

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

**For Interfacing Lochinvar Products:  
SYNC™, Knight®/Knight XL®/Armor/Wall Mount/Wall  
Hung, Crest®, Copper-Fin II®, Power Fin, Knight FTXL,  
Power Fin 2.5-5.0, IPW**

**To Building Automation Systems:  
BACnet MS/TP, BACnet/IP, Modbus TCP/IP, Metasys N2  
and LonWorks**

### APPLICABILITY & EFFECTIVITY

Explains ProtoNode hardware and how to install it.

The instructions are effective for the above as of November 2017.

## Technical Support

Thank you for purchasing the ProtoNode for Lochinvar.

Please call Lochinvar for Technical support of the ProtoNode product.

Sierra Monitor Corporation does not provide direct support. If Lochinvar needs to escalate the concern, they will contact Sierra Monitor Corporation for assistance.

Support Contact Information:

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300 Maddox Simpson Pkwy.  
Lebanon, TN 37090

Customer Service:  
1-800-722-2101

Email: [2tech@lochinvar.com](mailto:2tech@lochinvar.com)

Website: [www.lochinvar.com](http://www.lochinvar.com)

## Quick Start Guide

1. Record the information about the unit. (**Section 3.1**)
2. Set the device's COM settings and Node-ID for the device that is to connect to the ProtoNode. (**Section 3.2**)
3. Select a stored configuration then set the field protocol's MAC Address, Node-ID and baud rate. (**Section 3.3**)
4. Connect the ProtoNode's 6 pin RS-485 connector to the RS-485 network that is connected to the device. (**Section 4.2**)
5. **Connect the ProtoNode FPC-N34** 3 pin RS-485 port to the field protocol cabling, (**Section 4.2.3**) **or connect the ProtoNode FPC-N35** 2 pin LonWorks port to the field protocol cabling. (**Section 4.4**)
6. Connect power to the ProtoNode's 6 pin connector. (**Section 4.5**)
7. Ethernet network (FPC-N34): Use a web browser to access the ProtoNode Web Configurator page to change the IP Address. No changes to the configuration file are necessary. (**Section 5**)
8. LonWorks (FPC-N35): The ProtoNode must be commissioned on the LonWorks network. This must be done by the LonWorks administrator using a LonWorks commissioning tool. (**Section 7**)

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# 1 CERTIFICATION

## 1.1 BTL Mark<sup>®1</sup> – BACnet Testing Laboratory



BTLMark is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to requirements of ASHRAE Standard 133 is the responsibility of the BACnet International. BTL is a registered trademark of the BACnet International.

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/btl/](http://www.BACnetInternational.net/btl/) 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. Sierra Monitor 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.

<sup>1</sup> BACnet is a registered trademark of ASHRAE

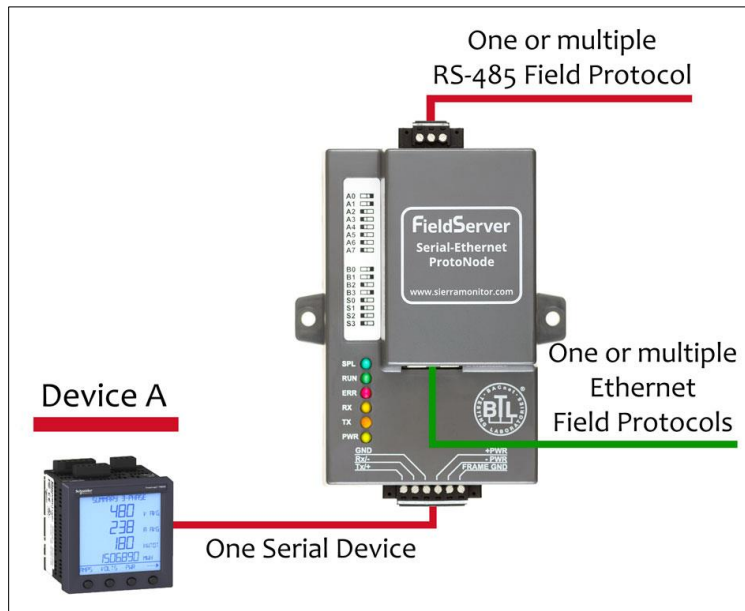
## 2 INTRODUCTION

### 2.1 ProtoNode Gateway

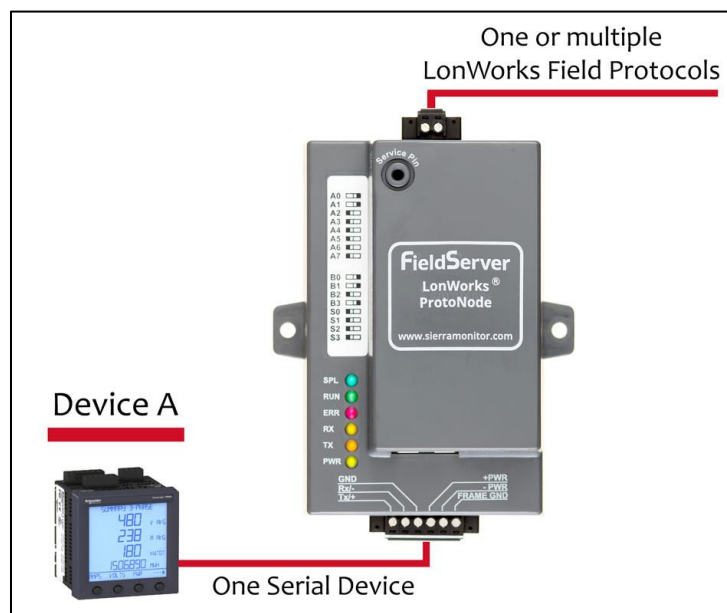
The ProtoNode is an external, high performance **building automation multi-protocol gateway** that has been preprogrammed for Lochinvar’s products (hereafter called “device”) to various building automation protocols. These protocols include BACnet MS/TP, BACnet/IP, Metasys<sup>®2</sup> N2 by JCI, Modbus TCP/IP, and LonWorks<sup>®3</sup>.

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.

#### FPC-N34 Connectivity Diagram:



#### FPC-N35 Connectivity Diagram:



<sup>2</sup> Metasys is a registered trademark of Johnson Controls Inc.

<sup>3</sup> LonWorks is a registered trademark of Echelon Corporation

### 3 SETUP FOR PROTONODE

#### 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 FPC-N34	FPC-N34-0614
ProtoNode FPC-N35	FPC-N35-0615

**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.

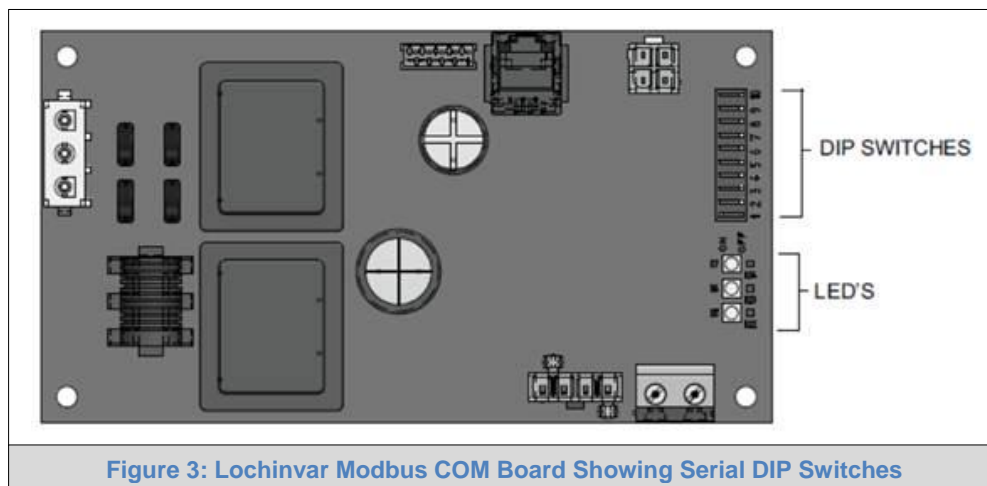
#### 3.2 Configuring Device Communications

##### 3.2.1 Input COM Settings on the Device Connected to the ProtoNode

- **The connected serial device MUST have the same baud rate, data bits, stop bits, and parity settings as the ProtoNode.**
- **Figure 2** specifies the device port settings required to communicate with the ProtoNode.

Port Setting	Device
Protocol	Modbus RTU
Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	2

**Figure 2: COM Settings**



##### 3.2.2 Set Node-ID for the Device Attached to the ProtoNode

- **Set the Modbus Node-ID to a value of 1.**



### 3.3 BMS Network Settings: Selecting Stored Configurations, Setting the MAC Address, Device Instance and Baud Rate

#### 3.3.1 Selecting Configuration Files for Devices: “S” Bank DIP Switches S0 – S3

The S bank of DIP switches (S0-S3) are used to select and load a configuration file from a group of pretested/preloaded configuration files which are stored in the ProtoNode FPC-N34 and the ProtoNode FPC-N35 (LonWorks).

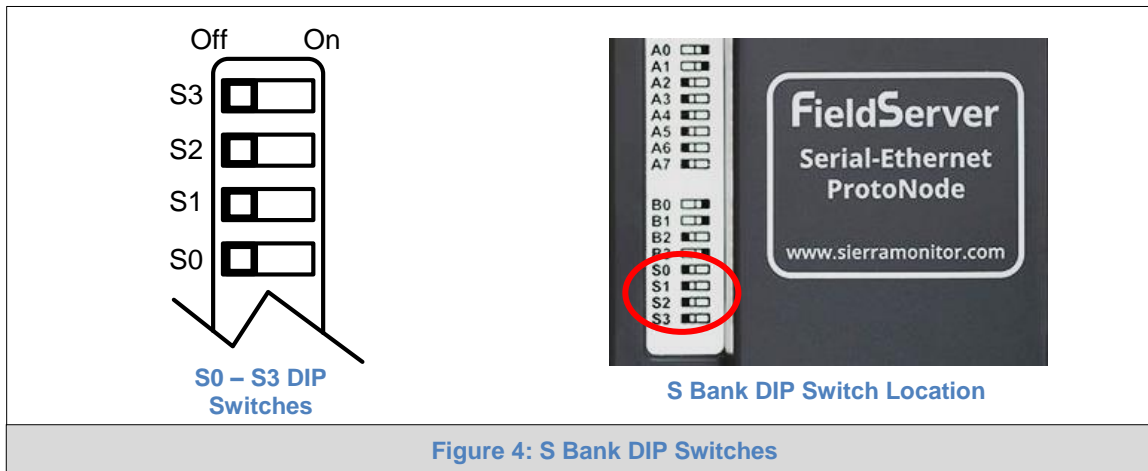


Figure 4: S Bank DIP Switches

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

#### 3.3.1.1 FPC-N34 DIP Switch Settings

For most BACnet and Modbus TCP/IP profiles, all small ProtoCessor DIP Switches (A1-A8) must be set to “off”. This is the default position when the ProtoNode is shipped so **check the profile chart on the next page before taking steps to manipulate the ProtoCessor DIP Switches.**

**NOTE:** The lid on top of the ProtoNode must be removed to select the small ProtoCessor DIP switches (A1-A8). To remove, pull on the lid while holding onto the 6 pin Phoenix connector. Do not hold the wall mount tabs as these are designed to break off if not required.

- To select configurations using the ProtoCessor DIP Switches, open the ProtoNode and find the DIP switches on the small ProtoCessor module that sits on top of the ProtoCarrier (**Figure 5**).
  - The ProtoCessor A1 DIP switch is the lowest of the ProtoCessor DIP switches with A8 at the top, as oriented in **Figure 5**.

**NOTE:** The ProtoCessor A2-A8 DIP switches are disabled for this configuration.

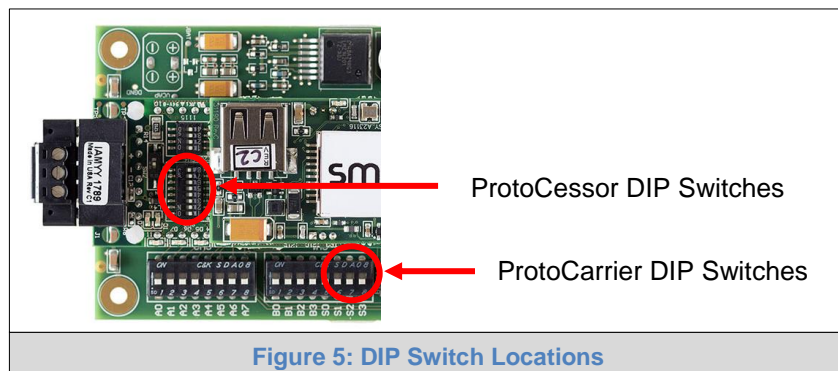


Figure 5: DIP Switch Locations

The following chart describes the S bank DIP Switch settings for devices to support the listed protocols on the ProtoNode.

