



**ProtoNode FPC-N34 and ProtoNode FPC-N35
Startup Guide
For Interfacing Lochinvar Products:
SYNC™, Knight®/Knight XL®/Armor/Wall Mount/Wall
Hung, Crest®, Copper-Fin II®, Power Fin, Knight FTXL
To Building Automation Systems:
BACnet MS/TP, BACnet/IP, Modbus TCP/IP, Metasys N2
and LonWorks**

APPLICABILITY & EFFECTIVITY

Explains ProtoNode FPC-N34 and FPC-N35 hardware and how to install it.

The instructions are effective for the above as of September 2015

Technical Support:

Thank you for purchasing the ProtoNode for Lochinvar Boilers.

Please call Lochinvar for Technical support of the ProtoNode product.

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

Support Contact Information:

Lochinvar, LLC
300 Maddox Simpson Pkwy.
Lebanon, TN 37090

Lochinvar Service:
1-800-722-2101

Email: 2tech@lochinvar.com

Website: www.lochinvar.com

A Quick Start Guide

1. Record the information about the unit. (Section 2.1)
2. Set the device's Modbus RTU serial settings (i.e. baud rate, parity, stop bits) and Modbus Node-ID for each of the devices that will be connected to ProtoNode FPC-N34 or FPC-N35. (Section 2.2)
3. Select a stored configuration and set field protocol MAC address/Node-ID/Device Instance, and baud rate. (Section 2.3)
4. Connect ProtoNode's 6 pin RS-485 connector to the Modbus RS-485 network that is connected to each of the devices. (Section 3.2)
5. Connect ProtoNode FPC-N34's 3 pin RS-485 port to the Field Protocol cabling, (Section 3.3) or connect ProtoNode FPC-N35's 2 pin LonWorks port to the Field Protocol cabling. (Section 3.4)
6. Connect Power to ProtoNode's 6 pin connector. (Section 3.5)
7. BACnet/IP or Modbus TCP/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 4)
8. 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 6)

Certifications

▪ BTL MARK – BACNET TESTING LABORATORY



The BTL Mark on ProtoNode RER 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](#)

▪ 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. FieldServer Technologies 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.

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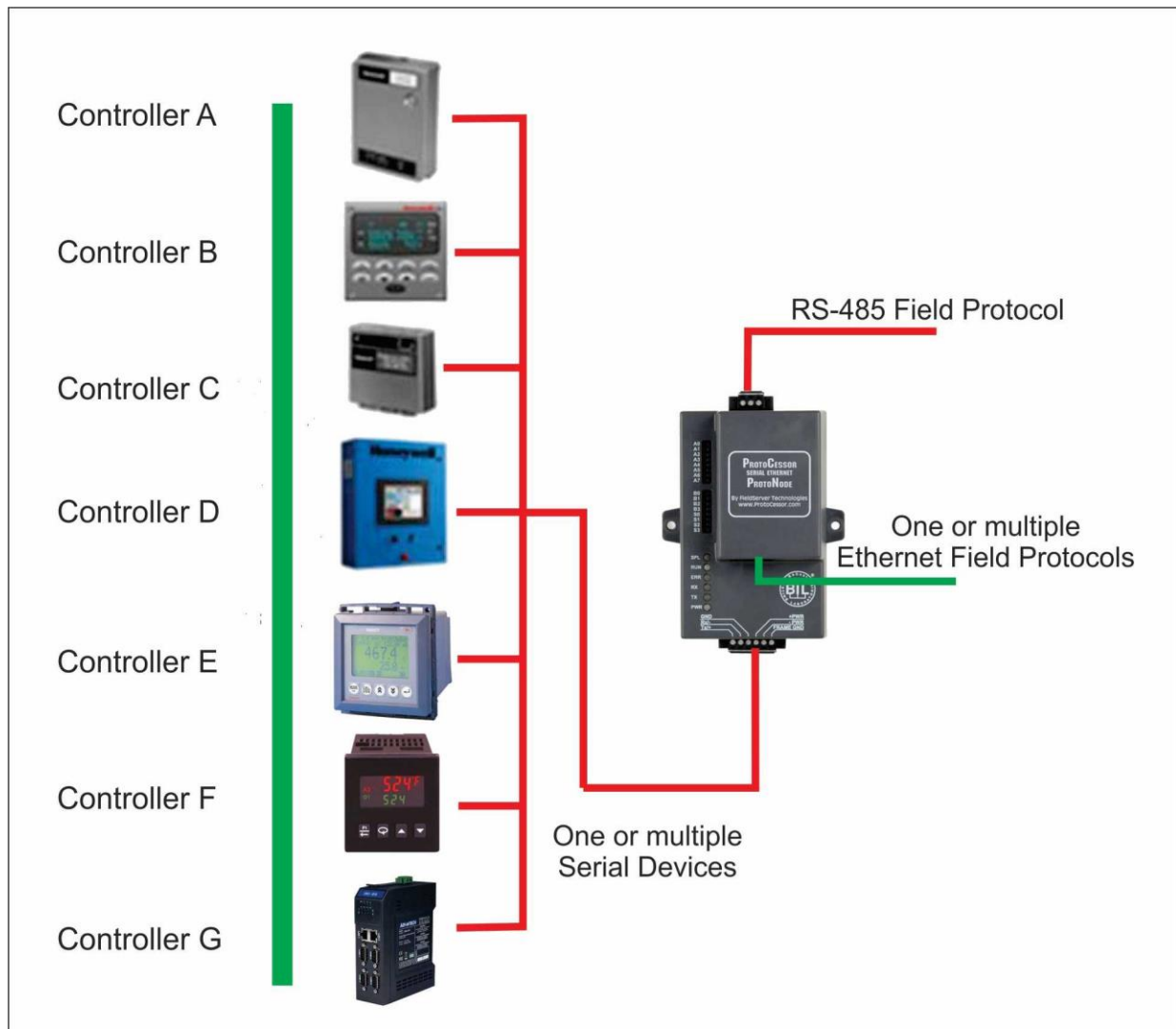
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1 INTRODUCTION

1.1 ProtoNode Gateway

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 BACnet¹MS/TP, BACnet/IP, Metasys² N2 by JCI, Modbus TCP/IP, and LonWorks³. Configurations for the various protocols are stored within the ProtoNode and are selectable via DIP switches for fast and easy installation.

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.



¹ BACnet is a registered trademark of ASHRAE

² Metasys is a registered trademark of Johnson Controls Inc.

⁴ LonWorks is a registered trademark of Echelon Corporation

2 BACNET/LONWORKS SETUP FOR PROTOCESSOR PROTONODE FPC-N34/FPC-N35

2.1 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: ProtoCessor Part Numbers	

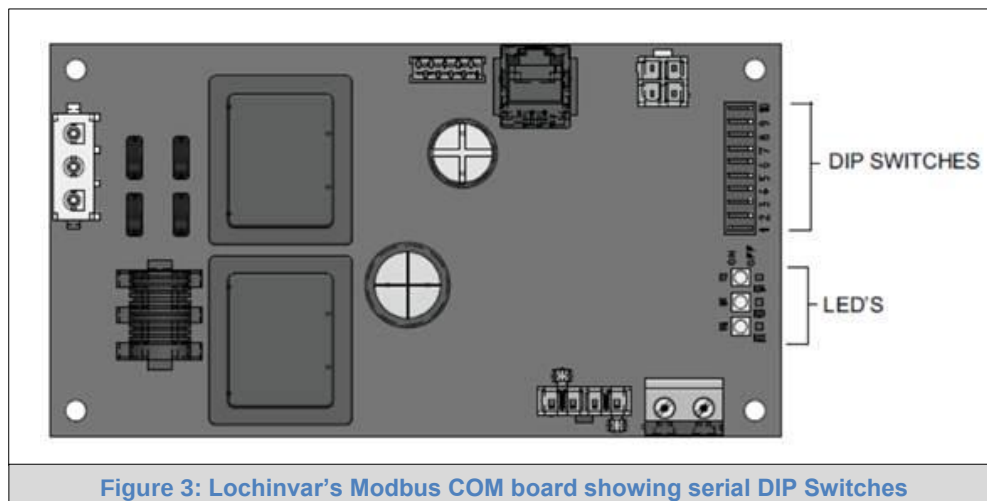
- FPC-N34 units have the following 3 ports: RS-485 + Ethernet + RS-485.
- FPC-N35 units have the following 3 ports: LonWorks + Ethernet + RS-485

2.2 Configuring Device Communications

2.2.1 Set Modbus COM setting on all of the devices connected to the ProtoNode

- All of the Serial devices connected to ProtoNode **MUST have the same Baud Rate, Data Bits, Stop Bits, and Parity settings.**
- Figure 2** specifies the device serial port settings required to communicate with the ProtoNode.

Serial Port Setting	Device
Protocol	Modbus RTU
Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	2
Figure 2: Modbus RTU COM Settings	



2.2.2 Set Modbus RTU Node-ID for each of the devices attached to the ProtoNode

Set the Modbus Node-ID for each of the devices attached to ProtoNode.

- The Modbus Node-ID's need to be uniquely assigned, **starting with a value of 1 for the first device.**
- **Modbus Node-ID values for additional devices must be sequential (2, 3, 4, ...).**

2.3 BMS Network Settings: Selecting Stored Configurations, Setting the Mac Address, Device Instance, and Baud Rate

2.3.1 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 (BACnet MS/TP, BACnet/IP, Modbus TCP/IP, Metasys N2) and the ProtoNode FPC-N35 (LonWorks).

