



## Modbus – BACnet Gateway User Guide

**This document describes use of ProtoNode FPC-N54 gateway  
for Modbus RTU to BACnet protocol translation  
for networking ebm-papst fans with Building Automation System**

### APPLICABILITY & EFFECTIVITY

The information in this guide is applicable exclusively for ebm-papst fans with Modbus RTU interface and either BACnet IP or BACnet MSTP networks. Effective for ProtoNode manufactured after October 2018.

## Technical Support

Thank you for purchasing the ProtoNode for ebm-papst.

Please call ebm-papst for technical support of the ProtoNode product.

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

Support Contact Information:

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100 Hyde Rd.  
P.O. Box 4009  
Farmington, CT 0603

Customer Service:  
(860) 674-1515

Website: [www.ebmpapst.us](http://www.ebmpapst.us)

Email: [sales@us.ebmpapst.com](mailto:sales@us.ebmpapst.com)

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## 1 ABOUT PROTONODE MODBUS-BACNET GATEWAY

### 1.1 ProtoNode FPC-54 Capabilities

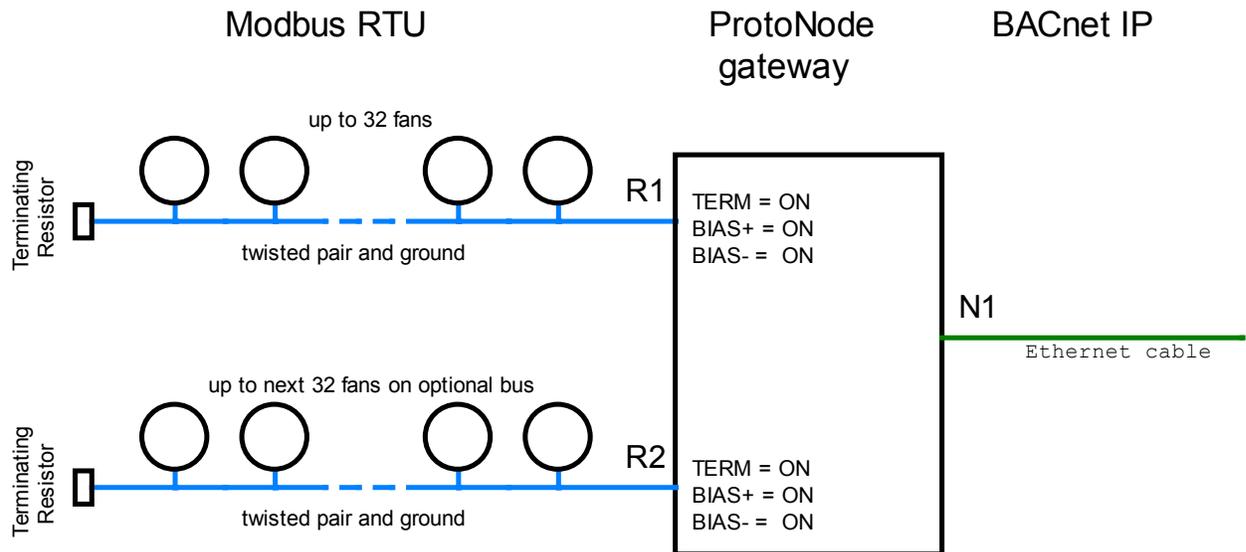
ProtoNode is a high performance, cost effective gateway providing protocol translation between ebmpapst EC Fans using Modbus RTU protocol and either BACnet IP or BACnet MSTP protocol used in building automation systems. It also can support (not described in this document) Modbus TCP and RS-232 connectivity.

FPC-N54 units have the following 3 data communication ports:

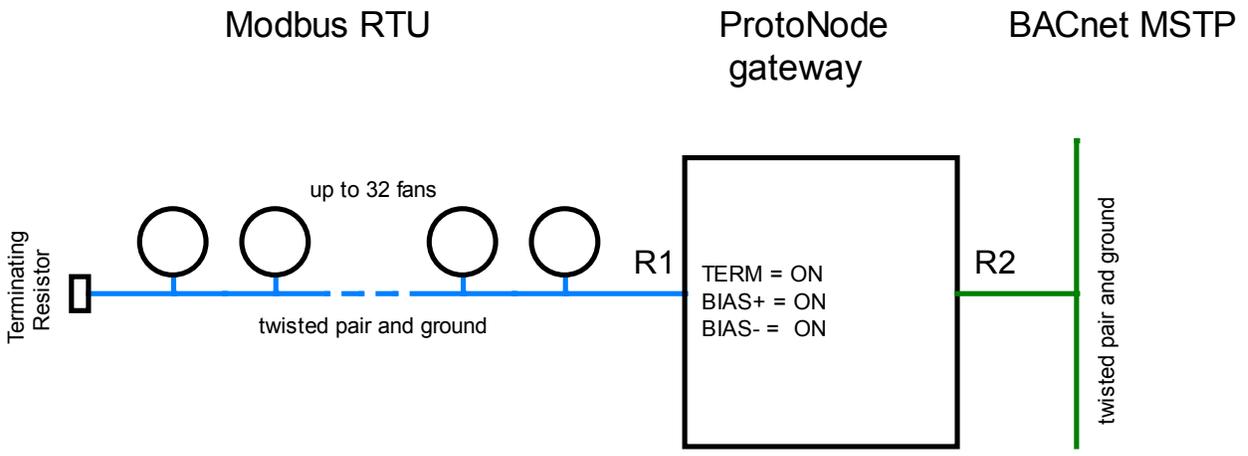
- RS-485 (designated as R1) for either ModbusRTU or BACnet MSTP
- RS-485 (designated as R2) for either ModbusRTU or BACnet MSTP
- Ethernet (designated as N1) for either BACnet IP or Modbus TCP

The P/N: FPC-N54-1821 supports up to total number of 5000 BACnet objects.

### 1.2 Connectivity



Typical Connection Diagram for BACnet IP with up to two Modbus RTU buses.



Typical Connection Diagram for BACnet MSTP.

## **2 INTEGRATING MODBUS FANS WITH BACNET BMS - OVERVIEW**

This User Guide is exclusively for ebm-papst EC fans with Modbus RTU interface. The interface allows for configuration, monitoring and control functions of the fan. This is accomplished by reading and writing values to Modbus registers described in EC Fan Modbus specification. In order to use Modbus fan on BACnet network it's necessary to use the correct profile that links Modbus registers with BACnet objects. With the profile residing in the gateway memory, the BACnet BMS is able to discover, monitor and change values of BACnet objects that are mapped to the fan Modbus registers.

### **Setting up Modbus fans.**

All ebm-papst Modbus fans should be set up for operation prior to connecting with gateway.

This includes:

- wiring power, Modbus and if used I/O devices
- programming Modbus holding registers for the application configuration requirements

### **Setting up ProtoNode gateway.**

The setup of ProtoNode is done by establishing connection with a PC via Ethernet. This involves specifying network parameters on the PC as well as in ProtoNode gateway.

The gateway configuration is done via **EZ Gateway** GUI by either accessing it from an internet browser, or by using **FieldServer Toolbox** software. Here, in the Settings section the protocols (Modbus RTU, BACnet IP or BACnet MSTP) and ports (R1, R2, N1) are configured. Also there, the fan Modbus address gets assigned to BACnet device name and profile in the DeviceProxy page. In the Device Profile page, fan profiles can be created and edited to match fan type and to accommodate specific BMS requirements.

### **Connecting fans to gateway and network.**

In this step fans are wired and connected to Modbus network client (gateway) and from there to the BMS network via Ethernet cable (BACnet IP) or twisted pair with ground (BACnet MSTP).

### **Verifying BACnet communication.**

BACnet communication should be verified prior to integrating with BMS. This can be accomplished using ProtoNode resident BACnet explorer or by BACnet explorer software installed on the PC connected to the BACnet network. At this point it may become necessary to adjust settings including altering profiles via EZ Gateway GUI.

### 3 SETTING UP MODBUS FANS

Complete wiring of all fans in the application prior to programming.

Determine number of fans and fan types to be handled by single gateway in the application. For the BACnet IP network there are two RS-485 ports available which makes it possible to connect up to 64 fans (32 fans per Modbus RS-485 port).

When more than one fan is being used on single gateway it's necessary to reprogram the fan addresses from the default address 1. The process is described in the specifications ([Appendix B.5 References to specifications](#)) and EC-Control Manual ([Appendix B.5 Reference to App guide](#)). Address changes must be done prior to connecting to the gateway. This can be accomplished by using a computer with USB/RS-485 converter as well as suitable software (e.g. EC Control). The Modbus communication parameters could be reprogrammed in this step as well. In such case **the communication parameters of all fans and the gateway must match**. The default Modbus interface setting for fans are: rate 19200 baud, even parity, 1 stop bit.

It is strongly recommended to perform complete fan configuration via Modbus before connecting to gateway. This includes programming control modes, setting up inputs and outputs and entering control parameter values.

Each fan type requires specific profile modification. Use the table below to record parameters found in **holding registers** for each used fan type.

Fan Type:

| Decimal Address | Hex Address | Value |
|-----------------|-------------|-------|
| 53529           | D119        |       |
| 53664           | D1A0        |       |
| 53665           | D1A1        |       |

Table for recording Modbus register values specific to fan type.

These values will be needed for calculating scaling parameters in the fan type profile. This is described in detail [Appendix B.4. Calculating Scaling Parameters](#).

## 4 INSTALLING THE PROTONODE

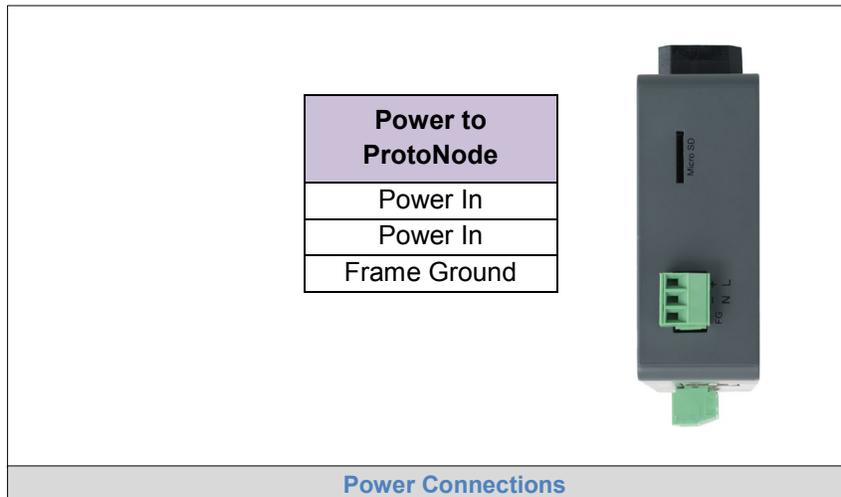
### 4.1 Powering-up ProtoNode

The ProtoNode gateway FPC-N54 can use the following power sources:

- DC: 12 - 24VDC, max. current draw 250mA.
- AC: 24VAC, 50/60Hz max. current draw 140mA

**NOTE: The power supply should be capable of 125% of the max current draw listed above to satisfy recommended safety margin.**

**FG terminal should be connected to Frame Ground (PE).**

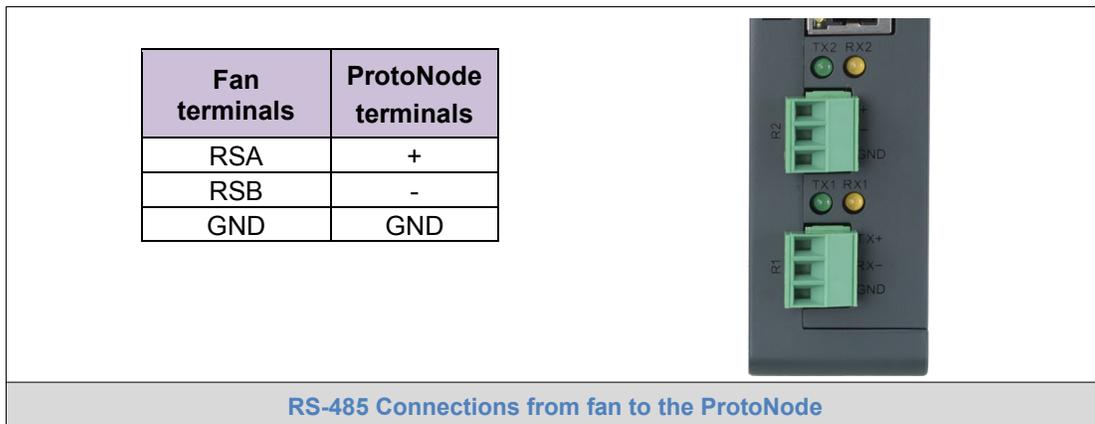


### 4.2 Modbus RTU Fan Connections to ProtoNode

The ProtoNode has two independent and isolated from each other RS-485 ports: R1 and R2. They are to be used for Modbus RTU or for BACnet MSTP protocols. The ProtoNode uses a 3-position pluggable terminal blocks for connecting RS-485 wiring to R1 and R2 ports.

