Read Community Name
$SNMPWCN,S,private	Write Community Name
$SNMPTCN,S,trap	Trap Community Name
$ALMBACK,S,300	Trap Alarm Backoff, 300 seconds = 5 minutes

In the above example, the SNMPTD1 and SNMPTD2 commands set the IP addresses of the SNMP management stations receiving all traps (alarm notifications). The meter supports two trap destinations, and at least one destination must be defined to enable trap generation. The time interval between repeated traps is 5 minutes.

$LOGIN,admin,admin	Login as admin
$SNMPAPUUE,S,1	Auth/Priv User Enable
$SNMPAPUU,G	Auth,Priv Username
$SNMPAPA,G	Authentication Algorithm Type
$SNMPAPPA,G	Privacy Algorithm Type
$SNMPAPP,S,Password1234!	Set Authentication Password
$SNMPAPPP,S,Password5432!	Set Privacy Password

The above example shows you how to setup SNMPv3 Auth/Priv credentials.

BACnet

BACnet (Building Automation and Control Networks) is a protocol focused on communicating with and controlling a variety of facility devices. The STARLINE CPM supports BACnet and may be easily added to existing networks through a BACnet discovery tool. The STARLINE CPM contains all BACnet objects necessary for establishing reliable communication with a BACnet browser. A list of BACnet objects may be found in the BACNet object list document.

Note: BACnet discovery may not work properly if the STARLINE CPM and BACnet computer are on different networks or subnets. If this is the case, additional hardware may be required to make a connection.

Quick Start Guide: BACnet for more details.

General Information

The sections below contain some general information about the protocols that the CPM supports

TCP/UDP Ports Used By CPM

Below is a list of the TCP and UDP ports that are accessible through the CPM. BACnet UDP is the only port that can be changed. SNMP trap use port 162

Protocol	Port									
SNMP	*161*									
SNMP Traps	*162*									
HTTPS	*443*									
SSH	*22*									
Modbus TCP	*502*									
BACnet UDP	*47808*	*47809*	*47810*	*47811*	*47812*	*47813*	*47814*	*47815*	*47816*	*47817*

Maximum Number of Instances Per Protocol

Below is a table which shows the maximum number of parallel sessions that can be established per protocol. For example, a maximum of 4 Modbus TCP sessions can be established simultaneously. BACnet and SNMP are UDP protocols, which are stateless, so it is possible to run more than two sessions but that has not been tested by Starline.

Protocol	*Maximum # of Sessions*
SNMP	2
BACnet	2
Modbus RTU	1
Modbus TCP	4
SSH	4

Meter Information

This section describes any procedures which may be performed as part of the daily operation and maintenance of the power meter. The M70 series meter has been designed to utilize the same meter maintenance technique.

Supported Browsers

- Google Chrome
- Safari
- Microsoft Edge
- Firefox
- Opera

Firmware Updates

Firmware updates are periodically provided for the STARLINE CPM. They can be downloaded online at the Starline Download Center: **https://downloads.Starlinepower.com/Starline/cpm/**

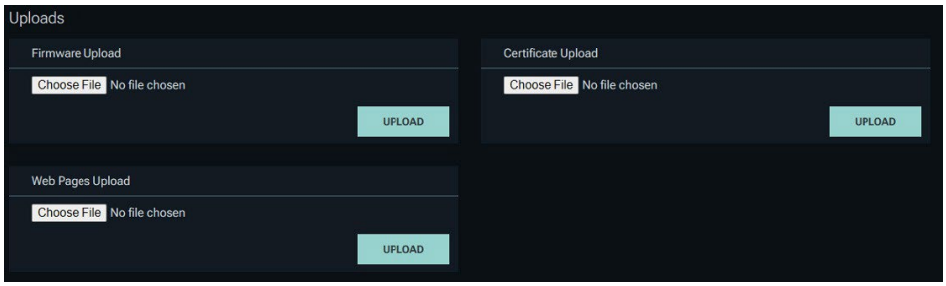
Firmware updates can be loaded from the meter configuration web page. None of the parameters on the CPM will be lost when performing a firmware upgrade.

Firmware upgrade time is ~2 minutes for the M70.

Note: Starline has tools available for performing firmware or webpage updates on multiple networked units without going directly to the webpage. Please contact your local Application Engineer for additional details.

Uploading new firmware to the meter

1. Download a new firmware version from the Starline Download Center.
2. On the configuration web page, click Settings.
3. Click Upload to go to the software update page.
4. On the software update page, browse to the firmware which you intended to upload.



5. Select the file on your hard drive in the file dialog that appears.
6. Click Upload to upload the new firmware to the meter.
7. Wait 1 minute for the process to complete. The file will be transferred, and the meter will automatically reboot, if necessary.

Note: In the event of reboot failure and communication lock, push the reset button on the front of the meter; communication will be restored, and the firmware update will be applied as expected.

Configuration Registers

This section contains all information related to the configuration registers on the CPM. Every configuration register is comprised of a 32-bit binary number which uses a single bit to enable/disable each independent feature. Using the following command makes the process of enabling and disabling registers more user friendly.

- In SSH, type $config,<Desired Register> to see the names of each command in the register.
- To enable or disable each command, enter $config, <Desired Register>, <command>, [enabled/disabled]

Example

Using Table 1 on the following page as an example, let's assume a user wanted to generate a configuration register where they needed to enable or disable SNMPv3:

- $config,ucr
  - This would pull up a list of the possible parameters to be changed
- $config,ucr,snmpv3,[enabled/disabled]
  - To see if the command worked properly, the user could then type $config, ucr again to see if the SNMPv3 parameter was set to the desired value.

Note: Some parameters are not written as enabled or disabled. The temperature display, for instance is defaulted to Fahrenheit being disabled, meaning the Celsius is enabled. To enable Fahrenheit, the user would type the following:

$LOGIN,admin,admin	Login as admin
$CONFIG,UCR,FAHRENHEIT,ENABLE	To set the temperature to Fahrenheit
$CONFIG,UCR,FAHRENHEIT,DISABLE	To set the temperature to Celsius

Table 1 – Breakout of the User Configuration Register (UCR)

Setting Name	Options		Bit	Setting Description
	0 =	1 =		
-	-	-	31	-
SNMPv3	Disabled	Enabled	30	Enable/Disable SNMPv3
SSH	Disabled	Enabled	29	Enable/Disable SSH
-	-	-	28	-
ModbusTCP	Enabled	Disabled	27	Enable/Disable Modbus protocol
SNMPv1v2c	Enabled	Disabled	26	Enable/Disable SNMP protocol
BacSec	Enabled	Disabled	25	Enable/Disable security for making configuration changes via BACNet
BACNet	Enabled	Disabled	24	Enable/Disable BACNet protocol
ModSec	Enabled	Disabled	23	Enable/Disable security for making configurations changes via Modbus
Web	Disabled	Enabled	22	Enable/Disable the webpage.
WiFi	Disabled	Enabled	21	Enable/Disable Wi-Fi for the unit.
Ring	Disabled	Enabled	20	Enable/Disable ring mode for the unit.
-	-	-	19	-
IPV6	Disabled	Enabled	18	Enable/Disable IPv6 for the unit.
ModF	Double	Float	17	Impacts how the CPM sends data points listed as Double in the Modbus map; forcing these to Float may be necessary for some BMS/DCIM packages
SnmpU	No	Yes	16	Enable/Disable if units are appending to text strings sent via SNMP
-	-	-	15...11	-
Fahrenheit	Celsius	Fahrenheit	10	Change temperature monitor data points to read either Celsius or Fahrenheit
-	-	-	9...7	-
RTU	Disabled	Enabled	6	Modbus/RTU
-	-	-	5...3	-
Factory	Disabled	Enabled	2	Enable/Disable factory credentials.
-	-	-	1	-
Demo	Live	Demo	0	Live is considered normal operation and demo mode provides triangle waveforms to assist with BMS/DCIM development

When sending a configuration register via SSH, the register will also accept a hexadecimal value. Sending a decimal value will be incorrectly interpreted. This is only recommended for users with experience converting bits to hex due to the wider margin of error. There are many online converters for converting a decimal number to a hexadecimal number which can assist in the conversion.

User Configuration Register

The user configuration register (UCR) is a register that allows a user to enable/disable a variety of features based on application or preference. The complete user configuration register may be found in Table 1 above.

Ethernet Ring Mode

Ethernet ring mode allows a daisy-chain of Ethernet-connected CPMs to be connected to an Ethernet switch twice for increased reliability. If a failure occurs during operation, the units will no longer be in a ring, but will use the still viable path to remain available on the network.

This was designed to work with two ports on a single Ethernet switch. If the front and back of the daisy-chain are connected to two different switches, there may be limitations based on network routing.

Display Configuration Register

The display configuration register (DCR) is a register that allows a user to enable/disable which types of data points are displayed on the 7-segment, LED display for M70 CPM. Table 2 shows the complete breakout of data points that can be displayed.

The user would follow the instructions in the Example shown above to edit this register.

Table 2 – Breakout of the Display Configuration Register (DCR)

Setting Name	Options		Bit	Setting Description
	0 =	1 =		
WLAN	Don't Display	Display	31	Controls if LED display will show Wireless LAN Settings.
LAN	Don't Display	Display	30	Controls if LED display will show LAN Settings.
OLCMA	Don't Display	Display	23	Controls if LED display will show AC Outlet line current max alarm
OPS	Don't Display	Display	22	Controls if LED display will show AC Outlet power summary
OLCP	Don't Display	Display	21	Controls if LED display will show Outlet line current PC
OLC	Don't Display	Display	20	Controls if LED display will show outlet line current
-	-	-	19...17	-
IPS	Don't Display	Display	16	Controls if LED display will show infeed power summary
IE	Don't Display	Display	15	Controls if LED display will show infeed energy
IAPP	Don't Display	Display	14	Controls if LED display will show infeed total apparent power value.
IACP	Don't Display	Display	13	Controls if LED display will show infeed total active power value.
IPF	Don't Display	Display	12	Controls if LED display will show infeed power factor values
ICMA	Don't Display	Display	11	Controls if LED display will show infeed current max alarms
ICPC	Don't Display	Display	10	Controls if LED display will show infeed current PC
INC	Don't Display	Display	9	Controls if LED display will show infeed neutral currents
IC	Don't Display	Display	8	Controls if LED display will show infeed phase currents (L1, L2, and L3)
-			7...5	
LLV	Don't Display	Display	4	Controls if LED display will show line to line voltages
-			3...1	
LNV	Don't Display	Display	0	Controls if LED display will show line to neutral voltages

Swap Configuration Register

The swap configuration register allows for current transformer (CT) polarity to be swapped (i.e. the CT is facing the line instead of the load). This is particularly useful when a backwards CT was not discovered until the system was already powering a critical load. If a CT is on the incorrect line, changing the polarity through this register will not correct the problem. This register will swap the CT in firmware without having to manually change the wiring.

Instead of the "Enabled/Disabled" commands that the user would have used in the previous registers, the commands for this register are "Normal/Reverse." The rest of the rules to edit this register are the same as the Example

Table 3 – Breakout of the Swap Configuration Register (SCR)

Setting Name	Options		Bit	Setting Description
	0 =	1 =		
-			31...6	
CT6P	Normal	Reverse	5	Swaps the polarity of the CT in position 6
CT5P	Normal	Reverse	4	Swaps the polarity of the CT in position 5
CT4P	Normal	Reverse	3	Swaps the polarity of the CT in position 4 (N CT.[5] in a typical feed unit)
CT3P	Normal	Reverse	2	Swaps the polarity of the CT in position 3 (L3 CT in a typical feed unit)
CT2P	Normal	Reverse	1	Swaps the polarity of the CT in position 2 (L2 CT in a typical feed unit)
CT1P	Normal	Reverse	0	Swaps the polarity of the CT in position 1 (L1 CT in a typical feed unit)

[5] Review the catalog numbering information to determine if your feed unit contains a neutral current transformer

Alarm Registers

This section contains all information related to the alarm registers on the CPM. Every alarm register is comprised of a 32-bit binary number which uses a single bit to indicate an alarm condition. These flags can be summed up to generate a single integer value which represents all active alarms. The alarm registers, while not settable, can be read and interpreted in the same way as the configuration registers above. To access the alarms, use the command $alarms. Unlike the configuration register, the alarm register does not have “options”, 0 always means no alarm condition and 1 always means an alarm condition. The CPM alarms will clear once the parameter returns to normal (the CPM does not store these alarm values in memory).

$alarms usage

```
$alarms
Infeed
------
00000001 Line 1 Current Minimum                active
02000000 L1-N Voltage Maximum                  active
Outlets
-------
Outlets2
--------
Breaker
-------
Temperature
-----------
00000200 Node 2 Maximum User Temperature       active
Security
--------
$alarms,OK*28
```

Infeed Alarm Status Register

$INFALM

Outlet Alarm Status Register 1

$OUTALM is used for outlets 1-4 and $OUTALM2 is used for outlets 5-6.

Breaker Status Alarm Register

The breaker status alarm register will indicate when a breaker is off/non-conducting. This register is a means of providing an alert that power has been lost, either intentionally (i.e. manually turning off the breaker) or unintentionally (i.e. breaker tripped), to the load powered off that breaker.

$BRKALM

Temperature Monitor Alarm Status Register

$TMPALM

The temperature monitor hardware has 2 sets of maximum temperature alarms. The purpose of the first set of alarms (System Max Temperature) is to communicate that the busway system is nearing a temperature where insulation or other components may be damaged. Unless otherwise specified, this threshold will be set to 85 °C by default. As soon as any node or the sensor on the CPM detect a temperature over this threshold, it will enter an alarm state.

The second set of alarms correspond to maximum temperature alarms set by the user. Like the system threshold alarms, these will act as a check for over temperature conditions. These alarms cannot be disabled and should be set well above the expected temperature range to effectively disable the alarm.

The third set of alarms are battery alarms, which warn a user when the battery life is reaching its end. This alarm should provide a user with around six months of warning before the battery dies completely. Since remaining battery life is dependent on the thermal profile of the final application, some variation should be expected. The battery powered/wireless temperature monitoring solution is no longer offered by Starline.

The final set of alarms correspond to unresponsive temperature sensors. If a wireless node goes more than 65 minutes without providing updated data, this alarm will be thrown to indicate a potential issue. This alarm will be the next step if the battery has not been replaced through the duration of the battery alarm. The battery powered/wireless temperature monitoring solution is no longer offered by Starline.

If a wired temperature node is missing, disconnected, or otherwise not functioning, the temperature for that node will be reported as 999.99 °C. The max threshold alarms going off and the value being reported as 999.99 °C will be the identifiers that a wired sensor is not reporting data.

Group Reset Register

The CPM has a group reset register which can be used to reset many different value types simultaneously. The register is intended to save the end user time by allowing for mass resetting. As with all configuration and status registers, this register is comprised of a 32-bit hexadecimal number. The user will calculate the value of the reset register and then send that value through a communication protocol, which will cause the CPM to reset all the selected values. Table 4 includes the complete set of resettable values.

The calculation of these registers will follow identically with the configuration registers. For example, if a user wanted to reset the maximum temperature (bit 0), peak metering (bit 2), and minimum metering values (bit 4), all through a single command, the following calculation would be performed: $20+2^2+2^4=1+4+16=21=0x15$

Sending the value of 0x15 through a communication protocol will reset temperature, peak metering, and min. metering values; this will also leave demand metering and maximum metering values untouched.

Table 4 – Breakout of Group Reset Register

Data Group	Bit	Group Status
-	31...5	
Maximum Temperature Values	4	1 = reset, 0 = remain unchanged
Demand Metering Values	3	1 = reset, 0 = remain unchanged
Peak Metering Values	2	1 = reset, 0 = remain unchanged
Maximum Metering Values	1	1 = reset, 0 = remain unchanged
Minimum Metering Values	0	1 = reset, 0 = remain unchanged

Troubleshooting

This section contains some basic information on troubleshooting issues on the CPM.

Current Transformers

One of the most common issues during an installation is reversing the polarity of the current transformation (CT) or placing the CT on the incorrect phase. A CT placed with the incorrect polarity will result in a negative active power on that individual line. The negative active power will also prevent energy from accumulating on the CPM.

If two or more CTs are placed on the incorrect phase termination (ie. CT for Phase A wired to Phase B termination pins), then typically two or more lines will read negative active power as well. There is a chance, depending on the actual power factor of the load, that the CPM will read a very low active power.

In either situation, reverse polarity or swapped CTs, Starline has tools to correct these issues through factory configuration. Please contact your local Application Engineer for additional details.

SSH

The SSH server is not verbose and does not echo typed characters back. It is recommended to first enable local echo on the SSH client. The SSH connection can be easily verified by issuing a get request and receiving a response, for example when requesting: “$ID” the meter will respond with $id,<Device ID>,OK*21”. To make this request type “$ID” and <Enter>.

It is necessary to log into the STARLINE CMPM before viewing and making changes requests made before logging in will return “ERR07”.

Privacy Policy

Starline privacy policy can be found here: **https://www.legrand.us/privacy**

Meter Maintenance

This section describes any procedures which may be performed as part of the daily operation and maintenance of the power meter. The M70 meter has been designed to utilize the same meter maintenance techniques, therefore this entire section will contain information relevant to both meter series.

Meter Reset

The STARLINE CPM can be reset using the pinhole button on the front of the meter. A short press of that button will reboot the meter with no changes to the settings. The LED will be off to indicate that the button is being depressed. Pressing and holding the pinhole button for 10 seconds will cause the networking settings to return to default which will be denoted by the LED blinking white. For more information on default network settings, see **Ethernet** and **Wireless**.

Pressing and holding the pinhole button for 15 seconds will reset the admin settings. This reset will clear all admin data from the meter resetting it to default values. After holding the button for 15 seconds the LED will blink red notifying that defaults were set. An additional momentary reset will be required after this procedure.

Pressing and holding the pinhole button for 20 seconds will reset the meter to factory settings. This reset will set the meter to all default settings like it is brand new. The LED will blink yellow to inform the user that the reset has happened.