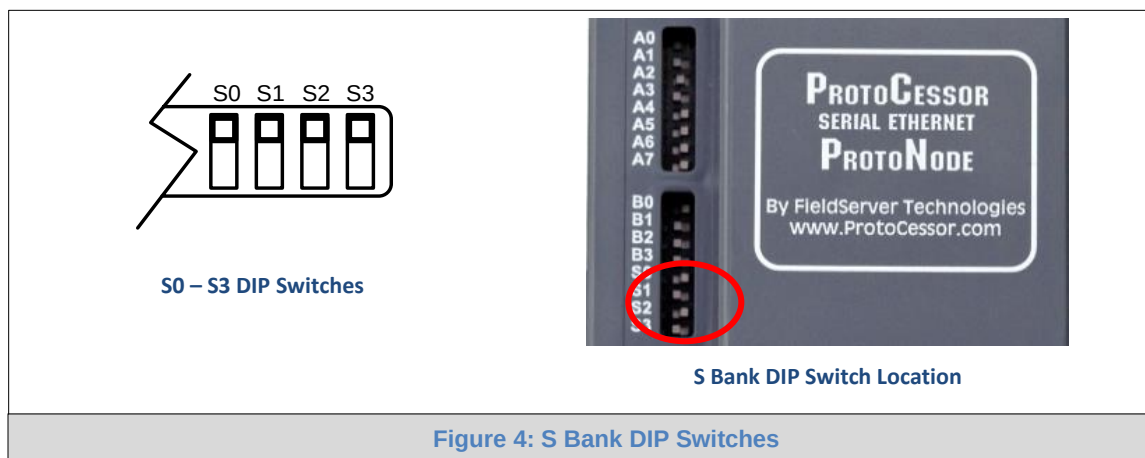


Figure 4: S Bank DIP Switches

2.3.1.1 BACnet MS/TP and BACnet/IP DIP Switch Settings

The following chart describes S0 - S3 DIP Switch configuration settings for 1 through 8 device applications to support **BACnet MS/TP and BACnet/IP** on a ProtoNode FPC-N34.

	ProtoCarrier DIP Switches			
Profile - FPC-N34-0614	S0	S1	S2	S3
BACnet/IP / BACnet MS/TP / Modbus TCP/IP SYNC Deg_C	Off	Off	Off	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Knight/Knight XL/Armor/Wall Mount/Wall Hung Deg_C	On	Off	Off	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Crest Deg_C	Off	On	Off	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Copper-Fin II Deg_C	On	On	Off	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Power Fin Deg_C	Off	Off	On	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Knight FTXL Deg_C	On	Off	On	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP SYNC Deg_F	Off	On	On	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Knight/Knight XL/Armor/Wall Mount/Wall Hung Deg_F	On	On	On	Off
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Crest Deg_F	Off	Off	Off	On
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Copper-Fin II Deg_F	On	Off	Off	On
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Power Fin Deg_F	Off	On	Off	On
BACnet/IP / BACnet MS/TP / Modbus TCP/IP Knight FTXL Deg_F	On	On	Off	On

See Appendix B.1 for the Configuration DIP switch settings to support Metasys N2 on a ProtoNode FPC-N34.

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

2.3.1.2 LonWorks DIP Switch Settings

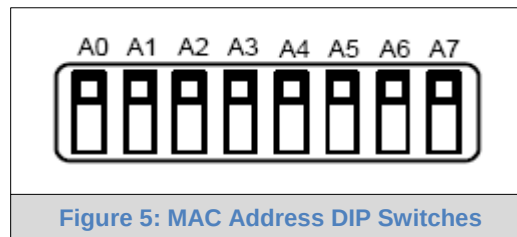
The following chart describes the DIP switch settings to support **LonWorks** on a ProtoNode FPC-N35.

	ProtoCarrier DIP Switches			
Profile - FPC-N35-0615	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

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

2.3.2 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 DIP switches A0 – A7 to assign MAC Address for BACnet MS/TP for the ProtoNode FPC-N34.
- Please refer to **Appendix D.1** for the complete range of MAC Addresses and DIP switch settings.



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

2.3.3 BACnet MS/TP and BACnet/IP (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 2.3.2)
 - 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 instances will be calculated by taking the Node_Offset (default is 50,000) found in Web Configurator (Section 2.3.2.1) and adding it to the value of the A Bank DIP switches. When more than one device is connected to the ProtoNode, the subsequent BACnet Device Instance values will be sequential from the first/previous device.

For example:

- **Given that: Device Instance = Node_Offset + A Bank DIP switch value**
 - Default Node_Offset value = 50,000
 - A Bank DIP switch value = 11
- **Then the Device Instance values for the devices are:**
 - Device 1 Instance = 50,011
 - Device 2 Instance will then be 50,011(Device Instance 1) +1 = 50,012
 - Device 3 Instance will then be 50,012 (previous Device Instance) +1 = 50,013

2.3.3.1 BACnet MS/TP or BACnet/IP: Assigning Specific Device Instances

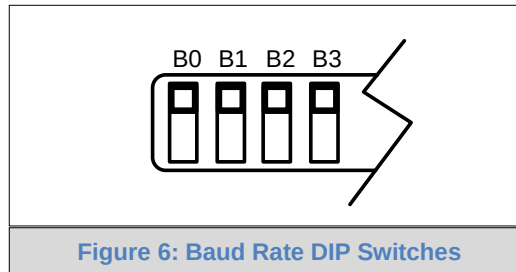
- With the default Node_Offset value of 50,000 the Device Instances values generated will be within the range of 50,001 to 50,127.
- The values allowed for a BACnet Device Instance can range from 1 to 4,194,303.
- To assign a specific Device Instance (or range), change the Node_Offset value.
- Methods for changing the Node_Offset value are provided in Section 4.2
 - This step cannot be performed until after the unit is connected and powered.

2.3.4 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 FPC-N34.
- Metasys N2 and Modbus TCP/IP Node-ID Addressing: Metasys N2 and Modbus TCP/IP Node-ID's range from 1-255
- Please refer to Appendix D.1 for the full range of addresses for setting Node-ID.

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

- DIP Switches B0 – B3 can be used to set the serial baud rate to match the baud rate required by the Building Management System for BACnet MS/TP.
- DIP Switches B0 – B3 are disabled on ProtoNode FPC-N35 (FPC-N35 LonWorks).
- The baud rate on ProtoNode for Metasys N2 is set for 9600. DIP Switches B0 – B3 are disabled for Metasys N2 on ProtoNode FPC-N34.



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

2.3.5.1 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 7: BMS Baud Rate

* Factory default setting = 38,400

3 INTERFACING PROTONODE TO DEVICES

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

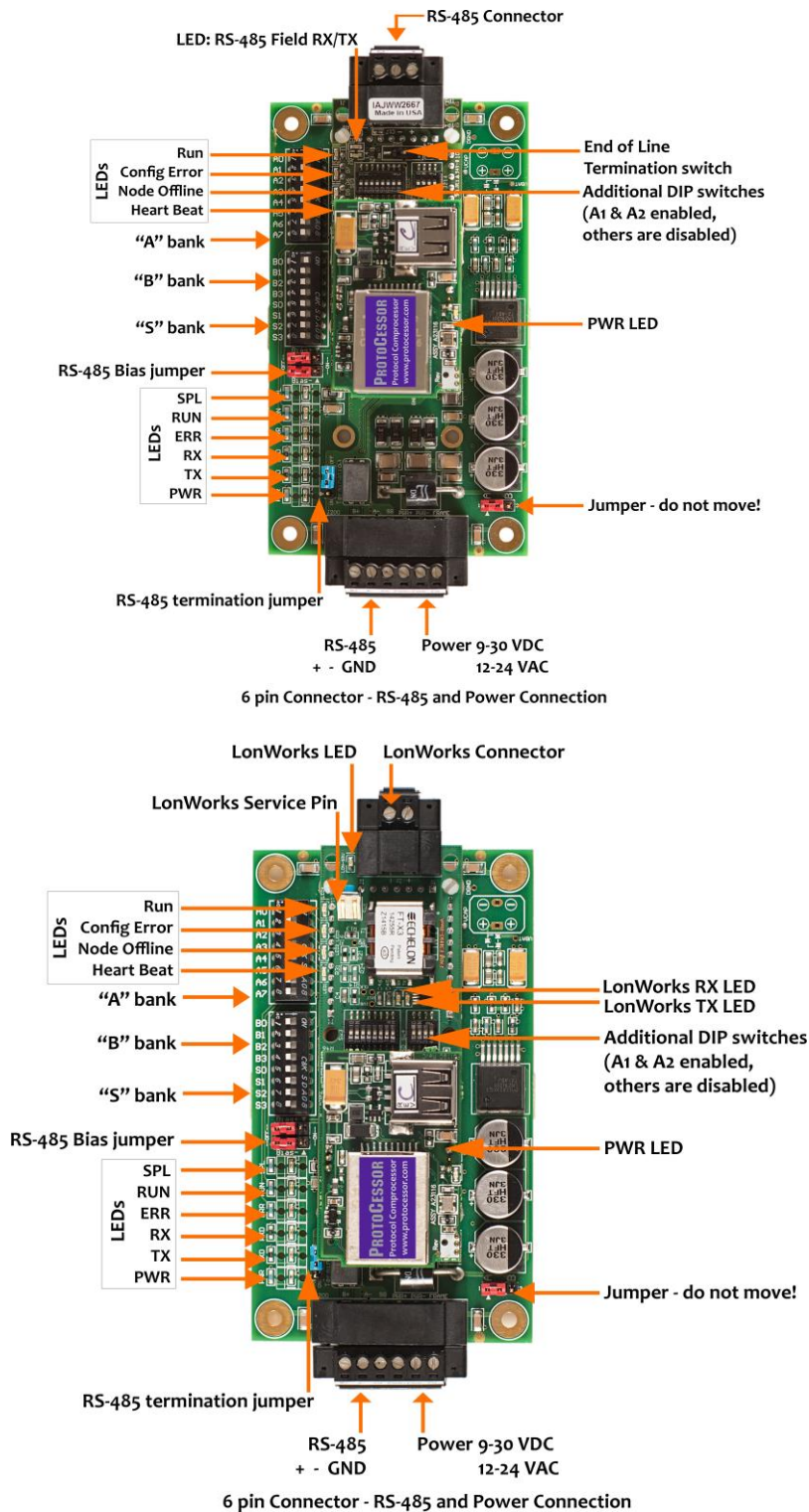


Figure 8: ProtoNode BACnet FPC-N34 (upper) and ProtoNode FPC-N35 (lower)

3.2 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 Modbus RS-485 devices.
 - The RS-485 GND (Pin 3) is not typically connected.
- Pins 4 through 6 are for power. **Do not connect power** (wait until Section 4).