Profiles for ProtoNode FPC-N34	S0	S1	S2	S3	A1
BACnet-Modbus TCP/IP SYNC Deg_C	Off	Off	Off	Off	Off
BACnet-Modbus TCP/IP Knight/Knight XL/Armor/ Wall Mount/Wall Hung Deg_C	On	Off	Off	Off	Off
BACnet-Modbus TCP/IP Crest Deg_C	Off	On	Off	Off	Off
BACnet-Modbus TCP/IP Copper-Fin II Deg_C	On	On	Off	Off	Off
BACnet-Modbus TCP/IP Power Fin Deg_C	Off	Off	On	Off	Off
BACnet-Modbus TCP/IP Knight FTXL Deg_C	On	Off	On	Off	Off
BACnet-Modbus TCP/IP SYNC Deg_F	Off	On	On	Off	Off
BACnet-Modbus TCP/IP Knight/Knight XL/Armor/ Wall Mount/Wall Hung Deg_F	On	On	On	Off	Off
BACnet-Modbus TCP/IP Crest Deg_F	Off	Off	Off	On	Off
BACnet-Modbus TCP/IP Copper-Fin II Deg_F	On	Off	Off	On	Off
BACnet-Modbus TCP/IP Power Fin Deg_F	Off	On	Off	On	Off
BACnet-Modbus TCP/IP Knight FTXL Deg_F	On	On	Off	On	Off
Metasys N2 SYNC Deg_C	Off	Off	On	On	Off
Metasys N2 Knight/Knight XL/Armor/ Wall Mount/Wall Hung Deg_C	On	Off	On	On	Off
Metasys N2 Crest Deg_C	Off	On	On	On	Off
Metasys N2 Copper-Fin II Deg_C	On	On	On	On	Off
Metasys N2 Power Fin Deg_C	Off	Off	Off	Off	On
Metasys N2 Knight FTXL Deg_C	On	Off	Off	Off	On
Metasys N2 SYNC Deg_F	Off	On	Off	Off	On
Metasys N2 Knight/Knight XL/Armor/ Wall Mount/Wall Hung Deg_F	On	On	Off	Off	On
Metasys N2 Crest Deg_F	Off	Off	On	Off	On
Metasys N2 Copper-Fin II Deg_F	On	Off	On	Off	On
Metasys N2 Power Fin Deg_F	Off	On	On	Off	On
Metasys N2 Knight FTXL Deg_F	On	On	On	Off	On
BACnet-Modbus TCP/IP Power Fin 2.5-5.0 Deg_C	Off	Off	Off	On	On
BACnet-Modbus TCP/IP Power Fin 2.5-5.0 Deg_F	On	Off	Off	On	On
Metasys N2 Power Fin 2.5-5.0 Deg_C	Off	On	Off	On	On
Metasys N2 Power Fin 2.5-5.0 Deg_F	On	On	Off	On	On
BACnet-Modbus TCP/IP IPW Deg_C	Off	Off	On	On	On
BACnet-Modbus TCP/IP IPW Deg_F	On	Of	On	On	On
Metasys N2 IPW Deg_C	Off	On	On	On	On
Metasys N2 IPW Deg_F	On	On	On	On	On

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

### 3.3.1.2 FPC-N35 DIP Switch Settings

The following chart describes the DIP switch settings for devices to support **LonWorks** on the ProtoNode.

**NOTE:** For LonWorks, all small ProtoCessor DIP Switches must be set to “off”. This is the default position when the ProtoNode is shipped.

Profiles for ProtoNode FPC-N35	S Bank DIP Switches			
	S0	S1	S2	S3
LonWorks SYNC	Off	Off	Off	Off
LonWorks Knight/Knight XL/ Armor/Wall Mount/Wall Hung	On	Off	Off	Off
LonWorks Crest	Off	On	Off	Off
LonWorks Copper-Fin II	On	On	Off	Off
LonWorks Power Fin	Off	Off	On	Off
LonWorks Knight FTXL	On	Off	On	Off
LonWorks Power Fin 2.5-5.0	Off	On	On	Off
LonWorks IPW	On	On	On	Off

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

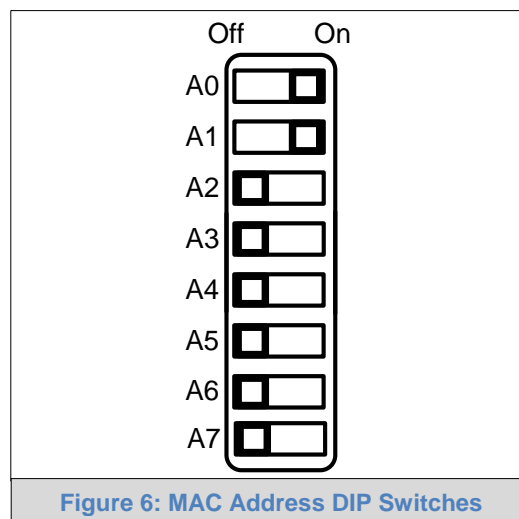
### 3.3.2 BACnet MS/TP (FPC-N34): Setting the MAC Address for BMS Network

- 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 DIP switches A0 – A7 to assign MAC Address for BACnet MS/TP for the ProtoNode FPC-N34.
- Refer to [Appendix C.1](#) for the complete range of MAC Addresses and DIP switch settings.

**NOTE: When using Metasys N2 and Modbus TCP/IP, the A Bank of DIP switches are disabled and not used. They should be set to OFF.**



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

### 3.3.3 BACnet (FPC-N34): Setting the Device Instance

- The A Bank of DIP switches are used for two purposes:
  - For BACnet MS/TP, they are used to set the BACnet MS/TP MAC address (**Section 3.3.2**)
  - For both BACnet MS/TP and BACnet/IP, they are also used to determine the BACnet Device Instance values
- The BACnet Device Instance can range from 1 to 4,194,303.
- The BACnet device instance is calculated by taking the Node\_Offset (default is 50,000) found in Web Configurator (**Section 5.2**) and adding it to the value of the A Bank DIP switches.
- The formula for calculating the Device Instance is:

***Device Instance = Node\_Offset + A Bank DIP switch value***

For example, if:

- Default Node\_Offset value = 50,000
- A Bank DIP switch value = 11

Then the Device Instance value for the device is:

- Device Instance = 50,011

### 3.3.4 Metasys N2 or Modbus TCP/IP (FPC-N34): Setting the Node-ID

- Set DIP switches A0 – A7 to assign a Node-ID for Metasys N2 or Modbus TCP/IP to the ProtoNode.
- Node-ID's range from 1-255. Refer to **Appendix C.1** for the full range of addresses for setting Node-ID.

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

- DIP switches B0 – B3 are 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. DIP Switches B0 – B3 are disabled for Metasys N2 on ProtoNode FPC-N34.
- DIP switches B0 – B3 are disabled on ProtoNode FPC-N35 (FPC-N35 LonWorks).

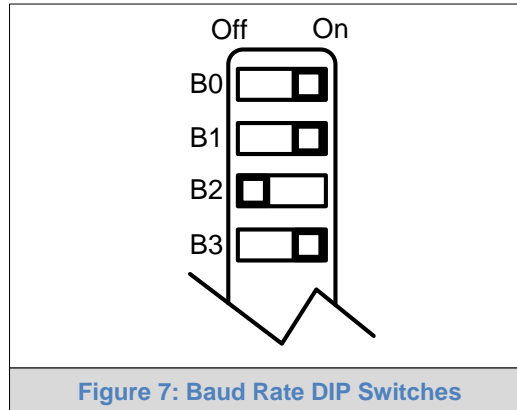


Figure 7: Baud Rate DIP Switches

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

#### 3.3.5.1 Baud Rate DIP Switch Selection

Baud	B0	B1	B2	B3
9600	On	On	On	Off
19200	Off	Off	Off	On
<b>38400*</b>	<b>On</b>	<b>On</b>	<b>Off</b>	<b>On</b>
57600	Off	Off	On	On
76800	On	Off	On	On

Figure 8: BMS Baud Rate

\* Factory default setting = 38400

4 INTERFACING PROTONODE TO DEVICES

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

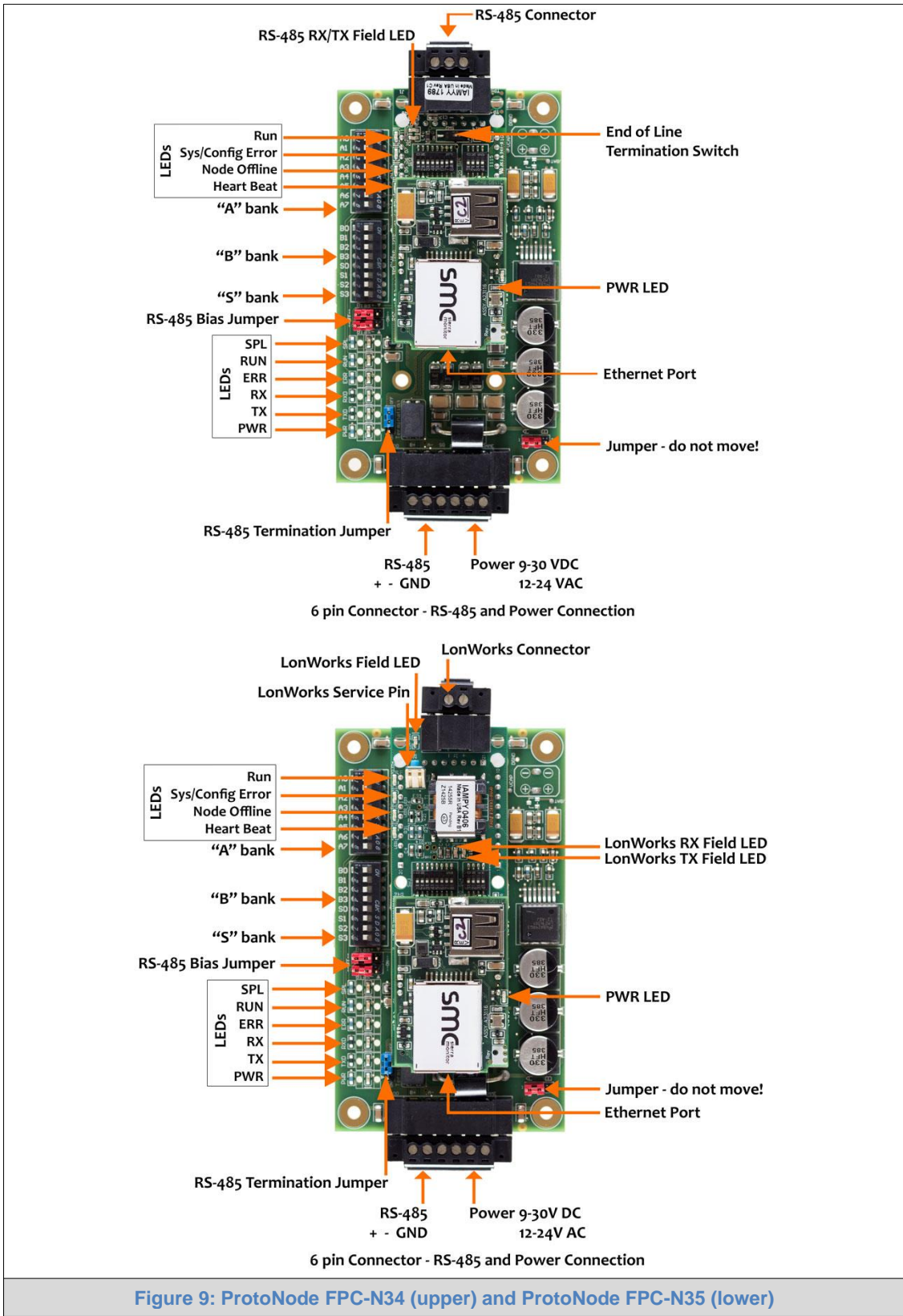


Figure 9: ProtoNode FPC-N34 (upper) and ProtoNode FPC-N35 (lower)

## 4.2 Device Connections to ProtoNode

### ProtoNode 6 Pin Phoenix connector:

- The 6 pin Phoenix connector is the same for ProtoNode FPC-N34 (BACnet) 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** (wait until **Section 4.5**).

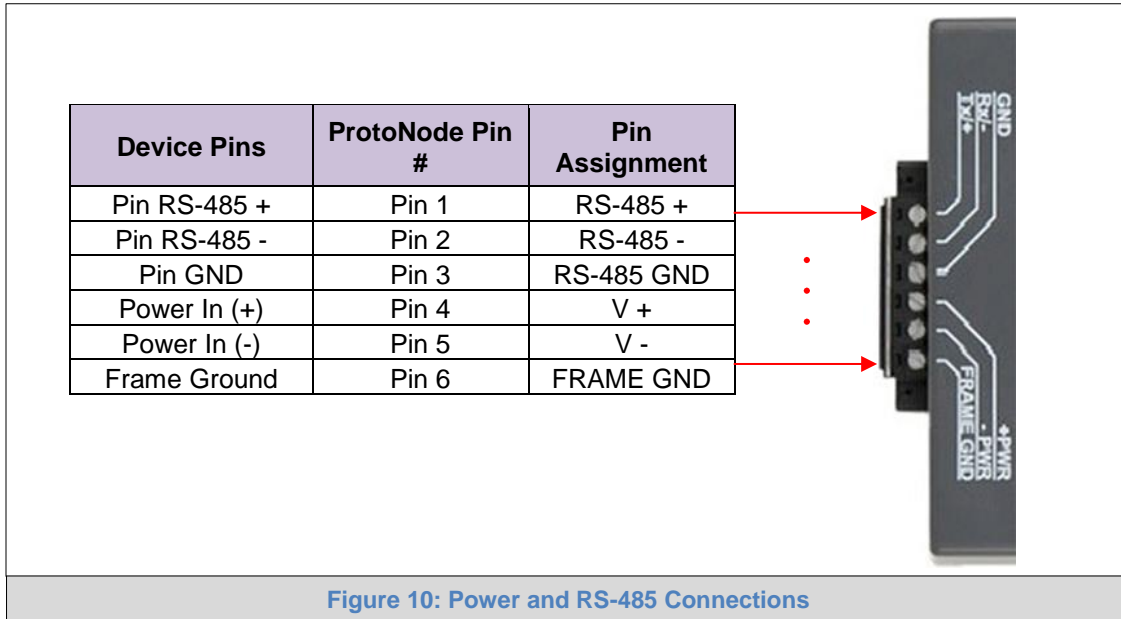


Figure 10: Power and RS-485 Connections

#### 4.2.1 Biasing the Modbus 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 11**)
- **Only turn biasing ON:**
  - **IF the BMS cannot see more than one device connected to the ProtoNode**
  - **AND all the settings (Modbus 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.