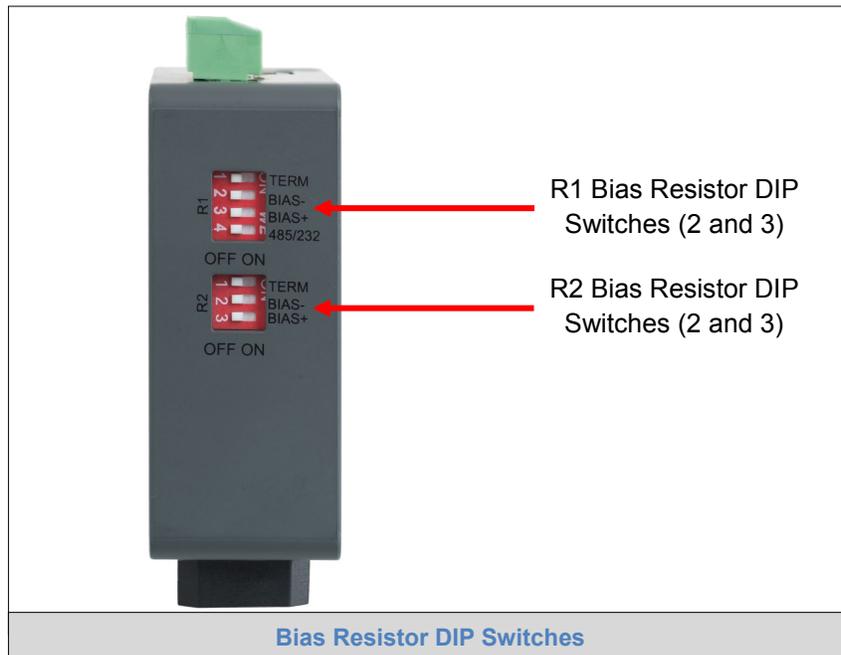
**The ebm-papst Application Note following Modbus standard require that fans connected to R1 port have GND terminals connected to R1 GND terminal. Similary, fans connected to R2 port have GND terminals connected to R2 GND terminal.**

**NOTE: the grounds on R1 and R2 ports are isolated from each other.**



### 4.3 Bias Resistors

To enable Bias Resistors, move both the BIAS- and BIAS+ dip switches to the right in the orientation shown below.



The ProtoNode bias resistors are used to keep the RS-485 bus in a known state, when there is no transmission on the line (bus is idling), to help prevent false bits of data from being detected as a result of noise. The bias resistors typically pull one line high and the other low - far away from the decision point of the logic.

#### Bias resistors on Modbus RTU

The bias switches should be set to on state on the ProtoNode gateway connected to the ebm-papst fans.

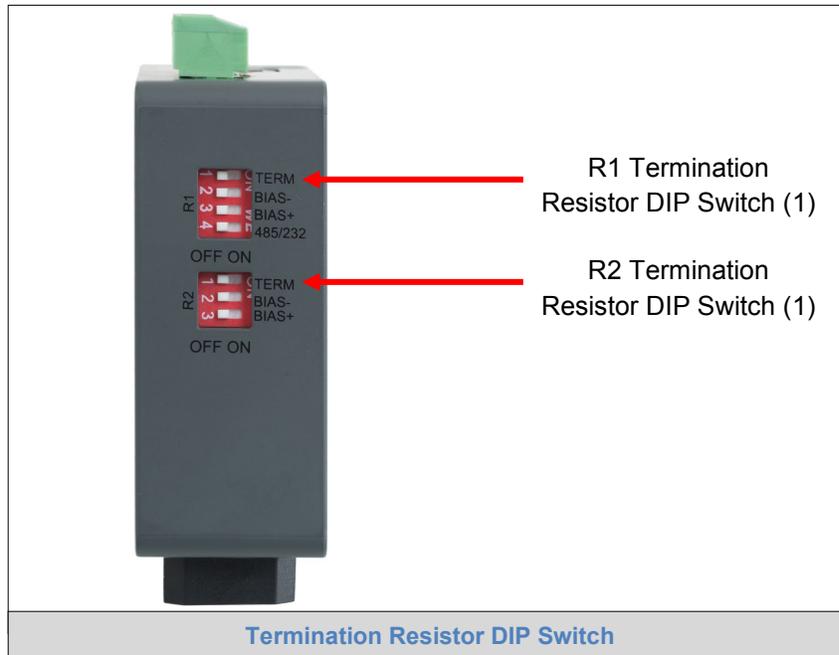
#### Bias resistors on BACnet MSTP

Only one ProtoNode gateway may have bias enabled on the MSTP network.

**NOTE:** See [www.ni.com/support/serial/resinfo.htm](http://www.ni.com/support/serial/resinfo.htm) for additional pictures and notes.

**NOTE:** The R1 and R2 DIP Switches apply settings to the respective serial port. Please make sure that R1 DIP switch position 4 is in OFF (485) state.

## 4.4 Termination Resistor



Each end of RS-485 serial bus must be terminated with resistor (120ohm).

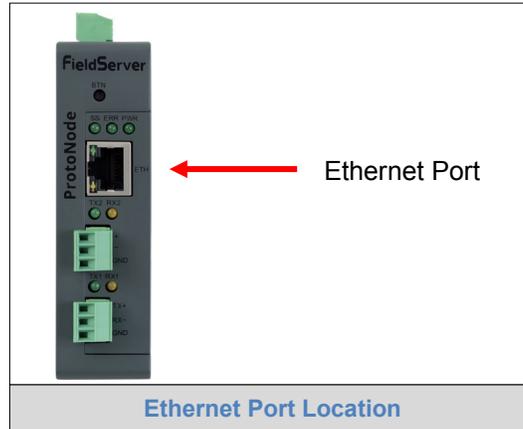
If the ProtoNode is the last device on the serial trunk, then the End-Of-Line Termination Switch needs to be turned on. **To enable the Termination Resistor, move the TERM dip switch to the right (ON state).**

**NOTE:** The R1 and R2 DIP Switches apply settings to the respective serial port.

## 5 CONNECT THE PC TO THE PROTONODE

### 5.1 Connecting to the ProtoNode via Ethernet

First, connect a CAT5 Ethernet cable (straight through or cross-over) between the local PC and ProtoNode.



#### 5.1.1 Enable Access Through the Local Browser

There are two methods to enable access to the ProtoNode in the local browser, either by changing the subnet of the connected PC (Section 5.1.1.1) or using the FieldServer Toolbox to change the IP Address of the ProtoNode (Section 5.1.1.2).

**NOTE: Only perform one method or the other.**

##### 5.1.1.1 Changing the Subnet of the Connected PC

The default IP Address for the ProtoNode Ethernet connection is **192.168.1.24**, Subnet Mask is **255.255.255.0**. If the PC and ProtoNode are on different IP networks, assign a static IP Address to the PC on the 192.168.1.xxx network.

For Windows 10:

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

Right-click on Local Area Connection > Properties

Highlight  [Internet Protocol Version 4 \(TCP/IPv4\)](#) > [Properties](#)

Use the following IP Address:

Use the following IP address:

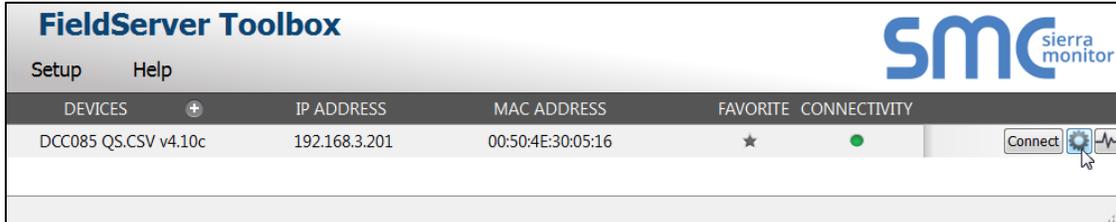
|                  |                     |
|------------------|---------------------|
| IP address:      | 192 . 168 . 1 . 11  |
| Subnet mask:     | 255 . 255 . 255 . 0 |
| Default gateway: | . . .               |

Click [OK](#) twice.

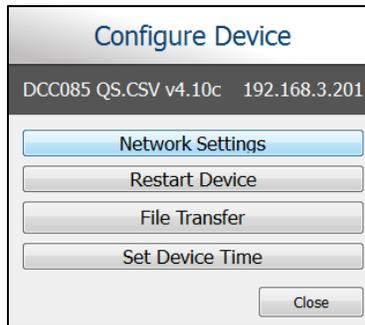
5.1.1.2 Changing the IP Address of the ProtoNode with FieldServer Toolbox

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor website’s [Software Downloads](#).
- Extract the executable file and complete the installation.
- Double click on the FS Toolbox Utility and click Discover Now on the splash page.
- Find the desired gateway and click the Configure Device button (gear icon) to the right of the gateway information.

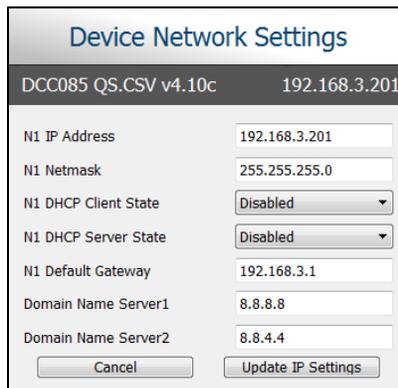
**NOTE:** If connectivity status is green, then the IP Address doesn’t need to be changed (the ProtoNode is already on the same subnet). Skip the rest of the section and go to Section 6.



- Select Network Settings in the Configure Device window.



- Modify the IP Address (N1 IP Address field) of the gateway Ethernet port.
  - Change additional fields as needed



**NOTE:** If the gateway is connected to a router, the Default Gateway field of the gateway should be set to the IP Address of the connected router.

**NOTE:** Do not change the DHCP Server State (N1 DHCP Server State field).

**NOTE:** If DNS settings are unknown, set DNS1 to “8.8.8.8” and DNS2 to “8.8.4.4”.

- Click Update IP Settings, then click the “Change and restart” button to reboot the Gateway and activate the new IP Address. See the [FieldServer Toolbox and GUI Manual](#) for more information.

## 6 CONFIGURING THE PROTONODE

Use the following Web Configurator GUI pages to configure the ProtoNode:

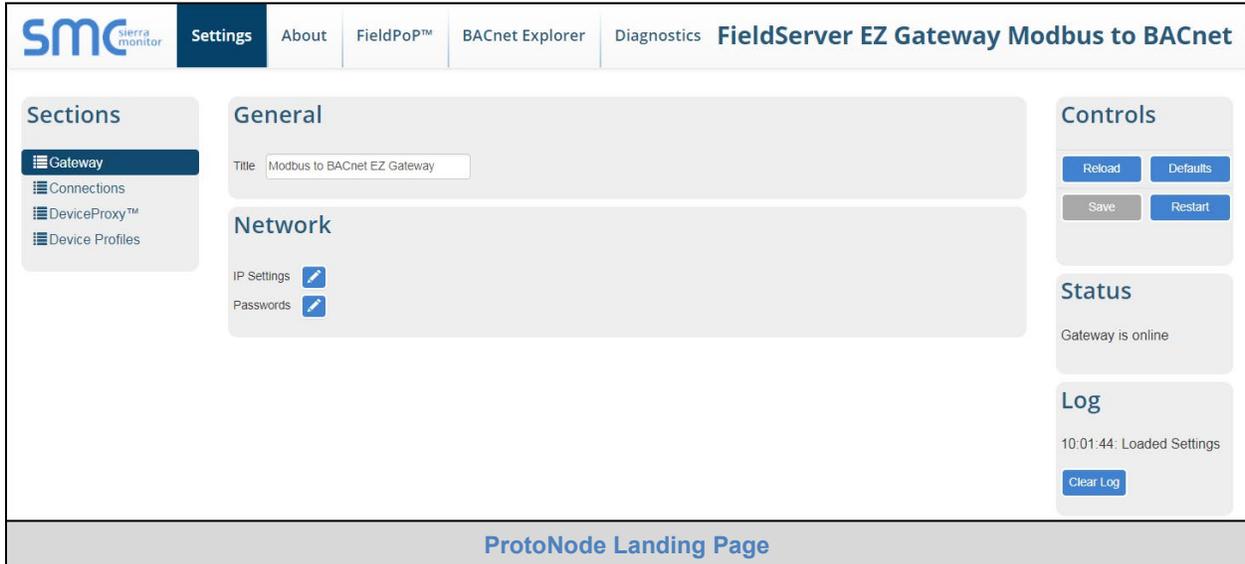


1. Use the Gateway page to name the ProtoNode and set the IP Address of the gateway on the field Ethernet network. (**Section 6.1**)
2. Use the Connections page to select device protocols, field protocol and the COM settings for each protocol. (**Section 6.2**)
3. Use the Device Profiles page to edit, save a modified profile in the ProtoNode, and import/export profiles from/to a local computer. A profile is a data file that contains mapping data linking Modbus registers with BACnet objects. Each fan handled by gateway must have a profile assigned. Generic profiles initially stored in ProtoNode require editing before use. The installer must select appropriate to the fan Modbus version generic profile that should be renamed and modified to match fan type. (**Section 6.3** and **Section 6.4**)
4. Use the DeviceProxy page to select a saved profile for each fan connected to the ProtoNode. This page also allows the selection of field protocol and BACnet Device Instances for each fan connected to the ProtoNode. (**Section 6.5**)

## 6.1 Accessing the ProtoNode Web Configurator GUI

- Navigate to the IP Address of the ProtoNode on the local PC using one of two methods:
  - Open a web browser and enter the IP Address of the ProtoNode (**default is 192.168.1.24**)
  - If using the FieldServer Toolbox (**Section 5.1.1.2**), click the Connect button

**NOTE: If the IP Address of the ProtoNode has been changed, the IP Address can be discovered using the FS Toolbox utility. See [Appendix A.1](#) for instructions.**



### 6.1.1 Controls, Status and Log Functions

Along the right side of every Web Configurator GUI page is a column of buttons and event generated messages.