Table: Admin Credentials Reset

Parameter	SSH Parameter
Modbus Admin Access Code	$MODAAC
SNMP read community	$SNMPRCN
SNMP write community	$SNMPWCN
SNMP trap community	$SNMPTCN
SNMPv3 Auth Password	$SNMPAP
SNMPv3 AuthPriv Password	$SNMPAPP
SNMPv3 AuthPriv Priv Password	$SNMPAPPP
SNMPv3 Trap Auth Password	$SNMPTAP
SNMPv3 Trap Priv Password	$SNMPTPP

Note: Energy values rollover at 9000000.000 kilowatt-hours. If Modbus is being used, and the data type is set to float and not double, you must read and reset the energy before it exceeds 6 significant digits, 999.999 kilowatt-hours.

Appendix A: Quick Start Guides

The guides contained in this section are provided to show the most common or default setup for the STARLINE CPM. They are designed to be broad overviews of the installation process and may not necessarily meet all your needs. You will require some knowledge of the configuration of the network that the CPM Power Meter will be connected to use these guides effectively. These guides are intended to be used as a reference to get your meter working quickly.

The guides assume that the host PC used to configure the STARLINE CPM is running Windows 10 or newer.

For more information about the STARLINE CPM please visit: **http://www.Starlinepower.com/busway/cpm/**

Please use the link below to get to the document library which contains all CPM literature:
https://downloads.Starlinepower.com/Starline/cpm/

Quick Start Guide: Ethernet

Please read this entire guide before you begin.

Using this guide, you will install a STARLINE Plug-in Unit or Feed Unit with integrated STARLINE CPM and configure the meter using the embedded web page.

Materials Required

The following materials and equipment are required for this procedure:

- STARLINE Busway System
- STARLINE Plug-in Unit or Feed Unit with integrated STARLINE CPM
- CAT-5e or CAT-6 standard Ethernet cable
- Host PC with web browser to connect to STARLINE CPM

In addition to these materials, you will need to know the network configuration of the local area network to which the STARLINE CPM will be connected.

Default Settings

The STARLINE CPM has the following default wired Ethernet settings when IPV4 is enabled:

- IP Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- Login Credentials
  - Username: admin
  - Password: admin
    - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section xxx for more details)

Installation Instructions

In this section, you will install, energize, and connect to the STARLINE CPM via the configuration web page.

1. Provide power to the STARLINE CPM by inserting the STARLINE Plug-in Unit into a compatible energized busway, or by energizing the Feed Unit.
2. Connect CAT-5e or CAT-6 cable from the Ethernet port on the front of the STARLINE CPM to the Ethernet port on the host PC.
3. Configure the host PC to connect to the STARLINE CPM by setting the host PC to a static IP in the 192.168.1.XX range, with a subnet mask of 255.255.255.0:
   a. Go to the Control Panel.
   b. Click Network and Sharing Center.
   c. On the left pane in the window, click Change Adapter Settings.
   d. Identify the Ethernet adapter to which the STARLINE CPM Meter is connected, and make sure it is marked Enabled. Right click the adapter and select Properties.
   e. In the Properties window, scroll through the list and highlight Internet Protocol Version 4 (TCP/IPv4). Click Properties.

Note: If this Ethernet adapter is used to connect to another network, take a screenshot of the Internet Protocol Version 4 (TCP/IPv4) Properties window, or carefully note the settings displayed in the window.

f. Click the Use the following IP address: radio button. In the IP address field, enter 192.168.1.50. In the Subnet mask field, enter 255.255.255.0.

g. Click OK to save the settings and click OK in the Properties window to dismiss it.

4. Open the web browser on the host PC and enter 192.168.1.99 in the address bar to connect to the STARLINE CPM configuration web page.

The STARLINE CPM has the following default wired Ethernet settings when IPV6 is enabled:

- IP Configuration: DHCP
- Link Local Address: fe80::/64 <Algorithmically created from device MAC address at run time>
- IP Address: Configured by DHCP
- Gateway: Configured by DHCP
- IPv4 is automatically disabled on first startup.
- IPv4 Address is not set.
- Login Credentials
  - Username: admin
  - Password: admin
    - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section xxx for more details)

Installation Instructions

In this section, you will install, energize, and connect to the STARLINE CPM via the configuration web page.

1. Provide power to the STARLINE CPM by inserting the STARLINE Plug-in Unit into a compatible energized busway, or by energizing the Feed Unit.
2. Connect CAT-5e or CAT-6 cable from the Ethernet port on the front of the STARLINE CPM to the local area network.
3. Connect the host PC to connect to the local area network.
4. To find the IPV6 address for the CPM unit use your routers DHCP Status to search the status table.
5. Open the web browser on the host PC. Type [IPv6 Address]

   a. Example: [fc00::7ff5:946f:f494:8e4c]

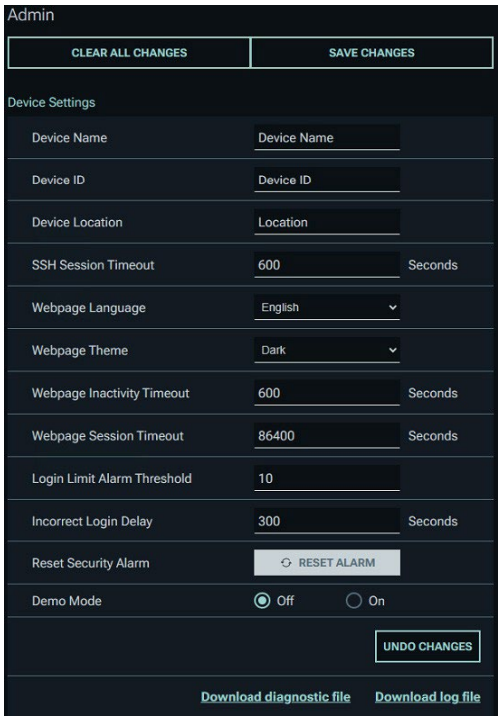
   b. If you do not have the IP address you are also able to access the webpage via the Local Link Address.

Configuration

In this section, you will use the configuration web page to adjust the alarm, identification, and network parameters of the meter. All procedures in this section are optional except final network configuration. It is highly recommended that you perform all procedures in this section.

Setting the device Name, ID and location

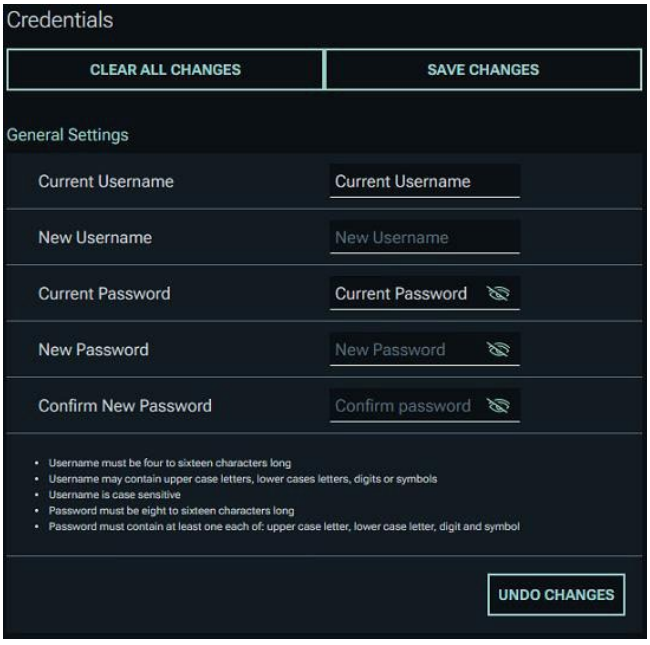
1. On the configuration web page, click Settings then Admin.
2. Using the text boxes, enter the Device Name, Device ID, and Device Location.



3. Click Save Changes. If prompted, enter your username and password and click OK.

Changing the admin account password

1. On the configuration web page, click Settings then Credentials.
2. Using the text boxes, enter the new Admin Password.



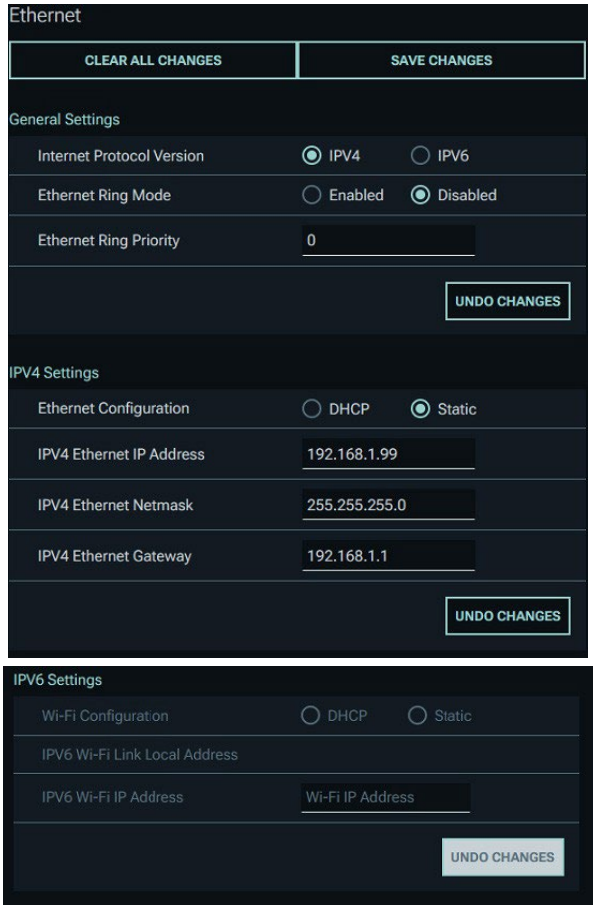
3. Click Save Changes. If prompted, enter your username and password and click OK.

Setting wired Ethernet configuration (IPV4)

Note: Perform this procedure last, as changing network settings will disconnect the host PC from the STARLINE CPM. This procedure requires you to know the network configuration of the local area network to which the STARLINE CPM will be connected.

1. On the configuration web page, click Settings.
2. Click Ethernet to configure the final network settings.

- If your network uses DHCP to assign IP addresses (dynamic IPs) click the DHCP radio button. If your network uses static IP addresses, click the Static radio button, and enter the Ethernet IP Address, Ethernet Netmask, and Ethernet Gateway for the meter.

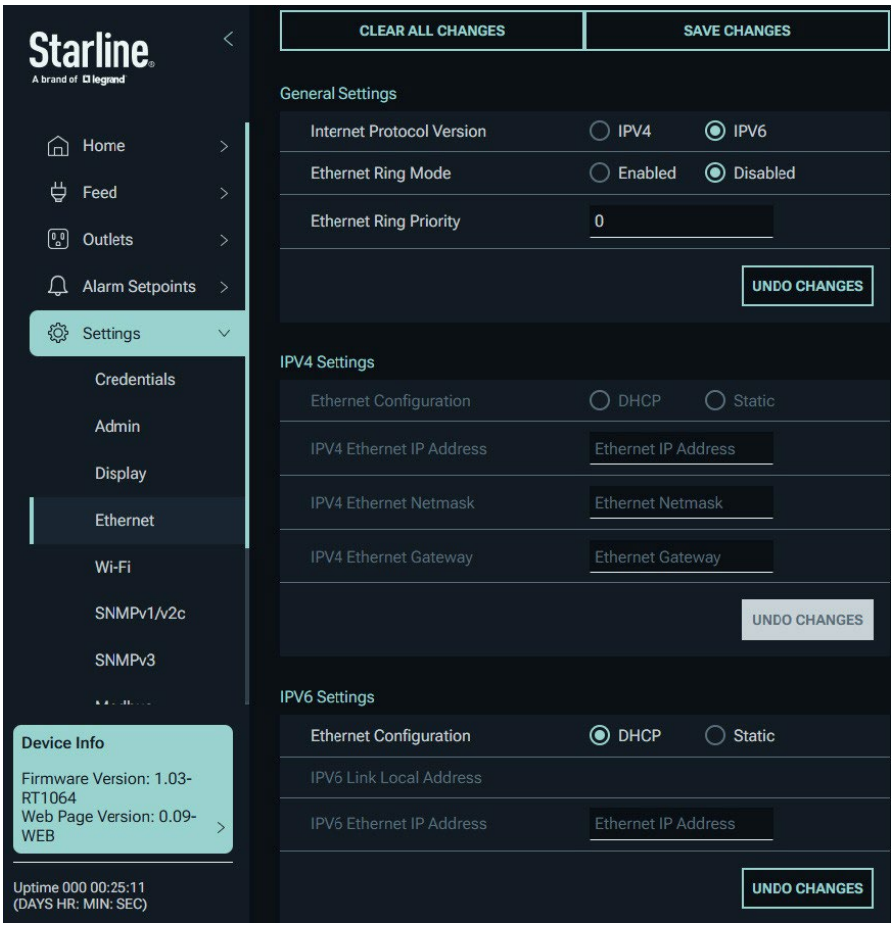


3. Click Save Changes. If prompted, enter your username and password and click OK.
4. A reset or reboot will be required upon completion of step 4.

Setting wired Ethernet configuration (IPV6)

Note: Perform this procedure last, as changing network settings will disconnect the host PC from the STARLINE CPM. This procedure requires you to know the network configuration of the local area network to which the STARLINE CPM will be connected.

1. On the configuration web page, click Settings.
2. Click Ethernet to configure the final network settings.
3. You are going to select the IPv6 radial button as well as in the IPv6 Settings make sure you have DHCP selected.



4. Click Save Changes and Reboot. If prompted, enter your username and password and click OK.
5. To find the IP address for your unit use your routers DHCP Status to search through the Status Table.

Quick Start Guide: Daisy-Chain Ethernet

Please read this entire guide before you begin.

Using this guide, you will set up a daisy-chain connection between two or more STARLINE M70 meters. This guide will contain information only relevant for the M70 meter configurations.

No device limit has been discovered based on meter hardware, unlike Modbus RTU and was functionally tested with over 150 meters in a single daisy-chain. It should be noted that each meter in the daisy-chain will add a very small delay to communication. If using a management software that requires a large amount of communication these delays may begin to impact the performance of the software.

When using a BMS (Building Management Software) that requires a great deal of communication it may be necessary to limit the number of daisy chained units. Since each meter will act as a repeater for the signal there should be no hardware limit to the number of meters that may be chained; the limit will be subject to the tolerances of the network or BMS.

Materials Required

The following materials and equipment are required for this procedure:

- STARLINE Busway System
- STARLINE Plug-in Units with integrated STARLINE CPM
- CAT-5e or CAT-6 standard Ethernet cable
- Host PC with web browser to connect to STARLINE CPM

In addition to these materials, you will need to know the network configuration of the local area network to which the STARLINE CPM will be connected.

Default Settings

The STARLINE CPM has the following default wired Ethernet settings:

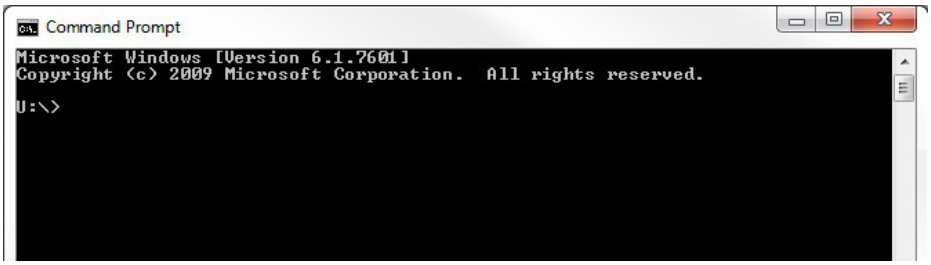
- IPv4 Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.
- Login Credentials
    - Username: admin
    - Password: admin
        - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section xxx for more details)

Installation Instructions

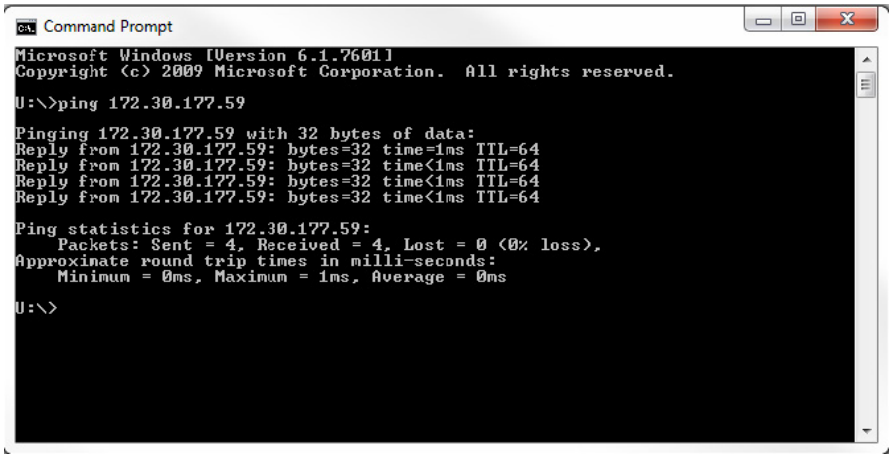
In this section, you will install, energize, and connect to the STARLINE CPM via the configuration web page.
The daisy-chain configuration utilizes device IP address for finding devices; if all devices in a chain have the same IP

address communication errors will be the result. For a new installation, it will be necessary to connect to each meter individually and go through the configuration as seen in **Quick Start Guide: Ethernet**. After each of the meters have been configured with unique IP addresses, a subnet mask, and a gateway follow the steps below:

1. Use a CAT-5e or CAT-6 cable to connect the first meter in the daisy-chain to the network router/switch
2. Use the second RJ45 jack on the first meter to connect to the first RJ45 jack of the second meter via a CAT-5e or CAT-6 cable
3. Repeat step 2 until all meters are connected in an Ethernet bus, where every meter is connected to the previous and next meter in the line
4. The last meter in the chain should be left unconnected on one side
5. Connect the host PC to the same router/network as the configured, daisy-chained meters
6. Verify the connection:
    a. Open Windows Command Prompt by typing “cmd” into the search bar from the windows start menu
    b. Open cmd.exe and see something like the figure below



    c. Use the command “ping” with the meter’s IP address and push the enter key



Note: It is possible to ping a series of meters if the IP Addresses are sequenced and share a subnet (i.e. 192.168.1.99, 192.168.1.100, 192.168.1.101, 192.168.1.102, …) using the following command:

For /l %i in (99,1,254) do @ping 192.168.1.%i -n 1 -w 100 | find “Reply”

The only two parts of this command that should be changed for custom needs are the bolded parts above. The values inside the parentheses represent the first IP value, incremented value, and the last IP value. This example starts at 192.168.1.99 and will go up to IP address 192.168.1.254; including every IP address between because it is incrementing the starting value by 1. The second portion that should be changed is representative of the shared portion of the IP address. In this example “192.168.1.” is the shared portion of the IP addresses, all meters will share these octets in their IP address.

