ProtoNode FPC-N34 and ProtoNode FPC-N35 Startup Guide For Interfacing LAARS Products: Sola 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 July 2015

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Technical Support:

Thank you for purchasing the ProtoNode for LAARS.

Please call LAARS Service for Technical support of the ProtoNode product.

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

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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,
   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

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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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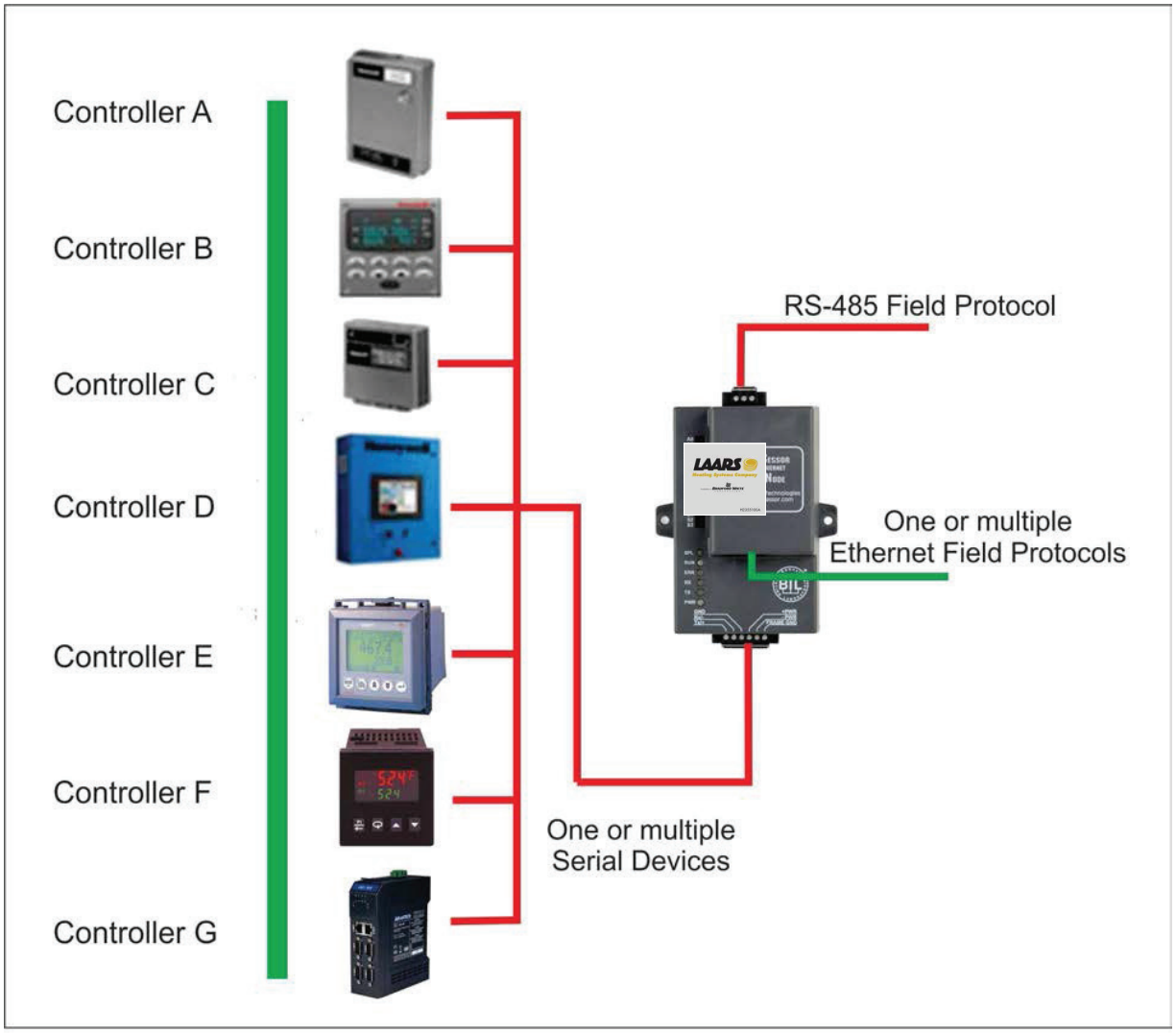
1 INTRODUCTION

1.1 ProtoNode Gateway

ProtoNode is an external, high performance **Building Automation multi-protocol gateway** that has been preprogrammed for LAARS' products (hereafter called "device") to various building automation protocols. These protocols include BACnet®[1] MS/TP, BACnet/IP, Metasys®[2] N2 by JCI, Modbus TCP/IP, and LonWorks®[3]. 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-N34-0701
ProtoNode FPC-N35	FPC-N35-0702

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	38400
Parity	None
Data Bits	8
Stop Bits	1

Figure 2: Modbus RTU COM Settings

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

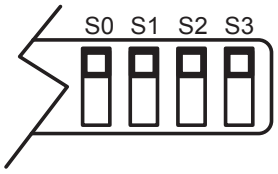
Set the Modbus Node-ID for each of the devices attached to ProtoNode.

- 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).



S0 – S3 DIP Switches

S Bank DIP Switch Location

Figure 3: S Bank DIP Switches

2.3.1.1 BACnet MS/TP and BACnet IP DIP Switch Settings

The following charts 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-N34-0701	**S0**	**S1**	**S2**	**S3**
BACnet/IP and BACnet MS/TP Sola 1 Deg_F	Off	Off	Off	Off
BACnet/IP and BACnet MS/TP Sola 2 Deg_F	On	Off	Off	Off
BACnet/IP and BACnet MS/TP Sola 3 Deg_F	Off	On	Off	Off
BACnet/IP and BACnet MS/TP Sola 4 Deg_F	On	On	Off	Off
BACnet/IP and BACnet MS/TP Sola 5 Deg_F	Off	Off	On	Off
BACnet/IP and BACnet MS/TP Sola 6 Deg_F	On	Off	On	Off
BACnet/IP and BACnet MS/TP Sola 7 Deg_F	Off	On	On	Off
BACnet/IP and BACnet MS/TP Sola 8 Deg_F	On	On	On	Off
BACnet/IP and BACnet MS/TP Sola 1 Deg_C	Off	Off	Off	On
BACnet/IP and BACnet MS/TP Sola 2 Deg_C	On	Off	Off	On
BACnet/IP and BACnet MS/TP Sola 3 Deg_C	Off	On	Off	On
BACnet/IP and BACnet MS/TP Sola 4 Deg_C	On	On	Off	On
BACnet/IP and BACnet MS/TP Sola 5 Deg_C	Off	Off	On	On
BACnet/IP and BACnet MS/TP Sola 6 Deg_C	On	Off	On	On
BACnet/IP and BACnet MS/TP Sola 7 Deg_C	Off	On	On	On
BACnet/IP and BACnet MS/TP Sola 8 Deg_C	On	On	On	On

	ProtoCarrier DIP Switches			
Profile - FPC-N34-0701	**S0**	**S1**	**S2**	**S3**
BACnet/IP and BACnet MS/TP Sola 1 Deg_F	Off	Off	Off	Off
BACnet/IP and BACnet MS/TP Sola 2 Deg_F	On	Off	Off	Off
BACnet/IP and BACnet MS/TP Sola 3 Deg_F	Off	On	Off	Off
BACnet/IP and BACnet MS/TP Sola 4 Deg_F	On	On	Off	Off
BACnet/IP and BACnet MS/TP Sola 5 Deg_F	Off	Off	On	Off
BACnet/IP and BACnet MS/TP Sola 6 Deg_F	On	Off	On	Off
BACnet/IP and BACnet MS/TP Sola 7 Deg_F	Off	On	On	Off
BACnet/IP and BACnet MS/TP Sola 8 Deg_F	On	On	On	Off
BACnet/IP and BACnet MS/TP Sola 1 Deg_C	Off	Off	Off	On
BACnet/IP and BACnet MS/TP Sola 2 Deg_C	On	Off	Off	On
BACnet/IP and BACnet MS/TP Sola 3 Deg_C	Off	On	Off	On
BACnet/IP and BACnet MS/TP Sola 4 Deg_C	On	On	Off	On
BACnet/IP and BACnet MS/TP Sola 5 Deg_C	Off	Off	On	On
BACnet/IP and BACnet MS/TP Sola 6 Deg_C	On	Off	On	On
BACnet/IP and BACnet MS/TP Sola 7 Deg_C	Off	On	On	On
BACnet/IP and BACnet MS/TP Sola 8 Deg_C	On	On	On	On

See Appendix B.1 for the Configuration DIP switch settings for - 1 through 8 Sola to Metasys N2 and Modbus TCP/IP.

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 for the Sola to support **LonWorks** on a ProtoNode FPC-N35.

	ProtoCarrier DIP Switches			
Profile - FPC-N35-0702	**S0**	**S1**	**S2**	**S3**
LonWorks Sola 1	Off	Off	Off	Off
LonWorks Sola 2	On	Off	Off	Off
LonWorks Sola 3	Off	On	Off	Off
LonWorks Sola 4	On	On	Off	Off
LonWorks Sola 5	Off	Off	On	Off
LonWorks Sola 6	On	Off	On	Off
LonWorks Sola 7	Off	On	On	Off
LonWorks Sola 8	On	On	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.

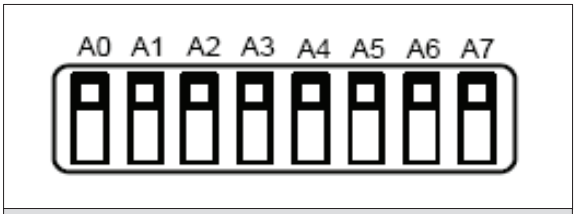


Figure 4: MAC Address DIP Switches

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.