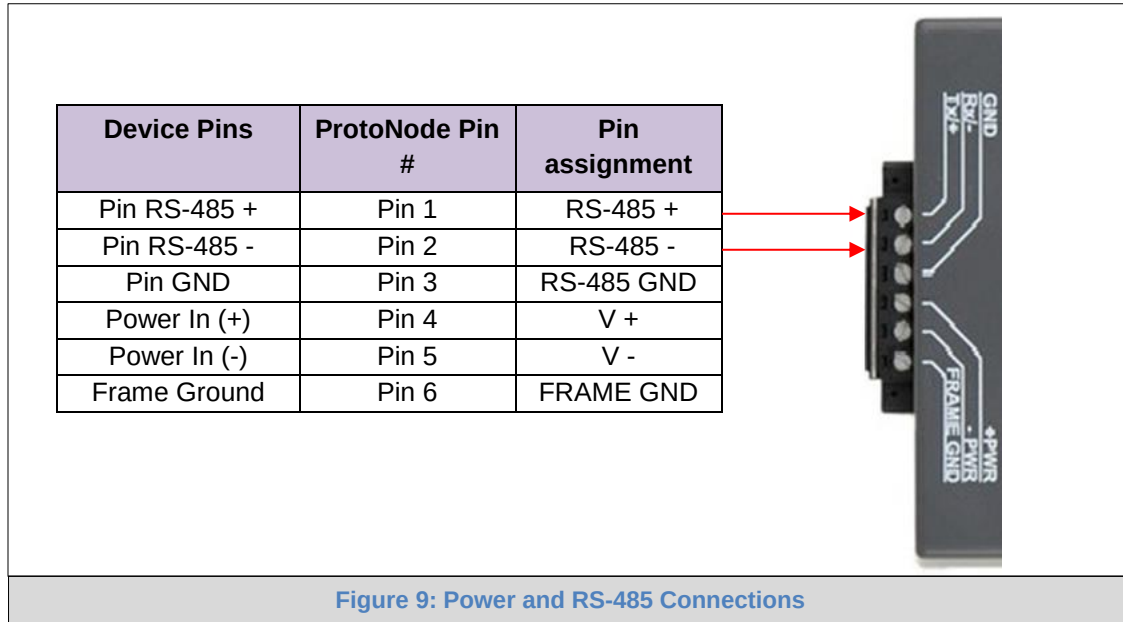
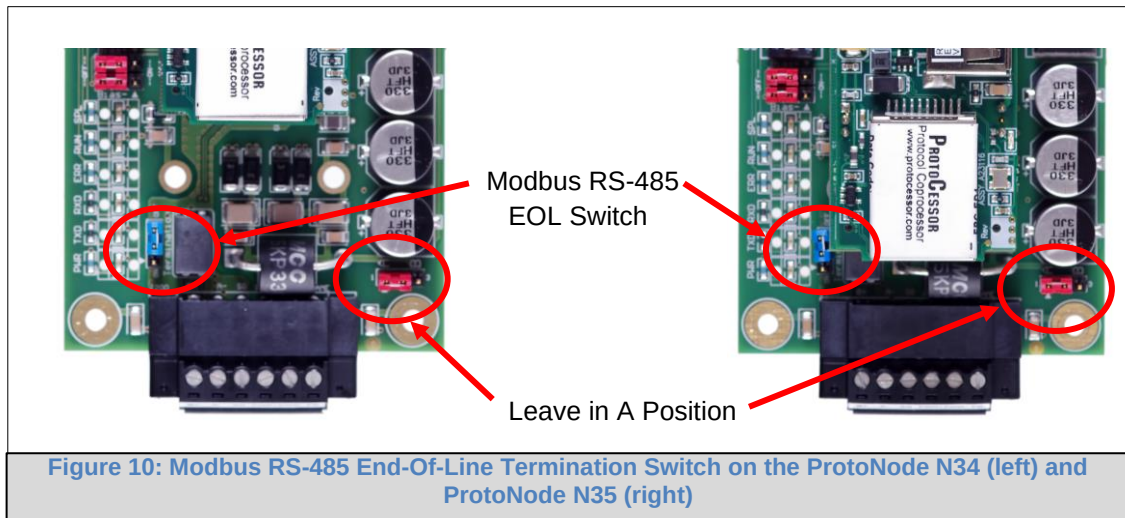


Figure 9: Power and RS-485 Connections

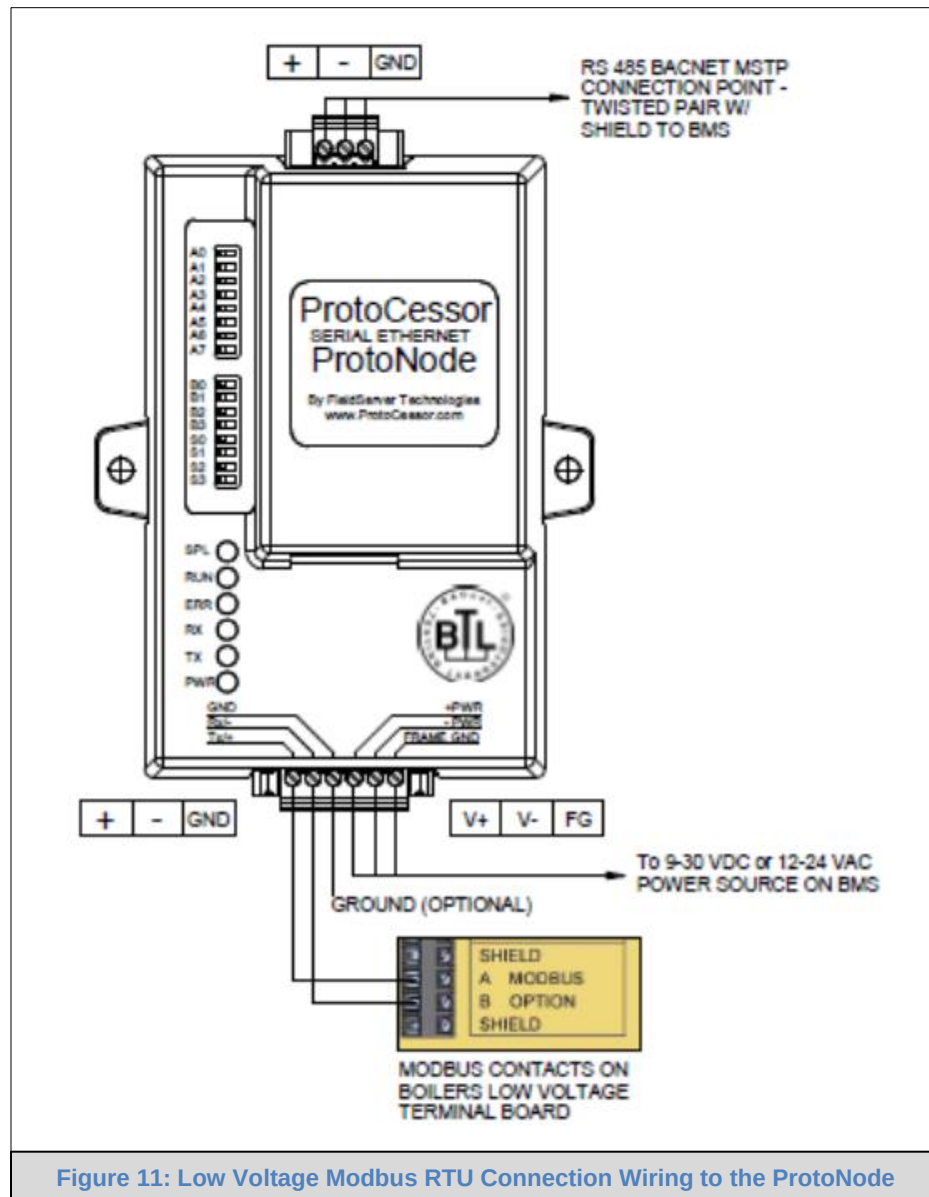
3.2.1 End of Line Termination Switch for the Modbus RS-485 Device Network

- 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).**



3.2.2 Lochinvar's Armor, SYNC/Armor X2, Knight/Knight XL, Crest, Copper-Fin II and FTXL Low Voltage Modbus RTU Connection Wiring to the ProtoNode:

- 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 the terminal strip which is Ground on the does not need to be grounded to the ProtoNode.



3.3 BACnet MS/TP or Metasys N2 (FPC-N34): Wiring Field Port to RS-485 BMS Network

- Connect the BACnet MS/TP or Metasys N2 RS-485 network wires to the 3-pin RS-485 connector on ProtoNode FPC-N34 as shown below in [Figure 12](#).
 - The RS-485 GND (Pin 3) is not typically connected.
- See [Section 4](#) for information on connecting to BACnet/IP network.
- If the ProtoNode is the last device on the BACnet MS/TP or Metasys N2 trunk, then the End-Of-Line Termination Switch needs to be enabled ([Figure 13](#)).
 - 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).

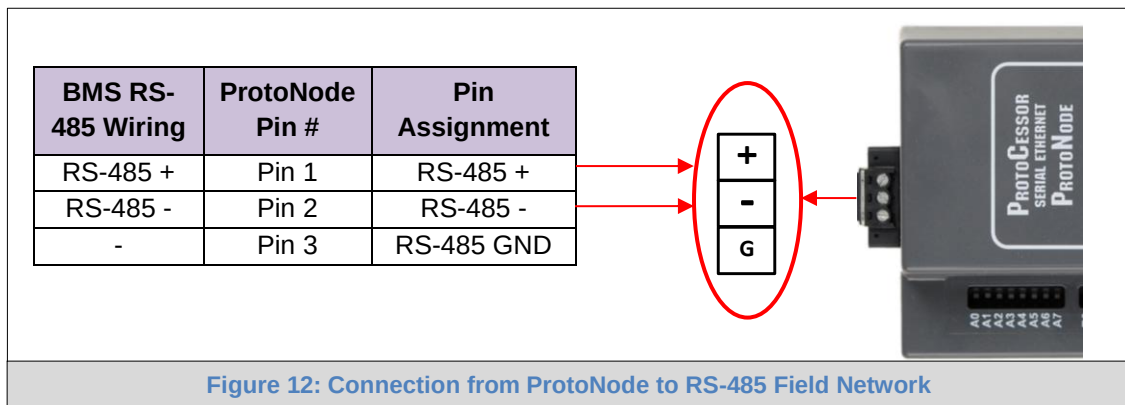


Figure 12: Connection from ProtoNode to RS-485 Field Network

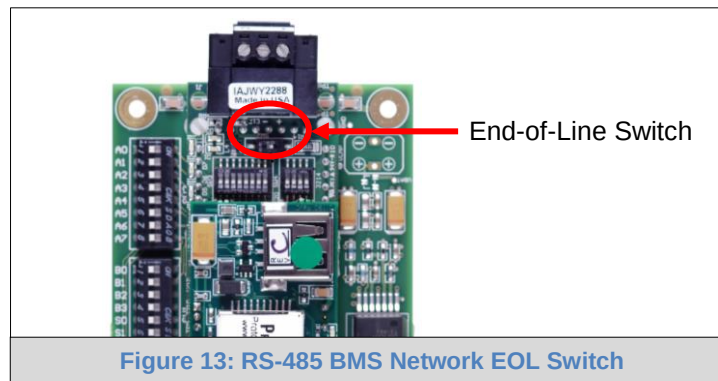


Figure 13: RS-485 BMS Network EOL Switch

3.4 LonWorks (FPC-N35): Wiring Field Port to LonWorks Network

- Connect ProtoNode to the field network with the LonWorks terminal using a twisted pair non-shielded cable. LonWorks has no polarity.