- **Controls Panel** – Contains the following four buttons:
  - *Reload* – Resets all settings to the last saved configuration
  - *Defaults* – Resets all settings to the default configuration
  - *Save* – Records all settings
  - *Restart* – Reboots the Gateway
- **Status Information** – Shows Gateway messages such as whether the Gateway is online, element validation status, unsaved settings, etc.
- **Log Messages** – Lists last five events and when they were performed.

## 6.2 Setting up the Connections

The Connections page is used to setup the connection ports and parameters. Select only one protocol per port:

R1: Modbus RTU or BACnet MSTP

R2: Modbus RTU or BACnet MSTP

N1: BACnet IP or Modbus TCP

Verify and update COM parameters for each port.

The screenshot displays the 'Connections Page' for the FieldServer EZ Gateway. The page is divided into several sections:

- Sections:** A sidebar on the left with 'Connections' highlighted.
- Modbus RTU R1:** Enabled, Port R1, Baud Rate 19200, Parity Even, Data Bits 8, Stop Bits 1, Poll Delay 0.1.
- Modbus TCP:** Disabled, Poll Delay 0.1, Max Concurrent Messages 1.
- BACnet IP:** Enabled, IP Port 47808, Virtual Network Number 1101, Router Network Number 1201, Enable BBMD disabled, Public IP Address and Port are blank, Broadcast Distribution Table checked.
- BACnet Explorer:** Router Network Number 1200.
- BACnet MSTP R1:** Disabled, Baud Rate 38400, Parity None, Data Bits 8, Stop Bits 1, Mode Master, Max Master 127, Max Info Frames 1, MAC Address 1, Virtual Network Number 1102, Router Network Number 1202.
- BACnet MSTP R2:** Enabled, Baud Rate 38400, Parity None, Data Bits 8, Stop Bits 1, Mode Master, Max Master 127, Max Info Frames 1, MAC Address 1, Virtual Network Number 1103, Router Network Number 1203.
- Modbus RTU R2:** Disabled, Port R2, Baud Rate 9600, Parity None, Data Bits 8, Stop Bits 1, Poll Delay 0.1.
- Controls:** Reload, Defaults, Save, Restart buttons.
- Status:** Gateway is online.
- Log:** 17:53:00: Loaded Settings, Clear Log button.

- After making changes to the settings, click the Save button on the right side of the screen.
- Then click the Restart button when prompted to make the changes effective.

### 6.3 Setting up Fan Profile

The ProtoNode comes with 6 profiles. These profiles are set up based on ebm-papst Modbus specification versions:

| Modbus version (date)    | Monitoring / control profile | Complete (all registers) |
|--------------------------|------------------------------|--------------------------|
| 5.00 (Jan. 8, 2014)      | V5_Monit_Min                 | V5_Complete              |
| 5.01 Lite (Nov. 6, 2014) | V5Lite_Monit_Min             | V5Lite_Complete          |
| 6.00 (Feb. 3, 2017)      | V6_Monit_Min                 | V6_Complete              |

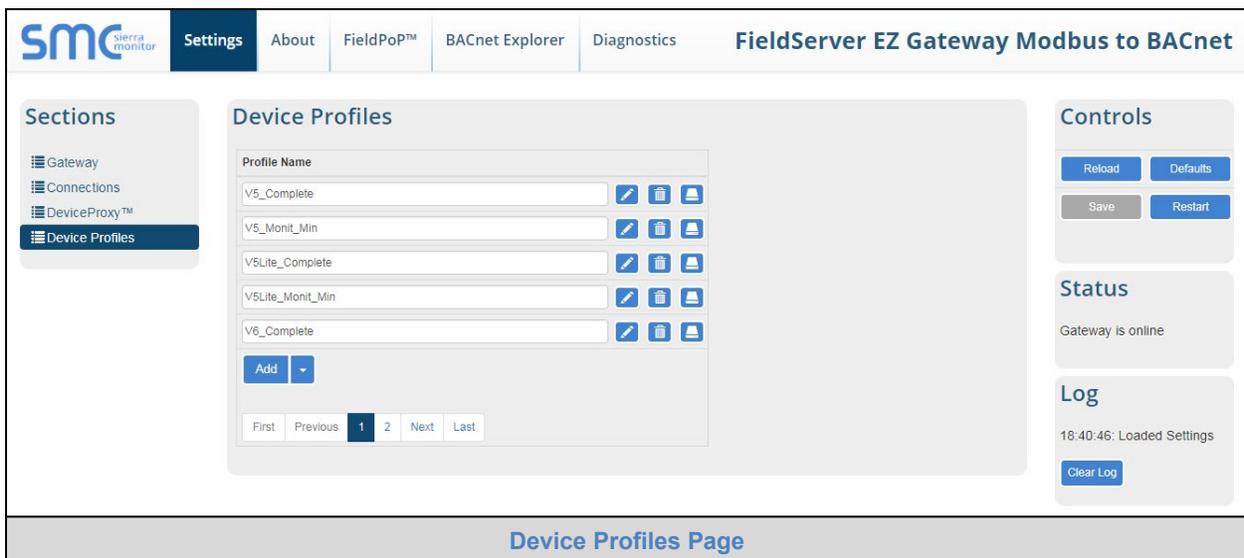
Profile Modbus version should match version used in the fan. The Modbus version for each fan can be found by reading Modbus input register D000 (hexadecimal address) or 53248 (decimal address).

Fans of different Modbus versions can coexist on Modbus network.

The profiles with \_Monit\_Min suffix have a small number of BACnet objects that are relevant for fan monitoring and control and are intended for use in the BACnet BMS. The profiles with \_Complete suffix contain mapping of all input registers and all holding registers. These profiles are therefore large and containing data that may be irrelevant for the application and slow to update. These profiles are intended for verification of fan configuration data and diagnostics. Operator can temporarily switch to \_Complete profile to verify or alter content of configuration register before going back to previous profile optimized for monitoring and control.

#### Step-by-step setup

- Export all profiles to local PC for backup. (Figure 18)
- Select “Vx\_Monit\_Min” profile where x is Modbus version of the used fan.
- Rename selected profile to new name indicating fan type.



- Click on the Edit button (pencil icon in Figure 11) next to the name of the profile to edit.
- Select Protocol Data Unit (used for ebm-papst fans) for Address Type.

**NOTE:** See [Appendix B.3](#) for additional information on Address Type.

**Edit Profile**

Device Settings | **Data Map** | State Tables | Notification Classes

**Modbus**

Address Type: Protocol Data Unit

Enable Write Multiple:

Write Length: 1

**BACnet**

Enable COV:

⏪ ⏩

**Edit Profile Window**

- Click on the Data Map tab to add or subtract Modbus address as needed.

**Edit Profile**

Device Settings | **Data Map** | State Tables | Notification Classes

| Address | Data Type        | Function          | Length | Scan Interval | Signed Value             |
|---------|------------------|-------------------|--------|---------------|--------------------------|
| + 53248 | Holding Register | Read Continuously | 1      | 1             | <input type="checkbox"/> |

Add

First Previous 1 Next Last

⏪ ⏩

There are unsaved settings.

**Data Map Window**

- Click on the blue plus sign icon on the left side of the Address to map the Modbus Registers to BACnet Objects. In the below example this action reveals a block of 5 input registers with consecutive addresses starting with address 53264. They have assigned BACnet Object Instance numbers and Object Names. These could be changed as desired. Grouping consecutive registers into blocks allows for update in a single Modbus transmission which improves responsiveness. Keep in mind that the number of registers should not exceed: 8 for version 5 and 5 Lite and should not exceed 36 for version 6.

**Edit Profile**

Device Settings | **Data Map** | State Tables | Notification Classes

| Address | Data Type        | Function          | Length | Scan Interval | Signed Value             |
|---------|------------------|-------------------|--------|---------------|--------------------------|
| + 53509 | Holding Register | Read Continuously | 1      | 31            | <input type="checkbox"/> |
| + 53589 | Holding Register | Read Once         | 1      | 1             | <input type="checkbox"/> |
| + 53664 | Holding Register | Read Once         | 2      | 1             | <input type="checkbox"/> |
| + 53248 | Input Register   | Read Once         | 1      | 1             | <input type="checkbox"/> |
| - 53264 | Input Register   | Read Continuously | 5      | 13            | <input type="checkbox"/> |

| Data Offset | Object Instance | Object Name          | Object Type  | Units                  | Description | Advanced                            |
|-------------|-----------------|----------------------|--------------|------------------------|-------------|-------------------------------------|
| 0           | 201             | D010 Actual speed    | Analog Input | revolutions-per-minute | -           | <input checked="" type="checkbox"/> |
| 1           | 202             | D011 Motor status    | Analog Input | -                      | -           | <input checked="" type="checkbox"/> |
| 2           | 203             | D012 Warning         | Analog Input | -                      | -           | <input checked="" type="checkbox"/> |
| 3           | 204             | D013 DC-link voltage | Analog Input | volts                  | -           | <input checked="" type="checkbox"/> |
| 4           | 205             | D014 DC-link current | Analog Input | amperes                | -           | <input checked="" type="checkbox"/> |

Add

First Previous **1** Next Last

Add

First Previous **1** **2** 3 Next Last

**Mapping Modbus Registers to BACnet Object Instances**

**NOTE: The Advanced button (eye icon) allows additional settings, including: Intrinsic Reporting, Bit Extraction, scaling and more.**

Advanced

**Intrinsic Reporting**

Notification Class

High Alarm

Low Alarm

---

**Bit Extraction**

Enable

Bit Offset

Length

---

**Other**

COV Increment

Relinquish Default

Predefined Scaling

Show Scaling Parameters

- Press Advanced button (eye icon) and when pop-up Advanced menu appears check the “Show Scaling Parameters” box at the bottom of menu.
- When Advanced menu expands revealing Scaling Parameters section, enter calculated results from calculations described in Appendix B.4 and click on blue checkbox.
- When back on Data Map screen select and update scaling parameters for remaining registers.
- Add desired registers and specify:

Data Type: Holding or input registers

Function: Read Continuously (for frequent updates),

Read Once (read once by gateway)

Write On Change (written to/from BACnet, not updated/read otherwise)

Length: Number of registers with consecutive addresses to be read in one transmission

Object Instance: BACnet instance number

Object Name (parameter description)

Object type: Analog Value – read/write; Analog Input - read only, Analog Output – write only,

