ProtoNode FPC-N34
Startup Guide

For Interfacing DDR Americas Products:
Sola

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

APPLICABILITY & EFFECTIVITY

Explains ProtoNode FPC-N34 hardware and installation.

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

Technical Support:

Thank you for purchasing the ProtoNode for DDR Americas.

Please call DDR Americas for Technical support of the ProtoNode product.

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

Support Contact Information:

DDR Americas
1090 Fountain Street North, Unit 10 & 11
Cambridge, Ontario, Canada N3E 1A3

Customer Service:

(519) 650-0420

Website: dedietrichboilers.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. (**Section 2.3**)

3. ProtoNode FPC-N34 units: Select the Field Protocol (BACnet MS/TP, BACnet/IP, Modbus TCP/IP or Metasys N2) on the S Bank Dip Switches. (**Section 2.4.1**)

4. Enable the ProtoNode "Auto Discovery" mode on Dip Switch Bank S. (**Section 2.4.2**)

5. BACnet MS/TP (FPC-N34): Set the MAC Address on DIP Switch Bank A. (**Section 2.5.1**)

6. BACnet MS/TP or BACnet/IP (FPC-N34): Set the BACnet Device Instance. (**Section 2.5.2**)

7. Metasys N2 or Modbus TCP/IP (FPC-N34): Set the Node-ID. (**Section 2.5.3**)

8. BACnet MS/TP (FPC-N34): Set the BAUD rate of the BACnet MS/TP Field Protocol on DIP Switch Bank B. (**Section 2.5.4**)

9. **Connect ProtoNode FPC-N34's** 3 pin RS-485 port to the Field Protocol cabling. (**Section 3.2**)

10. Connect ProtoNode's 6 pin RS-485 connector to the Modbus RS-485 network that is connected to each of the devices. (**Section 3.3**)

11. Connect Power to ProtoNode's 6 pin connector. (**Section 3.4**)

12. When power is applied it will take about 3 minutes for all the devices to be discovered, and the configuration file to be built. Once Auto-Discovery is complete turn OFF the S3 DIP Switch to save the configuration settings. (**Section 3.4.1**)

13. 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**)

Certifications

- ## BTL MARK – BACNET TESTING LABORATORY

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

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

TABLE OF CONTENTS

LIST OF FIGURES

1   INTRODUCTION

1.1   ProtoNode Gateway

ProtoNode is an external, high performance **Building Automation multi-protocol gateway** that is preconfigured to Auto-Discover any of DDR Americas' products (hereafter called "device") connected to the ProtoNode and automatically configures them for BACnet[1]MS/TP, BACnet/IP, Metasys[2] N2 by JCI, or Modbus TCP/IP.

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.

---
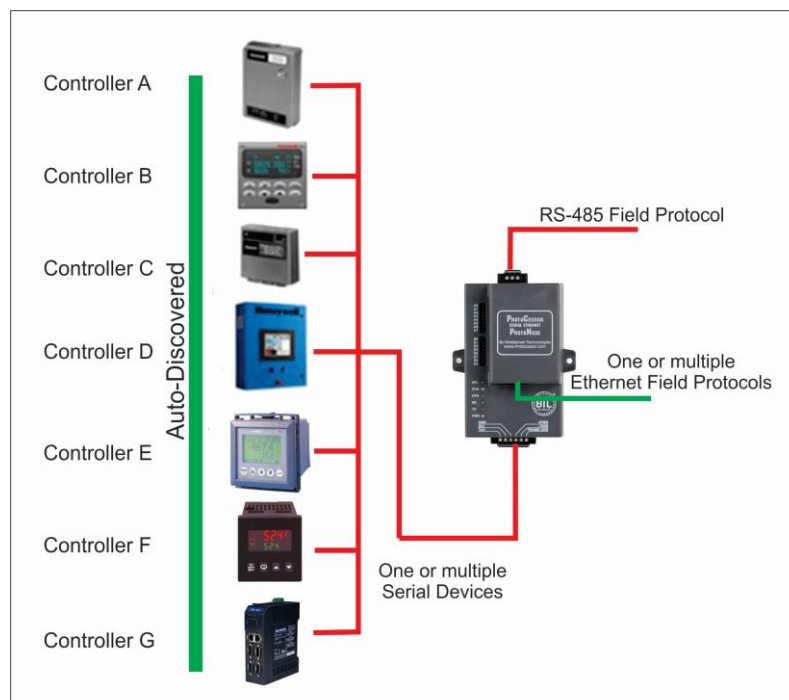
[1] BACnet is a registered trademark of ASHRAE
[2] Metasys is a registered trademark of Johnson Controls Inc.

2   BACNET SETUP FOR PROTOCESSOR PROTONODE FPC-N34

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 N34	FPC-N34-1301
Figure 1: ProtoCessor Part Numbers	

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

2.2   Point Count Capacity and Registers per Device

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

Part number	Total Registers
FPC-N34-1301	1,500
Figure 2: Supported Point Count Capacity	

Devices	Registers Per Device
Sola	72
Figure 3: Modbus Registers per Device	

2.3   Configuring Device Communications

2.3.1 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 4** 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 4: Modbus COM Settings	

2.3.2 Set Modbus RTU Node-ID for each of the Devices attached to the ProtoNode

- Set Modbus Node-ID for each of the devices attached to ProtoNode. The Modbus Node-ID's need to be uniquely assigned between 1 and 255.
  - ○ **The Modbus Node-ID that is assigned for each device needs to be documented.**
    - ▪ The Modbus Node-ID's assigned are used for designating the Device Instance for BACnet/IP and BACnet MS/TP (**Section 2.5.2**)
- The Metasys N2 and Modbus TCP/IP Node-ID will be set to same value as the Node-ID of the Modbus RTU device.

2.4 Selecting the Desired Field Protocol and Enabling Auto-Discovery

2.4.1 Selecting Desired Field Protocol

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

  o See the table in **Figure 5** for the switch settings to select BACnet MS/TP, BACnet/IP, Modbus TCP/IP, or Metasys N2.

  o The OFF position is when the DIP switches are set closest to the outside of the box.
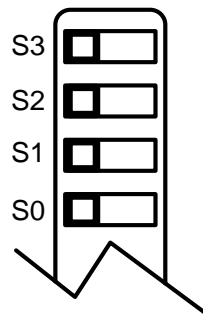
S0 – S3 DIP Switches

S Bank DIP Switch Location

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

BACnet MS/TP, BACnet/IP, Modbus TCP/IP, and Metasys N2 Settings for ProtoNode FPC-N34 (BACnet)

Figure 5: S Bank DIP Switches

2.4.2 Enabling Auto-Discovery

NOTE: If Modbus TCP/IP was selected in Section 2.4.1 for the Field/BMS protocol, skip this section. Auto-Discovery is NOT used for Modbus TCP/IP.

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

S3 DIP Switch Auto-Discovery Mode	S3
Auto-Discovery ON – Build New Configuration	On
Auto-Discover OFF – Save Current Configuration	Off
Figure 6: S3 DIP Switch setting for Auto Discovering Devices	

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

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

- Only 1 MAC address is set for ProtoNode regardless of how many devices are connected to ProtoNode.

- Set the BACnet MS/TP MAC addresses of the ProtoNode to a value between 1 to 127 (MAC Master Addresses); this is so that the BMS Front End can find the ProtoNode via BACnet auto discovery.

NOTE: **Never set a BACnet MS/TP MAC Address from 128 to 255**. Addresses from 128 to 255 are Slave Addresses and can not be discovered by BMS Front Ends that support auto discovery of BACnet MS/TP devices.

- Set "A" bank DIP switches A0 – A7 to assign a MAC Address to the ProtoNode for BACnet MS/TP.

- Please refer to **Appendix C.1** for the complete range of MAC Addresses and DIP switch settings.
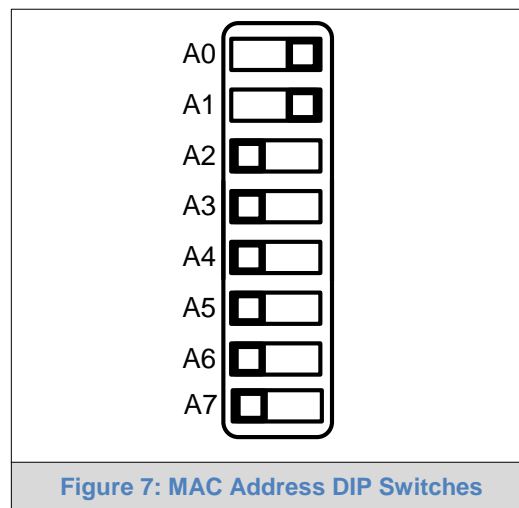
Figure 7: MAC Address DIP Switches

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

2.5.2 BACnet MS/TP and BACnet/IP (FPC-N34): Setting the Device Instance

- The BACnet Device Instances will be calculated by adding the Node_Offset (default value is 50,000) to the device's Modbus Node ID (that was assigned in **Section 2.3.2**).

- The BACnet Device Instance can range from 1 to 4,194,303.

- **To assign specific Device Instance values, change the Node_Offset value. (Section 2.3.2)**

   For example:

   - Node_Offset value (default) = 50,000
   - Device 1 has a Modbus Node-ID of 1
   - Device 2 has a Modbus Node-ID of 22
   - Device 3 has a Modbus Node-ID of 33
   - **Given that: Device Instance = Node_Offset + Modbus Node_ID**
   - Device Instance, Device 1 = 50,000 + 1 = 50,001
   - Device Instance, Device 2 = 50,000 + 22 = 50,022
   - Device Instance, Device 3 = 50,000 + 33 = 50,033

2.5.2.1 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 5**.

   - This step cannot be performed until after the unit is connected and powered.