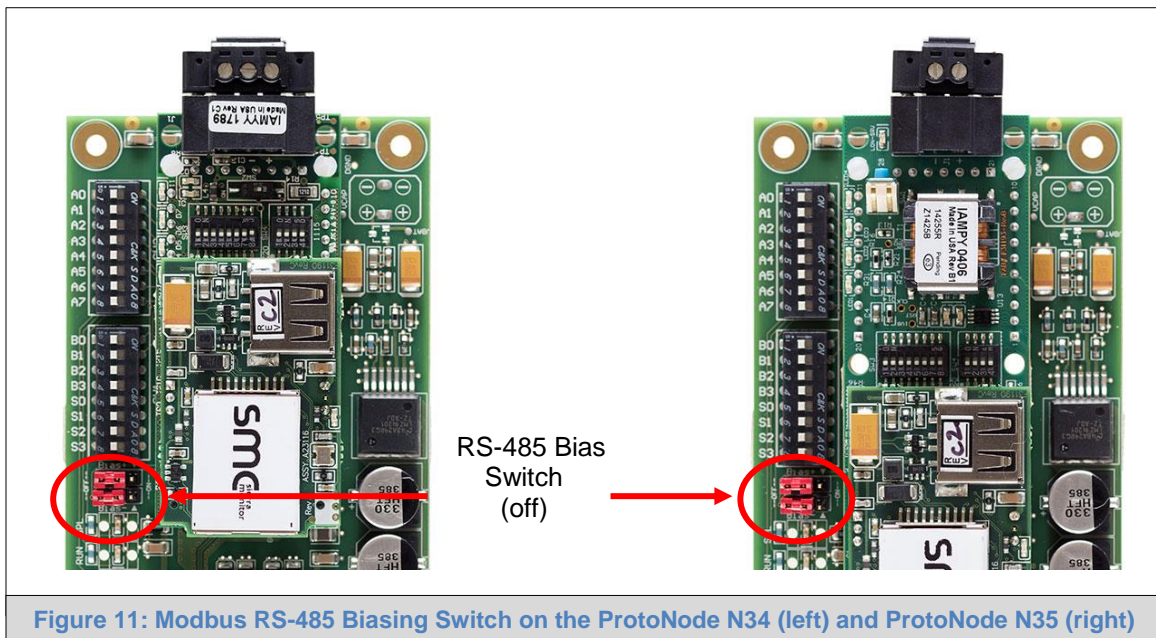


Figure 11: Modbus RS-485 Biasing Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)



#### 4.2.2 End of Line Termination Switch for the Modbus 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 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).**

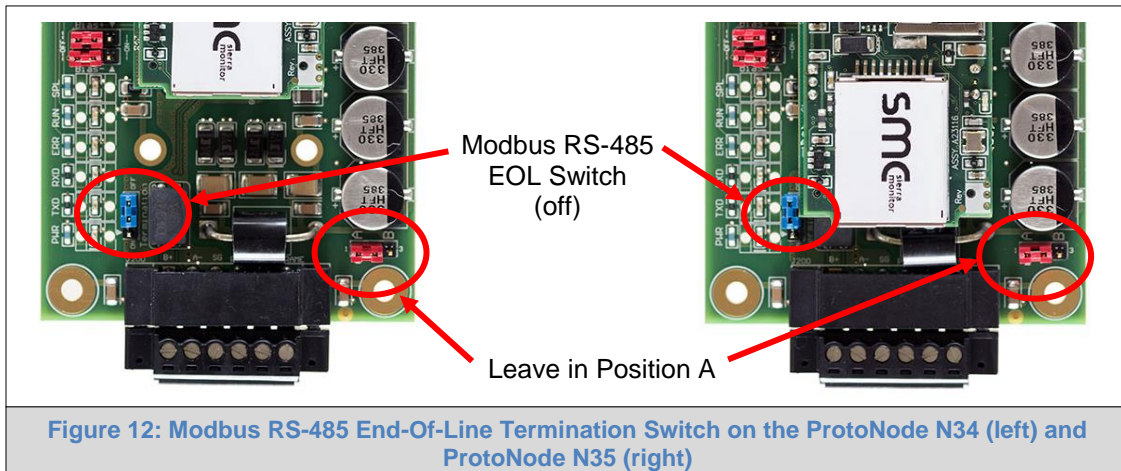


Figure 12: Modbus RS-485 End-Of-Line Termination Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)

4.2.3 Lochinvar Low Voltage Modbus RTU Wiring to the ProtoNode (Armor, SYNC/Armor X2, Knight/Knight XL, Crest, Copper-Fin II and FTXL)

- On the Lochinvar's Modbus terminal strip, connect Pin A (RS-485+) to B+ (RS-485+) on the ProtoNode's 6 Pin Phoenix connector.
- On the Lochinvar's Modbus terminal strip, connect Pin B (RS-485-) to A- (RS-485-) on the ProtoNode's 6 pin Phoenix connector.
- The Shield Pin on the terminal strip (which is Ground) does not need to be grounded to the ProtoNode.

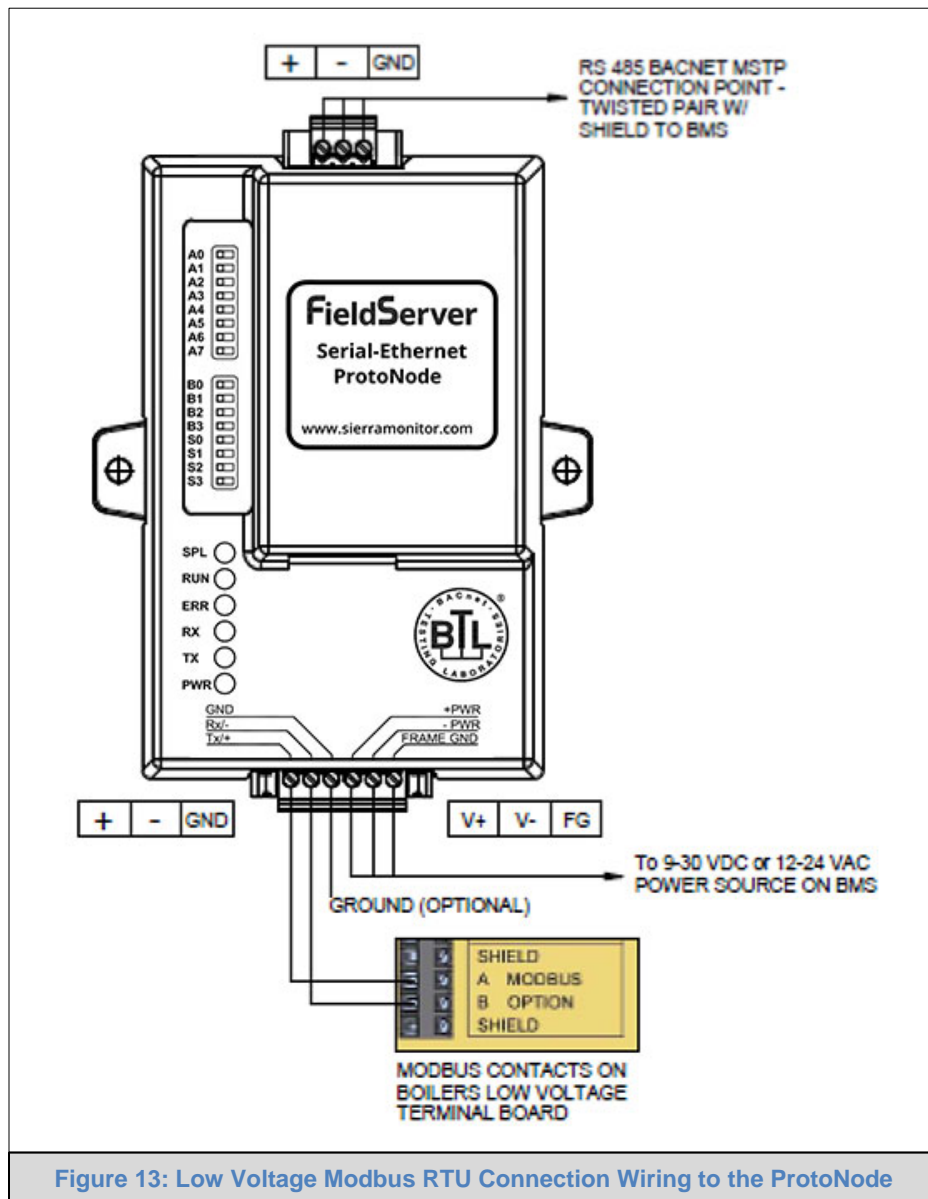


Figure 13: Low Voltage Modbus RTU Connection Wiring to the ProtoNode

### 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 below in **Figure 14**.
  - Use standard grounding principles for RS-485 GND
- See **Section 5.2** for information on connecting to BACnet/IP network.

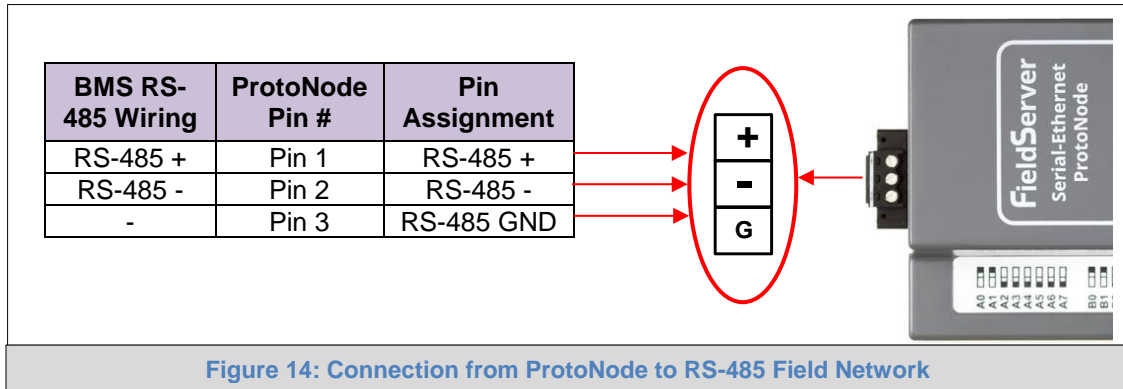


Figure 14: Connection from ProtoNode to RS-485 Field Network

- If the ProtoNode is the last device on the trunk, then the End-Of-Line Termination Switch needs to be enabled (**Figure 15**).
  - 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)

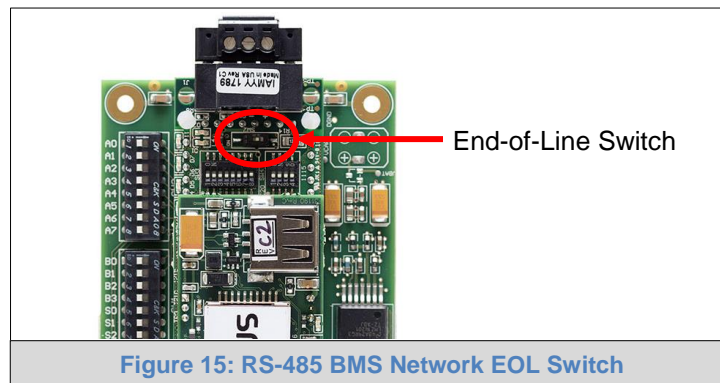


Figure 15: RS-485 BMS Network EOL Switch

### 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 16: LonWorks Terminal

## 4.5 Power-Up ProtoNode

Check power requirements in the table below:

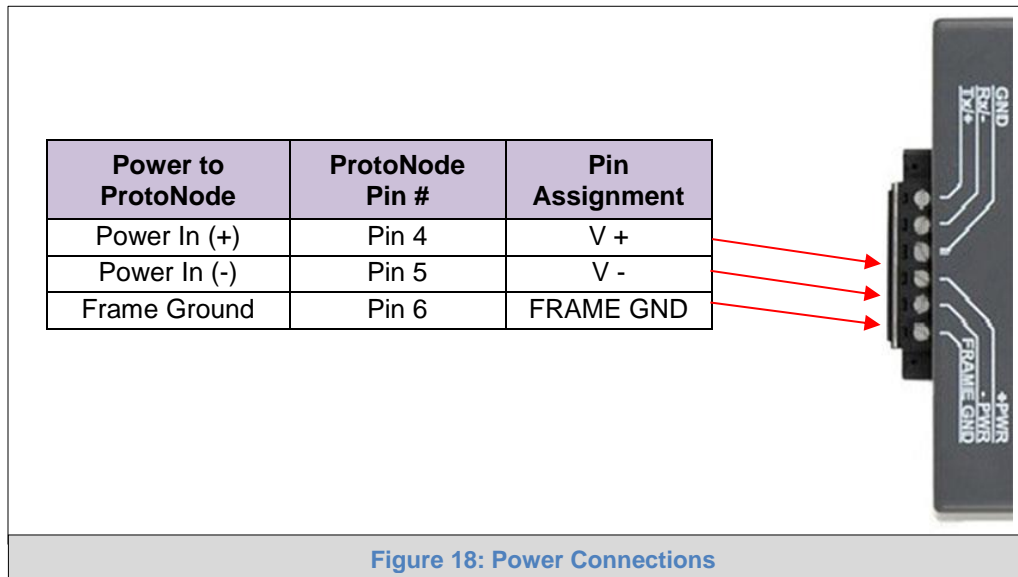
Power Requirement for ProtoNode External Gateway			
ProtoNode Family	Current Draw Type		
	12V DC/AC	24V DC/AC	30V DC
FPC – N34 (Typical)	170mA	100mA	80mA
FPC – N34 (Maximum)	240mA	140mA	100mA
FPC – N35 (Typical)	210mA	130mA	90mA
FPC – N35 (Maximum)	250mA	170mA	110mA

**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 17: Required Current Draw for the ProtoNode**

Apply power to the ProtoNode as shown below in **Figure 18**. Ensure that the power supply used complies with the specifications provided in **Appendix D.1**.





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



**5 USE THE PROTONODE WEB CONFIGURATOR TO SETUP THE GATEWAY**

**5.1 Connect the PC to ProtoNode via the Ethernet Port**

- Connect a CAT5 Ethernet cable (Straight through or Cross-Over) between the local PC and ProtoNode.
- The Default IP Address of 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:

Right click on  >  Control Panel >  Network and Internet  
 >  Network and Sharing Center > [Change adapter settings](#)

Right-click on Local Area Connection > Properties

Highlight   Internet Protocol Version 4 (TCP/IPv4) > 

- Use the following IP Address:

Use the following IP address:

IP address:	192 . 168 . 1 . 11
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	. . .

- Click  twice.

## 5.2 Ethernet Network: Setting IP Address for Field Network

- After setting a local PC on the same subnet as the ProtoNode (**Section 5.1**), open a web browser on the PC and enter the IP Address of the ProtoNode; the default address is 192.168.1.24.

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

- The Web Configurator is displayed as the landing page. (**Figure 19**)
- To access the FS-GUI, click on the “Diagnostics & Debugging” button in the bottom right corner of the page.

