PATTERSON-KELLEY

ProtoNode FPC-N34 and ProtoNode FPC-N35 Start-up Guide

For Interfacing Patterson-Kelley Products:

ENVI, Love, Nuro

To Building Automation Systems:

BACnet MS/TP, BACnet/IP, Modbus TCP/IP, Metasys N2, LonWorks and SMC Cloud

APPLICABILITY & EFFECTIVITY

Explains ProtoNode hardware and installation.

The instructions are effective for the above as of September 2020.

sierra monitor

Document Revision: 15.A
Auto Discovery
Template Revision: 72

Technical Support

Thank you for purchasing the ProtoNode for Patterson-Kelley.

Please call Patterson-Kelley for Technical support of the ProtoNode product.

MSA Safety does not provide direct support. If Patterson-Kelley needs to escalate the concern, they will contact MSA Safety for assistance.

Support Contact Information:

Patterson-Kelley
155 Burson St
East Stroudsburg, PA 18301

Customer Service:

(877) 728-5351

Email: pkboilersales@spx.com

Website: www.pattersonkelley.com

Quick Start Guide

1. Record the information about the unit. (**Section** 3.1)
2. Check that the ProtoNode and customer device COM settings match. (**Section** 3.3)
3. FPC-N34: Select the protocol configuration on the S Bank DIP Switches. (**Section** 3.4.1)
4. Enable the ProtoNode “Auto-Discovery” mode on S Bank DIP Switches. (**Section** 3.4.2)
5. BACnet MS/TP (FPC-N34): Set the MAC Address on the A Bank DIP Switches. (**Section** 3.5.1)
6. BACnet MS/TP (FPC-N34): Set the baud rate of the BACnet MS/TP field protocol on the B Bank DIP Switches. (**Section** 3.5.3)
7. Connect the ProtoNode 6 pin RS-485 connector to the RS-485 network that is connected to each of the devices. (**Section** 4.2)
8. **If using a serial field protocol:**
   Connect the ProtoNode FPC-N34 3 pin RS-485 port to the field protocol cabling, (**Section** 4.3)
   or connect the ProtoNode FPC-N35 2 pin LonWorks port to the field protocol cabling. (**Section** 4.4)
9. Connect power to the ProtoNode 6 pin port. (**Section** 4.6)
10. When power is applied it will take about 3 minutes for all the devices to be discovered and the configuration file to be built. Once Auto-Discovery is complete turn OFF the S3 DIP switch to save the configuration settings. (**Section** 4.5.1)
11. Connect a PC to the ProtoNode via Ethernet cable. (**Section** 5)
12. Setup Web Server Security and login via web browser. (**Section** 6)
13. If discovering devices via the Web Configurator page, fill in device parameters as needed and click the Discovery Mode button at the bottom of the screen. It may take about 3 minutes for all the devices to be discovered and the configuration file to be built. (**Section** 7)
14. Ethernet network (FPC-N34): If using an Ethernet field protocol, use a web browser to access the ProtoNode Web Configurator page to change the IP Address. (**Section** 7.4)
15. LonWorks (FPC-N35): The ProtoNode must be commissioned on the LonWorks Network. This needs to be done by the LonWorks administrator using a LonWorks Commissioning tool. (**Section** 8)

TABLE OF CONTENTS

LIST OF FIGURES

1 CERTIFICATION

1.1 BTL Mark – BACnet®[1] Testing Laboratory

The BTL Mark on ProtoNode is a symbol that indicates that a product has passed a series of rigorous tests conducted by an independent laboratory which verifies that the product correctly implements the BACnet features claimed in the listing. The mark is a symbol of a high-quality BACnet product.

Go to www.BACnetInternational.net for more information about the BACnet Testing Laboratory. Click here for the BACnet PIC Statement.

1.2 LonMark Certification

LonMark International is the recognized authority for certification, education, and promotion of interoperability standards for the benefit of manufacturers, integrators and end users. LonMark International has developed extensive product certification standards and tests to provide the integrator and user with confidence that products from multiple manufacturers utilizing LonMark devices work together. MSA Safety has more LonMark Certified gateways than any other gateway manufacturer, including the ProtoCessor, ProtoCarrier and ProtoNode for OEM applications and the full featured, configurable gateways.

[1] BACnet is a registered trademark of ASHRAE

2 INTRODUCTION

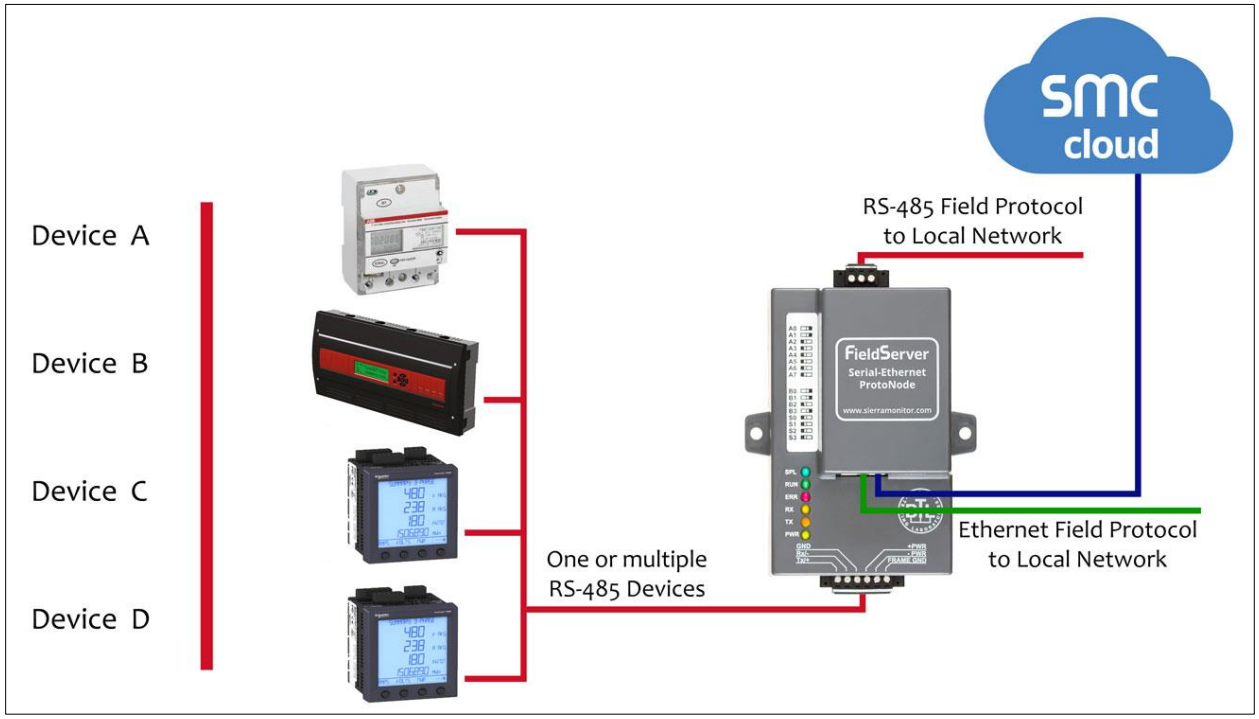
2.1 ProtoNode Gateway

The ProtoNode is an external, high performance **building automation multi-protocol gateway** that is preconfigured to auto-discover any of Patterson-Kelley's products (hereafter called "device") connected to the ProtoNode and automatically configures them for BACnet MS/TP, BACnet/IP, Metasys®[2] N2 by JCI, Modbus TCP/IP or LonWorks®[3].

It is not necessary to download any configuration files to support the required applications. The ProtoNode is pre-loaded with tested profiles/configurations for the supported devices.

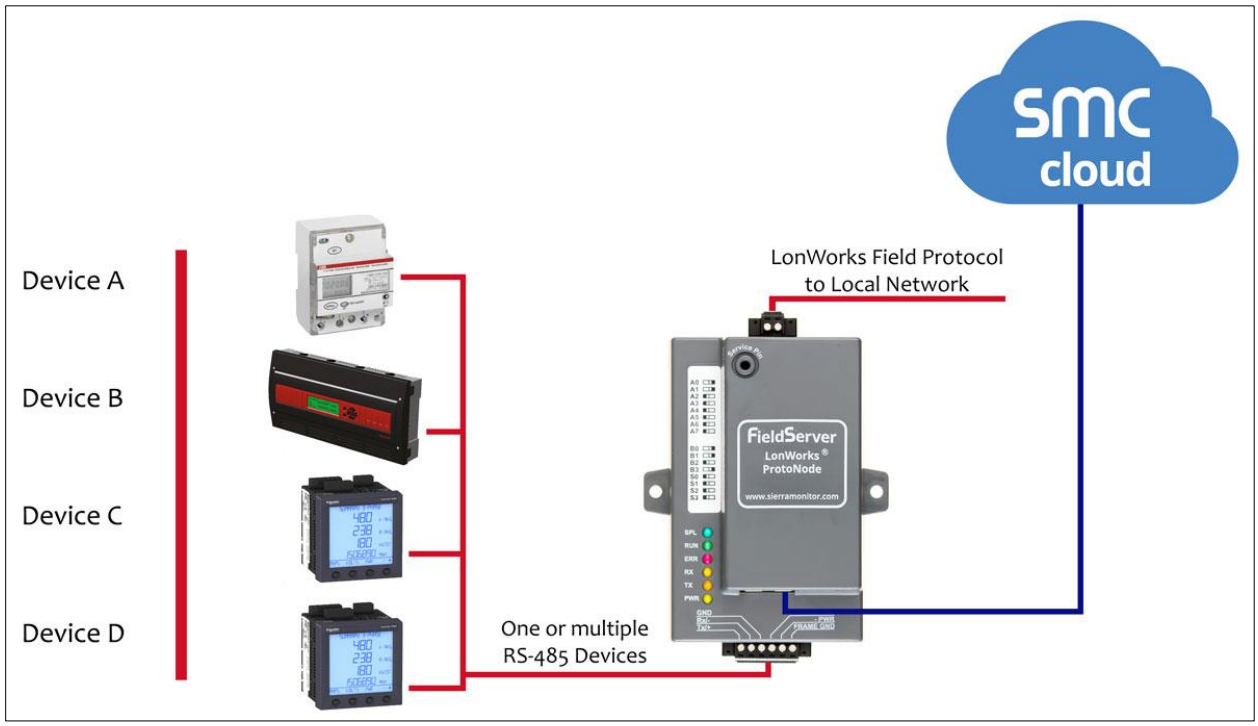
WARNING: Only use screws supplied by MSA Safety in the holes found on the back of the unit when attaching the optional DIN Rail bracket. Use of any other screws may damage the unit.

FPC-N34 Connectivity Diagram:



[2] Metasys is a registered trademark of Johnson Controls Inc.
[3] LonWorks is a registered trademark of Echelon Corporation

FPC-N35 Connectivity Diagram:



The ProtoNode can connect with the SMC Cloud. The SMC Cloud allows technicians, the OEM's support team and MSA Safety's support team to remotely connect to the ProtoNode. The SMC Cloud provides the following capabilities for any registered devices in the field:

- Remotely monitor and control devices.
- Collect device data and view it on the SMC Cloud Dashboard and the SMC Smart Phone App.
- Create user defined device notifications (alarm, trouble and warning) via SMS and/or Email.
- Generate diagnostic captures (as needed for troubleshooting) without going to the site.

For more information about the SMC Cloud, refer to the SMC Cloud Start-up Guide.

3 PROTONODE SETUP

3.1 Record Identification Data

Each ProtoNode has a unique part number located on the side or the back of the unit. This number should be recorded, as it may be required for technical support. The numbers are as follows:

Model	Part Number
ProtoNode N34	FPC-N34-0710
ProtoNode N35	FPC-N35-0771

Figure 1: ProtoNode Part Numbers

- FPC-N34 units have the following 3 ports: RS-485 + Ethernet + RS-485
- FPC-N35 units have the following 3 ports: LonWorks + Ethernet + RS-485

3.2 Point Count Capacity

The total number of points presented by all the devices attached to the ProtoNode cannot exceed:

Part number	Total Points
FPC-N34-0710	1,500
FPC-N35-0771	1,500

Figure 2: Supported Point Count Capacity

Devices	Points Per Device
Envi	53
Love	30
Nuro	64

Figure 3: Points per Device

3.3 Configuring Device Communications

3.3.1 Confirm the Device and ProtoNode COM Settings Match

- **Any connected serial device MUST have the same Baud Rate, Data Bits, Stop Bits, and Parity settings as the ProtoNode.**
- Figure 4 specifies the device serial port settings required to communicate with the ProtoNode.
- Set the Modbus COM settings on the devices now. When mixing devices, the selected baud rates are required to match the slowest device (ENVI=9600). When there are no ENVI units present, the baud rate could be set faster (LOVE end NURO support 19200 and 38400).
  - The ProtoCessor default settings are 9600 / None / 8 /1
- The Selected device COM settings need to be documented.

Port Setting	ENVI	LOVE	NURO
Protocol	Modbus RTU	Modbus RTU	Modbus RTU
Baud Rate	9600	9600, 19.2k, 38.4k	9600, 19.2k, 38.4k
Parity	None	None	None
Data Bits	8	8	8
Stop Bits	1	1 or 2	1 or 2

Figure 4: COM Settings

3.3.2 Set Node-ID for Any Device Attached to the ProtoNode

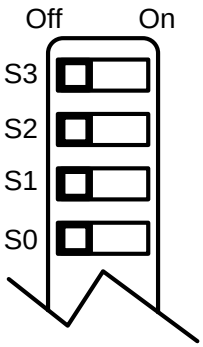
- Set Node-ID for any device attached to ProtoNode. The Node-ID need to be uniquely assigned between 1 and 255.
- Document the Node-ID that is assigned to any device. The Node-ID assigned is used for deriving the Device Instance for BACnet/IP and BACnet MS/TP. (**Section** 3.5.2)

NOTE: The Metasys N2 and Modbus TCP/IP field protocol Node-ID is automatically set to be the same value as the Node-ID of the device.

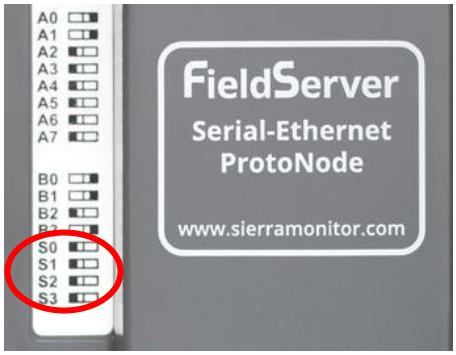
3.4 Selecting the Desired Protocol Configuration and Enabling Auto-Discovery

3.4.1 Selecting Desired Field Protocol

- ProtoNode FPC-N34 units use the "S" bank of DIP switches (S0 – S2) to select the protocol configuration.
  - See the table in **Figure 5** for the switch settings for the ProtoNode.
  - The OFF position is when the DIP switches are set closest to the outside of the box.
- ProtoNode FPC-N35 units do not use the "S" bank DIP switches (S0 – S2) to select a protocol.
  - On ProtoNode FPC-N35 units, these switches are disabled; the field protocol is always LonWorks.



S0 – S3 DIP Switches



S Bank DIP Switch Location

ProtoNode FPC-N34	S Bank DIP Switches		
Profile	**S0**	**S1**	**S2**
BACnet/IP	Off	Off	Off
BACnet MS/TP	On	Off	Off
Metasys N2	Off	On	Off
Modbus TCP/IP	On	On	Off
BACnet MS/TP (single node)	Off	Off	On

Profile Settings for ProtoNode

Figure 5: S Bank DIP Switches

NOTE: When setting DIP switches, ensure that power to the board is OFF.

3.4.2 Enabling Auto-Discovery

If using the Web Configurator Page to perform Auto-Discovery, skip this Section.

NOTE: If Modbus TCP/IP was selected in Section 3.4.1 for the field/BMS protocol, skip this section. Auto-Discovery is NOT used for Modbus TCP/IP.

- The S3 DIP switch is used to both enable Auto-Discovery of known devices attached to the ProtoNode, and to save the recently discovered configuration.
  - See the table in **Figure 6** for the switch setting to enable Auto-Discovery
  - If the ProtoNode is being installed for the first time, set S3 to the ON position to enable Auto-Discovery
  - The ON position is when the DIP switches are set closest to the inside of the box

S3 DIP Switch Auto-Discovery Mode	S3
Auto-Discovery ON – Build New Configuration	On
Auto-Discovery OFF – Save Current Configuration	Off

Figure 6: S3 DIP Switch Setting for Auto Discovering Devices

3.5 BMS Network Settings: MAC Address, Device Instance and Baud Rate

3.5.1 BACnet MS/TP (FPC-N34): Setting the MAC Address for BMS Network

- Only 1 MAC Address is set for ProtoNode regardless of how many devices are connected to ProtoNode.
- Set the BACnet MS/TP MAC Address of the ProtoNode to a value between 1 to 127 (MAC Master Addresses); this is so that the BMS front end can find the ProtoNode via BACnet Auto-Discovery.

NOTE: **Never set a BACnet MS/TP MAC Address from 128 to 255**. Addresses from 128 to 255 are Slave Addresses and cannot be discovered by BMS front ends that support Auto-Discovery of BACnet MS/TP devices.

- Set "A" bank DIP switches A0 – A7 to assign a MAC Address to the ProtoNode for BACnet MS/TP.
- Refer to **Appendix D.1** for the complete range of MAC Addresses and DIP switch settings.

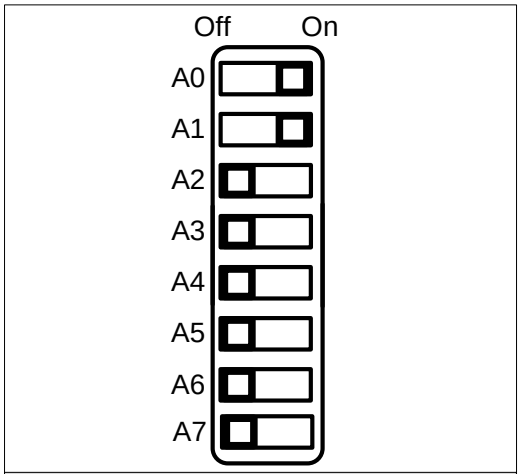


Figure 7: MAC Address DIP Switches

NOTE: When setting DIP Switches, ensure that power to the board is OFF.

3.5.2 BACnet (FPC-N34): Calculating the Default Device Instance

- The Device Instance value is automatically generated using the following formula:

  BACnet Device Instance = (Device Node ID) + (Default Node Offset)

NOTE: The default Node Offset is 50,000.

For example, if Device A has a Node ID of 1 and Device B has a Node ID of 2, then:

BACnet Device Instance A = (1) + (50000) = 50001

BACnet Device Instance B = (2) + (50000) = 50002

NOTE: The Node ID is set in Section 3.3.2.

- To reach a specific BACnet Device Instance result, refer to **Section 7.5**.

3.5.3 BACnet MS/TP (FPC-N34): Setting the Baud Rate for BMS Network

- DIP switches B0 – B3 can be used to set the field baud rate of the ProtoNode to match the baud rate required by the BMS for BACnet MS/TP.
- The ProtoNode baud rate for Metasys N2 is set for 9600. “B” bank DIP switches B0 – B3 are disabled for Metasys N2 on the ProtoNode FPC-N34.
- DIP switches B0 – B3 are disabled on ProtoNode FPC-N35 (LonWorks).

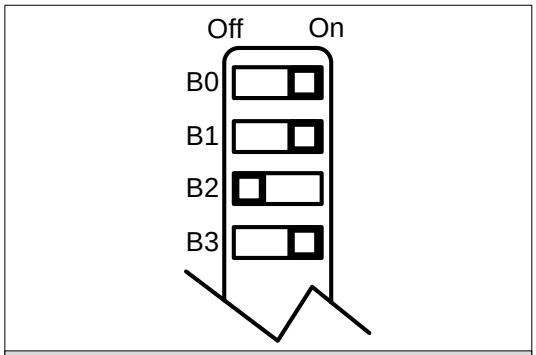


Figure 8: BMS Baud Rate DIP Switches

NOTE: When setting DIP switches, ensure that power to the board is OFF.