Figure 14: LonWorks Terminal

3.5 Power-Up ProtoNode

Apply power to ProtoNode as show below in **Figure 16**. Ensure that the power supply used complies with the specifications provided in **Appendix E.1**.

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

Power Requirement for ProtoNode External Gateway			
	Current Draw Type		
ProtoNode Family	12VDC/VAC	24VDC/VAC	30VDC
FPC – N34 (Typical)	170mA	100mA	80mA
FPC – N34 (Maximum)	240mA	140mA	100mA
FPC – N35 (Typical)	210mA	130mA	90mA
FPC – N35 (Maximum)	250mA	170mA	110mA
Note: These values are 'nominal' and a safety margin should be added to the power supply of the host system. A safety margin of 25% is recommended.			
Figure 15: Required current draw for the ProtoNode			

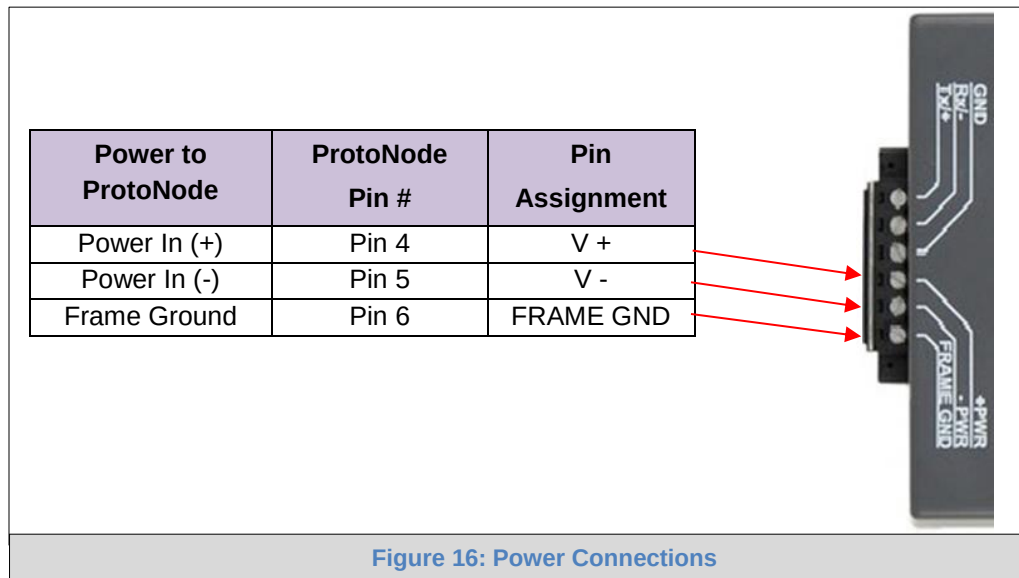


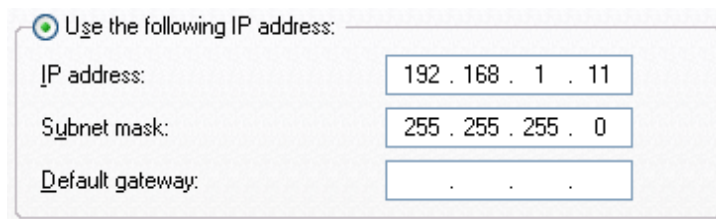
Figure 16: Power Connections

4 BACNET/IP AND MODBUS TCP/IP: CHANGE THE PROTONODE IP ADDRESS

4.1 Connect the PC to ProtoNode via the Ethernet Port

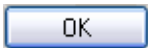
- Connect a Cat 5 Ethernet cable (Straight through or Cross-Over) between the PC and ProtoNode.
- The Default IP Address of ProtoNode is **192.168.1.24**, Subnet Mask is **255.255.255.0**. If the PC and ProtoNode are on different IP Networks, assign a static IP Address to the PC on the 192.168.1.xxx network.

- Go to  >  Control Panel >  Network Connections
- Right-click on Local Area Connection > Properties
- Highlight ☒  Internet Protocol (TCP/IP) >  Properties
- Select: Use the following IP address



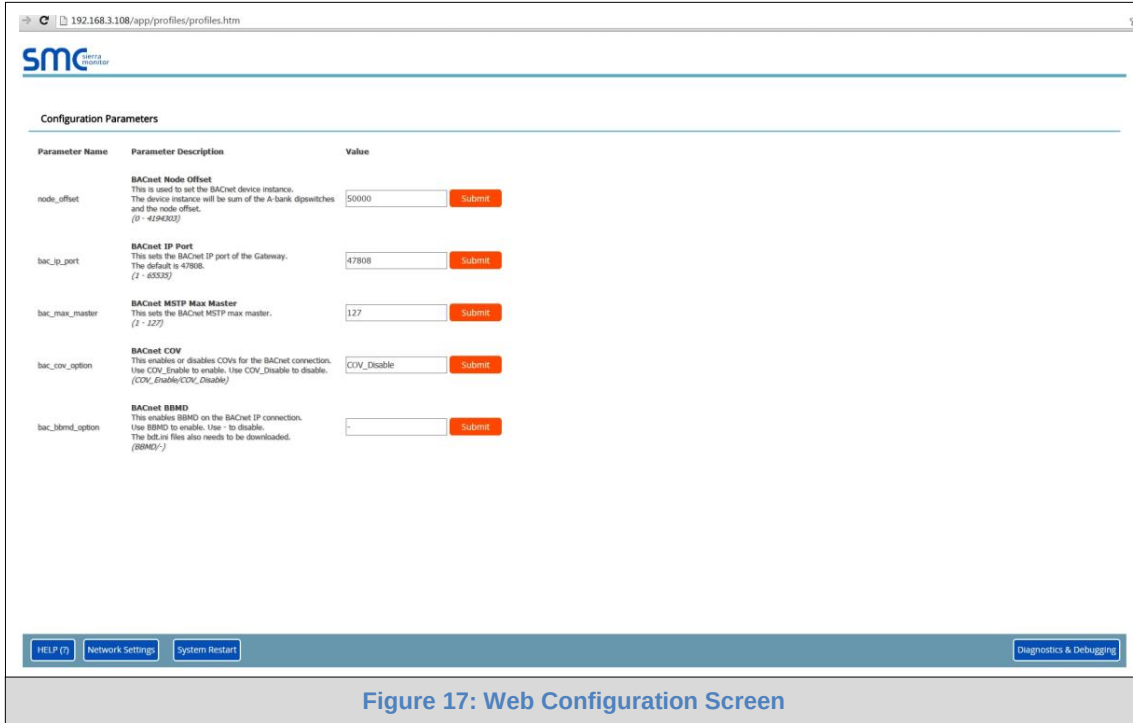
Use the following IP address:

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

- Click  twice

4.2 BACnet/IP and Modbus TCP/IP: Setting IP Address for Field Network

- After setting your PC to be on the same subnet as the ProtoNode (**Section 3.5**), open a web browser on your PC and enter the IP address of the ProtoNode; the default address is 192.168.1.24.
- The Web Configurator will be displayed as the landing page (**Figure 19**)
- From the Web Configurator landing page, click on the “Diagnostics & Debugging” button in the bottom right side of the page to access the FST Web GUI.



The screenshot shows a web browser window with the address bar displaying "192.168.3.108/app/profiles/profiles.htm". The page title is "Configuration Parameters". The main content area contains a table with five rows of configuration parameters, each with a text input field and a "Submit" button.

Parameter Name	Parameter Description	Value
node_offset	BACnet Node Offset This is used to set the BACnet device instance. The device instance will be sum of the A-bank dipswitches and the node offset. (0 - 4194300)	50000 Submit
bac_ip_port	BACnet IP Port This sets the BACnet IP port of the Gateway. The default is 47808. (2 - 65535)	47808 Submit
bac_max_master	BACnet MSTP Max Master This sets the BACnet MSTP max master. (2 - 127)	127 Submit
bac_cov_option	BACnet COV This enables or disables COVs for the BACnet connection. Use COV_Enable to enable. Use COV_Disable to disable. (COV_Enable/COV_Disable)	COV_Disable Submit
bac_bsm_option	BACnet BSM This enables BSM on the BACnet IP connection. Use BSM to enable. Use - to disable. The bsm files also needs to be downloaded. (BSM/-)	- Submit

At the bottom of the page, there is a navigation bar with buttons: "HELP (?)", "Network Settings", "System Restart", and "Diagnostics & Debugging".

Figure 17: Web Configuration Screen

- From the FST Web GUI's landing page, click on "Setup" to expand the navigation tree and then select "Network Settings" to access the IP Settings menu. (Figure 18)

192.168.3.108/htm/fsgui.htm#24_OID

smc
sierra
monitor

Navigation

- ✓ CN0614 Lochinvar v2.00a
 - About
 - ✓ Setup
 - File Transfer
 - **Network Settings**
 - Passwords
 - View
 - User Messages

Network Settings

IP Settings

Note
Updated settings only take effect after a System Restart. If the IP Address is changed you will need to direct your browser to the new IP Address after the System Restart.