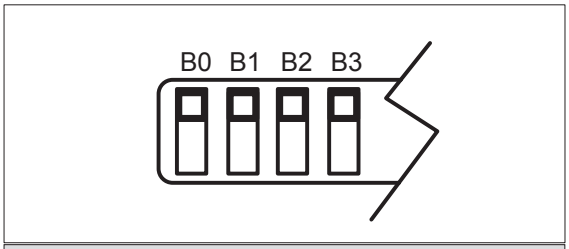


Figure 5: Baud Rate DIP Switches

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 6: BMS Baud Rate

* Factory default setting = 38,400

3 INTERFACING PROTONODE TO DEVICES

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

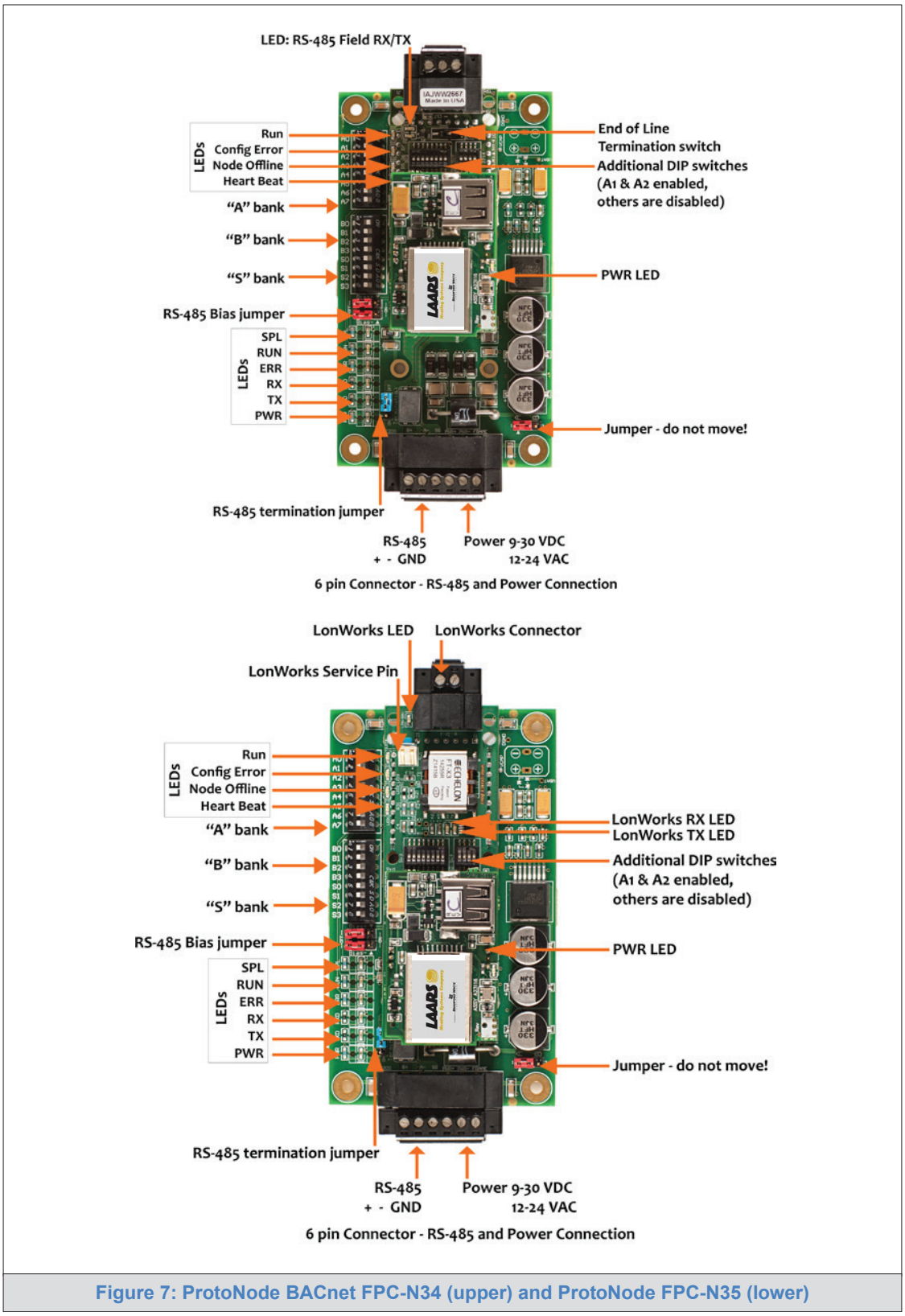


Figure 7: ProtoNode BACnet FPC-N34 (upper) and ProtoNode FPC-N35 (lower)

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).

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

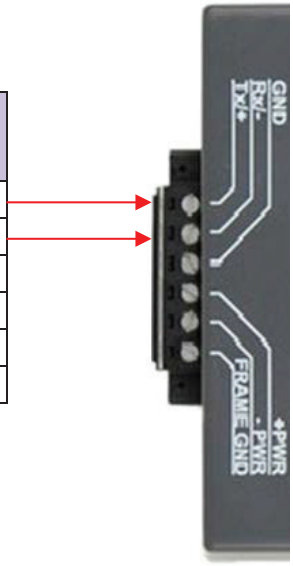


Figure 8: Power and RS-485 Connections

3.2.1 Sola wiring to the ProtoNode using Display

- On the System Operator Display COM 2 port, connect terminal A (RS-485+) to Pin 1 (B+) on the ProtoNode's 6 pin Phoenix connector. (Figure 9)
- Connect terminal B2 (RS-485-) to Pin 2 (A-) on the ProtoNode's 6 pin Phoenix connector.
- Pin C (Ground) does not need to be grounded to the ProtoNode.

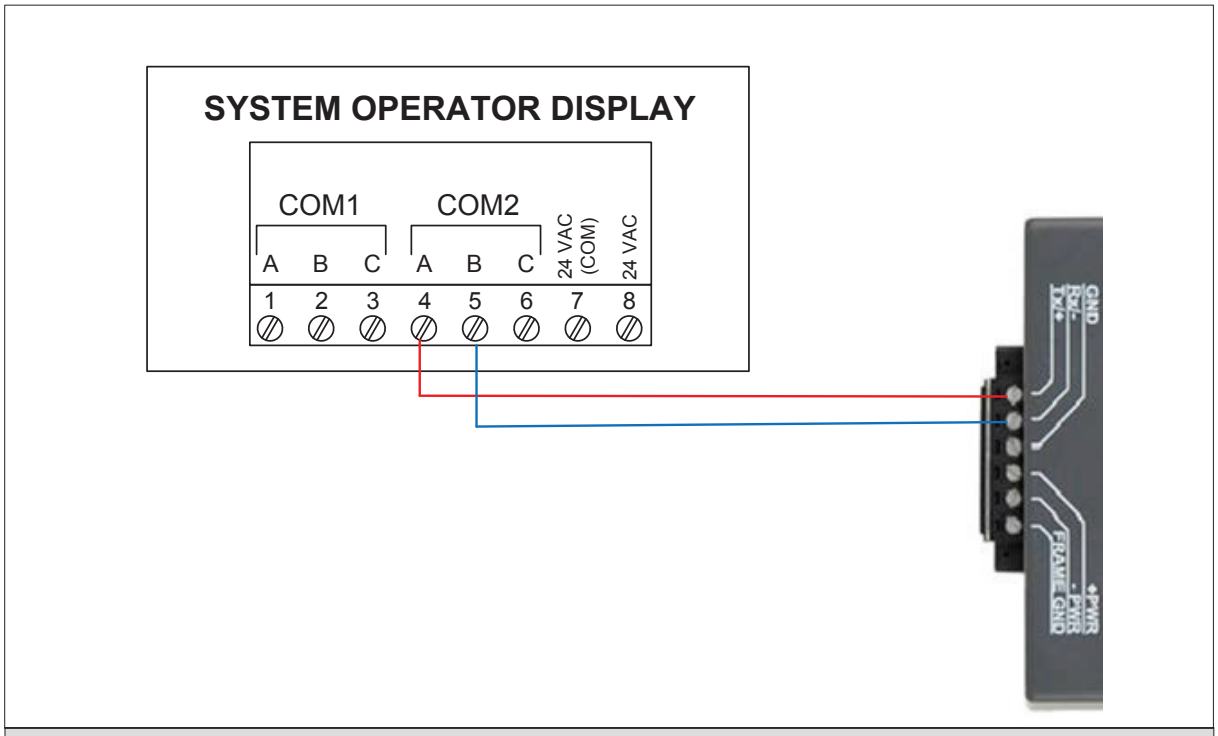


Figure 9: Sola wiring using Display

3.2.2 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. See **Figure 10**.
- **Only turn biasing ON:**
  - **IF the BMS cannot see more than one device connected to the ProtoNode**
  - **AND you have checked all the settings (Modbus COM settings, wiring, and DIP switches).**
- 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.