3.5.3.1 Baud Rate DIP Switch Selection

Baud	B0	B1	B2	B3
9600	On	On	On	Off
19200	Off	Off	Off	On
38400*	**On**	**On**	**Off**	**On**
57600	Off	Off	On	On
76800	On	Off	On	On

Figure 9: BMS Baud Rate

* Factory default setting = 38400

4 INTERFACING PROTONODE TO DEVICES

4.1 ProtoNode FPC-N34 and FPC-N35 Showing Connection Ports

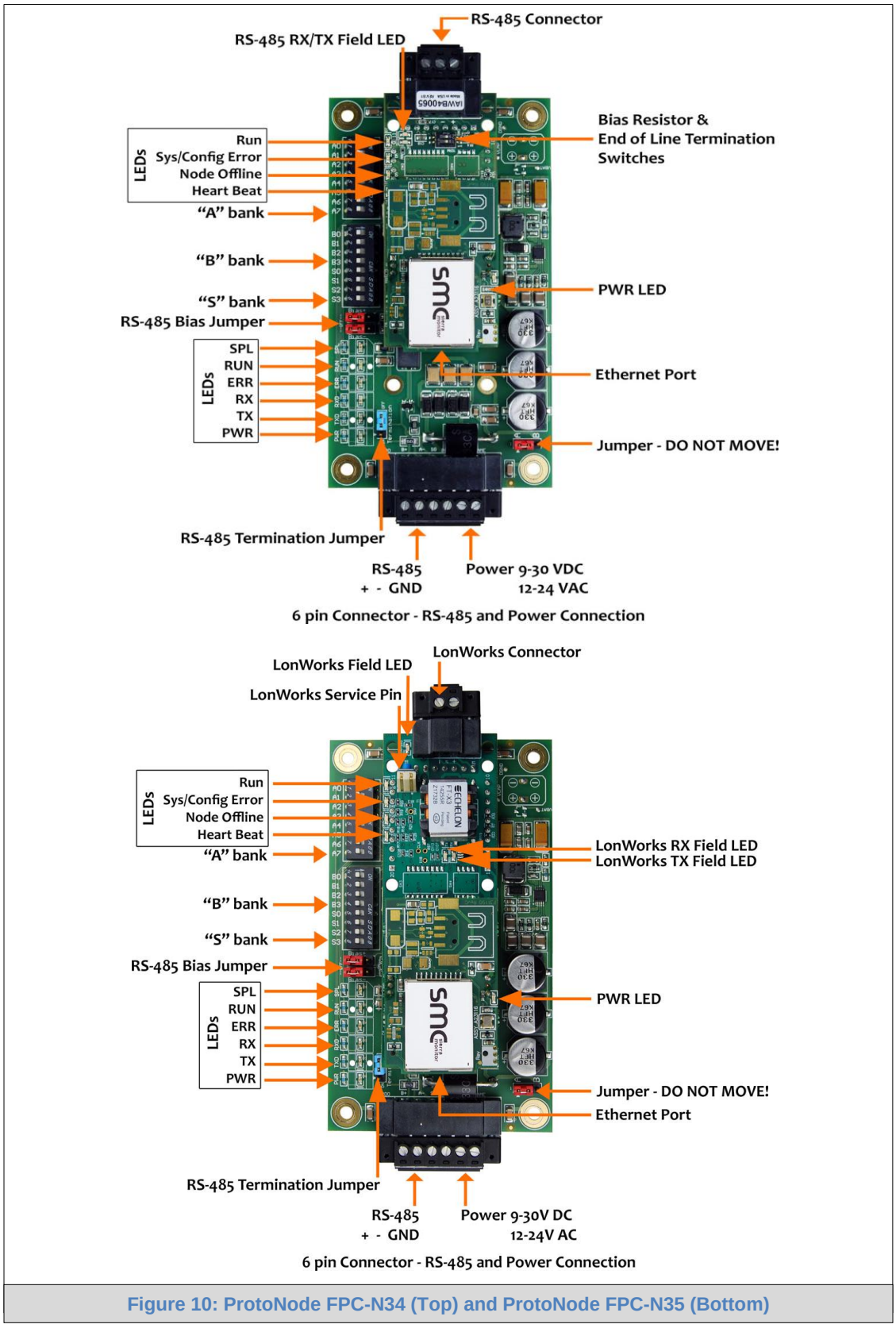


Figure 10: ProtoNode FPC-N34 (Top) and ProtoNode FPC-N35 (Bottom)

4.2 Device Connections to ProtoNode

ProtoNode 6 Pin Phoenix connector:

- The 6 pin Phoenix connector is the same for ProtoNode FPC-N34 and FPC-N35 (LonWorks).
- Pins 1 through 3 are for RS-485 devices.
  - Use standard grounding principles for RS-485 GND
- Pins 4 through 6 are for power. **Do not connect power until Section 4.6**.

Device Pins	ProtoNode Pin #	Pin Assignment
Pin RS-485 +	Pin 1	RS-485 +
Pin RS-485 -	Pin 2	RS-485 -
Pin GND	Pin 3	RS-485 GND
Power In (+)	Pin 4	V +
Power In (-)	Pin 5	V -
Frame Ground	Pin 6	FRAME GND

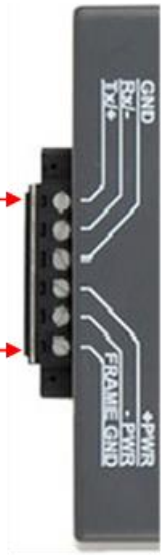


Figure 11: Power and RS-485 Connections

4.2.1 Connecting NURO Modbus RTU Boilers to the ProtoNode's RS-485

- Connect NURO's Modbus COM A to ProtoNode's pin 1 labeled Tx/+ on the Phoenix 6 pin connector.
- Connect NURO's Modbus COM B to ProtoNode's pin 2 labeled Rx/- on the Phoenix 6 pin connector.
- Do not connect Ground between NURO and the ProtoNode's RS-485 Ground.

4.2.2 Connecting LOVE Modbus RTU Boilers to the ProtoNode's RS-485

- Connect LOVE's Modbus DATA+ to ProtoNode's pin 1 labeled Tx/+ on the Phoenix 6 pin connector.
- Connect LOVE's Modbus DATA- to ProtoNode's pin 2 labeled Rx/- on the Phoenix 6 pin connector.
- Do not connect Ground between LOVE and the ProtoNode's RS-485 Ground.

4.2.3 Connecting ENVI Modbus RTU Boilers to the ProtoNode's RS-485

- Connect ENVI's Modbus COM 1A (RS-485+) to ProtoNode's pin 1 labeled B+ (RS-485+) on the Phoenix 6 pin connector.
- Connect ENVI's Modbus COM 1B (RS-485-) to ProtoNode's pin 2 labeled A- (RS-485-) on the Phoenix 6 pin connector.
- Do not connect Ground between ENVI and the ProtoNode's RS-485 Ground.

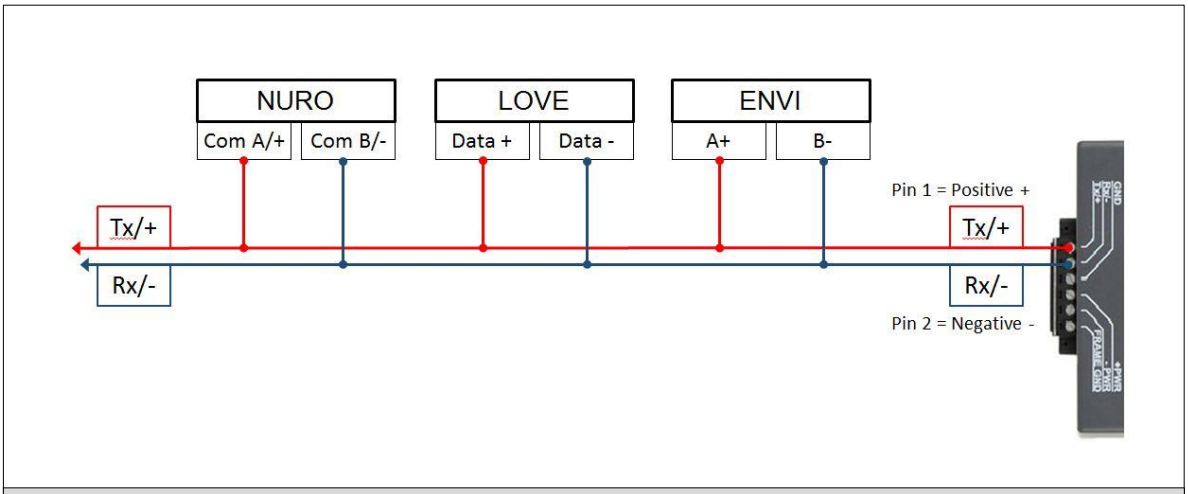


Figure 12: Wiring Diagram for Modbus RTU RS-485 Connections to the ProtoNode's RS-485 Port

4.2.4 Biasing the RS-485 Device Network

- An RS-485 network with more than one device needs to have biasing to ensure proper communication. The biasing only needs to be done on one device.
- The ProtoNode has 510 ohm resistors that can be used to set the biasing. The ProtoNode's default positions from the factory for the Biasing jumpers are OFF.
- The OFF position is when the 2 RED biasing jumpers straddle the 4 pins closest to the outside of the board of the ProtoNode. (**Figure 13**)
- **Only turn biasing ON:**
  - **IF the BMS cannot see more than one device connected to the ProtoNode**
  - **AND all the settings (COM settings, wiring, and DIP switches) have been checked**
- To turn biasing ON, move the 2 RED biasing jumpers to straddle the 4 pins closest to the inside of the board of the ProtoNode.

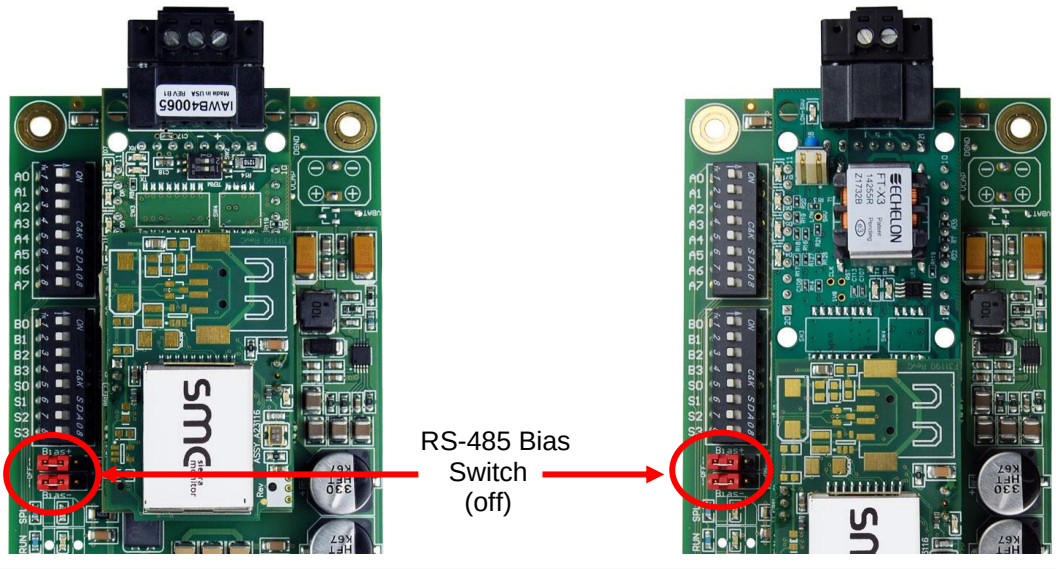


Figure 13: RS-485 Biasing Switch on the ProtoNode N34 (Left) and ProtoNode N35 (Right)

4.2.5 End of Line Termination Switch for the RS-485 Device Network

- On long RS-485 cabling runs, the RS-485 trunk must be properly terminated at each end.
- The ProtoNode has an End of Line (EOL) blue jumper. The default setting for this Blue EOL switch is OFF with the jumper straddling the pins closest to the inside of the board of the ProtoNode.
  - On short cabling runs the EOL switch does not to need to be turned ON
- **If the ProtoNode is placed at one of the ends of the trunk, set the blue EOL jumper to the ON position straddling the pins closest to the outside of the board of the ProtoNode.**
- **Always leave the single red jumper in the A position (default factory setting).**

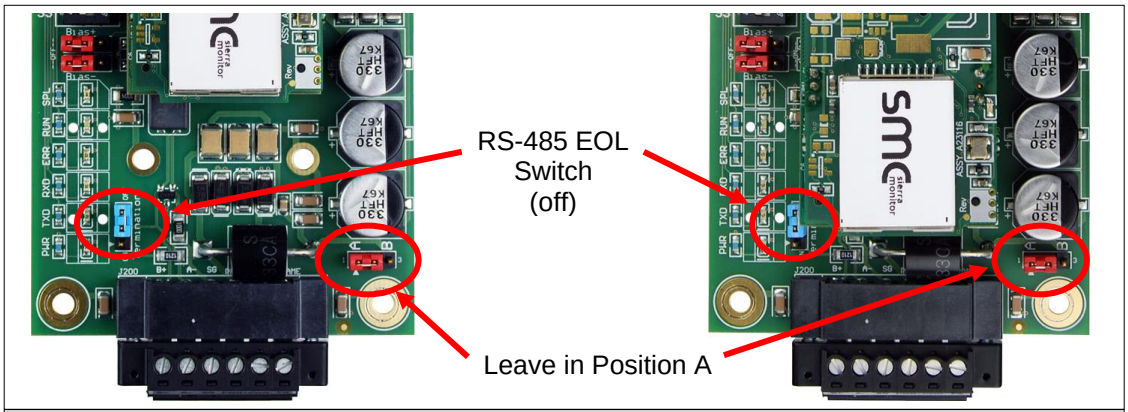


Figure 14: RS-485 End-Of-Line Termination Switch on the ProtoNode N34 (Left) and ProtoNode N35 (Right)

4.3 Serial Network (FPC-N34): Wiring Field Port to RS-485 Network

- Connect the RS-485 network wires to the 3-pin RS-485 connector on ProtoNode FPC-N34 as shown in **Figure 15**.
  - Use standard grounding principles for RS-485 GND
- See **Section 5** for information on connecting to an Ethernet network.

BMS RS-485 Wiring	ProtoNode Pin #	Pin Assignment
RS-485 +	Pin 1	RS-485 +
RS-485 -	Pin 2	RS-485 -
-	Pin 3	RS-485 GND

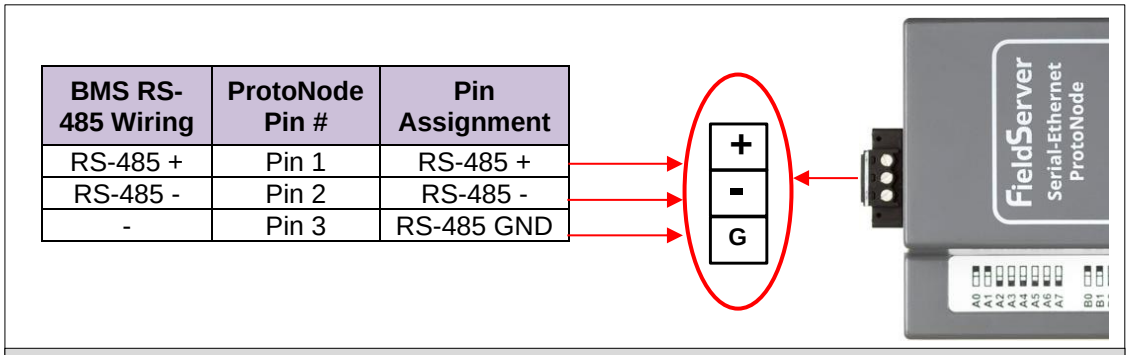


Figure 15: Connection from ProtoNode to RS-485 Field Network

- If the ProtoNode is the last device on the trunk, then the end of line (EOL) termination switch needs to be enabled. **See Figure 16 for the orientation of switch positions referenced below.**
  - The default setting from the factory is OFF (switch position = right side)
  - To enable the EOL termination, turn the EOL switch ON (switch position = left side)

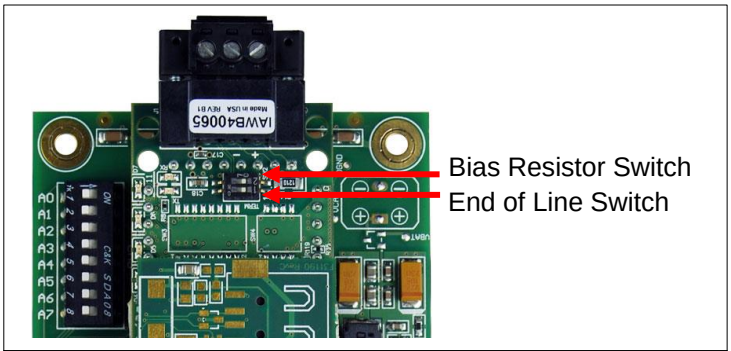


Figure 16: RS-485 EOL & Bias Resistor Switches

- If more than one RS-485 device is connected to the network, then the field bias resistor switch needs to be enabled to ensure proper communication. **See Figure 16 for the orientation of switch positions referenced below.**
  - The default factory setting is OFF (switch position = right side)
  - To enable biasing, turn the bias switch ON (switch position = left side)

NOTE: Biasing only needs to be enabled on one device. The ProtoNode has 510 ohm resistors that are used to set the biasing.

4.4 LonWorks (FPC-N35): Wiring LonWorks Devices to the LonWorks Terminal

- Wire the LonWorks device network to the ProtoNode LonWorks Terminal.
  - Use approved cable per the FT-10 installation guidelines
  - LonWorks has no polarity.

Figure 17: LonWorks Terminal

4.5 Auto-Discovery: Saving RS-485 Device Configurations

4.5.1 Auto-Discovery: After Completion – Turn Off

If using the Web Configurator Page to perform Auto-Discovery, skip this Section.

NOTE: If Modbus TCP/IP was selected in Section 3.4.1 for the field/BMS protocol, skip this section. Auto-Discovery is NOT used for Modbus TCP/IP.

The S3 DIP Switch for Enabling Auto-Discovery should have been set in **Section 3.4.2** before applying power to the ProtoNode. **Do not** enable Auto-Discovery when the unit is powered.

- When power is applied (**Section 4.6**) to a ProtoNode that is set to enable Auto-Discovery, it will take about 3 minutes to complete the discovery of all of the RS-485 devices attached to the ProtoNode.
  - The "TX" LED will flash during Auto-Discovery
  - Once completed, the "TX" and "RX" LEDs should flash rapidly, indicating good communication between discovered devices
- **Once the ProtoNode has discovered all the RS-485 devices, set the S3 DIP switch to the OFF position.**

S3 DIP Switch Auto-Discovery Mode	S3
Auto-Discovery ON – Build New Configuration	On
Auto-Discovery OFF – Save Current Configuration	Off

Figure 18: S3 DIP Switch setting for Auto Discovering Devices

4.6 Power-Up ProtoNode

Check power requirements in the table below:

Power Requirement for ProtoNode External Gateway			
	Current Draw Type		
ProtoNode Family	12V DC/AC	24V DC/AC	30VDC
FPC – N34 (Typical)	170mA	100mA	80mA
FPC – N34 (Maximum)	240mA	140mA	100mA
FPC – N35 (Typical)	210mA	130mA	90mA
FPC – N35 (Maximum)	250mA	170mA	110mA
NOTE: These values are 'nominal' and a safety margin should be added to the power supply of the host system. A safety margin of 25% is recommended.			

Figure 19: Required Current Draw for the ProtoNode

Apply power to the ProtoNode as shown below in **Figure 20.** Ensure that the power supply used complies with the specifications provided in **Appendix E.1**.

- ProtoNode accepts either 9-30VDC or 12-24VAC on pins 4 and 5.
- **Frame GND should be connected.**

Power to ProtoNode	ProtoNode Pin #	Pin Assignment
Power In (+)	Pin 4	V +
Power In (-)	Pin 5	V -
Frame Ground	Pin 6	FRAME GND

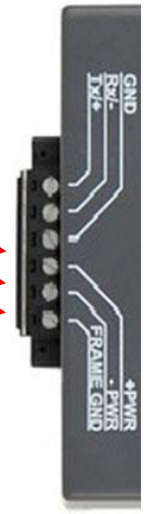


Figure 20: Power Connections

5 CONNECT THE PC TO THE PROTONODE

5.1 Connect the PC to ProtoNode via the Ethernet Port

Connect a Cat-5 Ethernet cable (straight through or cross-over) between the local PC and ProtoNode.