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

- The Modbus RTU Node-ID's assigned to the devices attached to the ProtoNode in **Section 2.3.2** will be the Metasy N2 or Modbus TCP/IP Node-ID's to the field protocols.

- Metasys N2 and Modbus TCP/IP Node-ID Addressing: Metasys N2 and Modbus TCP/IP Node-ID's range from 1-255.

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

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

- The baud rate on ProtoNode for Metasys N2 is set for 9600. "B" bank DIP switches B0 – B3 are disabled for Metasys N2 on ProtoNode FPC-N34.
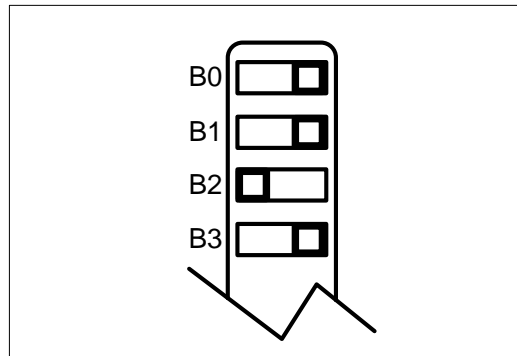
Figure 8: BMS Baud Rate DIP Switches

2.5.4.1 Baud Rate DIP Switch Selection

Baud	B0	B1	B2	B3
9600	On	On	On	Off
19200	Off	Off	Off	On
38400*	**On**	**On**	**Off**	**On**
57600	Off	Off	On	On
76800	On	Off	On	On
Figure 9: BMS Baud Rate				

* Factory default setting = 38,400

3   INTERFACING PROTONODE TO DEVICES

3.1   ProtoNode FPC-N34 Showing Connection Ports

Figure 10: ProtoNode BACnet FPC-N34
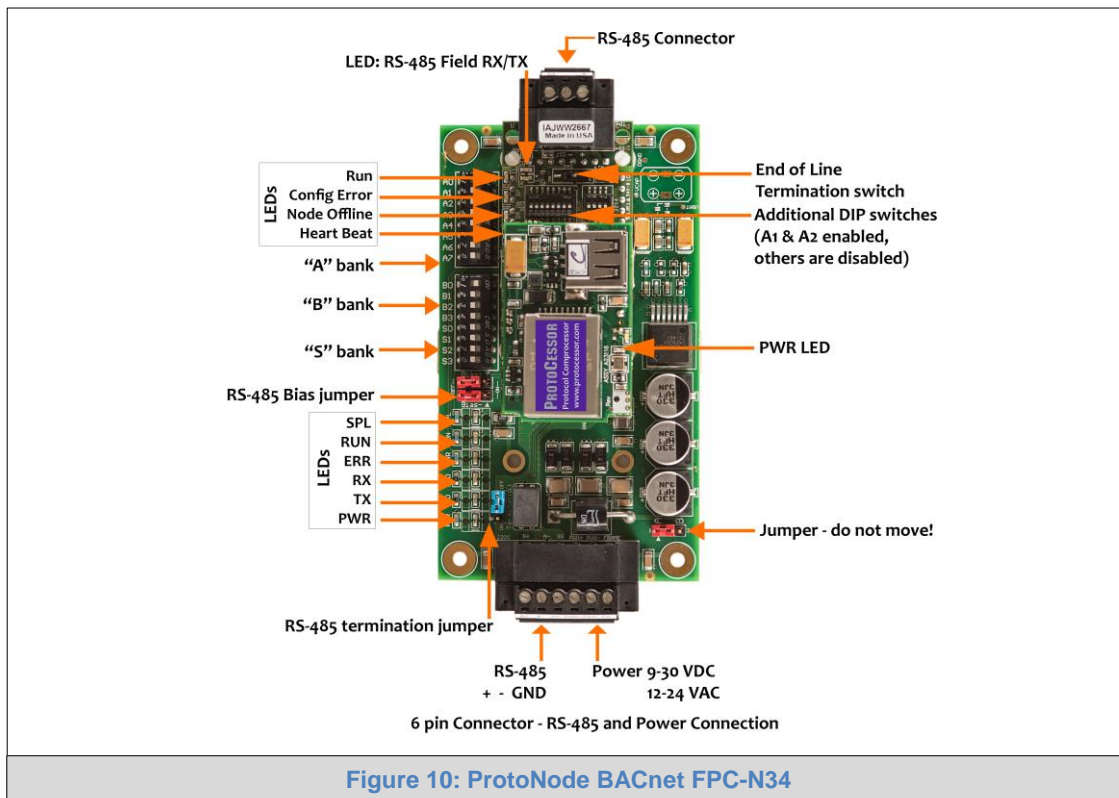
3.2   Device Connections to ProtoNode

ProtoNode 6 Pin Phoenix connector for RS-485 Devices

- Pins 1 through 3 are for Modbus RS-485 devices.

    o   The RS-485 GND (Pin 3) is not typically connected.

- Pins 4 through 6 are for power. **Do not connect power wait until Section 3.4**.

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 11: Power and RS-485 Connections
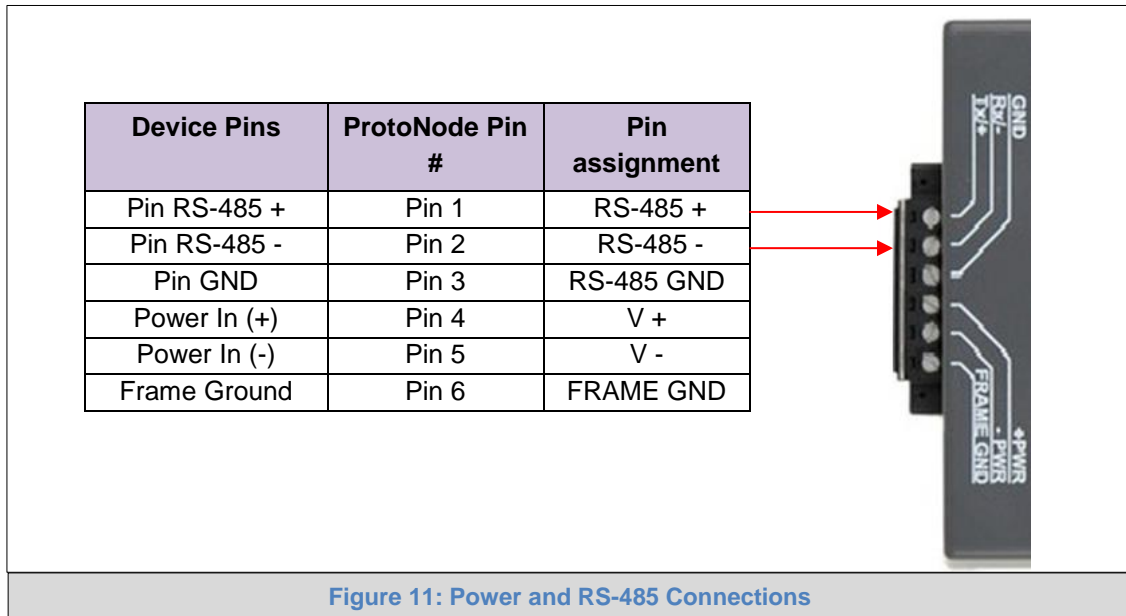
3.2.1 Biasing the Modbus RS-485 Device Network

- An RS-485 network with more than one device needs to have biasing to ensure proper communication. The biasing only needs to be done on one device.

- The ProtoNode has 510 Ohm resistors that can be used to set the biasing. The ProtoNode's default positions from the factory for the Biasing jumpers are OFF.

- The OFF position is when the 2 RED biasing jumpers straddle the 4 pins closest to the outside of the board of the ProtoNode. (**Figure 12**)

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

- To turn biasing ON, move the 2 RED biasing jumpers to straddle the 4 pins closest to the inside of the board of the ProtoNode.

RS-485 Bias Switch (off)

Figure 12: Modbus RS-485 Biasing Switch on the ProtoNode N34
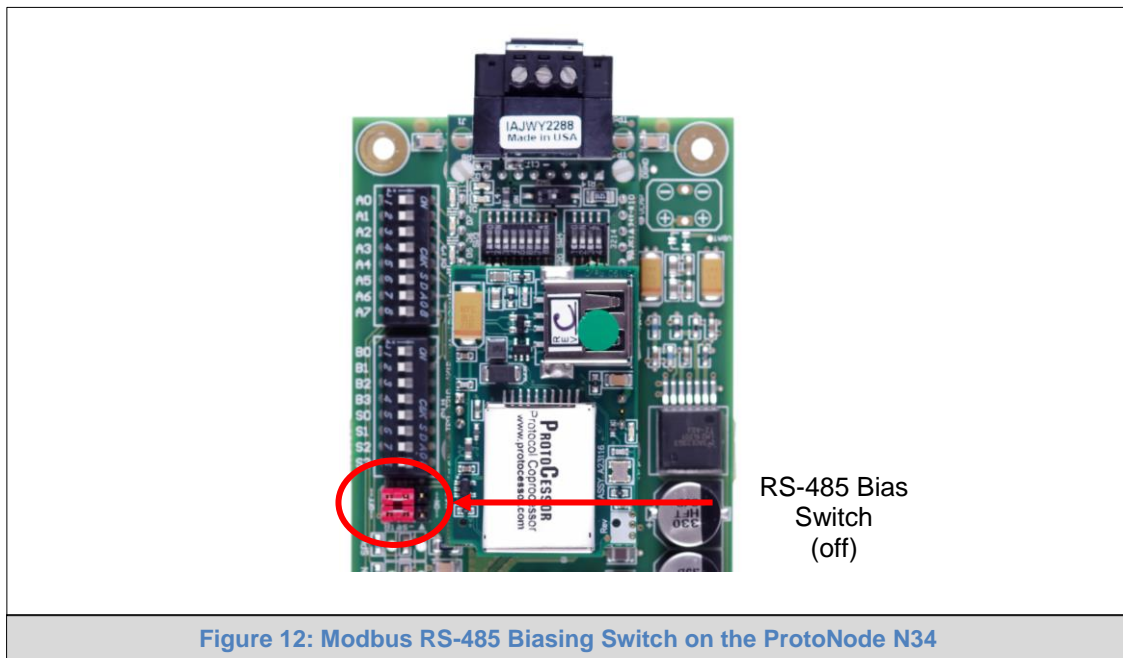
3.2.2 End of Line Termination Switch for the Modbus RS-485 Device Network

- On long RS-485 cabling runs, the RS-485 trunk must be properly terminated at each end.