N1 IP Address	192.168.3.108
N1 Netmask	255.255.255.0
N1 DHCP Client State	DISABLED ▼
N1 DHCP Server State	DISABLED ▼
Default Gateway	192.168.3.1
Domain Name Server1	0.0.0.0
Domain Name Server2	0.0.0.0

MAC Address

N1 MAC Address: 00:50:4E:10:2E:27

Figure 18: Changing IP Address via FST Web 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 router, the IP Gateway of the ProtoNode should be set to the IP address of the router that it is connected to.
- 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 the ProtoNode to the network hub or router.
- Record the IP address assigned to the ProtoNode for future reference.**

5 BACNET MS/TP AND BACNET/IP: SETTING NODE_OFFSET TO ASSIGN SPECIFIC DEVICE INSTANCES

- After setting your PC to be on the same subnet as the ProtoNode (Section 4.1), open a web browser on your PC and enter the IP address of the ProtoNode; the default address is 192.168.1.24.
- The Web Configurator will be displayed as your landing page. (Figure 19)
- Node_Offset field will be presented displaying the current value (default = 50,000).
- Change the value of Node_Offset to establish the desired Device Instance values, and click SUBMIT.
 - Given that: Device Instance = Node_Offset + A Bank Setting**
 - Then: Node_Offset (required) = Device Instance (desired) – A Bank Setting**

For example:

- Device 1 has a Modbus Node-ID of 1
- Device 2 has a Modbus Node-ID of 2
- Device 3 has a Modbus Node-ID of 3
- “A” Bank DIP switches setting = 11
- Desired Device Instance for 1st device = 1,011
- Node_Offset (required) = 1,011 – (A Bank Setting) = 1,011 – 11 = 1,000**
- The Node_Offset value will be applied to all devices.
- Device 1 Instance will then be = 1,000 + A Bank Setting = 1,000 + 11 = 1,011
- Device 2 Instance will then be = Previous Value + 1 = 1,011 + 1 = 1,012
- Device 3 Instance will then be = Previous Value + 1 = 1,012 + 1 = 1,013

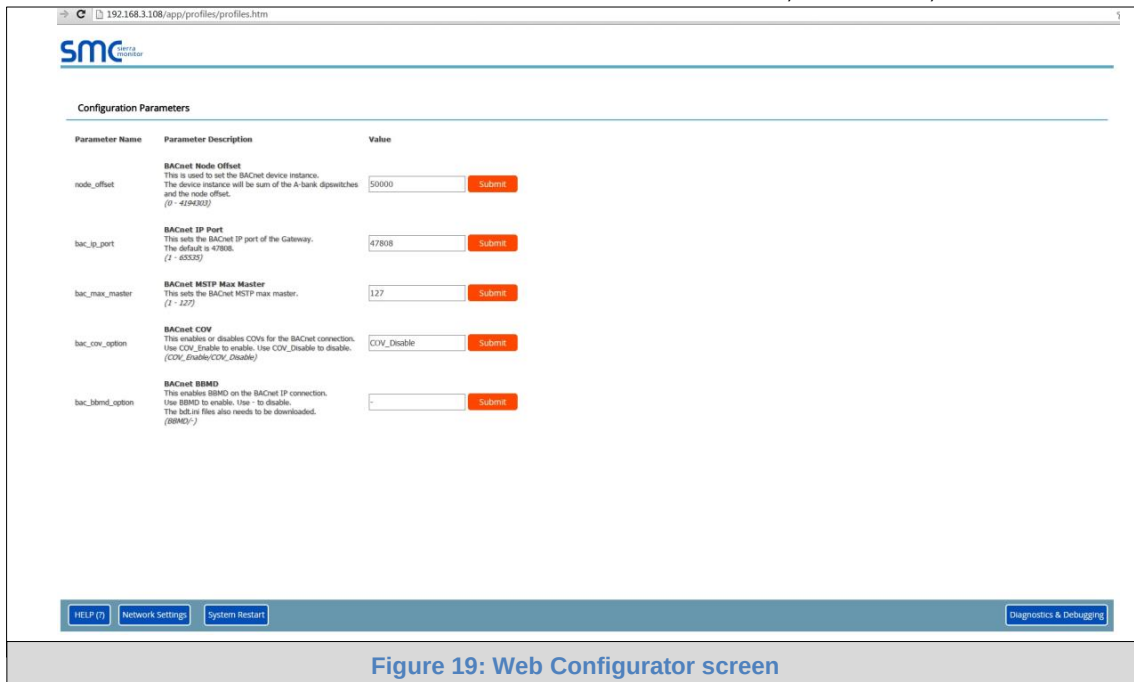


Figure 19: Web Configurator screen

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

Commissioning may only be performed by the LonWorks administrator.

6.1 Commissioning ProtoNode FPC-N35 on a LonWorks Network

The User will be prompted by the LonWorks Administrator to hit the Service Pin on the ProtoNode FPC-N35 at the correct step of the Commissioning process which is different for each LonWorks Network Management Tool.

- If an XIF file is required, see steps in Section 6.1.1 to generate XIF



Figure 20: LonWorks Service Pin Location

6.1.1 Instructions to Download XIF File from ProtoNode FPC-N35 Using Browser

- Connect a Cat 5 Ethernet cable (Straight through or Cross-Over) between the PC and ProtoNode.
- The Default IP Address 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:

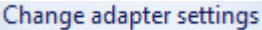
Go to  >  Control Panel >  Network Connections

Right-click on Local Area Connection > Properties

Highlight ☒  Internet Protocol (TCP/IP) > 

- For Windows 7:

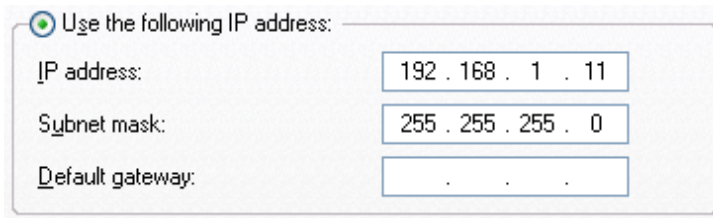
Go to  >  Control Panel >  Network and Internet

>  Network and Sharing Center > 

Right-click on Local Area Connection > Properties

Highlight ☒  Internet Protocol Version 4 (TCP/IPv4) > 

- For Windows XP and Windows 7, select: Use the following IP address



- Click  twice
- Open a web browser and go to the following address: IP address of ProtoCessor/fserver.xif
- Example: 192.168.1.24/fserver.xif
- If the web browser prompts you to save file, save the file onto the PC. If the web browser displays the xif file as a web page, save the file on your PC as fserver.xif

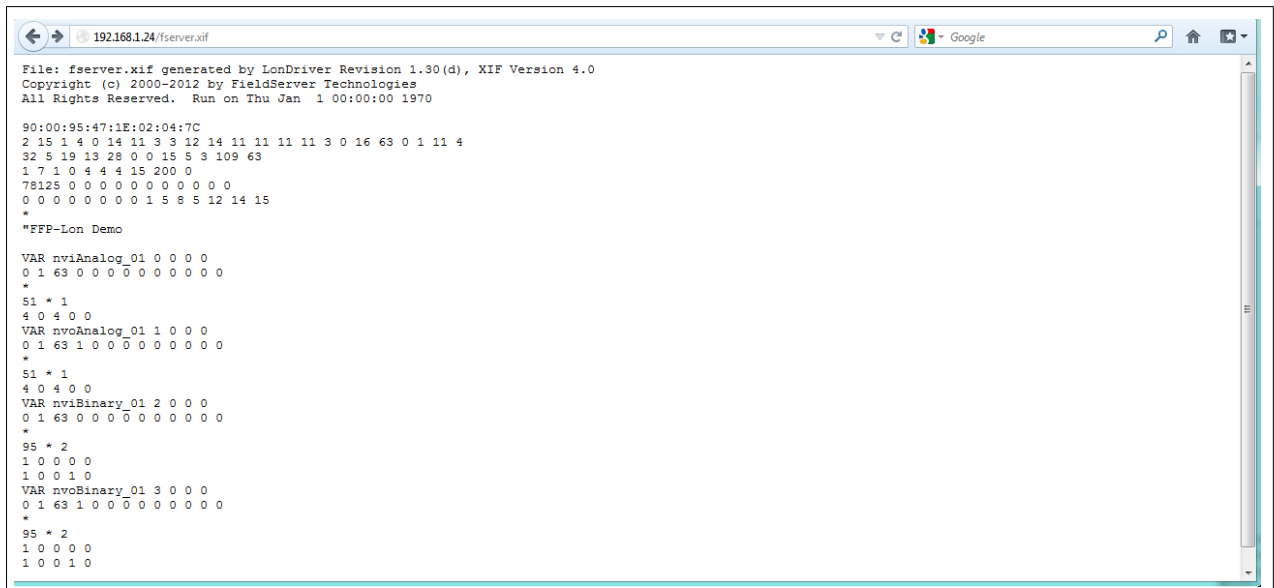


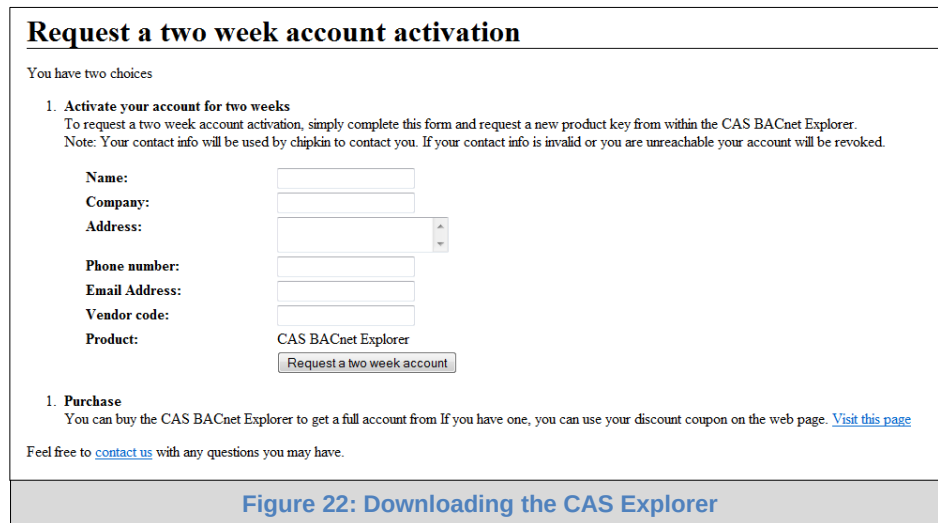
Figure 21: Sample of Fserver.XIF File Being Generated

7 CAS BACNET EXPLORER FOR VALIDATING PROTONODE IN THE FIELD

ProtoCessor has arranged a complementary 2 week fully functional copy of CAS BACnet Explorer (through Chipkin Automation) that can be used to validate BACnet MS/TP and/or BACnet/IP communications of ProtoNode in the field without having to have the BMS Integrator on site. A Serial or USB to RS-485 converter is needed to test BACnet MS/TP.

7.1 Downloading the CAS Explorer and Requesting an Activation Key

- To request the complementary BACnet CAS key, go to <http://app.chipkin.com/activation/twoweek/> and fill in all the information. **Enter Vendor Code "lochinvar12"**. Once completed, the email address that was submitted will be registered.