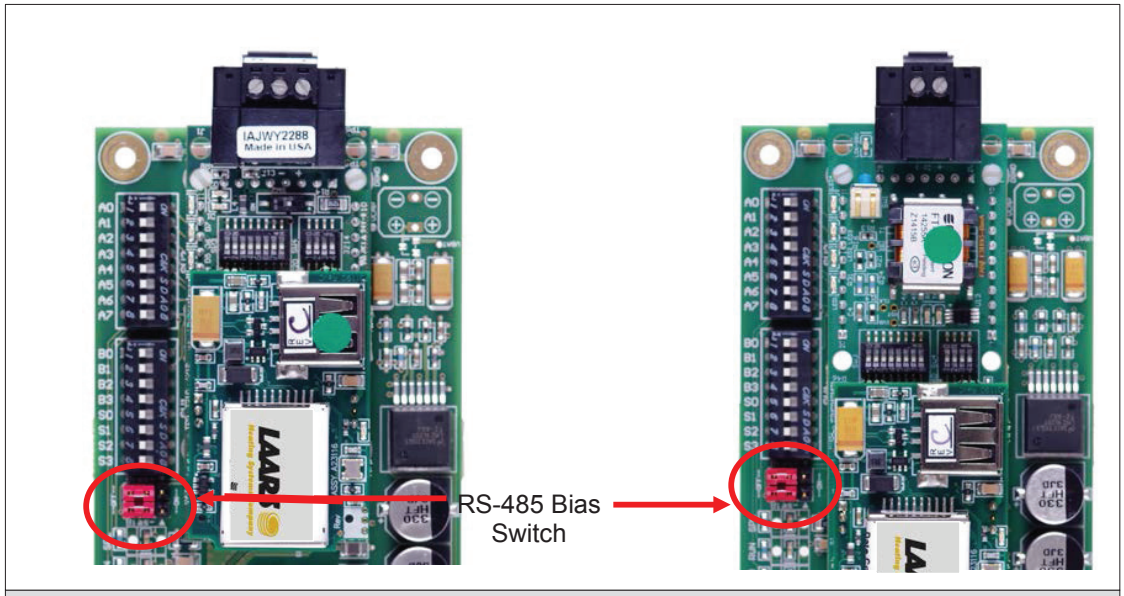


Figure 10: Modbus RS-485 Biasing Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)

3.2.3 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).**

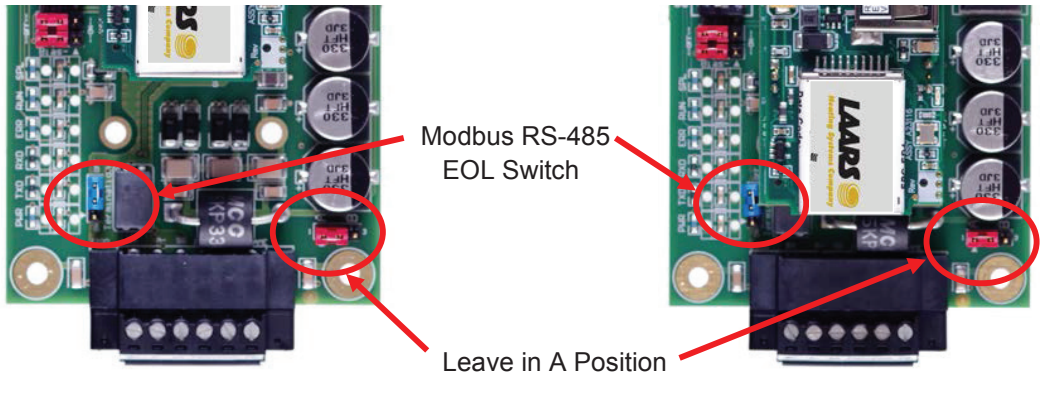


Figure 11: Modbus RS-485 End-Of-Line Termination Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)

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

- For BACnet/IP see **Section 4** for information on connecting to BACnet/IP 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.
- 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).

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

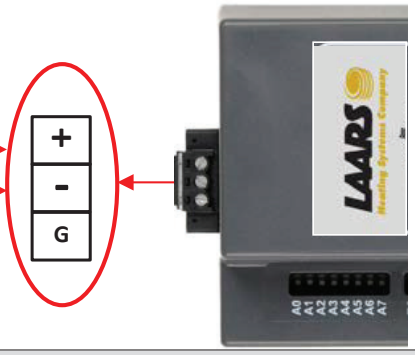


Figure 12: Connection from ProtoNode to RS-485 Field Network

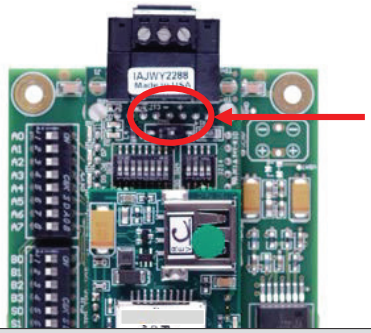


Figure 13: RS-485 BMS Network EOL Switch

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

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

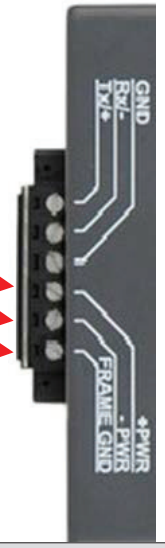


Figure 16: Power Connections

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 

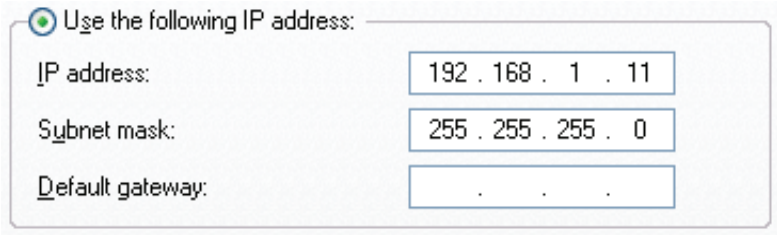
> 

> 

- Right-click on Local Area Connection > Properties
- Highlight 

> 

- Select: Use the following IP address



- 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 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 the landing page (Figure 17)
- 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.

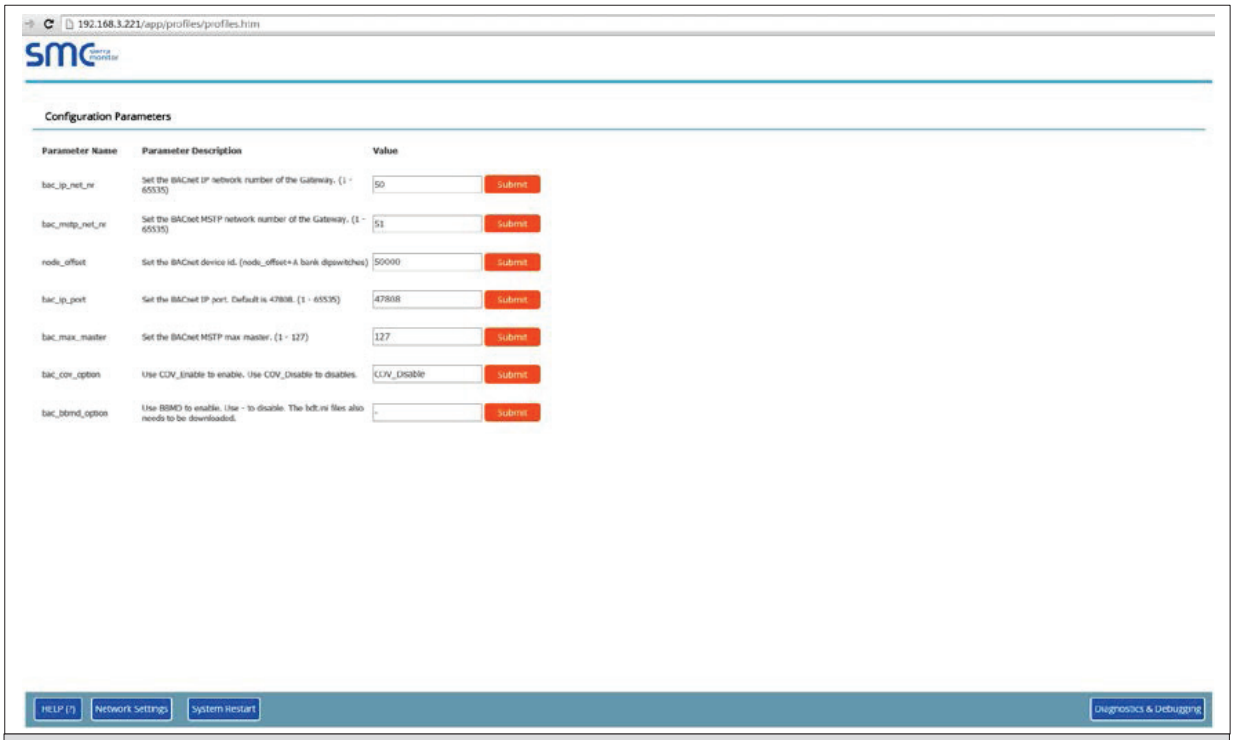


Figure 17: Web Configuration Screen

- 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**)