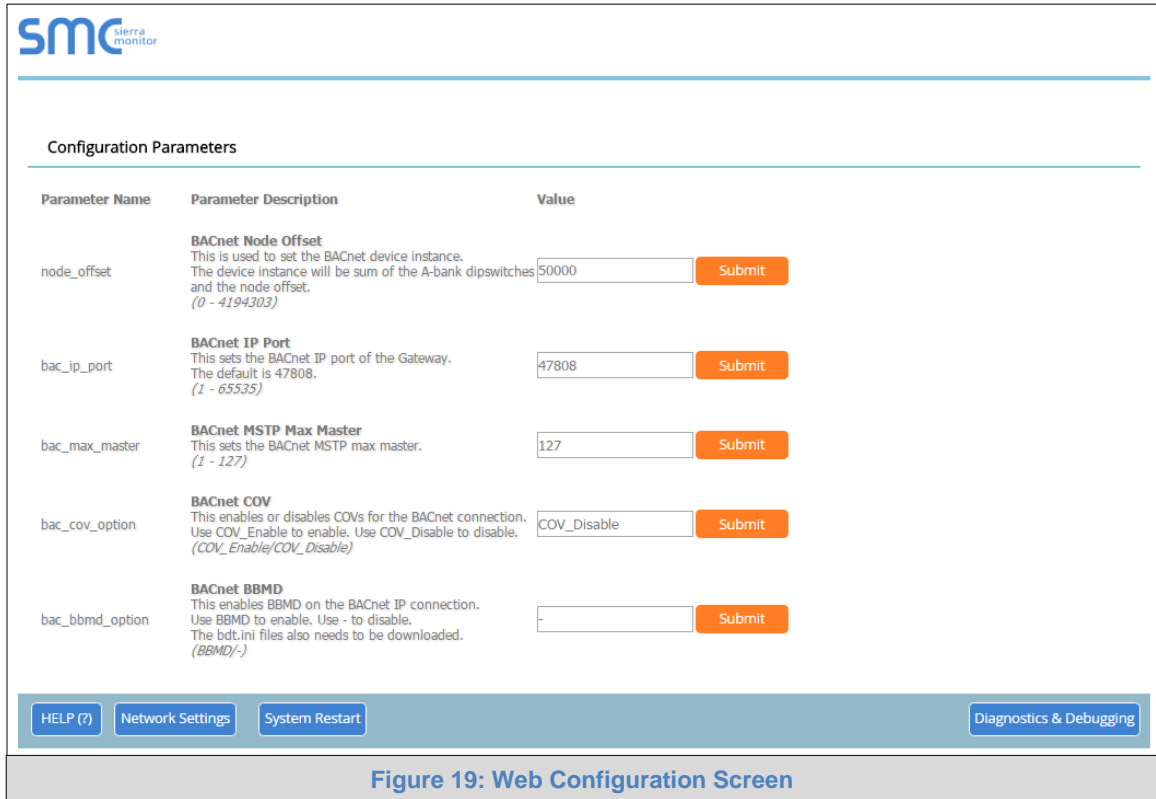


Figure 19: Web Configuration Screen

- From the FS-GUI landing page, click on “Setup” to expand the navigation tree and then select “Network Settings” to access the IP Settings menu. (Figure 20)

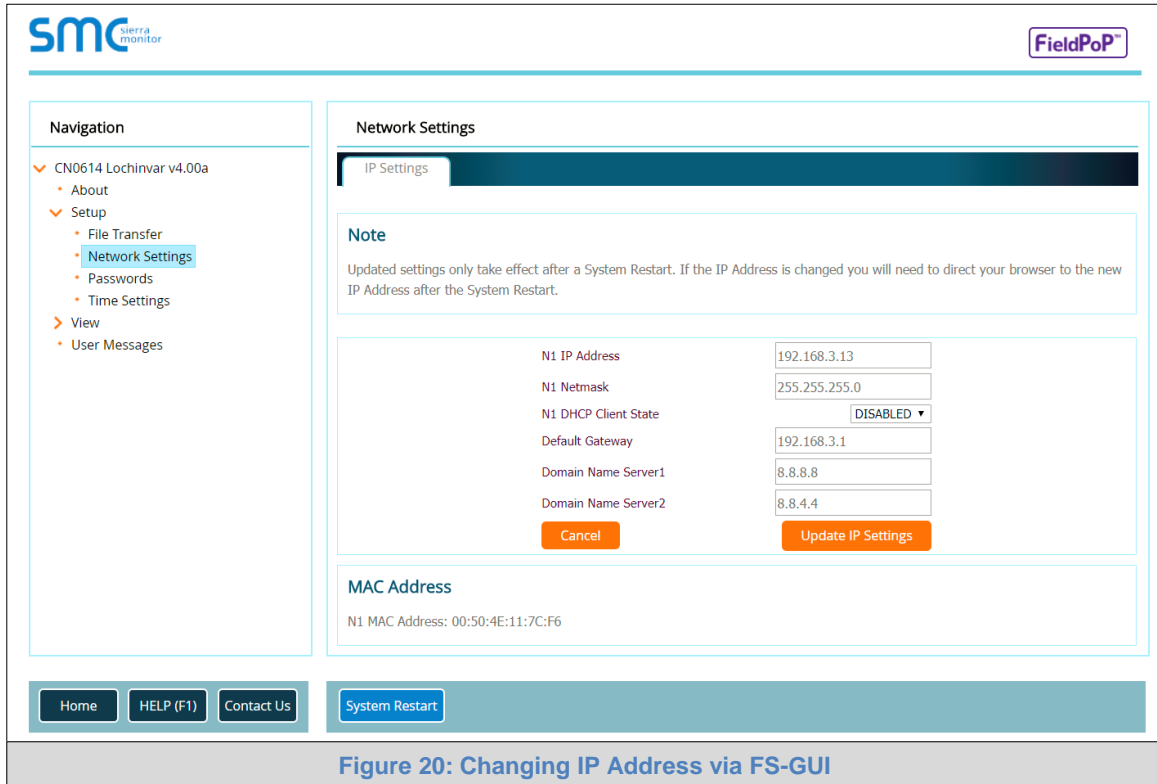



Figure 20: Changing IP Address via FS-GUI

- Enter the new IP Address for the ProtoNode’s Ethernet port in the “N1 IP Address” field.
- If necessary, change the Subnet Mask setting in the “N1 Netmask” field.
- If necessary, change the IP Gateway setting in the “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 ProtoNode for future reference.**

**NOTE:** The FieldPoP™ button  (see Figure 20) allows users to connect to the SMC Cloud, Sierra Monitor’s device cloud solution for the 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](#).

## 6 BACNET: SETTING NODE\_OFFSET TO ASSIGN SPECIFIC DEVICE INSTANCES

- After setting a local PC to the same subnet as the ProtoNode (**Section 5.1**), open a web browser on the PC and enter the IP Address of the ProtoNode; the default address is 192.168.1.24.
  - If the IP Address of the ProtoNode has been changed by previous configuration, the assigned IP Address must be gathered from the network administrator.
  - The Web Configurator is displayed as the landing page.
- 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 in the Web Configurator (**Figure 19**) using the calculation below:

$$\text{Device Instance (desired)} = \text{Node\_Offset} + \text{Node\_ID}$$

For example, if the desired Device Instance for the device is 50,001 and the following is true:

- Device has a Node-ID of 1

Then plug the device’s information into the formula to find the desired Node\_Offset:

$$50,001 = \text{Node\_Offset} + 1$$

- **50,000 = Node\_Offset**

Once the Node\_Offset value is input, it will be applied to the device as shown below:

- Device Instance = 50,000 + Node\_ID = 50,000 + 1 = 50,001

- Click “Submit” once the desired value is entered.

node_offset	<p><b>BACnet Node Offset</b>          This is used to set the BACnet device instance.          The device instance will be sum of the Modbus device address and the node offset.  <i>(0 - 4194303)</i></p>	<input type="text" value="50000"/>	<input type="button" value="Submit"/>
-------------	--	------------------------------------	---------------------------------------

Figure 21: Web Configurator Node Offset Field



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

Commissioning may only be performed by the LonWorks administrator.

### 7.1 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 7.1.1** to generate XIF.



Figure 22: LonWorks Service Pin Location

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

- Connect a CAT5 Ethernet cable (straight through or cross-over) between the PC and ProtoNode.
- The Default IP Address of 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:

Right click on  >  Control Panel >  Network and Internet  
>  Network and Sharing Center > [Change adapter settings](#)


Right-click on Local Area Connection > Properties

Highlight   Internet Protocol Version 4 (TCP/IPv4) > 

- Once in the properties window, enter the following IP Address:

Use the following IP address:

IP address:	192 . 168 . 1 . 11
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	. . .

- Click  twice.

- Open a web browser and go to the following address: [IP Address of the 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