Troubleshooting

This section contains a list of common issues that may cause communication problems with one or more of the meters in a daisy-chain.

Verifying the meters are turned on

An M70 meter with power will have a Light bar which is solid green. If the Light bar is not lit, the meter is not powered on. If the meter is plugged into the busway and the busway is powered on, please contact an Applications Engineer from Starline for further assistance.

Verifying the physical connection

All M70 meters are equipped with Ethernet ports with connectivity lights. If a meter is not communicating, please verify that both the green and yellow LED on the Ethernet jack on turned on or blinking. If the connection is insecurely made the LEDs will be turned off.

Note: The LEDs will only be turned on when the cable is securely connected to another Ethernet device (such as another M70 meter or a network switch). If an Ethernet cable is plugged into the meter but disconnected on the other end the LEDs will not be lit.

Determine if IP Addresses are set correctly

The first step is to ensure that all meters have been reset since their IP address was changed. IP address changes only take effect after a meter reboot (either a reboot command sent via SSH/webpage or hitting the reset button on the meter), so it is important to verify that the meter has been rebooted.

If a communication issue persists with one of the meters after all the meters have been rebooted it will be necessary to isolate that meter by disconnecting it from the daisy-chain. Connect directly to that meter with a computer or laptop and attempt to ping the meter. If the ping is successful, the likely cause is that another meter in the daisy-chain was set to an identical IP address. If the ping is unsuccessful, then the IP address for the meter is likely set incorrectly. By holding the reset button for 5 second, the meter will be reset back to default communication values, returning the IP address to the default 192.168.1.99. Once the IP address is returned to default follow the same steps as before to change the IP address to the desired value and reboot the meter.

Recent firmware update

After performing a firmware update on all meters, it is important to ensure that all meters are correctly running the new version (which may be verified at the top of the webpage or through the '$FV' command in SSH. If a meter is running an older version of firmware, it may not be passing packets correctly through to other meters and causing communication issues. If it appears that all communicating meters are running the same firmware it is recommended to perform a hardware reset (hitting the reset button) on the meter. After hitting the reset button, the meter should come back and begin communicating in about 30 seconds. If this does not fix the issues, then please contact an Applications Engineer from Starline for further assistance.

Quick Start Guide: Wireless (Wi-Fi)

Please read this entire guide before you begin.

Using this guide, you will install a STARLINE Plug-in Unit or Feed Unit with integrated STARLINE CPM and configure the meter using the embedded web page.

Materials Required

The following materials and equipment are required for this procedure:

- STARLINE Busway System
- STARLINE Plug-In Unit or Feed Unit with integrated STARLINE CPM
- CAT-5e or CAT-6 standard Ethernet cable
- Host PC with web browser to connect to STARLINE CPM (Firefox, Chrome, or Internet Explorer recommended)

In addition to these materials, you will need to know the network configuration of the wireless local area network to which the STARLINE CPM will be connected.

Default Settings

The STARLINE CPM has the following default wired Ethernet settings:

- IP Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- Login Credentials
  - Username: admin
  - Password: admin
    - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section Meter Reset for more details)

Additionally, the STARLINE CPM has the following default wireless settings:

- IP Configuration: Static
- IP Address: 192.168.1.98
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.

Installation Instructions

In this section, you will install, energize, and connect to the STARLINE CPM via the configuration web page.

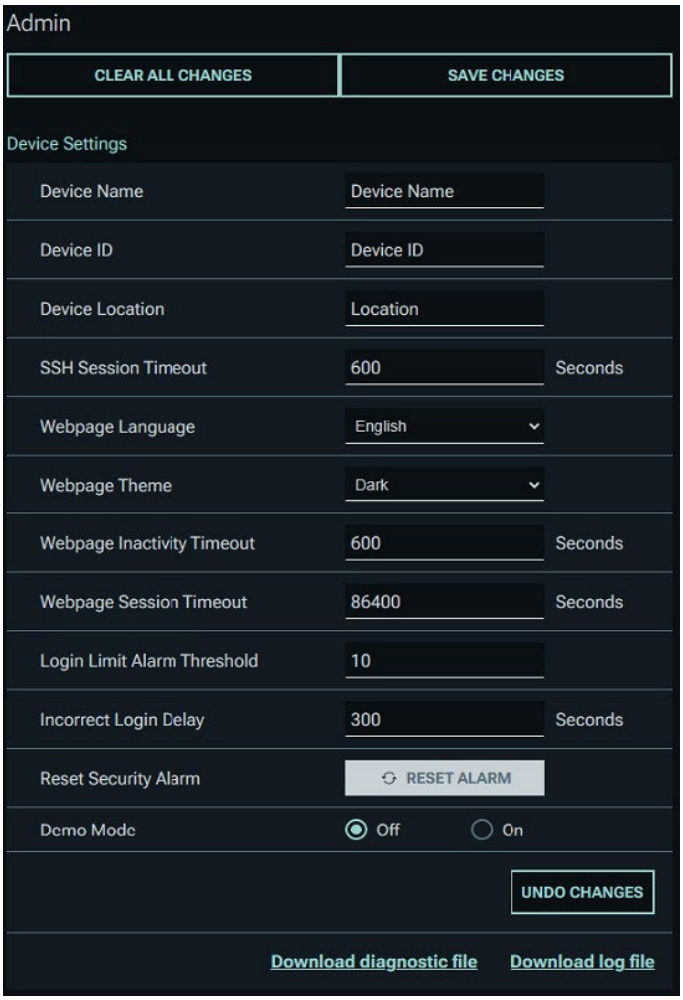
1. Provide power to the STARLINE CPM by inserting the STARLINE Plug-in Unit into a compatible energized busway, or by energizing the Feed Unit.
2. Connect CAT-5e or CAT-6 cable from the Ethernet port on the front of the STARLINE CPM to the Ethernet port on the host PC.
3. Configure the host PC to connect to the STARLINE CPM by setting the host PC to a static IP in the 192.168.1.XX range, with a subnet mask of 255.255.255.0:
    a. Go to the Control Panel.
    b. Click Network and Sharing Center.
    c. On the left pane in the window, click Change Adapter Settings.
    d. Identify the Ethernet adapter to which the STARLINE CPM Meter is connected, and make sure it is marked Enabled. Right click the adapter and select Properties.
    e. In the Properties window, scroll through the list and highlight Internet Protocol Version 4 (TCP/IPv4). Click Properties. Note: If this Ethernet adapter is used to connect to another network, take a screenshot of the Internet Protocol Version 4 (TCP/IPv4) Properties window, or carefully note the settings displayed in the window.
    f. Click the Use the following IP address: radio button. In the IP address field, enter 192.168.1.50. In the Subnet mask field, enter 255.255.255.0.
    g. Click OK to save the settings and click OK in the Properties window to dismiss it.
4. Open the web browser on the host PC and enter 192.168.1.99 in the address bar to connect to the STARLINE CPM configuration web page.

Configuration

In this section, you will use the configuration web page to adjust the alarm, identification, and network parameters of the meter. All procedures in this section are optional except final wireless configuration. Although changing the default password is not required, it is recommended that you do so for security purposes. It is highly recommended that you perform all procedures in this section.

Setting the device Name, ID and location

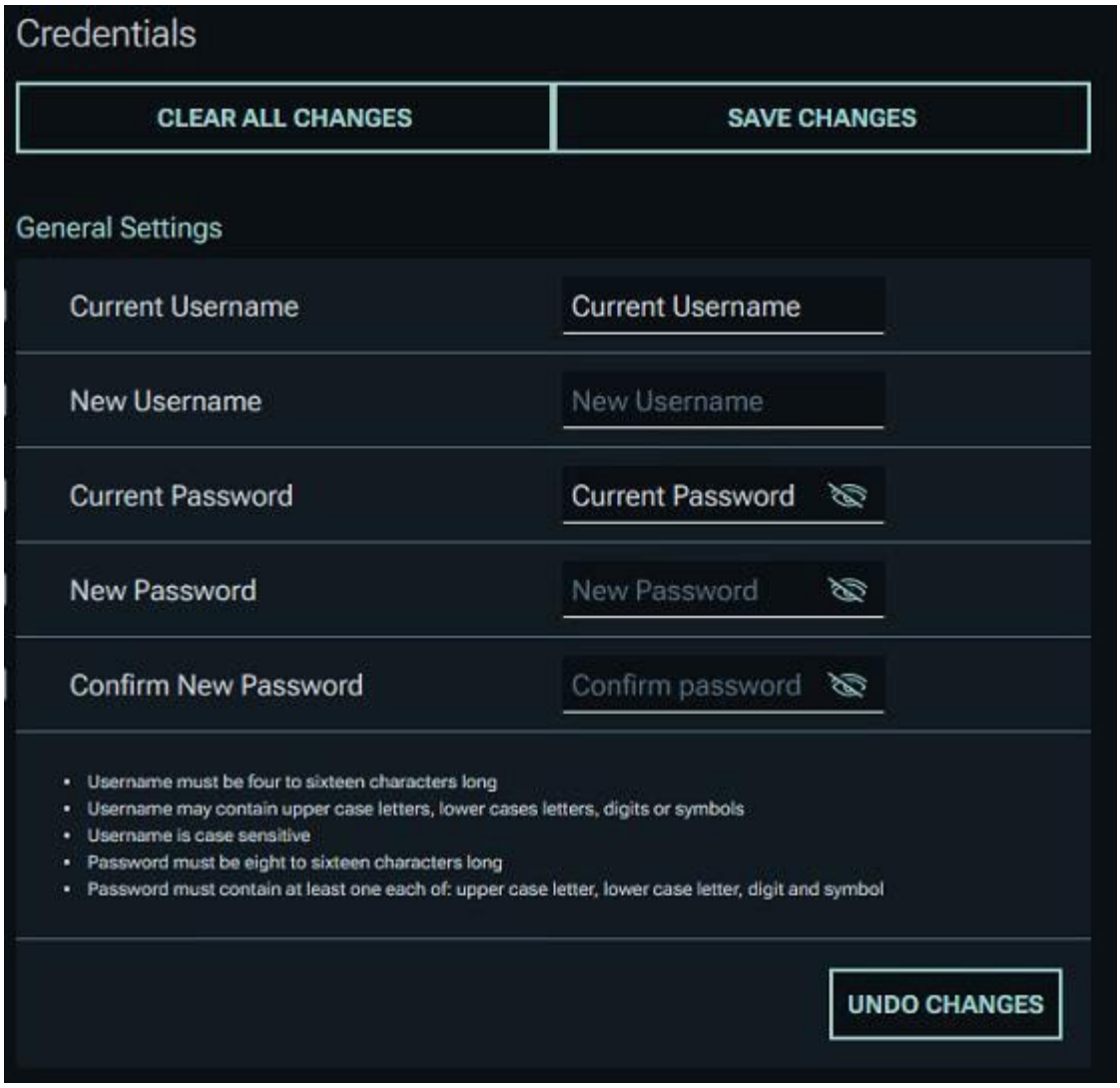
1. On the configuration web page, click Settings then Admin.
2. Using the text boxes, enter the Device Name, Device ID, and Device Location.



3. Click Save Changes. If prompted, enter your username and password and click OK.

Changing the admin account password

1. On the configuration web page, click Settings then Credentials.
2. Using the text boxes, enter the new Admin Password.

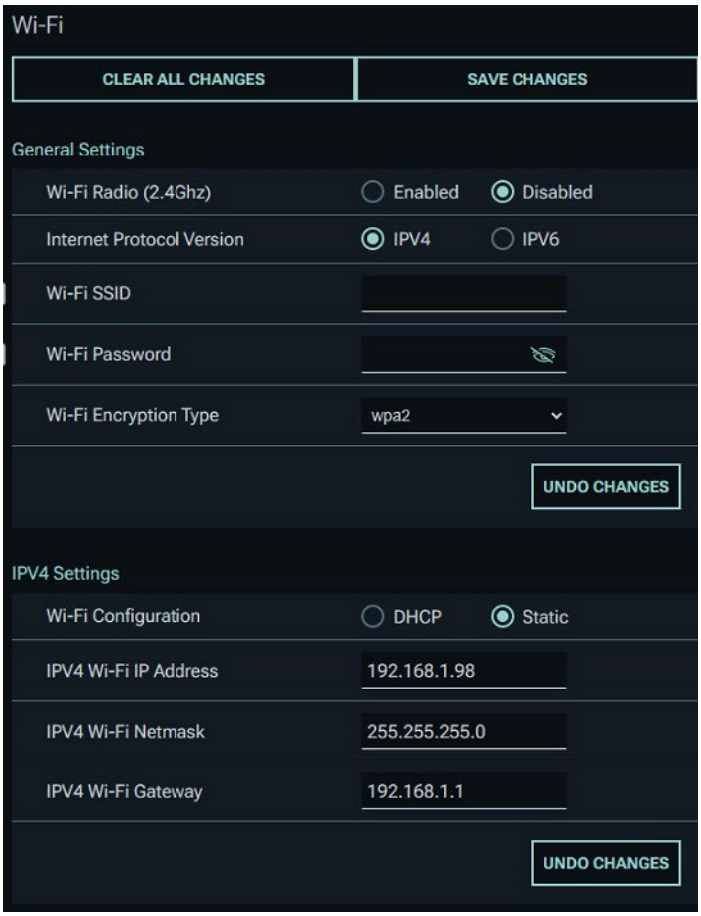


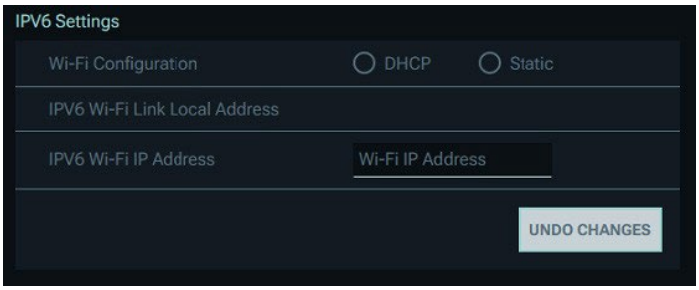
3. Click Save Changes. If prompted, enter your username and password and click OK.

Setting final wireless configuration

Note: This procedure requires you to know the network configuration of the local area network to which the STARLINE CPM will be connected.

1. On the configuration web page, click Settings.
2. Click Wi-Fi to configure the final wireless settings.
3. If your network uses DHCP to assign IP addresses (dynamic IPs) click the DHCP radio button, and enter the Wi-Fi SSID and Wi-Fi Password. If your network uses static IP addresses, click the Static radio button, and enter the Ethernet IP Address, Ethernet Netmask, and Ethernet Gateway for the meter, as well as the Wi-Fi SSID and the Wi-Fi Password.





4. Click Save Changes. If prompted, enter your username and password and click OK.

Quick Start Guide: Modbus RTU

Please read this entire guide before you begin.

Using this guide, you will install a STARLINE Plug-in Unit or Feed Unit with integrated STARLINE CPM, and configure the meter using Modbus RTU.

Note: The STARLINE CPM also supports Modbus TCP. If you want to set the meter up in a Modbus over Ethernet environment, use the **Quick start guide: Ethernet**, and connect to meter's IP address using your Modbus software.

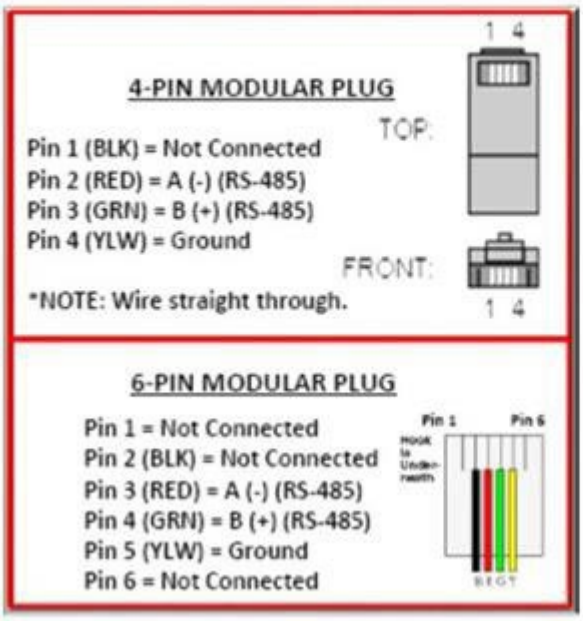
The Modbus configuration page on the embedded webpage does contain information relevant to Modbus TCP as well. The Modbus RTU protocol uses Big-Endian.

Materials Required

The following materials and equipment are required for this procedure:

- STARLINE Busway System
- STARLINE Plug-In Unit or Feed Unit with integrated STARLINE CPM
- RS-485 Cable

Refer to the following images for correct crimping of the RS-485 wire and RJ-11 4-pin modular plugs.



If your STARLINE CPM does not have a front panel display, the following additional materials are required:

- CAT-5e or CAT-6 standard Ethernet cable
- Host PC with web browser to connect to STARLINE CPM (Firefox, Chrome, or Internet Explorer recommended)

Default Settings

The STARLINE CPM has the following default Modbus settings:

- Baud: 19200
- Parity: None
- Stop bits: 1
- Address: 001

The STARLINE CPM has the following default wired Ethernet settings:

- IP Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.
- Login Credentials
  - Username: admin
  - Password: admin
    - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section xxx for more details)

Installation Instructions

In this section, you will install, energize, and configure the STARLINE CPM to your RS-485 Modbus network.

