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

For Interfacing Peerless PureFire Boilers Products: 852IF, PFA-1

To Building Automation Systems: BACnet MS/TP, BACnet/IP and LonWorks

APPLICABILITY & EFFECTIVITY

Explains ProtoNode hardware and installation.

The instructions are effective for the above as of November 2016.

Document Revision: 1.C
Auto Discovery
Template Revision: 63

Technical Support

Thank you for purchasing the ProtoNode for Peerless PureFire Boilers.

Please call PB Heat, LLC for Technical support of the ProtoNode product.

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

Support Contact Information:

PB Heat, LLC
131 S Church St,
Bally, PA 19503

Technical Service:

(610) 845-6130 (choose option 3 then option 4)

Email: info@pbheat.com

Website: www.peerlessboilers.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 each of the devices that are to connect to ProtoNode FPC-N34 or FPC-N35. (**Section** 3.3)
3. FPC-N34: Select the Field Protocol on the S Bank Dip Switches. (**Section** 3.4.1)
4. Enable the ProtoNode "Auto Discovery" mode on Dip Switch Bank S. (**Section** 3.4.2)
5. BACnet MS/TP (FPC-N34): Set the MAC Address on DIP Switch Bank A. (**Section** 3.5.1)
6. BACnet MS/TP (FPC-N34): Set the BAUD rate of the BACnet MS/TP Field Protocol on DIP Switch Bank B. (**Section** 3.5.2)
7. Connect ProtoNode's 6 pin RS-485 connector to the RS-485 network that is connected to each of the devices. (**Section** 4.2)
8. **Connect ProtoNode FPC-N34's** 3 pin RS-485 port to the Field Protocol cabling, (**Section** 4.3)
   or connect ProtoNode FPC-N35's 2 pin LonWorks port to the Field Protocol cabling. (**Section** 4.4)
9. Connect Power to ProtoNode's 6 pin connector. (**Section** 4.5)
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. BACnet/IP (FPC-N34): Use the ProtoNode's embedded tool which is accessed with a browser, referred to in this manual as the Web Configurator, to change the IP Address. No changes to the configuration file are necessary. (**Section** 5)
12. 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)

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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 http://www.BACnetInternational.net/btl/ for more information about the BACnet Testing Laboratory. Click here for 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.

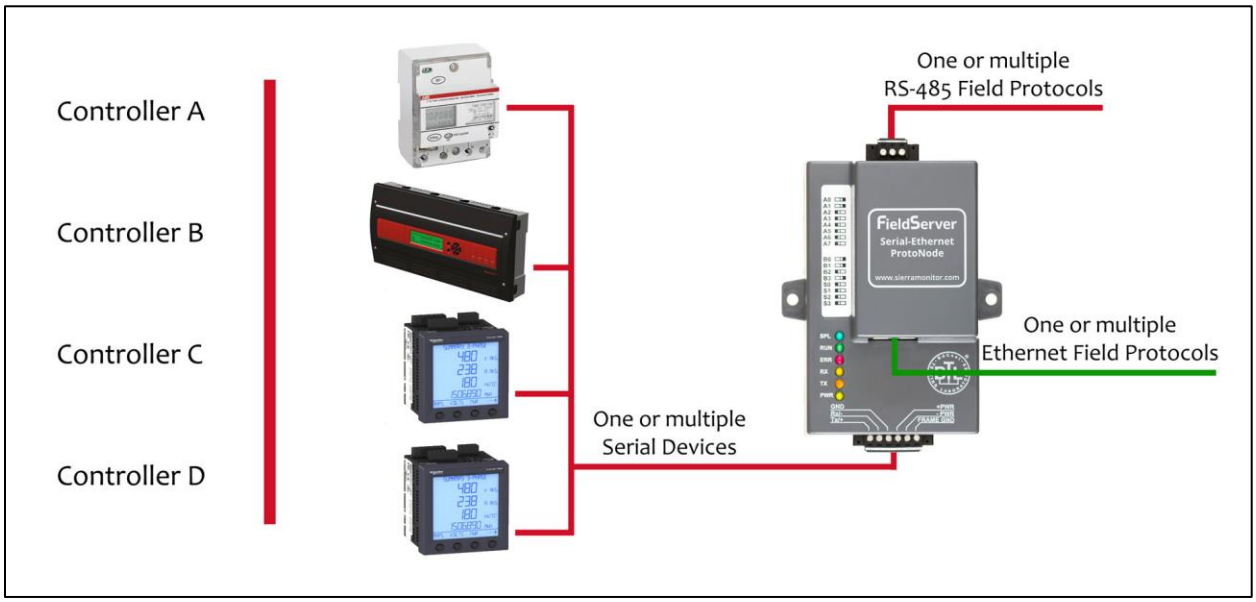
[1] BACnet is a registered trademark of ASHRAE

2 INTRODUCTION

2.1 ProtoNode Gateway

ProtoNode is an external, high performance **Building Automation multi-protocol gateway** that is preconfigured to Auto-Discover any of Peerless PureFire Boilers' products (hereafter called "device") connected to the ProtoNode and automatically configures them for BACnet MS/TP, BACnet/IP or LonWorks®[2].

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.



[2] LonWorks is a registered trademark of Echelon Corporation

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-N34-0731
ProtoNode N35	FPC-N35-0734

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 and Registers per Device

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

Part number	Total Registers
FPC-N34-0731	1,500
FPC-N35-0734	1,500

Figure 2: Supported Point Count Capacity

Boiler Models	Devices	Registers Per Device
PF-460, PF-850, PF-1000 & PF-1500	852IF	35
PF-50 through PF-399	PFA-1	16

Figure 3: Registers per Device

3.3 Configuring Device Communications

3.3.1 Input COM settings on all Devices connected to the ProtoNode

- **All of the connected serial devices 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.

Port Setting	Device
Protocol	Modbus RTU
Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	1

Figure 4: Modbus COM Settings

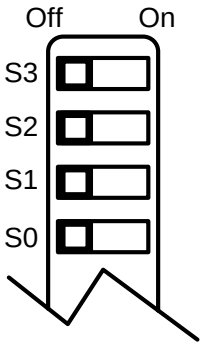
3.3.2 Set Modbus RTU Node-ID for each Device attached to the ProtoNode

- Set Modbus Node-ID for each of the devices attached to ProtoNode. The Modbus Node-ID's need to be uniquely assigned between 1 and 255.
    - **The Modbus Node-ID that is assigned for each device needs to be documented.**
        - The Modbus Node-ID's assigned are used for designating the Device Instance for BACnet/IP and BACnet MS/TP (**Section** 6)

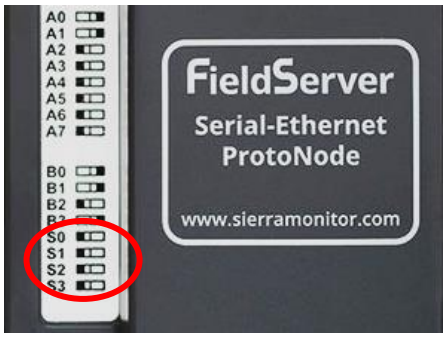
3.4 Selecting the Desired Field Protocol and Enabling Auto-Discovery

3.4.1 Selecting Desired Field Protocol

- ProtoNode FPC-N34 units use the "S" bank of DIP switches (S0 – S2) to select the Field Protocol.
  - 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 Field 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

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

- 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-Discover 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 addresses 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 can not 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 C.1** for the complete range of MAC Addresses and DIP switch settings.

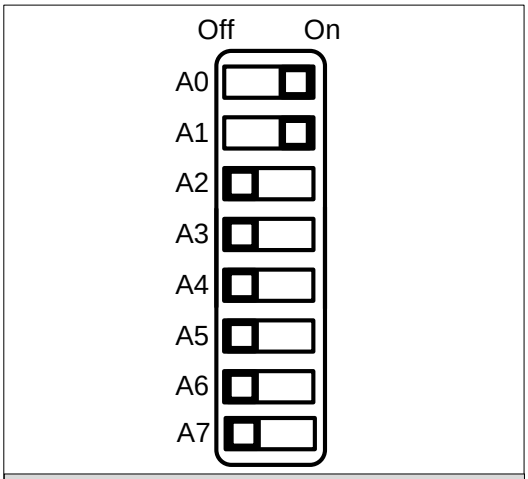


Figure 7: MAC Address DIP Switches

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

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

- "B" bank DIP switches B0 – B3 can be used to set the Field baud rate of the ProtoNode to match the baud rate required by the Building Management System for BACnet MS/TP.
- "B" bank DIP switches B0 – B3 are disabled on ProtoNode FPC-N35 (LonWorks).