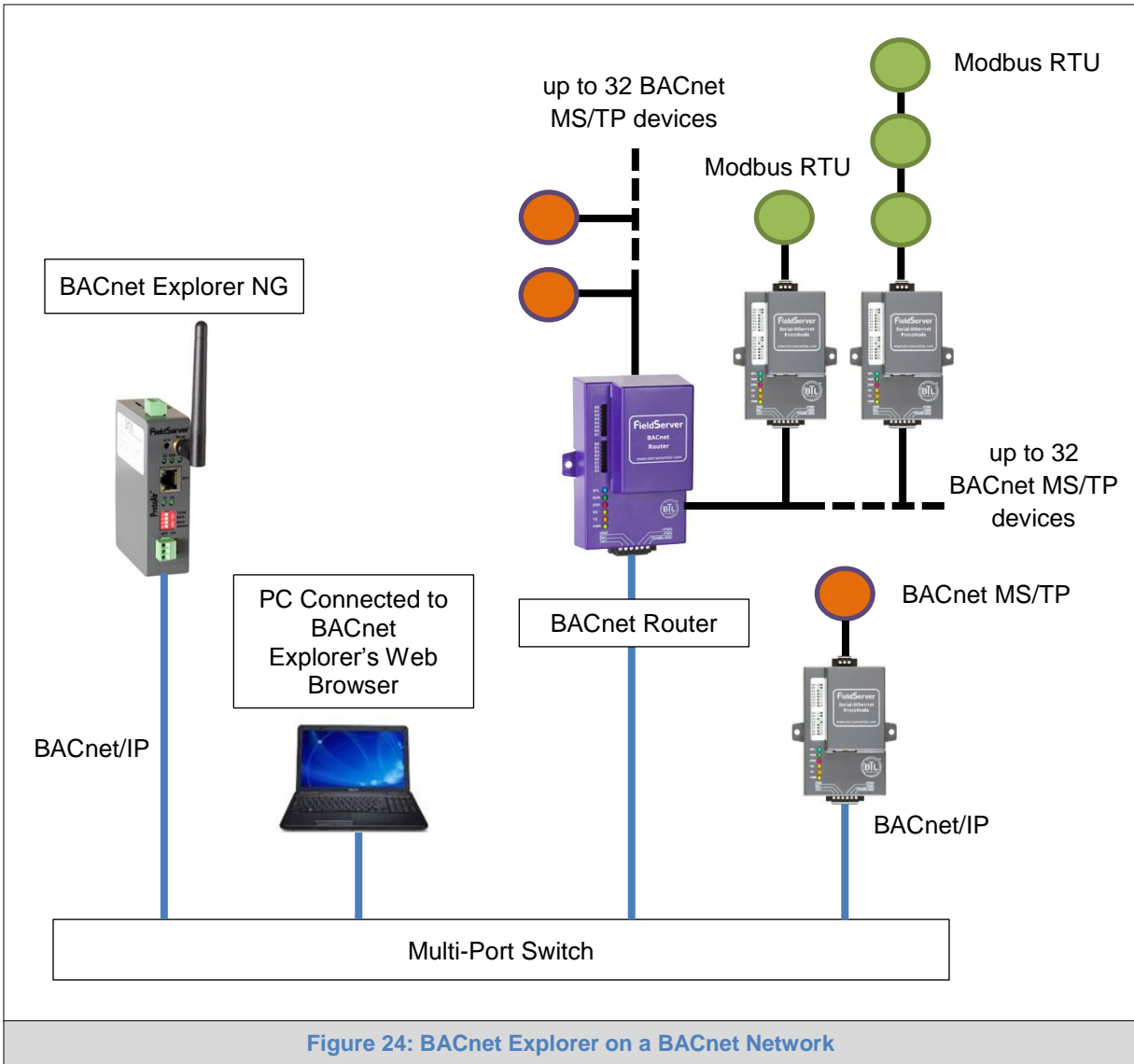
VAR nviAnalog_01 0 0 0 0
0 1 63 0 0 0 0 0 0 0 0 0 0 0
*
51 * 1
4 0 4 0 0
VAR nvoAnalog_01 1 0 0 0
0 1 63 1 0 0 0 0 0 0 0 0 0
*
51 * 1
4 0 4 0 0
VAR nviBinary_01 2 0 0 0
0 1 63 0 0 0 0 0 0 0 0 0 0
*
95 * 2
1 0 0 0 0
1 0 0 1 0
VAR nvoBinary_01 3 0 0 0
0 1 63 1 0 0 0 0 0 0 0 0 0
*
95 * 2
1 0 0 0 0
1 0 0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

```

Figure 23: Sample of Fserver.XIF File Generated

**8 BACNET EXPLORER NG**

A typical working example of a BACnet Explorer NG on a BACnet Network:



For additional details related to the BACnet Explorer NG, go to the Sierra Monitor website's [Resource Center](#) and download the BACnet Explorer NG Start-up Guide.

For purchasing information, look up the [BACnet Explorer NG page](#) on the Sierra Monitor website and click on the "BUY NOW" tab.

## 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 Resource Center [Software Downloads](#).
- Extract the executable file and complete the installation.

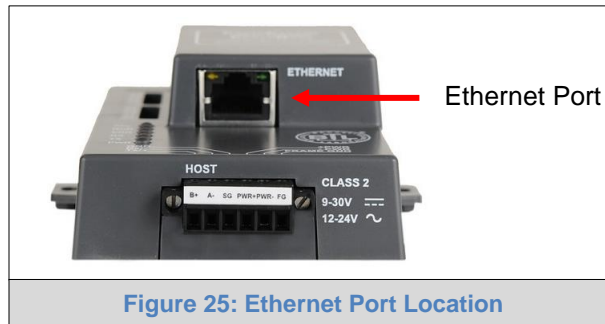
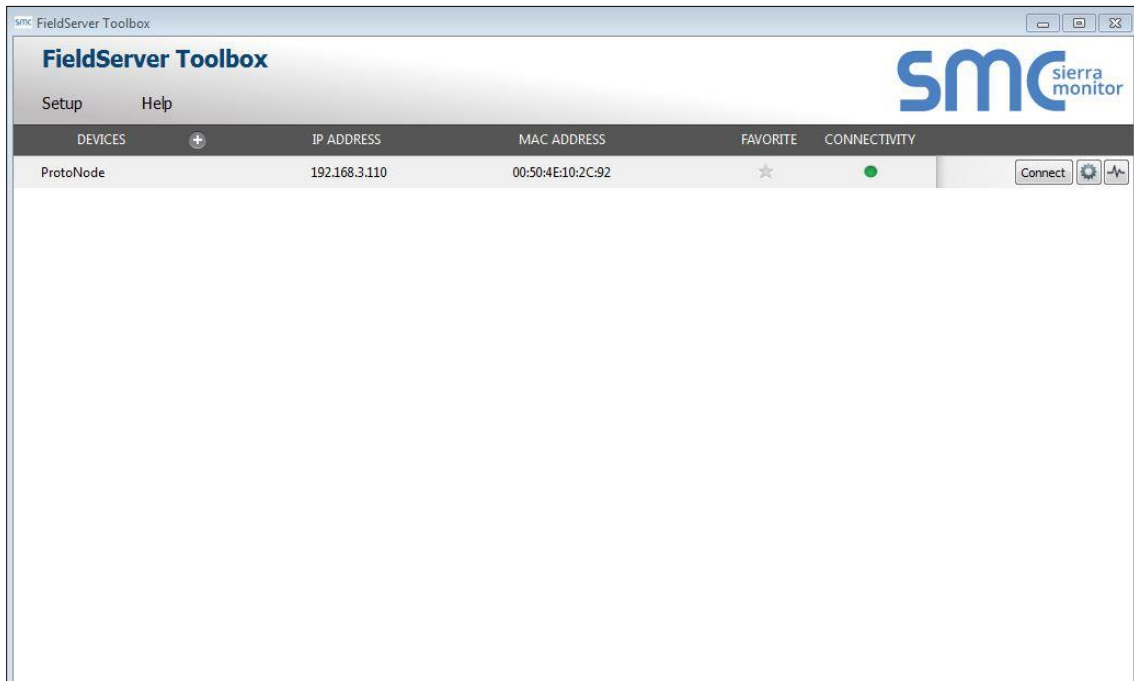



Figure 25: Ethernet Port Location

- Connect a standard CAT5 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.

The screenshot shows the SMC web interface. On the left is a navigation menu with options like 'About', 'Setup', 'View', and 'Connections'. The 'Connections' section is active, displaying a table with the following data:

Index	Name	Tx Msg	Rx Msg	Tx Char	Rx Char	Errors
0	S1 - MODBUS_RTU	33	0	264	0	33
1	N1 - BACnet_IP	1	552	15	3,312	0
2	R1 - BACnet_MSTP	1	0	15	0	0
3	N1 - Modbus/TCP	0	0	0	0	0

At the bottom of the interface, there are buttons for 'Home', 'HELP (F1)', 'Contact Us', and 'Reset Statistics'.

Figure 26: Error Messages Screen

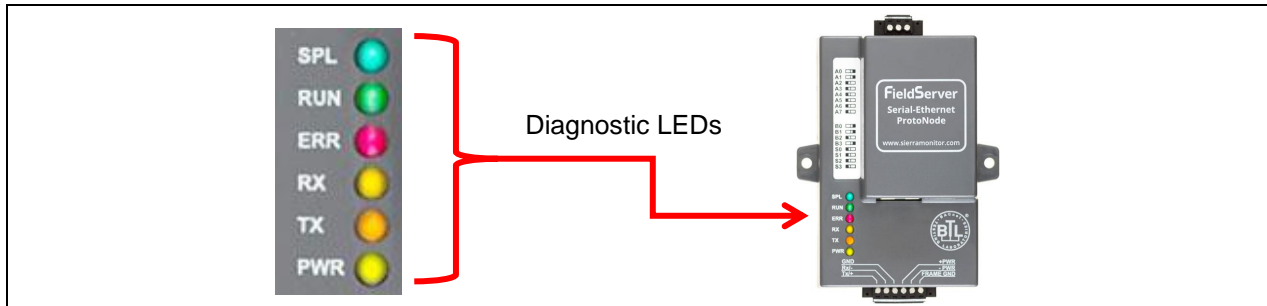
### Appendix A.3. Checking Wiring and Settings

- No COMS on Modbus RTU side. If the Tx/Rx LEDs are not flashing rapidly then there is a COM issue. 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 Modbus device is connected to the same subnet as the ProtoNode
  - Verify Modbus device was discovered in Web Configurator ([Section 5.2](#))
- Field COM problems:
  - If Ethernet protocols are used, observe Ethernet LEDs on the ProtoNode ([Appendix A.4](#))
  - Check dipswitch 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 support. ([Appendix A.5](#))**

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

See the diagram below for LED locations to the ProtoNode.



Tag	Description
<b>SPL</b>	The SPL LED will light if the unit is not getting a response from one or more of the configured devices. <b>For LonWorks units</b> , LED will light until the unit is commissioned on the LonWorks network.
<b>RUN</b>	The RUN LED will start flashing 20 seconds after power indicating normal operation.
<b>ERR</b>	The SYS ERR LED will go on solid 15 seconds after power up. It will turn off after 5 seconds. A steady red light will indicate there is a system error on unit. If this occurs, immediately report the related “system error” shown in the error screen of the GUI interface to support for evaluation.
<b>RX</b>	The RX LED will flash when a message is received on the serial port on the 6-pin connector. <b>If the serial port is not used</b> , this LED is non-operational.
<b>TX</b>	The TX LED will flash when a message is sent on the serial port on the 6-pin connector. <b>If the serial port is not used</b> , this LED is non-operational.
<b>PWR</b>	This is the power light and should show steady green at all times when the unit is powered.

Figure 27: Diagnostic LEDs

Appendix A.5. Taking Diagnostic Capture with the FieldServer Toolbox

- **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 Resource Center [Software Downloads](#).
- Extract the executable file and complete the installation.

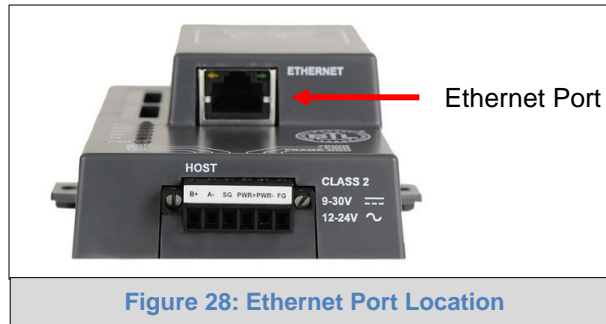

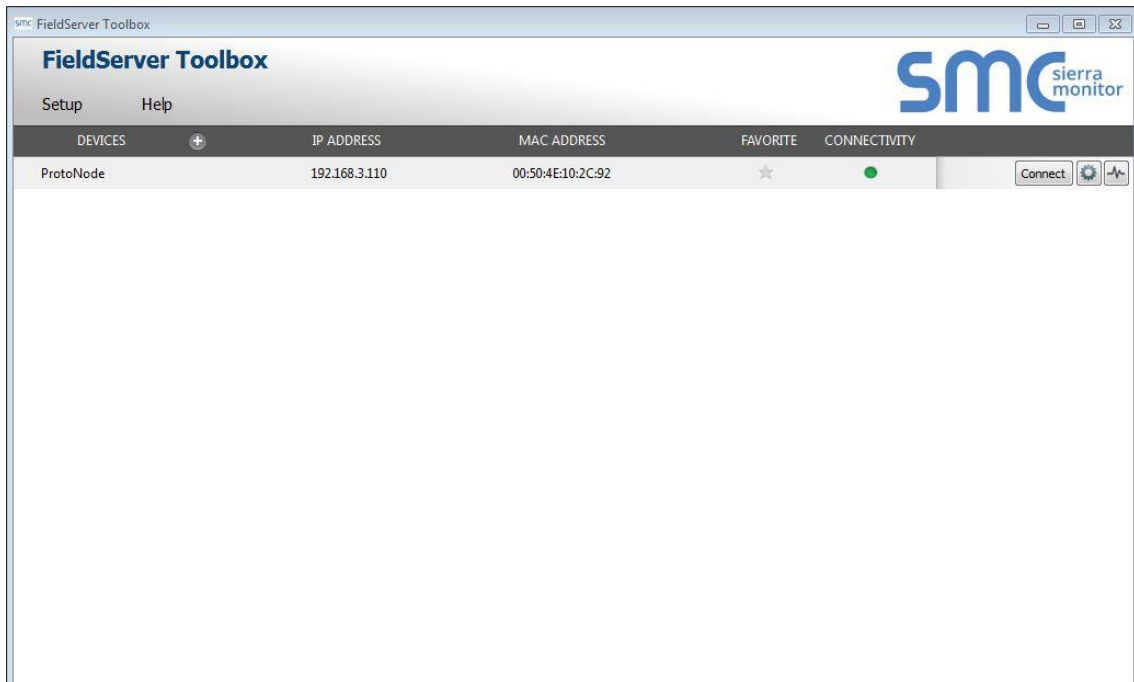


Figure 28: Ethernet Port Location

- Connect a standard CAT5 Ethernet cable between the PC and ProtoNode.
- Double click on the FS Toolbox Utility.
- **Step 1:** Take a Log
  - Click on the diagnose icon  of the desired device.



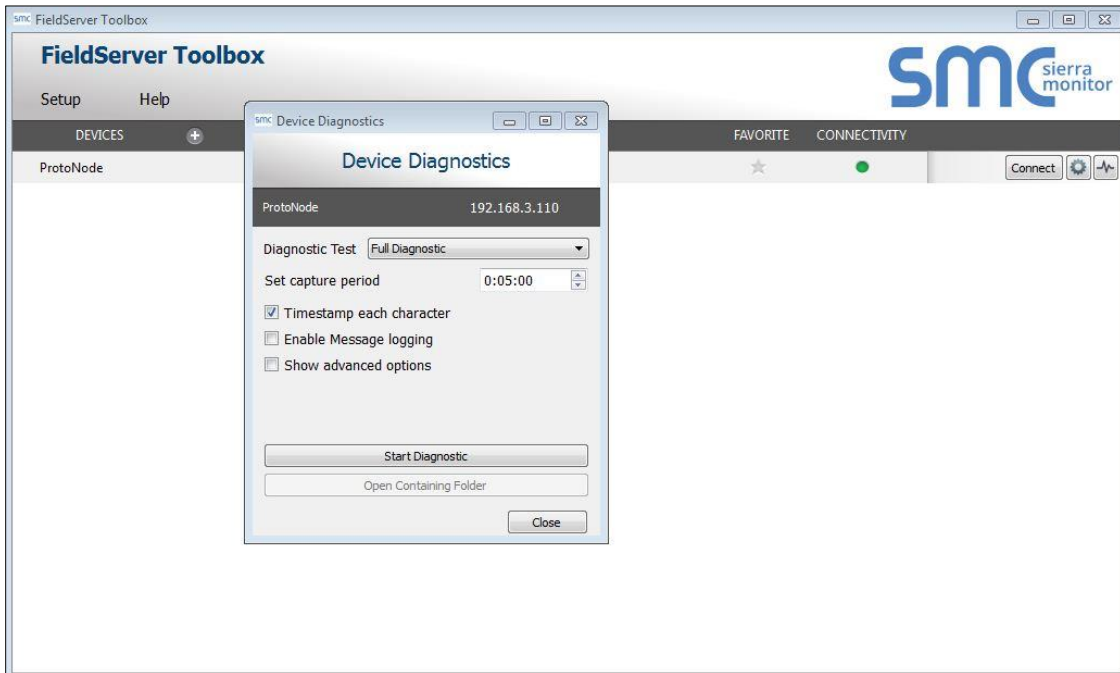


- Ensure "Full Diagnostic" is selected (this is the default)



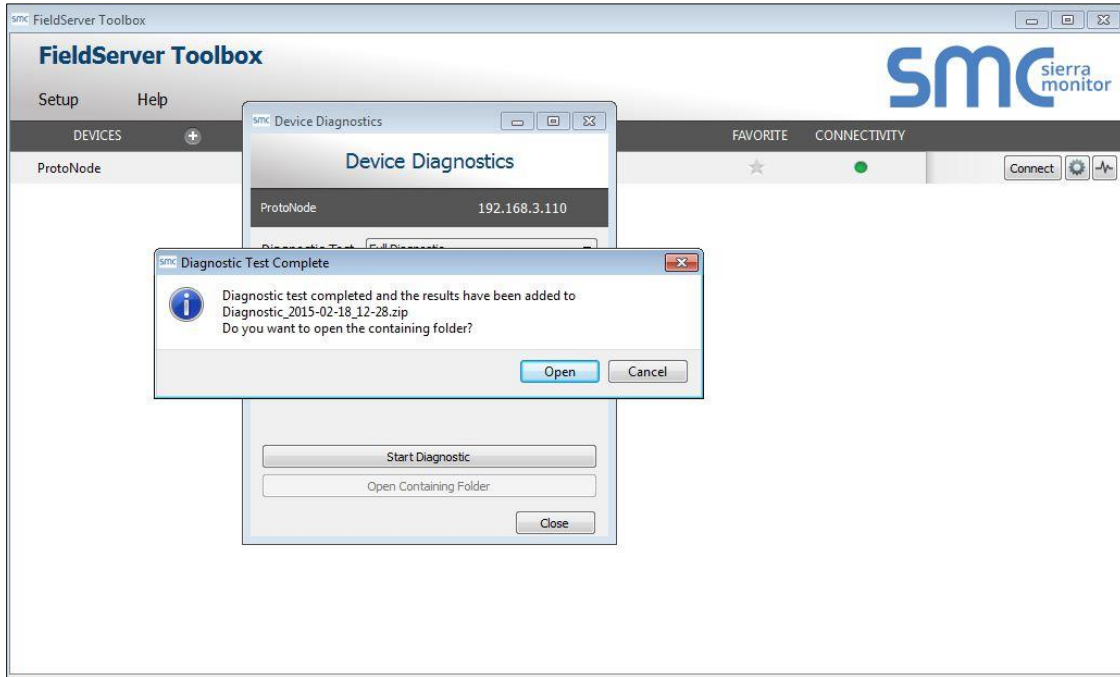
**NOTE:** If desired, the default capture period can be changed.

- Click on "Start Diagnostic"



- 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 <mailto:info@Customer.com>

 Diagnostic_2014-07-17_20-15.zip	2014/07/17 20:16	zip Archive	676 KB
---	------------------	-------------	--------

## Appendix A.6. 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 A.7. Securing ProtoNode with Passwords

Access to the ProtoNode can be restricted by enabling a password on the FS-GUI Passwords page – click Setup and then Passwords in the navigation panel. There are 2 access levels defined by 2 account names: Admin and User.

- The Admin account has unrestricted access to the ProtoNode.
- The User account can view any ProtoNode information, but cannot make any changes or restart the ProtoNode.

The password needs to be a minimum of eight characters and **is case sensitive**.

If the password is lost, click cancel on the password authentication popup window, and email the password recovery token to technical support to receive a temporary password from the support team. Access the ProtoNode to set a new password.

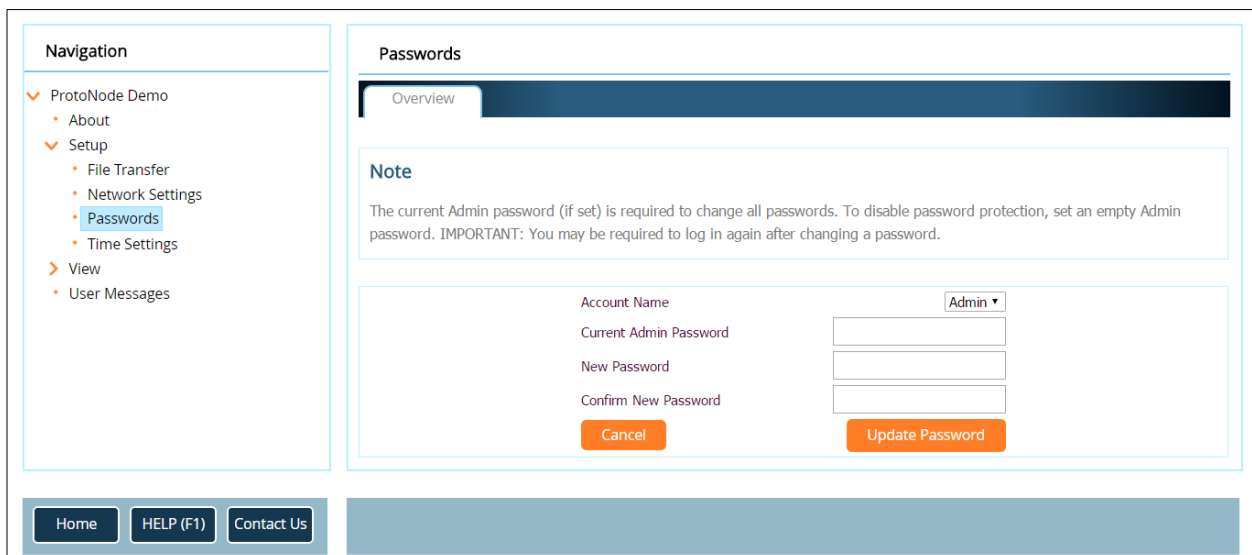


Figure 29: FS-GUI Passwords Page

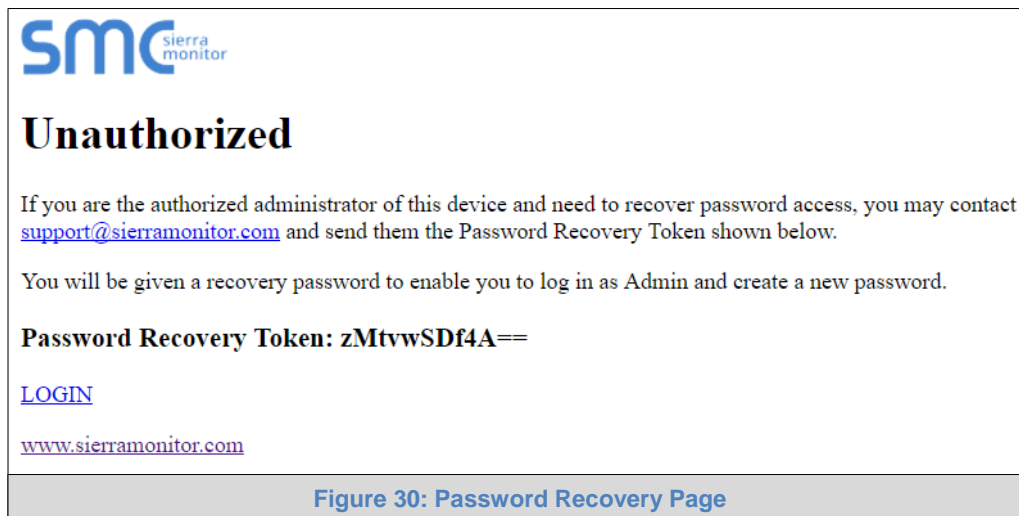


Figure 30: Password Recovery Page

**Appendix B. Vendor Information - Lochinvar**

**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 Lochinvar technical support. The Modbus TCP/IP node address of the device is also the same as the Modbus RTU node address.

**Appendix B.1. SYNC 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
Boiler Enable/Room Thermostat 1/Stg 1	BV	1	DO	1	i/oBlrEn_Stg1	SNVT_switch
Tank Thermostat	BV	2	DO	2	i/oTankThermostat	SNVT_switch
Manual Reset High Limit 1	BI	3	DI	3	oManResHiLim1	SNVT_switch
Flow Switch 1	BI	4	DI	4	oFLoSw1	SNVT_switch
Gas Pressure Switch 1	BI	5	DI	5	oGasPrsSw1	SNVT_switch
Louver Proving Switch 1	BI	6	DI	6	oLouverProvSw1	SNVT_switch
Air Pressure Switch/Flap Vlv 1	BI	7	DI	7	oAirPrsSwFlpVlv1	SNVT_switch
Blocked Drain Switch 1	BI	8	DI	8	oBlockedDrainSw1	SNVT_switch
Auto Reset High Limit 1	BI	9	DI	9	oAutoResHiLim1	SNVT_switch
Flame 1	BI	10	DI	10	oFlame1	SNVT_switch
Enable/Room Thermostat 1/Stg 1	BI	11	DI	11	oEnRmThermStg1	SNVT_switch
Tank Thermostat	BI	12	DI	12	oTnkThermostat	SNVT_switch
Manual Reset High Limit 2	BI	13	DI	13	oManResHiLim2	SNVT_switch
Flow Switch 2	BI	14	DI	14	oFLoSw2	SNVT_switch
Gas Pressure Switch 2	BI	15	DI	15	oGasPrsSw2	SNVT_switch
Louver Proving Switch 2	BI	16	DI	16	oLouverProvSw2	SNVT_switch
Air Pressure Switch/Flap Vlv 2	BI	17	DI	17	oAirPrsSwFlpVlv2	SNVT_switch
Blocked Drain Switch 2	BI	18	DI	18	oBlockedDrainSw2	SNVT_switch
Flame 2	BI	19	DI	19	oFlame2	SNVT_switch
Run-time Contacts	BI	20	DI	20	oRunTimeContcts	SNVT_switch
Alarm Contacts 1	BI	21	DI	21	oAlarmContacts1	SNVT_switch
CH Pump 1	BI	22	DI	22	oCHPump1	SNVT_switch
DHW Pump 1	BI	23	DI	23	oDHW Pump1	SNVT_switch
Gas Vlv 1	BI	24	DI	24	oGasVlv1	SNVT_switch
System Pump	BI	25	DI	25	oSystemPump	SNVT_switch
Run-time Contacts 2	BI	26	DI	26	oRunTimeContcts2	SNVT_switch
Alarm Contacts 2	BI	27	DI	27	oAlarmContacts2	SNVT_switch
CH Pump 2	BI	28	DI	28	oCHPump2	SNVT_switch