Request a two week account activation

You have two choices

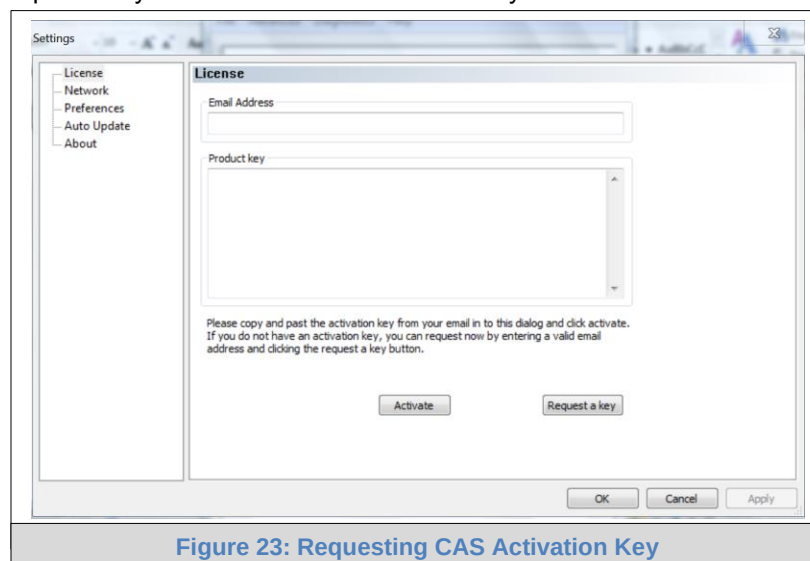
1. Activate your account for two weeks
To request a two week account activation, simply complete this form and request a new product key from within the CAS BACnet Explorer.
Note: Your contact info will be used by chipkin to contact you. If your contact info is invalid or you are unreachable your account will be revoked.

Name:
Company:
Address:
Phone number:
Email Address:
Vendor code:
Product: CAS BACnet Explorer

1. Purchase
You can buy the CAS BACnet Explorer to get a full account from If you have one, you can use your discount coupon on the web page. [Visit this page](#)
Feel free to [contact us](#) with any questions you may have.

Figure 22: Downloading the CAS Explorer

- Go to the following web site, download and install the CAS BACnet Explorer to your PC: <http://www.chipkin.com/technical-resources/cas-bacnet-explorer/>
- Open CAS BACnet Explorer; in the CAS Activation form, enter the email address that was registered and click on "Request a key". The CAS key will then be emailed to the registered address. Cut/paste key from email into the Product key field and click "Activate".



Settings

License
Network
Preferences
Auto Update
About

License

Email Address:

Product key:

Please copy and past the activation key from your email in to this dialog and click activate.
If you do not have an activation key, you can request now by entering a valid email address and clicking the request a key button.

Figure 23: Requesting CAS Activation Key

7.2 CAS BACnet Setup

These are the instructions to set CAS Explorer up for the first time on BACnet MS/ST and BACnet/IP.

7.2.1 CAS BACnet MS/TP Setup

- Using the Serial or USB to RS-485 converter, connect it to your PC and the 3 Pin BACnet MS/TP connector on ProtoNode FPC-N34.
- In CAS Explorer, do the following:
 - Click on settings
 - Check the BACnet MS/TP box and uncheck the BACnet/IP and BACnet Ethernet boxes
 - Set the BACnet MS/TP MAC address to 0
 - Set the BACnet MS/TP Baud Rate to 38400
 - Click Ok
 - On the bottom right-hand corner, make sure that the BACnet MS/TP box is green
 - Click on discover
 - Check all 4 boxes
 - Click Send

7.2.2 CAS BACnet BACnet/IP Setup

- See Section 4.1 to set the IP address and subnet of the PC that will be running the CAS Explorer.
- Connect a straight through or cross Ethernet cable from the PC to ProtoNode.
- In CAS Explorer, do the following:
 - Click on settings
 - Check the BACnet/IP box and uncheck the BACnet MS/TP and BACnet Ethernet boxes
 - In the "Select a Network Device" box, select the network card of the PC by clicking on it
 - Click Ok
 - On the bottom right-hand corner, make sure that the BACnet/IP box is green
 - Click on discover
 - Check all 4 boxes
 - Click Send

Appendix A. Troubleshooting

Appendix A.1. Viewing Diagnostic information

- Type the IP address of the ProtoNode into your 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, please refer to Appendix A.2 for the relevant wiring and settings.

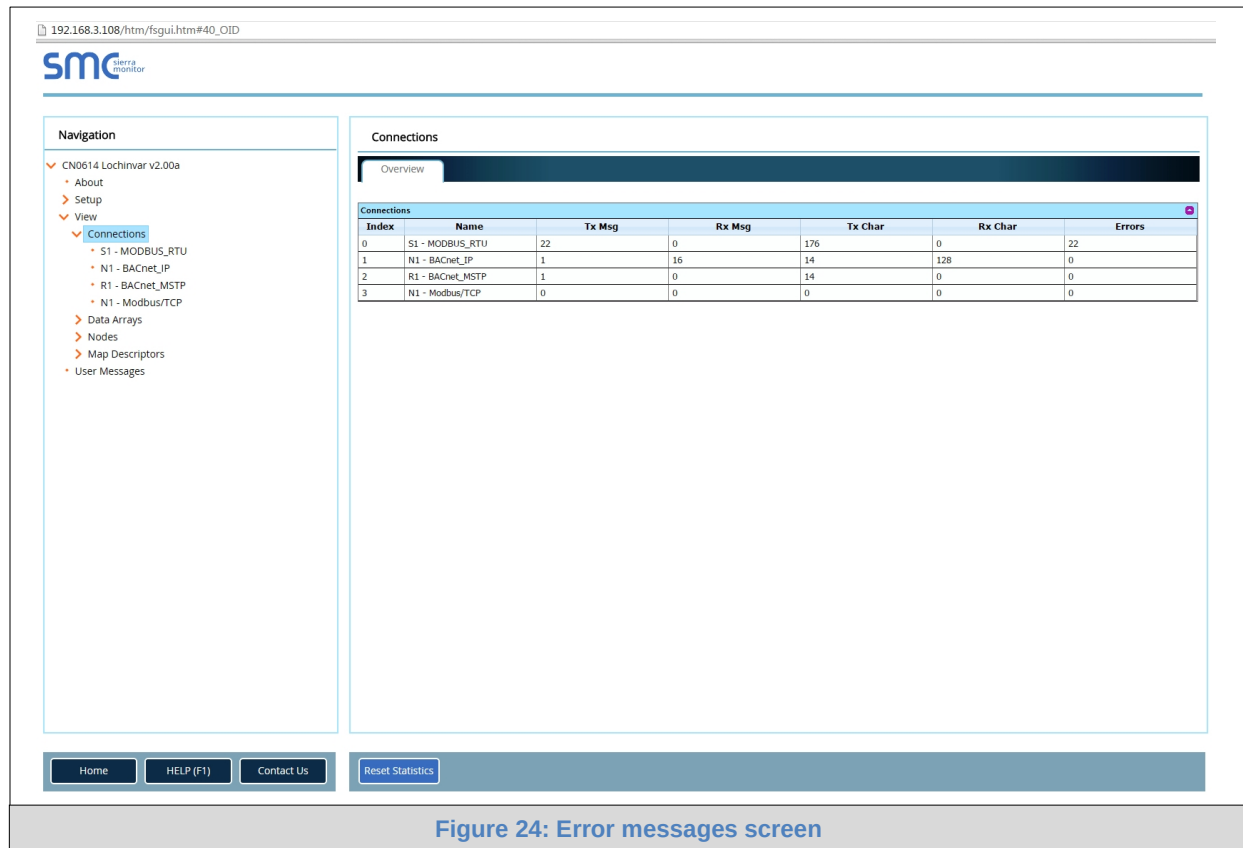


Figure 24: Error messages screen

Appendix A.2. Check 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 and you need to check the following things:
 - Visual observations of LEDs on ProtoNode. (**Appendix A.5**)
 - Check baud rate, parity, data bits, stop bits
 - Check Modbus device address
 - Verify wiring
 - Verify all the Modbus RTU devices that were discovered in FST Web Configurator. (**Section 5**)
- Field COM problems:
 - Visual observations of LEDs on ProtoNode. (**Appendix A.5**)
 - Visual dipswitch settings (using correct baud rate and device instance)
 - Verify IP address setting
 - Verify wiring

If the problem still exists, a Diagnostic Capture needs to be taken and sent to Sierra Monitor Corporation. (Appendix A.3)

Appendix A.3. Take Diagnostic Capture With the FieldServer Utilities

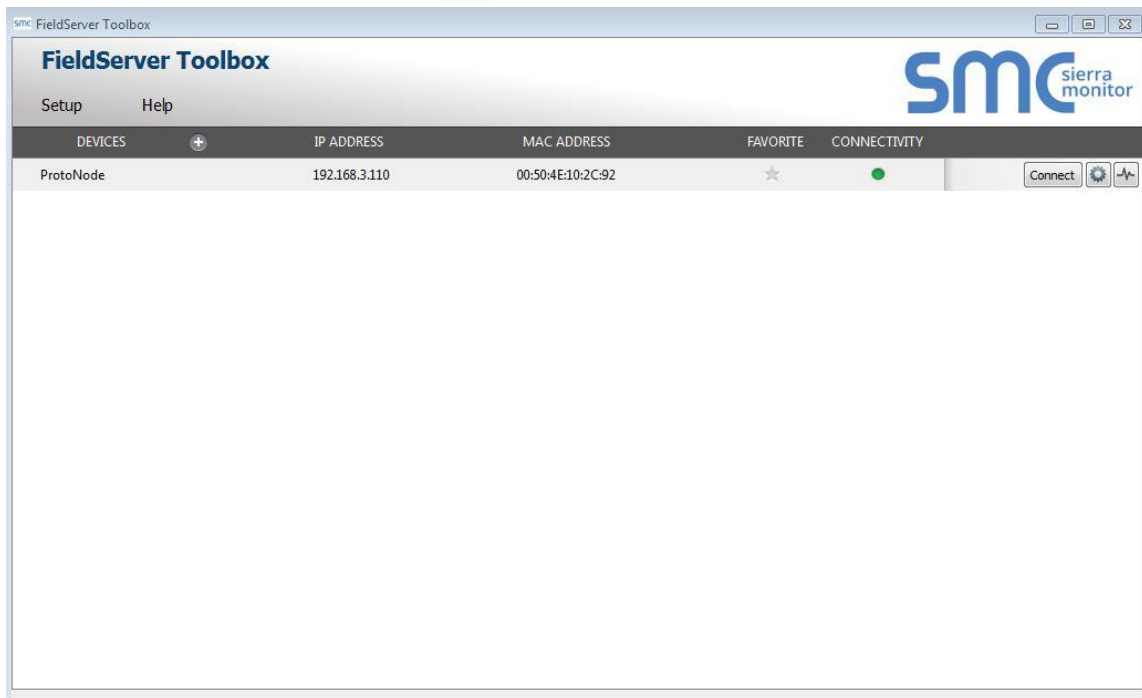
- **Once the Diagnostic Capture is complete, email it to support@sierramonitor.com. The Diagnostic Capture will allow us to rapidly diagnose the problem.**
- Ensure that FieldServer Toolbox is Loaded on the PC that is currently being used, or download FieldServer-Toolbox.zip on the Sierra Monitor Corporation webpage, 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.