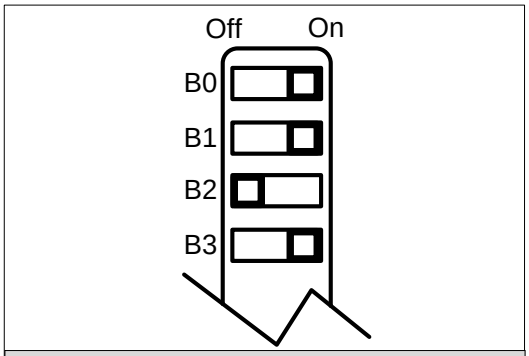


Figure 8: BMS Baud Rate DIP Switches

3.5.2.1 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

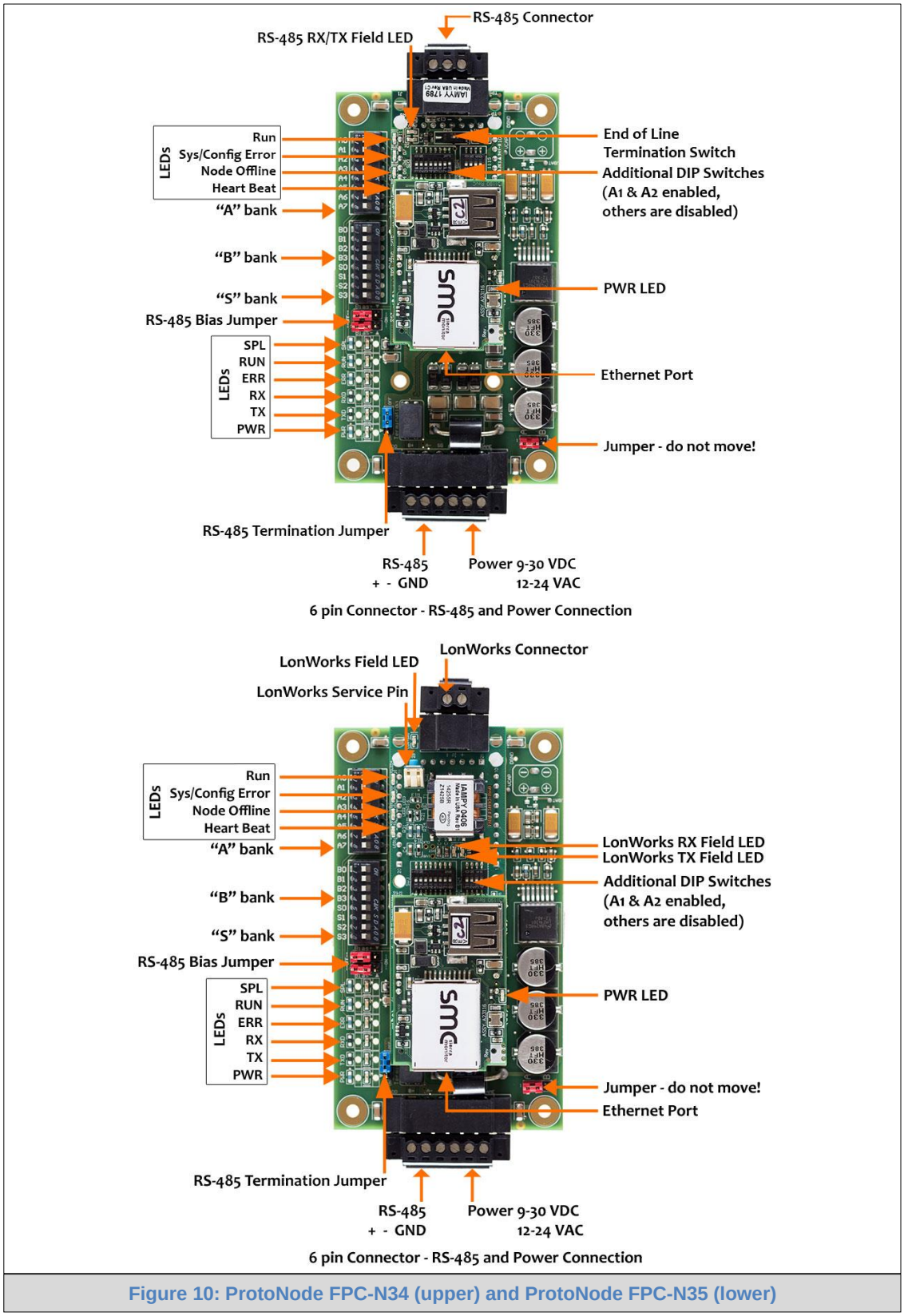


Figure 10: ProtoNode FPC-N34 (upper) and ProtoNode FPC-N35 (lower)

4.2 Device Connections to ProtoNode

ProtoNode 6 Pin Phoenix connector for RS-485 Devices.

- 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 until Section 4.5**.

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

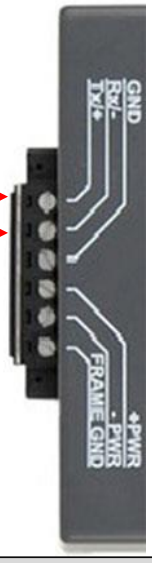


Figure 11: Power and RS-485 Connections

4.2.1 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 12**)
- **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.

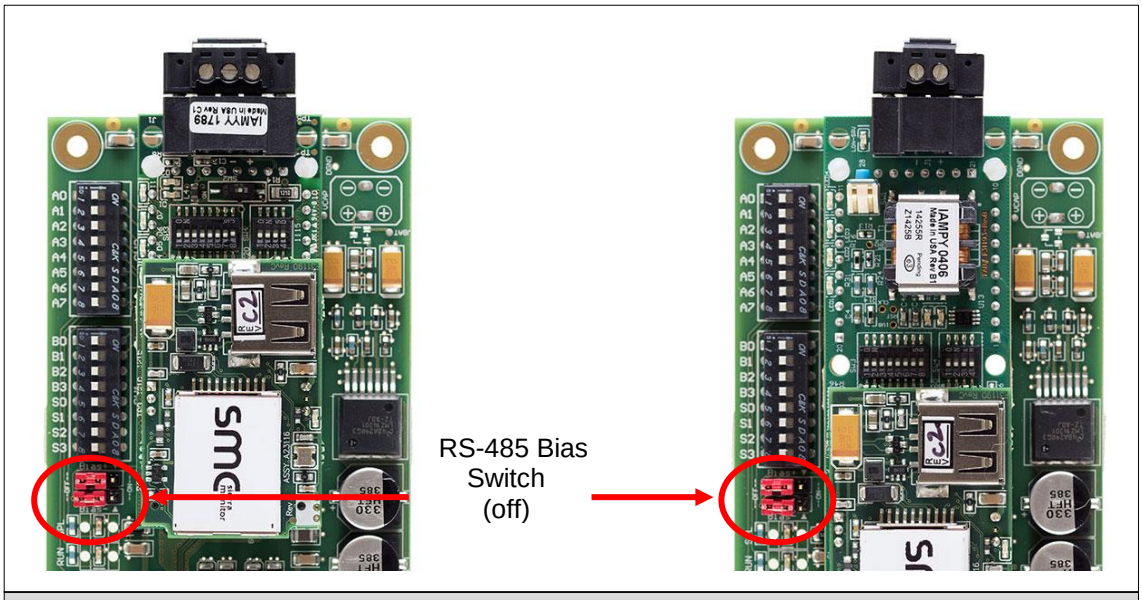


Figure 12: Modbus RS-485 Biasing Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)

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 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).**