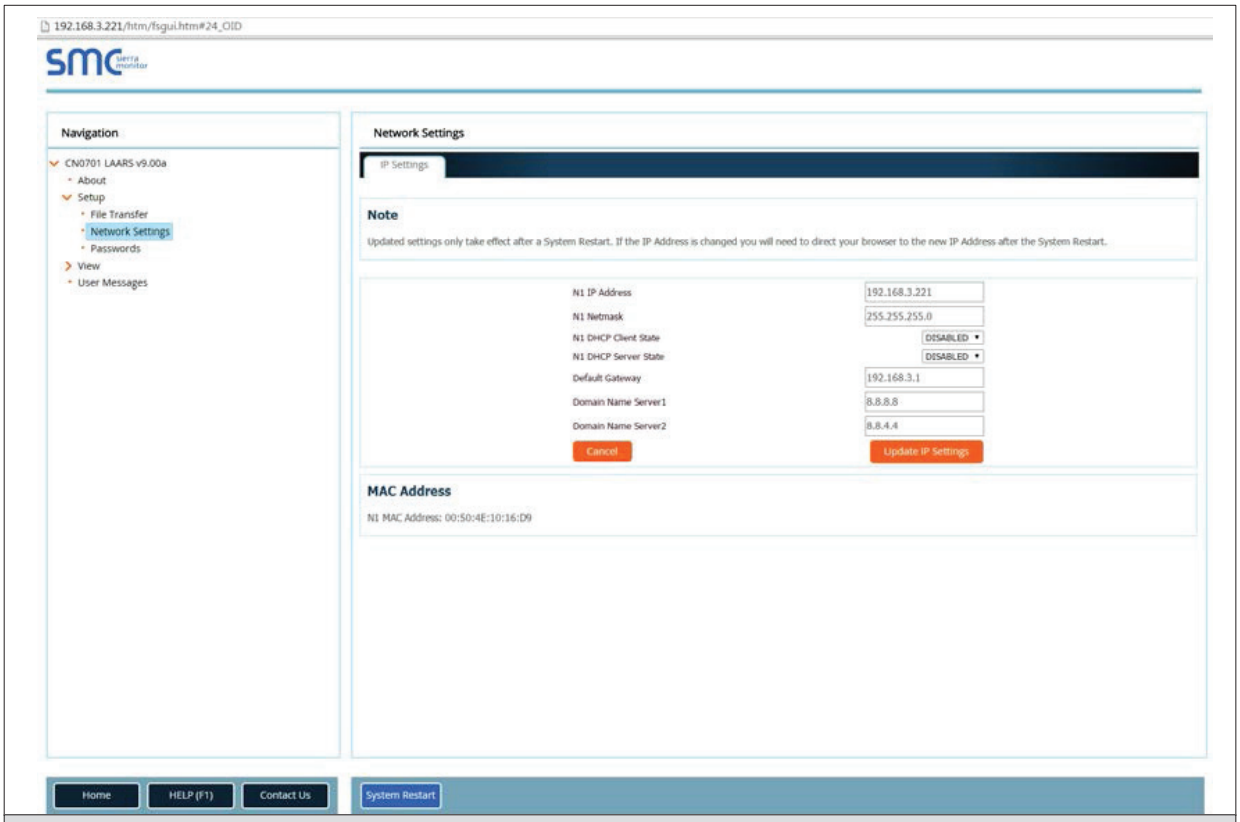


Figure 18: Changing IP Address via FST Web GUI

- 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

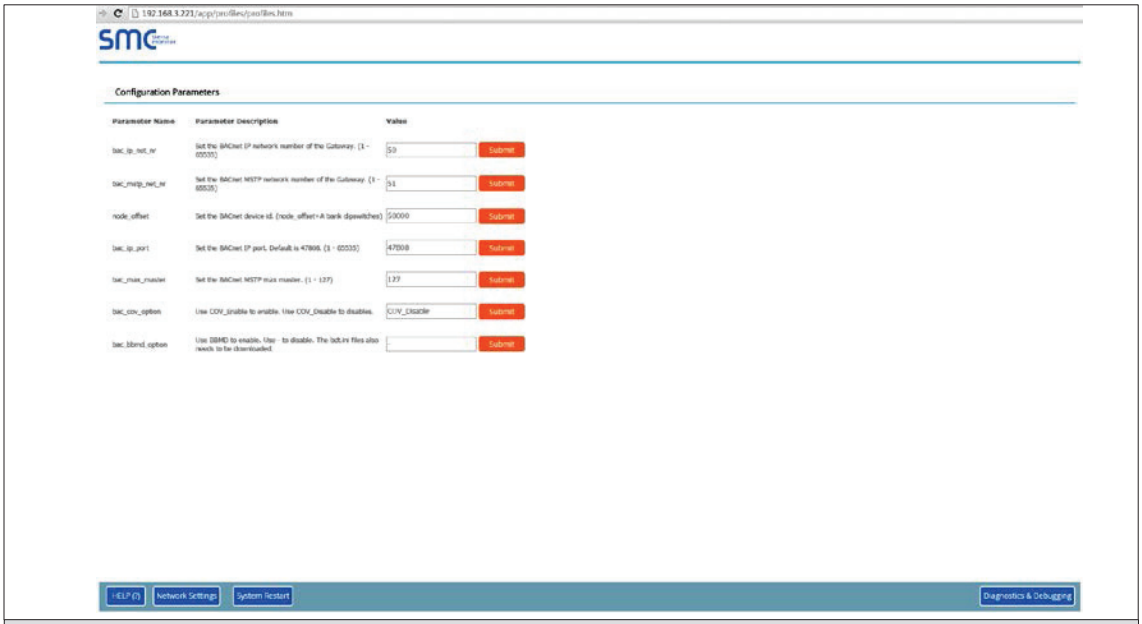


Figure 19: Web Configurator screen

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 start > Control Panel > Network Connections

  Right-click on Local Area Connection > Properties

  Highlight Internet Protocol (TCP/IP) > Properties

- For Windows 7:

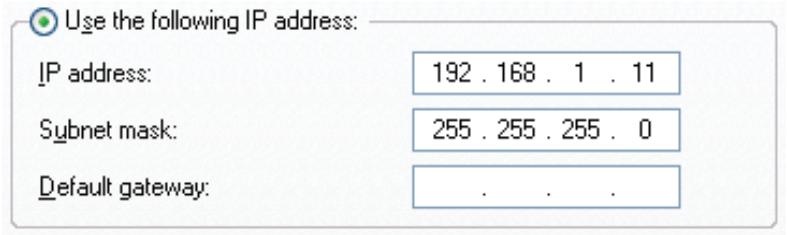
  Go to > Control Panel > Network and Internet

  > 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, 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

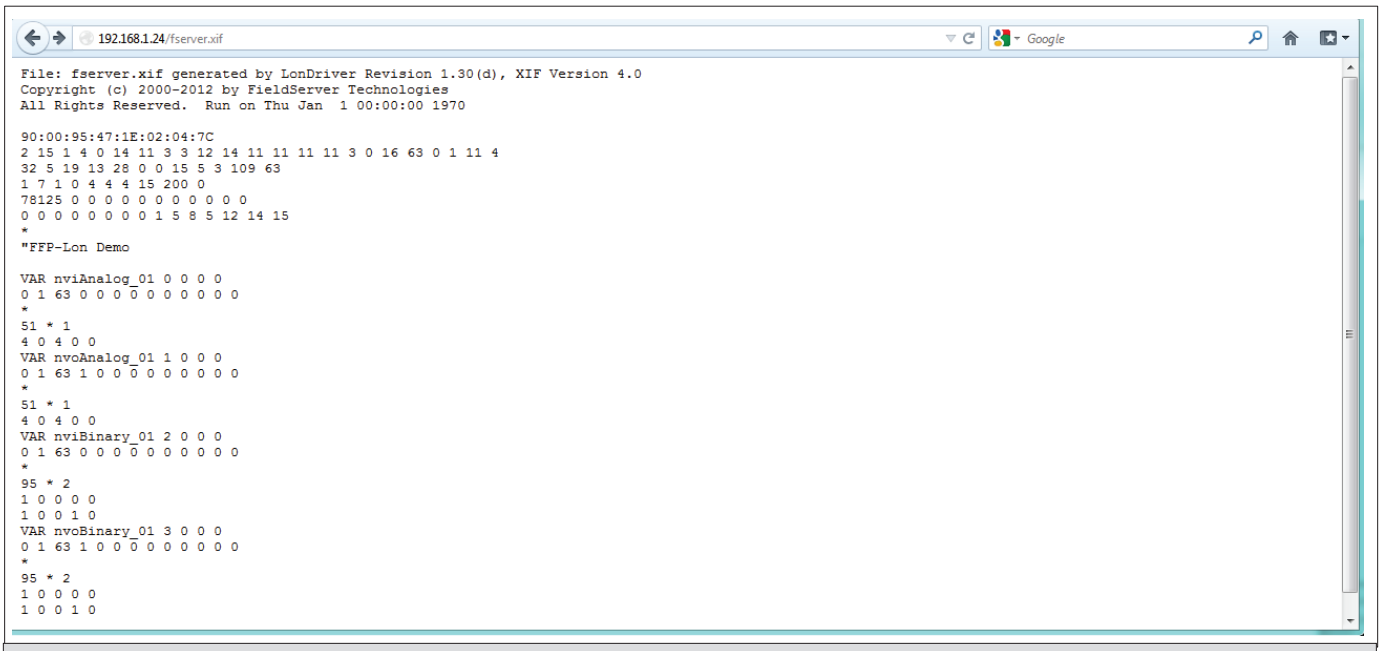


Figure 21: Sample of Fserver.XIF File Being Generated

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 "Laars2BACnet".** Once completed, the email address that was submitted will be registered.