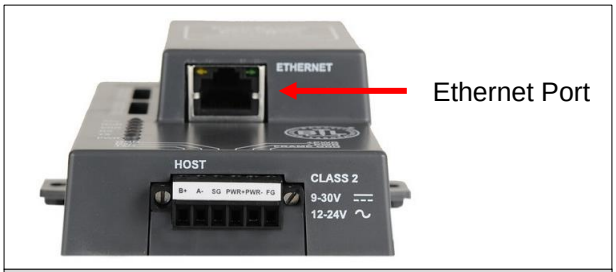


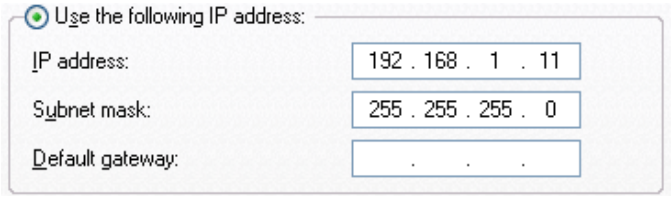
Figure 21: Ethernet Port Location

5.1.1 Changing the Subnet of the Connected PC

The default IP Address for the ProtoNode is **192.168.1.24**, Subnet Mask is **255.255.255.0**. If the PC and ProtoNode are on different IP networks, assign a static IP Address to the PC on the 192.168.1.xxx network.

For Windows 10:

- Find the search field in the local computer's taskbar (usually to the right of the windows icon) and type in "Control Panel".
- Click "Control Panel", click "Network and Internet" and then click "Network and Sharing Center".
- Click "Change adapter settings" on the left side of the window.
- Right-click on "Local Area Connection" and select "Properties" from the dropdown menu.
- Highlight Internet Protocol Version 4 (TCP/IPv4) and then click the Properties button.
- Select and enter a static IP Address on the same subnet. For example:



- Click the Okay button to close the Internet Protocol window and the Close button to close the Ethernet Properties window.

6 SETUP WEB SERVER SECURITY

Navigate to the IP Address of the ProtoNode on the local PC by opening a web browser and entering the IP Address of the ProtoNode; the default Ethernet address is 192.168.1.24.

NOTE: If the IP Address of the ProtoNode has been changed, the IP Address can be discovered using the FS Toolbox utility. See Appendix A.1 for instructions.

6.1 Login to the FieldServer

The first time the FieldServer GUI is opened in a browser, the IP Address for the gateway will appear as untrusted. This will cause the following pop-up windows to appear.

- When the Web Server Security Unconfigured window appears, read the text and choose whether to move forward with HTTPS or HTTP.

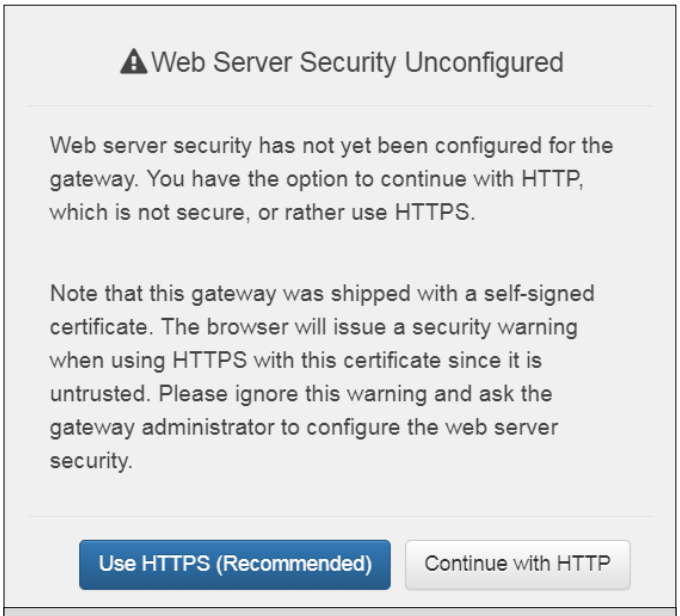


Figure 22: Web Server Security Unconfigured Window

- When the warning that “Your connection is not private” appears, click the advanced button on the bottom left corner of the screen.

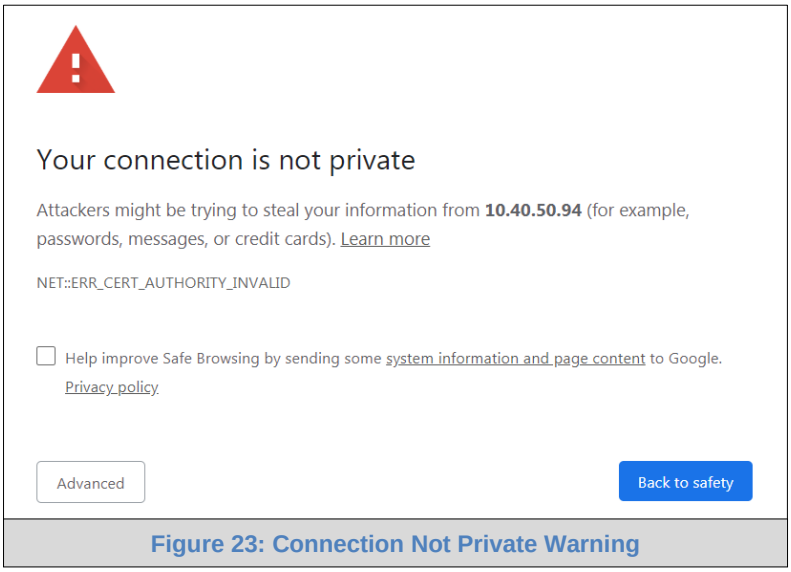


Figure 23: Connection Not Private Warning

- Additional text will expand below the warning, click the underlined text to go to the IP Address. In the **Figure 24** example this text is "Proceed to 10.40.50.94 (unsafe)".

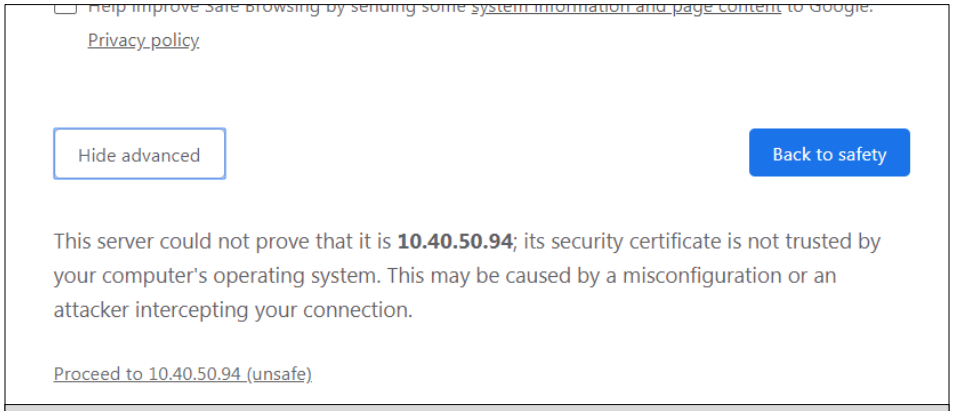


Figure 24: Warning Expanded Text

- When the login screen appears, put in the Username (default is "admin") and the Password (found on the label of the FieldServer).

NOTE: There is also a QR code in the top right corner of the FieldServer label that shows the default unique password when scanned.

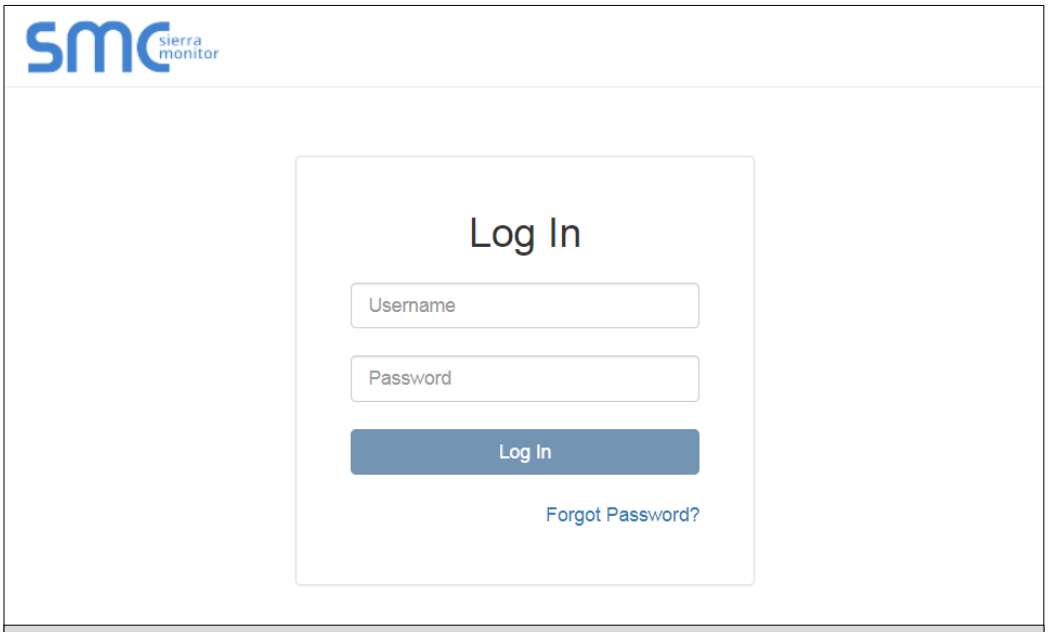


Figure 25: FieldServer Login

NOTE: A user has 5 attempts to login then there will be a 10-minute lockout. There is no timeout on the FieldServer to enter a password.

NOTE: To create individual user logins, go to Appendix B.5.

6.2 Select the Security Mode

- On the first login to the FieldServer, the following screen will appear that allows the user to select which mode the FieldServer should use.

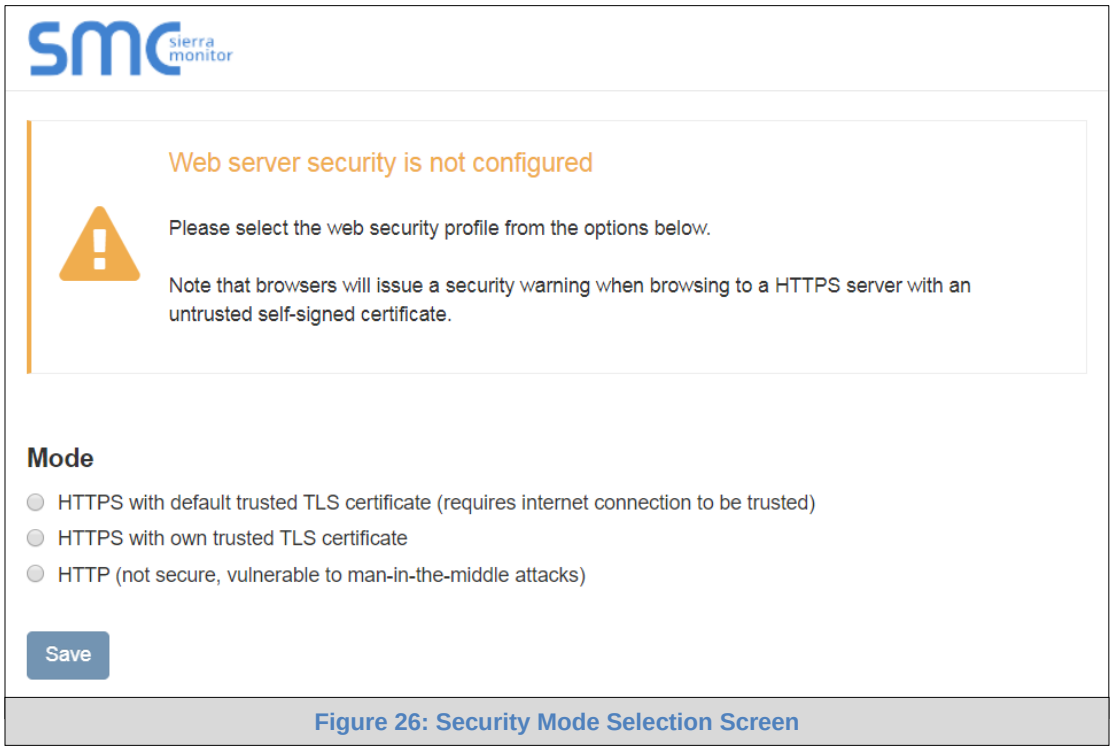


Figure 26: Security Mode Selection Screen

NOTE: Cookies are used for authentication.

NOTE: To change the web server security mode after initial setup, go to Appendix B.4.

The sections that follow include instructions for assigning the different security modes.

6.2.1 HTTPS with Own Trusted TLS Certificate

This is the recommended selection and the most secure.

- Once this option is selected, the Certificate, Private Key and Private Key Passphrase fields will appear under the mode selection.

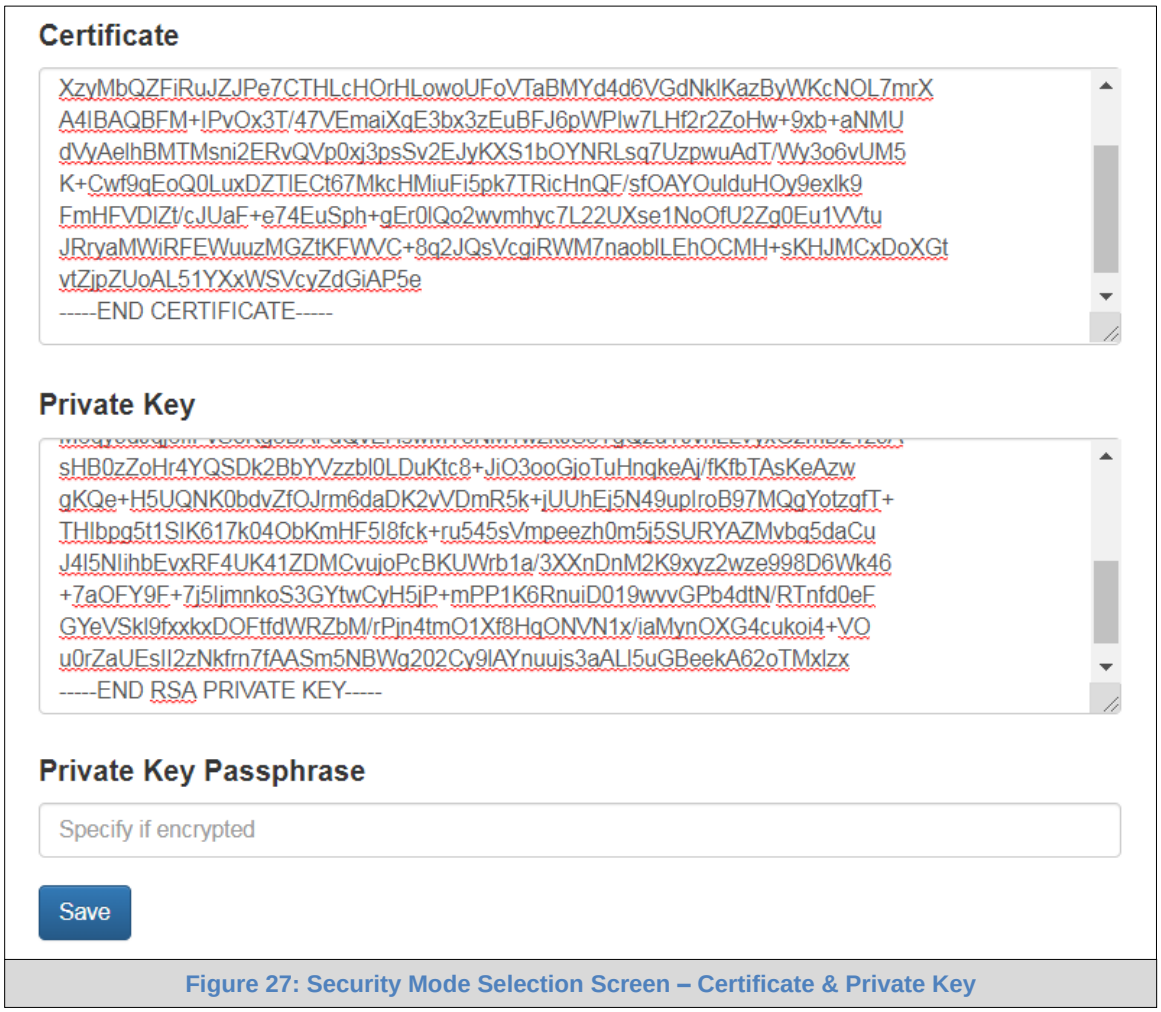


Figure 27: Security Mode Selection Screen – Certificate & Private Key

- Copy and paste the Certificate and Private Key text into their respective fields. If the Private Key is encrypted type in the associated Passphrase.
- Click Save.
- A “Redirecting” message will appear. After a short time the Web Configurator page will open.

6.2.2 HTTPS with Default Untrusted Self-Signed TLS Certificate or HTTP with Built-in Payload Encryption

- Select one of these options and click the Save button.
- A “Redirecting” message will appear. After a short time the Web Configurator page will open.

7 CONFIGURE THE PROTONODE

7.1 Set Configuration Parameters

- On the Web Configurator page, all the configuration parameters are listed.

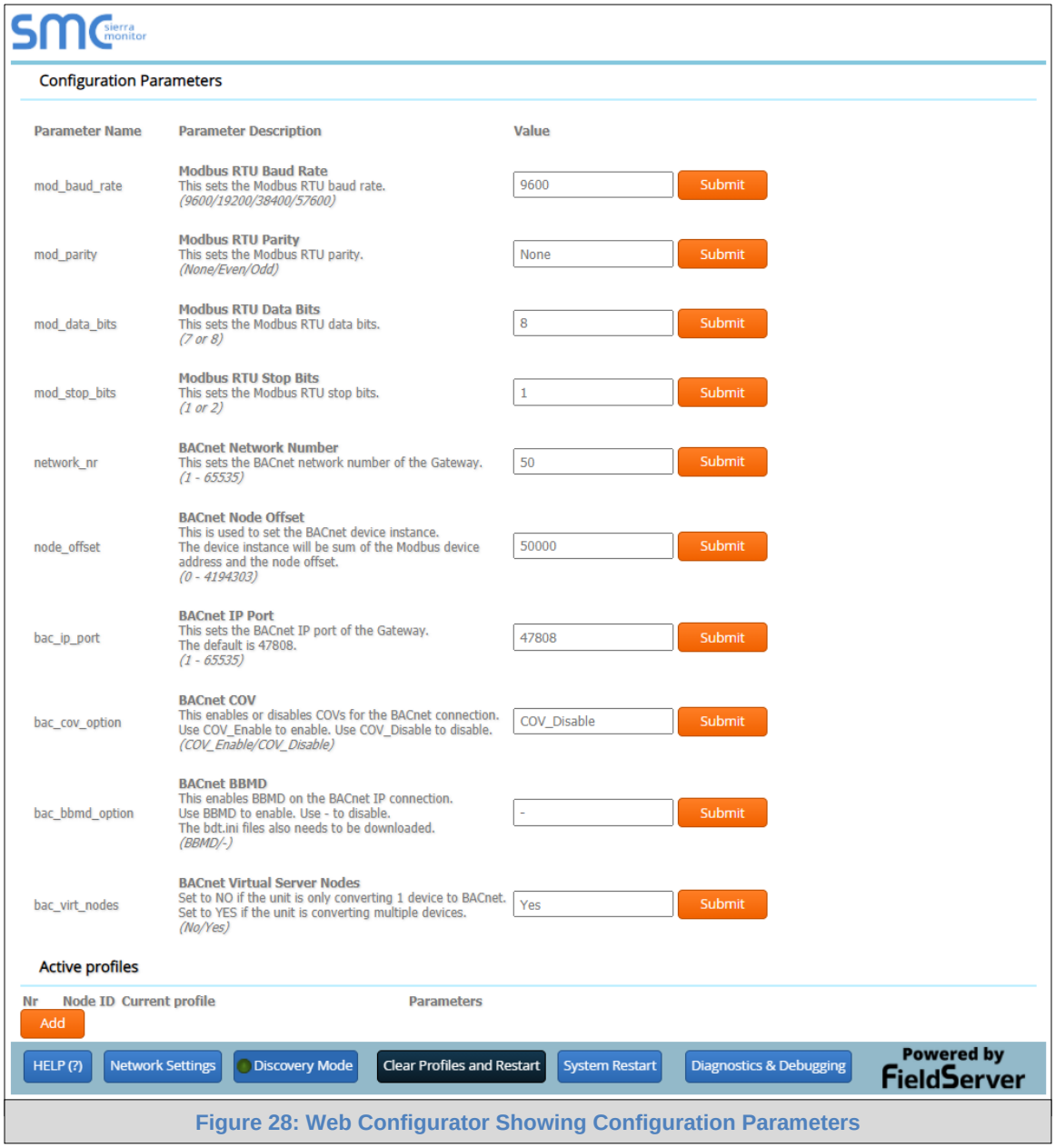


Figure 28: Web Configurator Showing Configuration Parameters

NOTE: Protocol specific parameters are only visible when the associated protocol is enabled.