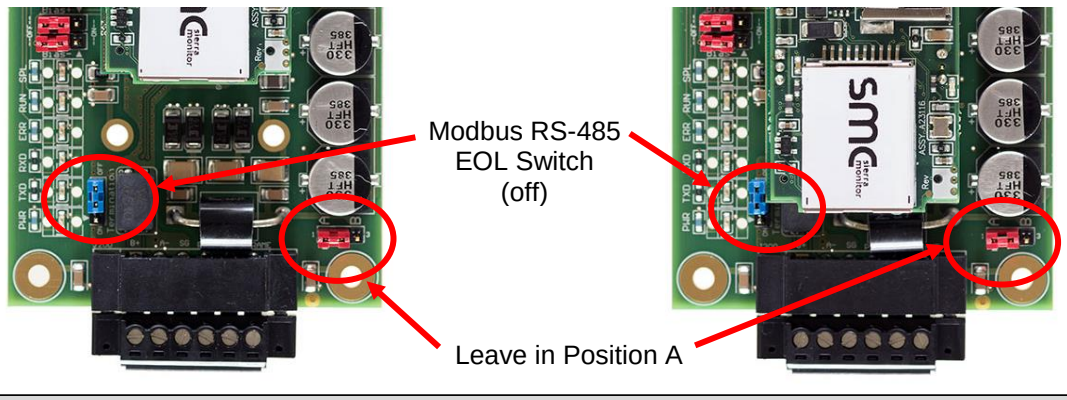


Figure 13: Modbus RS-485 End-Of-Line Termination Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)

4.3 BACnet MS/TP (FPC-N34): Wiring Field Port to RS-485 Network

- Connect the BACnet MS/TP RS-485 network wires to the 3-pin RS-485 connector on ProtoNode FPC-N34. (**Figure 14**)
  - Use standard grounding principles for RS-485 GND
- See **Section 5.2** for information on connecting to BACnet/IP network.
- If the ProtoNode is the last device on the BACnet MS/TP 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)

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

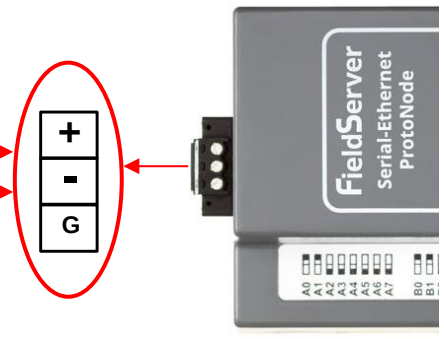


Figure 14: Connection from ProtoNode to RS-485 Field Network

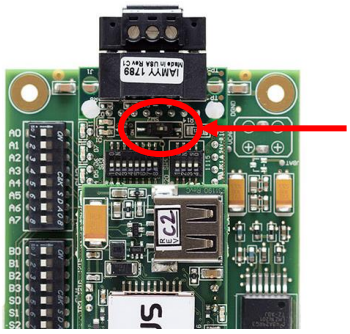


Figure 15: RS-485 BMS Network EOL Switch

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			
	Current Draw Type		
ProtoNode Family	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 ProtoNode as show 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.**

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

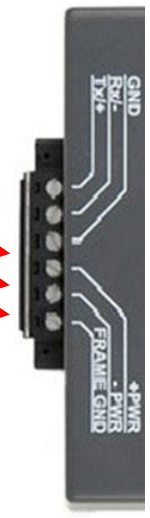


Figure 18: Power Connections

4.5.1 Auto-Discovery: After Completion – Turn Off to Save Configuration

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 to a ProtoNode that is set to Enable Auto-Discovery, it will take 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. The "TX" LED will stop flashing when completed.
- **Once the ProtoNode has discovered all of the RS-485 devices, set the S3 DIP switch to the OFF position to save the current configuration.**
- Then turn the power to the ProtoNode back ON. The stored configuration is now loaded.

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

Figure 19: S3 DIP Switch setting for Auto Discovering Devices

5 BACNET/IP: CHANGE THE PROTONODE IP ADDRESS

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 XP:

  Go to 

> 

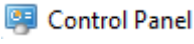
> 

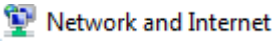
  Right-click on Local Area Connection > Properties

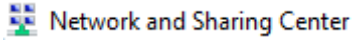
  Highlight 

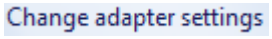
> 

- For Windows 7 or later:

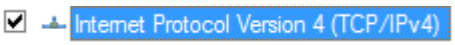
  Go to 
> 

> 

> 

> 

  Right-click on Local Area Connection > Properties

  Highlight 

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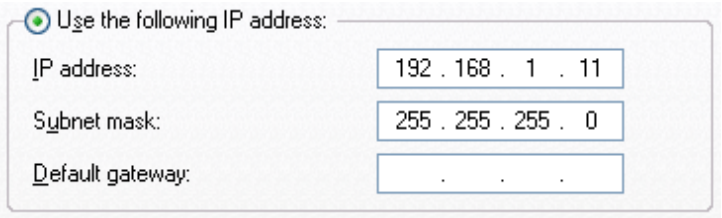
- For Windows XP and Windows 7, use the following IP Address:



- Click 

twice.

5.2 BACnet/IP: 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 **Appendix A.1** for instructions.

- The Web Configurator is displayed as the landing page. (**Figure 20**)

NOTE: Below the "Active profiles" heading are listed the profiles for connected devices. 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.

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.

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

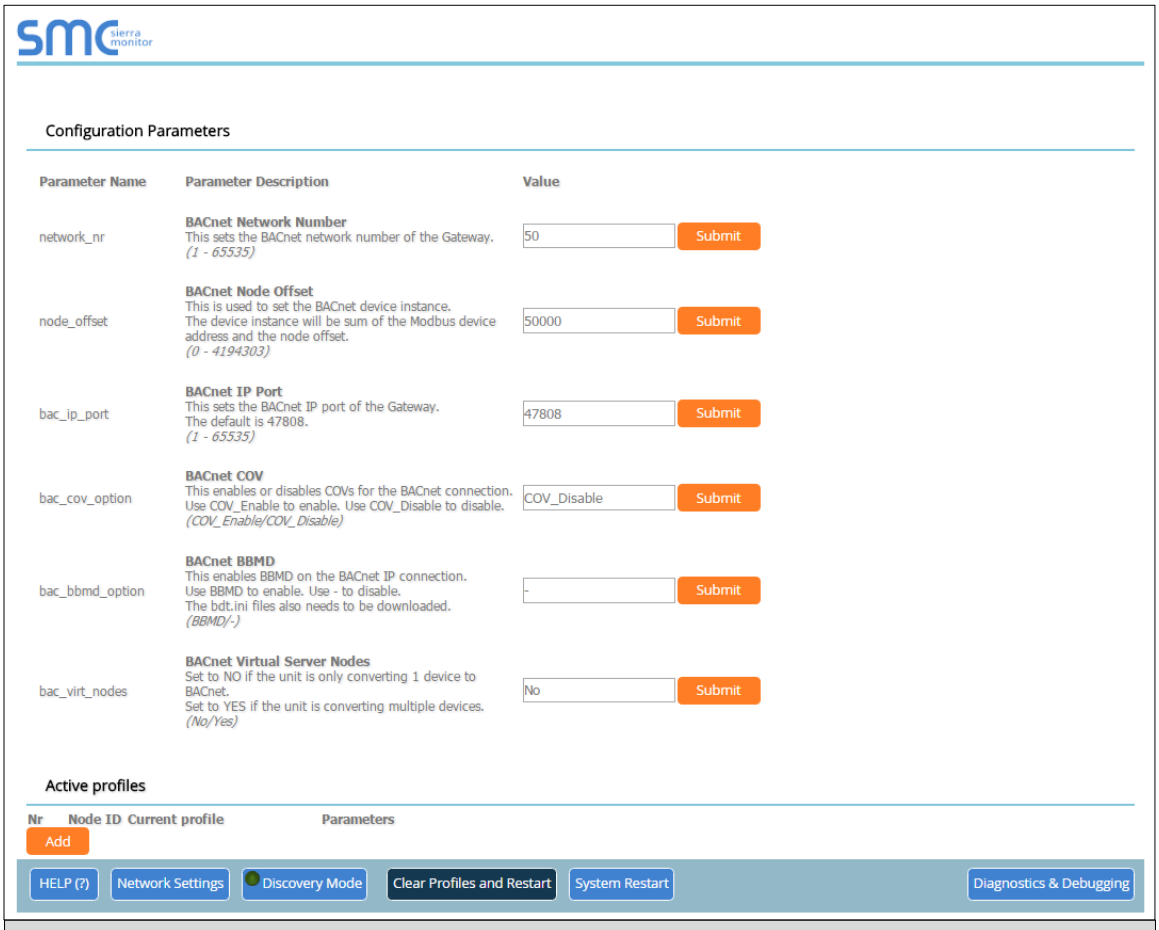


Figure 20: Web Configurator Screen

- 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 21)