**Advanced**

**Intrinsic Reporting**

Notification Class -

High Alarm

Low Alarm

**Bit Extraction**

Enable

Bit Offset

Length

**Other**

COV Increment

Relinquish Default

Predefined Scaling

Show Scaling Parameters

**Scaling Parameters**

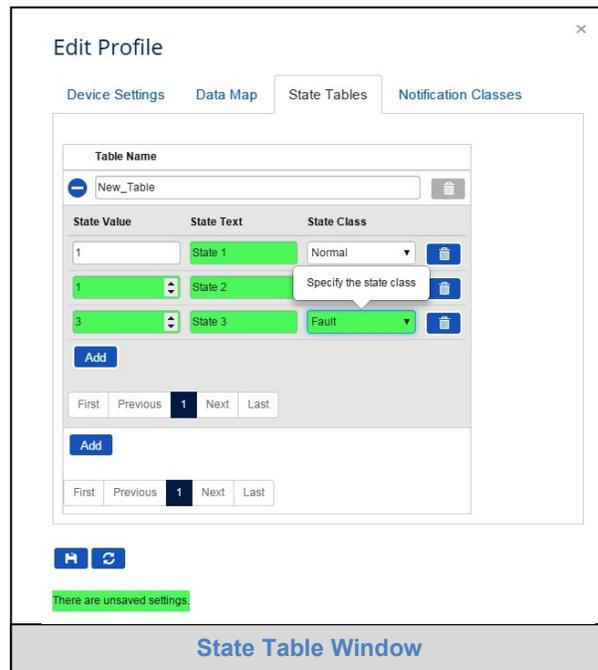
Source Low

Source High

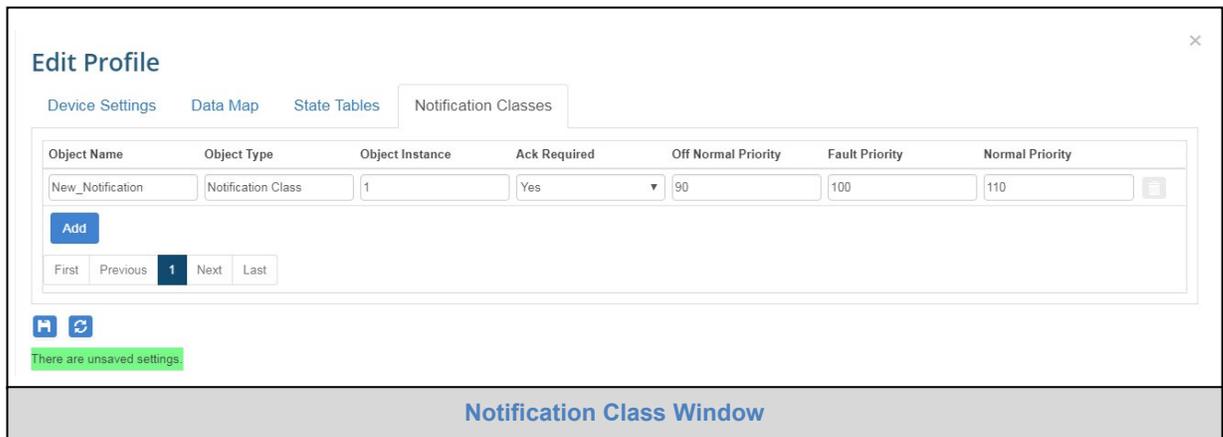
Target Low

Target High

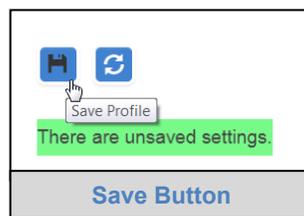
- If using a BACnet State Table, click on the “State Table” tab to define the table and its variables.



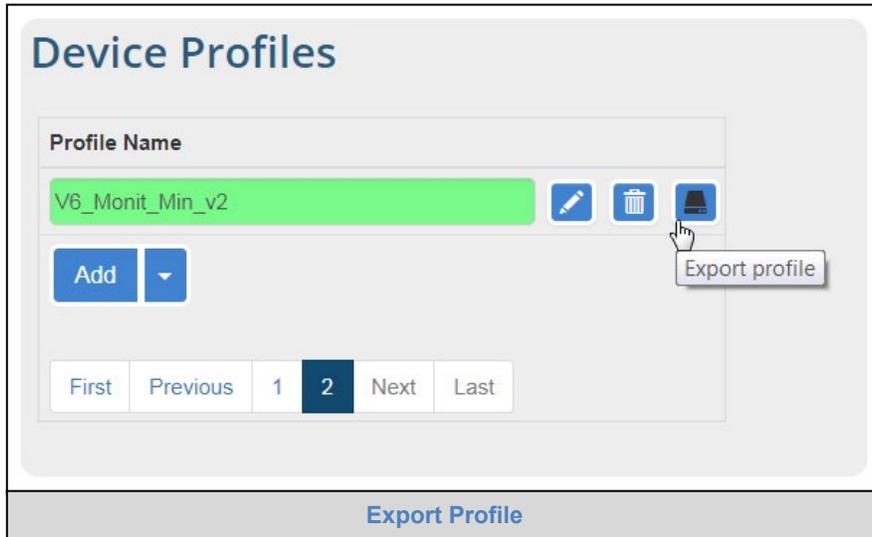
To define a Notification Class, click the “Notification Class” tab and define the parameters as needed.



- Once all mappings and settings are changed as desired, click the “Save” button in the bottom left corner of the window to record the Profile.

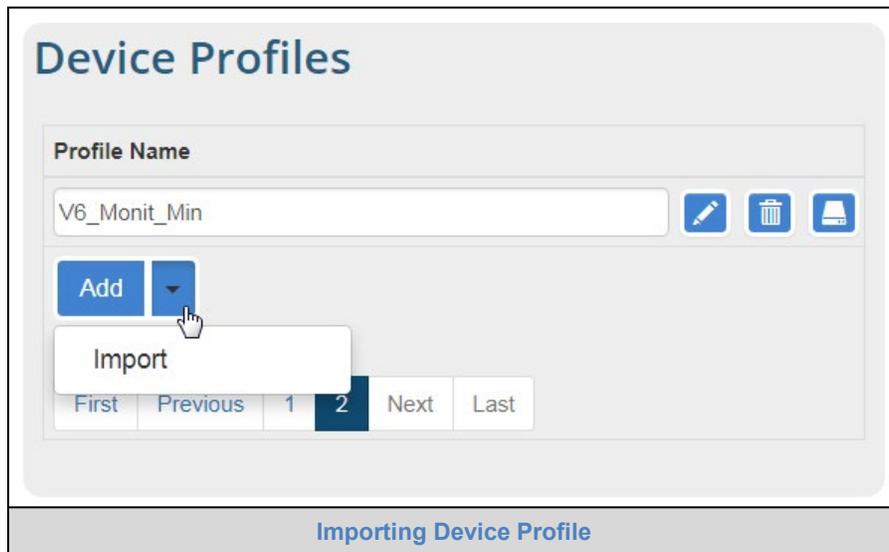


- Back on the Device Profiles page, the profile should be exported to PC for backup or future use by hitting the Export Profile button (hard drive icon). The profile downloads to the local computer in the format: <Profile Name>.profile

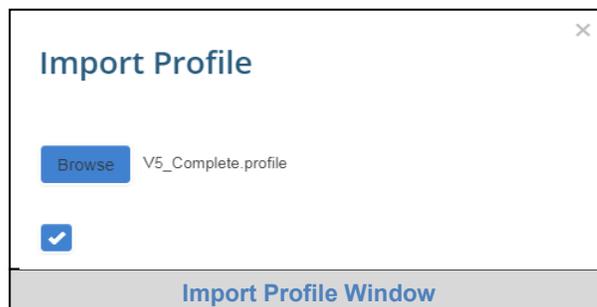


#### 6.4 Importing a Device Profile

- Profiles on the local computer can be imported to the ProtoNode by going to the Device Profiles section and clicking the arrow to the right of the Add button.



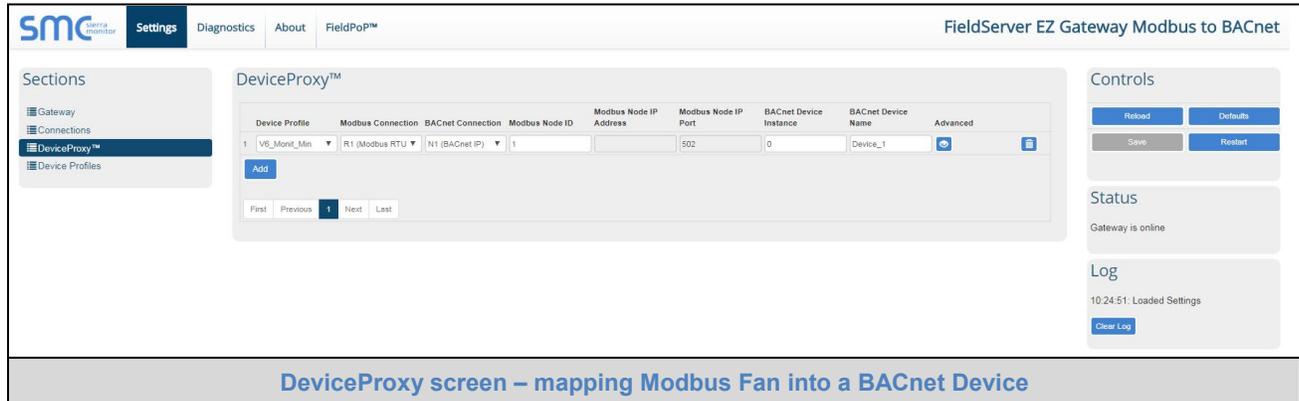
- Browse the local PC and select profiles one at a time to import.
- Click the check to import.



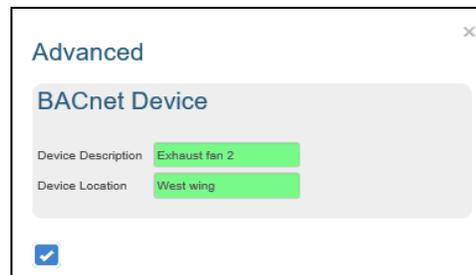
NOTE: All profiles will need to be created or imported to the ProtoNode before proceeding.

## 6.5 Assigning Profiles to Fans

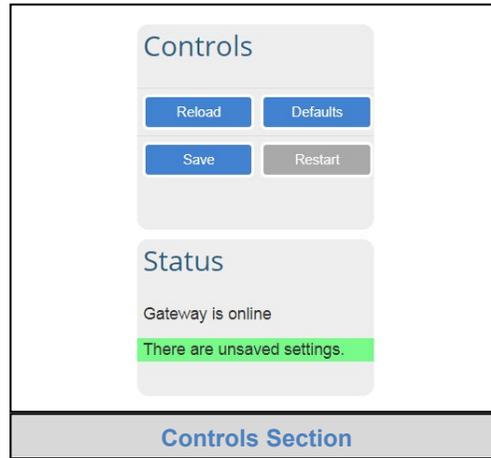
- Click on the DeviceProxy™ button.
- Click Add to open a new entry.
- Select one of the loaded profiles to use from the Device Profile drop down menu.



**NOTE:** If required, click the Advanced Settings button (eye icon) to enter the Device Description and Device Location.

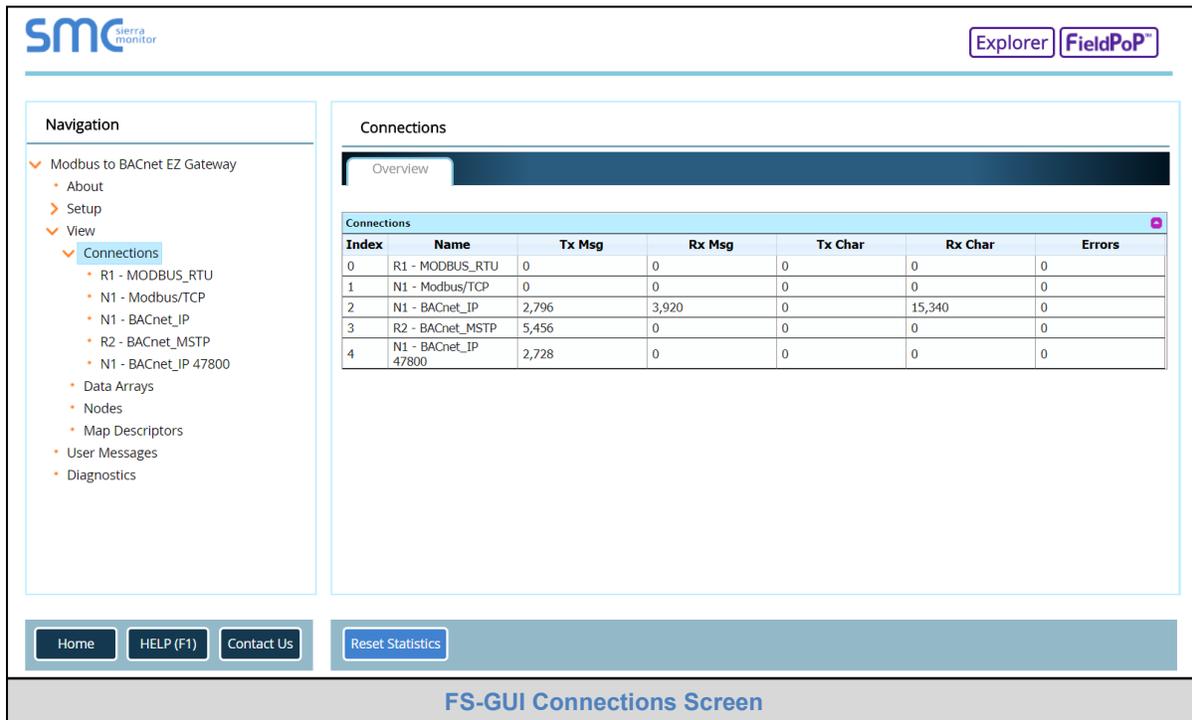


- For each fan, select correct RS-485 port (R1 or R2) in Modbus Connection cell.
- Select BACnet Connection: N1(BACnet IP), R1(BACnet MSTP) or R2(BACnet MSTP).
- Enter Modbus address of the selected fan in Modbus Node ID cell.
- Assign unique BACnet Device Instance number and BACnet Device Name.
- Click Add to repeat process with remaining fans.
- Click the Save button in the Controls section once all device EZ Profiles are added and then click the Restart button to reset the system.