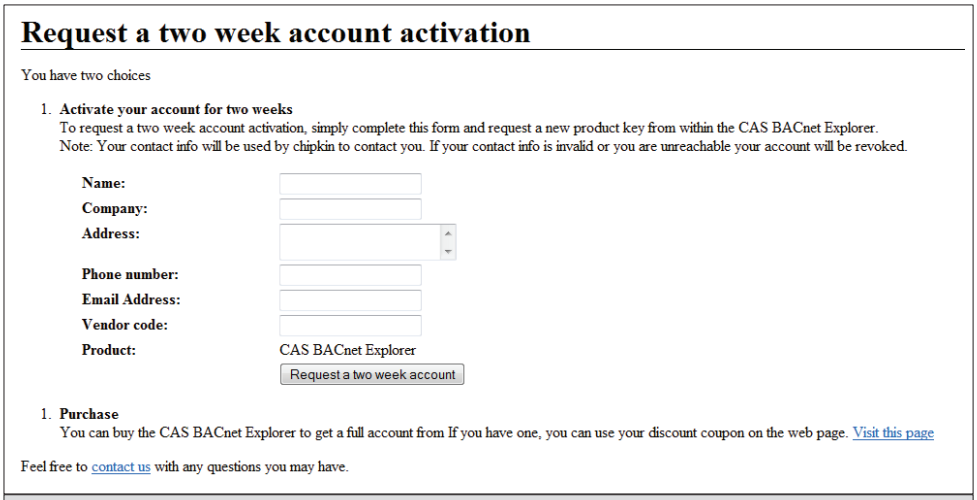


Figure 22: Downloading the CAS Explorer

- 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".

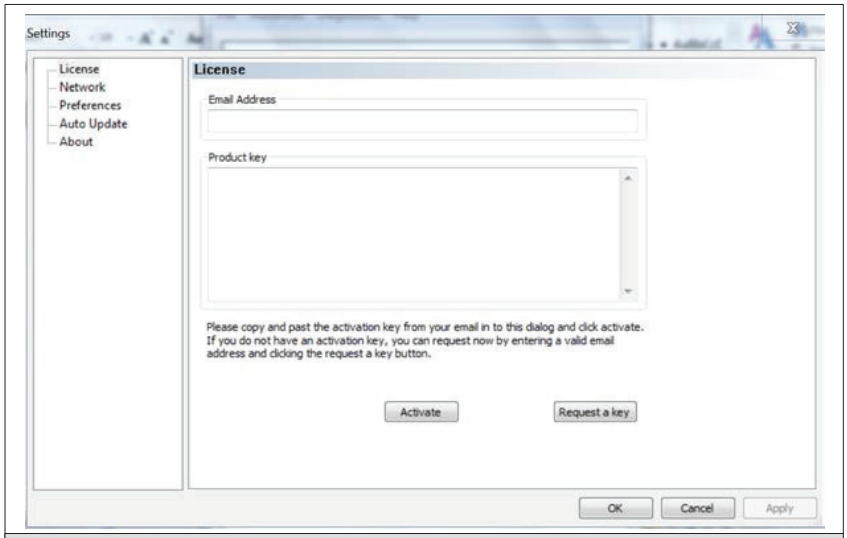


Figure 23: Requesting CAS Activation Key

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.

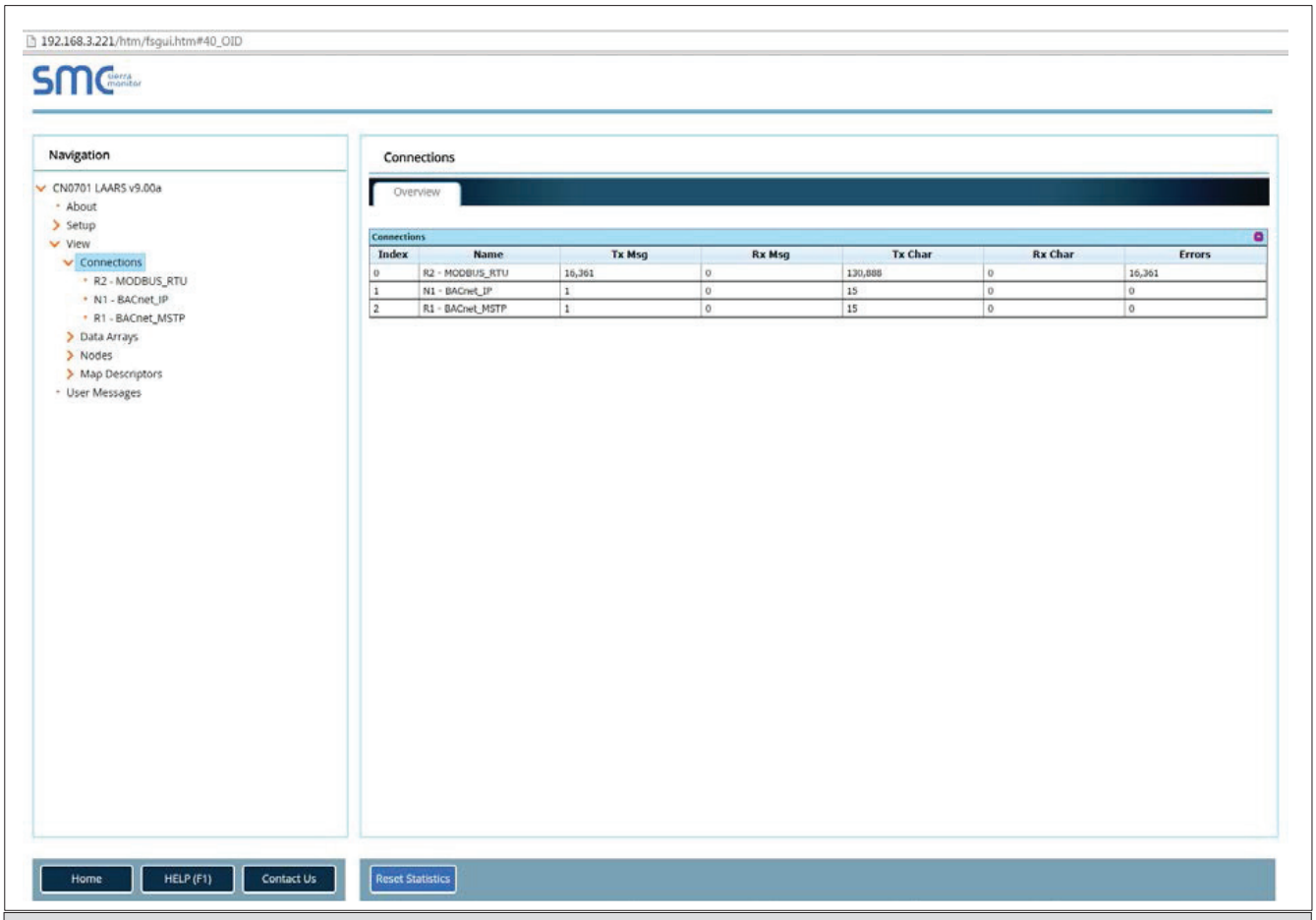


Figure 24: Error messages screen

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)

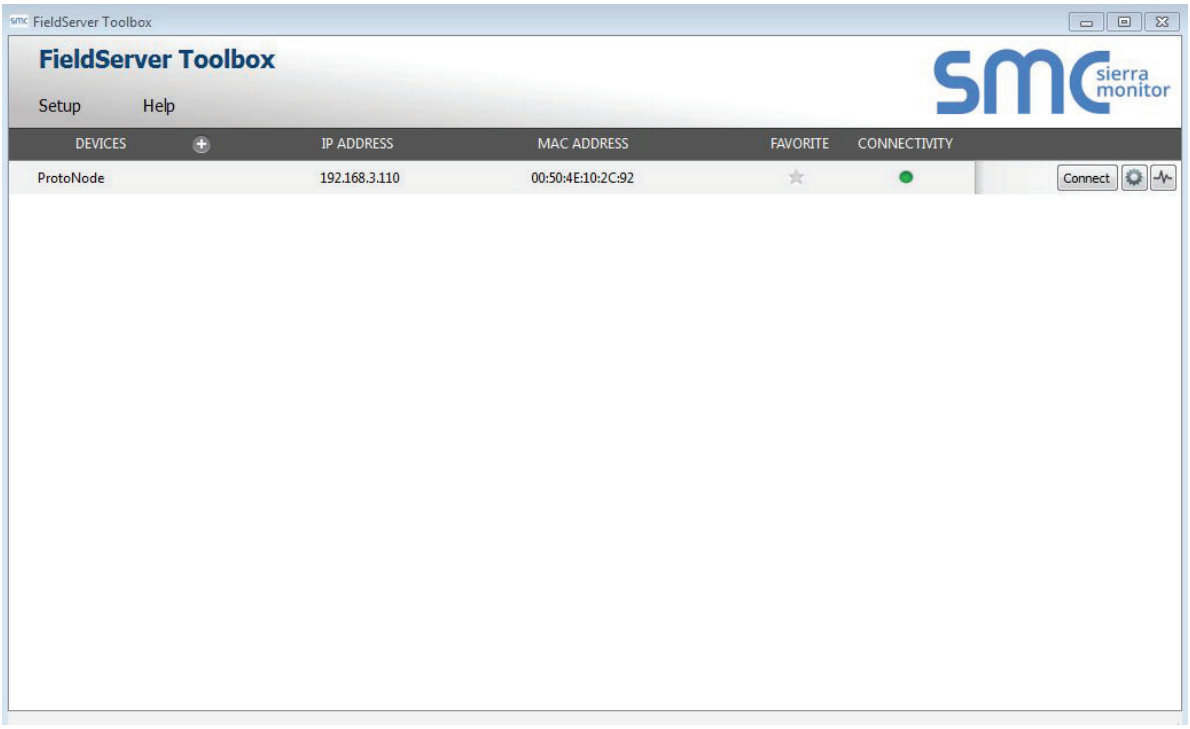
Appendix A.3. Take Diagnostic Capture With the FieldServer Utilities

- **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.