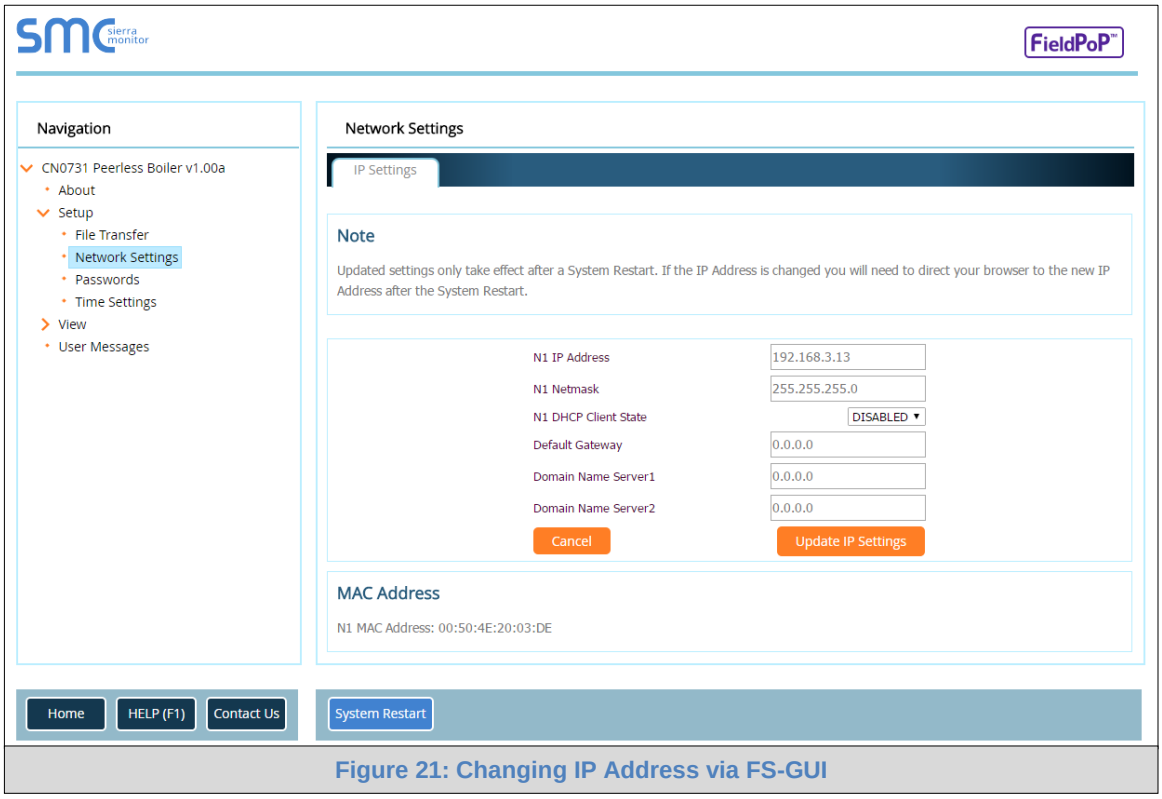


Figure 21: Changing IP Address via FS-GUI

- Modify the IP Address (N1 IP Address field) of the ProtoNode Ethernet port.
- If necessary, change the Netmask (N1 Netmask field).
- Type in a new Subnet Mask.
- If necessary, change the IP Gateway (Default Gateway field).
- Type in a new IP Gateway.

NOTE: If the ProtoNode is connected to a router, the IP Gateway of the ProtoNode should be set to the IP Address as the router.

- Reset ProtoNode.
- Unplug Ethernet cable from PC and connect it to the network hub or router.
- **Record the IP Address assigned to the ProtoNode for future reference.**

NOTE: For FieldPoP™ information, refer to the FieldPoP™ Device Cloud Start-up Guide online at the Sierra Monitor.com Resource Center.
www.sierramonitor.com/customer-care/resource-center

6 BACNET MS/TP AND BACNET/IP: 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 will need to be obtained from the network administrator.
    - The Web Configurator is displayed as the landing page. (**Figure 22**)
- 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 + Modbus Node_ID

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

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

    1,001 = Node_Offset + 1

    ➢ **1,000 = Node_Offset**

    Once the Node_Offset value is input, it will be applied to all devices as shown below:
    - Device 1 Instance = 1,000 + Modbus Node_ID = 1,000 + 1 = 1,001
    - Device 2 Instance = 1,000 + Modbus Node_ID = 1,000 + 2 = 1,022
    - Device 3 Instance = 1,000 + Modbus Node_ID = 1,000 + 3 = 1,033
- Click “Submit” once the desired value is entered.

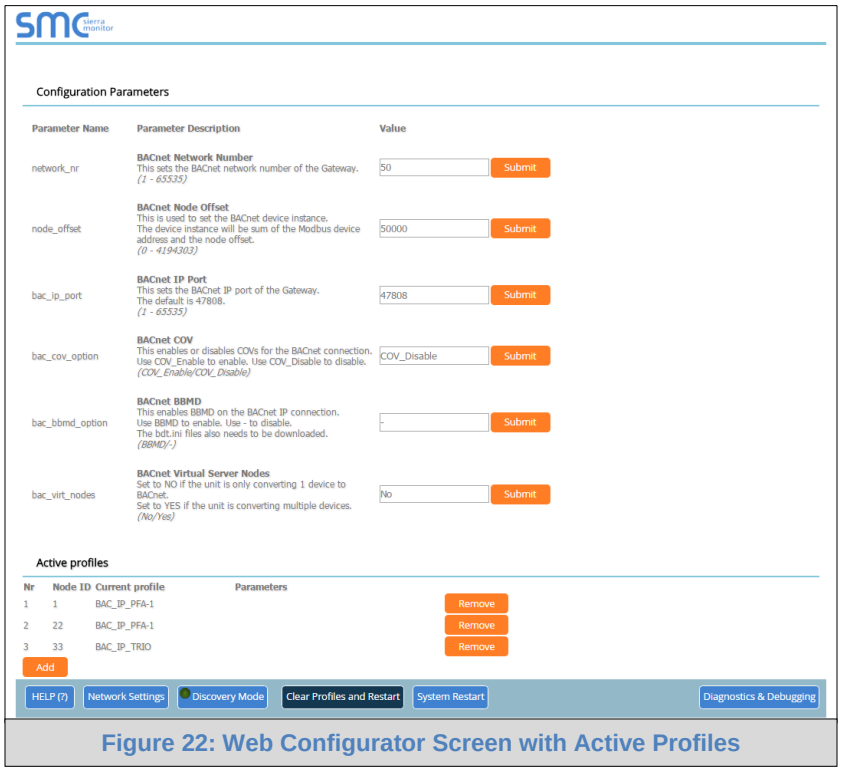


Figure 22: Web Configurator Screen with Active Profiles

7 HOW TO START THE INSTALLATION OVER: CLEARING PROFILES

- 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 will need to be obtained from the network administrator.
- The Web Configurator is displayed as the landing page.
- **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 will 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 23: LonWorks Service Pin Location

8.1.1 Instructions to Download 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 XP:

  Go to start > Control Panel > Network Connections

  Right-click on Local Area Connection > Properties

  Highlight Internet Protocol (TCP/IP) > Properties

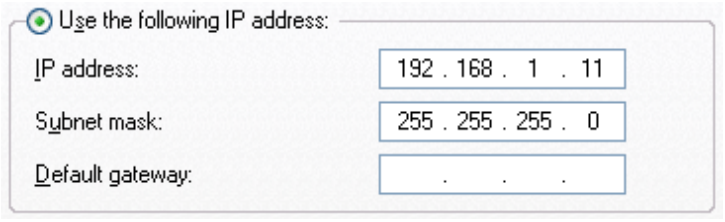
- For Windows 7 or later:

  Go to > 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) > Properties

- For Windows XP and Windows 7, use the following IP Address:



- Click 

twice.
- 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 24: Sample of Fserver.XIF File Generated