## 6.6 Test and Commission the ProtoNode

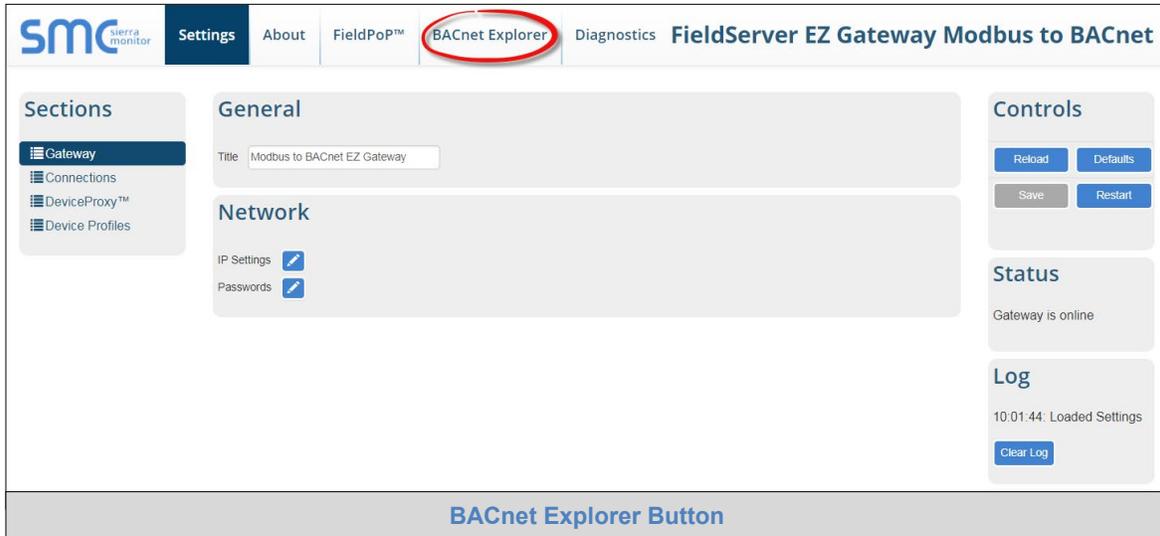
- After loading the profiles in the DeviceProxy page, click on the Diagnostic button to view the device and field communications in FS-GUI.
- From the landing page of the FS-GUI click on View in the navigation tree, then Connections to see the number of messages on each protocol.
- Confirm the Tx and Rx messages show good communication with no errors.
  - **If errors exist, refer to [Appendix A](#).**



## 7 USING THE EMBEDDED BACNET EXPLORER

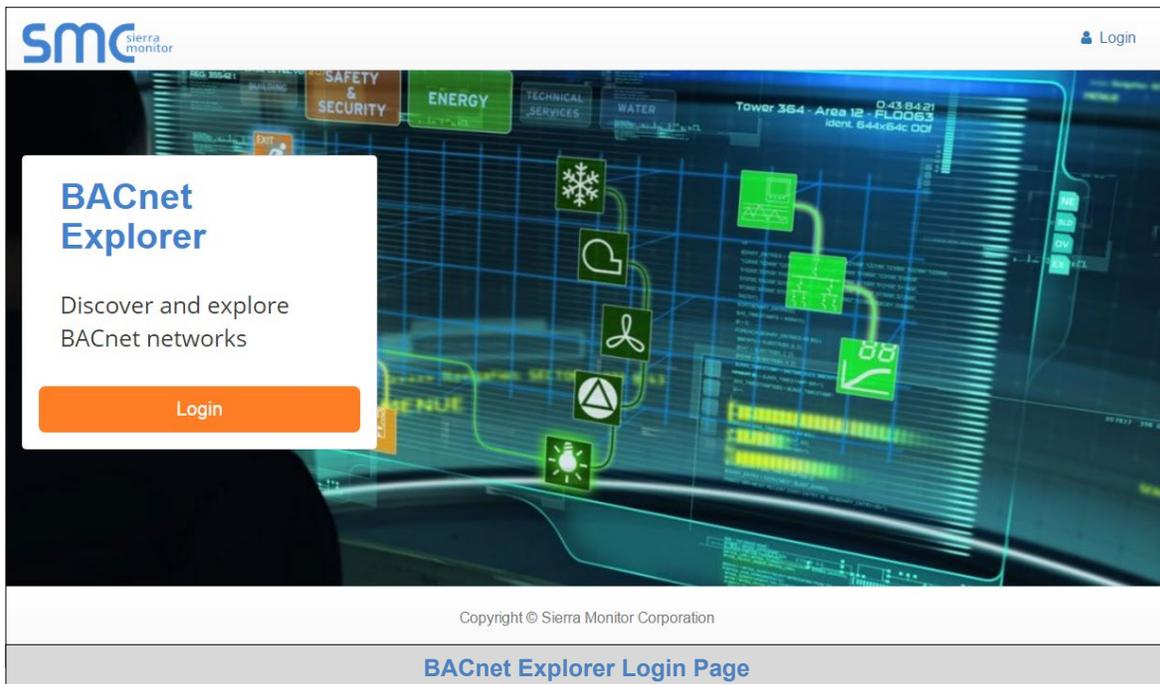
The Embedded BACnet Explorer allows installers to validate their equipment is working on BACnet without having to ask the BMS integrator to test the unit.

- To access the embedded BACnet Explorer, click the BACnet Explorer tab.



- Then login to the BACnet Explorer page using the supplied username and password.

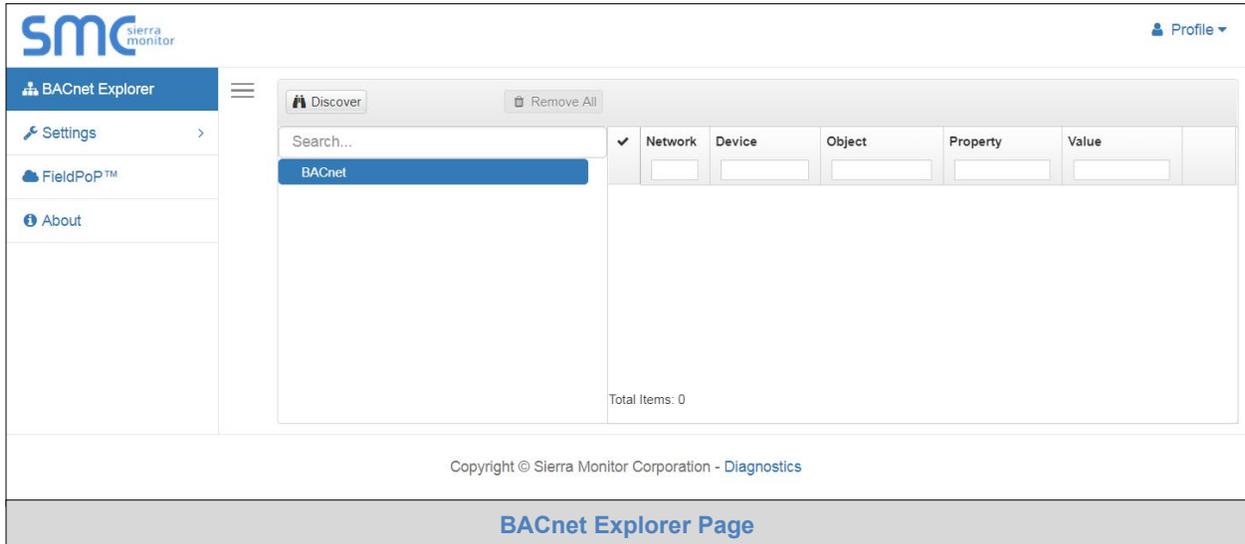
**NOTE: The default user name is “admin” and default password is “admin”.**



**NOTE: For BACnet/IP, click on the Settings button on the BACnet Explorer Page to ensure the ProtoNode is on the BACnet/IP network subnet or to configure BBMD.**

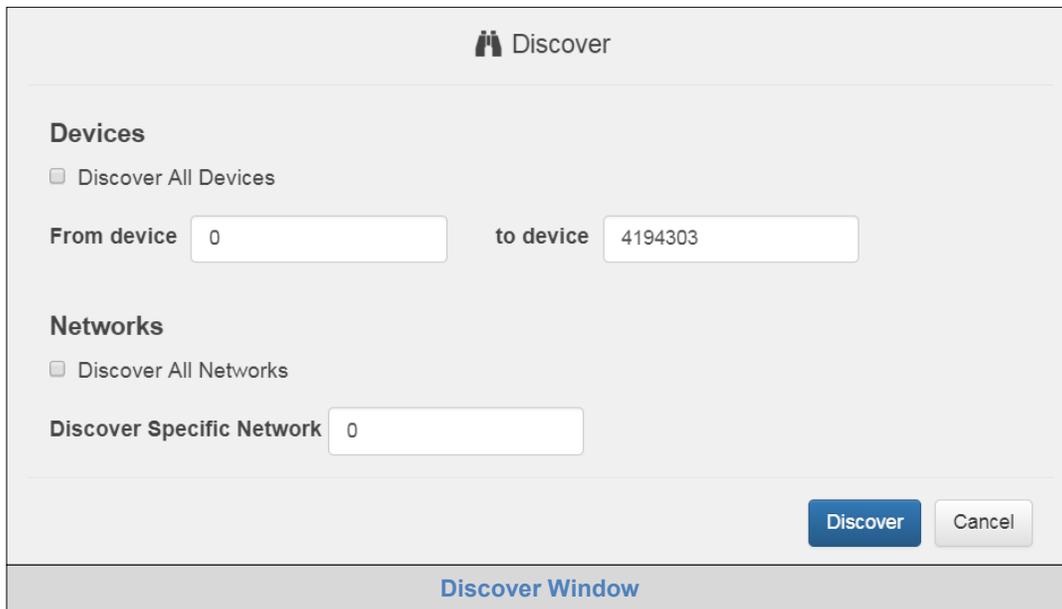
## 7.1 Discover BACnet Device List

- From the BACnet Explorer landing page, click on the BACnet Explorer button on the left side of the screen to go to the BACnet Explorer page.



BACnet Explorer Page

- To discover the devices (fans) connected to the same subnet as the BACnet Explorer, click the Discover button  (binocular icon).
- This will open the Discover window – click the checkboxes next to the desired search settings and click Discover to start the search.



Discover Window

**NOTE:** The “Discover All Devices” or “Discover All Networks” checkboxes must be unchecked to search for a specific device range or network.