Setting up a STARLINE CPM without a front panel display

1. Connect RS-485 cable to either of the two RS-485 ports on the front of the device. Both ports are connected in parallel as defined by an RS-485 bus definition.
2. Connect CAT-5e or CAT-6 cable from the Ethernet port on the front of the STARLINE CPM to the Ethernet port on the host PC.
3. Provide power to the STARLINE CPM by inserting the STARLINE Plug-in Unit into a compatible energized busway, or by energizing the Feed Unit. Note: Once powered, the STARLINE CPM will take several seconds to boot and begin displaying metered parameters.
4. Configure the host PC to connect to the STARLINE CPM by setting the host PC to a static IP in the 192.168.1.XX range, with a subnet mask of 255.255.255.0:
    a. Go to the Control Panel.
    b. Click Network and Sharing Center.
    c. On the left pane in the window, click Change Adapter Settings.
    d. Identify the Ethernet adapter to which the STARLINE CPM Meter is connected, and make sure it is marked Enabled. Right click the adapter and select Properties.
    e. In the Properties window, scroll through the list and highlight Internet Protocol Version 4 (TCP/IPv4). Click Properties. Note: If this Ethernet adapter is used to connect to another network, take a screenshot of the Internet Protocol Version 4 (TCP/IPv4) Properties window, or carefully note the settings displayed in the window.
    f. Click the Use the following IP address: radio button. In the IP address field, enter 192.168.1.50. In the Subnet mask field, enter 255.255.255.0.
    g. Click OK to save the settings and click OK in the Properties window to dismiss it.

5. Open the web browser on the host PC and enter 192.168.1.99 in the address bar to connect to the STARLINE CPM configuration web page.
6. From the configuration webpage, click Settings.
7. Click Modbus to configure RS-485 Modbus settings.

8. Using the text box and radio buttons, enter the Modbus Serial Address, Modbus Baud Rate, Modbus Stop Bits, and Modbus Parity.
9. Click Save Changes. If prompted, enter your username and password and click OK.
10. Click Reboot. Note: you may have to reload the webpage in the web browser.
11. Using your Modbus controller and connect to the meter and verify that it is working.
12. Disconnect the Ethernet cable from the meter and the host PC.

Modbus Security

The CPM has an optional proprietary password feature that can be used with Modbus. This feature is linked to the following commands:

1. Default Admin Access Code: 2570
    a. The default value shown above is in decimal format.
    b. SSH Command to change the Admin Access Code: $MODAAC

For security purposes it is recommended to change these values from the defaults.

This feature works by requiring the user to “login” before a write can be performed. The feature works like this:

1. Write one of the access codes shown above into decimal address 2047.
    - This will be “admin” access code.
2. A write can be then performed on any other parameter listed in the Modbus Map.
3. Every time a parameter needs to be changed; the access code must first be written into decimal address 2047.

This feature works with both Modbus TCP and RTU. It is possible to disable this feature on the embedded webpage or via SSH (through the User Configuration Register (UCR)). A change to the UCR must be made through a SSH connection, see SSH and Table 1 for more information. If the Modbus Security feature is disabled, then any parameter in Modbus can be changed without inputting a password.

Example

Example of changing Modbus User Configuration Registers (UCR)

$LOGIN,admin,admin	
$CONFIG,UCR,G	Returns the current value of the UCR
$CONFIG,UCR,ModF,ENABLE	Enables Modbus Floats to read Floats
$CONFIG,UCR,ModF,DISABLE	Disables Modbus Floats to read Doubles
$CONFIG,UCR,ModSec,ENABLE	Enables Modbus Security
$CONFIG,UCR,ModSec,DISABLE	Disables Modbus Security
$REBOOT	

Quick Start Guide: BACnet

Please read this entire guide before you begin.

This guide may be used to set up a BACnet connection to the STARLINE CPM. A BACnet connection will require an existing Ethernet or wireless connection to the meter. To establish these connections please refer to Quick Start Guide: Ethernet or Quick Start Guide: Wireless.

Materials Required

The following materials and equipment are required for this procedure:

- STARLINE Busway System
- STARLINE Plug-In Unit or Feed Unit with integrated STARLINE CPM
- Host PC with a BACnet explorer or software (with BACnet discovery functionality) installed
  - YABE (Yet Another BACnet Explorer) is an open source explorer which may be downloaded from **http://sourceforge.net/projects/yetanotherbacnetexplorer/**
- Host PC with web browser to connect to STARLINE CPM

Default Settings

Note that BACnet is disabled by default. BACnet can be enabled on the Starline CPM embedded webpage or via SSH.

The STARLINE CPM has the following default BACnet settings:

- BACnet Port: BAC0 (decimal value of 47808)
- BACnet ID: 99

The STARLINE CPM has the following default wired Ethernet settings:

- IP Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- Login Credentials
  - Username: admin
  - Password: admin
  - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section xxx for more details)

The STARLINE CPM has the following default wireless settings:

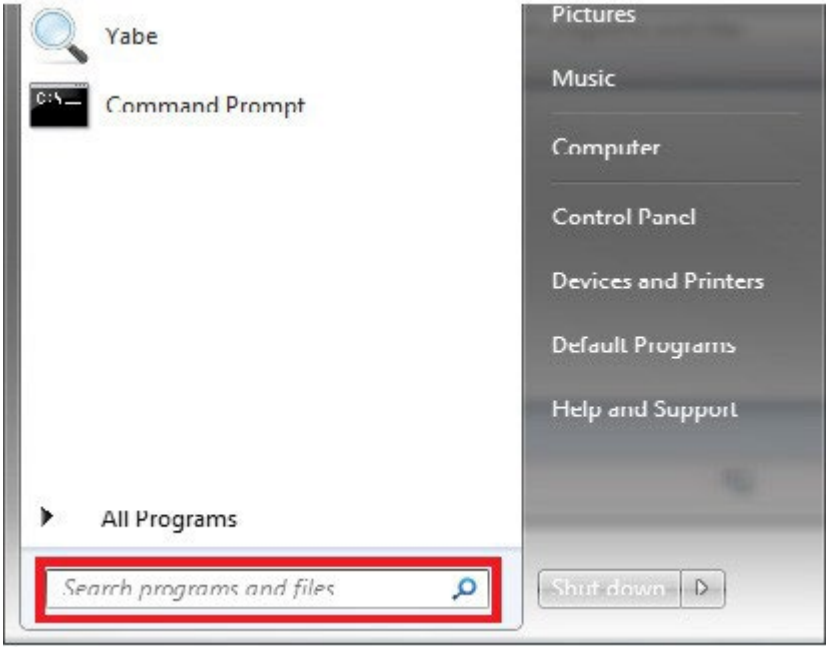
- IP Configuration: Static
- IP Address: 192.168.1.98
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.

Installation Instructions

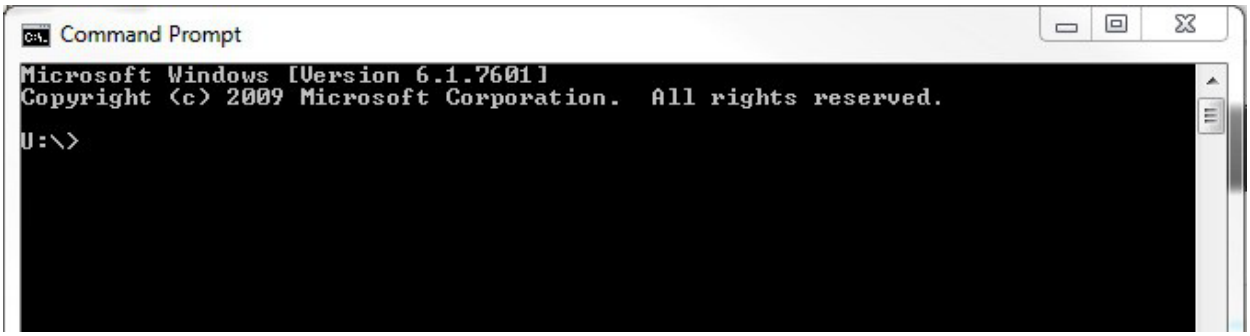
This section will describe the step by step instructions for establishing the BACnet connection.

1. Create the connection to the meter via a wired Ethernet or wireless connection.
    a. If the host PC has a usable web browser (i.e. Firefox, Chrome, or Internet Explorer), verify the connection by typing the CPM's IP address into the browser's URL bar. If a connection has been made, then a webpage should appear like that seen in the figure below.

2. Find the host PC's IP address that is being used to connect to the STARLINE CPM
    a. This may be done through windows command prompt, which is reached by typing "cmd" into the search bar of the start menu as seen in the figure below.

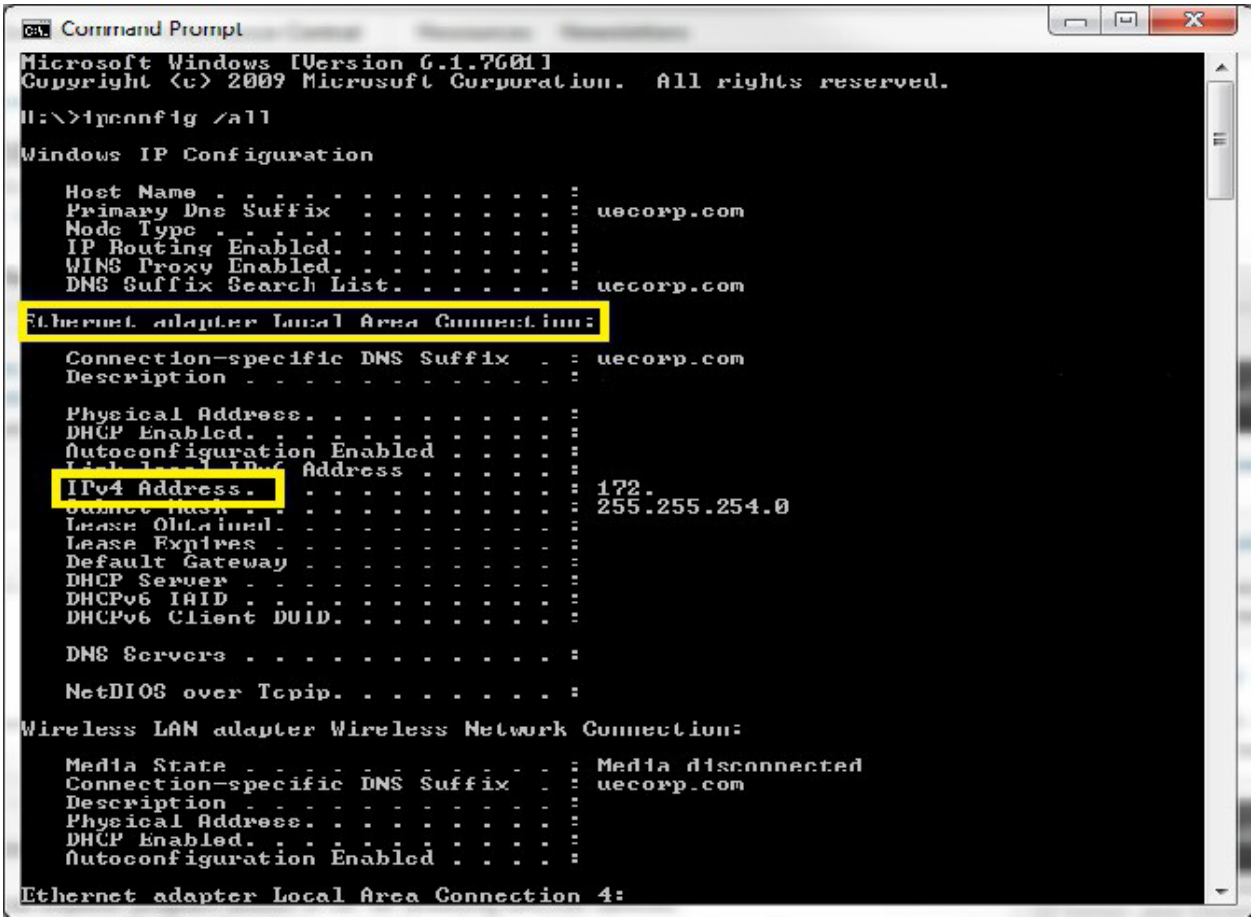


b. After typing “cmd” and pushing the enter key the command prompt will appear and should look like the figure below.

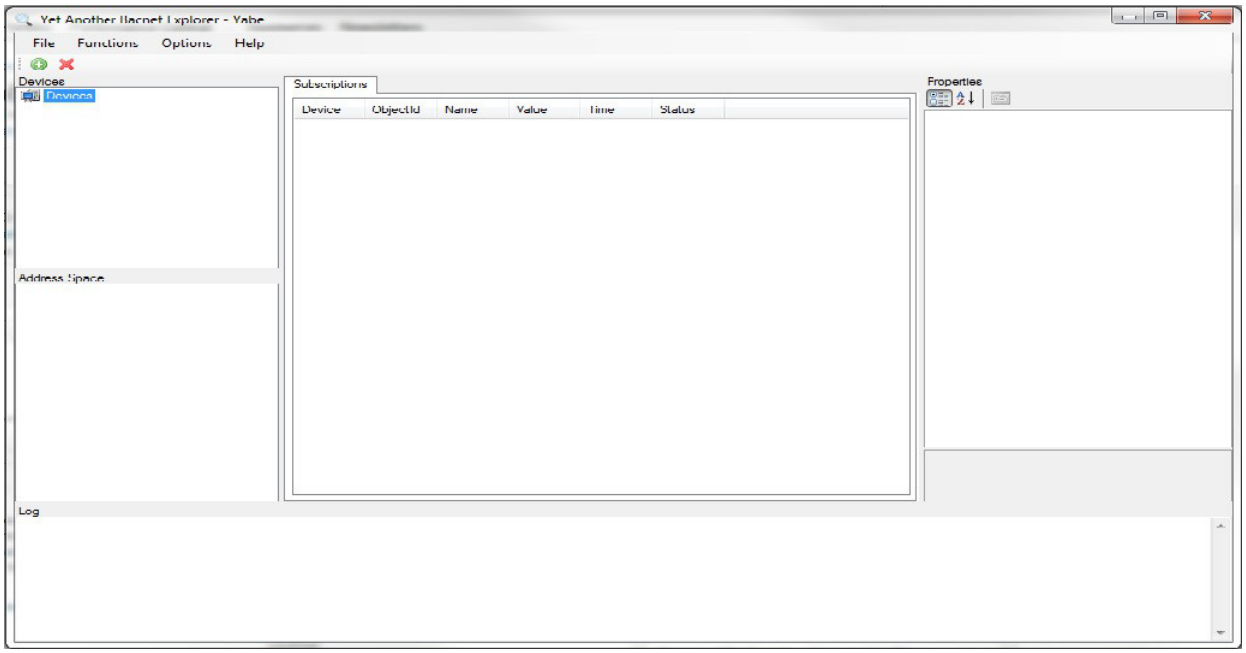


c. In the command prompt window type “ipconfig /all” and push enter. This will cause a large scroll of information in the command prompt window.

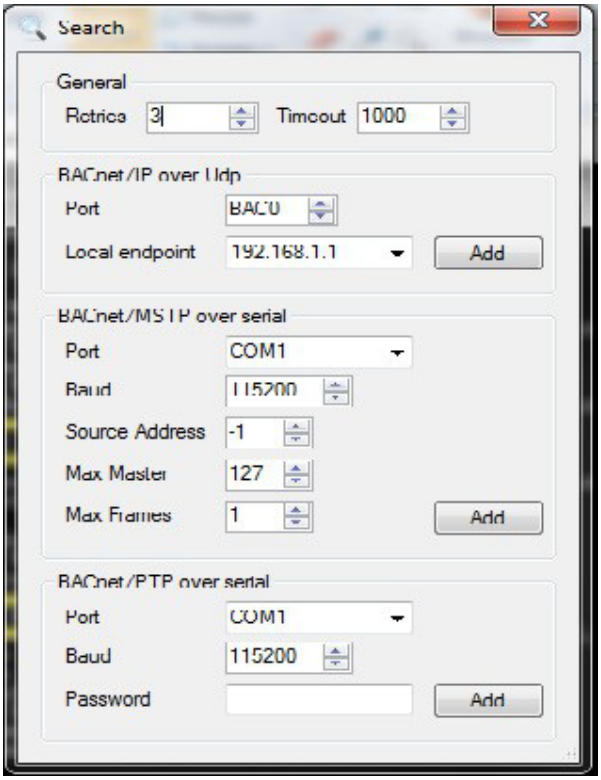
d. Use the slide bar on the right side of the window to scroll back through the information to locate the adapter that is being used to connect to the STARLINE CPM. The name of the adapter and brief description should appear like the first yellow box in the figure. Under the adapter, the IPv4 Address will be listed as seen by the second yellow box in the figure below. The IP address should be comprised of 4 octets of numbers (i.e. 192.168.1.1).