9 BACNET EXPLORER

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

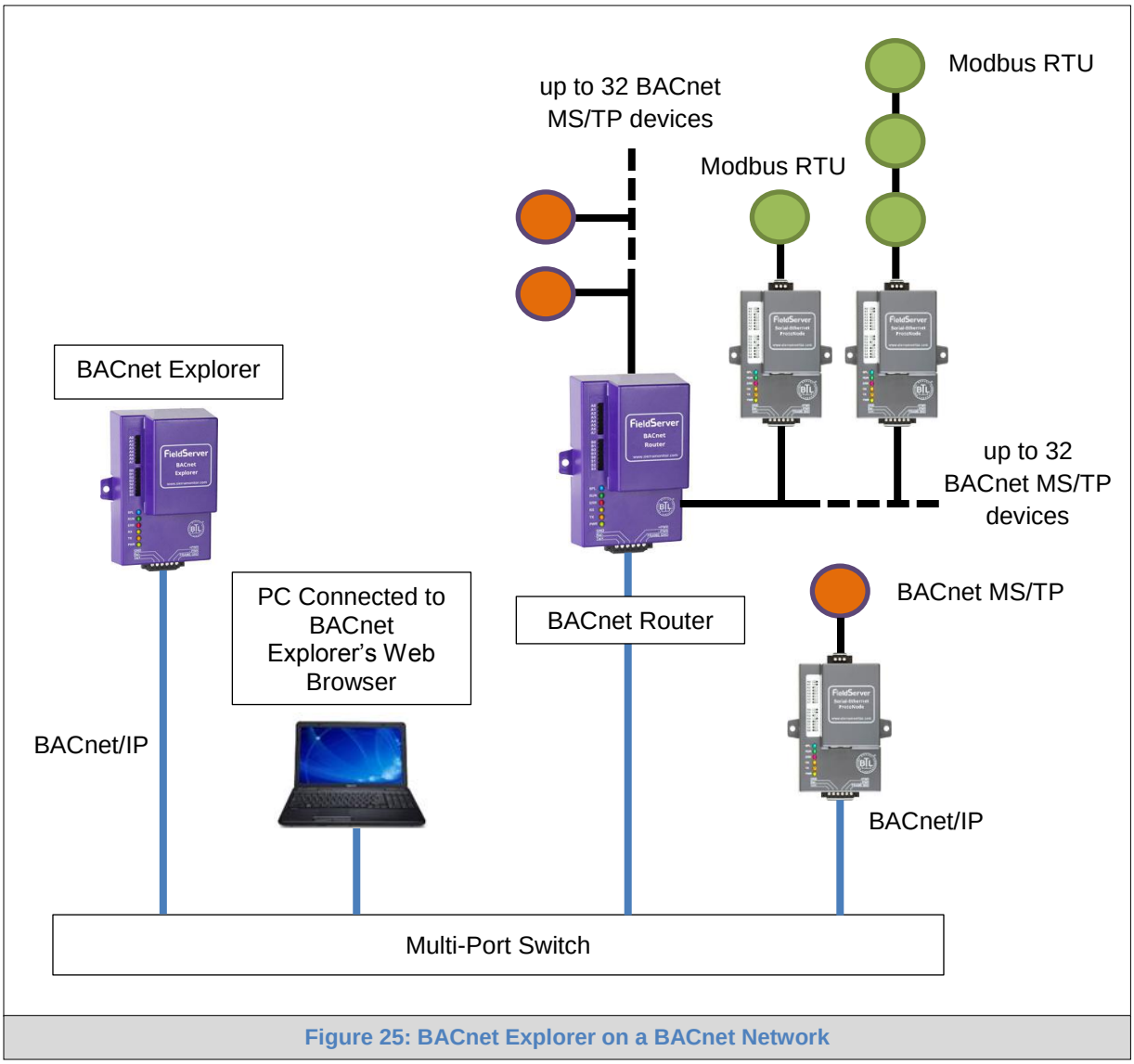


Figure 25: BACnet Explorer on a BACnet Network

For additional details related to the BACnet Explorer, go to the Sierra Monitor Resource Center (www.sierramonitor.com/customer-care/resource-center) and download the BACnet Explorer Start-up Guide.

For purchasing information, look up the BACnet Explorer page on the Sierra Monitor website (www.sierramonitor.com/connect/all-protocol-gateway-products/bacnet-explorer) 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. If not, download FieldServer-Toolbox.zip on the Sierra Monitor web page, under Customer Care-Resource Center, Software Downloads:
  http://www.sierramonitor.com/customer-care/resource-center?filters=software-downloads
- Extract the executable file and complete the installation.

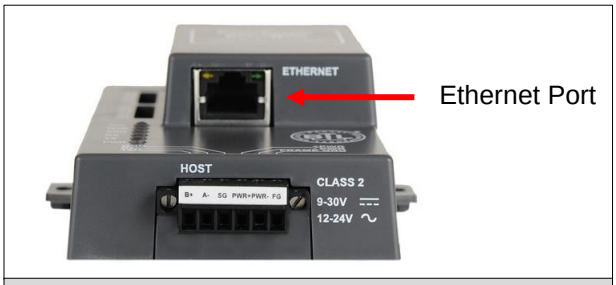
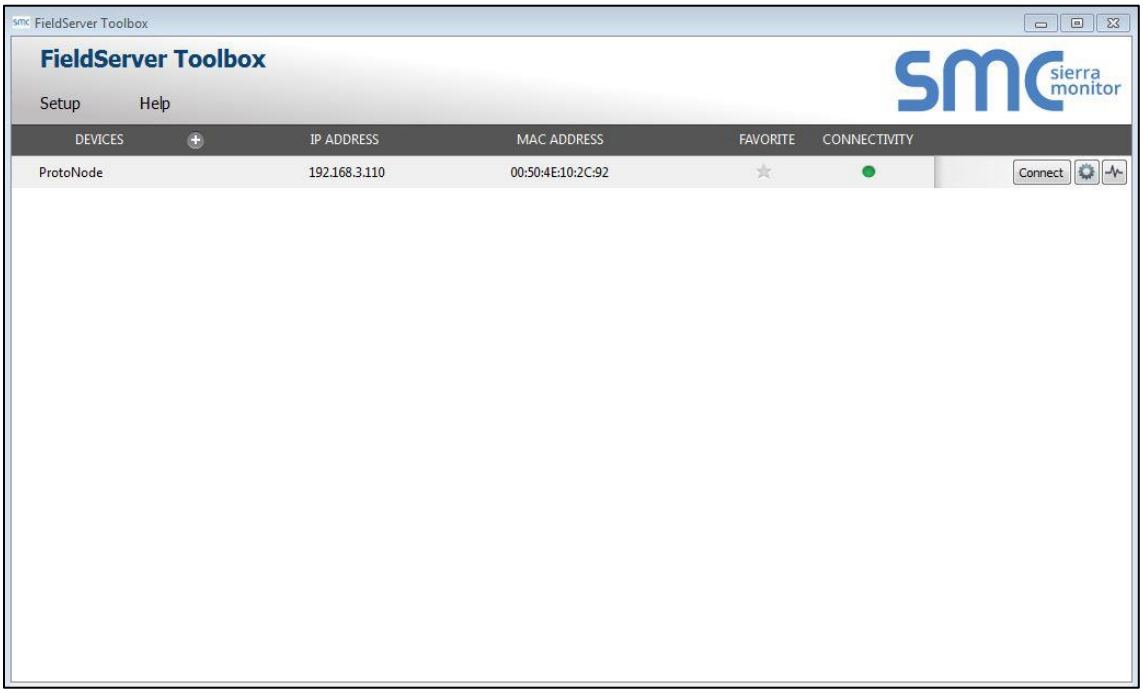


Figure 26: Ethernet Port Location

- Disable firewall and virus protection software if possible.
- Connect a standard CAT5 Ethernet cable between the PC and ProtoNode.
- Double click on the FS Toolbox Utility.
- Check IP Addresses from the Device listings.



- Correct IP Address(es) by right clicking the settings icon and changing the IP Address.

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.