- Ensure that all parameters are entered for successful operation of the gateway. Find the legal value options for each parameter under the Parameter Description in parentheses.

NOTE: If multiple devices are connected to the ProtoNode, set the BACnet Virtual Server Nodes field to "Yes"; otherwise leave the field on the default "No" setting.

7.2 Use Discovery Mode to Configure Devices Connected to the Gateway

NOTE: If Modbus TCP/IP was selected in Section 3.4.1 for the field/BMS protocol, skip this section. Auto-Discovery is NOT used for Modbus TCP/IP.

NOTE: If Auto-Discovery was performed in Section 4.5.1, skip this section.

- Click the Discovery Mode button at the bottom of the screen.

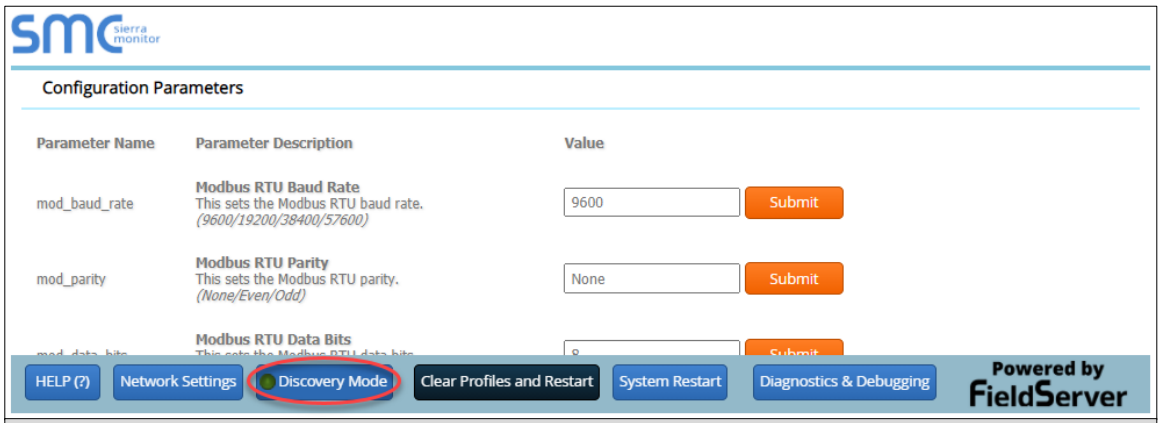


Figure 29: Web Configurator Showing Discovery Mode Button

- Click the OK button in the window that appears to discover devices and restart the device.
- Wait for the ProtoNode to restart and the Discovery in Progress window to disappear.

NOTE: It may take about 3 minutes for all the devices to be discovered and the configuration file to be built.

- If the discovery is successful the desired device profile should appear under the Active profiles title near the bottom of the screen.

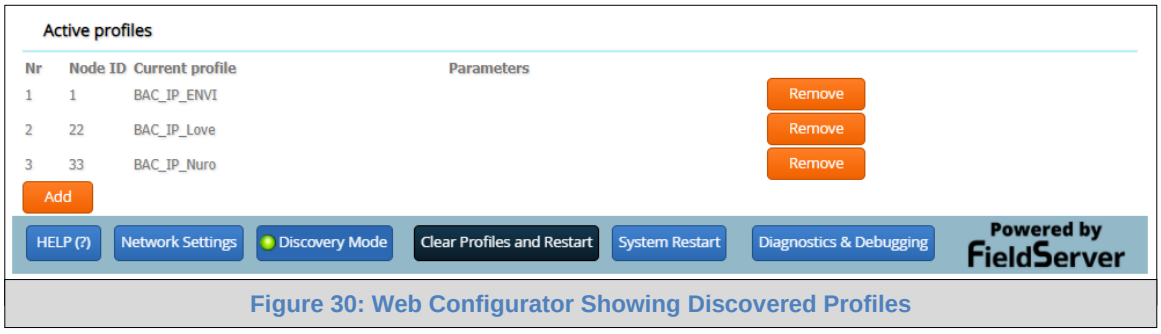


Figure 30: Web Configurator Showing Discovered Profiles

NOTE: Scroll down the page if the Active profiles header is not visible.

7.3 Verify Device Communications

Below the "Active profiles" heading, the profiles for connected devices are listed (**Figure 30**). If no profiles are present, then the wiring, baud rate, and DIP switch settings must be checked, because there is a problem with device communications. All the Active Profiles must show the correct Node-ID's before proceeding.

- **Check that TX and RX LEDs** are rapidly flashing. See **Appendix A.4** for information and images.
- Confirm the software shows communication without errors (**Appendix A.2**).

7.4 Ethernet Network: Setting IP Address for Field Network

- To access the FS-GUI, click on the "Diagnostics & Debugging" button in the bottom right side of the page.

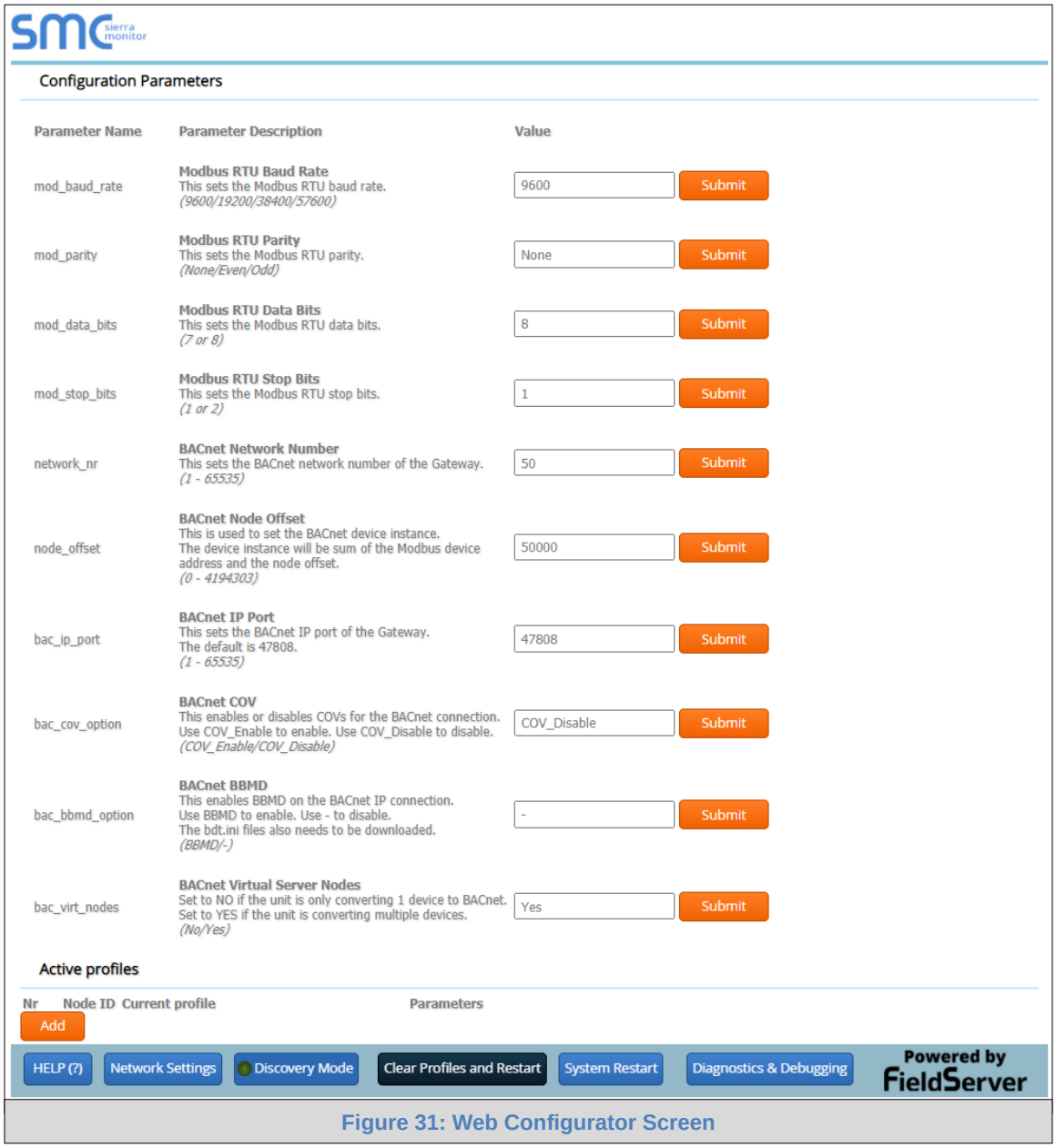


Figure 31: Web Configurator Screen

- From the FS-GUI landing page, click on "Setup" to expand the navigation tree. Then select "Network Settings" to access the IP Settings menu. (Figure 32)

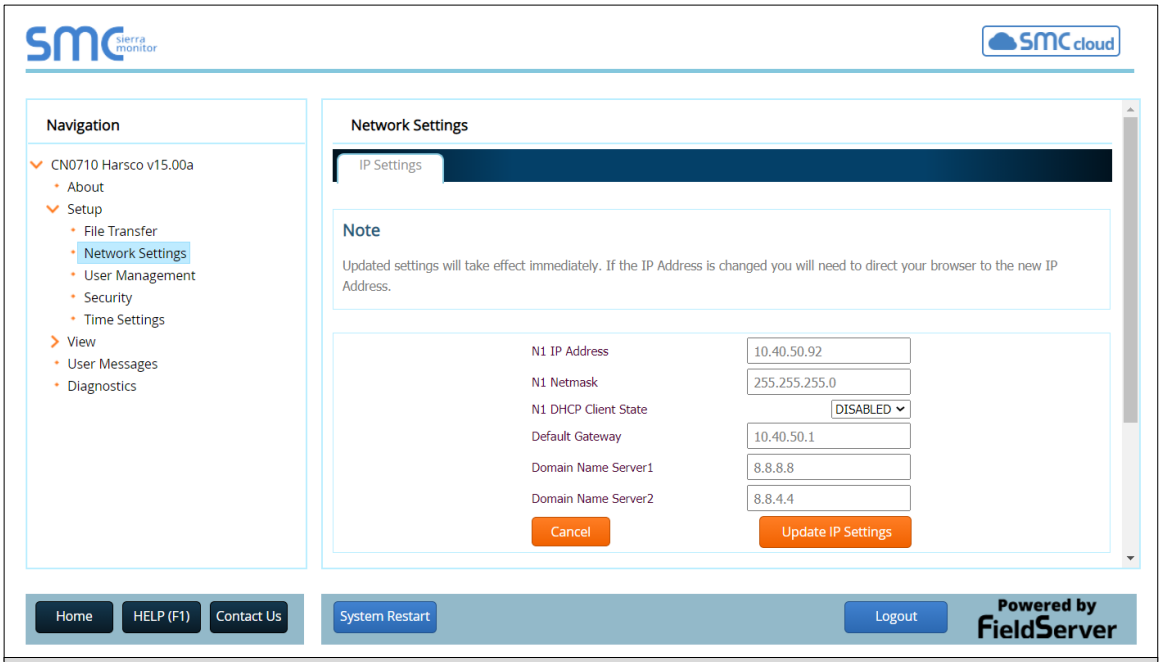


Figure 32: Changing IP Address via FS-GUI

- Modify the IP Address (N1 IP Address field) of the ProtoNode Ethernet port.
- If necessary, change the Netmask (N1 Netmask field).
- If necessary, change the IP Gateway (Default Gateway field).

NOTE: If the ProtoNode is connected to a managed switch/router, the IP Gateway of the ProtoNode should be set to the IP Address of that managed switch/router.

- Click the "System Restart" button at the bottom of the page to apply changes and restart the ProtoNode.
- Unplug Ethernet cable from PC and connect it to the network switch or router.
- Record the IP Address assigned to the ProtoCessor for future reference.

NOTE: The SMC Cloud button (see Figure 32) allows users to connect to the SMC Cloud, MSA Safety's device cloud solution for IIoT. The SMC Cloud enables secure remote connection to field devices through a FieldServer and its local applications for configuration, management, maintenance. For more information about the SMC Cloud, refer to the SMC Cloud Start-up Guide.

7.5 BACnet: Setting Node_Offset to Assign Specific Device Instances

- Follow the steps outlined in **Section 5.1** to access the ProtoNode Web Configurator.
- Node_Offset field shows the current value (default = 50,000).
  - The values allowed for a BACnet Device Instance can range from 1 to 4,194,303.
- To assign a specific Device Instance (or range); change the Node_Offset value as needed using the calculation below:

  Device Instance (desired) = Node_Offset + Node_ID

  For example, if the desired Device Instance for the device 1 is 50,001 and the following is true:
  - Device 1 has a Node-ID of 1
  - Device 2 has a Node-ID of 22
  - Device 3 has a Node-ID of 33

  Then plug the device 1's information into the formula to find the desired Node_Offset:

  50,001 = Node_Offset + 1

  ➢ **50,000 = Node_Offset**

  Once the Node_Offset value is input, it will be applied as shown below:
  - Device 1 Instance = 50,000 + Node_ID = 50,000 + 1 = 50,001
  - Device 2 Instance = 50,000 + Node_ID = 50,000 + 22 = 50,022
  - Device 3 Instance = 50,000 + Node_ID = 50,000 + 33 = 50,033
- Click "Submit" once the desired value is entered.

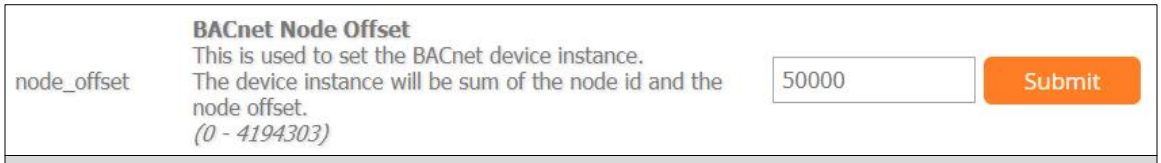


Figure 33: Web Configurator Node Offset Field

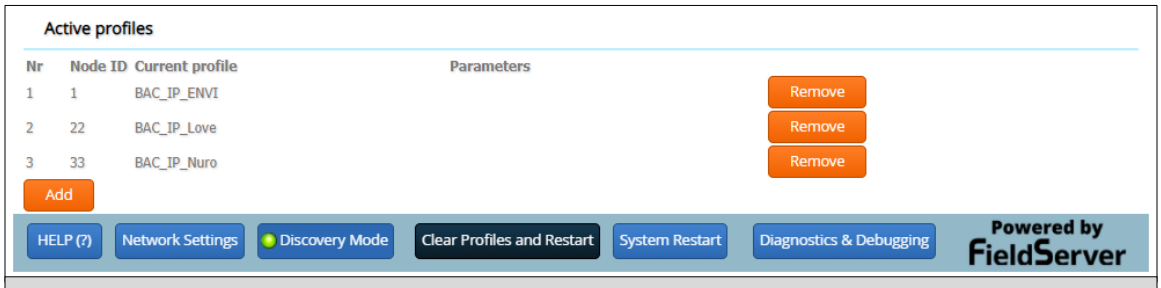


Figure 34: Active Profiles

7.6 How to Start the Installation Over: Clearing Profiles

- Follow the steps outlined in **Section 5.1** to access the ProtoNode Web Configurator.
- At the bottom-left of the page, click the “Clear Profiles and Restart” button.
- Once restart is complete, all past profiles discovered and/or added via Web Configurator are deleted. The unit can now be reinstalled.

8 LONWORKS (FPC-N35): COMMISSIONING PROTONODE ON A LONWORKS NETWORK

Commissioning may only be performed by the LonWorks administrator.

8.1 Commissioning ProtoNode FPC-N35 on a LonWorks Network

During the commissioning process, the LonWorks Administrator may prompt the User to hit the Service Pin on the ProtoNode FPC-N35 at a specific point (this step occurs at different points of the commissioning process for each LonWorks Network Management Tool).

- If an XIF file is required, see steps in **Section** 8.1.1 to generate XIF.

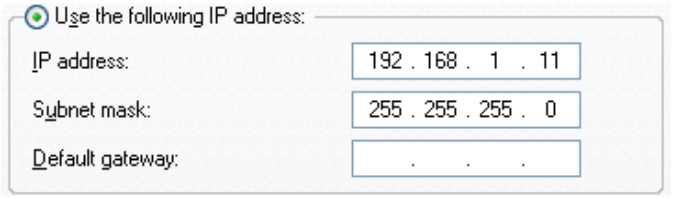
Figure 35: LonWorks Service Pin Location

8.1.1 Instructions to Upload XIF File from ProtoNode FPC-N35 Using Browser

- Connect a Cat-5 Ethernet cable (straight through or cross-over) between the PC and ProtoNode.
- The default IP Address for the ProtoNode is **192.168.1.24**, Subnet Mask is **255.255.255.0**. If the PC and ProtoNode are on different IP networks, assign a static IP Address to the PC on the 192.168.1.xxx network.

For Windows 10:

- Find the search field in the local computer's taskbar (usually to the right of the windows icon) and type in "Control Panel".
- Click "Control Panel", click "Network and Internet" and then click "Network and Sharing Center".
- Click "Change adapter settings" on the left side of the window.
- Right-click on "Local Area Connection" and select "Properties" from the dropdown menu.
- Highlight Internet Protocol Version 4 (TCP/IPv4) and then click the Properties button.
- Select and enter a static IP Address on the same subnet. For example:



- Click the Okay button to close the Internet Protocol window and the Close button to close the Ethernet Properties window.

- Open a web browser and go to the following address: [IP Address of ProtoNode]/fserver.xif.
  - Example: 192.168.1.24/fserver.xif
- If the web browser prompts to save the file, save the file onto the PC. If the web browser displays the xif file as a web page, save the file onto the local PC as “fserver.xif”.

```
File: fserver.xif generated by LonDriver Revision 1.30(d), XIF Version 4.0
Copyright (c) 2000-2012 by FieldServer Technologies
All Rights Reserved.  Run on Thu Jan  1 00:00:00 1970

90:00:95:47:1E:02:04:7C
2 15 1 4 0 14 11 3 3 12 14 11 11 11 11 3 0 16 63 0 1 11 4
32 5 19 13 28 0 0 15 5 3 109 63
1 7 1 0 4 4 4 15 200 0
78125 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 5 8 5 12 14 15
*
"FFP-Lon Demo

VAR nviAnalog_01 0 0 0 0
0 1 63 0 0 0 0 0 0 0 0 0 0
*
51 * 1
4 0 4 0 0
VAR nvoAnalog_01 1 0 0 0
0 1 63 1 0 0 0 0 0 0 0 0 0
*
51 * 1
4 0 4 0 0
VAR nviBinary_01 2 0 0 0
0 1 63 0 0 0 0 0 0 0 0 0 0
*
95 * 2
1 0 0 0 0
1 0 0 1 0
VAR nvoBinary_01 3 0 0 0
0 1 63 1 0 0 0 0 0 0 0 0 0
*
95 * 2
1 0 0 0 0
1 0 0 1 0
```

Figure 36: Sample of Fserver.XIF File Generated

Appendix A. Troubleshooting

Appendix A.1. Lost or Incorrect IP Address

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor website's Software Downloads.
- Extract the executable file and complete the installation.