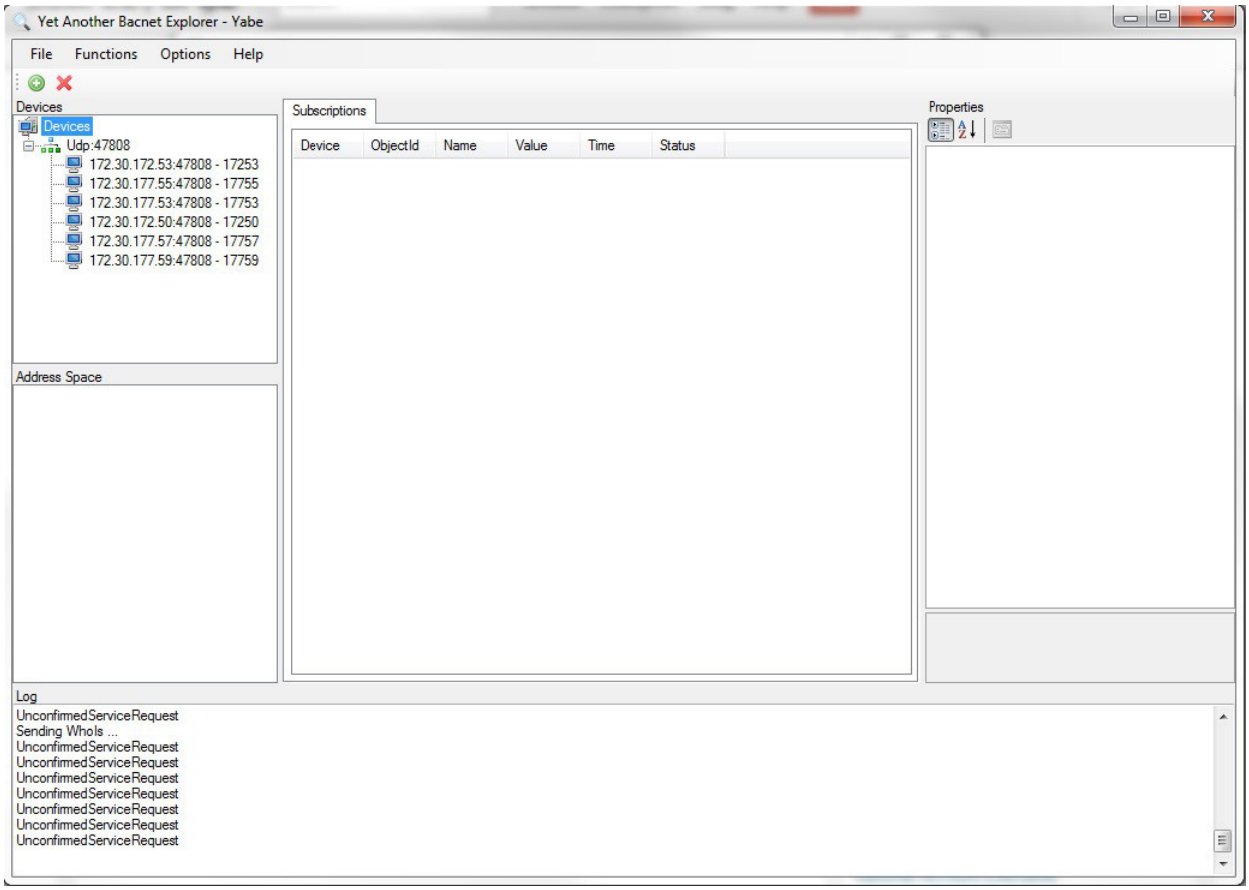
3. Open the BACnet browser or software that will be used. YABE is depicted below.



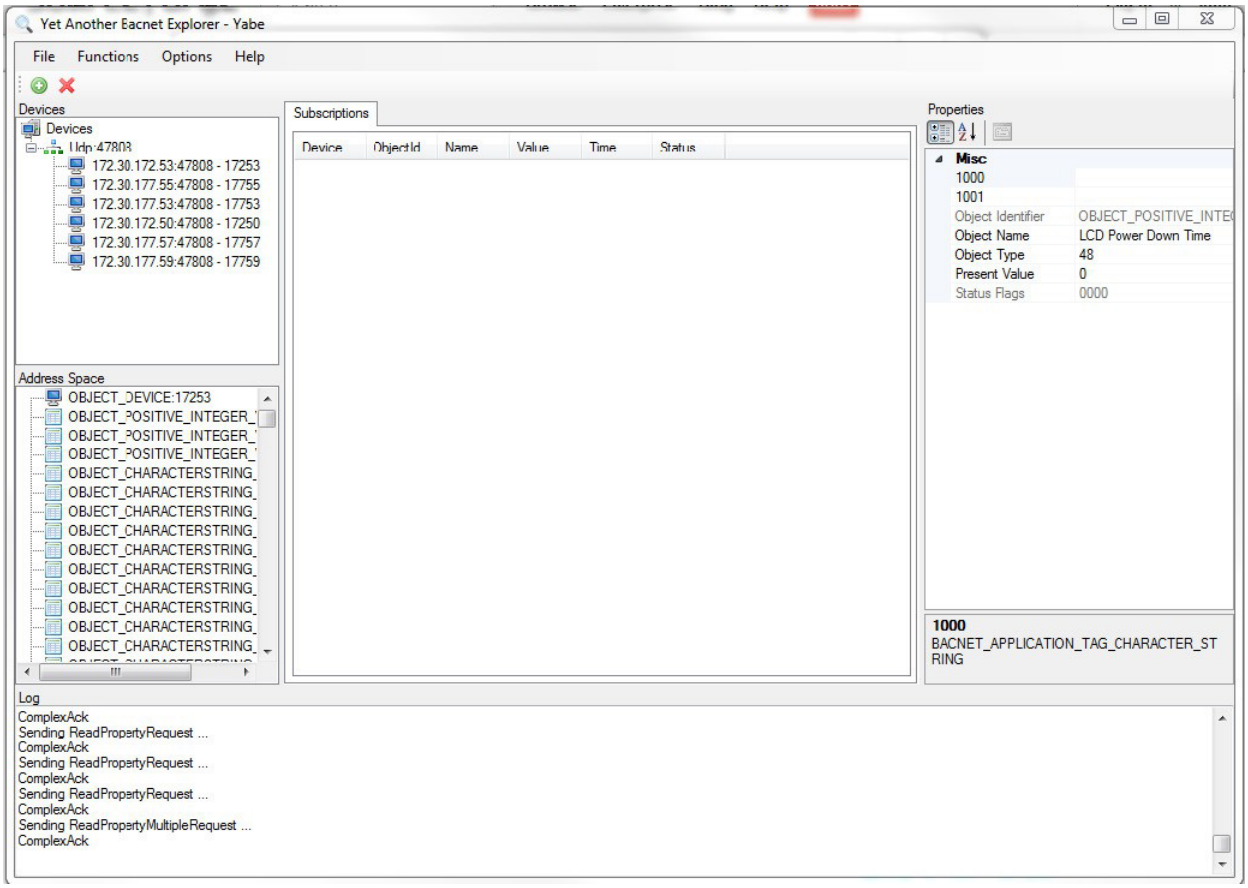
4. Use the Add Device feature, the green plus towards the top left of the window. Clicking the button will pull up a window as seen in the figure below.



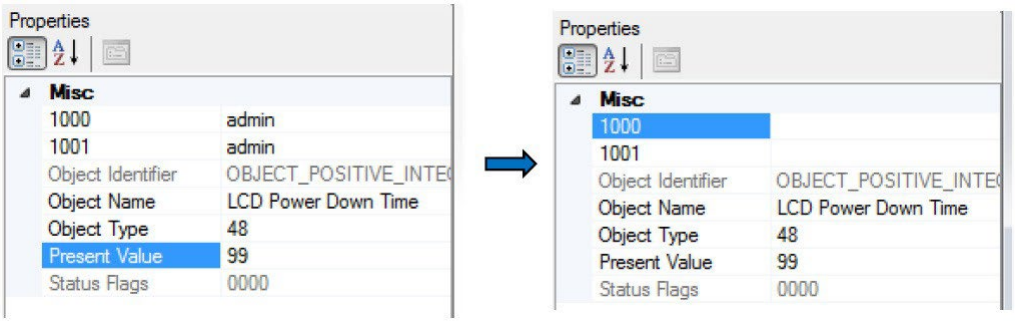
5. The connection will be made using BACnet/IP over UDP. Enter the Host PC's IP address, as was found in the previous steps, into the 'Local endpoint' field of the Search window. By default, the 'Port' field should be populated with BAC0 (this is also the default port setting for the STARLINE CPM). After the two fields are filled, click the Add button next to the Local endpoint.
    a. Yabe (or other BACnet software) will send out a Who-Is broadcast on the network. BACnet devices detecting this broadcast will automatically respond with device communication information. The top left of the figure below displays all the devices found by the Who-Is broadcasts.



6. If BACnet has failed to find any devices, consult the troubleshooting section below. If BACnet has found the STARLINE CPM, information may be immediately polled from the device. By selecting a specific device in the list, the address space will populate with all the BACnet objects of that device.
7. Selecting a specific BACnet object from the Address Space will populate the Properties box on the right side of the window. This will display all pertinent information for that BACnet object as seen below.
    a. The very first BACnet object is the LCD Power Down Time, which in this example has a present value of 0, meaning that the LCD power down feature has been deactivated.
    b. A list of BACnet object may be found in BACNet object list document.



8. BACnet is now fully functional and communicating with the device. If information needs to be updated, simply clicking the object a second time will send a request for new data from the STARLINE CPM. In this way, data may be constantly read and updated from the meter. In order to write data, it will be necessary to fill in the login credentials into field 1000 (Username) and 1001 (Password). After filling in the Username and Password a single change may be made to the Present Value of that object. After the Present Value has been changed, the 1000 and 1001 fields will clear and will have to be reentered to make another change.

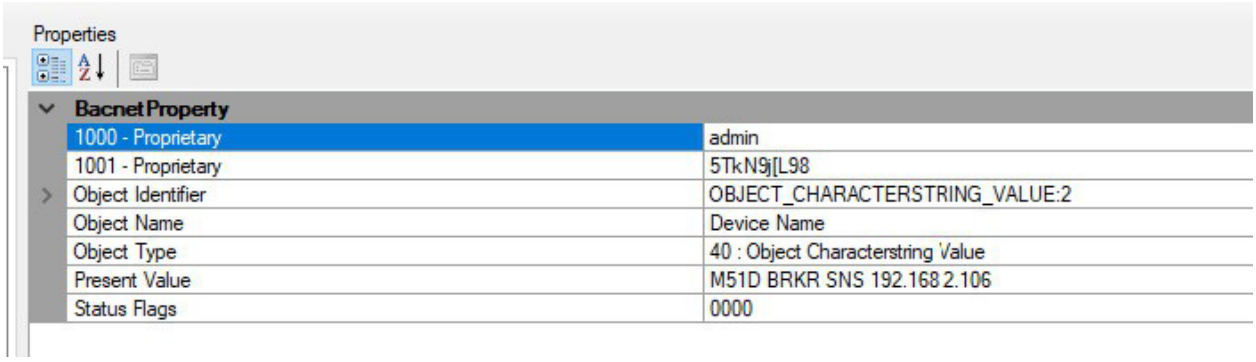


BACnet Security

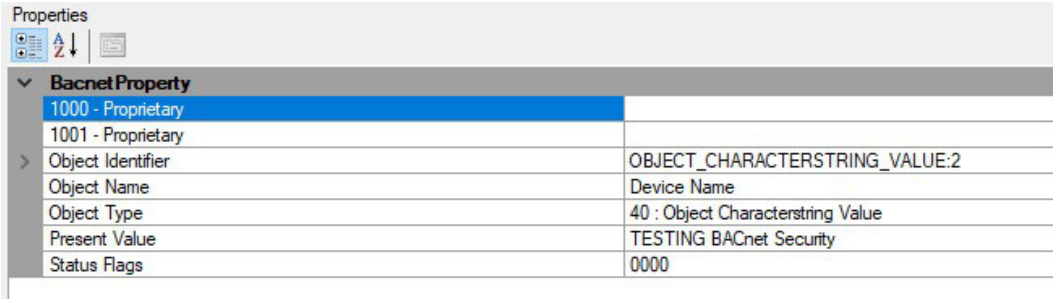
The CPM has an optional proprietary password feature that can be used with BACnet. This feature utilizes the user and admin passwords of the CPM which can be changed via SSH ($PWA for admin).

This feature requires the user to login before a write can be performed. The feature works like this:

1. "1000 – Proprietary" is the username
    a. This will be "admin"
    b. In the example below the "admin" username is used.
2. "1001 – Proprietary" is the password
    a. This will be the "admin password"
    b. In the example below the "admin" password is used (5TkN9j[L98)
        - The password will be different for every unit. "5TkN9j[L98" happened to be the password on this unit.



- Once the username and password are entered, the "Present Value" can be changed. In this example the Present Value was changed from M51D BRKR SNS 192.168.2.106 to "TESTING BACnet Security".:
    - Once you hit "return" the username and password disappear.



It is possible to disable this feature on the embedded webpage or via SSH (through the User Configuration Register (UCR)). A change to the UCR must be made through a SSH connection, see SSH and Table 1 for more information.

Troubleshooting

This section lists common issues while using BACnet and possible solutions.

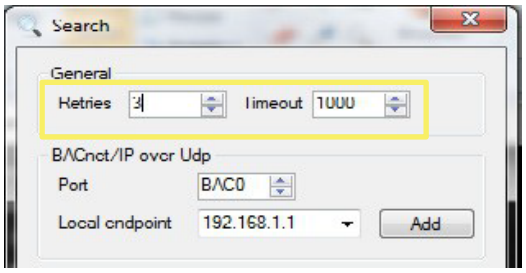
Enable BACnet capability

It is possible to enable the BACnet functionality of the STARLINE CPM through the User Configuration Register (UCR). By setting the "BACnet" bit to 0, BACnet becomes enabled on the meter and will respond to BACnet broadcasts (Who-Is requests). A change to the UCR must be made through a SSH connection, see SSH and Table 1 for more information.

BACnet does not discover all the STARLINE CPM meters

Perform the following steps if the BACnet discovery tool does not find all the STARLINE CPM meters:

- When searching for BACnet devices, increase the number of retries and/or timeout to give the meters more opportunity to respond to the discovery broadcast.



- Ensure that the missing meter is powered on and the host PC has an established connection by checking the meter webpage through an internet browser.
- Ensure that the BACnet discovery tool is using the correct Local endpoint.
  - It may be necessary to check the adapter settings on the host PC to determine which adapter is connected to the meter.

BACnet does not discover any of the STARLINE CPM meters

The most common problem when attempting to use BACnet discovery (assuming connection has been confirmed by accessing the webpage) on a STARLINE CPM involves do with networks routers. As previously stated, BACnet discovery requires a broadcast command to discover BACnet devices. Most routers will not allow the transmission of broadcasts and therefore will make discovery impossible.

To determine if the router is the issue, create a direct connection between the host PC and a STARLINE CPM. After a direct connection is made, use the discovery method as prescribed above. If the CPM has been discovered and connectivity is made, then the issue is associated with the router/networking devices. If the CPM is still not discovered ensure that the IP address being entered in the Local endpoint field is correct.

Some possible solutions to bypassing the router:

- Contact the network administrator to determine if it is possible to modify the current router to allow for transmission of broadcast commands.
- Install network devices that do not contain an internal router, such as a wireless access point, to create a router-less connection between the CPM and host PC.
- Incorporate a BACnet Broadcast Management Device (BBMD) into the network. These devices are designed to work with a router to allow the transmission of BACnet discover broadcasts.

Quick Start Guide: SNMPv1/v2c

Please read this entire guide before you begin.

This guide may be used to set up an SNMPv1/v2c connection to the STARLINE CPM. An SNMPv1/v2 connection will require an existing Ethernet or wireless connection to the meter. To establish these connections please refer to **Quick Start Guide: Ethernet** or **Quick Start Guide: Wireless**.

Materials Required

The following materials and equipment are required for this procedure:

- Host PC with an SNMP MIB explorer or software installed
  - iReasoning is a useful tool which can be downloaded from
  - **http://www.ireasoning.com/**
- Host PC with web browser to connect to STARLINE CPM (Firefox, Chrome, or Internet Explorer recommended)
- The latest version of the Starline CPM SNMP MIB File (UEC_vXX)
- The latest version of the SNMP OID Map spreadsheet

Default Settings

Note that SNMPv1 and v2c are disabled by default. They can be enabled on the Starline CPM embedded webpage or via SSH.

The STARLINE CPM has the following default SNMPv1/v2c settings:

- Default Trap Destination Address 1: 0.0.0.0
  - SSH Command: $SNMPTD1
- Default Trap Destination Address 2: 0.0.0.0
  - SSH Command: $SNMPTD2
- Default Read Community Name: private
  - SSH Command: $SNMPRCN
- Default Write Community Name: public
  - SSH Command: $SNMPWCN
- Default Trap Community Name: trap
  - SSH Command: $SNMPTCN
- Default Trap Alarm Back off Time: 300 Seconds

These settings can be changed on the Starline CPM embedded webpage or via SSH.

The STARLINE CPM has the following default wired Ethernet settings:

- IP Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.
- Login Credentials
  - Username: admin
  - Password: admin
    - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section xxx for more details)

The STARLINE CPM has the following default wireless settings:

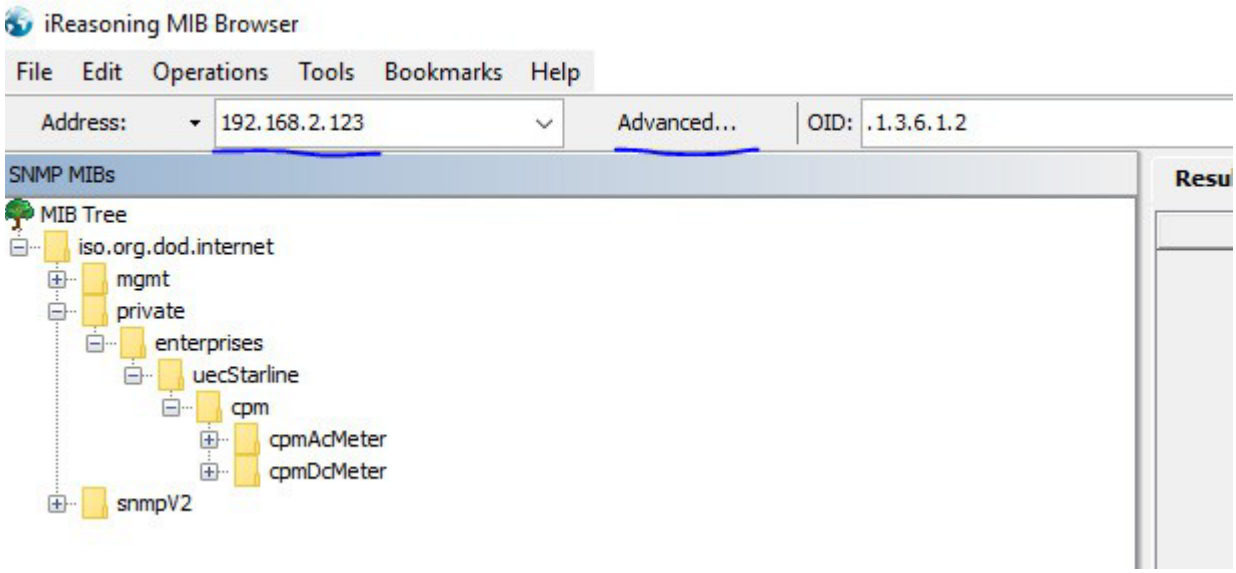
- IP Configuration: Static
- IP Address: 192.168.1.98
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.