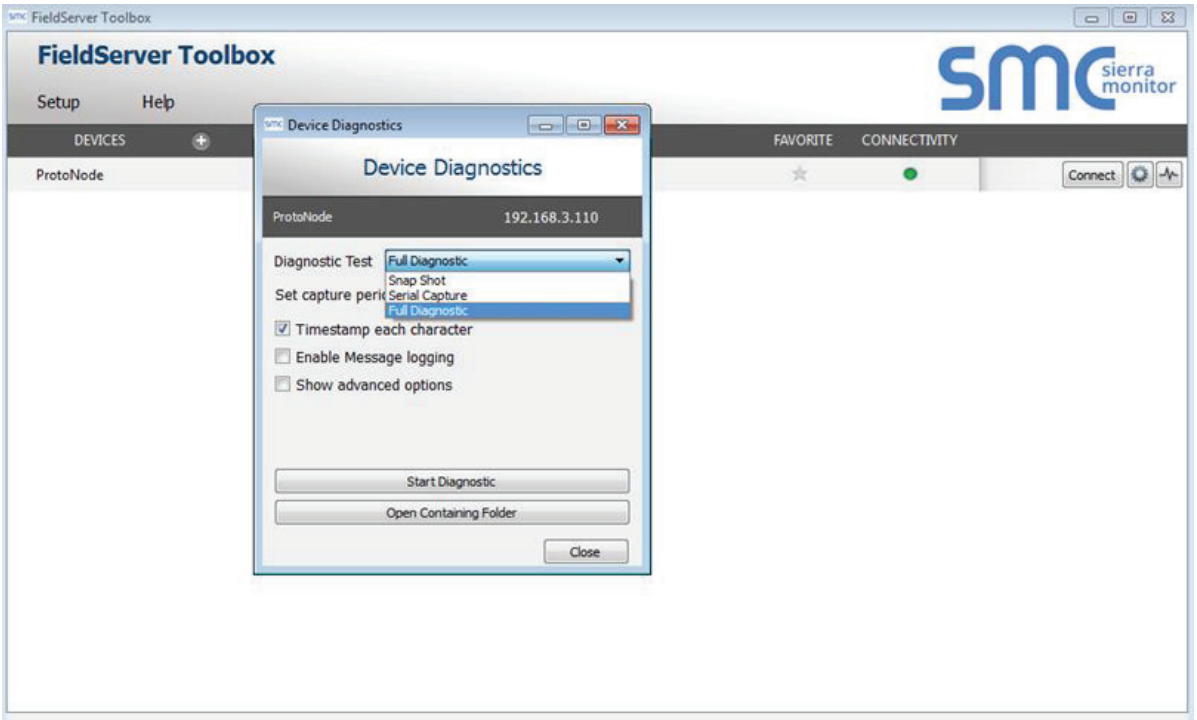
Figure 25: Ethernet Port Location

- 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

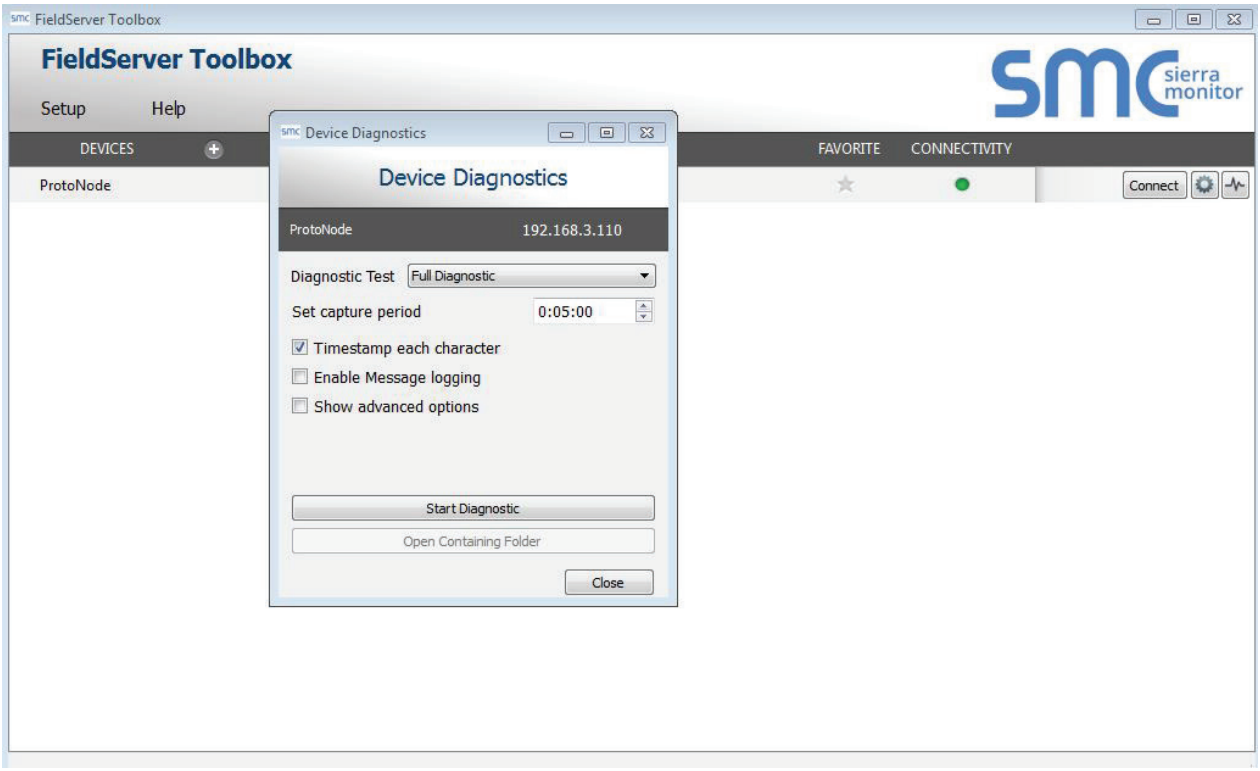
- Double click on the FS Toolbox Utility
- **Step 1:** Take a Log
    - Click on the diagnose icon  of the desired device.



    - Select full Diagnostic

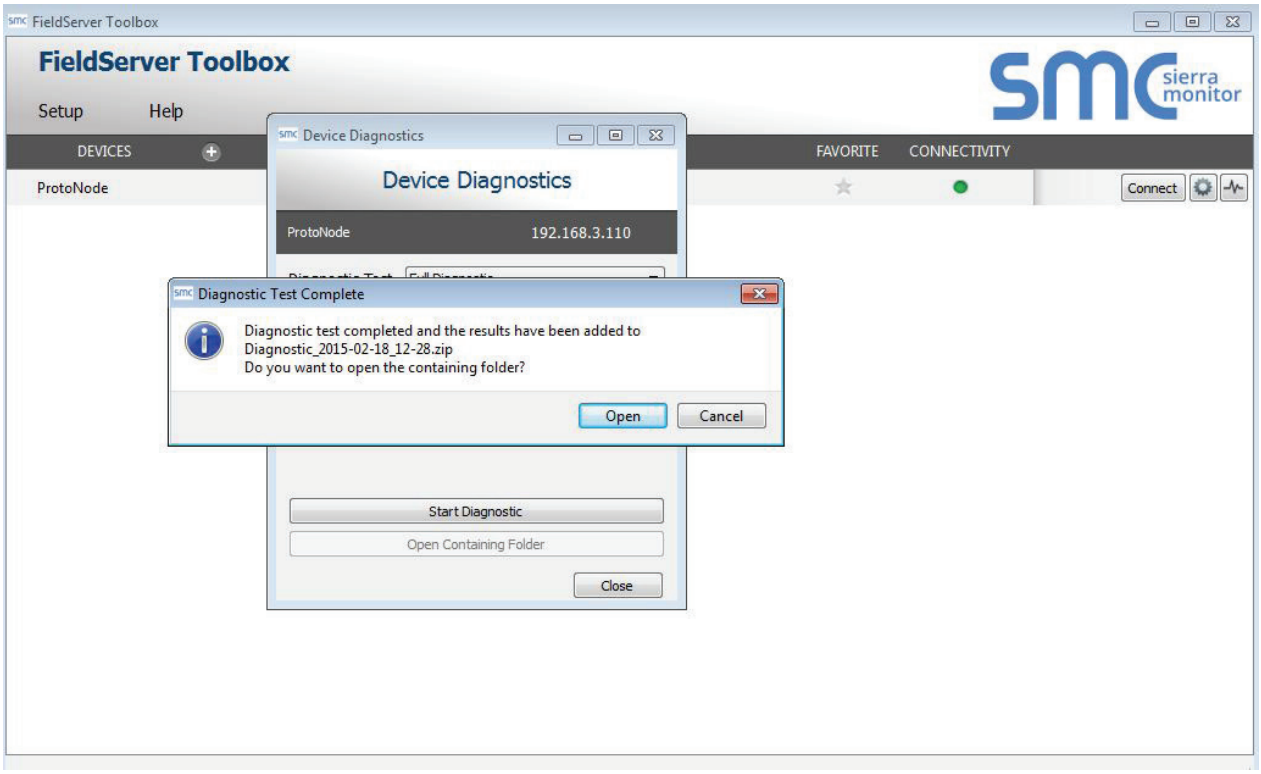


    - If desired, the default capture period can be changed.
    - Click on Start Diagnostic



- 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

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.