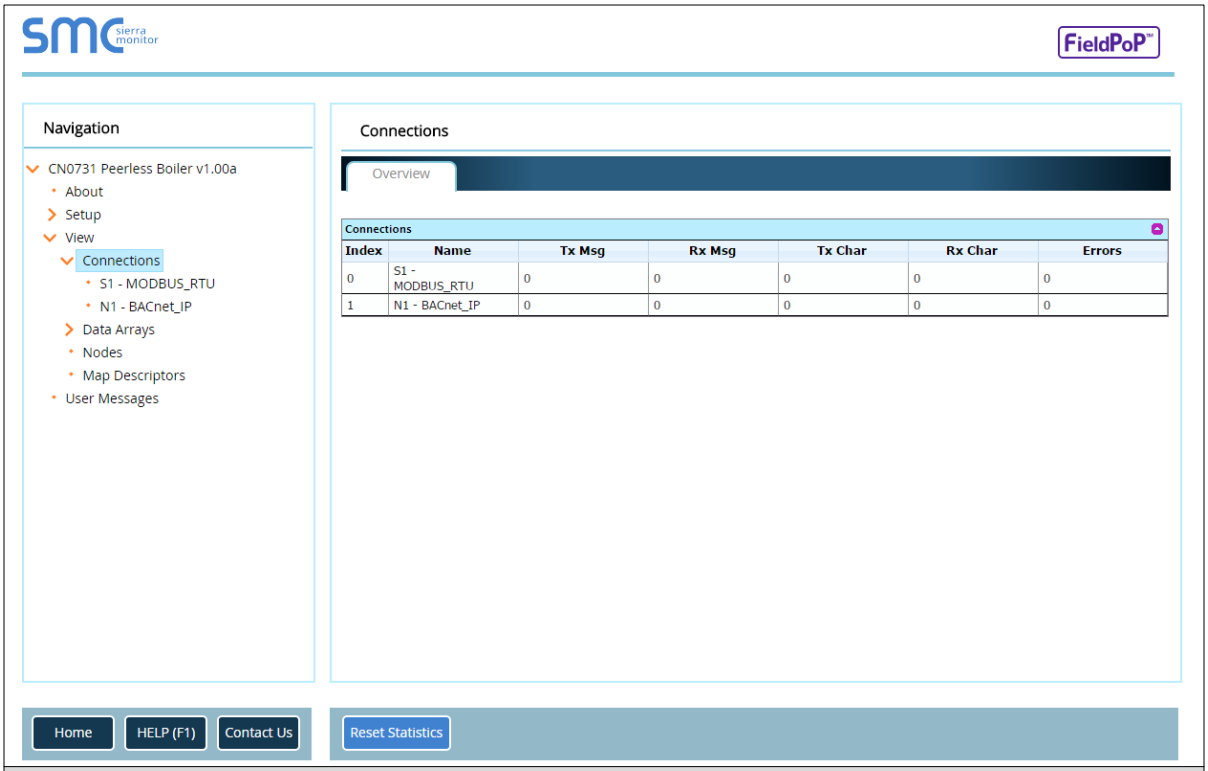


Figure 27: Error messages screen

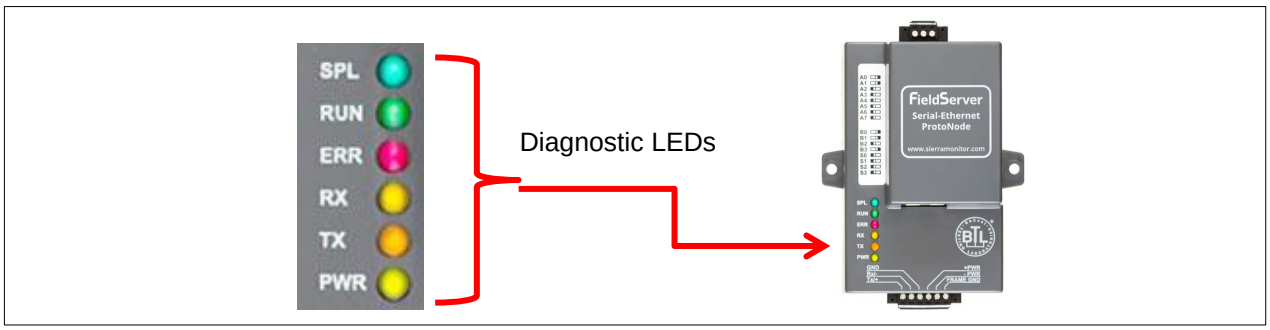
Appendix A.3. Checking Wiring and Settings

- 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 Modbus device is connected to the same subnet as the ProtoNode
  - Verify the 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 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	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 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	This is the power light and should show steady green at all times when the unit is powered.

Figure 28: Diagnostic LEDs

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

- **Once the Diagnostic Capture is complete, email it to info@pbheat.com. The Diagnostic Capture will accelerate diagnosis of the problem.**
- Ensure that FieldServer Toolbox is Loaded on the PC that is currently being used, or download FieldServer-Toolbox.zip on the Sierra Monitor Corporation web page, under Customer Care-Resource Center, Software Downloads:
  http://www.sierramonitor.com/customer-care/resource-center?filters=software-downloads
- Extract the executable file and complete the installation.

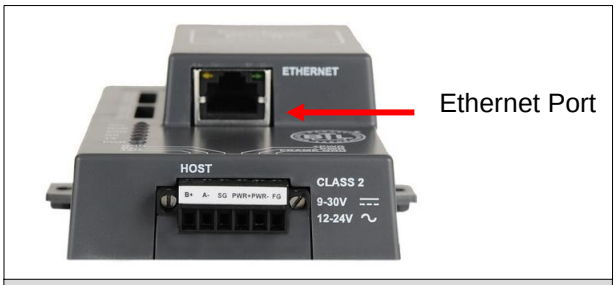
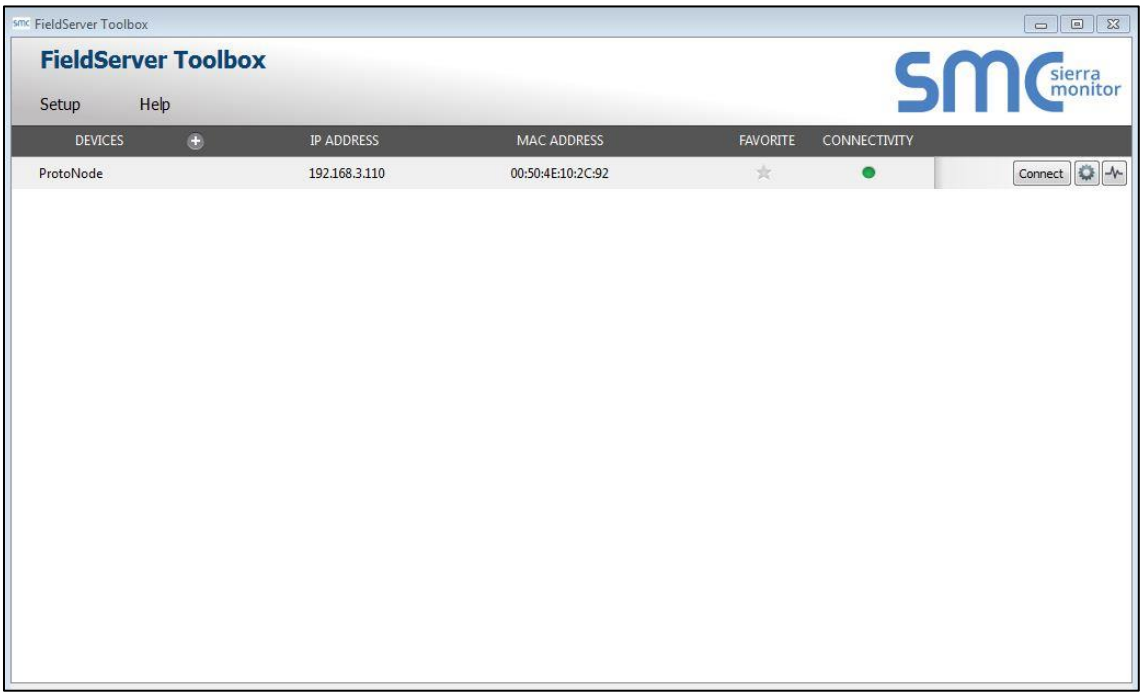
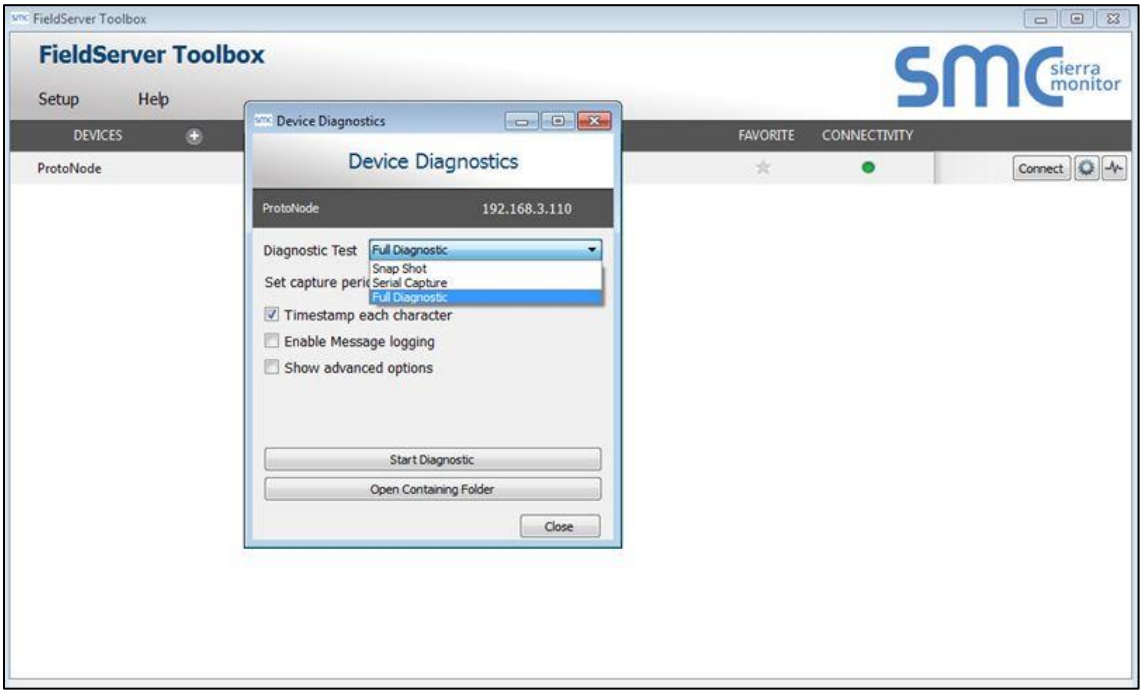