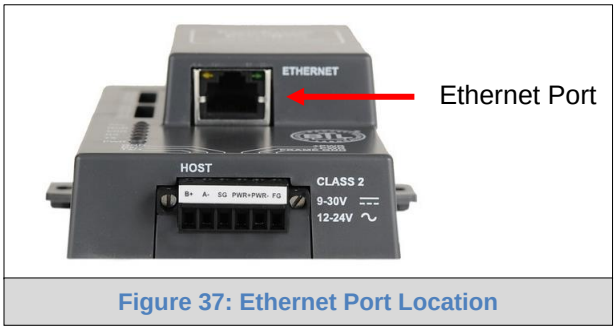
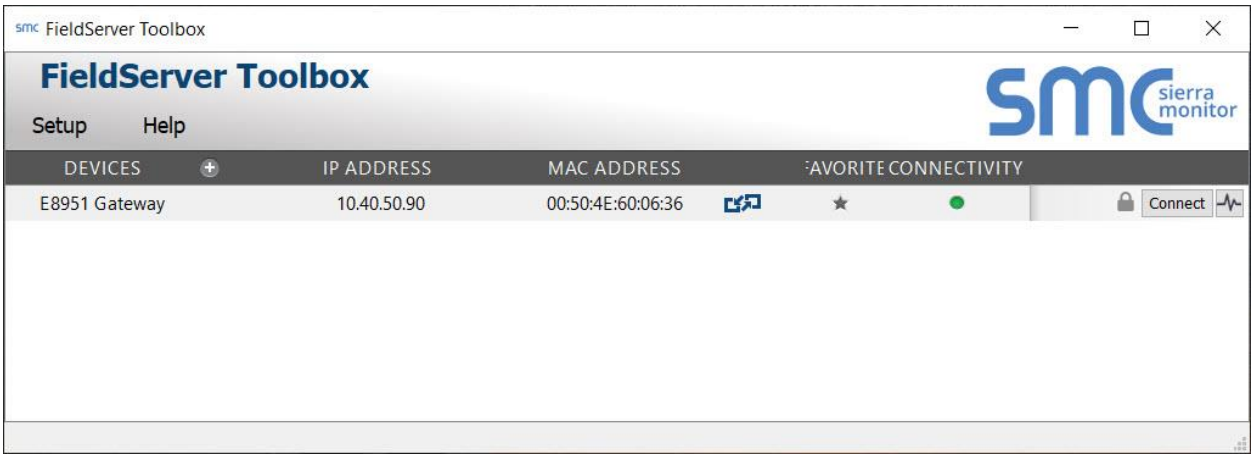


Figure 37: Ethernet Port Location

- Connect a standard Cat-5 Ethernet cable between the user's PC and ProtoNode.
- Double click on the FS Toolbox Utility and click Discover Now on the splash page.
- Check for the IP Address of the desired gateway.



- If correcting the IP Address of the gateway: click the settings icon on the same row as the gateway, then click Network Settings, change the IP Address and click Update IP Settings to save.

Appendix A.2. Viewing Diagnostic Information

- Type the IP Address of the ProtoNode into the web browser or use the FieldServer Toolbox to connect to the ProtoNode.
- Click on Diagnostics and Debugging Button, then click on view, and then on connections.
- If there are any errors showing on the Connection page, refer to **Appendix A.3** for the relevant wiring and settings.

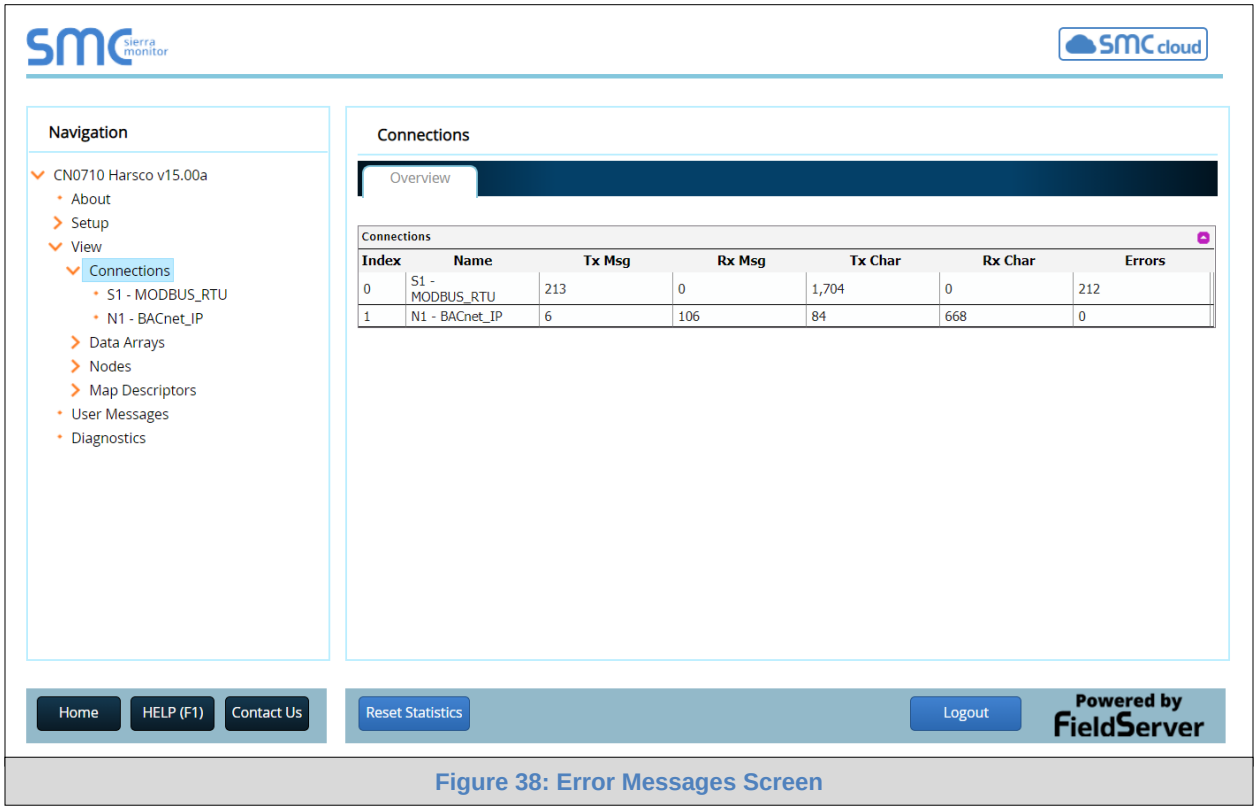


Figure 38: Error Messages Screen

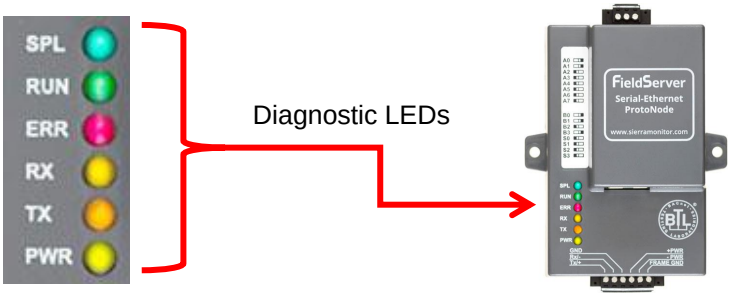
Appendix A.3. Checking Wiring and Settings

- No COMS on Modbus RTU side. If Tx/Rx are not flashing rapidly then there is a COM issue on the Modbus side. To fix this problem, check the following:
  - Visual observations of LEDs on ProtoNode (**Appendix A.4**)
  - Check baud rate, parity, data bits, stop bits
  - Check Modbus device address
  - Verify wiring
  - Verify the Modbus device was discovered in Web Configurator (**Section 7.2**)
- Field COM problems:
  - If Ethernet protocols are used, observe Ethernet LEDs on the ProtoNode (**Appendix A.4**)
  - Check DIP switch settings (using correct baud rate and device instance)
  - Verify IP Address setting
  - Verify wiring

NOTE: If the problem still exists, a Diagnostic Capture needs to be taken and sent to technical support. (Appendix A.5)

Appendix A.4. LED Diagnostics for Communications Between ProtoNode and Devices

See the diagram below for ProtoNode FPC-N34 and FPC-N35 LED Locations.



Tag	Description
SPL	The SPL LED will light if the unit is not getting a response from one or more of the configured devices. **For LonWorks units**, LED will light until the unit is commissioned on the LonWorks network.
RUN	The RUN LED will start flashing 20 seconds after power indicating normal operation.
ERR	A steady red light will indicate there is a system error on the unit. If this occurs, immediately report the related "system error" shown in the error screen of the FS-GUI interface to support for evaluation.
RX	The RX LED will flash when a message is received on the serial port on the 6-pin connector. **If the serial port is not used,** this LED is non-operational.
TX	The TX LED will flash when a message is sent on the serial port on the 6-pin connector. **If the serial port is not used,** this LED is non-operational.
PWR	The power light should always show steady green when connected to a functioning power source.

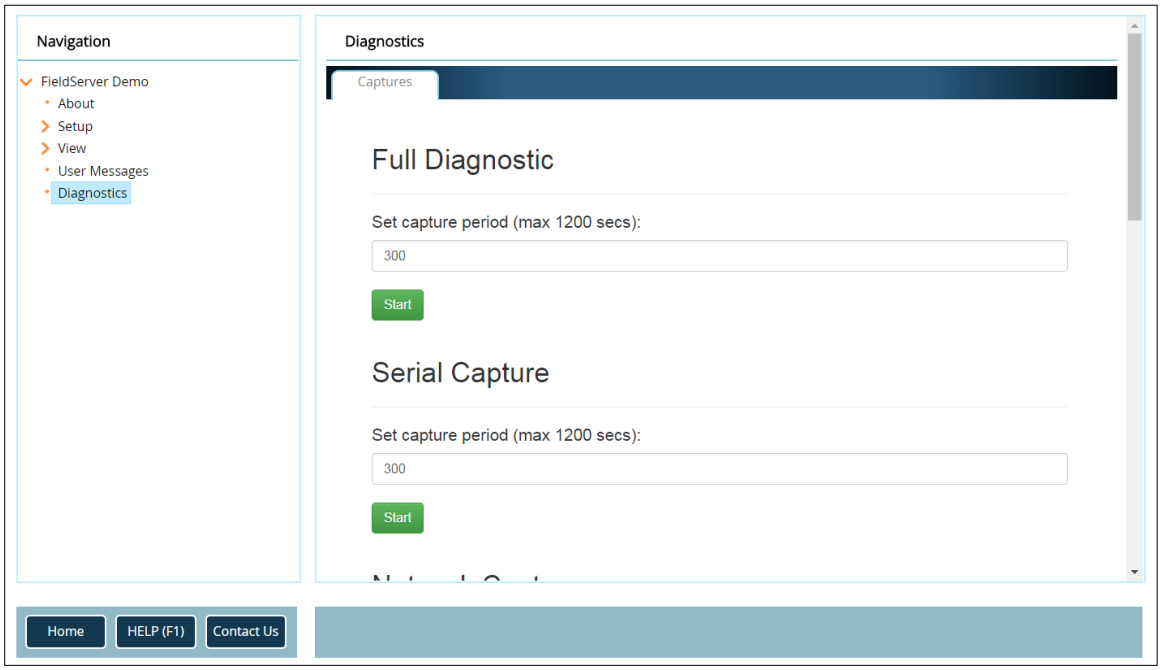
Figure 39: Diagnostic LEDs

Appendix A.5. Take a FieldServer Diagnostic Capture

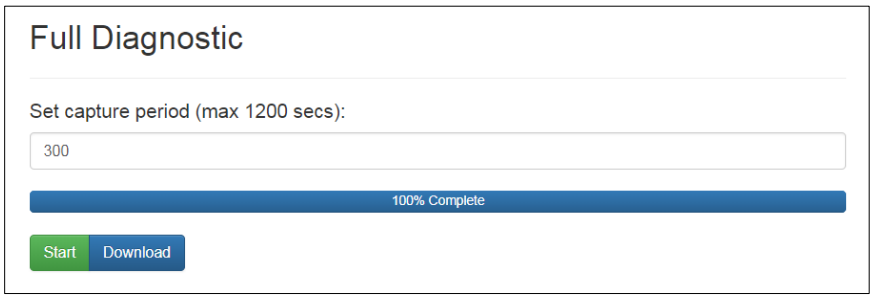
When there is a problem on-site that cannot easily be resolved, perform a Diagnostic Capture before contacting support. Once the Diagnostic Capture is complete, email it to technical support. The Diagnostic Capture will accelerate diagnosis of the problem.

If the FieldServer bios is updated/released on November 2017 or later then the Diagnostic Capture is performed via the gateway's on-board system.

- Access the FieldServer Diagnostics page via one of the following methods:
  - Open the FieldServer FS-GUI page and click on Diagnostics in the Navigation panel
  - Open the FieldServer Toolbox software and click the diagnose icon  of the desired device



- Go to Full Diagnostic and select the capture period.
- Click the Start button under the Full Diagnostic heading to start the capture.
  - When the capture period is finished, a Download button will appear next to the Start button



- Click Download for the capture to be downloaded to the local PC.
- Send the diagnostic zip file to technical support.

NOTE: Diagnostic captures of BACnet MS/TP communication are output in a ".PCAP" file extension which is compatible with Wireshark.

Appendix A.5.1. Taking a Capture with Older Firmware

If the FieldServer firmware is from before November 2017, the Diagnostic Capture can be done by downloading the FieldServer Toolbox software but network connections (such as Ethernet and Wi-Fi) cannot be captured (if a network diagnostic is needed take a Wire Shark capture).

Once the Diagnostic Capture is complete, email it to technical support. The Diagnostic Capture will accelerate diagnosis of the problem.

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor website's Software Downloads.
- Extract the executable file and complete the installation.

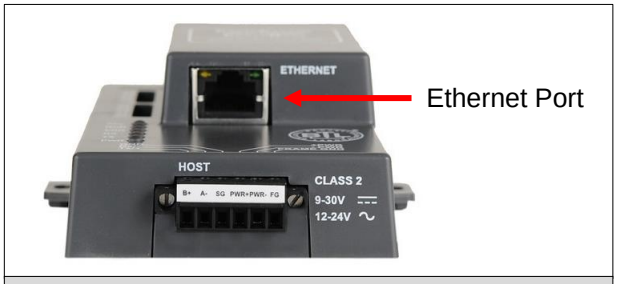
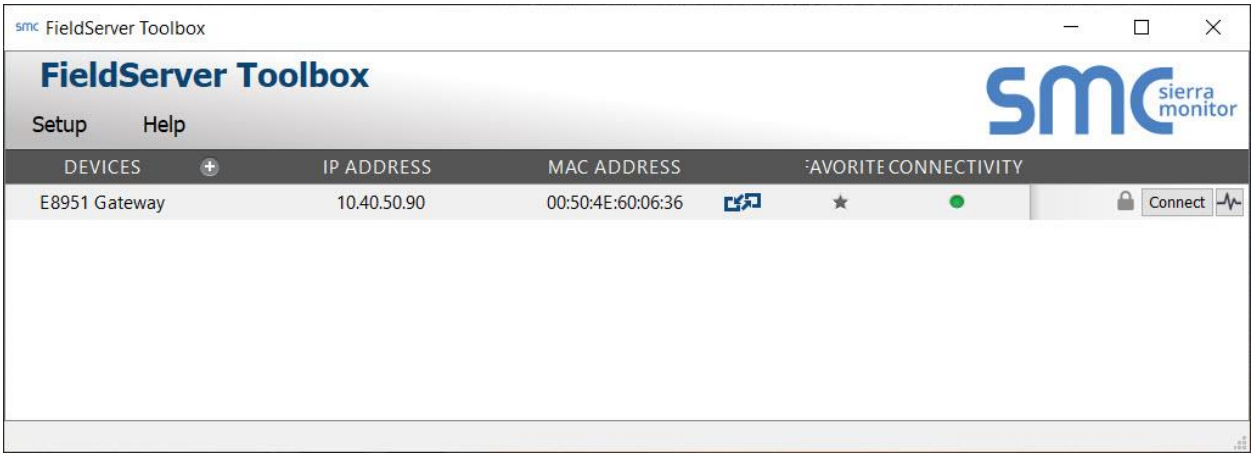


Figure 40: Ethernet Port Location

- Connect a standard Cat-5 Ethernet cable between the PC and ProtoNode.
- Double click on the FS Toolbox Utility.
- **Step 1:** Take a Log
  - Click on the diagnose icon for the desired device



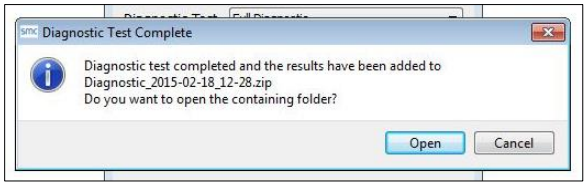
- Select “Full Diagnostic" from the drop down menu

NOTE: If desired, the default capture period can be changed.

- Click on the Start Diagnostic button

- Wait for the capture period to finish and the Diagnostic Test Complete window will appear

- **Step 2**: Send Log
  - Once the diagnostic test is complete, a .zip file is saved on the PC



  - Choose “Open” to launch explorer and have it point directly at the correct folder
  - Send the Diagnostic zip file to technical support

Appendix B. Additional Information

Appendix B.1. Updating Firmware

To load a new version of the firmware, follow these instructions:

1. Extract and save the new file onto the local PC.
2. Open a web browser and type the IP Address of the FieldServer in the address bar.
   - Default IP Address is 192.168.1.24
   - Use the FS Toolbox utility if the IP Address is unknown (**Appendix A.1**)
3. Click on the “Diagnostics & Debugging” button.
4. In the Navigation Tree on the left hand side, do the following:
   a. Click on “Setup”
   b. Click on “File Transfer”
   c. Click on the “General” tab
5. In the General tab, click on “Choose Files” and select the web.img file extracted in step 1.
6. Click on the orange “Submit” button.
7. When the download is complete, click on the “System Restart” button.

Appendix B.2. BACnet: Setting Network_Number for More Than One ProtoNode on the Subnet

For both BACnet MS/TP and BACnet/IP, if more than one ProtoNode is connected to the same subnet, they must be assigned unique Network_Number values.

On the main Web Configuration screen, update the BACnet Network Number field and click submit. The default value is 50.

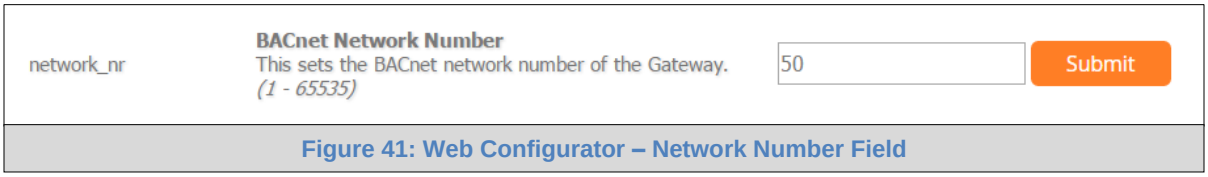


Figure 41: Web Configurator – Network Number Field

Appendix B.3. Internet Browser Software Support

The following web browsers are supported:

- Chrome Rev. 57 and higher
- Firefox Rev. 35 and higher
- Microsoft Edge Rev. 41 and higher
- Safari Rev. 3 and higher

NOTE: Internet Explorer is no longer supported as recommended by Microsoft.

NOTE: Computer and network firewalls must be opened for Port 80 to allow FieldServer GUI to function.

Appendix B.4. Change Web Server Security Settings After Initial Setup

NOTE: Any changes will require a FieldServer reboot to take effect.

- From the FS-GUI page, click Setup in the Navigation panel.