- The ProtoNode has an End Of Line (EOL) blue jumper. The default setting for this Blue EOL switch is OFF with the jumper straddling the pins closest to the inside of the board of the ProtoNode.

  o 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).**

Modbus RS-485
EOL Switch
(off)

Leave in Position A

Figure 13: Modbus RS-485 End-Of-Line Termination Switch on the ProtoNode N34
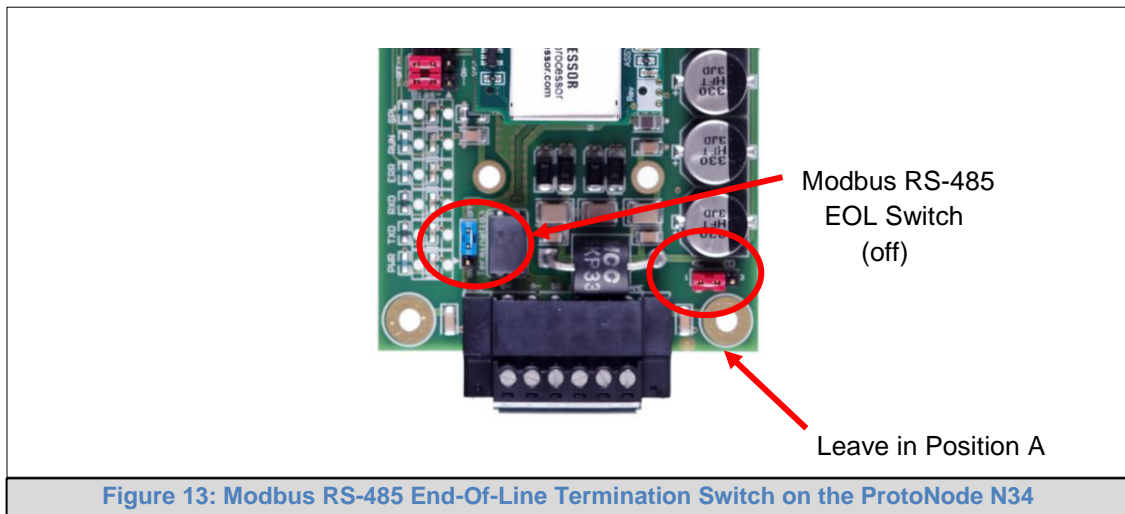
3.3 BACnet MS/TP or Metasys N2 (FPC-N34): Wiring Field Port to RS-485 BMS Network

- Connect the BACnet MS/TP or Metasys N2 RS-485 network wires to the 3-pin RS-485 connector on ProtoNode FPC-N34. (**Figure 14**)

  o The RS-485 GND (Pin 3) is not typically connected.

- See **Section 5** 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 15**)

  o The default setting from the factory is OFF (switch position = right side).

  o To enable the EOL Termination, turn the EOL switch ON (switch position = left side).

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

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

End-of-Line Switch

Figure 15: RS-485 BMS Network EOL Switch
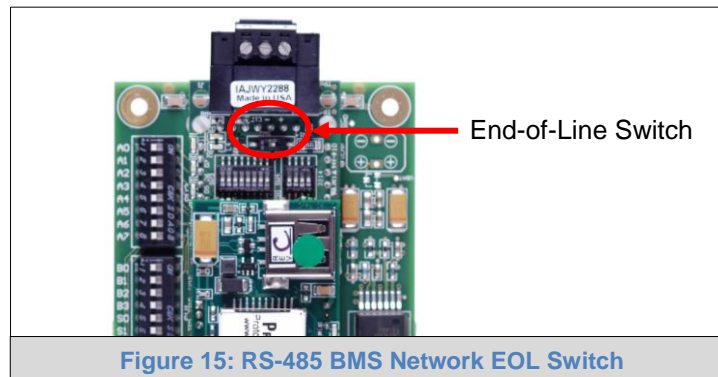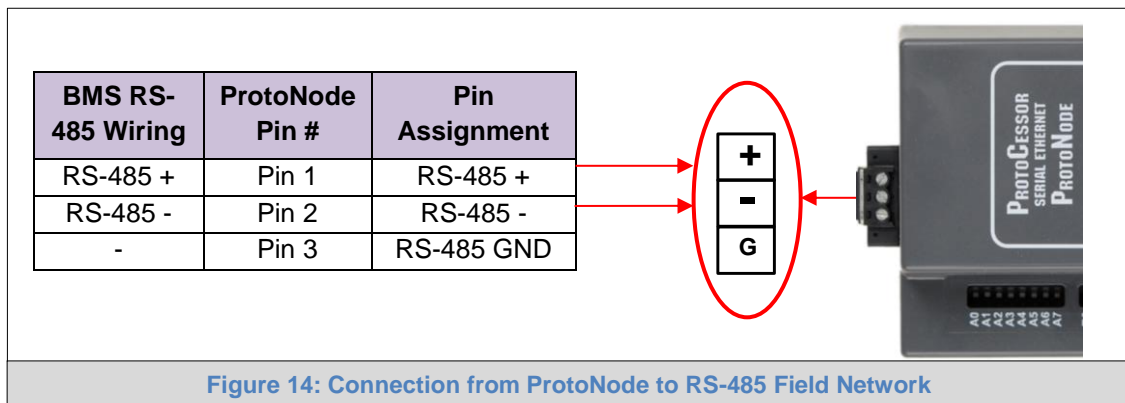
3.4   Power-Up ProtoNode

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

Power to ProtoNode	ProtoNode Pin #	Pin Assignment
Power In (+)	Pin 4	V +
Power In (-)	Pin 5	V -
Frame Ground	Pin 6	FRAME GND
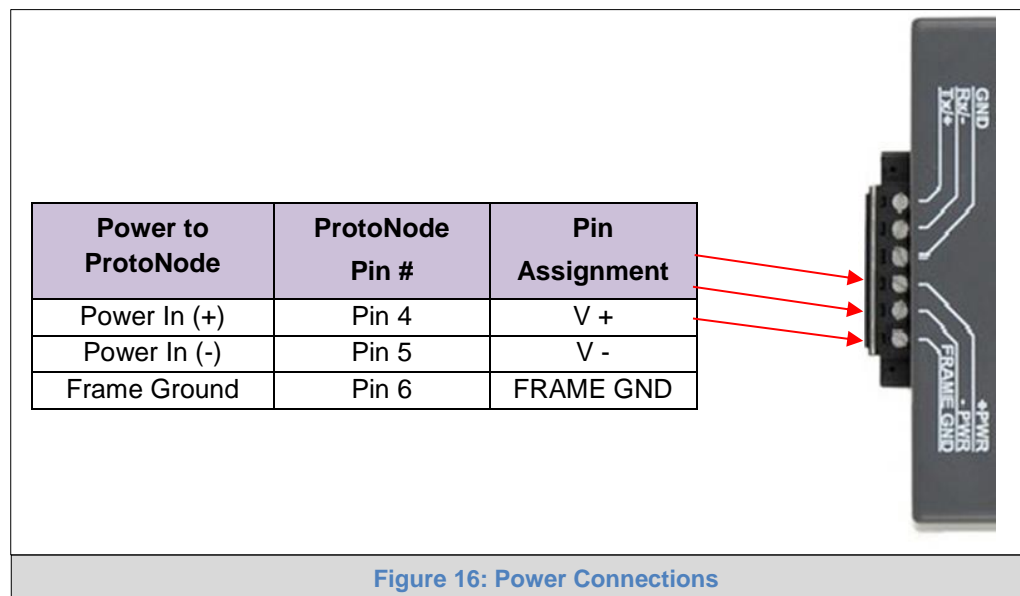
Figure 16: Power Connections

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

NOTE: If Modbus TCP/IP was selected in Section 2.4.1 for the Field/BMS protocol, skip this section. Auto-Discovery is NOT used for Modbus TCP/IP.

The S3 DIP Switch for Enabling Auto-Discovery should have been set in **Section 2.4.2** before applying power to the ProtoNode. **Do not** Enable Auto-Discovery when the unit is powered.

- When power is applied to a ProtoNode that is set to Enable Auto-Discovery, it will take 3 minutes to complete the discovery of all of the RS-485 devices attached to the ProtoNode.

- **Once the ProtoNode has discovered all of the RS-485 devices, set the S3 DIP switch to the OFF position to save the current configuration.**

ProtoNode FPC-N34	
S3 DIP Switch Auto-Discovery Mode	**S3**
Auto-Discovery ON – Build New Configuration	On
Auto-Discover OFF – Save Current Configuration	Off
Figure 17: S3 DIP Switch setting for Auto Discovering Devices	

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

4.1   Connect the PC to ProtoNode via the Ethernet Port
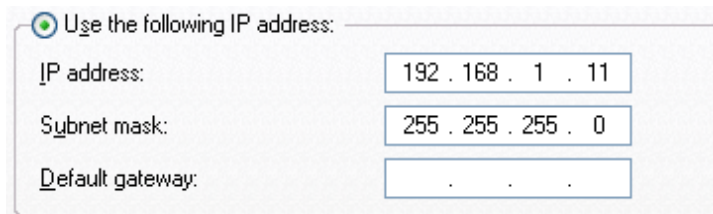
- Connect a CAT5 Ethernet cable (Straight through or Cross-Over) between the PC and ProtoNode.