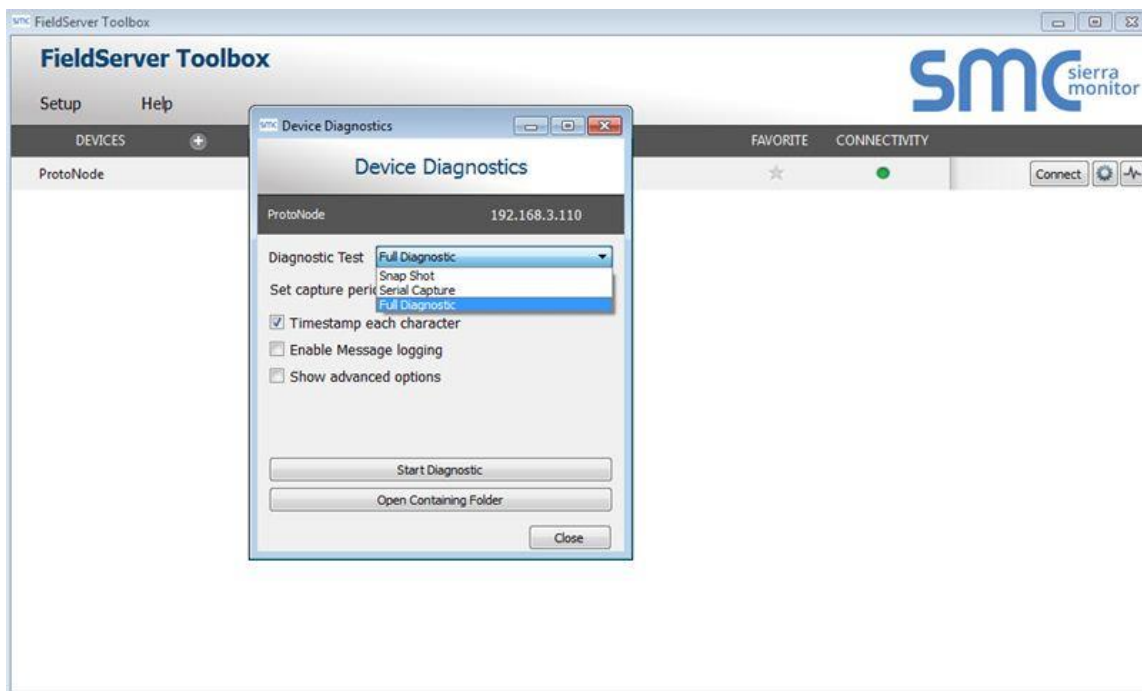
Figure 25: Ethernet Port Location

- Disable any wireless Ethernet adapters on the PC/Laptop
- 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

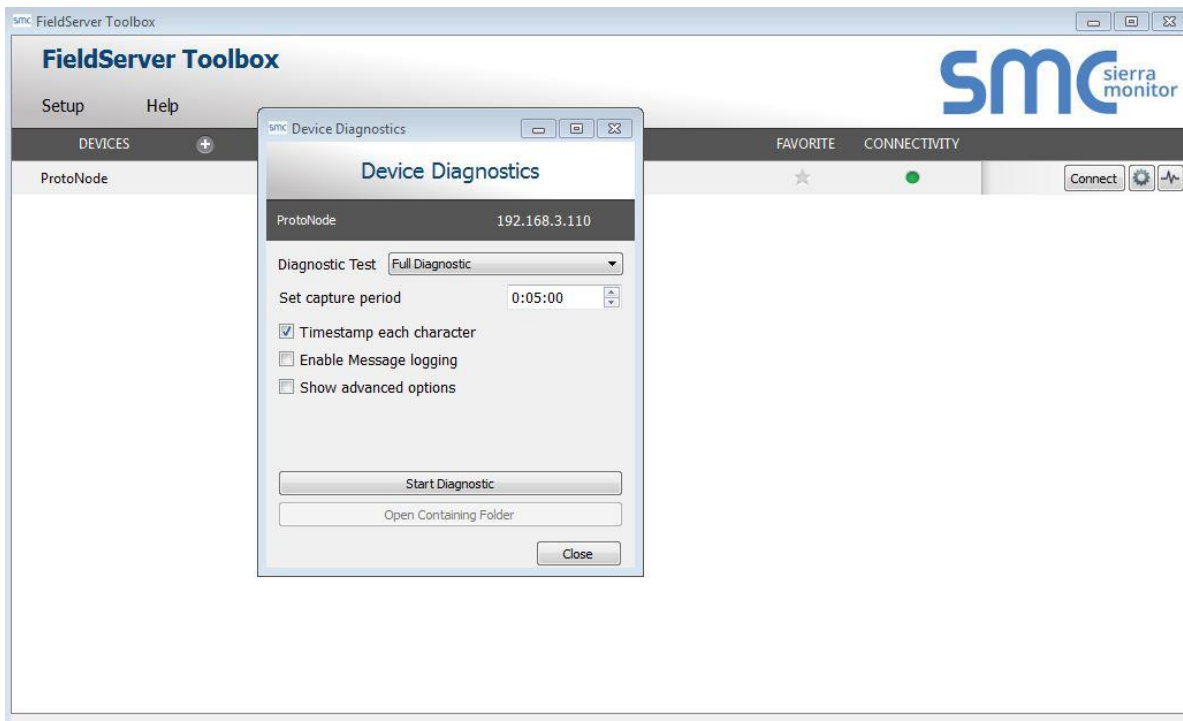
- **Step 1: Take a Log**
 - Click on the diagnose icon  of the desired device.



- Select full Diagnostic



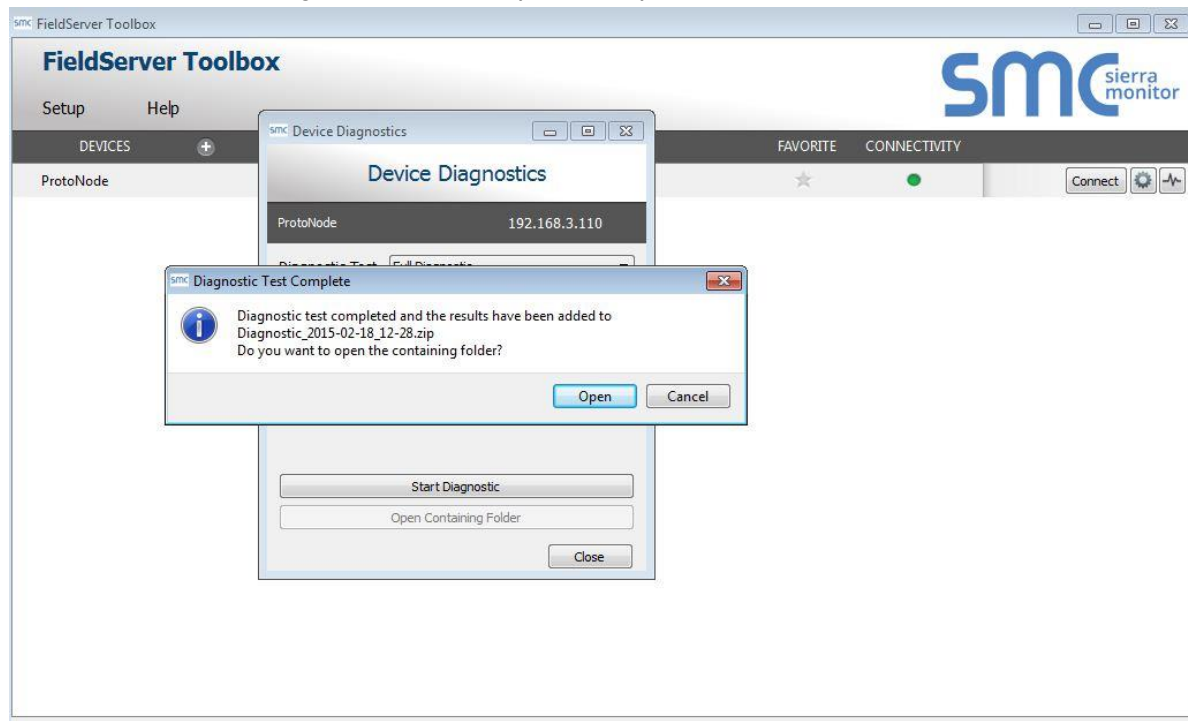
- If desired, the default capture period can be changed.
- Click on Start Diagnostic



- Wait for Capture period to finish. Diagnostic Test Complete window will appear.

• **Step 2:** Send Log

- Once the Diagnostic test is complete, a .zip file will be saved on the PC.