**NOTE: Allow the devices (fans) to populate before interacting with the device list for optimal performance. Any discovery or explore process will cause a green message to appear in the upper right corner of the browser to confirm that the action is complete.**

The screenshot shows a web interface titled "Discover" with a "Remove All" button. On the left, there is a search bar and a tree view of BACnet networks. The main area displays a table of discovered devices. Below the table, it says "Total Items: 28".

| Network | Device          | Object                 | Property                 | Value    |     |
|---------|-----------------|------------------------|--------------------------|----------|-----|
| 1101    | 2001 (EC_Fan 5) | device:2001 (EC_Fan 5) | object-name              | EC_Fan 5 | ↻ ↗ |
| 1101    | 2001 (EC_Fan 5) | device:2001 (EC_Fan 5) | vendor-identifier        | 37       | ↻ ↗ |
| 1101    | 2002 (EC_Fan 6) | device:2002 (EC_Fan 6) | max-apdu-length-accepted | 1458     | ↻ ↗ |
| 1101    | 2002 (EC_Fan 6) | device:2002 (EC_Fan 6) | object-name              | EC_Fan 6 | ↻ ↗ |
| 1101    | 2002 (EC_Fan 6) | device:2002 (EC_Fan 6) | vendor-identifier        | 37       | ↻ ↗ |
| 1101    | 2003 (EC_Fan 7) | device:2003 (EC_Fan 7) | max-apdu-length-accepted | 1458     | ↻ ↗ |
| 1101    | 2003 (EC_Fan 7) | device:2003 (EC_Fan 7) | object-name              | EC_Fan 7 | ↻ ↗ |
| 1101    | 2003 (EC_Fan 7) | device:2003 (EC_Fan 7) | vendor-identifier        | 37       | ↻ ↗ |
| 1101    | 2004 (EC_Fan 8) | device:2004 (EC_Fan 8) | max-apdu-length-accepted | 1458     | ↻ ↗ |
| 1101    | 2004 (EC_Fan 8) | device:2004 (EC_Fan 8) | object-name              | EC_Fan 8 | ↻ ↗ |
| 1101    | 2004 (EC_Fan 8) | device:2004 (EC_Fan 8) | vendor-identifier        | 37       | ↻ ↗ |
| 1101    | 3000            | device:3000            | max-apdu-length-accepted | 1458     | ↻ ↗ |
| 1101    | 3000            | device:3000            | vendor-identifier        | 37       | ↻ ↗ |
| 1103    | 1001 (EC Fan 1) | device:1001 (EC Fan 1) | max-apdu-length-accepted | 480      | ↻ ↗ |
| 1103    | 1001 (EC Fan 1) | device:1001 (EC Fan 1) | object-name              | EC Fan 1 | ↻ ↗ |
| 1103    | 1001 (EC Fan 1) | device:1001 (EC Fan 1) | vendor-identifier        | 37       | ↻ ↗ |
| 1103    | 1002 (EC Fan 2) | device:1002 (EC Fan 2) | max-apdu-length-accepted | 480      | ↻ ↗ |
| 1103    | 1002 (EC Fan 2) | device:1002 (EC Fan 2) | object-name              | EC Fan 2 | ↻ ↗ |
| 1103    | 1002 (EC Fan 2) | device:1002 (EC Fan 2) | vendor-identifier        | 37       | ↻ ↗ |
| 1103    | 1003 (EC Fan 3) | device:1003 (EC Fan 3) | max-apdu-length-accepted | 480      | ↻ ↗ |
| 1103    | 1003 (EC Fan 3) | device:1003 (EC Fan 3) | object-name              | EC Fan 3 | ↻ ↗ |
| 1103    | 1003 (EC Fan 3) | device:1003 (EC Fan 3) | vendor-identifier        | 37       | ↻ ↗ |
| 1103    | 1004 (EC Fan 4) | device:1004 (EC Fan 4) | max-apdu-length-accepted | 480      | ↻ ↗ |
| 1103    | 1004 (EC Fan 4) | device:1004 (EC Fan 4) | object-name              | EC Fan 4 | ↻ ↗ |
| 1103    | 1004 (EC Fan 4) | device:1004 (EC Fan 4) | vendor-identifier        | 37       | ↻ ↗ |

**BACnet Device List**

## 7.2 View BACnet Device Objects and Explore Object properties.

- To view the device objects, click the blue plus sign ( + ) next to the desired device in the list. This will show only some of the device objects.

The screenshot shows the "Discover" interface with the tree view expanded to show "network:3101" containing "device:3000 (Fan10)". The main area displays a table of object properties for this device.

| Object              | Property                 | Value |     |
|---------------------|--------------------------|-------|-----|
| device:3000 (Fan10) | max-apdu-length-accepted | 1458  | ↻ ↗ |
| device:3000 (Fan10) | object-name              | Fan10 | ↻ ↗ |
| device:3000 (Fan10) | vendor-identifier        | 37    | ↻ ↗ |

**Device Sub-items**

To view the full list of a device (fan) BACnet objects, highlighting the device directly and click the Explore button that appears to the right of the highlighted device as a magnifying glass icon or double-click the highlighted device. This action will result with a list of all fan objects that are specified in the fan profile.

| Object                                 | Property           | Value                                       | Mon... |
|--|--------------------|---|--------|
| device:3000 (Fan10)                    | max-apdu-length... | 1458  | Off    |
| device:3000 (Fan10)                    | object-list        | [device 3000; notification-class 1; anal... | Off    |
| device:3000 (Fan10)                    | object-name        | Fan10                                       | Off    |
| device:3000 (Fan10)                    | vendor-identifier  | 37  | Off    |
| analog-input:3 (D009 Operating ho...   | object-name        | D009 Operating hours counter                | Off    |
| analog-input:4 (D00A Operating mi...   | object-name        | D00A Operating minutes counter              | Off    |
| analog-input:13 (D11A Maximum p...     | object-name        | D11A Maximum permissible speed              | Off    |
| analog-input:18 (DD135 Maximum...      | object-name        | DD135 Maximum permitted power               | Off    |
| analog-input:18 (D1A0 DC-link volt...  | object-name        | D1A0 DC-link voltage reference value        | Off    |
| analog-input:19 (D1A1 DC-link curr...  | object-name        | D1A1 DC-link current reference value        | Off    |
| analog-input:20 (D1A4 Date of ma...    | object-name        | D1A4 Date of manufacture                    | Off    |
| analog-input:200 (D000 Identificati... | object-name        | D000 Identification                         | Off    |
| analog-input:201 (D010 Actual spe...   | object-name        | D010 Actual speed                           | Off    |
| analog-input:202 (D011 Motor status)   | object-name        | D011 Motor status                           | Off    |
| analog-input:203 (D012 Warning)        | object-name        | D012 Warning                                | Off    |
| analog-input:204 (D013 DC-link vol...  | object-name        | D013 DC-link voltage                        | Off    |
| analog-input:205 (D014 DC-link cu...   | object-name        | D014 DC-link current                        | Off    |
| analog-input:208 (D015 Module te...    | object-name        | D015 Module temperature                     | Off    |
| analog-input:207 (D016 Motor tem...    | object-name        | D016 Motor temperature                      | Off    |
| analog-input:208 (D017 Electronic...   | object-name        | D017 Electronics temperature                | Off    |
| analog-input:209 (D01A Current se...   | object-name        | D01A Current set value                      | Off    |

**Device Objects List**

- Double-click on one of the device BACnet objects or click on Explore (magnifying glass) button to see object properties.

A full list of the object properties will appear on the right side window. If changes are expected since the last explore, simply press the Refresh button (🔄) that appears to right of the property to refresh the value.

**NOTE:** The Explorer Discovery Tree has 3 levels that correspond to the following.

- **Network number**
  - **BACnet Device ID number**
    - **Device object type and number**

The screenshot shows the BACnet Explorer interface. On the left, a tree view displays the hierarchy: network:5100 > 3000 (Fan10) > device:3000 (Fan10) > analog-input:201 (D010 Actual speed). The selected object is highlighted. On the right, a table lists the properties of this object:

| Property               | Value                                      |     |
|------------------------|--|-----|
| acked-transitions      | [to-offnormal: true; to-fault: true; to... | 🔄   |
| cov-increment          | 0  | 🔄 ✎ |
| deadband               | 0  | 🔄 ✎ |
| description            | D010 Actual speed                          | 🔄 ✎ |
| event-detection-enable | true                                       | 🔄 ✎ |
| event-enable           | [to-offnormal: true; to-fault: true; to... | 🔄   |
| event-state            | high-limit                                 | 🔄   |
| event-time-stamps      | [[date: Wed Dec 31 1969; time: 17...       | 🔄   |
| high-limit             | 0  | 🔄 ✎ |
| limit-enable           | [low-limit-enable: true; high-limit-e...   | 🔄   |
| low-limit              | 0  | 🔄 ✎ |
| notification-class     | 0  | 🔄 ✎ |
| notify-type            | alarm                                      | 🔄   |
| object-identifier      | analog-input 201                           | 🔄   |
| object-name            | D010 Actual speed                          | 🔄 ✎ |
| object-type            | analog-input                               | 🔄   |
| out-of-service         | false                                      | 🔄 ✎ |
| present-value          | 1369.8173828125                            | 🔄 ✎ |
| reliability            | no-fault-detected                          | 🔄   |
| status-flags           | [in-alarm: true; fault: false; overrid...  | 🔄   |
| time-delay             | 0  | 🔄 ✎ |
| units                  | revolutions-per-minute                     | 🔄   |

Below the table, the text "Specific object properties" is displayed.

### 7.2.1 Editing the Present Value Field

On the Modbus fan, only specific *holding registers* can be written to. The gateway profile enables writing to *holding registers* that are of *analog value* or *analog output* BACnet type. The writing can be done from the BACnet Explorer by editing BACnet property *present value*. The only recommended field to edit via BACnet Explorer is the device's *present value* field.

**NOTE: Other BACnet properties are editable (such as object name, object description, etc.); however, this is not recommended because the BACnet Explorer is a discovery tool not a Building Management System (BMS).**

To edit the present value of the specific object:

- Select desired object
- Then click the Write button ( ✎ ) on the right of the present value property to bring up the Write Property window.
- Enter the appropriate change and click the Write button.

Discover
Remove All

- analog-input:204 (D013 DC-link voltage)
- analog-input:205 (D014 DC-link current)
- analog-input:206 (D015 Module temperature)
- analog-input:208 (D017 Electronics temperature)
- analog-input:209 (D01A Current set value)
- analog-input:210 (D01B Sensor actual value)
- analog-input:211 (D01C Enable/Disable input state)
- analog-input:212 (D01D Current parameter set)
- analog-input:213 (D01E Current controller function)
- analog-input:214 (D021 Current power)
- analog-input:215 (D023 Sensor actual value 1)
- analog-input:216 (D024 Sensor actual value 2)
- analog-input:217 (D028 Current set value source)
- analog-output:2 (D000 Reset)
- analog-value:1 (D001 Set value) Q
- analog-value:5 (D101 Set value source)
- analog-value:6 (D103 Save set value)
- analog-value:7 (D105 Internal parameter set)
- analog-value:8 (D106 Control mode set 1)
- analog-value:9 (D107 Control mode set 2)
- analog-value:10 (D112 Motor stop enable set 1)
- analog-value:11 (D113 Motor stop enable set 2)
- analog-value:12 (D119 Maximum speed)
- analog-value:14 (D11F Ramp-up curve)
- analog-value:15 (D120 Ramp-down curve)
- analog-value:16 (D12E Source for controller function)

| Property               | Value                                      |  |
|------------------------|--|--|
| acked-transitions      | [to-offnormal: true; to-fault: true; to... |  |
| cov-increment          | 0  |  |
| deadband               | 0  |  |
| description            | D001 Set value                             |  |
| event-detection-enable | true                                       |  |
| event-enable           | [to-offnormal: true; to-fault: true; to... |  |
| event-state            | low-limit                                  |  |
| event-time-stamps      | [[date: Wed Dec 31 1969; time: 17...       |  |
| high-limit             | 0  |  |
| limit-enable           | [low-limit-enable: true; high-limit-e...   |  |
| low-limit              | 0  |  |
| notification-class     | 0  |  |
| notify-type            | alarm                                      |  |
| object-identifier      | analog-value 1                             |  |
| object-name            | D001 Set value                             |  |
| object-type            | analog-value                               |  |
| out-of-service         | false                                      |  |
| present-value          | 0  |  |
| priority-array         | [null; null; null; null; null; null; ...   |  |
| reliability            | no-fault-detected                          |  |
| relinquish-default     | 0  |  |
| status-flags           | [in-alarm: true; fault: false; overrid...  |  |
| time-delay             | 0  |  |
| units                  | no-units                                   |  |

Object present value editing

(Step from above: “Enter the appropriate change and click the Write button.”)