- The Default IP Address of ProtoNode is **192.168.1.24**, Subnet Mask is **255.255.255.0**. If the PC and ProtoNode are on different IP Networks, assign a static IP Address to the PC on the 192.168.1.xxx network.

- Go to **start** > 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 OK twice
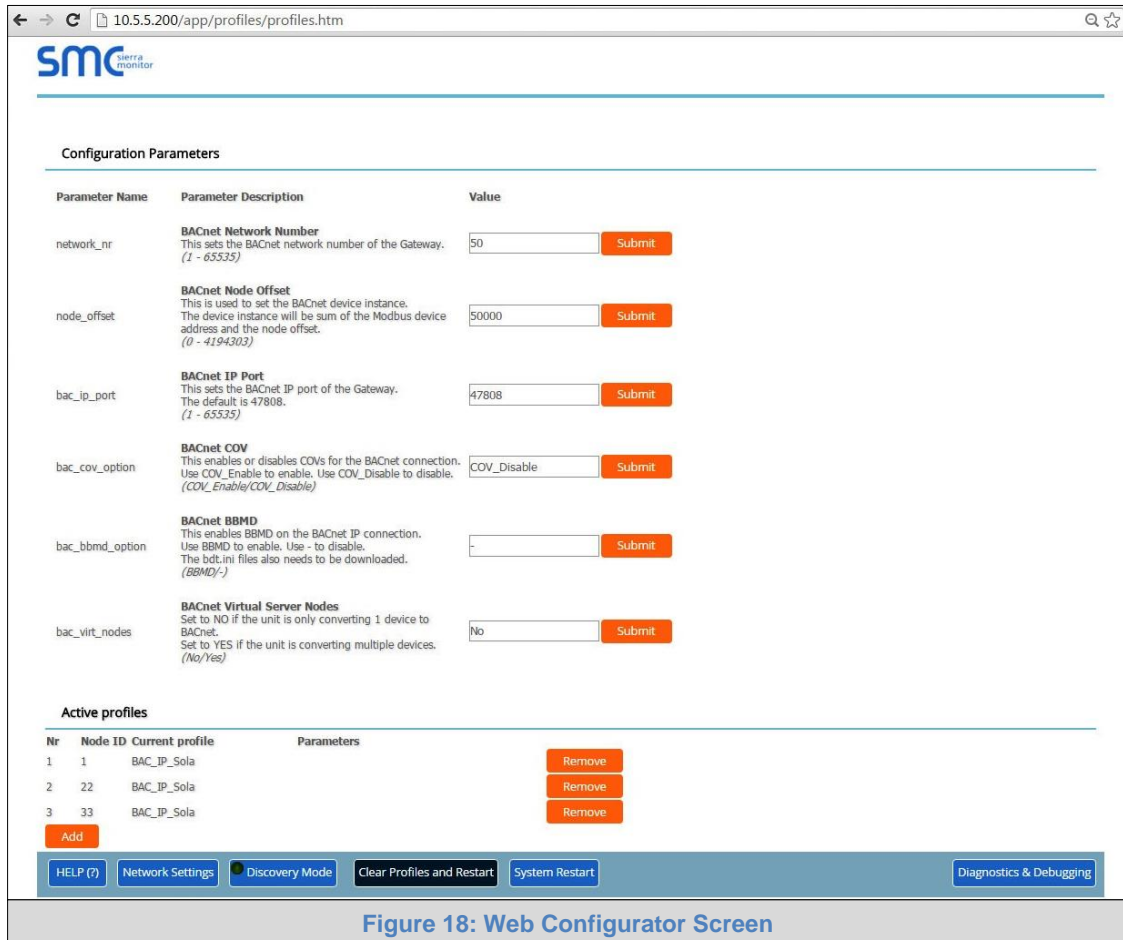
4.2 BACnet/IP and Modbus TCP/IP: Setting IP Address for Field Network

- After setting a local PC on the same subnet as the ProtoNode (**Section 4.1**), open a web browser on the 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 18**)

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

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

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

Figure 18: Web Configurator Screen

- From the Web GUI's landing page, click on "Setup" to expand the navigation tree. Then select "Network Settings" to access the IP Settings menu. (**Figure 19**)
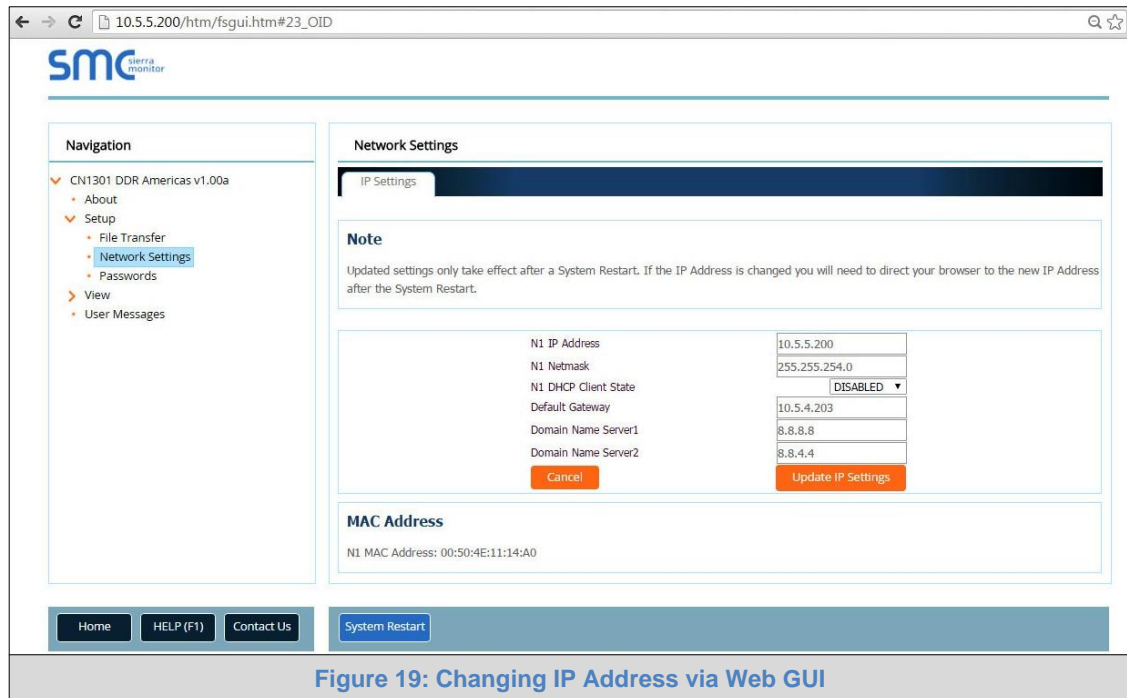
Figure 19: Changing IP Address via Web GUI

- Modify the IP Address (N1 IP Address field) of the ProtoNode Ethernet port.

- If necessary, change the Netmask (N1 Netmask field).

- Type in a new Subnet Mask.

- If necessary, change the IP Gateway (Default Gateway field).

- Type in a new IP Gateway.

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

- Reset ProtoNode.

- Unplug Ethernet cable from PC and connect it to the network hub or router.

- **Record the IP Address assigned to the ProtoNode for future reference.**

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

- After setting a local PC to the same subnet as the ProtoNode (**Section 4.1**), open a web browser on the PC and enter the IP Address of the ProtoNode; the default address is 192.168.1.24.

- If the IP Address of the ProtoNode has been changed by previous configuration, the assigned IP Address will need to be obtained from the network administrator.

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

- 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 + Modbus Node_ID**
    - Then: **Node_Offset (required) = Device Instance (desired) – Modbus Node_ID**

For example, if the desired Device Instance for the 1st device is 1,001:
    - Device 1 has a Modbus Node-ID of 1
    - Device 2 has a Modbus Node-ID of 22
    - Device 3 has a Modbus Node-ID of 33
    - **Node_Offset (required) = 1,001 – (Modbus Node_ID) = 1,001 – 1 = 1,000**

NOTE: The Node_Offset value will be applied to all devices.

    - Device 1 Instance will then be = 1,000 + Modbus Node_ID = 1,000 + 1 = 1,001
    - Device 2 Instance will then be = 1,000 + Modbus Node_ID = 1,000 + 22 = 1,022
    - Device 3 Instance will then be = 1,000 + Modbus Node_ID = 1,000 + 33 = 1,033
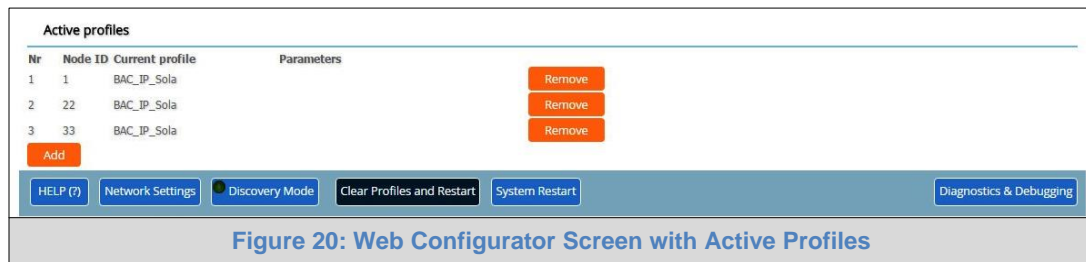
Figure 20: Web Configurator Screen with Active Profiles