Gas Vlv 2	BI	29	DI	29	oGasVlv2	SNVT_switch
Discrete Inputs 1 - 16	AI	30	AI	30	oDisclnputs1_16	SNVT_count_f
Discrete Inputs 17 - 32	AI	31	AI	31	oDisclnputs17_32	SNVT_count_f
Discrete Inputs 33 - 48	AI	32	AI	32	oDisclnputs33_48	SNVT_count_f
System/Cascade Setpoint	AI	33	AI	33	oSysCascadeSP	SNVT_temp_p
Cascade Total Power	AI	34	AI	34	oCascadeTotalPwr	SNVT_lev_percent
Cascade Current Power	AI	35	AI	35	oCascadeCrrntPwr	SNVT_lev_percent
Outlet Setpoint 1	AI	36	AI	36	oOutletSP1	SNVT_temp_p
Outlet Temperature 1	AI	37	AI	37	oOutletTmp1	SNVT_temp_p
Inlet Temperature 1	AI	38	AI	38	oInletTmp1	SNVT_temp_p
Flue Temperature 1	AI	39	AI	39	oFlueTmp1	SNVT_temp_p
Firing Rate 1	AI	40	AI	40	oFiringRate1	SNVT_lev_percent
Boiler 1 Status Code	AI	41	AI	41	oBlr1StatusCode	SNVT_count_f
Boiler 1 Blocking Code	AI	42	AI	42	oBlr1BlckngCode	SNVT_count_f
Boiler 1 Lockout Code	AI	43	AI	43	oBlr1LockoutCode	SNVT_count_f
Outlet Setpoint 2	AI	44	AI	44	oOutletSP2	SNVT_temp_p
Outlet Temperature 2	AI	45	AI	45	oOutletTmp2	SNVT_temp_p
Inlet Temperature 2	AI	46	AI	46	oInletTmp2	SNVT_temp_p
Flue Temperature 2	AI	47	AI	47	oFlueTmp2	SNVT_temp_p
Firing Rate 2	AI	48	AI	48	oFiringRate2	SNVT_lev_percent
Boiler 2 Status Code	AI	49	AI	49	oBlr2StatusCode	SNVT_count_f
Boiler 2 Blocking Code	AI	50	AI	50	oBlr2BlckngCode	SNVT_count_f
Boiler 2 Lockout Code	AI	51	AI	51	oBlr2LockoutCode	SNVT_count_f
Configuration	AV	52	AO	52	i/oConfiguration	SNVT_count_f
Coils	AV	53	AO	53	i/oCoils	SNVT_count_f

0-10 Volt Input/Rate Cmd/SP Cmd	AV	54	AO	54	i/o0_10VltInRtCmd	SNVT_lev_percent
Tank Setpoint	AV	55	AO	55	i/oTankSP	SNVT_temp_p
Tank Temperature	AV	56	AO	56	i/oTankTmp	SNVT_temp_p
Outdoor Temperature	AV	57	AO	57	i/oOutdoorTmp	SNVT_temp_p
System Supply Temperature	AV	58	AO	58	i/oSysSupplyTmp	SNVT_temp_p

### Appendix B.2. Knight/Knight XL/Armor/Wall Mount/Wall Hung 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
Room Thermostat 1	BV	1	DO	1	i/oRmThermostat1	SNVT_switch
Room Thermostat 2	BV	2	DO	2	i/oRmThermostat2	SNVT_switch
Room Thermostat 3	BV	3	DO	3	i/oRmThermostat3	SNVT_switch
Tank Thermostat	BV	4	DO	4	i/oTankThermostat	SNVT_switch
Flow Switch	BI	5	DI	5	oFlowSw	SNVT_switch
Gas Pressure Switch	BI	6	DI	6	oGasPressureSw	SNVT_switch
Louver Proving Switch	BI	7	DI	7	oLouverPrvingSw	SNVT_switch
Air Pressure Switch	BI	8	DI	8	oAirPressureSw	SNVT_switch
Blocked Drain Switch	BI	9	DI	9	oBlockedDrainSw	SNVT_switch
Auto Reset High Limit	BI	10	DI	10	oAutoResetHiLim	SNVT_switch
Flame	BI	11	DI	11	oFlame	SNVT_switch
Room Thermostat 1	BI	12	DI	12	oRmThrmostat1	SNVT_switch
Tank Thermostat	BI	13	DI	13	oTnkThrmostat	SNVT_switch
Room Thermostat 2	BI	14	DI	14	oRmThrmostat2	SNVT_switch
Run-time Contacts	BI	15	DI	15	oRunTimeContacts	SNVT_switch
Alarm Contacts	BI	16	DI	16	oAlarmContacts	SNVT_switch
CH Pump	BI	17	DI	17	oCHPump	SNVT_switch
DHW Pump	BI	18	DI	18	oDHWump	SNVT_switch
Gas Valve	BI	19	DI	19	oGasValve	SNVT_switch
System Pump	BI	20	DI	20	oSystemPump	SNVT_switch
Discrete Inputs 1 - 16	AI	21	AI	21	oDisclnputs1-16	SNVT_count_f
Discrete Inputs 17 - 32	AI	22	AI	22	oDisclnputs17-32	SNVT_count_f
Discrete Inputs 33 - 48	AI	23	AI	23	oDisclnputs33-48	SNVT_count_f
System Cascade Setpoint	AI	24	AI	24	oSystemCascadeSP	SNVT_temp_p
System Pump Speed	AI	25	AI	25	oSystemPumpSpeed	SNVT_lev_percent
Cascade Total Power	AI	26	AI	26	oCascadeTotalPwr	SNVT_lev_percent
Cascade Current Power	AI	27	AI	27	oCascadeCrrntPwr	SNVT_lev_percent
Outlet Setpoint	AI	28	AI	28	oOutletSP	SNVT_temp_p
Outlet Temperature	AI	29	AI	29	oOutletTmp	SNVT_temp_p
Inlet Temperature	AI	30	AI	30	oInletTmp	SNVT_temp_p
Flue Temperature	AI	31	AI	31	oFlueTmp	SNVT_temp_p
Firing Rate	AI	32	AI	32	oFiringRate	SNVT_lev_percent
Boiler Pump Speed	AI	33	AI	33	oBlrPumpSpeed	SNVT_lev_percent
Boiler Status Code	AI	34	AI	34	oBlrStatusCode	SNVT_count_f
Boiler Blocking Code	AI	35	AI	35	oBlrBlockingCode	SNVT_count_f
Boiler Lockout Code	AI	36	AI	36	oBlrLockoutCode	SNVT_count_f
Configuration	AV	37	AO	37	i/oConfiguration	SNVT_count_f
Coils	AV	38	AO	38	i/oCoils	SNVT_count_f
0-10 Volt Input/Rate Cmd/SP Cmd	AV	39	AO	39	i/o0_10VltInRtCmd	SNVT_lev_percent
Tank Setpoint	AV	40	AO	40	i/oTankSP	SNVT_temp_p
Tank Temperature	AV	41	AO	41	i/oTankTmp	SNVT_temp_p
Outdoor Temperature	AV	42	AO	42	i/oOutdoorTmp	SNVT_temp_p
System Supply Temperature	AV	43	AO	43	i/oSystemSupplyTmp	SNVT_temp_p
System Return Temperature	AV	44	AO	44	i/oSystemReturnTmp	SNVT_temp_p

**Appendix B.3. Crest 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
Boiler Enable	BV	1	DO	1	nvi/nvoBoilerEnable	SNVT_switch
Tank Thermostat	BV	2	DO	2	nvi/nvoTnkThermostat	SNVT_switch
Manual Reset High Limit	BI	3	DI	3	nvoManResetHiLim	SNVT_switch
Flow Switch	BI	4	DI	4	nvoFlowSw	SNVT_switch
Gas Pressure Switch	BI	5	DI	5	nvoGasPrsSw	SNVT_switch
Louvers Proving Switch	BI	6	DI	6	nvoLouversPrvSw	SNVT_switch
Blower Proving Switch 1	BI	7	DI	7	nvoBlwrPrvSw1	SNVT_switch
Blocked Drain Switch	BI	8	DI	8	nvoBlkDrainSw	SNVT_switch
Flame 1	BI	9	DI	9	nvoFlame1	SNVT_switch
Enable	BI	10	DI	10	nvoEnable	SNVT_switch
Tank Thermostat	BI	11	DI	11	nvoTnkThrmostat	SNVT_switch
Blocked Flue	BI	12	DI	12	nvoBlockedFlue	SNVT_switch
Blower Proving Switch 2	BI	13	DI	13	nvoBlwrPrvSw2	SNVT_switch
Flue Damper Proving Switch	BI	14	DI	14	nvoFlueDmprPrvSw	SNVT_switch
Flame 2	BI	15	DI	15	nvoFlame2	SNVT_switch
Run Time Contacts	BI	16	DI	16	nvoRunTimContcts	SNVT_switch
Alarm Contacts	BI	17	DI	17	nvoAlarmContacts	SNVT_switch
SH Pump	BI	18	DI	18	nvoSHPump	SNVT_switch
HWG Pump	BI	19	DI	19	nvoHWGPump	SNVT_switch
Louver Relay	BI	20	DI	20	nvoLouverRel	SNVT_switch
Gas Valve 1	BI	21	DI	21	nvoGasVlv1	SNVT_switch
System Pump	BI	22	DI	22	nvoSysPump	SNVT_switch
Vent Damper Relay	BI	23	DI	23	nvoVentDmprRel	SNVT_switch
Gas Valve 2	BI	24	DI	24	nvoGasVlv2	SNVT_switch
Blower #1 Power	BI	25	DI	25	nvoBlwr#1Pwr	SNVT_switch
Blower #2 Power	BI	26	DI	26	nvoBlwr#2Pwr	SNVT_switch
Spark Igniter	BI	27	DI	27	nvoSparkIgniter	SNVT_switch
Transition Gas Valve	BI	28	DI	28	nvoTranGasVlv	SNVT_switch
Air Valve Trigger	BI	29	DI	29	nvoAirVlvTrg	SNVT_switch
Air Valve Proving	BI	30	DI	30	nvoAirVlvPrv	SNVT_switch
Discrete Inputs 01-16	AI	31	AI	31	nvoDI_01_16	SNVT_count_f
Discrete Inputs 17-32	AI	32	AI	32	nvoDI_17_32	SNVT_count_f
Discrete Inputs 33-48	AI	33	AI	33	nvoDI_33_48	SNVT_count_f
System Cascade Setpoint	AI	34	AI	34	nvoSysCascadeSP	SNVT_temp_p
System Pump Speed In	AI	35	AI	35	nvoSysPumpSpdIn	SNVT_lev_percent
Cascade Total Power	AI	36	AI	36	nvoCascdTotPwr	SNVT_lev_percent
Cascade Current Power	AI	37	AI	37	nvoCascdCrntPwr	SNVT_lev_percent
Outlet Setpoint	AI	38	AI	38	nvoOutletSP	SNVT_temp_p
Outlet Temperature	AI	39	AI	39	nvoOutletTmp	SNVT_temp_p
Inlet Temperature	AI	40	AI	40	nvoInletTmp	SNVT_temp_p
Flue Temperature	AI	41	AI	41	nvoFlueTmp	SNVT_temp_p
Firing Rate	AI	42	AI	42	nvoFiringRate	SNVT_lev_percent
Boiler Pump Speed Out	AI	43	AI	43	nvoBlrPmpSpdOut	SNVT_lev_percent
Boiler Status Code	AI	44	AI	44	nvoBlrStatusCode	SNVT_count_f
Boiler Blocking Code	AI	45	AI	45	nvoBlrBlckngCode	SNVT_count_f
Boiler Lock Out Code	AI	46	AI	46	nvoBlrLckOutCode	SNVT_count_f
Discrete Inputs 49-64	AI	47	AI	47	nvoDI_49_64	SNVT_count_f
Lockout Error Leader	AI	48	AI	48	nvoLckOutErrLdr	SNVT_count_f
Lockout Error Member 1	AI	49	AI	49	nvoLckOutErrM1	SNVT_count_f
Lockout Error Member 2	AI	50	AI	50	nvoLckOutErrM2	SNVT_count_f
Lockout Error Member 3	AI	51	AI	51	nvoLckOutErrM3	SNVT_count_f
Lockout Error Member 4	AI	52	AI	52	nvoLckOutErrM4	SNVT_count_f
Lockout Error Member 5	AI	53	AI	53	nvoLckOutErrM5	SNVT_count_f