Figure 29: Ethernet Port Location

- Disable firewall and virus protection software if possible.
- 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

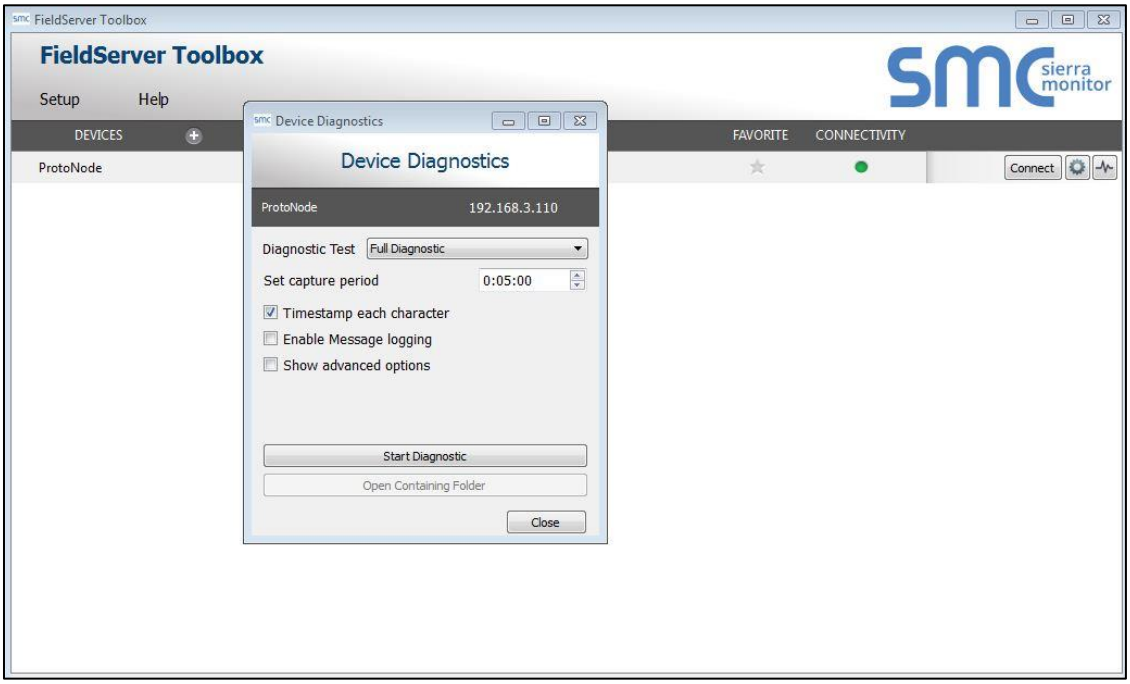


- Select full Diagnostic



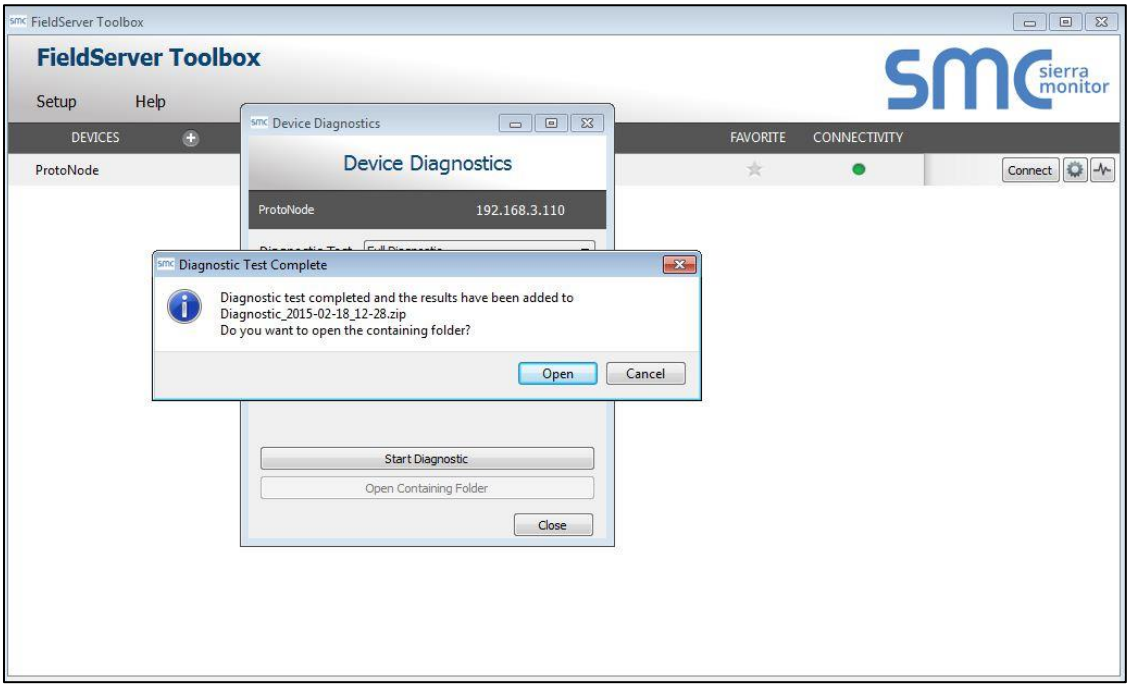
NOTE: If desired, the default capture period can be changed.

- Click on “Start Diagnostic”



- Wait for Capture period to finish, then 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 info@pbheat.com

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 “Firmware” tab
5. In the Firmware tab, click on “Choose Files” and select the firmware 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. BACnet: Setting Network_Number for more than one ProtoNode on 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 Network Number with the “network_nr” field and click submit. The default value is 50.