6   HOW TO START THE INSTALLATION OVER: CLEARING PROFILES
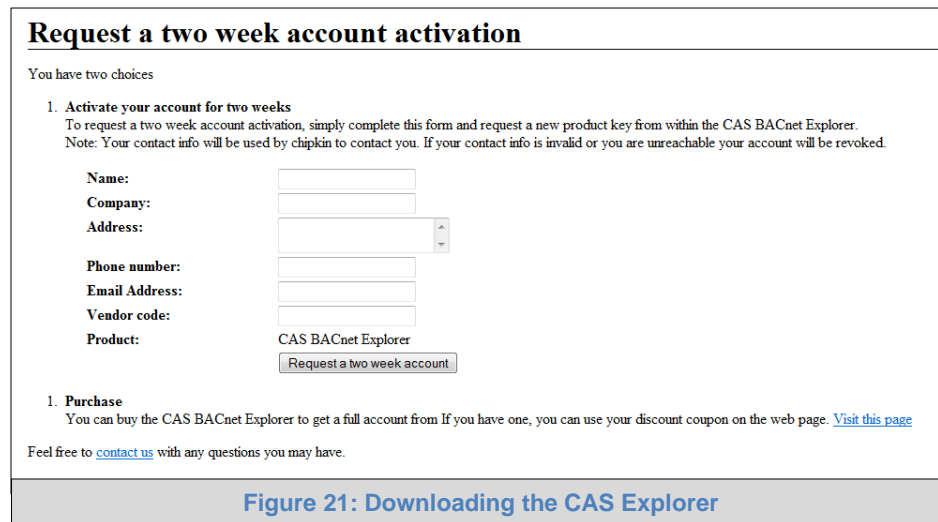
- After setting a local PC to the same subnet as the ProtoNode (**Section** **4.1**), open a web browser on the PC and enter the IP Address of the ProtoNode; the default address is 192.168.1.24.

- If the IP Address of the ProtoNode has been changed by previous configuration, the assigned IP Address will need to be obtained from the network administrator.

- The Web Configurator will be displayed as the landing page.

- **At the bottom-left of the page, click the "Clear Profiles and Restart" button.**

- Once restart is complete, all past profiles discovered and/or added via Web configurator are deleted. The unit can now be reinstalled.

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 "DDRAmericas2BACnet".** Once completed, the email address that was submitted will be registered.

Figure 21: Downloading the CAS Explorer

- Go to the following web site, download and install the CAS BACnet Explorer to the local 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 22: 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 the local PC and the 3 Pin BACnet MS/TP connector on ProtoNode FPC-N34.

- In CAS Explorer, do the following:

  - o   Click on settings

  - o   Check the BACnet MS/TP box and uncheck the BACnet/IP and BACnet Ethernet boxes

  - o   Set the BACnet MS/TP MAC address to 0

  - o   Set the BACnet MS/TP Baud Rate to 38400

  - o   Click Ok

  - o   On the bottom right-hand corner, make sure that the BACnet MS/TP box is green

  - o   Click on discover

  - o   Check all 4 boxes

  - o   Click Send

7.2.2   CAS BACnet BACnet/IP Setup

- See **Section 4.2** 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:

  - o   Click on settings

  - o   Check the BACnet/IP box and uncheck the BACnet MS/TP and BACnet Ethernet boxes

  - o   In the "Select a Network Device" box, select the network card of the PC

  - o   Click Ok

  - o   On the bottom right-hand corner, make sure that the BACnet/IP box is green

  - o   Click on discover

  - o   Check all 4 boxes

  - o   Click Send

Appendix A. Troubleshooting

Appendix A.1. Lost or Incorrect IP Address

- Ensure that FieldServer Toolbox is loaded onto the local PC. If not, download FieldServer-Toolbox.zip on the Sierra Monitor 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.
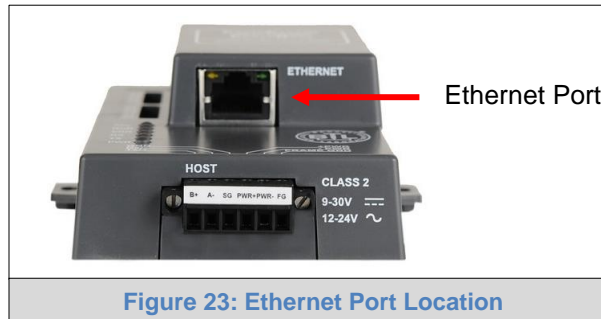
Ethernet Port

Figure 23: Ethernet Port Location
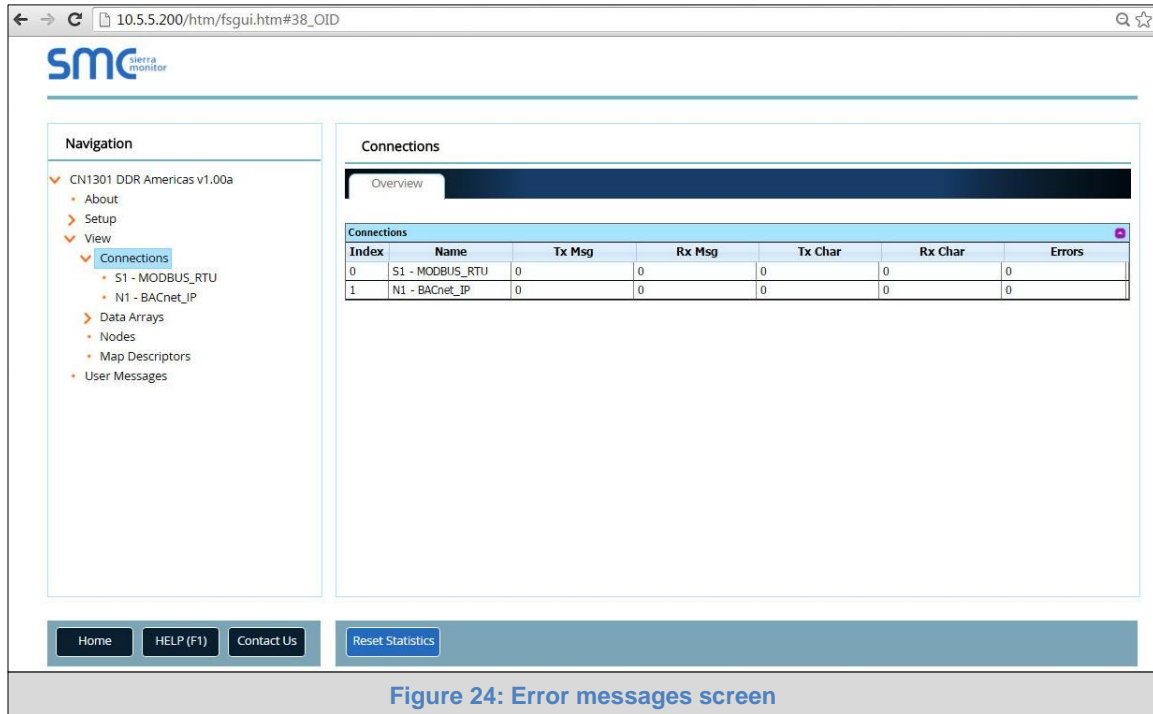
- Disable any wireless Ethernet adapters on the PC/Laptop.

- 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.

- Check IP Addresses from the Device listings.
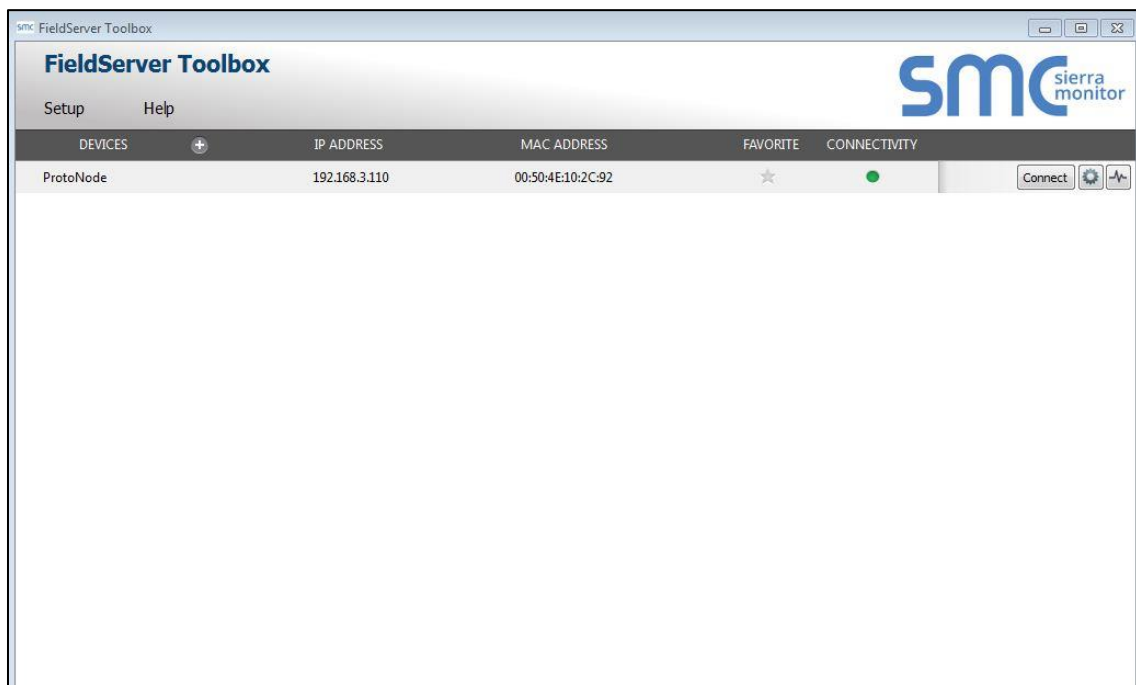
- Correct IP Address(es) by right clicking the settings icon and changing the IP Address.

Appendix A.2. Viewing Diagnostic information

- Type the IP Address of the ProtoNode into the web browser or use the FieldServer Toolbox to connect to the ProtoNode.