Lockout Error Member 6	AI	54	AI	54	nvoLckOutErrM6	SNVT_count_f
Lockout Error Member 7	AI	55	AI	55	nvoLckOutErrM7	SNVT_count_f
Configuration	AV	56	AO	56	nvi/nvoConfiguration	SNVT_count_f
Coils	AV	57	AO	57	nvi/nvoCoils	SNVT_count_f
0-10 Volt Input	AV	58	AO	58	nvi/nvo0_10VoltInput	SNVT_lev_percent
Tank Setpoint	AV	59	AO	59	nvi/nvoTnkSP	SNVT_temp_p

Tank Temperature	AV	60	AO	60	nvi/nvoTnkTmp	SNVT_temp_p
Outdoor Temperature	AV	61	AO	61	nvi/nvoOutdoorTmp	SNVT_temp_p
System Supply Temperature	AV	62	AO	62	nvi/nvoSysSupplyTmp	SNVT_temp_p
System Return Temperature	AV	63	AO	63	nvi/nvoSysReturnTmp	SNVT_temp_p

Appendix B.4. Copper-Fin II 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
Stage 1 Enable	BV	1	DO	1	nvi/nvoStg1Enable	SNVT_switch
Stage 2 Enable	BV	2	DO	2	nvi/nvoStg2Enable	SNVT_switch
Stage 3 Enable	BV	3	DO	3	nvi/nvoStg3Enable	SNVT_switch
Stage 4 Enable	BV	4	DO	4	nvi/nvoStg4Enable	SNVT_switch
Tank Thermostat	BV	5	DO	5	nvi/nvoTankThrmstat	SNVT_switch
High Limits	BI	6	DI	6	nvoHiLimits	SNVT_switch
Flow Switch	BI	7	DI	7	nvoFlowSw	SNVT_switch
Gas Pressure Switch	BI	8	DI	8	nvoGasPresSw	SNVT_switch
Louver Proving Switch	BI	9	DI	9	nvoLouverProvSw	SNVT_switch
Air Pressure Switch	BI	10	DI	10	nvoAirPresSw	SNVT_switch
Flame 1	BI	11	DI	11	nvoFlame1	SNVT_switch
Stage 1 On	BI	12	DI	12	nvoStg1On	SNVT_switch
Tank Thermostat	BI	13	DI	13	nvoTnkThrmstat	SNVT_switch
Stage 2 On	BI	14	DI	14	nvoStg2On	SNVT_switch
Stage 3 On	BI	15	DI	15	nvoStg3On	SNVT_switch
Stage 4 On	BI	16	DI	16	nvoStg4On	SNVT_switch
Flame 2	BI	17	DI	17	nvoFlame2	SNVT_switch
Enable 2	BI	18	DI	18	nvoEnable2	SNVT_switch
Run Time Contacts	BI	19	DI	19	nvoRunTimContct	SNVT_switch
Alarm Contacts	BI	20	DI	20	nvoAlarmContact	SNVT_switch
HTR Pump	BI	21	DI	21	nvoHTRPump	SNVT_switch
DHW Pump	BI	22	DI	22	nvoDHWpump	SNVT_switch
Louver Relay	BI	23	DI	23	nvoLouverRelay	SNVT_switch
Gas Valve 1	BI	24	DI	24	nvoGasValve1	SNVT_switch
System Pump	BI	25	DI	25	nvoSysPump	SNVT_switch
Gas Valve 2	BI	26	DI	26	nvoGasValve2	SNVT_switch
Gas Valve 3	BI	27	DI	27	nvoGasValve3	SNVT_switch
Gas Valve 4	BI	28	DI	28	nvoGasValve4	SNVT_switch
Discrete Inputs 01-16	AI	29	AI	29	nvoDI_01_16	SNVT_count_f
Discrete Inputs 17-32	AI	30	AI	30	nvoDI_17_32	SNVT_count_f
Discrete Inputs 33-48	AI	31	AI	31	nvoDI_33_48	SNVT_count_f
System Cascade Setpoint	AI	32	AI	32	nvoSysCascadeSP	SNVT_temp_p
System Pump Speed	AI	33	AI	33	nvoSysPumpSpeed	SNVT_lev_percent
Cascade Total Power	AI	34	AI	34	nvoCascdTotPwr	SNVT_lev_percent
Cascade Current Power	AI	35	AI	35	nvoCascdCrntPwr	SNVT_lev_percent
Outlet Setpoint	AI	36	AI	36	nvoOutletSP	SNVT_temp_p
Outlet Temperature	AI	37	AI	37	nvoOutletTmp	SNVT_temp_p
Inlet Temperature	AI	38	AI	38	nvoInletTmp	SNVT_temp_p
Pool Temperature	AI	39	AI	39	nvoPoolTmp	SNVT_temp_p
Firing Rate	AI	40	AI	40	nvoFiringRate	SNVT_lev_percent
Boiler Status Code	AI	41	AI	41	nvoBlrStatusCode	SNVT_count_f
Boiler Blocking Code	AI	42	AI	42	nvoBlrBlckngCode	SNVT_count_f
Boiler Lockout Code	AI	43	AI	43	nvoBlrLckOutCode	SNVT_count_f
Configuration	AV	45	AO	45	nvi/nvoConfiguration	SNVT_count_f
Coils	AV	46	AO	46	nvi/nvoCoils	SNVT_count_f
0-10 Volt Input	AV	47	AO	47	nvi/nvo0_10VoltInput	SNVT_lev_percent
Pool Setpoint	AV	48	AO	48	nvi/nvoPoolSetpoint	SNVT_temp_p
Tank Temperature	AV	49	AO	49	nvi/nvoTankTmp	SNVT_temp_p
Outdoor Temperature	AV	50	AO	50	nvi/nvoOutdoorTmp	SNVT_temp_p
System Supply Temperature	AV	51	AO	51	nvi/nvoSysSupplyTmp	SNVT_temp_p
System Return Temperature	AV	52	AO	52	nvi/nvoSysReturnTmp	SNVT_temp_p



**Appendix B.5. Power Fin 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
Boiler Enable/Room Thermostat 1/Stg 1	BV	1	DO	1	i/oBlrEn_Stg1	SNVT_switch
Tank Thermostat	BV	2	DO	2	i/oTankThermostat	SNVT_switch
Manual Reset High Limit 1	BI	3	DI	3	oManResHiLim1	SNVT_switch
Flow Switch 1	BI	4	DI	4	oFLoSw1	SNVT_switch
Gas Pressure Switch 1	BI	5	DI	5	oGasPrsSw1	SNVT_switch
Louver Proving Switch 1	BI	6	DI	6	oLouverProvSw1	SNVT_switch
Air Pressure Switch/Flap Vlv 1	BI	7	DI	7	oAirPrsSwFlpVlv1	SNVT_switch
Blocked Drain Switch 1	BI	8	DI	8	oBlockedDrainSw1	SNVT_switch
Auto Reset High Limit 1	BI	9	DI	9	oAutoResHiLim1	SNVT_switch
Flame 1	BI	10	DI	10	oFlame1	SNVT_switch
Enable/Room Thermostat 1/Stg 1	BI	11	DI	11	oEnRmThermStg1	SNVT_switch
Tank Thermostat	BI	12	DI	12	oTnkThermostat	SNVT_switch
Run-time Contacts	BI	13	DI	13	oRunTimeContcts	SNVT_switch
Alarm Contacts 1	BI	14	DI	14	oAlarmContacts1	SNVT_switch
CH Pump 1	BI	15	DI	15	oCHPump1	SNVT_switch
DHW Pump 1	BI	16	DI	16	oDHWpump1	SNVT_switch
Gas Vlv 1	BI	17	DI	17	oGasVlv1	SNVT_switch
System Pump	BI	18	DI	18	oSystemPump	SNVT_switch
Mains Fan 1	BI	19	DI	19	oMainsFan1	SNVT_switch
External Spark	BI	20	DI	20	oExtSpark	SNVT_switch
Discrete Inputs 1 - 16	AI	21	AI	21	oDisclnputs1_16	SNVT_count_f
Discrete Inputs 17 - 32	AI	22	AI	22	oDisclnputs17_32	SNVT_count_f
Discrete Inputs 33 - 48	AI	23	AI	23	oDisclnputs33_48	SNVT_count_f
System/Cascade Setpoint	AI	24	AI	24	oSysCascadeSP	SNVT_temp_p
Cascade Total Power	AI	25	AI	25	oCascadeTotalPwr	SNVT_lev_percent
Cascade Current Power	AI	26	AI	26	oCascadeCrrntPwr	SNVT_lev_percent
Outlet Setpoint 1	AI	27	AI	27	oOutletSP1	SNVT_temp_p
Outlet Temperature 1	AI	28	AI	28	oOutletTmp1	SNVT_temp_p
Inlet Temperature 1	AI	29	AI	29	oInletTmp1	SNVT_temp_p
Flue Temperature 1	AI	30	AI	30	oFlueTmp1	SNVT_temp_p
Firing Rate 1	AI	31	AI	31	oFiringRate1	SNVT_lev_percent
Boiler 1 Status Code	AI	32	AI	32	oBlr1StatusCode	SNVT_count_f
Boiler 1 Blocking Code	AI	33	AI	33	oBlr1BlckngCode	SNVT_count_f
Boiler 1 Lockout Code	AI	34	AI	34	oBlr1LockoutCode	SNVT_count_f
Discrete Inputs 49-64	AI	35	AI	35	oDisclnputs49_64	SNVT_count_f
Configuration	AV	36	AO	36	i/oConfiguration	SNVT_count_f
Coils	AV	37	AO	37	i/oCoils	SNVT_count_f
0-10 Volt Input/Rate Cmd/SP Cmd	AV	38	AO	38	i/o0_10VltInRtCmd	SNVT_lev_percent
Tank Setpoint	AV	39	AO	39	i/oTankSP	SNVT_temp_p
Tank Temperature	AV	40	AO	40	i/oTankTmp	SNVT_temp_p
Outdoor Temperature	AV	41	AO	41	i/oOutdoorTmp	SNVT_temp_p
System Supply Temperature	AV	42	AO	42	i/oSysSupplyTmp	SNVT_temp_p
System Return Temperature	AV	43	AO	43	i/oSysReturnTmp	SNVT_temp_p

**Appendix B.6. Knight FTXL 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
Room Thermostat 1	BV	1	DO	1	i/oRmThermostat1	SNVT_switch
Room Thermostat 2	BV	2	DO	2	i/oRmThermostat2	SNVT_switch
Room Thermostat 3	BV	3	DO	3	i/oRmThermostat3	SNVT_switch
Tank Thermostat	BV	4	DO	4	i/oTankThermostat	SNVT_switch
Flow Switch	BI	5	DI	5	oFlowSw	SNVT_switch
Gas Pressure Switch	BI	6	DI	6	oGasPressureSw	SNVT_switch
Louver Proving Switch	BI	7	DI	7	oLouverPrvingSw	SNVT_switch
Air Pressure Switch	BI	8	DI	8	oAirPressureSw	SNVT_switch
Blocked Drain Switch	BI	9	DI	9	oBlockedDrainSw	SNVT_switch
Auto Reset High Limit	BI	10	DI	10	oAutoResetHiLim	SNVT_switch

Flame	BI	11	DI	11	oFlame	SNVT_switch
Room Thermostat 1	BI	12	DI	12	oRmThmostat1	SNVT_switch
Tank Thermostat	BI	13	DI	13	oTnkThmostat	SNVT_switch
Room Thermostat 2	BI	14	DI	14	oRmThmostat2	SNVT_switch
Run-time Contacts	BI	15	DI	15	oRunTimeContacts	SNVT_switch
Alarm Contacts	BI	16	DI	16	oAlarmContacts	SNVT_switch
CH Pump	BI	17	DI	17	oCHPump	SNVT_switch
DHW Pump 1	BI	18	DI	18	oDHWpump1	SNVT_switch
Louver Relay	BI	19	DI	19	oLouverRelay	SNVT_switch
Gas Valve	BI	20	DI	20	oGasValve	SNVT_switch
System Pump	BI	21	DI	21	oSystemPump	SNVT_switch
DHW Pump 2	BI	22	DI	22	oDHWpump2	SNVT_switch
Discrete Inputs 1 - 16	AI	23	AI	23	oDisInputs1-16	SNVT_count_f
Discrete Inputs 17 - 32	AI	24	AI	24	oDisInputs17-32	SNVT_count_f
Discrete Inputs 33 - 48	AI	25	AI	25	oDisInputs33-48	SNVT_count_f