Installation Instructions

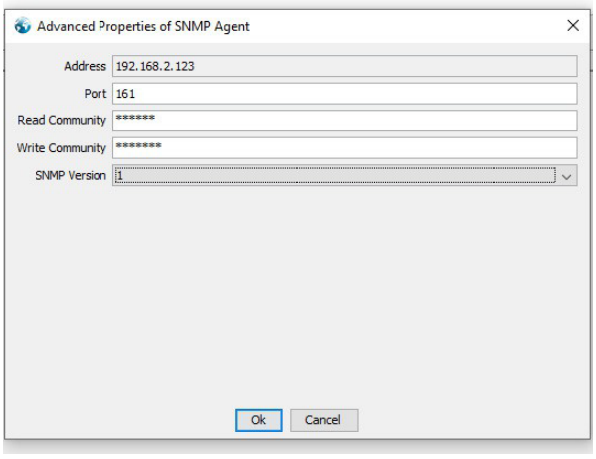
This section will describe the step by step instructions for establishing the SNMPv1/v2 connection.

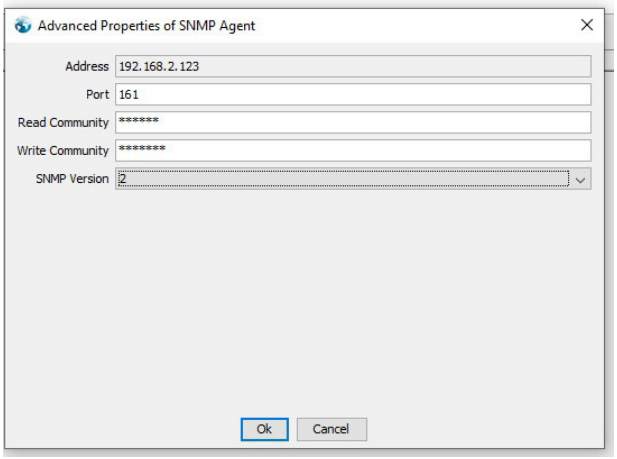
1. Create the connection to the meter via a wired Ethernet or wireless connection.
    a. If the host PC has a usable web browser (i.e. Firefox, Chrome, or Internet Explorer), verify the connection by typing the CPM's IP address into the browser's URL bar. If a connection has been made, then a webpage should appear like that seen in the figure below.

2. Open the SNMP browser or software that will be used. iReasoning is depicted below.
3. Load the MIB file into the software.
4. Enter the IP address into the “Address:” field and then select “Advanced…”. Again, every software may do this a bit differently but the process should be the same:

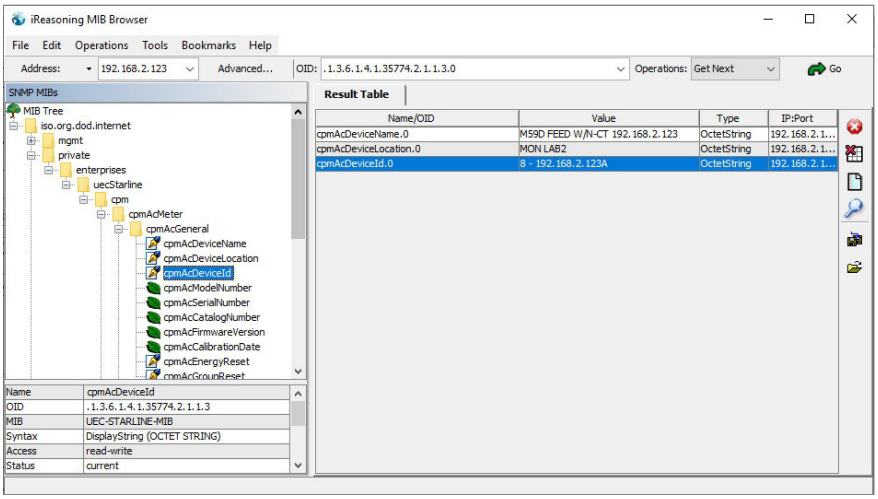


5. In Advanced, select SNMP Version 1 or Version 2 and type in your Read Community Name and Write Community Name:

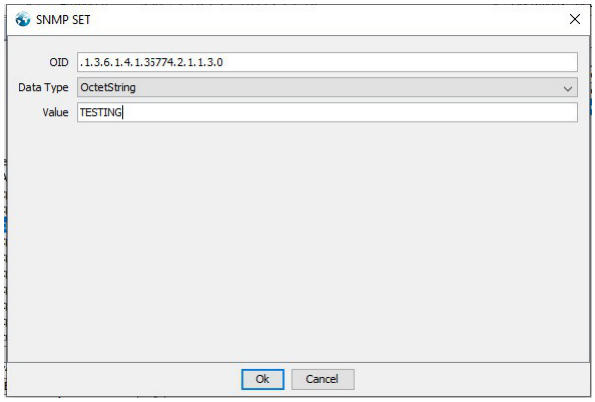


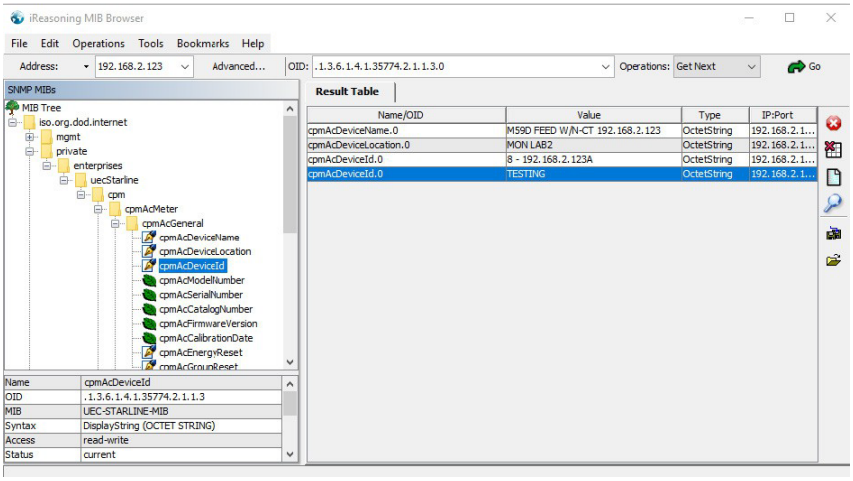


6. The MIB Tree can now be used to pull information from the CPM:
    a. To change a parameter right click on the “value” and select “set”. A new prompt will show up which will allow you to change the parameter:



7. Once you change a parameter you must “get” that parameter again for it to update.

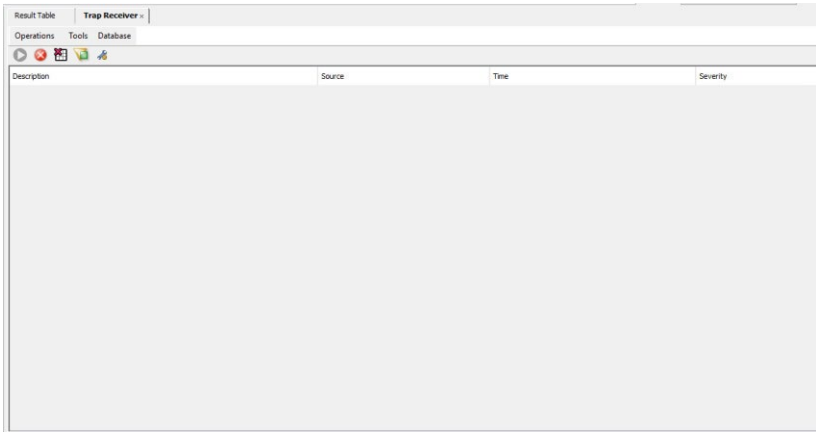




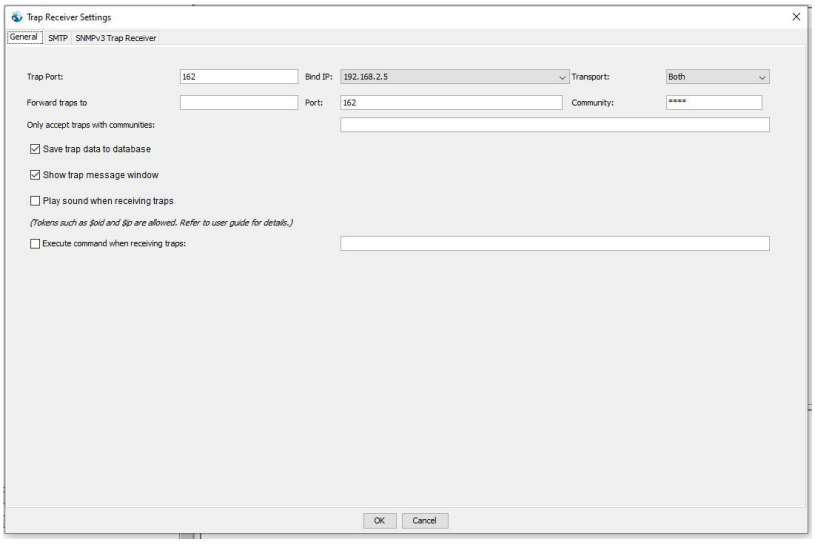
Traps

SNMP traps can be used once the trap destination for the CPM is set.

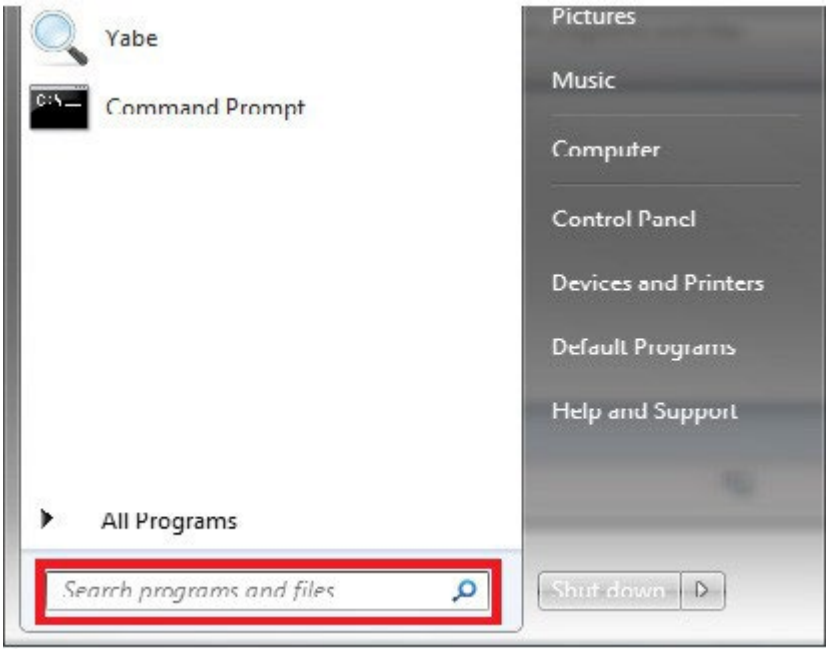
1. In iReasoning Select Tools>Trap Receiver. This will cause a Trap Receiver tab to open:



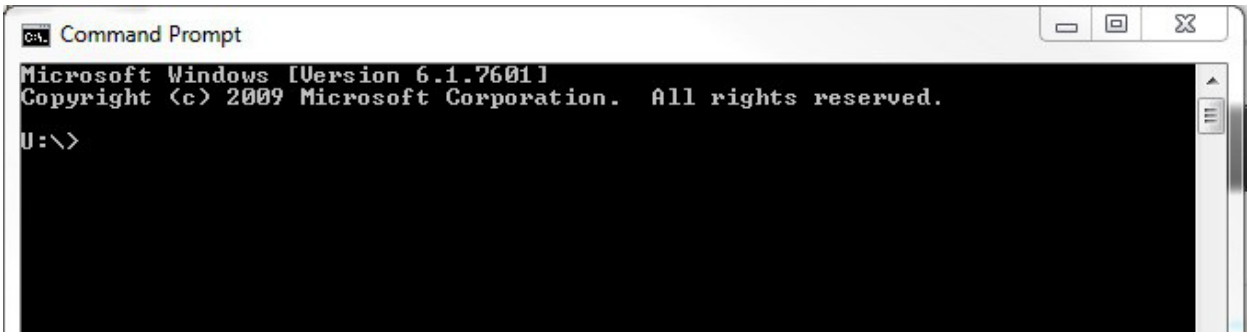
2. In the Trap Receiver pane Select Tools>Options. This is where the trap community name and host PC IP address can be entered.



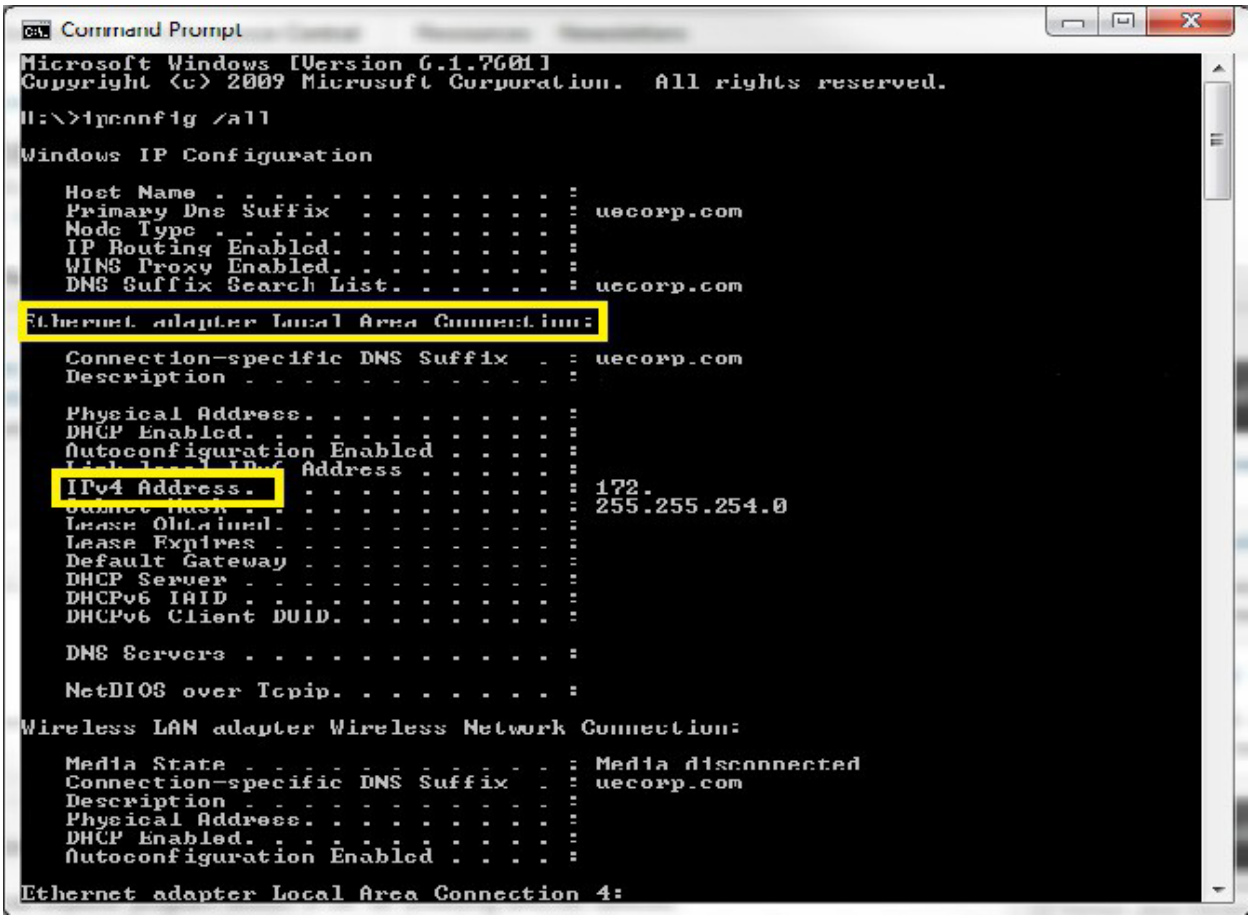
3. Find the host PC's IP address that is being used to connect to the STARLINE CPM
    a. This may be done through windows command prompt, which is reached by typing "cmd" into the search bar of the start menu as seen in the figure below.



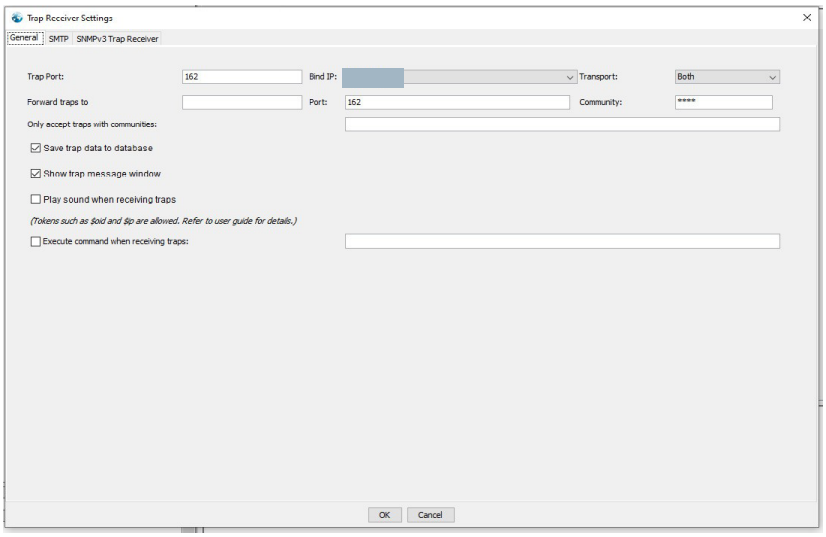
    b. After typing "cmd" and pushing the enter key the command prompt will appear and should look like the figure below.