- Click on Diagnostics and Debugging Button, then click on view, and then on connections.

- If there are any errors showing on the Connection page, please refer to **Appendix A.3** for the relevant wiring and settings.

Figure 24: Error messages screen

Appendix A.3. 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. To fix this problem, check the following:
    - o Visual observations of LEDs on ProtoNode (**Appendix A.6**)
    - o Check baud rate, parity, data bits, stop bits
    - o Check Modbus device address
    - o Verify wiring
    - o Verify Modbus device is connected to the same subnet as the ProtoNode
    - o Verify the Modbus device was discovered in Web Configurator (**Section 5**)

- Field COM problems:
    - o Visual observations of LEDs on ProtoNode (**Appendix A.6**)
    - o Visual dipswitch settings (using correct baud rate and device instance)
    - o Verify IP Address setting
    - o Verify wiring

If the problem still exists, a Diagnostic Capture needs to be taken and sent to Sierra Monitor Corporation. (Appendix A.4)

Appendix A.4. 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.
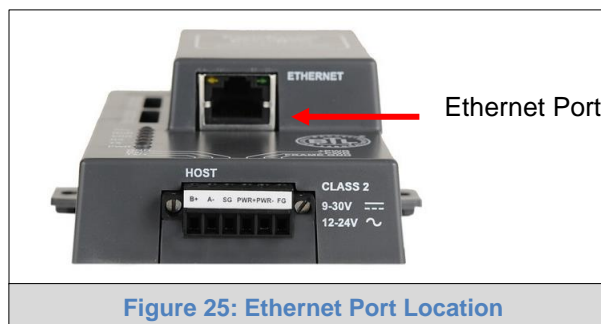
Figure 25: Ethernet Port Location

- 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
  - o Click on the diagnose icon of the desired device.
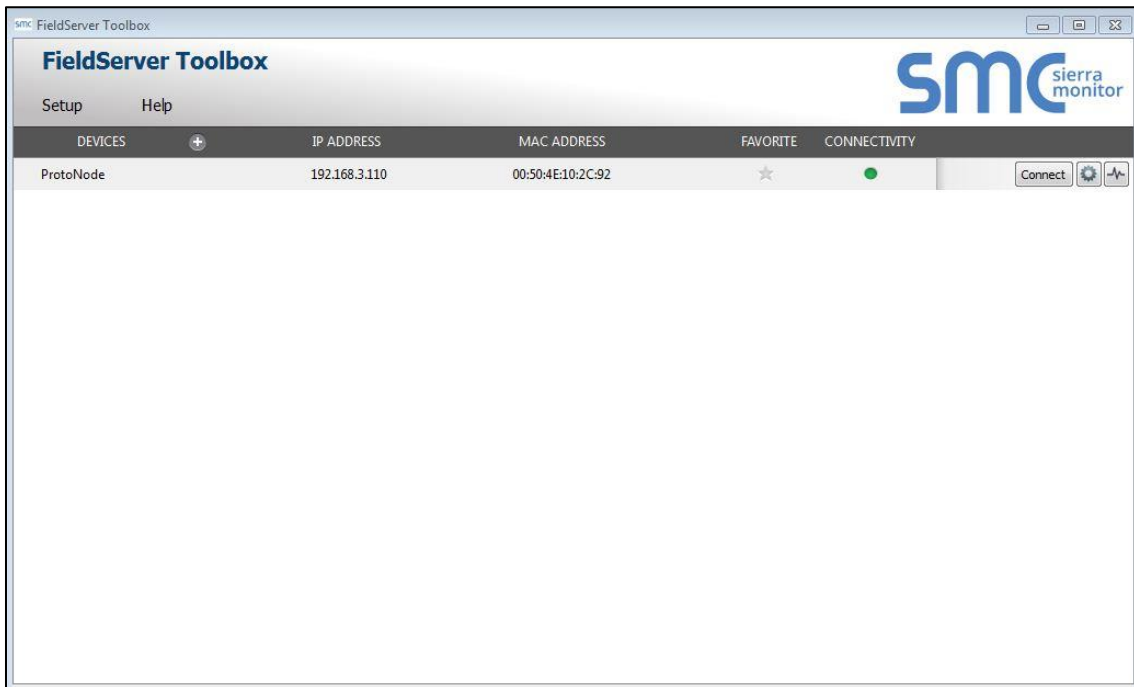
  - o Select full Diagnostic.
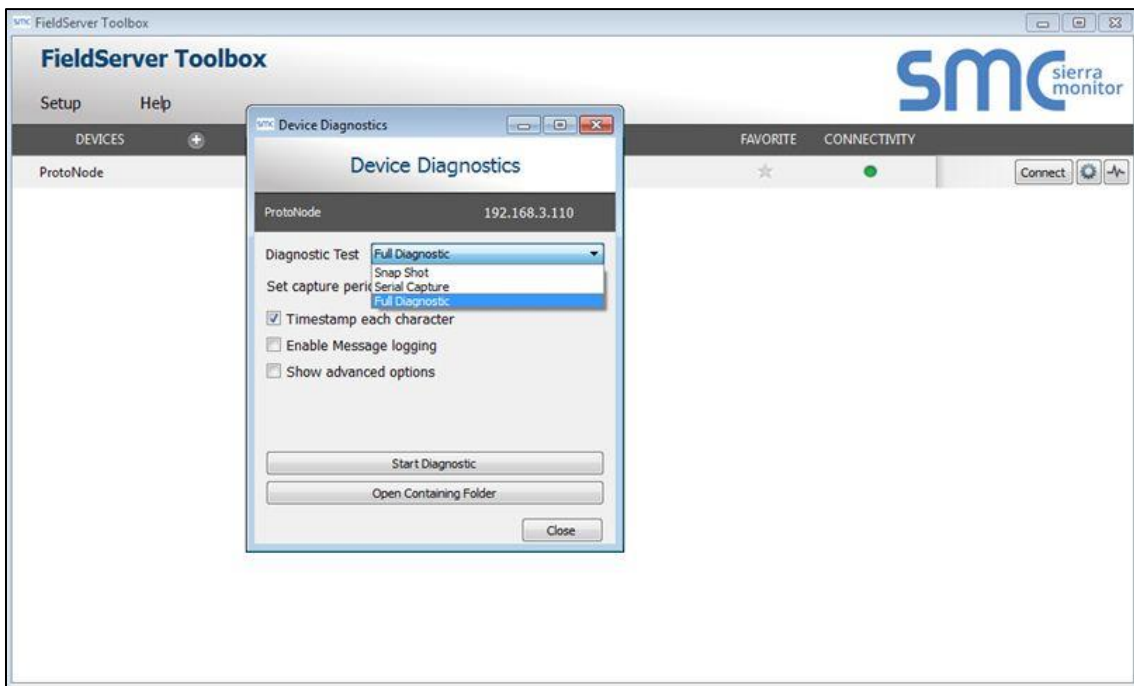
  - o If desired, the default capture period can be changed.

o   Click on "Start Diagnostic".
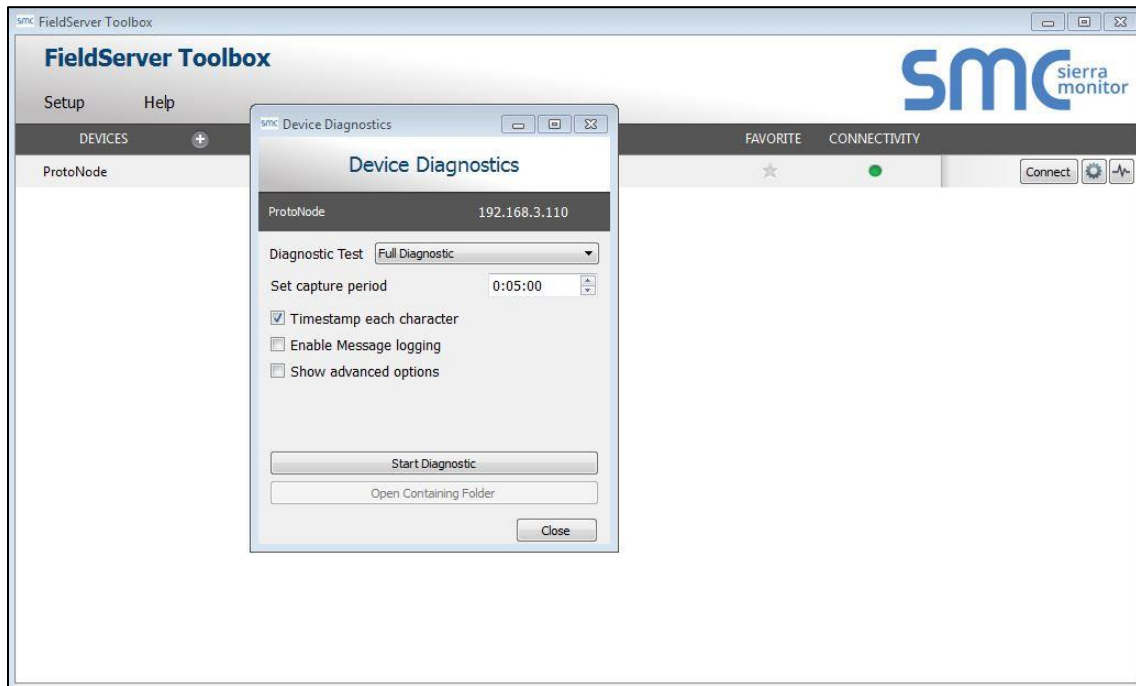
o   Wait for Capture period to finish. Diagnostic Test Complete window will appear.