There is a Network number field for BACnet/IP and a Network number field for BACnet MS/TP, please fill in the appropriate box.

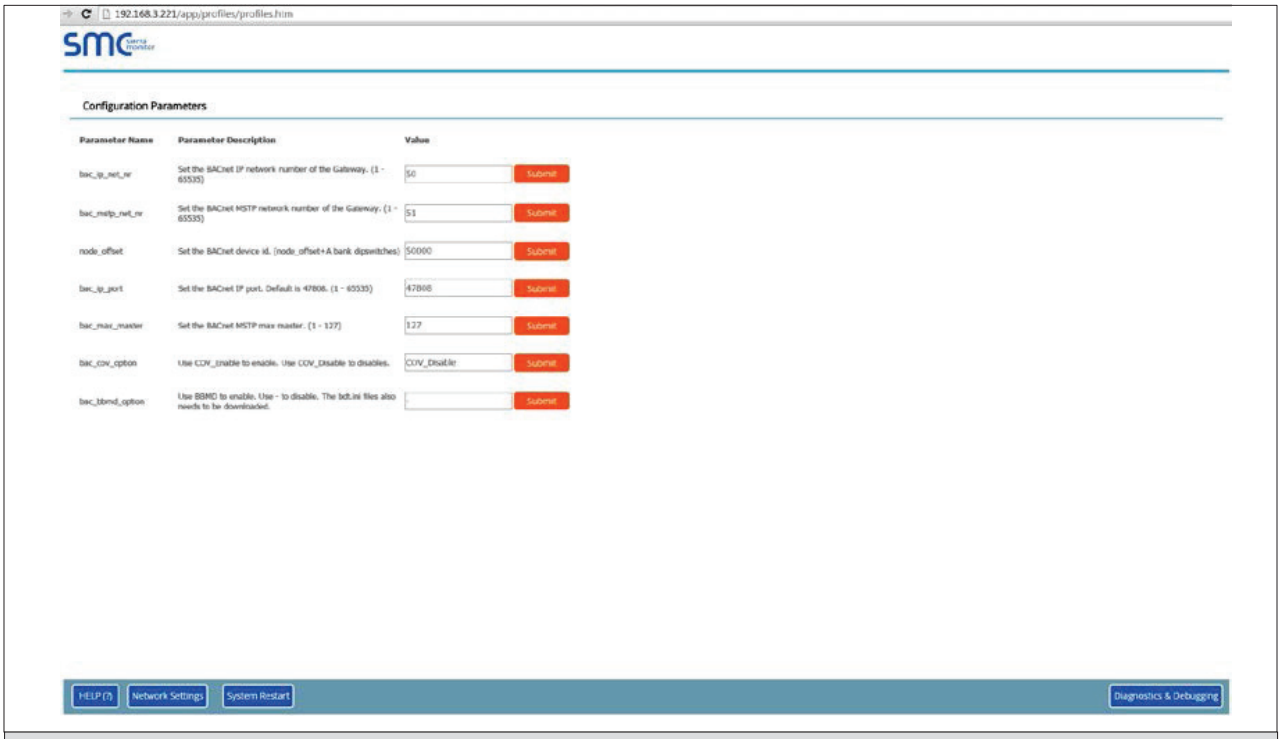
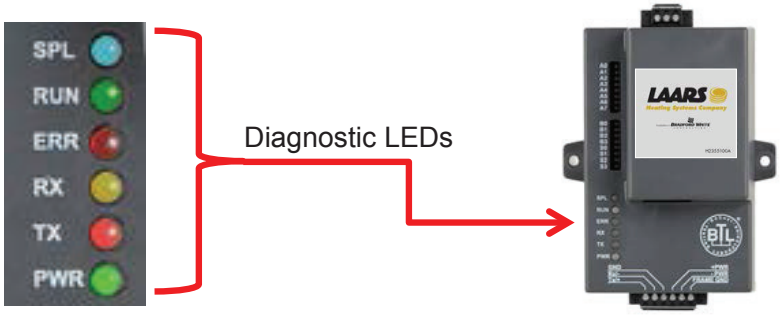


Figure 26: Web Configurator showing setting the network number for BACnet

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.



Tag	Description
SPL	The SPL LED will light if the ProtoNode is off line.
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 ProtoNode. If this occurs, immediately report the related “system error” shown in the error screen of the GUI interface to FieldServer Technologies for evaluation.
RX	The RX LED will flash when a message is received on the host port.
TX	The TX LED will flash when a message is sent on the host port.
PWR	This is the power light and should show steady green at all times when ProtoNode is powered.

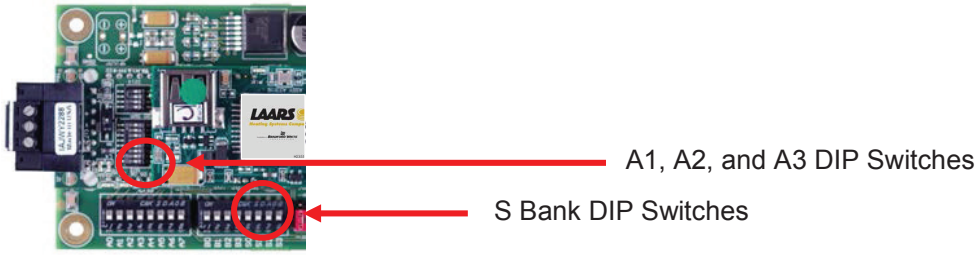
Figure 27: Diagnostic LEDs

Appendix B. Additional Features

Appendix B.1. DIP switch settings to support 1 through 8 Sola to Metasys N2 and Modbus TCP/IP

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 and Modbus TCP/IP	ProtoCarrier DIP Switches				ProtoCessor DIP Switches (Remove Cover)							
Profile - FPC-N34-0701	**S0**	**S1**	**S2**	**S3**	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**
Metasys N2 Sola 1 Deg_F		Off	Off	Off	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 2 Deg_F		On	Off	Off	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 3 Deg_F		Off	On	Off	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 4 Deg_F		On	On	Off	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 5 Deg_F		Off	Off	On	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 6 Deg_F		On	Off	On	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 7 Deg_F		Off	On	On	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 8 Deg_F		On	On	On	Off	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 1 Deg_C		Off	Off	Off	On	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 2 Deg_C		On	Off	Off	On	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 3 Deg_C		Off	On	Off	On	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 4 Deg_C		On	On	Off	On	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 5 Deg_C		Off	Off	On	On	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 6 Deg_C		On	Off	On	On	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 7 Deg_C		Off	On	On	On	On	Off	Off	Off	Off	Off	Off
Metasys N2 Sola 8 Deg_C		On	On	On	On	On	Off	Off	Off	Off	Off	Off
Modbus TCP Sola 1		Off	Off	Off	Off	Off	On	Off	Off	Off	Off	Off
Modbus TCP Sola 2		On	Off	Off	Off	Off	On	Off	Off	Off	Off	Off
Modbus TCP Sola 3		Off	On	Off	Off	Off	On	Off	Off	Off	Off	Off
Modbus TCP Sola 4		On	On	Off	Off	Off	On	Off	Off	Off	Off	Off
Modbus TCP Sola 5		Off	Off	On	Off	Off	On	Off	Off	Off	Off	Off
Modbus TCP Sola 6		On	Off	On	Off	Off	On	Off	Off	Off	Off	Off
Modbus TCP Sola 7		Off	On	On	Off	Off	On	Off	Off	Off	Off	Off
Modbus TCP Sola 8		On	On	On	Off	Off	On	Off	Off	Off	Off	Off