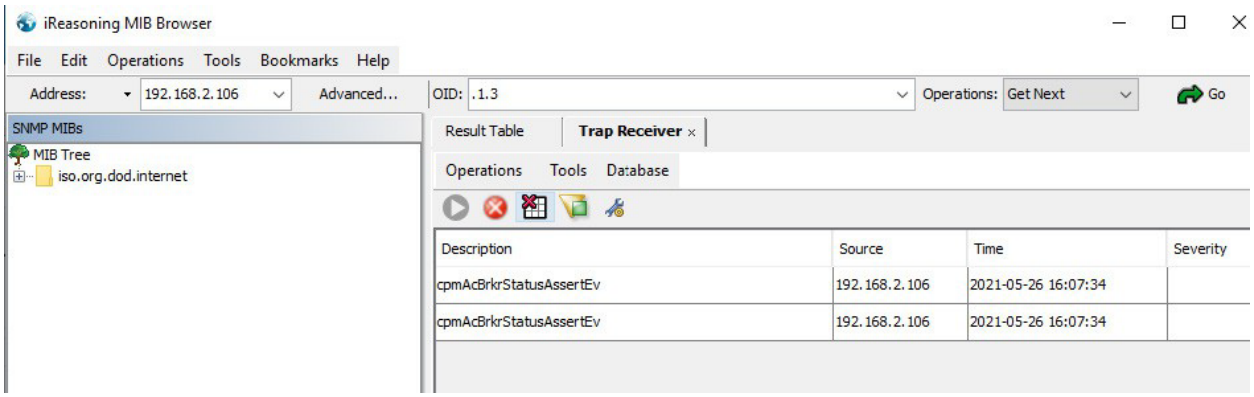
    c. In the command prompt window type "ipconfig /all" and push enter. This will cause a large scroll of information in the command prompt window.
    d. Use the slide bar on the right side of the window to scroll back through the information to locate the adapter that is being used to connect to the STARLINE CPM. The name of the adapter and brief description should appear like the first yellow box in the figure. Under the adapter, the IPv4 Address will be listed as seen by the second yellow box in the figure below. The IP address should be comprised of 4 octets of numbers (i.e. 192.168.1.1).


Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
H:\>ipconfig /all
Windows IP Configuration
Host Name . . . . . :
Primary Dns Suffix . . . . . : uecorp.com
Node Type . . . . . :
IP Routing Enabled. . . . . :
WINS Proxy Enabled. . . . . :
DNS Suffix Search List. . . . . : uecorp.com
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : uecorp.com
Description . . . . . :
Physical Address. . . . . :
DHCP Enabled. . . . . :
Autoconfiguration Enabled . . . . :
IPv4 Address. . . . . : 172.
Subnet Mask . . . . . : 255.255.254.0
Lease Obtained. . . . . :
Lease Expires . . . . . :
Default Gateway . . . . . :
DHCP Server . . . . . :
DHCPv6 IAID . . . . . :
DHCPv6 Client DUID. . . . . :
DNS Servers . . . . . :
NetBIOS over Tcpip. . . . . :
Wireless LAN adapter Wireless Network Connection:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . : uecorp.com
Description . . . . . :
Physical Address. . . . . :
DHCP Enabled. . . . . :
Autoconfiguration Enabled . . . . :
Ethernet adapter Local Area Connection 4:

4. The IP address shown above is the one that should be selected in the “BIND IP Address Section of iReasoning”:



5. Traps will be received once all these settings have been correctly entered.



Troubleshooting

This section lists common issues while using SNMPv1/v2 and possible solutions.

Enable SNMPv1/v2 capability

It is possible to enable SNMPv1/v2 functionality of the STARLINE CPM through the User Configuration Register (UCR). By setting the “SNMPv1/2c” bit to 0, SNMPv1/v2 becomes enabled on the meter. A change to the UCR must be made through a SSH connection, see SSH and Table 1 of the User Manual for more information. Once SNMPv1/v2c is enabled in the UCR, the CPM must be restarted for the change to take effect.

Quick Start Guide: SNMPv3

Please read this entire guide before you begin.

This guide may be used to set up an SNMPv3 connection to the STARLINE CPM. An SNMPv3 connection will require an existing Ethernet or wireless connection to the meter. To establish these connections please refer to **Quick Start Guide: Ethernet** or **Quick Start Guide: Wireless**.

Materials Required

The following materials and equipment are required for this procedure:

- Host PC with an SNMP MIB explorer or software installed
  - iReasoning is a useful tool which can be downloaded from
  - **http://www.ireasoning.com/**
- Host PC with web browser to connect to STARLINE CPM (Firefox, Chrome, or Internet Explorer recommended)
- The latest version of the Starline CPM SNMP MIB File (UEC_vXX)
- The latest version of the SNMP OID Map spreadsheet

Enable SNMPv3 capability

SNMPv3 is disabled by default on the CPM. It is possible to enable SNMPv3 functionality of the STARLINE CPM through the User Configuration Register (UCR). By setting the “SNMPv3” bit to 1, SNMPv3 becomes enabled on the meter. A change to the UCR must be made through a SSH connection, see SSH and Table 1 of the User Manual for more information. Once SNMPv3 is enabled in the UCR, the CPM must be restarted for the change to take effect.

There are multiple credentials that may be used to access the meter with SNMPv3, all of which are outlined below. The Starline CPM embedded webpage does not contain any settings for SNMPv3, therefore, all the settings below must be changed via SSH. The SSH commands for each setting are also listed below. Note that no two usernames can be the same:

- No authentication and no privacy (No Auth, No Priv) – This credential is blocked from writing to any OID in the CPM MIB file. The credentials are read-only.
    - Default Unauthenticated Username: UsmUnauth
        - SSH Command: $SNMPUUU
        - To disable No Auth, No Priv
            - SSH command: $SNMPUUUE,S,0
        - This username cannot be equal to the Auth/No Priv or Auth/Priv username.
- Authentication and no privacy (Auth, No Priv) – These credentials have full read/write capabilities to all OIDs except for 1.3.6.1.6.3.18.1., 1.3.6.1.6.3.16.1.4 , 1.3.6.1.6.3.16.1.2 , 1.3.6.1.6.3.15.1.2.2 and 1.3.6.1.6.3.16.1.5.2.
    - Default Authenticated Username: UsmAuth
        - SSH Command: $SNMPAUU
    - Default Authenticated Algorithm: MD5
        - Both MD5 and SHA are supported on the CPM
        - The CPM will reject anything other than SHA or MD5.
        - SSH Command: $SNMPAA
    - Default Authenticated Password:
        - Telnet Command: $SNMPAP
            - You will have to create your own unique password.
                - Password must be eight to sixteen characters long.
                - Password must contain at least one each of upper-case letter, lower case letter, digit, and symbol.
        - To disable Auth, No Priv
            - SSH command: $SNMPAUUE,S,0
        - This username cannot be equal to the No Auth/No Priv or Auth/Priv username.
- Authentication and privacy (Auth, Priv) – These credentials have full read/write capabilities to all OIDs.
- Default Authenticated Username: UsmAuthPriv
        - SSH Command: $SNMPAPUU
    - Default Authenticated Algorithm: MD5
        - Both MD5 and SHA are supported on the CPM
        - The CPM will reject anything other than SHA or MD5.
        - SSH Command: $SNMPAPA
    - Default Authenticated Password:
    - SSH Command: $SNMPAPP
        - You will have to create your own unique password.
            - Password must be eight to sixteen characters long.
            - Password must contain at least one each of upper-case letter, lower case letter, digit, and symbol.
    - Default Privacy Algorithm: DES
        - Both DES and AES128 are supported on the CPM.
            - To use AES128 change this parameter to AES
        - The CPM will reject anything other than AES or DES.

- SSH Command: $SNMPAPPA
- Default Privacy Password:
  - SSH Command: $SNMPAPPP
    - You will have to create your own unique password.
      - Password must be eight to sixteen characters long.
      - Password must contain at least one each of upper-case letter, lower case letter, digit, and symbol.
  - To disable Auth, No Priv
  - SSH command: $SNMPAUUE,S,0
    - This username cannot be equal to the No Auth/No Priv or Auth/No Priv username.

SNMPv3 Default Trap Settings:

- Trap Destination Address 1: 0.0.0.0
  - SSH Command: $SNMPTD1
- Trap Destination Address 2: 0.0.0.0
  - SSH Command: $SNMPTD2
- SNMPv3 Trap Username: TrapUsm
  - SSH Command: $SNMPTUU
  - If $SNMPTAA = $SNMPAUU then the CPM will use these commands for the authentication mechanisms:
    - SSH Command: $SNMPAA
    - SSH Command: $SNMPAP
  - If $SNMPTAA = $SNMPAPUU then the CPM will use these commands for the authentication and privacy mechanisms:
    - SSH Command: $SNMPAPA
    - SSH Command: $SNMPAPP
    - SSH Command: $SNMPAPPA
    - SSH Command: $SNMPAPPP
  - If $SNMPTAA ≠ $SNMPAPUU or $SNMPAUU then CPM will use these commands for the authentication and privacy mechanisms then it will use the following:
    - SNMPv3 Trap Authenticated Algorithm: MD5
      - Both MD5 and SHA are supported on the CPM
      - The CPM will reject anything other than SHA, MD5, or -.
      - If – is entered, then authentication algorithms will not be used.
      - SSH Command: $SNMPTAA
    - SNMPv3 Trap Authenticated Password: TAuthPass
      - SSH Command: $SNMPTAP
    - SNMPv3 Trap Private Algorithm: DES
      - Both DES and AES128 are supported on the CPM.
        - To use AES128 change this parameter to AES
      - If – is entered, then privacy algorithms will not be used.
      - The CPM will reject anything other than AES, DES, or -.
      - SSH Command: $SNMPTPA
    - SNMPv3 Trap Private Password:
      - SSH Command: $SNMPTPP

    - You will have to create your own unique password.
        - Password must be eight to sixteen characters long.
        - Password must contain at least one each of upper-case letter, lower case letter, digit, and symbol.

Other SNMPv3 Settings:

- SNMPv3 Engine ID:
    - This field is left blank by default.
    - The CPM will auto-generate a unique SNMPv3 Engine ID if the user does not change this parameter.
    - SSH Command: $SNMPEID
    - Engine IDs must be specified as semicolon separated octets, for example: 00:01:02:03:04:05:06:07:08:09:0a:0b
- SNMPv3 Engine Boot Counter
    - This keeps track of the number of times SNMPv3 has been restarted.
    - The counter should only be reset if the engine ID is changed.
- Trap Alarm Back off Time: 300 Seconds
    - SSH Command: $ALMBACK

For security purposes, it is recommended that all the usernames and passwords be changed from the factory defaults before using the device. The SNMP parameters will only take effect after a reboot, therefore, once the parameters have been configured, the CPM should be reset.

For more information on the SSH commands associated with SNMPv3, please see the SSH command list.

The STARLINE CPM has the following default wired Ethernet settings:

- IP Configuration: Static
- IP Address: 192.168.1.99
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.
- Login Credentials
    - Username: admin
    - Password: admin
        - This password is required to be changed upon initial log-in and configuration. The username and password can be reverted to factory default by holding the reset button (see section xxx for more details)

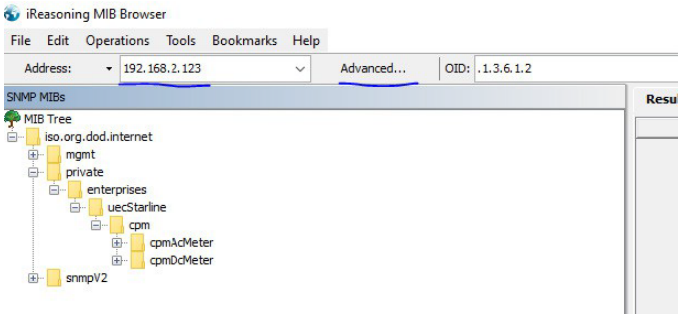
The STARLINE CPM has the following default wireless settings:

- IP Configuration: Static
- IP Address: 192.168.1.98
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- IPv6 is automatically disabled on first time setup.
- IPv6 Address is not set.

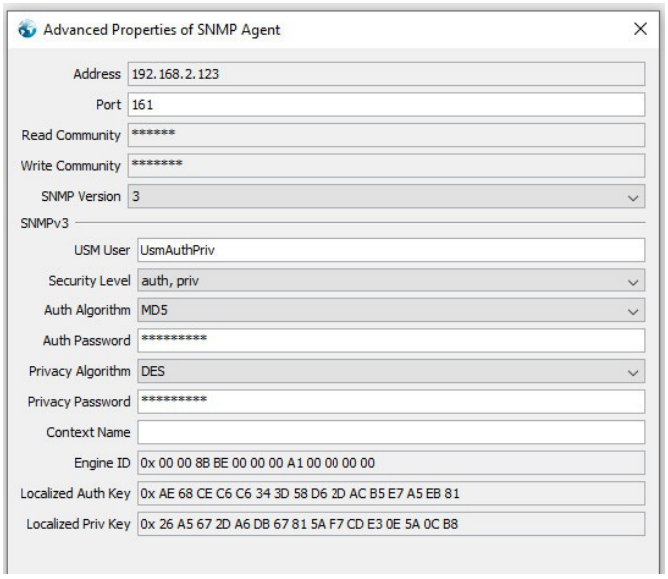
Installation Instructions

This section will describe the step by step instructions for establishing the SNMPv3 connection.

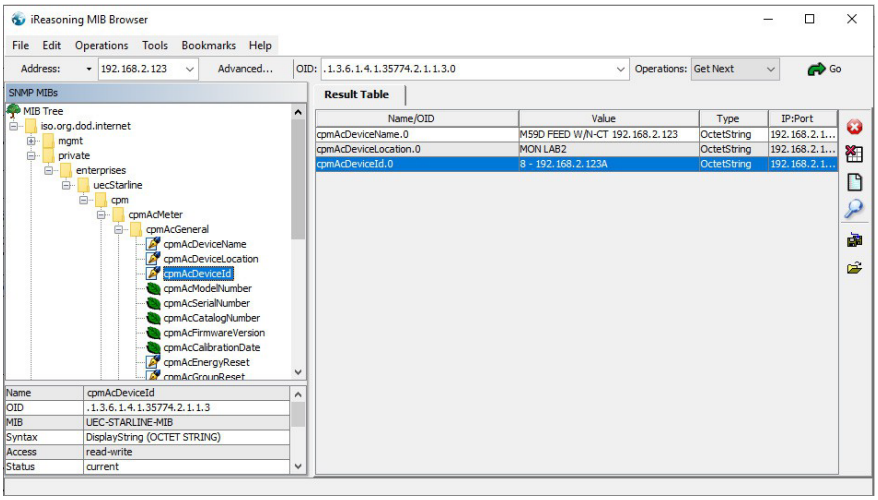
1. Open the SNMP browser or software that will be used. iReasoning is depicted below.
2. Load the MIB file into the software.
3. Enter the IP address into the “Address:” field and then select “Advanced…”. Again, every software may do this a bit differently, but the process should be the same:



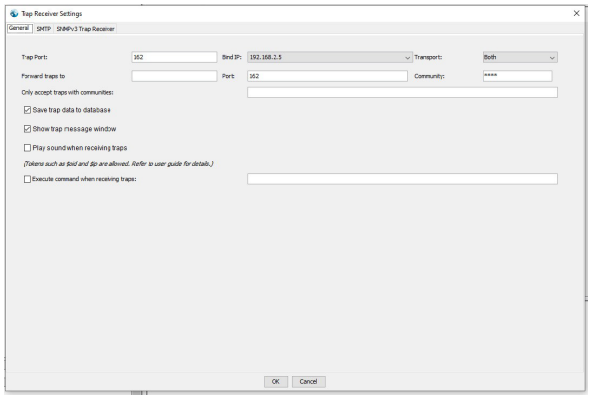
4. In Advanced, select SNMP Version 3 and then select the security level. There are three different security levels and the commands associated with each are listed in the Default Settings section of this QuickStart guide. Auth, Priv was used in the example below but here are the 3 options:
    a. No Auth, No Priv
    b. Auth, No Priv
    c. Auth, Priv

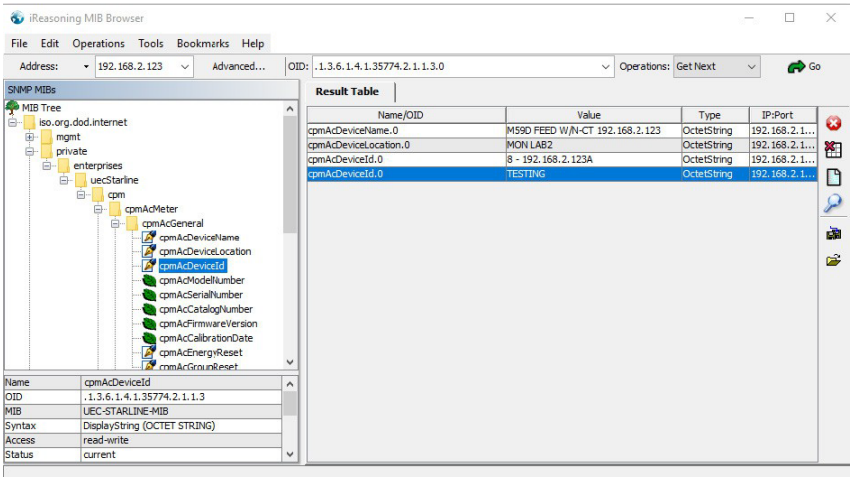


5. Once the login credentials are correctly entered, the MIB Tree can be used to read and write to the CPM:



6. To change a parameter right click on the “value” and select “set”. A new prompt will show up which will allow you to change the parameter:
    a. Once you change a parameter you must “get” that parameter again for it to update.