System Cascade Setpoint	AI	26	AI	26	oSystemCascadeSP	SNVT_temp_p
System Pump Speed	AI	27	AI	27	oSystemPumpSpeed	SNVT_lev_percent
Cascade Total Power	AI	28	AI	28	oCascadeTotalPwr	SNVT_lev_percent
Cascade Current Power	AI	29	AI	29	oCascadeCrrntPwr	SNVT_lev_percent
Outlet Setpoint	AI	30	AI	30	oOutletSP	SNVT_temp_p
Outlet Temperature	AI	31	AI	31	oOutletTmp	SNVT_temp_p
Inlet Temperature	AI	32	AI	32	oInletTmp	SNVT_temp_p
Flue Temperature	AI	33	AI	33	oFlueTmp	SNVT_temp_p
Firing Rate	AI	34	AI	34	oFiringRate	SNVT_lev_percent
Boiler Pump Speed	AI	35	AI	35	oBlrPumpSpeed	SNVT_lev_percent
Boiler Status Code	AI	36	AI	36	oBlrStatusCode	SNVT_count_f
Boiler Blocking Code	AI	37	AI	37	oBlrBlockingCode	SNVT_count_f
Boiler Lockout Code	AI	38	AI	38	oBlrLockoutCode	SNVT_count_f
Configuration	AV	39	AO	39	i/oConfiguration	SNVT_count_f
Coils	AV	40	AO	40	i/oCoils	SNVT_count_f
0-10 Volt Input/Rate Cmd/SP Cmd	AV	41	AO	41	i/o0_10VltInRtCmd	SNVT_lev_percent
Tank Setpoint	AV	42	AO	42	i/oTankSP	SNVT_temp_p
Tank Temperature	AV	43	AO	43	i/oTankTmp	SNVT_temp_p
Outdoor Temperature	AV	44	AO	44	i/oOutdoorTmp	SNVT_temp_p
System Supply Temperature	AV	45	AO	45	i/oSystemSupplyTmp	SNVT_temp_p
System Return Temperature	AV	46	AO	46	i/oSystemReturnTmp	SNVT_temp_p

**Appendix B.7. Power Fin 2.5-5.0 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
Boiler Enable/Room Thermostat 1/Stg 1	BV	1	DO	1	i/oBlrEn_Stg1	SNVT_switch
Tank Thermostat Cmd	BV	2	DO	2	i/oTankThermostat	SNVT_switch
Manual Reset High Limit 1	BI	3	DI	3	oManResHiLim1	SNVT_switch
Flow Switch 1	BI	4	DI	4	oFLoSw1	SNVT_switch
Gas Pressure Switch 1	BI	5	DI	5	oGasPrsSw1	SNVT_switch
Louver Proving Switch 1	BI	6	DI	6	oLouverProvSw1	SNVT_switch
Blocked Drain Switch 1	BI	7	DI	7	oBlockedDrainSw1	SNVT_switch
Flame 1	BI	8	DI	8	oFlame1	SNVT_switch
Enable/Room Thermostat 1/Stg 1	BI	9	DI	9	oEnRmThermStg1	SNVT_switch
Tank Thermostat	BI	10	DI	10	oTnkThermostat	SNVT_switch
Stage 2/Air Pressure Switch	BI	11	DI	11	oStg2ArPrsSwitch	SNVT_switch
Air Pres Switch 2/Flap Vlv 2/Flue Vlv	BI	12	DI	12	oArPrsSw2FipVlv2	SNVT_switch
Run-time Contacts	BI	13	DI	13	oRunTimeContcts	SNVT_switch
Alarm Contacts 1	BI	14	DI	14	oAlarmContacts1	SNVT_switch
CH Pump 1	BI	15	DI	15	oCHPump1	SNVT_switch
DHW Pump 1	BI	16	DI	16	oDHWpump1	SNVT_switch
Louver Relay 1	BI	17	DI	17	oLouvRelay1	SNVT_switch
Gas Vlv 1	BI	18	DI	18	oGasVlv1	SNVT_switch
System Pump	BI	19	DI	19	oSystemPump	SNVT_switch
DHW Pump 2/Flue Valve	BI	20	DI	20	oDHWpmp2FIVlve	SNVT_switch
Mains Fan 1	BI	21	DI	21	oMainsFan1	SNVT_switch
External Spark	BI	22	DI	22	oExtSpark	SNVT_switch

Discrete Inputs 1 - 16	AI	23	AI	23	oDisclnputs1_16	SNVT_count_f
Discrete Inputs 17 - 32	AI	24	AI	24	oDisclnputs17_32	SNVT_count_f
Discrete Inputs 33 - 48	AI	25	AI	25	oDisclnputs33_48	SNVT_count_f
System/Cascade Setpoint	AI	26	AI	26	oSysCascadeSP	SNVT_temp_p
System Pump Speed	AI	27	AI	27	oSystemPumpSpeed	SNVT_lev_percent
Cascade Total Power	AI	28	AI	28	oCascadeTotalPwr	SNVT_lev_percent
Cascade Current Power	AI	29	AI	29	oCascadeCrrntPwr	SNVT_lev_percent
Outlet Setpoint 1	AI	30	AI	30	oOutletSP1	SNVT_temp_p
Outlet Temperature 1	AI	31	AI	31	oOutletTmp1	SNVT_temp_p
Inlet Temperature 1	AI	32	AI	32	oInletTmp1	SNVT_temp_p
Flue Temperature 1	AI	33	AI	33	oFlueTmp1	SNVT_temp_p
Firing Rate 1	AI	34	AI	34	oFiringRate1	SNVT_lev_percent
Boiler 1 Pump Speed	AI	35	AI	35	oBlr1PumpSpeed	SNVT_lev_percent
Boiler 1 Status Code	AI	36	AI	36	oBlr1StatusCode	SNVT_count_f
Boiler 1 Blocking Code	AI	37	AI	37	oBlr1BlckngCode	SNVT_count_f
Boiler 1 Lockout Code	AI	38	AI	38	oBlr1LockoutCode	SNVT_count_f
Discrete Inputs 49-64	AI	39	AI	39	oDisclnputs49_64	SNVT_count_f
Lockout Error Leader	AI	40	AI	40	oLckOutErrLdr	SNVT_count_f
Lockout Error Member 1	AI	41	AI	41	oLckOutErrM1	SNVT_count_f
Lockout Error Member 2	AI	42	AI	42	oLckOutErrM2	SNVT_count_f
Lockout Error Member 3	AI	43	AI	43	oLckOutErrM3	SNVT_count_f
Lockout Error Member 4	AI	44	AI	44	oLckOutErrM4	SNVT_count_f
Lockout Error Member 5	AI	45	AI	45	oLckOutErrM5	SNVT_count_f
Lockout Error Member 6	AI	46	AI	46	oLckOutErrM6	SNVT_count_f
Lockout Error Member 7	AI	47	AI	47	oLckOutErrM7	SNVT_count_f
Configuration	AV	48	AO	48	i/oConfiguration	SNVT_count_f
Coils	AV	49	AO	49	i/oCoils	SNVT_count_f
0-10 Volt Input/Rate Cmd/SP Cmd	AV	50	AO	50	i/o0_10VltInRtCmd	SNVT_lev_percent
Tank Setpoint	AV	51	AO	51	i/oTankSP	SNVT_temp_p
Tank Temperature	AV	52	AO	52	i/oTankTmp	SNVT_temp_p
Outdoor Temperature	AV	53	AO	53	i/oOutdoorTmp	SNVT_temp_p
System Supply Temperature	AV	54	AO	54	i/oSysSupplyTmp	SNVT_temp_p
System Return Temperature	AV	55	AO	55	i/oSysReturnTmp	SNVT_temp_p

**Appendix B.8. IPW 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
Outlet Temperature	AI	1	AI	1	nvoOutletTemp	SNVT_temp_p
Inlet Temperature	AI	2	AI	2	nvoInletTemp	SNVT_temp_p
Outlet Voltage	AI	3	AI	3	nvoOutletVoltage	SNVT_count_f
Setpoint	AV	4	AO	4	nvi/nvoSetpoint	SNVT_temp_p

**Appendix C. "A" Bank DIP Switch Settings**

**Appendix C.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
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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
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97	On	Off	Off	Off	Off	On	On	Off
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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
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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
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227	On	On	Off	Off	Off	On	On	On
228	Off	Off	On	Off	Off	On	On	On
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230	Off	On	On	Off	Off	On	On	On
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234	Off	On	Off	On	Off	On	On	On
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236	Off	Off	On	On	Off	On	On	On
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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 D. Reference

Appendix D.1. Specifications



	ProtoNode FPC-N34	ProtoNode FPC-N35
<b>Electrical Connections</b>	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
<b>Approvals</b>	CE Certified; TUV approved to UL 916, EN 60950-1, EN 50491-3 and CSA C22-2 standards; FCC Class A Part 15; DNP 3.0 Conformance Tested; RoHS Compliant; CSA 205 Approved	
	BTL Marked	LonMark Certified
<b>Power Requirements</b>	Multi-mode power adapter: 9-30V DC or 12 - 24V AC	
<b>Physical Dimensions</b>	11.5 cm L x 8.3 cm W x 4.1 cm H (4.5 x 3.2 x 1.6 in.)	
<b>Weight</b>	0.2 kg (0.4 lbs)	
<b>Operating Temperature</b>	-40°C to 75°C (-40°F to 167°F)	
<b>Surge Suppression</b>	EN61000-4-2 ESD EN61000-4-3 EMC EN61000-4-4 EFT	
<b>Humidity</b>	5 - 90% RH (non-condensing)	
(Specifications subject to change without notice)		

Figure 31: Specifications

Appendix D.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.

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**Appendix E. Limited 2 Year Warranty**

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Sierra Monitor Corporation warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. Sierra Monitor Corporation 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 Sierra Monitor Corporation 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 Sierra Monitor Corporation'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 Sierra Monitor Corporation'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, Sierra Monitor Corporation 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 Sierra Monitor Corporation for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.