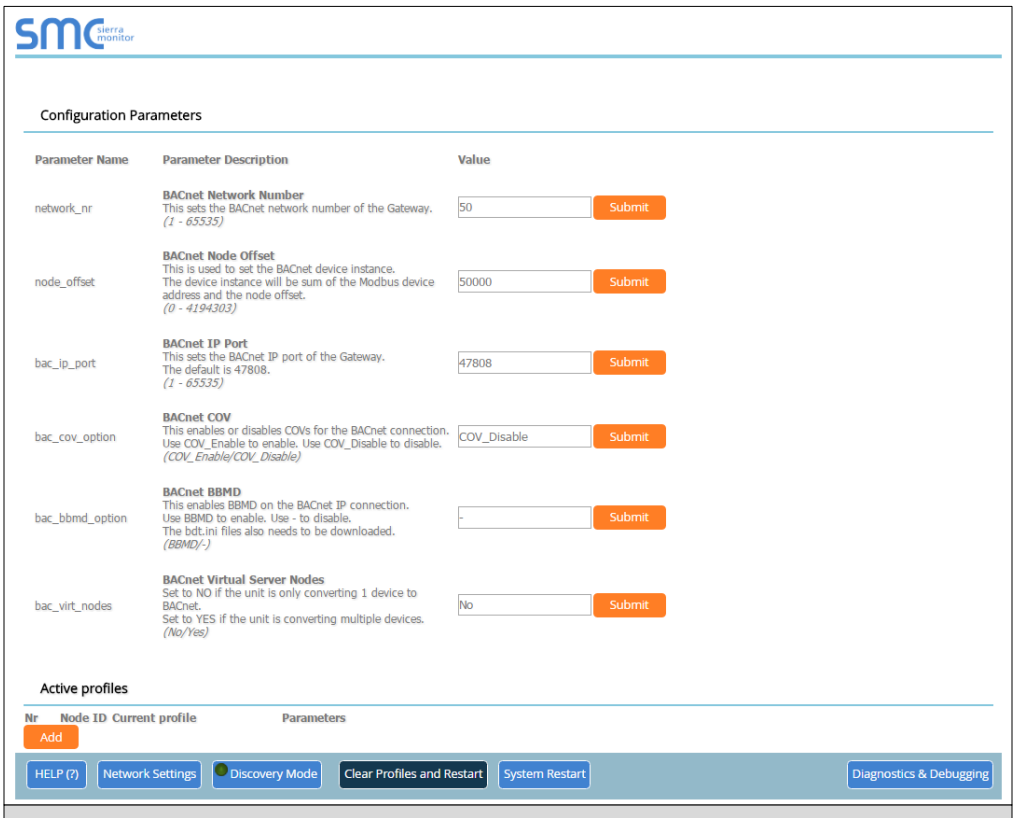


Figure 30: Web Configurator – Setting Network Number for BACnet

Appendix A.8. Securing ProtoNode with Passwords

Access to the ProtoNode can be restricted by enabling a password. 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 info@pbheat.com to receive a temporary password from the customer support team. Access the ProtoNode to set a new password.

Appendix B. Vendor Information - Peerless PureFire Boilers

Appendix B.1. 852IF Modbus RTU Mappings to BACnet and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	LonWorks Name	LonWorks SNVT
Modbus Units	BI	1	nvoModUnits_XXX	SNVT_switch
Device Type	AI	2	nvoDevType_XXX	SNVT_count_inc_f
State (Managing)	AI	3	nvoStateMan_XXX	SNVT_count_inc_f
Status (Managing)	AI	4	nvoStatusMan_XXX	SNVT_count_inc_f
Error Code (Managing)	AI	5	nvoErrCdeMan_XXX	SNVT_count_inc_f
Warning Code	AI	6	nvoWrnCde_XXX	SNVT_count_inc_f
CH Setpoint	AI	7	nvoCHSP_XXX	SNVT_count_inc_f
DHW Setpoint	AI	8	nvoDHWSP_XXX	SNVT_count_inc_f
CH Mode	AI	9	nvoCHMode_XXX	SNVT_count_inc_f
DHW Mode	AI	10	nvoDHWMode_XXX	SNVT_count_inc_f
Supply Temp	AI	11	nvoSupplyTmp_XXX	SNVT_count_inc_f
Return Temp	AI	12	nvoReturnTmp_XXX	SNVT_count_inc_f
DHW Temp	AI	13	nvoDHWTmp_XXX	SNVT_count_inc_f
Flue Gas Temp	AI	14	nvoFluGasTmp_XXX	SNVT_count_inc_f
Header Temp	AI	15	nvoHeaderTmp_XXX	SNVT_count_inc_f
Firing Rate	AI	16	nvoFirRate_XXX	SNVT_lev_percent
Flame Current	AI	17	nvoFlmCurrnt_XXX	SNVT_count_inc_f
Analog In	AI	18	nvoAnalogIn_XXX	SNVT_count_inc_f
CH Pump	AI	19	nvoCHPmp_XXX	SNVT_count_inc_f
DHW Pump	AI	20	nvoDHWPmp_XXX	SNVT_count_inc_f
Successful Igntions	AI	21	nvoSucIgn_XXX	SNVT_count_inc_f
Failed Ignitions	AI	22	nvoFailedIgn_XXX	SNVT_count_inc_f
Flame Failures	AI	23	nvoFlameFail_XXX	SNVT_count_inc_f
Burner On	AI	24	nvoBrnrOn_XXX	SNVT_time_hour
Burner On DHW	AI	25	nvoBrnrOnDHW_XXX	SNVT_time_hour
State (Dependent)	AI	26	nvoStateDep_XXX	SNVT_count_inc_f
Status (Dependent)	AI	27	nvoStatusDep_XXX	SNVT_count_inc_f
Error Code (Dependent)	AI	28	nvoErrCdeDep_XXX	SNVT_count_inc_f
Firiing Rate (Dependent)	AI	29	nvoFirRatDep_XXX	SNVT_lev_percent
Controller Reset	BV	1	nviContReset_XXX	SNVT_switch
Modbus Units	BV	2	nviModUnits_XXX	SNVT_switch
CH Setpoint	AV	3	nviCHSP_XXX	SNVT_count_inc_f
DHW Setpoint	AV	4	nviDHWSP_XXX	SNVT_count_inc_f
CH Mode	AV	5	nviCHMode_XXX	SNVT_count_inc_f
DHW Mode	AV	6	nviDHWMode_XXX	SNVT_count_inc_f

Appendix B.2. PFA-1 Modbus RTU Mappings to BACnet and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	LonWorks Name	LonWorks SNVT
STATE	AI	1	nvoState_XXX	SNVT_count_inc_f
STATUS	AI	2	nvoStatus_XXX	SNVT_count_inc_f
ERROR_NUMBER	AI	3	nvoErr_Num_XXX	SNVT_count_inc_f
WARNING_NUMBER	AI	4	nvoWrn_Num_XXX	SNVT_count_inc_f
FLOW_TEMP	AI	5	nvoFlow_Temp_XXX	SNVT_count_inc_f
RETURN_TEMP	AI	6	nvoRet_Temp_XXX	SNVT_count_inc_f
DHW_TEMP	AI	7	nvoDHW_Temp_XXX	SNVT_count_inc_f
FLUE_TEMP	AI	8	nvoFlue_Temp_XXX	SNVT_count_inc_f
APPLIANCE_TYPE	AI	9	nvoApp_Type_XXX	SNVT_count_inc_f
CONTROL_CONFIG_BYTE	AI	10	nvoCtrCfgByt_XXX	SNVT_count_inc_f
CH_MODE	AI	11	nvoCH_Mode_XXX	SNVT_count_inc_f
DHW_MODE	AI	12	nvoDHW_Mode_XXX	SNVT_count_inc_f
CH_SETPOINT	AI	13	nvoCH_SP_XXX	SNVT_count_inc_f
DHW_SETPOINT	AI	14	nvoDHW_SP_XXX	SNVT_count_inc_f
CH_SETPOINT CMD	AV	15	nviCH_SP_Cmd_XXX	SNVT_count_inc_f
DHW_SETPOINT CMD	AV	16	nviDHW_SPCmd_XXX	SNVT_count_inc_f

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

Address	A0	A1	A2	A3	A4	A5	A6	A7
46	Off	On	On	On	Off	On	Off	Off
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

Address	A0	A1	A2	A3	A4	A5	A6	A7
91	On	On	Off	On	On	Off	On	Off
92	Off	Off	On	On	On	Off	On	Off
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
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Address	A0	A1	A2	A3	A4	A5	A6	A7
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Address	A0	A1	A2	A3	A4	A5	A6	A7
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Appendix D. Reference

Appendix D.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; 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
Power Requirements	Multi-mode power adapter: 9-30V DC or 12 - 24V AC	
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 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.

Appendix E. Limited 2 Year Warranty

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.