### Write Property

Relinquish Command

present-value

64000

priority

16

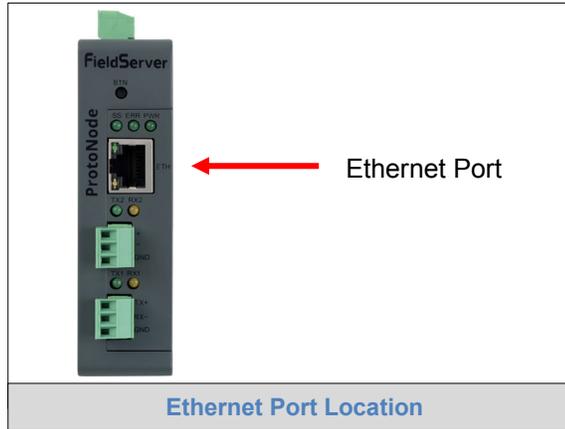
Write
Cancel

Write Property Window

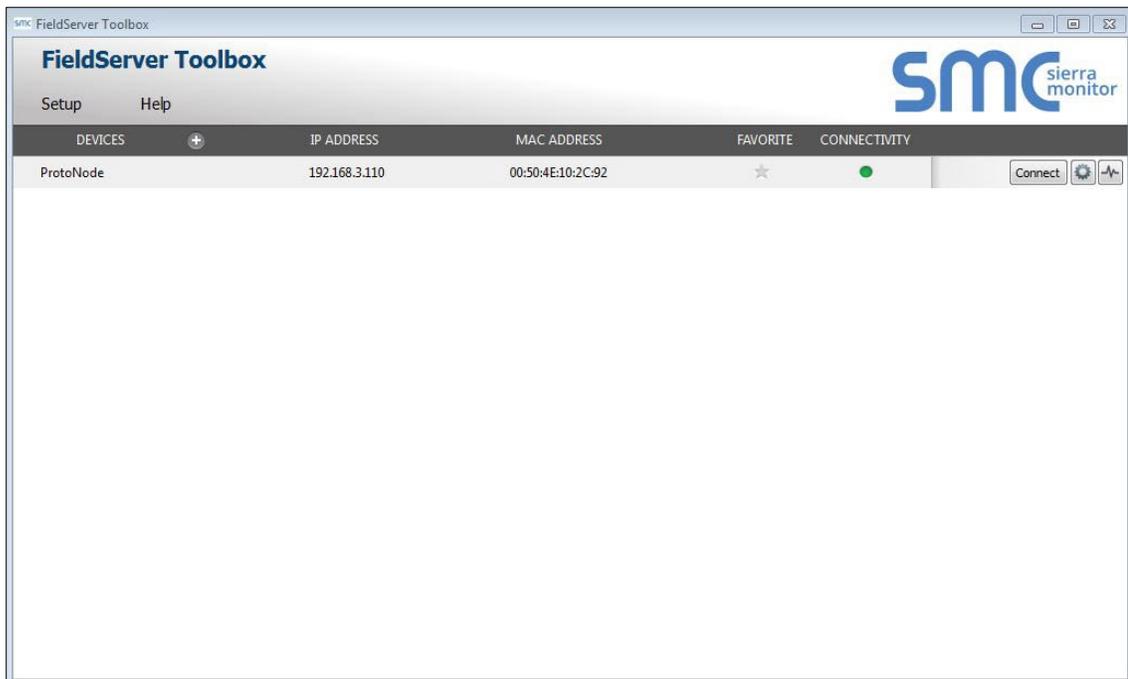
## Appendix A Troubleshooting

### Appendix A.1. Lost or Incorrect IP Address

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor website's [Software Downloads](#).
- Extract the executable file and complete the installation.



- Connect a standard CAT5 Ethernet cable between the user's PC and ProtoNode.
- Double click on the FS Toolbox Utility and click Discover Now on the splash page.
- Check for the IP Address of the desired gateway.



- If correcting the IP Address of the gateway: click the settings icon  on the same row as the gateway, then click Network Settings, change the IP Address and click Update IP Settings to save.

Appendix A.2. Viewing Diagnostic Information

- Type the IP Address of the ProtoNode into the web browser or use the FieldServer Toolbox to connect to the ProtoNode.
- Click on Diagnostics and Debugging Button, then click on View, and then on Connections.
- If there are any errors showing on the Connection page, refer to [Appendix A.3](#) for the relevant wiring and settings.

The screenshot displays the SMC Sierra Monitor web interface. On the left is a navigation menu with options like 'Modbus to BACnet EZ Gateway', 'View', and 'Connections'. The main area shows a 'Connections' table with the following data:

| Index | Name                 | Tx Msg | Rx Msg | Tx Char | Rx Char | Errors |
|-------|----------------------|--------|--------|---------|---------|--------|
| 0     | R1 - MODBUS_RTU      | 0      | 0      | 0       | 0       | 0      |
| 1     | N1 - Modbus/TCP      | 0      | 0      | 0       | 0       | 0      |
| 2     | N1 - BACnet_IP       | 2,796  | 3,920  | 0       | 15,340  | 0      |
| 3     | R2 - BACnet_MSTP     | 5,456  | 0      | 0       | 0       | 0      |
| 4     | N1 - BACnet_IP 47800 | 2,728  | 0      | 0       | 0       | 0      |

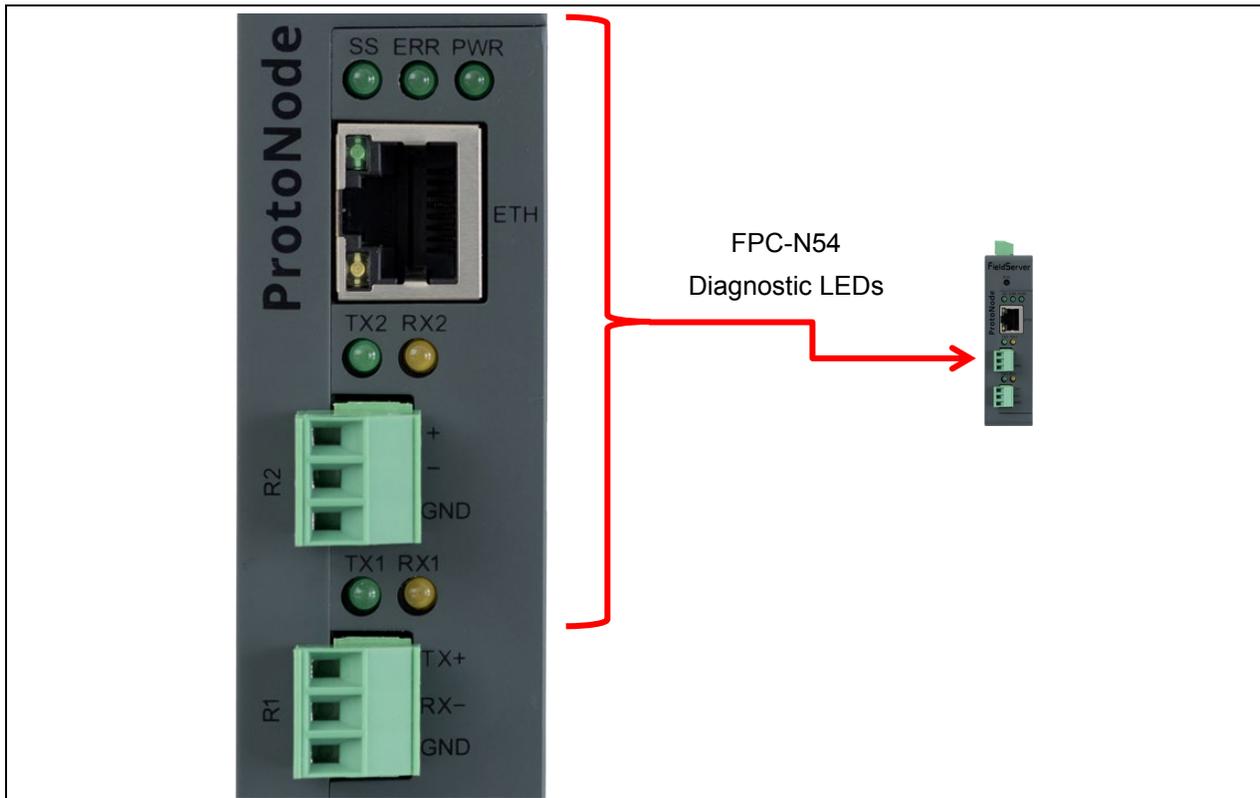
At the bottom of the interface, there are buttons for 'Home', 'HELP (F1)', 'Contact Us', and 'Reset Statistics'. The footer text reads 'Error Messages Screen'.

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

- Confirm that the network cabling is correct.
- Confirm that the computer network card is operational and correctly configured.
- Confirm that there is an Ethernet adapter installed in the PC's Device Manager List, and that it's configured to run the TCP/IP protocol.
- Check that the IP netmask of the PC matches the ProtoNode. The Default IP Address of the ProtoNode is 192.168.1.24, Subnet Mask is 255.255.255.0.
  - Go to Start|Run
  - Type in "ipconfig"
  - The account settings should be displayed
  - Ensure that the IP Address is 102.168.1.24 and the netmask 255.255.255.0
- Ensure that the PC and EZ Gateway are on the same IP Network, or assign a Static IP Address to the PC on the 192.168.1.X network.

Appendix A.4. LED Functions

See the diagram below for ProtoNode FPC-N54 LED Locations.



| Tag                    | Description   |
|------------------------|---|
| <b>SS</b>              | The SPL LED will light if the unit is not getting a response from one or more of the configured devices.  |
| <b>ERR</b>             | The SYS ERR LED will go on solid indicating there is a system error. If this occurs, immediately report the related “system error” shown in the error screen of the FS-GUI interface to support for evaluation.                 |
| <b>PWR</b>             | This is the power light and should show steady green at all times when the unit is powered.   |
| <b>TX</b>              | The TX LED will flash when a message is sent on the serial port on the 3-pin connector.<br><b>If the serial port is not used, this LED is non-operational.</b> TX1 applies to the R1 port while TX2 applies to the R2 port.     |
| <b>RX</b>              | The RX LED will flash when a message is received on the serial port on the 3-pin connector.<br><b>If the serial port is not used, this LED is non-operational.</b> RX1 applies to the R1 port while RX2 applies to the R2 port. |
| <b>Diagnostic LEDs</b> |   |

## Appendix A.5. Taking a Diagnostic Capture

There are 2 ways to take a Diagnostic Capture with the ProtoNode:

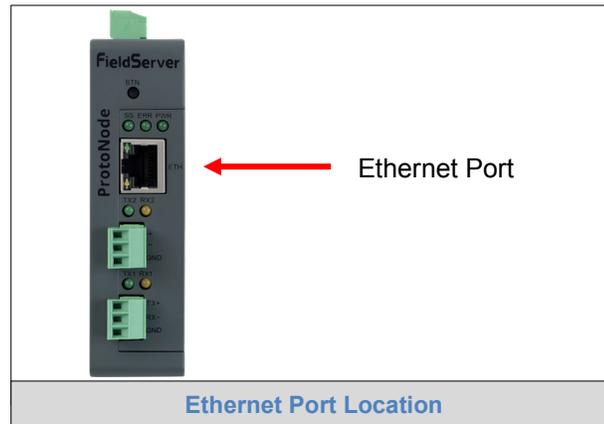
- Use the FieldServer Toolbox program on a connected PC ([Appendix A.5.1](#)).
- Use the new diagnostics feature on the FS-GUI page ([Appendix A.5.2](#)).

**NOTE: The new diagnostic feature for the FS-GUI means that downloading the FieldServer Toolbox is no longer required to take a diagnostic capture.**

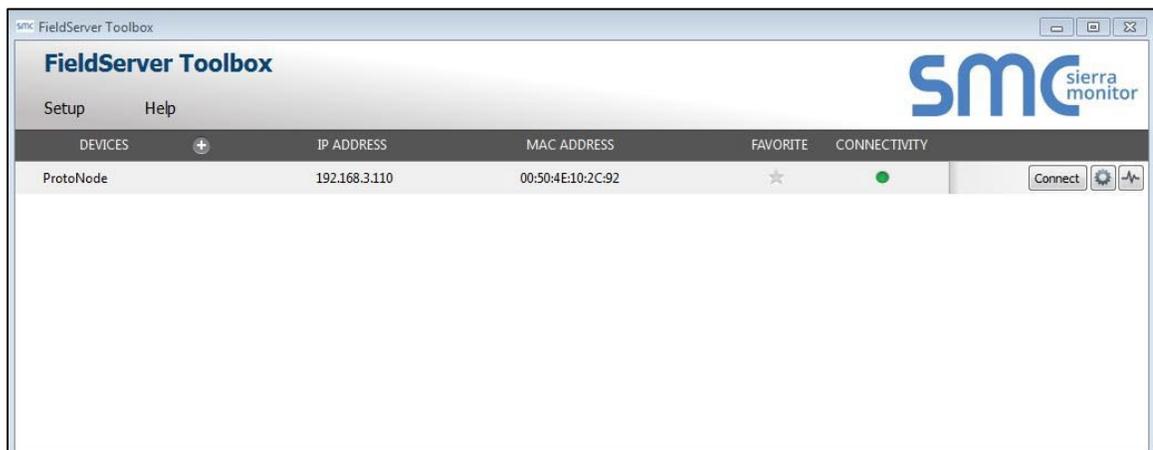
### Appendix A.5.1. Using FieldServer Toolbox

**When a problem occurs that cannot be resolved with regular troubleshooting, take a log via the FieldServer Toolbox. Send this log together with a detailed description of the problem to [support@sierramonitor.com](mailto:support@sierramonitor.com) for evaluation. The diagnostic capture assists technical support to quickly solve the problem.**

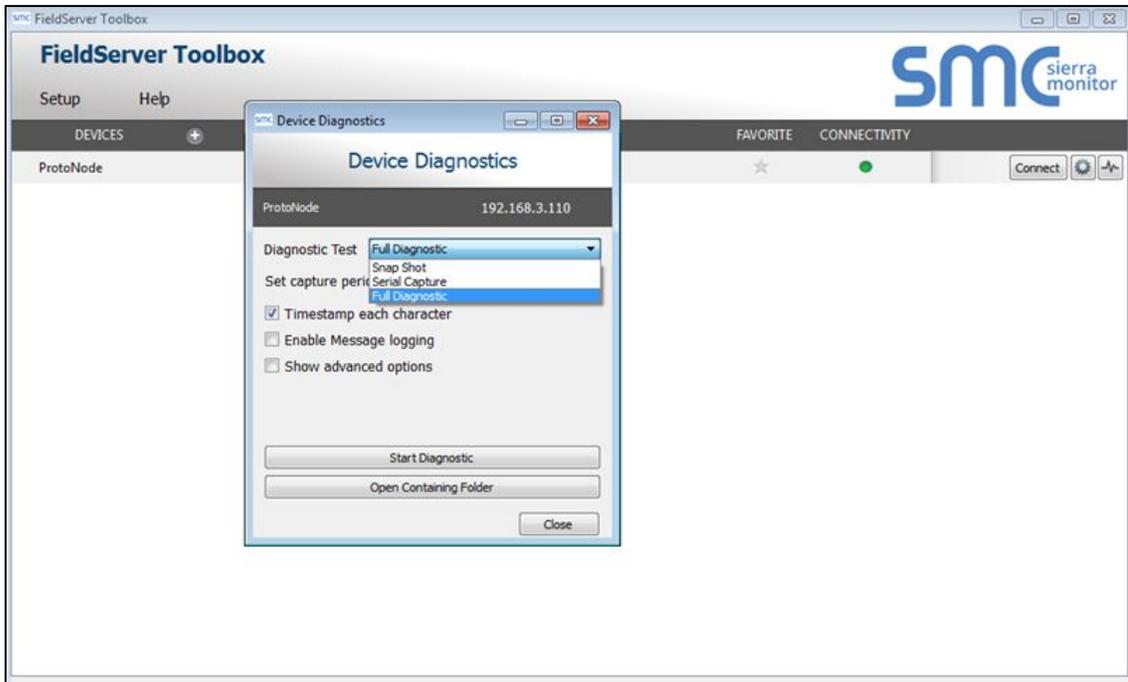
- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor [Software Downloads](#).
- Extract the executable file and complete the installation.