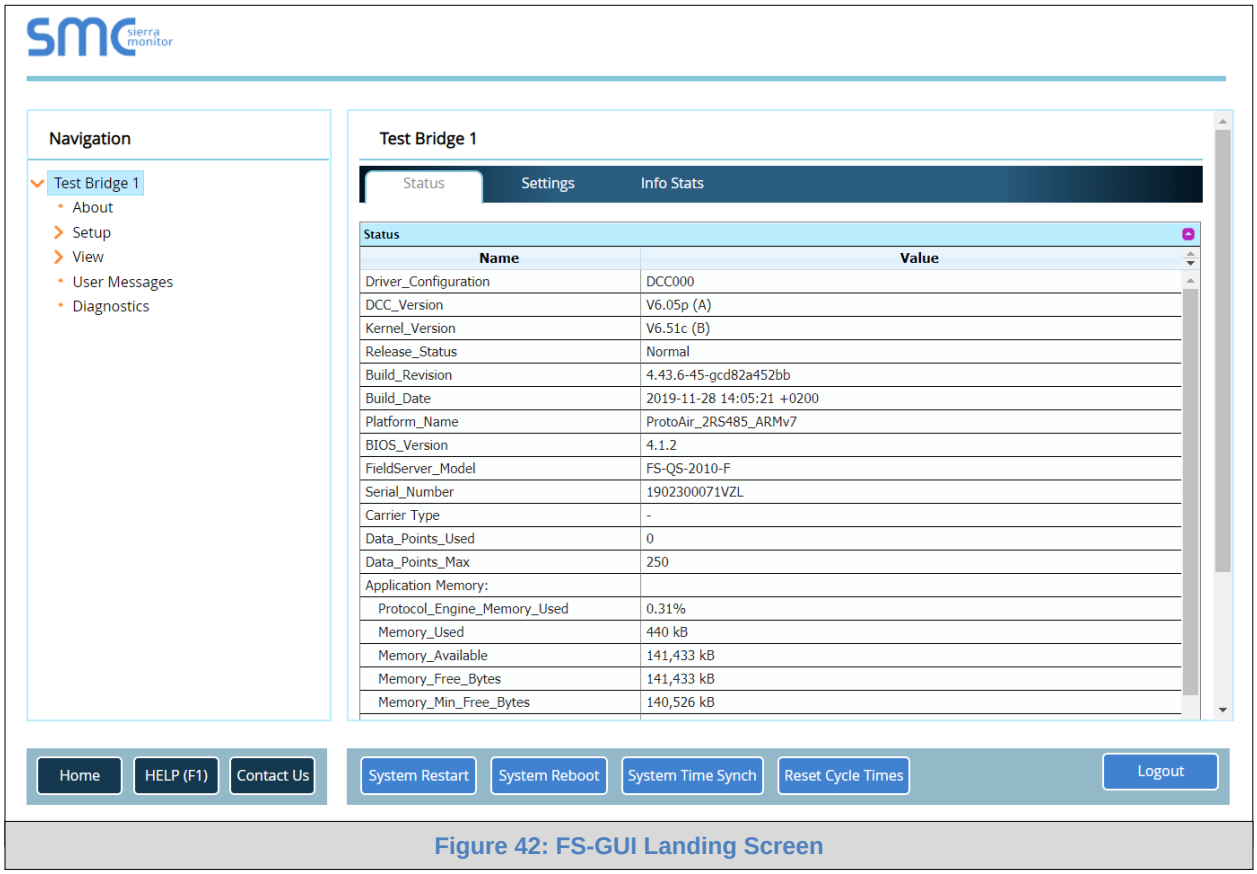


Figure 42: FS-GUI Landing Screen

Appendix B.4.1. Change Security Mode

- Click Security in the Navigation panel.

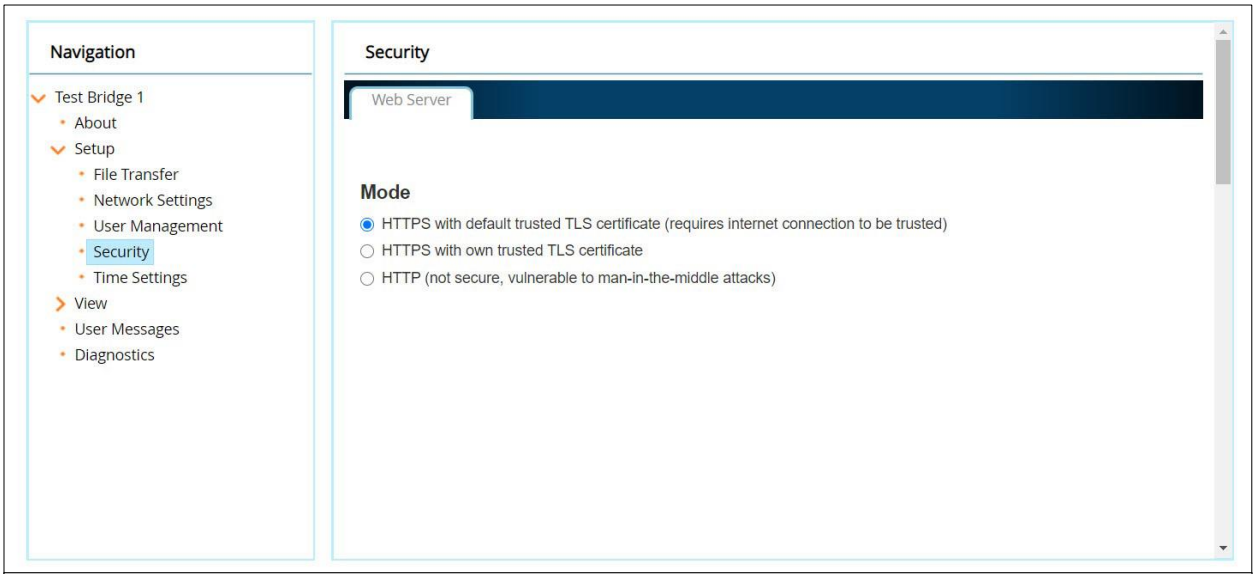


Figure 43: FS-GUI Security Setup

- Click the Mode desired.
  - If HTTPS with own trusted TLS certificate is selected, follow instructions in **Section** 6.2.1
- Click the Save button.

Appendix B.4.2. Edit the Certificate Loaded onto the FieldServer

NOTE: A loaded certificate will only be available if the security mode was previously setup as HTTPS with own trusted TLS certificate.

- Click Security in the Navigation panel.

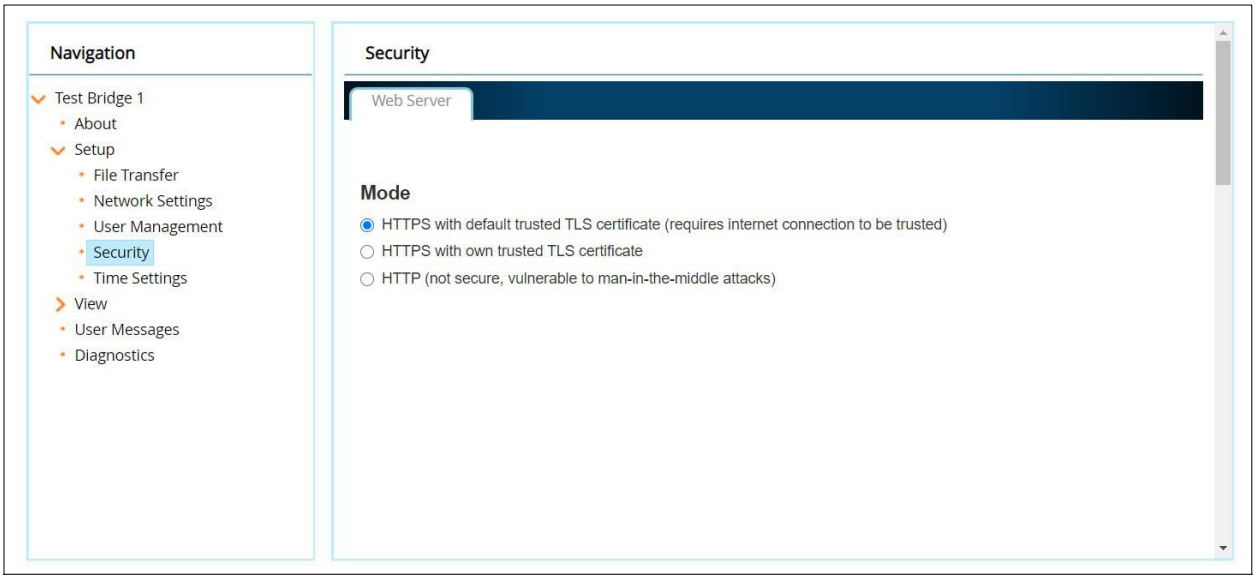


Figure 44: FS-GUI Security Setup – Certificate Loaded

- Click the Edit Certificate button to open the certificate and key fields.
- Edit the loaded certificate or key text as needed.
- Click Save.

Appendix B.5. Change User Management Settings

- From the FS-GUI page, click Setup in the Navigation panel.
- Click User Management in the navigation panel.

NOTE: If the passwords are lost, the unit can be reset to factory settings to reinstate the default unique password on the label. For ProtoNode, ProtoCessor or ProtoCarrier recovery instructions, see the FieldServer Recovery Instructions document. For ProtoNode FPC-N54 or ProtoAir recovery instructions, see the FieldServer Next Gen Recovery document. If the default unique password is lost, then the unit must be mailed back to the factory.

NOTE: Any changes will require a FieldServer reboot to take effect.

Appendix B.5.1. User Management

- Check that the Users tab is selected.

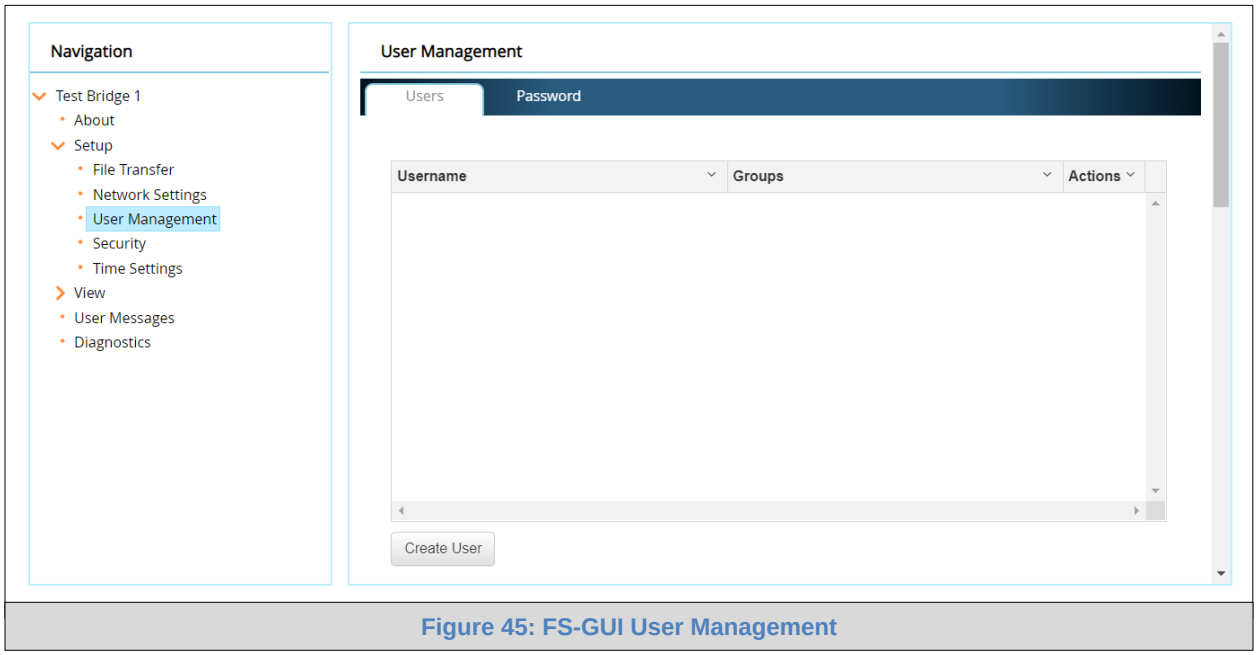


Figure 45: FS-GUI User Management

User Types:

Admin – Can modify and view any settings on the FieldServer.

Operator – Can modify and view any data in the FieldServer array(s).

Viewer – Can only view settings/readings on the FieldServer.

Appendix B.5.1.1. Create Users

- Click the Create User button.

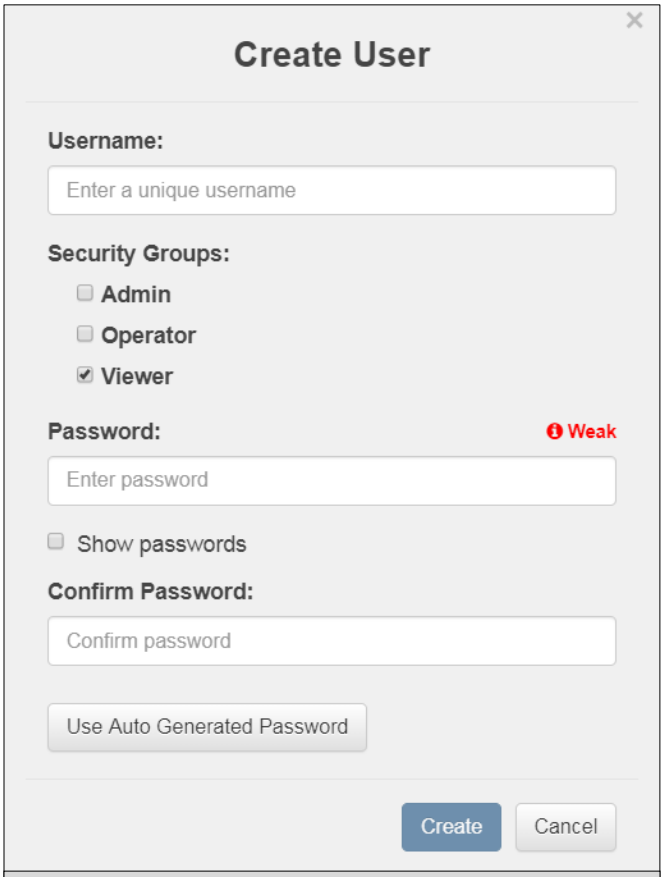


Figure 46: Create User Window

- Enter the new User fields: Name, Security Group and Password.
  - **User details are hashed and salted**

NOTE: The password must meet the minimum complexity requirements. An algorithm automatically checks the password entered and notes the level of strength on the top right of the Password text field.

- Click the Create button.
- Once the Success message appears, click OK.

Appendix B.5.1.2. Edit Users

- Click the pencil icon next to the desired user to open the User Edit window.

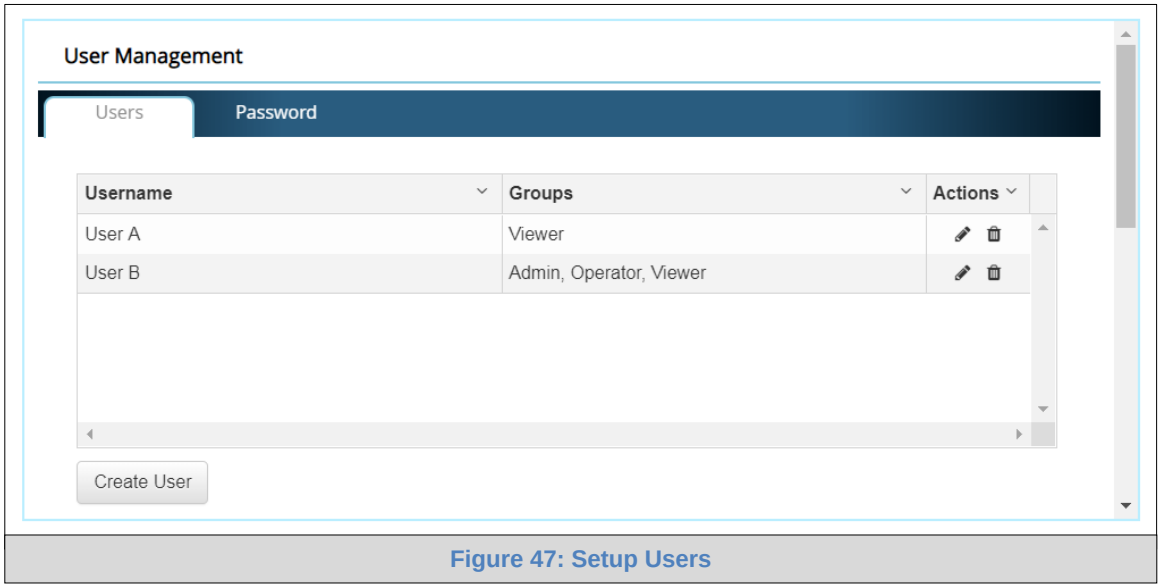


Figure 47: Setup Users

- Once the User Edit window opens, change the User Security Group and Password as needed.

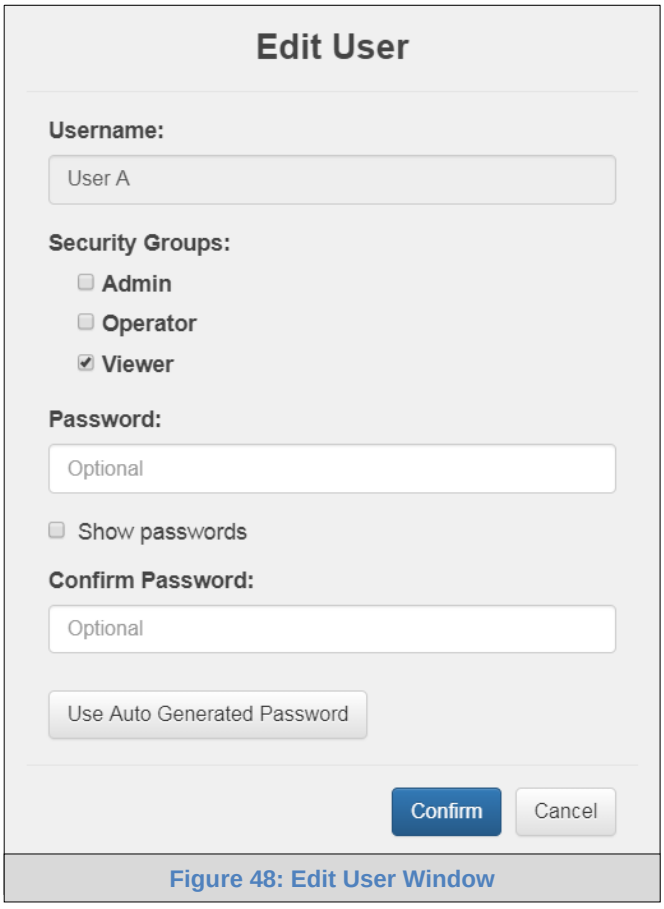


Figure 48: Edit User Window

- Click Confirm.
- Once the Success message appears, click OK.

Appendix B.5.1.3. Delete Users

- Click the trash can icon next to the desired user to delete the entry.

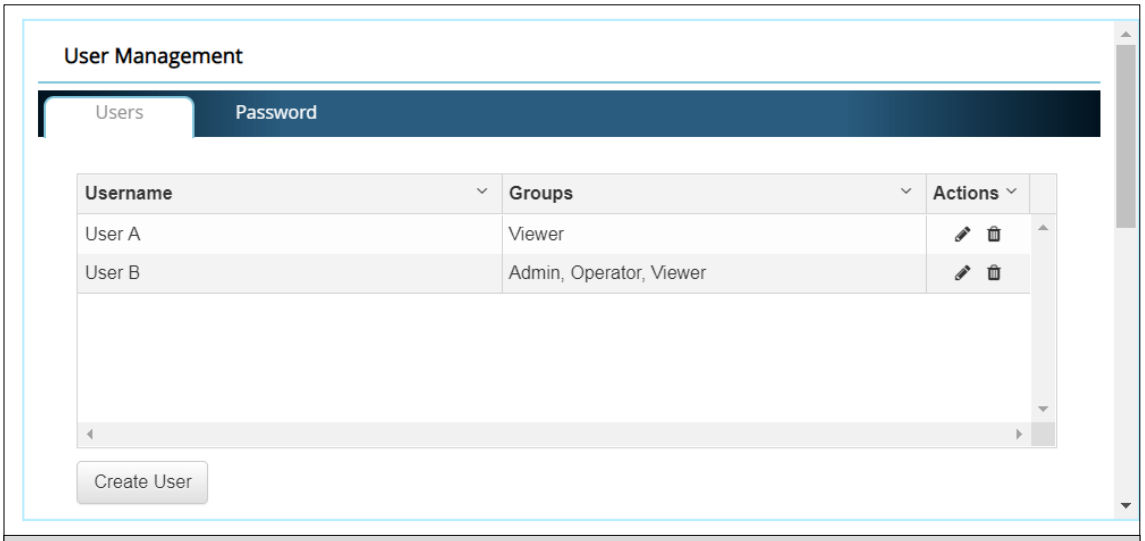


Figure 49: Setup Users

- When the warning message appears, click Confirm.