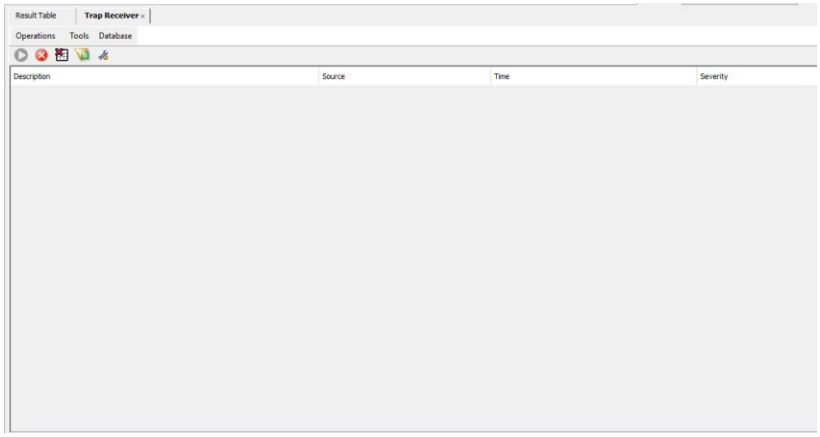




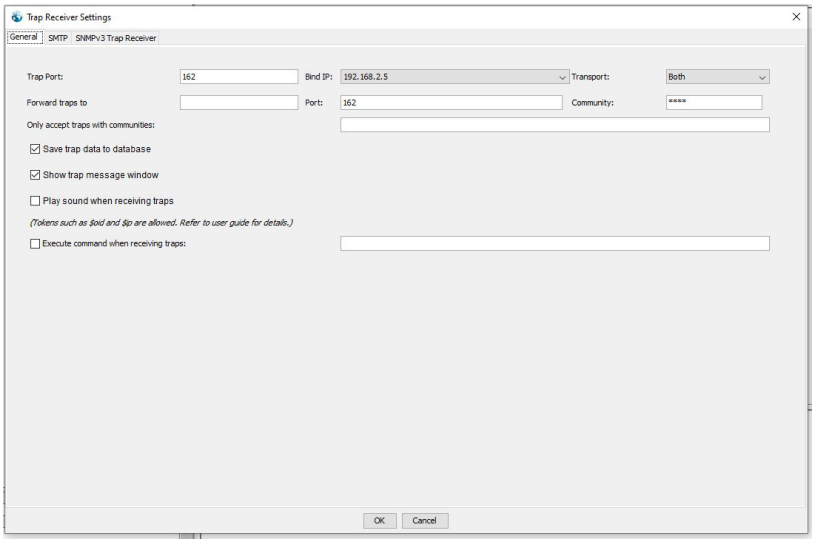
Traps

SNMPv3 traps can be used once the default Trap settings listed in the “Default Settings” section have been set.

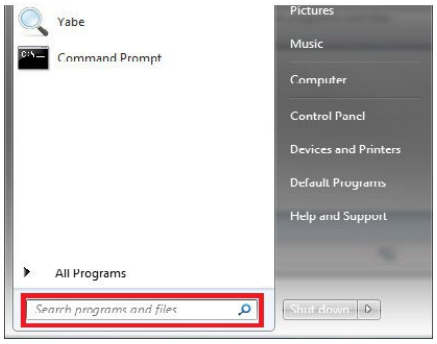
1. In iReasoning Select Tools>Trap Receiver. This will cause a Trap Receiver tab to open:



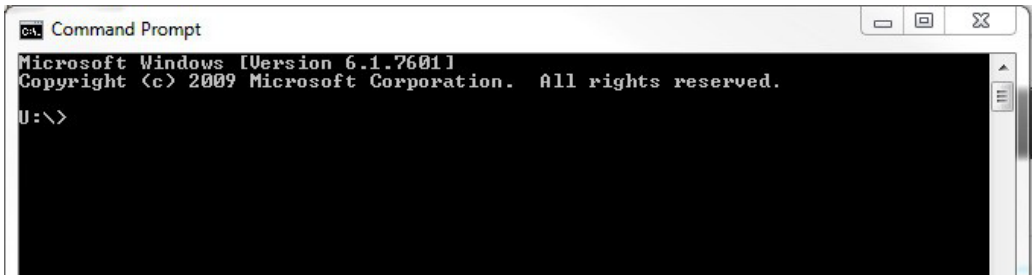
2. In the Trap Receiver pane Select Tools>Options. This is where the host PC IP address must be selected from the “Bind IP” drop down menu.



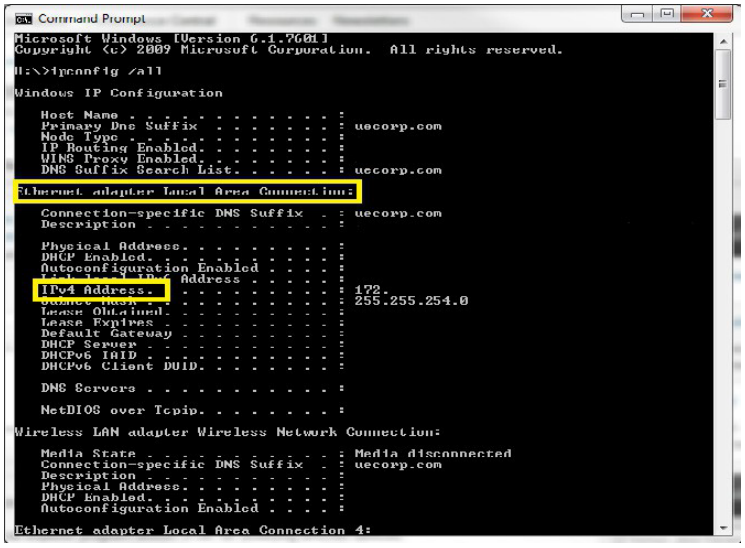
3. Find the host PC's IP address that is being used to connect to the STARLINE CPM
    a. This may be done through windows command prompt, which is reached by typing "cmd" into the search bar of the start menu as seen in the figure below.



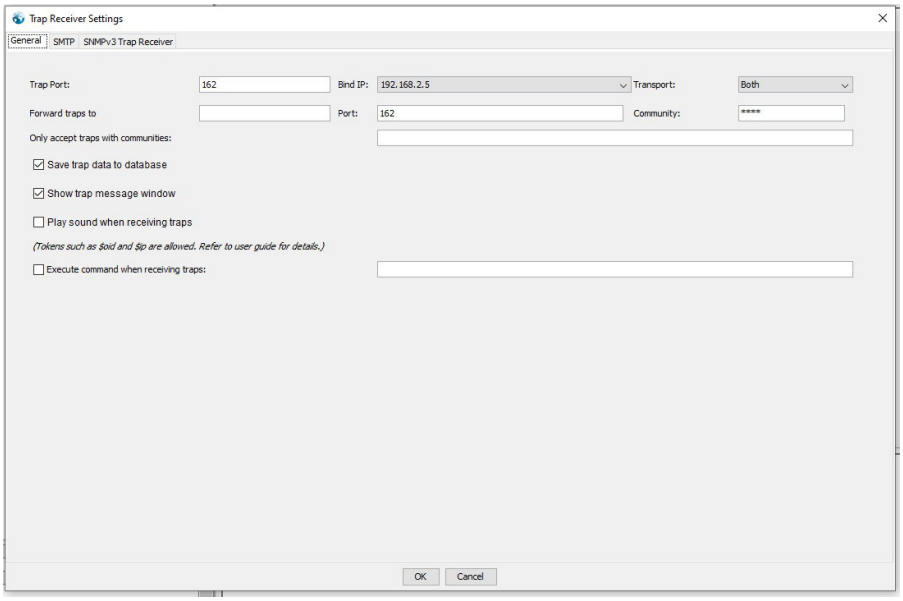
    b. After typing "cmd" and pushing the enter key the command prompt will appear and should look like the figure below.



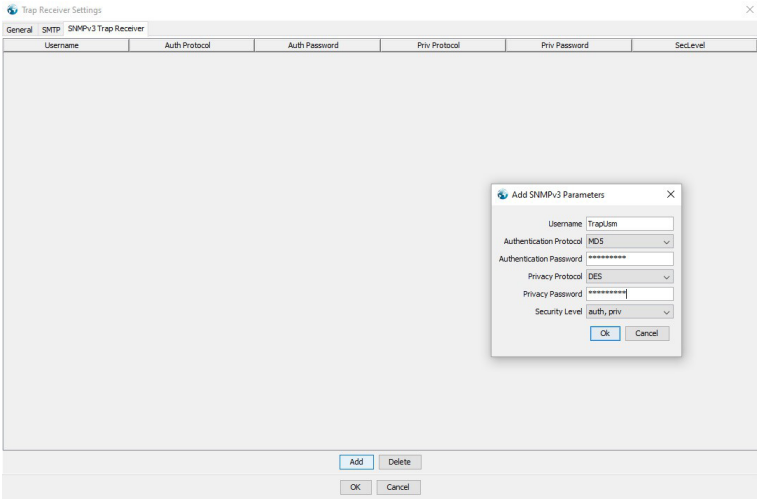
    c. In the command prompt window type "ipconfig /all" and push enter. This will cause a large scroll of information in the command prompt window.
    d. Use the slide bar on the right side of the window to scroll back through the information to locate the adapter that is being used to connect to the STARLINE CPM. The name of the adapter and brief description should appear like the first yellow box in the figure. Under the adapter, the IPv4 Address will be listed as seen by the second yellow box in the figure below. The IP address should be comprised of 4 octets of numbers (i.e. 192.168.1.1).



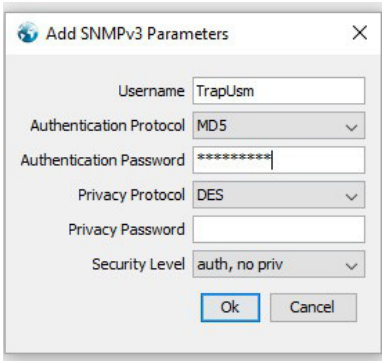
4. The IP address shown above is the one that should be selected in the “BIND IP” dropdown in iReasoning”:



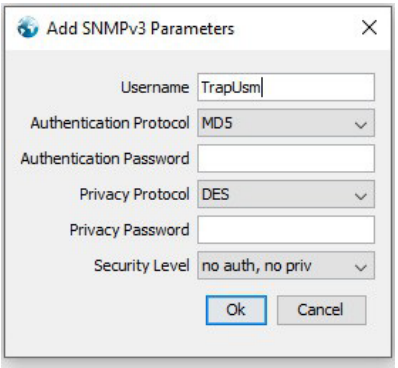
5. Next open the SNMPv3 Trap Receiver tab and select “Add”. A new UI will appear. This is where the trap credentials that were outlined in the “Default Settings” section need to go:



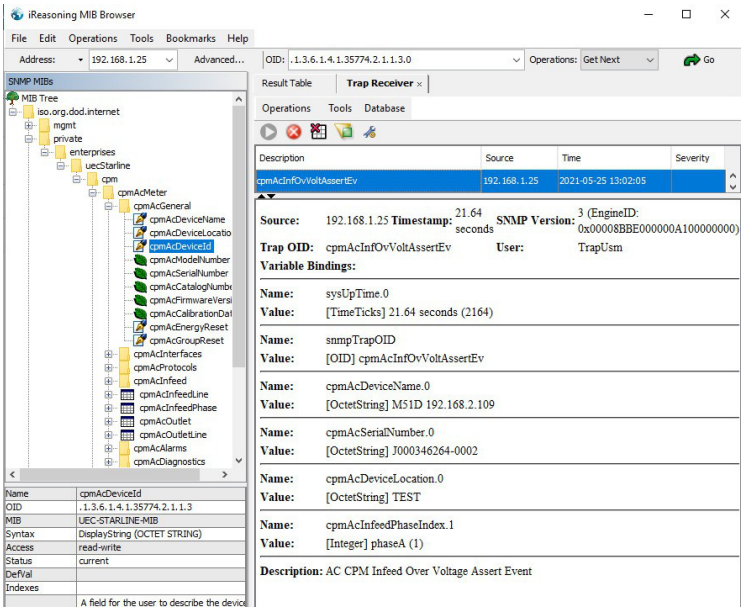
6. Optional: To disable the privacy algorithm, change the $SNMPTPA to a "-" (without the quotation marks):
    a. $SNMPTPA,S,-
    b. This will allow the user to use the auth/no priv Security Level when setting up the trap.



7. Optional: To disable the authentication algorithm, change $SNMPTAA to a "–" (without the quotation marks):
    a. $SNMPTAA,S,-
    b. This will allow the user to use the no auth/no priv Security Level when setting up the trap.



8. Traps will now appear whenever an alarm is triggered on the CPM:



Reserved for future use

Appendix B: ASCII Table

Dec	Hex	Char		Dec	Hex	Char		Dec	Hex	Char		Dec	Hex	Char
0	0	NUL (null)		32	20	Space		64	40	@		96	60	`
1	1	SOH (start of heading)		33	21	!		65	41	A		97	61	a
2	2	STX (start of text)		34	22	"		66	42	B		98	62	b
3	3	ETX (end of text)		35	23	#		67	43	C		99	63	c
4	4	EOT (end of transmission)		36	24	$		68	44	D		100	64	d
5	5	ENQ (enquiry)		37	25	%		69	45	E		101	65	e
6	6	ACK (acknowledge)		38	26	&		70	46	F		102	66	f
7	7	BEL (bell)		39	27	'		71	47	G		103	67	g
8	8	BS (backspace)		40	28	(		72	48	H		104	68	h
9	9	TAB (horizontal tab)		41	29	)		73	49	I		105	69	i
10	A	LF (NL line feed, new line)		42	2A	*		74	4A	J		106	6A	j
11	B	VT (vertical tab)		43	2B	+		75	4B	K		107	6B	k
12	C	NP (NP form feed, new page)		44	2C	,		76	4C	L		108	6C	l
13	D	CR (carriage return)		45	2D	-		77	4D	M		109	6D	m
14	E	SO (shift out)		46	2E	.		78	4E	N		110	6E	n
15	F	SI (shift in)		47	2F	/		79	4F	O		111	6F	o
16	10	DLE (data link escape)		48	30	0		80	50	P		112	70	p
17	11	DC1 (device control 1)		49	31	1		81	51	Q		113	71	q
18	12	DC2 (device control 2)		50	32	2		82	52	R		114	72	r
19	13	DC3 (device control 3)		51	33	3		83	53	S		115	73	s
20	14	DC4 (device control 4)		52	34	4		84	54	T		116	74	t
21	15	NAK (negative acknowledge)		53	35	5		85	55	U		117	75	u
22	16	SYN (synchronous idle)		54	36	6		86	56	V		118	76	v
23	17	ETB (end of trans. block)		55	37	7		87	57	W		119	77	w
24	18	CAN (cancel)		56	38	8		88	58	X		120	78	x
25	19	EM (end of medium)		57	39	9		89	59	Y		121	79	y
26	1A	SUB (substitute)		58	3A	:		90	5A	Z		122	7A	z
27	1B	ESC (escape)		59	3B	;		91	5B	[		123	7B	{
28	1C	FS (file separator)		60	3C	<		92	5C	\		124	7C	|
29	1D	GS (group separator)		61	3D	=		93	5D	]		125	7D	}
30	1E	RS (record separator)		62	3E	>		94	5E	^		126	7E	~
31	1F	US (unit separator)		63	3F	?		95	5F	_		127	7F	DEL

Compliance

Satisfying RF exposure compliance and Radio compliance FCC Part 15 Digital Emissions Compliance
We Starline, 168 Georgetown Road, Canonsburg, PA 15317, 724-597-7800, declare under our sole responsibility that the product CPM M70 series complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING: This equipment has been tested 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 in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna. Increase the separation between the equipment and receiver. Connect the equipment into an outlet on a circuit different from the one the receiver is connected to. Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful: The Interference Handbook - this booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 004-000-00345-4.

Industry Canada Notice:

This device complies with Canadian RSS-210. To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmitting antenna) that is installed outdoors is subject to licensing. The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's web site www.hcsc.gc.ca/rpb. "This Class B digital apparatus complies with Canadian ICES-003"

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada Avis de Conformité à la Réglementation d'Industrie Canada: Pour empêcher toute interférence aux services faisant l'objet d'une licence, cet appareil doit être utilisé à l'intérieur seulement et devrait être placé loin des fenêtres afin de fournir un écran de blindage maximal. L'installateur du présent matériel radio doit s'assurer que l'antenne est située ou pointée de manière à ce que cette dernière n'émette pas de champs radioélectriques supérieurs aux limites specifées par Santé Canada pour le grand public; consulter le Code de sécurité 6, disponible sur le site Web de Santé Canada, à l'adresse suivante: **www.hc-sc.gc.ca/rpb**.

United States

This equipment has been tested 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 in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Canada

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference;
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

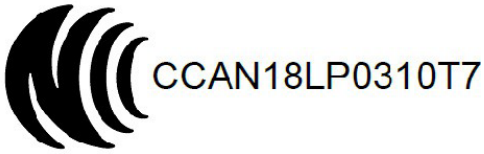
Japan

For the ATWILC1000-MR110PB module, due to a limited module size, the technical conformity logo and ID is displayed in the data sheet and/or packaging and cannot be displayed on the module label. The final product in which this module is being used must have a label referring to the type certified module inside:

Taiwan

根據 NCC LP0002 低功率射頻器材技術規範_章節 3.8.2：

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前述合法通信，指依電信管理法規定作業之無線電通信。
低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。



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