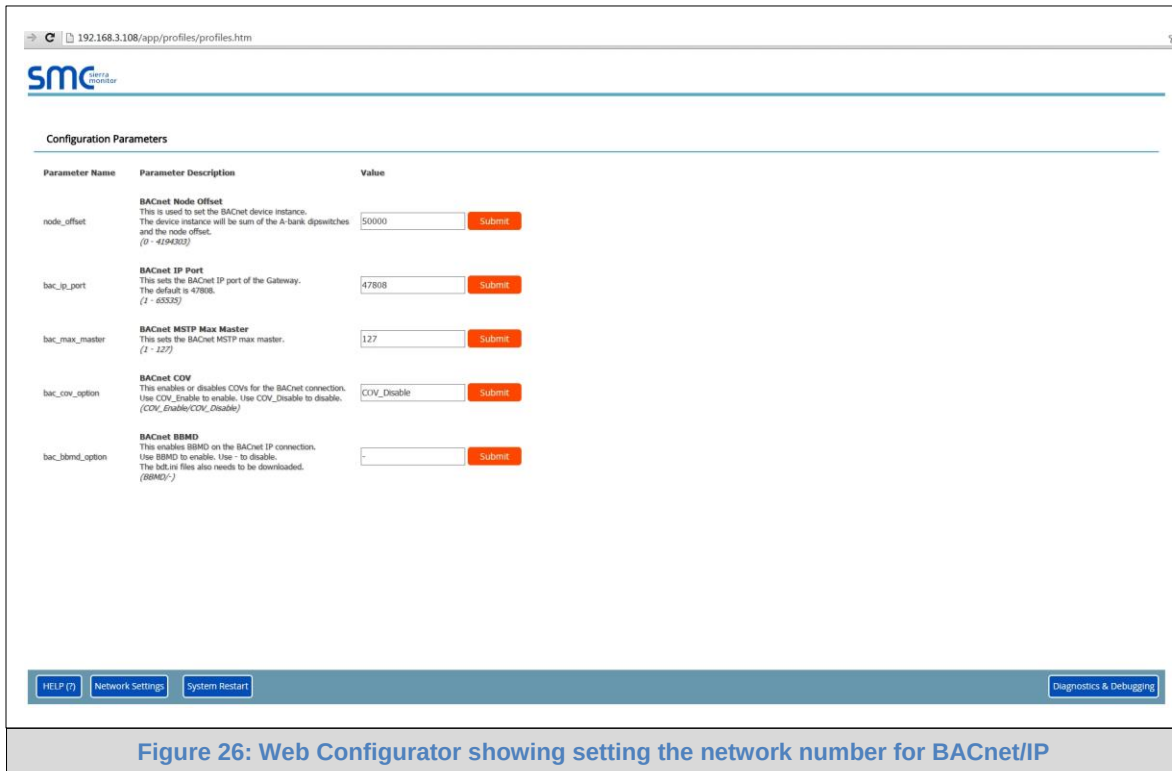
- Choose open to launch explorer and have it point directly at the correct folder. Send the Diagnostic zip file to support@sierramonitor.com

Diagnostic_2014-07-17_20-15.zip	2014/07/17 20:16	zip Archive	676 KB
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Appendix A.4. 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.



The screenshot shows the SMC Web Configurator interface. The browser address bar displays "192.168.3.108/app/profiles/profiles.htm". The page title is "Configuration Parameters". Below the title is a table with three columns: "Parameter Name", "Parameter Description", and "Value".

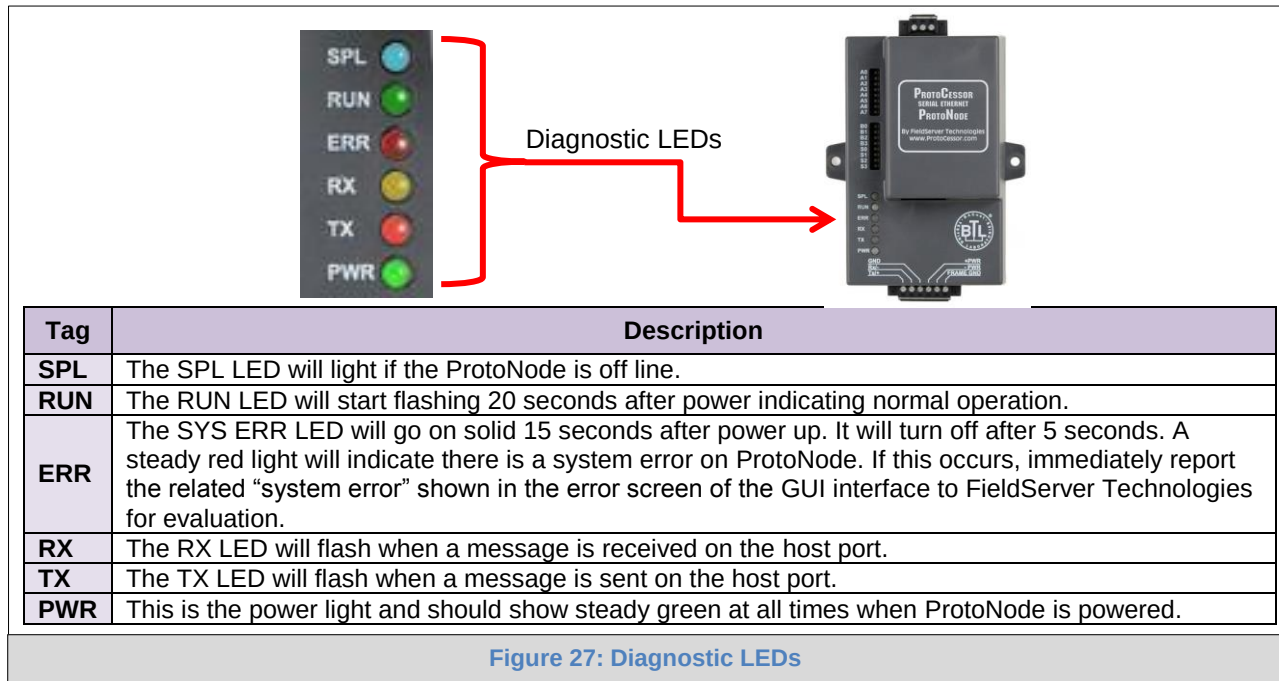
Parameter Name	Parameter Description	Value
node_offset	BACnet Node Offset This is used to set the BACnet device instance. The device instance will be sum of the A-bank dipswitches and the node offset. (0 - 42949632)	50000 Submit
bac_ip_port	BACnet IP Port This sets the BACnet IP port of the Gateway. The default is 47808. (1 - 65535)	47808 Submit
bac_max_master	BACnet MSTP Max Master This sets the BACnet MSTP max master. (1 - 127)	127 Submit
bac_cov_option	BACnet COV This enables or disables COV for the BACnet connection. Use COV_Enable to enable. Use COV_Disable to disable. (COV_Enable/COV_Disable)	COV_Disable Submit
bac_bmd_option	BACnet BBMD This enables BBMD on the BACnet IP connection. Use BBMD to enable. Use - to disable. The bllm files also needs to be downloaded. (BBMD/-)	- Submit

At the bottom of the configuration area, there are four buttons: "HELP (?)", "Network Settings", "System Restart", and "Diagnostics & Debugging".

Figure 26: Web Configurator showing setting the network number for BACnet/IP

Appendix A.5. LED Diagnostics for Modbus RTU Communications Between ProtoNode and Devices

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



Appendix A.6. 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 you forgot your password, click cancel on the password authentication popup window, and e-mail the Password recovery token to support@sierramonitor.com to receive a temporary password from the Sierra Monitor support team. You can now access the ProtoNode to set a new password.

Appendix B. Additional Features

Appendix B.1. DIP switch settings to support Metasys N2

Note: The lid on top of the ProtoNode has to be removed in order to select the A Bank of DIP switches. Pull on the lid while holding the on to the 6 pin Phoenix connector. Please do not hold the wall mount tabs as these are designed to break off if not required!

- To set select these configurations, open the ProtoNode and select the A bank of switches (A1 or A2 or A3) on the small ProtoCessor module that sits on top of the ProtoCarrier (inside the ProtoNode).
- ProtoCessor A1 DIP switch starts on the bottom of the A bank of DIP switches below.
- ProtoCessor A3-A8 DIP switches are disabled.



Falcon N2	ProtoCarrier DIP Switches				ProtoCessor DIP Switches (Remove Cover)							
Profile - FPC-N34-0614	S0	S1	S2	S3	A1	A2	A3	A4	A5	A6	A7	A8
Metasys N2 SYNC Deg_C	Off	Off	On	On	Off	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Knight/Knight XL/Armor/Wall Mount/Wall Hung Deg_C	On	Off	On	On	Off	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Crest Deg_C	Off	On	On	On	Off	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Copper-Fin II Deg_C	On	On	On	On	Off	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Power Fin Deg_C	Off	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Knight FTXL Deg_C	On	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	Off
Metasys N2 SYNC Deg_F	Off	On	Off	Off	On	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Knight/Knight XL/Armor/Wall Mount/Wall Hung Deg_F	On	On	Off	Off	On	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Crest Deg_F	Off	Off	On	Off	On	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Copper-Fin II Deg_F	On	Off	On	Off	On	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Power Fin Deg_F	Off	On	On	Off	On	Off	Off	Off	Off	Off	Off	Off
Metasys N2 Knight FTXL Deg_F	On	On	On	Off	On	Off	Off	Off	Off	Off	Off	Off

Appendix C. Vendor Information - Lochinvar

Appendix C.1. Sync Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon 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	oDHWpump1	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 C.2. Knight Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon 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	oDHW Pump	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 C.3. Crest Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon 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 C.4. Copper-Fin II Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon 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	nvoDHW Pump	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 C.5. Power Fin Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2 and LonWorks

Point Name	BACnet	BACnet	N2 Data	N2	Lon Name	Lon SNVT
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	Object Type	Object ID	Type	Point Address		
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	oDHW Pump1	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 C.6. Knight FTXL Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon 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 1	BI	18	DI	18	oDHW Pump1	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 D. "A" Bank DIP Switch Settings

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

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

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
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Appendix E. Reference

Appendix E.1. Specifications



	ProtoNode FPC-N34	ProtoNode FPC-N35
Electrical Connections	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One 3-pin Phoenix connector with: RS-485 port (+ / - / gnd) One Ethernet 10/100 BaseT port	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One Ethernet 10/100 BaseT port One FTT-10 LonWorks 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; DNP3 Conformance Tested; RoHS Compliant; CSA 205 Approved	
	BTL Marked	LonMark Certified
Power Requirements	Multi-mode power adapter: 9-30VDC or 12 - 24VAC	
Physical Dimensions	11.5 cm L x 8.3 cm W x 4.1 cm H (4.5 x 3.2 x 1.6 in.)	
Weight:	0.2 kg (0.4 lbs)	
Operating Temperature:	-40°C to 75°C (-40°F to167°F)	
Surge Suppression	EN61000-4-2 ESD EN61000-4-3 EMC EN61000-4-4 EFT	
Humidity:	5 - 90% RH (non-condensing)	
(Specifications subject to change without notice)		
Figure 28: Specifications		

Appendix E.1.1. Compliance with UL Regulations

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

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

Appendix F. Limited 2 Year Warranty

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.