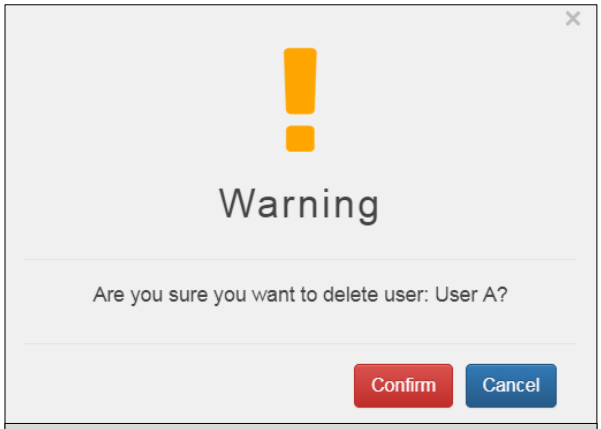


Figure 50: User Delete Warning

Appendix B.5.2. Change FieldServer Password

- Click the Password tab.

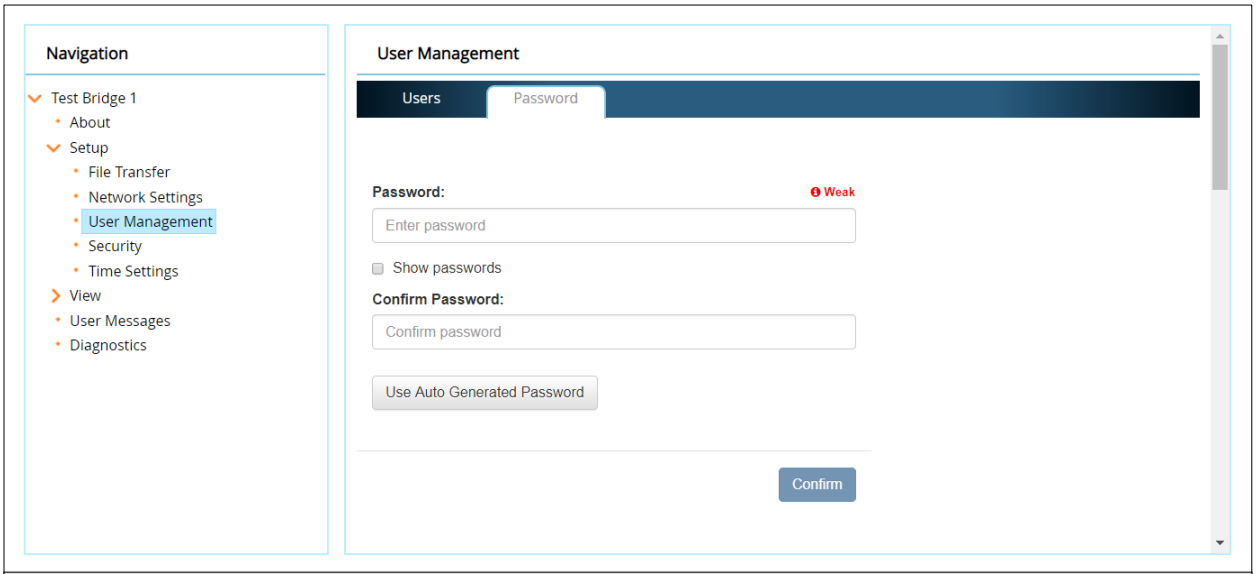


Figure 51: FieldServer Password Update via FS-GUI

- Change the general login password for the FieldServer as needed.

NOTE: The password must meet the minimum complexity requirements. An algorithm automatically checks the password entered and notes the level of strength on the top right of the Password text field.

NOTE: If a gateway in the field is updated to a secure gateway, the password will change to "admin". This change will still occur if the gateway was already setup with a unique password that was loaded in the factory and printed on the label.

Appendix C. Vendor Information – Patterson-Kelley

NOTE: All Modbus TCP/IP registers are the same as the Modbus RTU registers for the serial device. If this point list is needed, contact technical support. The Modbus TCP/IP node address of the device is also the same as the Modbus RTU node address.

Appendix C.1. ENVI Modbus RTU Mappings to BACnet, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Address	LonWorks Name	LonWorks SNVT	Data Array Name	Offset
State	AI	1	AI	1	nvoState_XXX	SNVT_count_inc_f	DA_Byt_XXX	0
Supply Temp	AI	2	AI	2	nvoSupplyTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	1
Return Temp	AI	3	AI	3	nvoReturnTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	2
DHW Temp	AI	4	AI	4	nvoDHWTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	3
Header Temp	AI	5	AI	5	nvoHeaderTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	4
Firing Rate	AI	6	AI	6	nvoFiringRat_XXX	SNVT_lev_percent	DA_Byt_XXX	5
Flue Gas Temp	AI	7	AI	7	nvoFluGasTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	6
HX Temp	AI	8	AI	8	nvoHXTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	7
Outside Temp	AI	9	AI	9	nvoOutsidTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	8
Flame Signal	AI	10	AI	10	nvoFlameSig_XXX	SNVT_count_inc_f	DA_Byt_XXX	9
CH Setpoint	AV	11	AO	11	nvi/nvoCHSP_XXX	SNVT_count_inc_f	DA_Byt_XXX	10
DHW Setpoint	AV	12	AO	12	nvi/nvoDHWSP_XXX	SNVT_count_inc_f	DA_Byt_XXX	11
Boiler Operation	AV	13	AO	13	nvi/nvoBlrOpera_XXX	SNVT_count_inc_f	DA_Byt_XXX	12
High Outdoor Air Temp	AV	14	AO	14	nvi/nvoHiOATmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	13
Min Outdoor Air Setpoint	AV	15	AO	15	nvi/nvoMinOASP_XXX	SNVT_count_inc_f	DA_Byt_XXX	14
Low Outdoor Air Temp	AV	16	AO	16	nvi/nvoLoOATmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	15
Max Outdoor Air Setpoint	AV	17	AO	17	nvi/nvoMaxOASP_XXX	SNVT_count_inc_f	DA_Byt_XXX	16
Outdoor Air Shutdown Temp	AV	18	AO	18	nvi/nvoOAShtdnTp_XXX	SNVT_count_inc_f	DA_Byt_XXX	17
Night Setback	AV	19	AO	19	nvi/nvoNightStbk_XXX	SNVT_count_inc_f	DA_Byt_XXX	18
Error Code	AI	20	AI	20	nvoErrorCode_XXX	SNVT_count_inc_f	DA_Byt_XXX	19
Analog In	AI	21	AI	21	nvoAnalogIn_XXX	SNVT_volt	DA_Byt_XXX	20
Analog Out	AI	22	AI	22	nvoAnalogOut_XXX	SNVT_volt	DA_Byt_XXX	21
Ignitions	AI	23	AI	23	nvoIgnitions_XXX	SNVT_count_inc_f	DA_U16_XXX	11
Burner High Hours	AI	24	AI	24	nvoBrnrHiHrs_XXX	SNVT_time_hour	DA_U16_XXX	12
Burner Medium Hours	AI	25	AI	25	nvoBrnrMdHrs_XXX	SNVT_time_hour	DA_U16_XXX	13
Burner Low Hours	AI	26	AI	26	nvoBrnrLoHrs_XXX	SNVT_time_hour	DA_U16_XXX	14
Water Level	BI	27	DI	27	nvoWaterLvl_XXX	SNVT_switch	DA_Bit_XXX	0
Low Gas Pressure	BI	28	DI	28	nvoLoGasPrs_XXX	SNVT_switch	DA_Bit_XXX	1
Air Pressure	BI	29	DI	29	nvoAirPrs_XXX	SNVT_switch	DA_Bit_XXX	2
Blocked Flue	BI	30	DI	30	nvoBlckdFlue_XXX	SNVT_switch	DA_Bit_XXX	3
CH Pump	BI	31	DI	31	nvoCHPump_XXX	SNVT_switch	DA_Bit_XXX	4
DHW Pump	BI	32	DI	32	nvoDHWPump_XXX	SNVT_switch	DA_Bit_XXX	5
Air Damper	BI	33	DI	33	nvoAirDamper_XXX	SNVT_switch	DA_Bit_XXX	6
High Gas Pressure	BI	34	DI	34	nvoHiGasPrs_XXX	SNVT_switch	DA_Bit_XXX	7
ET Error Number	AI	35	AI	35	nvoETErrNum_XXX	SNVT_count_inc_f	DA_Byt_XXX	23
ET Supply Temp	AI	36	AI	36	nvoETSupTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	24
ET Return Temp	AI	37	AI	37	nvoETRetTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	25
ET DHW Temp	AI	38	AI	38	nvoETDHWTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	26
ET Flue Gas Temp	AI	39	AI	39	nvoETFluGsTp_XXX	SNVT_count_inc_f	DA_Byt_XXX	27
ET HX Temp	AI	40	AI	40	nvoETHXTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	28
ET Outside Temp	AI	41	AI	41	nvoETOtsdTmp_XXX	SNVT_count_inc_f	DA_Byt_XXX	29
Boiler State	AI	42	AI	42	nvoBlrState_XXX	SNVT_count_inc_f	DA_Byt_XXX	38
Frost Protection	BI	43	DI	43	nvoFrstPrtct_XXX	SNVT_switch	DA_Bit_XXX	8
DHW Mode	BI	44	DI	44	nvoDHWMode_XXX	SNVT_switch	DA_Bit_XXX	9
CH Mode	BI	45	DI	45	nvoCHMode_XXX	SNVT_switch	DA_Bit_XXX	10
ET Month	AI	46	AI	46	nvoETMonth_XXX	SNVT_count_inc_f	DA_Byt_XXX	31
ET Day	AI	47	AI	47	nvoETDay_XXX	SNVT_count_inc_f	DA_Byt_XXX	32
ET Year	AI	48	AI	48	nvoETYear_XXX	SNVT_count_inc_f	DA_Byt_XXX	33
ET Hours	AI	49	AI	49	nvoETHrs_XXX	SNVT_count_inc_f	DA_Byt_XXX	34
ET Minutes	AI	50	AI	50	nvoETMinutes_XXX	SNVT_count_inc_f	DA_Byt_XXX	35
ET Day Count High	AI	51	AI	51	nvoETDyCntHi_XXX	SNVT_count_inc_f	DA_Byt_XXX	36
ET Day Count Low	AI	52	AI	52	nvoETDyCntLo_XXX	SNVT_count_inc_f	DA_Byt_XXX	37

ET Run Hours	AI	53	AI	53	nvoETRunHrs_XXX	SNVT_time_hour	DA_U16_XXX	23

Appendix C.2. Love Modbus RTU Mappings to BACnet, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Address	LonWorks Name	LonWorks SNVT	Data Array Name	Offset
Process Value	AI	1	AI	1	nvoProcVal_XXX	SNVT_count_inc_f	DA_U16_XXX	0
Setpoint	AV	2	AO	2	nvi/nvoSetpoint_XXX	SNVT_count_inc_f	DA_U16_XXX	1
Upper-Limit of Temp Range	AI	3	AI	3	nvoUpLmTpRng_XXX	SNVT_count_inc_f	DA_U16_XXX	2
Lower-Limit of Temp Range	AI	4	AI	4	nvoLoLmTpRng_XXX	SNVT_count_inc_f	DA_U16_XXX	3
Control Method	AV	5	AO	5	nvi/nvoCtrlMethd_XXX	SNVT_count_inc_f	DA_U16_XXX	4
PB Proportional Band	AV	6	AO	6	nvi/nvoPB_PrpBnd_XXX	SNVT_count_inc_f	DA_U16_XXX	5
Ti Integral Time	AV	7	AO	7	nvi/nvoTiIntegTm_XXX	SNVT_count_inc_f	DA_U16_XXX	6
Td Derivative Time	AV	8	AO	8	nvi/nvoTdDerTime_XXX	SNVT_count_inc_f	DA_U16_XXX	7
Output Value	AV	9	AO	9	nvi/nvoOutputVal_XXX	SNVT_lev_percent	DA_U16_XXX	8
Upper-Limit Regulation	AV	10	AO	10	nvi/nvoUpLimReg_XXX	SNVT_count_inc_f	DA_U16_XXX	9
Lower-Limit Regulation	AV	11	AO	11	nvi/nvoLoLimReg_XXX	SNVT_count_inc_f	DA_U16_XXX	10
Analog Decimal Setting	AV	12	AO	12	nvi/nvoAnaDecSet_XXX	SNVT_count_inc_f	DA_U16_XXX	11
PID Parameter Selection	AV	13	AO	13	nvi/nvoPIDPrmSel_XXX	SNVT_count_inc_f	DA_U16_XXX	12
SV Value	AV	14	AO	14	nvi/nvoSVValue_XXX	SNVT_count_inc_f	DA_U16_XXX	13
Alarm 1 Type	AV	15	AO	15	nvi/nvoAlm1Type_XXX	SNVT_count_inc_f	DA_U16_XXX	14
Alarm 2 Type	AV	16	AO	16	nvi/nvoAlm2Type_XXX	SNVT_count_inc_f	DA_U16_XXX	15
Alarm 3 Type	AV	17	AO	17	nvi/nvoAlm3Type_XXX	SNVT_count_inc_f	DA_U16_XXX	16
Upper-Limit Alarm 1	AV	18	AO	18	nvi/nvoUpLimAlm1_XXX	SNVT_count_inc_f	DA_U16_XXX	17
Lower-Limit Alarm 1	AV	19	AO	19	nvi/nvoLoLimAlm1_XXX	SNVT_count_inc_f	DA_U16_XXX	18
Upper-Limit Alarm 2	AV	20	AO	20	nvi/nvoUpLimAlm2_XXX	SNVT_count_inc_f	DA_U16_XXX	19
Lower-Limit Alarm 2	AV	21	AO	21	nvi/nvoLoLimAlm2_XXX	SNVT_count_inc_f	DA_U16_XXX	20
Upper-Limit Alarm 3	AV	22	AO	22	nvi/nvoUpLimAlm3_XXX	SNVT_count_inc_f	DA_U16_XXX	21
Lower-Limit Alarm 3	AV	23	AO	23	nvi/nvoLoLimAlm3_XXX	SNVT_count_inc_f	DA_U16_XXX	22
Setting Lock Status	AV	24	AO	24	nvi/nvoSetLkStat_XXX	SNVT_count_inc_f	DA_U16_XXX	23
Communication Write-in Selection	AI	25	AI	25	nvoComWrinSl_XXX	SNVT_count_inc_f	DA_U16_XXX	24
Temp Unit Display Selection	BV	26	DO	26	nvi/nvoTmpUnit_XXX	SNVT_switch	DA_U16_XXX	25
Control RUN/STOP Setting	BV	27	DO	27	nvi/nvoCtrRnStSt_XXX	SNVT_switch	DA_U16_XXX	26
STOP Setting for PID	BV	28	DO	28	nvi/nvoStpSetPID_XXX	SNVT_switch	DA_U16_XXX	27
Temp STOP for PID	BV	29	DO	29	nvi/nvoTmpStpPID_XXX	SNVT_switch	DA_U16_XXX	28
Error Status	AI	30	AI	30	nvoErrStat_XXX	SNVT_count_inc_f	DA_U16_XXX	29

Appendix C.3. Nuro Modbus RTU Mappings to BACnet, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Address	LonWorks Name	LonWorks SNVT	Data Array Name	Offset
Supply Temperature	AI	1	AI	1	nvoSupplyTmp_XXX	SNVT_temp_p	DA_Scl_XXX	0
Return Temperature	AI	2	AI	2	nvoReturnTmp_XXX	SNVT_temp_p	DA_Scl_XXX	1
Stack Temperature	AI	3	AI	3	nvoStackTmp_XXX	SNVT_temp_p	DA_Scl_XXX	2
DHW Temperature	AI	4	AI	4	nvoDHWTmp_XXX	SNVT_temp_p	DA_Scl_XXX	3
Header Temperature	AI	5	AI	5	nvoHeaderTmp_XXX	SNVT_temp_p	DA_Scl_XXX	4
HX Temperature	AI	6	AI	6	nvoHXTmp_XXX	SNVT_temp_p	DA_Scl_XXX	5
ODA Temperature Filtered	AI	7	AI	7	nvoODATmpFlt_XXX	SNVT_temp_p	DA_Scl_XXX	6
Extra Field Temperature	AI	8	AI	8	nvoExtFldTmp_XXX	SNVT_temp_p	DA_Scl_XXX	7
Wireless Temperature	AI	9	AI	9	nvoWirlssTmp_XXX	SNVT_temp_p	DA_Scl_XXX	8
Analog Input	AI	10	AI	10	nvoAnaInput_XXX	SNVT_count_f	DA_Scl_XXX	9
Analog Output	AI	11	AI	11	nvoAnaOutput_XXX	SNVT_count_f	DA_U16_XXX	10
Burner Control Digital I/O	AI	12	AI	12	nvoBrnCtDgIO_XXX	SNVT_count_f	DA_U16_XXX	11
Burner Control Digital I/O 2	AI	13	AI	13	nvoBrCtDgIO2_XXX	SNVT_count_f	DA_U16_XXX	12
CH Mode Active Setpoint	AI	14	AI	14	nvoCHMdActSP_XXX	SNVT_temp_p	DA_Scl_XXX	13
DHW Mode Active Setpoint	AI	15	AI	15	nvoDHWMdAcSP_XXX	SNVT_temp_p	DA_Scl_XXX	14
Demand Source	AI	16	AI	16	nvoDmdSrc_XXX	SNVT_count_f	DA_U16_XXX	15
Active Demand Status	AI	17	AI	17	nvoActDmdSt_XXX	SNVT_count_f	DA_U16_XXX	16
Boiler State	AI	18	AI	18	nvoBlrState_XXX	SNVT_count_f	DA_U16_XXX	17
Flame Signal	AI	19	AI	19	nvoFlameSig_XXX	SNVT_count_f	DA_U16_XXX	18
Fan Speed	AI	20	AI	20	nvoFanSpeed_XXX	SNVT_count_f	DA_U16_XXX	19