- **Step 2**: Send Log

   o   Once the Diagnostic test is complete, a .zip file will be saved on the PC.
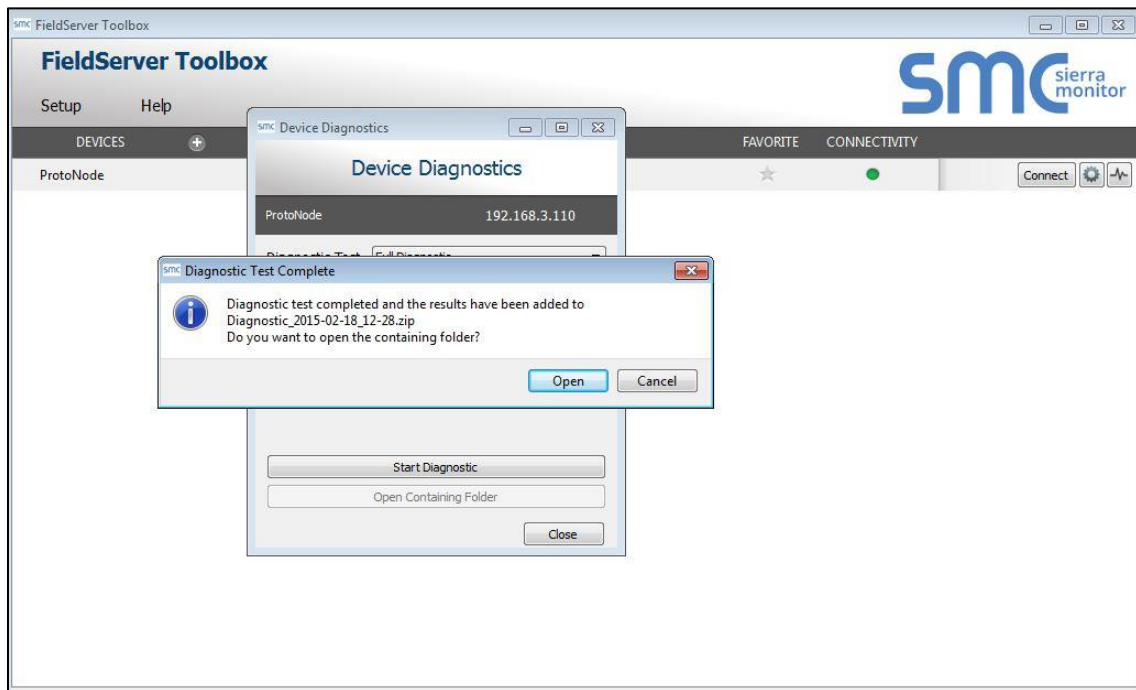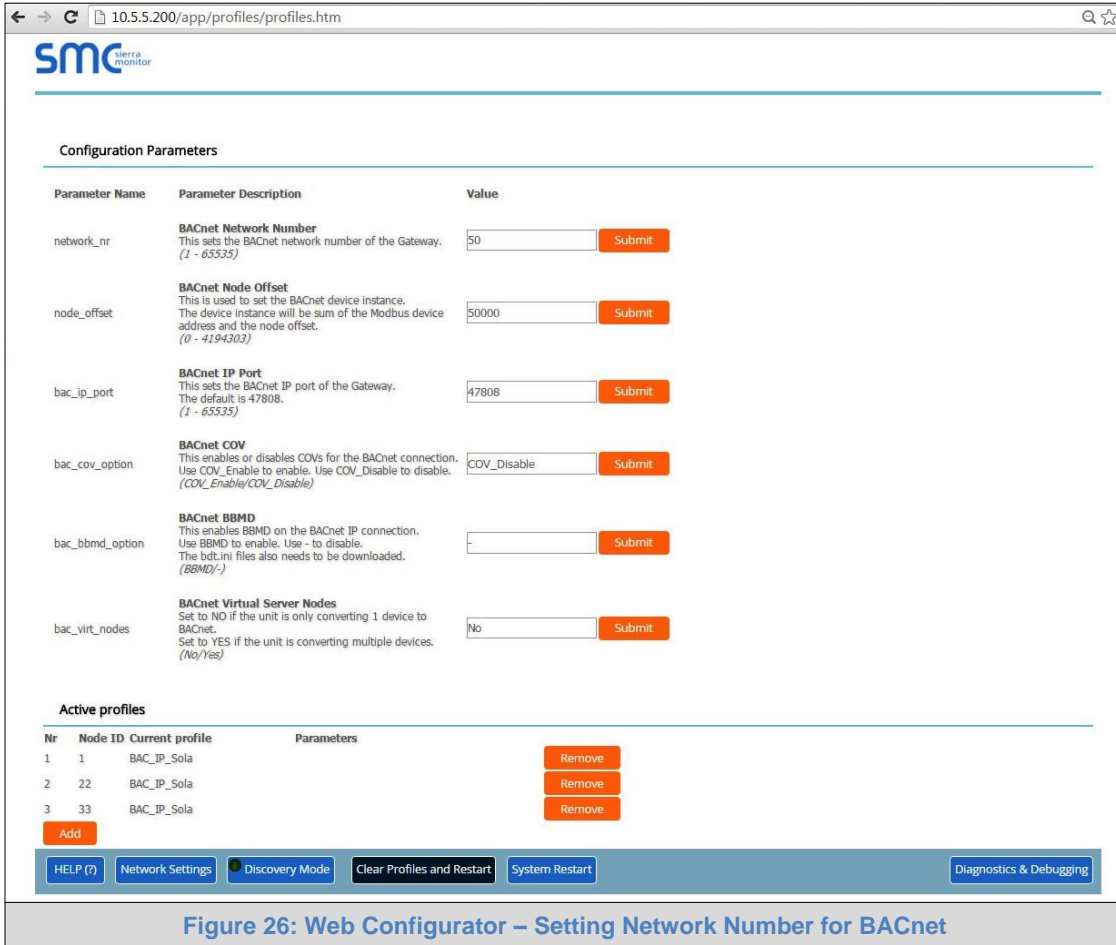
   o   Choose open to launch explorer and have it point directly at the correct folder. Send the Diagnostic zip file to **support@sierramonitor.com**.

Appendix A.5. BACnet: Setting Network_Number for more than one ProtoNode on Subnet

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

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

Figure 26: Web Configurator – Setting Network Number for BACnet

Appendix A.6. LED Diagnostics for Communications Between ProtoNode and Devices

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

Tag	Description
SPL	The SPL LED will light if the ProtoNode is not getting a response from one or more of the configured devices.
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 A.7. Passwords

Access to the ProtoNode can be restricted by enabling a password. There are 2 access levels defined by 2 account names: Admin and User.

- The Admin account has unrestricted access to the ProtoNode.

- The User account can view any ProtoNode information, but cannot make any changes or restart the ProtoNode.

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

If the password is lost, click cancel on the password authentication popup window, and e-mail the Password recovery token to support@sierramonitor.com to receive a temporary password from the Sierra Monitor support team. Access the ProtoNode to set a new password.

Appendix B. Vendor Information - DDR Americas

Appendix B.1. Sola Modbus RTU Mappings to BACnet, Metasys N2 and Modbus TCP/IP

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Modbus Register
Demand source	AI	1	AI	1	40007
Outlet sensor	AI	2	AI	2	40008
Firing rate	AI	3	AI	3	40009
Fan speed	AI	4	AI	4	40010
Flame signal	AI	5	AI	5	40011
Inlet sensor	AI	6	AI	6	40012
DHW sensor	AI	7	AI	7	40013
S5 sensor	AI	8	AI	8	40014
Stack sensor	AI	9	AI	9	40015
4 - 20 mA remote ctl input	AI	10	AI	10	40016
Active CH setpoint	AI	11	AI	11	40017
Active DHW setpoint	AI	12	AI	12	40018
Active LL setpoint	AI	13	AI	13	40019
Analog modulation input	AI	14	AI	14	40022
Burner control status	AI	15	AI	15	40033
Lockout code	AI	16	AI	16	40035
Alarm reason	AI	17	AI	17	40033
Hold code	AI	18	AI	18	40041
CH status	AI	19	AI	19	40065
CH setpoint source	AI	20	AI	20	40066
CH heat demand	AI	21	AI	21	40067
CH burner demand	AI	22	AI	22	40068
CH requested rate	AI	23	AI	23	40069
DHW status	AI	24	AI	24	40081
DHW Priority Count	AI	25	AI	25	40083
DHW heat demand	AI	26	AI	26	40084
DHW burner demand	AI	27	AI	27	40085
DHW requested rate	AI	28	AI	28	40086
DHW pump status	AI	29	AI	29	40101
DHW Pump Idle Days Count	AI	30	AI	30	40105

System pump status	AI	31	AI	31	40106
System Pump Idle Days Count	AI	32	AI	32	40108
Boiler pump status	AI	33	AI	33	40109
Boiler Pump Idle Days Count	AI	34	AI	34	40111
Burner run time	AV	35	AO	35	40131/40132
DHW pump cycle count	AV	36	AO	36	40135/40136
System pump cycle count	AV	37	AO	37	40137/40138
Boiler pump cycle count	AV	38	AO	38	40139/40140
Controller Cycle Count	AI	39	AI	39	40143/40144
Controller run time	AI	40	AI	40	40145/40146
Lead lag master status	AI	41	AI	41	40161
Lead lag slave status	AI	42	AI	42	40162
Lead Lag Master Setpoint Source	AI	43	AI	43	40163
Lead Lag Master Pump Demand	AI	44	AI	44	40164
Outdoor temperature	AI	45	AI	45	40171
CH setpoint	AV	46	AO	46	40212
CH TOD setpoint	AV	47	AO	47	40213
Prepurge Time	AV	48	AO	48	40232
Post Purge Time	AV	49	AO	49	40237
DHW Demand Switch	AV	50	AO	50	40449
Outlet high limit setpoint	AV	51	AO	51	40465
Lead Lag setpoint	AV	52	AO	52	40547