Appendix C. Vendor Information - Laars

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

Point Name	Modbus Register	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT
Demand source	40007	AI	1	AI	1	nvoXDemSrc	SNVT_count_inc_f
Outlet sensor	40008	AI	2	AI	2	nvoXOutletSensor	SNVT_count_inc_f
Firing rate	40009	AI	3	AI	3	nvoXFiringRate	SNVT_count_inc_f
Fan speed	40010	AI	4	AI	4	nvoXFanSpeed	SNVT_count_inc_f
Flame signal	40011	AI	5	AI	5	nvoXFlameSignal	SNVT_count_inc_f
Inlet sensor	40012	AI	6	AI	6	nvoXInletSensor	SNVT_count_inc_f
DHW sensor	40013	AI	7	AI	7	nvoXDHWSensor	SNVT_count_inc_f
S5 sensor	40014	AI	8	AI	8	nvoXS5Sensor	SNVT_count_inc_f
Stack sensor	40015	AI	9	AI	9	nvoXStackSensor	SNVT_count_inc_f
4 - 20 mA remote ctl input	40016	AI	10	AI	10	nvoXRemCtlInput	SNVT_count_inc_f
Active CH setpoint	40017	AI	11	AI	11	nvoXAct_CH_SP	SNVT_count_inc_f
Active DHW setpoint	40018	AI	12	AI	12	nvoXAct_DHW_SP	SNVT_count_inc_f
Active LL setpoint	40019	AI	13	AI	13	nvoXAct_LL_SP	SNVT_count_inc_f
Analog modulation input	40022	AI	14	AI	14	nvoXAnaModInput	SNVT_count_inc_f
Burner control status	40033	AI	15	AI	15	nvoXBrnrCtlStat	SNVT_count_inc_f
Lockout code	40035	AI	16	AI	16	nvoXLockoutCode	SNVT_count_inc_f
Alarm reason	40036	AI	17	AI	17	nvoXAlmReason	SNVT_count_inc_f
Hold code	40041	AI	18	AI	18	nvoXHoldCode	SNVT_count_inc_f
CH status	40065	AI	19	AI	19	nvoXCH_Status	SNVT_count_inc_f
CH setpoint source	40066	AI	20	AI	20	nvoXCH_SP_Src	SNVT_count_inc_f
CH heat demand	40067	AI	21	AI	21	nvoXCH_HeatDmnd	SNVT_count_inc_f
CH burner demand	40068	AI	22	AI	22	nvoXCH_BrnrDmnd	SNVT_count_inc_f
CH requested rate	40069	AI	23	AI	23	nvoXCH_ReqRate	SNVT_count_inc_f
DHW status	40081	AI	24	AI	24	nvoXDHW_Status	SNVT_count_inc_f
DHW Priority Count	40083	AI	25	AI	25	nvoXDHW_PriCnt	SNVT_count_inc_f
DHW heat demand	40084	AI	26	AI	26	nvoXDHW_HeatDmnd	SNVT_count_inc_f
DHW burner demand	40085	AI	27	AI	27	nvoXDHW_BrnrDmnd	SNVT_count_inc_f
DHW requested rate	40086	AI	28	AI	28	nvoXDHW_ReqRate	SNVT_count_inc_f
DHW pump status	40101	AI	29	AI	29	nvoXDHW_PmpStat	SNVT_count_inc_f
DHW Pump Idle Days Count	40105	AI	30	AI	30	nvoXDHW_PpIdDyCt	SNVT_count_inc_f
System pump status	40106	AI	31	AI	31	nvoXSysPmpStatus	SNVT_count_inc_f
System Pump Idle Days Count	40108	AI	32	AI	32	nvoXSysPmpIdDyCt	SNVT_count_inc_f
Boiler pump status	40109	AI	33	AI	33	nvoXBlrPmpStatus	SNVT_count_inc_f
Boiler Pump Idle Days Count	40111	AI	34	AI	34	nvoXBlrPmpIdDyCt	SNVT_count_inc_f
Burner run time	40131/40132	AV	35	AO	35	nvi/nvoXBrnrRunTime	SNVT_count_inc_f
DHW pump cycle count	40135/40136	AV	36	AO	36	nvi/nvoXDHWPmpCycCnt	SNVT_count_inc_f
System pump cycle count	40137/40138	AV	37	AO	37	nvi/nvoXSysPmpCycCnt	SNVT_count_inc_f
Boiler pump cycle count	40139/40140	AV	38	AO	38	nvi/nvoXBlrPmpCycCnt	SNVT_count_inc_f
Controller Cycle Count	40143/40144	AI	39	AI	39	nvoXCtllerCycCnt	SNVT_count_inc_f
Controller run time	40145/40146	AI	40	AI	40	nvoXCtllerRunTim	SNVT_count_inc_f
Lead lag master status	40161	AI	41	AI	41	nvoXLdLgMstrStat	SNVT_count_inc_f
Lead lag slave status	40162	AI	42	AI	42	nvoXLdLgSlavStat	SNVT_count_inc_f
Lead Lag Master Setpoint Source	40163	AI	43	AI	43	nvoXLdLgMstSPSrc	SNVT_count_inc_f
Lead Lag Master Pump Demand	40164	AI	44	AI	44	nvoXLdLgMstPpDmd	SNVT_count_inc_f
Outdoor temperature	40171	AI	45	AI	45	nvoXOutdoorTmp	SNVT_count_inc_f
CH setpoint	40212	AV	46	AO	46	nvi/nvoXCH_SP	SNVT_count_inc_f
CH TOD setpoint	40213	AV	47	AO	47	nvi/nvoXCH_TOD_SP	SNVT_count_inc_f
DHW Demand Switch	40449	AV	48	AO	48	nvi/nvoXDHW_DmdSwitc	SNVT_count_inc_f
Outlet high limit setpoint	40465	AV	49	AO	49	nvi/nvoXOutltHiLimSP	SNVT_count_inc_f
Lead Lag setpoint	40547	AV	50	AO	50	nvi/nvoXLeadLagSP	SNVT_count_inc_f

Point Name	Modbus Register	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT
Leadlag modulation sensor	40559	AV	51	AO	51	nvi/nvoXLdLgModSensr	SNVT_count_inc_f
Warm weather shutdown setpoint	40629	AV	52	AO	52	nvi/nvoXWrmWthrShtSP	SNVT_count_inc_f
Lead Lag active service	40769	AI	53	AI	53	nvoXLdLgActSrvc	SNVT_count_inc_f
Slave 1 State	40771	AI	54	AI	54	nvoXSlv1State	SNVT_count_inc_f
Slave 1 firing rate	40773	AI	55	AI	55	nvoXSlv1FirRat	SNVT_count_inc_f
Slave 2 State	40775	AI	56	AI	56	nvoXSlv2State	SNVT_count_inc_f
Slave 2 firing rate	40777	AI	57	AI	57	nvoXSlv2FirRat	SNVT_count_inc_f
Slave 3 State	40779	AI	58	AI	58	nvoXSlv3State	SNVT_count_inc_f
Slave 3 firing rate	40781	AI	59	AI	59	nvoXSlv3FirRat	SNVT_count_inc_f
Slave 4 State	40783	AI	60	AI	60	nvoXSlv4State	SNVT_count_inc_f
Slave 4 firing rate	40785	AI	61	AI	61	nvoXSlv4FirRat	SNVT_count_inc_f
Slave 5 State	40787	AI	62	AI	62	nvoXSlv5State	SNVT_count_inc_f
Slave 5 firing rate	40789	AI	63	AI	63	nvoXSlv5FirRat	SNVT_count_inc_f
Slave 6 State	40791	AI	64	AI	64	nvoXSlv6State	SNVT_count_inc_f
Slave 6 firing rate	40793	AI	65	AI	65	nvoXSlv6FirRat	SNVT_count_inc_f
Slave 7 State	40795	AI	66	AI	66	nvoXSlv7State	SNVT_count_inc_f
Slave 7 firing rate	40797	AI	67	AI	67	nvoXSlv7FirRat	SNVT_count_inc_f
Slave 8 State	40799	AI	68	AI	68	nvoXSlv8State	SNVT_count_inc_f
Slave 8 firing rate	40801	AI	69	AI	69	nvoXSlv8FirRat	SNVT_count_inc_f
Master firing rate	40803	AI	70	AI	70	nvoXMstrFirRat	SNVT_count_inc_f
Burner Control Sequence	40034	AI	71	AI	71	nvoXBrnrCtrlSeq	SNVT_count_inc_f
Active Rate Limiter	40057	AI	72	AI	72	nvoXActRateLim	SNVT_count_inc_f
Burner Cycle Count	40129/40130	AV	73	AO	73	nvi/nvoXBrnrCycCnt	SNVT_count_inc_f
Lead Lag Slave Demand	40165	AI	74	AI	74	nvoXLdLgSlvDem	SNVT_count_inc_f
Lead Lag Slave Requested Rate	40166	AI	75	AI	75	nvoXLdLgSlvReqRt	SNVT_count_inc_f
CH Enable	40209	AV	76	AO	76	nvi/nvoXCHEnable	SNVT_count_inc_f
DHW Setpoint	40454	AV	77	AO	77	nvi/nvoXDHW_SP	SNVT_count_inc_f
DHW Time Of Day Setpoint	40455	AV	78	AO	78	nvi/nvoXDHW_TOD_SP	SNVT_count_inc_f
Lead Lag Slave Enable	40545	AV	79	AO	79	nvi/nvoXLdLgSlvEnbl	SNVT_count_inc_f
Lead Lag Time Of Day Setpoint	40548	AV	80	AO	80	nvi/nvoXLdLg_TOD_SP	SNVT_count_inc_f
Lead Lag Operation Switch	40556	AV	81	AO	81	nvi/nvoXLdLgOpSw	SNVT_count_inc_f
Warm Weather Shutdown Enbl/Disbl	40628	AV	82	AO	82	nvi/nvoXWrmWthrShtdn	SNVT_count_inc_f
Lead Lag DHW Setpoint	40706	AV	83	AO	83	nvi/nvoXLdLgDHW_SP	SNVT_count_inc_f
Lead Lag DHW Time Of Day SP	40736	AV	84	AO	84	nvi/nvoXLdLgDHWTodSp	SNVT_count_inc_f
Password Reg 1	40178	AV	85	AO	85	nviXPassword1	SNVT_count_inc_f
Password Reg 2	40179	AV	86	AO	86	nviXPassword2	SNVT_count_inc_f
Burner Switch	40204	AV	87	AO	87	nvi/nvoXBrnrSwitch	SNVT_count_inc_f
S10 Sensor Reading	40175	AI	88	AI	88	nviXS10SensRead	SNVT_count_inc_f

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
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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
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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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Address	A0	A1	A2	A3	A4	A5	A6	A7
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233	On	Off	Off	On	Off	On	On	On
234	Off	On	Off	On	Off	On	On	On

Address	A0	A1	A2	A3	A4	A5	A6	A7
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252	Off	Off	On	On	On	On	On	On
253	On	Off	On	On	On	On	On	On
254	Off	On	On	On	On	On	On	On
255	On	On	On	On	On	On	On	On

Appendix E. Reference

Appendix E.1. Specifications

	ProtoNode FPC-N34	ProtoNode FPC-N35
Electrical Connections	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One 3-pin Phoenix connector with: RS-485 port (+ / - / gnd) One Ethernet 10/100 BaseT port	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One 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; OPC Self-tested for Compliance; 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.