Firing Rate	AI	21	AI	21	nvoFirRate_XXX	SNVT_lev_percent	DA_U16_XXX	20
Error Code	AI	22	AI	22	nvoErrCode_XXX	SNVT_count_f	DA_U32_XXX	0
Error Type	AI	23	AI	23	nvoErrType_XXX	SNVT_count_f	DA_U16_XXX	23
Burner Control Cycle Count	AI	24	AI	24	nvoBrCtrCyCt_XXX	SNVT_count_f	DA_U32_XXX	1
Burner Control Run Hours	AI	25	AI	25	nvoBrCtrRnHr_XXX	SNVT_time_hour	DA_U32_XXX	2
CH Boiler Control	BV	26	DO	26	nvi/nvoCHBlrCtrl_XXX	SNVT_switch	DA_U16_XXX	28
BMS CH Setpoint	AV	27	AO	27	nvi/nvoBMSCHSP_XXX	SNVT_temp_p	DA_U16_XXX	29
BMS CH Demand	BV	28	DO	28	nvi/nvoBMSCHDmd_XXX	SNVT_switch	DA_U16_XXX	30
DHW Boiler Control	BV	29	DO	29	nvi/nvoDHWBlCtrl_XXX	SNVT_switch	DA_U16_XXX	31
BMS DHW Setpoint	AV	30	AO	30	nvi/nvoBMSDHWSP_XXX	SNVT_temp_p	DA_U16_XXX	32
BMS DHW Tank Setpoint	AV	31	AO	31	nvi/nvoBMDHWTkSP_XXX	SNVT_temp_p	DA_U16_XXX	33
Relay A	BI	32	DI	32	nvoRelayA_XXX	SNVT_switch	DA_Bit_XXX	0
Relay B	BI	33	DI	33	nvoRelayB_XXX	SNVT_switch	DA_Bit_XXX	1
Relay C	BI	34	DI	34	nvoRelayC_XXX	SNVT_switch	DA_Bit_XXX	2
Relay D	BI	35	DI	35	nvoRelayD_XXX	SNVT_switch	DA_Bit_XXX	3
External Ignition	BI	36	DI	36	nvoExtIgn_XXX	SNVT_switch	DA_Bit_XXX	4
Gas Valve	BI	37	DI	37	nvoGasValve_XXX	SNVT_switch	DA_Bit_XXX	5
Alarm Relay	BI	38	DI	38	nvoAlmRelay_XXX	SNVT_switch	DA_Bit_XXX	7
Interlock Control Circuit	BI	39	DI	39	nvoIntCtlCkt_XXX	SNVT_switch	DA_Bit_XXX	8
Damper End Switch	BI	40	DI	40	nvoDmpEndSw_XXX	SNVT_switch	DA_Bit_XXX	9
Limit Control Circuit	BI	41	DI	41	nvoLimCtlCkt_XXX	SNVT_switch	DA_Bit_XXX	10
Enable	BI	42	DI	42	nvoEnable_XXX	SNVT_switch	DA_Bit_XXX	13
Night Setback Input	BI	43	DI	43	nvoNtStbkInp_XXX	SNVT_switch	DA_Bit_XXX	14
Safety Relay	BI	44	DI	44	nvoSafetyRel_XXX	SNVT_switch	DA_Bit_XXX	15
Air Switch	BI	45	DI	45	nvoAirSwitch_XXX	SNVT_switch	DA_Bit_XXX	16
Start Interlock 1	BI	46	DI	46	nvoStIntlk1_XXX	SNVT_switch	DA_Bit_XXX	17
Start Interlock 2	BI	47	DI	47	nvoStIntlk2_XXX	SNVT_switch	DA_Bit_XXX	18
Auxiliary Input 1	BI	48	DI	48	nvoAuxInput1_XXX	SNVT_switch	DA_Bit_XXX	19
High Temperature Limit	BI	49	DI	49	nvoHiTmpLim_XXX	SNVT_switch	DA_Bit_XXX	20
Low Water Cutoff	BI	50	DI	50	nvoLoWtrCtof_XXX	SNVT_switch	DA_Bit_XXX	21
High Gas Pressure	BI	51	DI	51	nvoHiGasPrs_XXX	SNVT_switch	DA_Bit_XXX	22
Aux Input 2 or Flow Switch	BI	52	DI	52	nvoAuxInput2_XXX	SNVT_switch	DA_Bit_XXX	23
BMS Heartbeat	AV	53	AO	53	nvi/nvoBMSHrtbt_XXX	SNVT_count_f	DA_U16_XXX	34
BMS Header Temperature	AI	54	AI	54	nvoBMSHdrTmp_XXX	SNVT_temp_p	DA_Scl_XXX	35
BMS Outdoor Air Temperature	AI	55	AI	55	nvoBMSOATmp_XXX	SNVT_temp_p	DA_Scl_XXX	36
BMS Analog Input	AI	56	AI	56	nvoBMSAI_XXX	SNVT_count_f	DA_Scl_XXX	37
BMS DHW Demand	AV	57	AO	57	nvi/nvoBMSDHWDem_XXX	SNVT_count_f	DA_U16_XXX	38
BMS DHW Temperature	AI	58	AI	58	nvoBMSDHWTmp_XXX	SNVT_temp_p	DA_Scl_XXX	39
Burner Control Dig I/O	AI	59	AI	59	nvoBrnCtDIO_XXX	SNVT_count_f	DA_U16_XXX	11
Burner Control Dig I/O 2	AI	60	AI	60	nvoBrCtDIO2_XXX	SNVT_count_f	DA_U16_XXX	12
BMS Header Temperature	AV	61	AO	61	nviBMSHdrTmp_XXX	SNVT_temp_p	DA_U16_XXX	35
BMS Outdoor Air Temperature	AV	62	AO	62	nviBMSOATmp_XXX	SNVT_temp_p	DA_U16_XXX	36
BMS Analog Input	AV	63	AO	63	nviBMSAI_XXX	SNVT_count_f	DA_U16_XXX	37
BMS DHW Temperature	AV	64	AO	64	nviBMSDHWTmp_XXX	SNVT_temp_p	DA_U16_XXX	39

Appendix D. "A" Bank DIP Switch Settings

Appendix D.1. "A" Bank DIP Switch Settings

Address	A0	A1	A2	A3	A4	A5	A6	A7
1	On	Off	Off	Off	Off	Off	Off	Off
2	Off	On	Off	Off	Off	Off	Off	Off
3	On	On	Off	Off	Off	Off	Off	Off
4	Off	Off	On	Off	Off	Off	Off	Off
5	On	Off	On	Off	Off	Off	Off	Off
6	Off	On	On	Off	Off	Off	Off	Off
7	On	On	On	Off	Off	Off	Off	Off
8	Off	Off	Off	On	Off	Off	Off	Off
9	On	Off	Off	On	Off	Off	Off	Off
10	Off	On	Off	On	Off	Off	Off	Off
11	On	On	Off	On	Off	Off	Off	Off
12	Off	Off	On	On	Off	Off	Off	Off
13	On	Off	On	On	Off	Off	Off	Off
14	Off	On	On	On	Off	Off	Off	Off
15	On	On	On	On	Off	Off	Off	Off
16	Off	Off	Off	Off	On	Off	Off	Off
17	On	Off	Off	Off	On	Off	Off	Off
18	Off	On	Off	Off	On	Off	Off	Off
19	On	On	Off	Off	On	Off	Off	Off
20	Off	Off	On	Off	On	Off	Off	Off
21	On	Off	On	Off	On	Off	Off	Off
22	Off	On	On	Off	On	Off	Off	Off
23	On	On	On	Off	On	Off	Off	Off
24	Off	Off	Off	On	On	Off	Off	Off
25	On	Off	Off	On	On	Off	Off	Off
26	Off	On	Off	On	On	Off	Off	Off
27	On	On	Off	On	On	Off	Off	Off
28	Off	Off	On	On	On	Off	Off	Off
29	On	Off	On	On	On	Off	Off	Off
30	Off	On	On	On	On	Off	Off	Off
31	On	On	On	On	On	Off	Off	Off
32	Off	Off	Off	Off	Off	On	Off	Off
33	On	Off	Off	Off	Off	On	Off	Off
34	Off	On	Off	Off	Off	On	Off	Off
35	On	On	Off	Off	Off	On	Off	Off
36	Off	Off	On	Off	Off	On	Off	Off
37	On	Off	On	Off	Off	On	Off	Off
38	Off	On	On	Off	Off	On	Off	Off
39	On	On	On	Off	Off	On	Off	Off
40	Off	Off	Off	On	Off	On	Off	Off
41	On	Off	Off	On	Off	On	Off	Off
42	Off	On	Off	On	Off	On	Off	Off
43	On	On	Off	On	Off	On	Off	Off
44	Off	Off	On	On	Off	On	Off	Off
45	On	Off	On	On	Off	On	Off	Off
46	Off	On	On	On	Off	On	Off	Off

Address	A0	A1	A2	A3	A4	A5	A6	A7
47	On	On	On	On	Off	On	Off	Off
48	Off	Off	Off	Off	On	On	Off	Off
49	On	Off	Off	Off	On	On	Off	Off
50	Off	On	Off	Off	On	On	Off	Off
51	On	On	Off	Off	On	On	Off	Off
52	Off	Off	On	Off	On	On	Off	Off
53	On	Off	On	Off	On	On	Off	Off
54	Off	On	On	Off	On	On	Off	Off
55	On	On	On	Off	On	On	Off	Off
56	Off	Off	Off	On	On	On	Off	Off
57	On	Off	Off	On	On	On	Off	Off
58	Off	On	Off	On	On	On	Off	Off
59	On	On	Off	On	On	On	Off	Off
60	Off	Off	On	On	On	On	Off	Off
61	On	Off	On	On	On	On	Off	Off
62	Off	On	On	On	On	On	Off	Off
63	On	On	On	On	On	On	Off	Off
64	Off	Off	Off	Off	Off	Off	On	Off
65	On	Off	Off	Off	Off	Off	On	Off
66	Off	On	Off	Off	Off	Off	On	Off
67	On	On	Off	Off	Off	Off	On	Off
68	Off	Off	On	Off	Off	Off	On	Off
69	On	Off	On	Off	Off	Off	On	Off
70	Off	On	On	Off	Off	Off	On	Off
71	On	On	On	Off	Off	Off	On	Off
72	Off	Off	Off	On	Off	Off	On	Off
73	On	Off	Off	On	Off	Off	On	Off
74	Off	On	Off	On	Off	Off	On	Off
75	On	On	Off	On	Off	Off	On	Off
76	Off	Off	On	On	Off	Off	On	Off
77	On	Off	On	On	Off	Off	On	Off
78	Off	On	On	On	Off	Off	On	Off
79	On	On	On	On	Off	Off	On	Off
80	Off	Off	Off	Off	On	Off	On	Off
81	On	Off	Off	Off	On	Off	On	Off
82	Off	On	Off	Off	On	Off	On	Off
83	On	On	Off	Off	On	Off	On	Off
84	Off	Off	On	Off	On	Off	On	Off
85	On	Off	On	Off	On	Off	On	Off
86	Off	On	On	Off	On	Off	On	Off
87	On	On	On	Off	On	Off	On	Off
88	Off	Off	Off	On	On	Off	On	Off
89	On	Off	Off	On	On	Off	On	Off
90	Off	On	Off	On	On	Off	On	Off
91	On	On	Off	On	On	Off	On	Off
92	Off	Off	On	On	On	Off	On	Off

Address	A0	A1	A2	A3	A4	A5	A6	A7
93	On	Off	On	On	On	Off	On	Off
94	Off	On	On	On	On	Off	On	Off
95	On	On	On	On	On	Off	On	Off
96	Off	Off	Off	Off	Off	On	On	Off
97	On	Off	Off	Off	Off	On	On	Off
98	Off	On	Off	Off	Off	On	On	Off
99	On	On	Off	Off	Off	On	On	Off
100	Off	Off	On	Off	Off	On	On	Off
101	On	Off	On	Off	Off	On	On	Off
102	Off	On	On	Off	Off	On	On	Off
103	On	On	On	Off	Off	On	On	Off
104	Off	Off	Off	On	Off	On	On	Off
105	On	Off	Off	On	Off	On	On	Off
106	Off	On	Off	On	Off	On	On	Off
107	On	On	Off	On	Off	On	On	Off
108	Off	Off	On	On	Off	On	On	Off
109	On	Off	On	On	Off	On	On	Off
110	Off	On	On	On	Off	On	On	Off
111	On	On	On	On	Off	On	On	Off
112	Off	Off	Off	Off	On	On	On	Off
113	On	Off	Off	Off	On	On	On	Off
114	Off	On	Off	Off	On	On	On	Off
115	On	On	Off	Off	On	On	On	Off
116	Off	Off	On	Off	On	On	On	Off
117	On	Off	On	Off	On	On	On	Off
118	Off	On	On	Off	On	On	On	Off
119	On	On	On	Off	On	On	On	Off
120	Off	Off	Off	On	On	On	On	Off
121	On	Off	Off	On	On	On	On	Off
122	Off	On	Off	On	On	On	On	Off
123	On	On	Off	On	On	On	On	Off
124	Off	Off	On	On	On	On	On	Off
125	On	Off	On	On	On	On	On	Off
126	Off	On	On	On	On	On	On	Off
127	On	On	On	On	On	On	On	Off
128	Off	Off	Off	Off	Off	Off	Off	On
129	On	Off	Off	Off	Off	Off	Off	On
130	Off	On	Off	Off	Off	Off	Off	On
131	On	On	Off	Off	Off	Off	Off	On
132	Off	Off	On	Off	Off	Off	Off	On
133	On	Off	On	Off	Off	Off	Off	On
134	Off	On	On	Off	Off	Off	Off	On
135	On	On	On	Off	Off	Off	Off	On
136	Off	Off	Off	On	Off	Off	Off	On
137	On	Off	Off	On	Off	Off	Off	On
138	Off	On	Off	On	Off	Off	Off	On
139	On	On	Off	On	Off	Off	Off	On
140	Off	Off	On	On	Off	Off	Off	On
141	On	Off	On	On	Off	Off	Off	On
142	Off	On	On	On	Off	Off	Off	On

Address	A0	A1	A2	A3	A4	A5	A6	A7
143	On	On	On	On	Off	Off	Off	On
144	Off	Off	Off	Off	On	Off	Off	On
145	On	Off	Off	Off	On	Off	Off	On
146	Off	On	Off	Off	On	Off	Off	On
147	On	On	Off	Off	On	Off	Off	On
148	Off	Off	On	Off	On	Off	Off	On
149	On	Off	On	Off	On	Off	Off	On
150	Off	On	On	Off	On	Off	Off	On
151	On	On	On	Off	On	Off	Off	On
152	Off	Off	Off	On	On	Off	Off	On
153	On	Off	Off	On	On	Off	Off	On
154	Off	On	Off	On	On	Off	Off	On
155	On	On	Off	On	On	Off	Off	On
156	Off	Off	On	On	On	Off	Off	On
157	On	Off	On	On	On	Off	Off	On
158	Off	On	On	On	On	Off	Off	On
159	On	On	On	On	On	Off	Off	On
160	Off	Off	Off	Off	Off	On	Off	On
161	On	Off	Off	Off	Off	On	Off	On
162	Off	On	Off	Off	Off	On	Off	On
163	On	On	Off	Off	Off	On	Off	On
164	Off	Off	On	Off	Off	On	Off	On
165	On	Off	On	Off	Off	On	Off	On
166	Off	On	On	Off	Off	On	Off	On
167	On	On	On	Off	Off	On	Off	On
168	Off	Off	Off	On	Off	On	Off	On
169	On	Off	Off	On	Off	On	Off	On
170	Off	On	Off	On	Off	On	Off	On
171	On	On	Off	On	Off	On	Off	On
172	Off	Off	On	On	Off	On	Off	On
173	On	Off	On	On	Off	On	Off	On
174	Off	On	On	On	Off	On	Off	On
175	On	On	On	On	Off	On	Off	On
176	Off	Off	Off	Off	On	On	Off	On
177	On	Off	Off	Off	On	On	Off	On
178	Off	On	Off	Off	On	On	Off	On
179	On	On	Off	Off	On	On	Off	On
180	Off	Off	On	Off	On	On	Off	On
181	On	Off	On	Off	On	On	Off	On
182	Off	On	On	Off	On	On	Off	On
183	On	On	On	Off	On	On	Off	On
184	Off	Off	Off	On	On	On	Off	On
185	On	Off	Off	On	On	On	Off	On
186	Off	On	Off	On	On	On	Off	On
187	On	On	Off	On	On	On	Off	On
188	Off	Off	On	On	On	On	Off	On
189	On	Off	On	On	On	On	Off	On
190	Off	On	On	On	On	On	Off	On
191	On	On	On	On	On	On	Off	On
192	Off	Off	Off	Off	Off	Off	On	On

Address	A0	A1	A2	A3	A4	A5	A6	A7
193	On	Off	Off	Off	Off	Off	On	On
194	Off	On	Off	Off	Off	Off	On	On
195	On	On	Off	Off	Off	Off	On	On
196	Off	Off	On	Off	Off	Off	On	On
197	On	Off	On	Off	Off	Off	On	On
198	Off	On	On	Off	Off	Off	On	On
199	On	On	On	Off	Off	Off	On	On
200	Off	Off	Off	On	Off	Off	On	On
201	On	Off	Off	On	Off	Off	On	On
202	Off	On	Off	On	Off	Off	On	On
203	On	On	Off	On	Off	Off	On	On
204	Off	Off	On	On	Off	Off	On	On
205	On	Off	On	On	Off	Off	On	On
206	Off	On	On	On	Off	Off	On	On
207	On	On	On	On	Off	Off	On	On
208	Off	Off	Off	Off	On	Off	On	On
209	On	Off	Off	Off	On	Off	On	On
210	Off	On	Off	Off	On	Off	On	On
211	On	On	Off	Off	On	Off	On	On
212	Off	Off	On	Off	On	Off	On	On
213	On	Off	On	Off	On	Off	On	On
214	Off	On	On	Off	On	Off	On	On
215	On	On	On	Off	On	Off	On	On
216	Off	Off	Off	On	On	Off	On	On
217	On	Off	Off	On	On	Off	On	On
218	Off	On	Off	On	On	Off	On	On
219	On	On	Off	On	On	Off	On	On
220	Off	Off	On	On	On	Off	On	On
221	On	Off	On	On	On	Off	On	On
222	Off	On	On	On	On	Off	On	On
223	On	On	On	On	On	Off	On	On
224	Off	Off	Off	Off	Off	On	On	On
225	On	Off	Off	Off	Off	On	On	On
226	Off	On	Off	Off	Off	On	On	On
227	On	On	Off	Off	Off	On	On	On
228	Off	Off	On	Off	Off	On	On	On
229	On	Off	On	Off	Off	On	On	On
230	Off	On	On	Off	Off	On	On	On
231	On	On	On	Off	Off	On	On	On
232	Off	Off	Off	On	Off	On	On	On
233	On	Off	Off	On	Off	On	On	On
234	Off	On	Off	On	Off	On	On	On
235	On	On	Off	On	Off	On	On	On
236	Off	Off	On	On	Off	On	On	On
237	On	Off	On	On	Off	On	On	On
238	Off	On	On	On	Off	On	On	On
239	On	On	On	On	Off	On	On	On
240	Off	Off	Off	Off	On	On	On	On
241	On	Off	Off	Off	On	On	On	On
242	Off	On	Off	Off	On	On	On	On

Address	A0	A1	A2	A3	A4	A5	A6	A7
243	On	On	Off	Off	On	On	On	On
244	Off	Off	On	Off	On	On	On	On
245	On	Off	On	Off	On	On	On	On
246	Off	On	On	Off	On	On	On	On
247	On	On	On	Off	On	On	On	On
248	Off	Off	Off	On	On	On	On	On
249	On	Off	Off	On	On	On	On	On
250	Off	On	Off	On	On	On	On	On
251	On	On	Off	On	On	On	On	On
252	Off	Off	On	On	On	On	On	On
253	On	Off	On	On	On	On	On	On
254	Off	On	On	On	On	On	On	On
255	On	On	On	On	On	On	On	On

Appendix E. Reference

Appendix E.1. Specifications

	ProtoNode FPC-N34	ProtoNode FPC-N35
Electrical Connections	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One 3-pin Phoenix connector with RS-485 port (+ / - / gnd) One Ethernet 10/100 BaseT port	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One 2-pin Phoenix connector with: One FTT-10 LonWorks port One Ethernet 10/100 BaseT port
Approvals	CE certified; UL 916 approved; WEEE compliant; REACH compliant; EN 50491-3 and CSA C22-2 standards; FCC Class A Part 15; DNP 3.0 conformance tested; RoHS 3 compliant; CSA 205 approved	
	BTL Marked	LonMark Certified
Power Requirements	9-30VDC or 12 - 24VAC	
Physical Dimensions	11.5 cm L x 8.3 cm W x 4.1 cm H (4.5 x 3.2 x 1.6 in.)	
Weight	0.2 kg (0.4 lbs)	
Operating Temperature	-40°C to 75°C (-40°F to167°F)	
Surge Suppression	EN61000-4-2 ESD EN61000-4-3 EMC EN61000-4-4 EFT	
Humidity	5 - 90% RH (non-condensing)	
(Specifications subject to change without notice)		

Figure 52: Specifications

Appendix E.1.1. Compliance with UL Regulations

For UL compliance, the following instructions must be met when operating ProtoNode.

- The units shall be powered by listed LPS or Class 2 power supply suited to the expected operating temperature range.
- The interconnecting power connector and power cable shall:
  - Comply with local electrical code
  - Be suited to the expected operating temperature range
  - Meet the current and voltage rating for ProtoNode
- Furthermore, the interconnecting power cable shall:
  - Be of length not exceeding 3.05m (118.3”)
  - Be constructed of materials rated VW-1, FT-1 or better
- If the unit is to be installed in an operating environment with a temperature above 65 °C, it should be installed in a Restricted Access Area requiring a key or a special tool to gain access.
- This device must not be connected to a LAN segment with outdoor wiring.

Appendix F. Limited 2 Year Warranty

MSA Safety warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. MSA Safety will repair or replace any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by MSA Safety personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without MSA Safety's approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables or to any damage resulting from battery leakage.

In all cases MSA Safety's responsibility and liability under this warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above, MSA Safety disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of MSA Safety for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.