Appendix C. "A" Bank DIP Switch Settings

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

Address	A0	A1	A2	A3	A4	A5	A6	A7		Address	A0	A1	A2	A3	A4	A5	A6	A7
1	On	Off	Off	Off	Off	Off	Off	Off		46	Off	On	On	On	Off	On	Off	Off
2	Off	On	Off	Off	Off	Off	Off	Off		47	On	On	On	On	Off	On	Off	Off
3	On	On	Off	Off	Off	Off	Off	Off		48	Off	Off	Off	Off	On	On	Off	Off
4	Off	Off	On	Off	Off	Off	Off	Off		49	On	Off	Off	Off	On	On	Off	Off
5	On	Off	On	Off	Off	Off	Off	Off		50	Off	On	Off	Off	On	On	Off	Off
6	Off	On	On	Off	Off	Off	Off	Off		51	On	On	Off	Off	On	On	Off	Off
7	On	On	On	Off	Off	Off	Off	Off		52	Off	Off	On	Off	On	On	Off	Off
8	Off	Off	Off	On	Off	Off	Off	Off		53	On	Off	On	Off	On	On	Off	Off
9	On	Off	Off	On	Off	Off	Off	Off		54	Off	On	On	Off	On	On	Off	Off
10	Off	On	Off	On	Off	Off	Off	Off		55	On	On	On	Off	On	On	Off	Off
11	On	On	Off	On	Off	Off	Off	Off		56	Off	Off	Off	On	On	On	Off	Off
12	Off	Off	On	On	Off	Off	Off	Off		57	On	Off	Off	On	On	On	Off	Off
13	On	Off	On	On	Off	Off	Off	Off		58	Off	On	Off	On	On	On	Off	Off
14	Off	On	On	On	Off	Off	Off	Off		59	On	On	Off	On	On	On	Off	Off
15	On	On	On	On	Off	Off	Off	Off		60	Off	Off	On	On	On	On	Off	Off
16	Off	Off	Off	Off	On	Off	Off	Off		61	On	Off	On	On	On	On	Off	Off
17	On	Off	Off	Off	On	Off	Off	Off		62	Off	On	On	On	On	On	Off	Off
18	Off	On	Off	Off	On	Off	Off	Off		63	On	On	On	On	On	On	Off	Off
19	On	On	Off	Off	On	Off	Off	Off		64	Off	Off	Off	Off	Off	Off	On	Off
20	Off	Off	On	Off	On	Off	Off	Off		65	On	Off	Off	Off	Off	Off	On	Off
21	On	Off	On	Off	On	Off	Off	Off		66	Off	On	Off	Off	Off	Off	On	Off
22	Off	On	On	Off	On	Off	Off	Off		67	On	On	Off	Off	Off	Off	On	Off
23	On	On	On	Off	On	Off	Off	Off		68	Off	Off	On	Off	Off	Off	On	Off
24	Off	Off	Off	On	On	Off	Off	Off		69	On	Off	On	Off	Off	Off	On	Off
25	On	Off	Off	On	On	Off	Off	Off		70	Off	On	On	Off	Off	Off	On	Off
26	Off	On	Off	On	On	Off	Off	Off		71	On	On	On	Off	Off	Off	On	Off
27	On	On	Off	On	On	Off	Off	Off		72	Off	Off	Off	On	Off	Off	On	Off
28	Off	Off	On	On	On	Off	Off	Off		73	On	Off	Off	On	Off	Off	On	Off
29	On	Off	On	On	On	Off	Off	Off		74	Off	On	Off	On	Off	Off	On	Off
30	Off	On	On	On	On	Off	Off	Off		75	On	On	Off	On	Off	Off	On	Off
31	On	On	On	On	On	Off	Off	Off		76	Off	Off	On	On	Off	Off	On	Off
32	Off	Off	Off	Off	Off	On	Off	Off		77	On	Off	On	On	Off	Off	On	Off
33	On	Off	Off	Off	Off	On	Off	Off		78	Off	On	On	On	Off	Off	On	Off
34	Off	On	Off	Off	Off	On	Off	Off		79	On	On	On	On	Off	Off	On	Off
35	On	On	Off	Off	Off	On	Off	Off		80	Off	Off	Off	Off	On	Off	On	Off
36	Off	Off	On	Off	Off	On	Off	Off		81	On	Off	Off	Off	On	Off	On	Off
37	On	Off	On	Off	Off	On	Off	Off		82	Off	On	Off	Off	On	Off	On	Off
38	Off	On	On	Off	Off	On	Off	Off		83	On	On	Off	Off	On	Off	On	Off
39	On	On	On	Off	Off	On	Off	Off		84	Off	Off	On	Off	On	Off	On	Off
40	Off	Off	Off	On	Off	On	Off	Off		85	On	Off	On	Off	On	Off	On	Off
41	On	Off	Off	On	Off	On	Off	Off		86	Off	On	On	Off	On	Off	On	Off
42	Off	On	Off	On	Off	On	Off	Off		87	On	On	On	Off	On	Off	On	Off
43	On	On	Off	On	Off	On	Off	Off		88	Off	Off	Off	On	On	Off	On	Off
44	Off	Off	On	On	Off	On	Off	Off		89	On	Off	Off	On	On	Off	On	Off
45	On	Off	On	On	Off	On	Off	Off		90	Off	On	Off	On	On	Off	On	Off

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

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

Address	A0	A1	A2	A3	A4	A5	A6	A7
187	On	On	Off	On	On	On	Off	On
188	Off	Off	On	On	On	On	Off	On
189	On	Off	On	On	On	On	Off	On
190	Off	On	On	On	On	On	Off	On
191	On	On	On	On	On	On	Off	On
192	Off	Off	Off	Off	Off	Off	On	On
193	On	Off	Off	Off	Off	Off	On	On
194	Off	On	Off	Off	Off	Off	On	On
195	On	On	Off	Off	Off	Off	On	On
196	Off	Off	On	Off	Off	Off	On	On
197	On	Off	On	Off	Off	Off	On	On
198	Off	On	On	Off	Off	Off	On	On
199	On	On	On	Off	Off	Off	On	On
200	Off	Off	Off	On	Off	Off	On	On
201	On	Off	Off	On	Off	Off	On	On
202	Off	On	Off	On	Off	Off	On	On
203	On	On	Off	On	Off	Off	On	On
204	Off	Off	On	On	Off	Off	On	On
205	On	Off	On	On	Off	Off	On	On
206	Off	On	On	On	Off	Off	On	On
207	On	On	On	On	Off	Off	On	On
208	Off	Off	Off	Off	On	Off	On	On
209	On	Off	Off	Off	On	Off	On	On
210	Off	On	Off	Off	On	Off	On	On
211	On	On	Off	Off	On	Off	On	On
212	Off	Off	On	Off	On	Off	On	On
213	On	Off	On	Off	On	Off	On	On
214	Off	On	On	Off	On	Off	On	On
215	On	On	On	Off	On	Off	On	On
216	Off	Off	Off	On	On	Off	On	On
217	On	Off	Off	On	On	Off	On	On
218	Off	On	Off	On	On	Off	On	On
219	On	On	Off	On	On	Off	On	On
220	Off	Off	On	On	On	Off	On	On
221	On	Off	On	On	On	Off	On	On
222	Off	On	On	On	On	Off	On	On
223	On	On	On	On	On	Off	On	On
224	Off	Off	Off	Off	Off	On	On	On
225	On	Off	Off	Off	Off	On	On	On
226	Off	On	Off	Off	Off	On	On	On
227	On	On	Off	Off	Off	On	On	On
228	Off	Off	On	Off	Off	On	On	On
229	On	Off	On	Off	Off	On	On	On
230	Off	On	On	Off	Off	On	On	On
231	On	On	On	Off	Off	On	On	On
232	Off	Off	Off	On	Off	On	On	On
233	On	Off	Off	On	Off	On	On	On
234	Off	On	Off	On	Off	On	On	On

Address	A0	A1	A2	A3	A4	A5	A6	A7
235	On	On	Off	On	Off	On	On	On
236	Off	Off	On	On	Off	On	On	On
237	On	Off	On	On	Off	On	On	On
238	Off	On	On	On	Off	On	On	On
239	On	On	On	On	Off	On	On	On
240	Off	Off	Off	Off	On	On	On	On
241	On	Off	Off	Off	On	On	On	On
242	Off	On	Off	Off	On	On	On	On
243	On	On	Off	Off	On	On	On	On
244	Off	Off	On	Off	On	On	On	On
245	On	Off	On	Off	On	On	On	On
246	Off	On	On	Off	On	On	On	On
247	On	On	On	Off	On	On	On	On
248	Off	Off	Off	On	On	On	On	On
249	On	Off	Off	On	On	On	On	On
250	Off	On	Off	On	On	On	On	On
251	On	On	Off	On	On	On	On	On
252	Off	Off	On	On	On	On	On	On
253	On	Off	On	On	On	On	On	On
254	Off	On	On	On	On	On	On	On
255	On	On	On	On	On	On	On	On

Appendix D. Reference

Appendix D.1. Specifications

	ProtoNode FPC-N34	
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
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	
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 D.1.1.   Compliance with UL Regulations

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

- The units shall be powered by listed LPS or Class 2 power supply suited to the expected operating temperature range.

- The interconnecting power connector and power cable shall:
  - Comply with local electrical code
  - Be suited to the expected operating temperature range
  - Meet the current and voltage rating for ProtoNode/Net

- Furthermore, the interconnecting power cable shall:
  - Be of length not exceeding 3.05m (118.3")
  - Be constructed of materials rated VW-1, FT-1 or better

- If the unit is to be installed in an operating environment with a temperature above 65 °C, it should be installed in a Restricted Access Area requiring a key or a special tool to gain access.

- This device must not be connected to a LAN segment with outdoor wiring.

Appendix E. Limited 2 Year Warranty

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

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

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

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