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

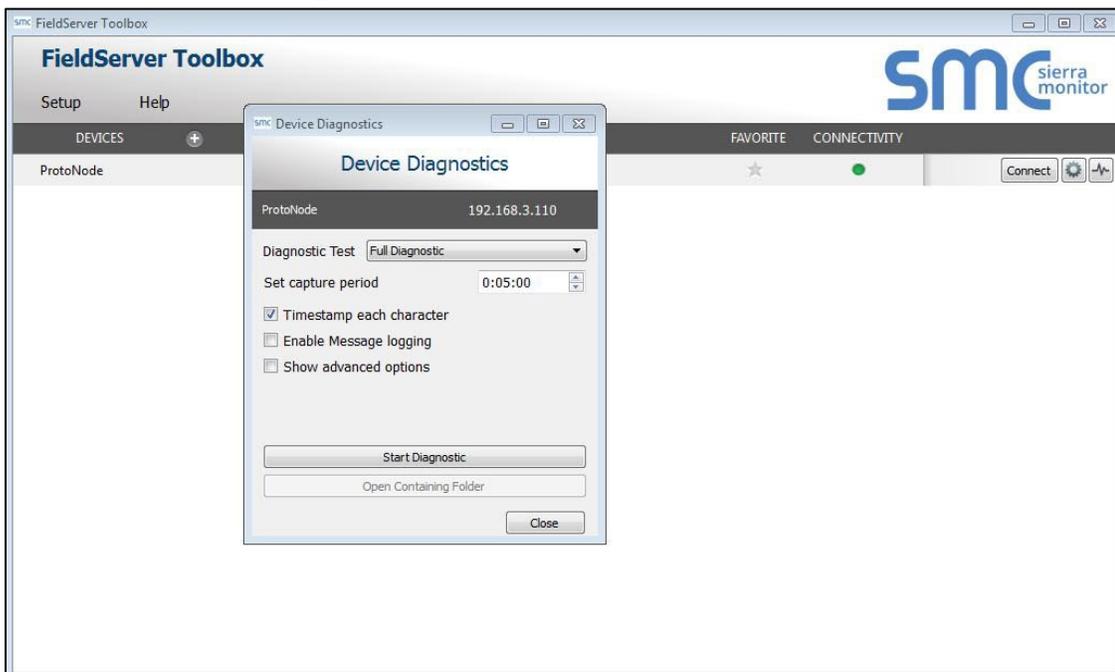


- Ensure "Full Diagnostic" is selected (this is the default)



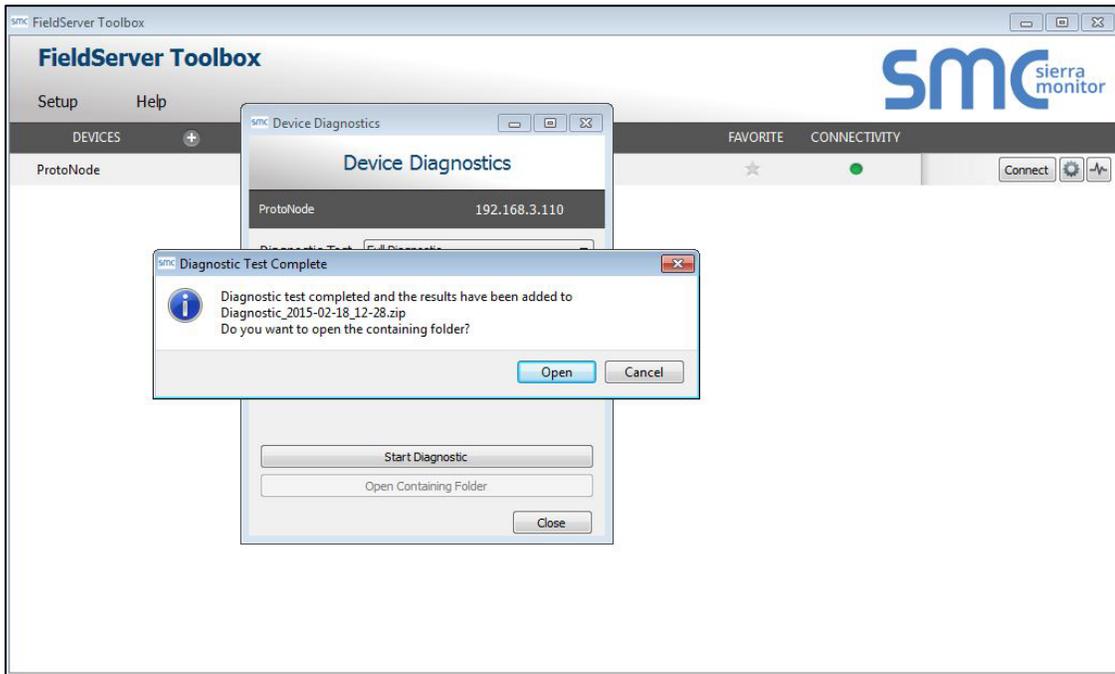
**NOTE:** If desired, the default capture period can be changed.

- Click on “Start Diagnostic”



- Wait for Capture period to finish, then the Diagnostic Test Complete window will appear

- **Step 2: Send Log**
  - Once the Diagnostic test is complete, a .zip file 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 [sales@us.ebmpapst.com](mailto:sales@us.ebmpapst.com)

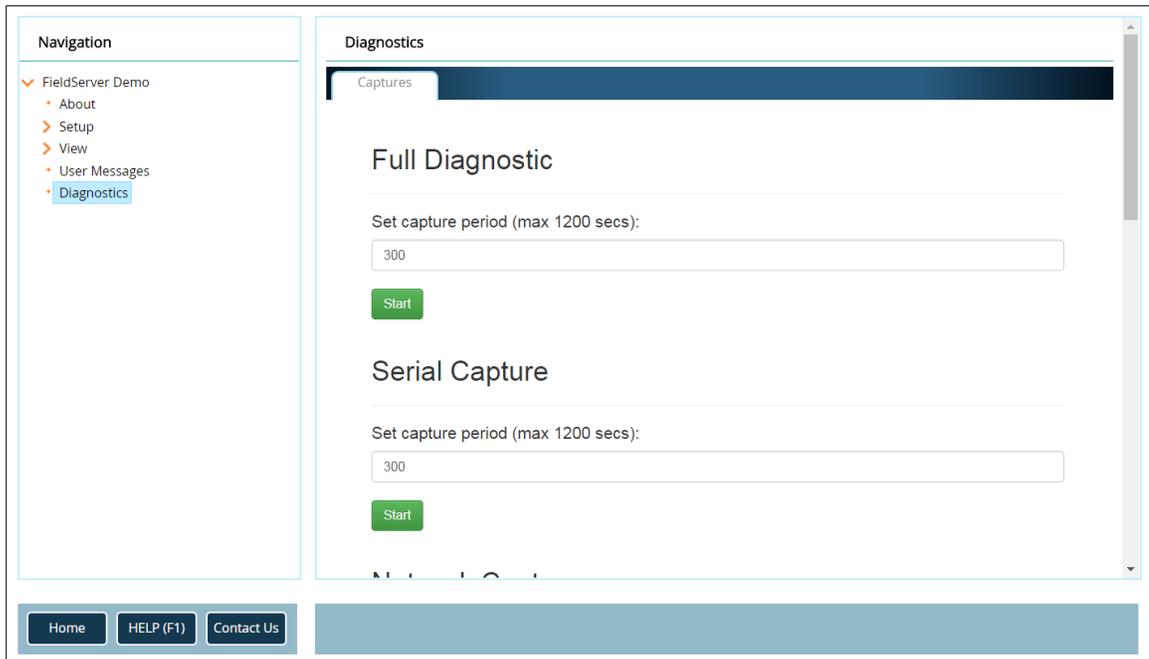
|   |                  |             |        |
|---|------------------|-------------|--------|
|  Diagnostic_2014-07-17_20-15.zip | 2014/07/17 20:16 | zip Archive | 676 KB |
|---|------------------|-------------|--------|

Appendix A.5.2. Using FS-GUI

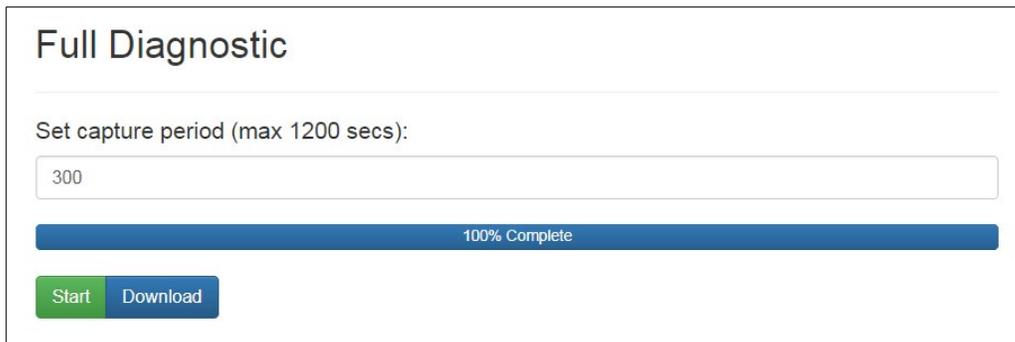
Completing a Diagnostic Capture through the FieldServer allows network connections to be captured.

Once the Diagnostic Capture is complete, email it to technical support. The Diagnostic Capture will accelerate the diagnosis of the problem.

- Open the FieldServer FS-GUI page.
- Click on Diagnostics in the Navigation panel.



- Go to Full Diagnostic and select the capture period.
- Click the Start button under the Full Diagnostic heading to start the capture.
  - When the capture period is finished, a Download button will appear next to the Start button



- Click Download for the capture to be downloaded to the local PC.
- Send the diagnostic zip file to technical support.

## Appendix A.6. Notes Regarding Subnets and Subnet Masks

RFC standards allocate the IP Address range of 192.0.0.0 through to 223.255.255.255 to be used in Class-C subnetting (Subnets listed as 255.255.255.xxx, where xxx can vary based on filtering required).

Consequently, the IP stack for this product will not allow any IP Addresses in this range to be allocated a subnet that does not fall within the Class C range.

## Appendix A.7. Update Firmware

To load a new version of the firmware, follow these instructions:

1. Extract and save the new file onto the local PC.
2. Open a web browser and type the IP Address of the FieldServer in the address bar.
  - Default IP Address is 192.168.1.24
  - Use the FS Toolbox utility if the IP Address is unknown ([Appendix A.1](#))
3. Click on the “Diagnostics & Debugging” button.
4. In the Navigation Tree on the left hand side, do the following:
  - a. Click on “Setup”
  - b. Click on “File Transfer”
  - c. Click on the “General” tab
5. In the General tab, click on “Choose Files” and select the web.img file extracted in step 1.
6. Click on the orange “Submit” button.
7. When the download is complete, click on the “System Restart” button.

## Appendix A.8. Mounting

The ProtoNode can be mounted using the DIN rail mounting bracket on the back of the unit.



## Appendix A.9. Securing ProtoNode with Passwords

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

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

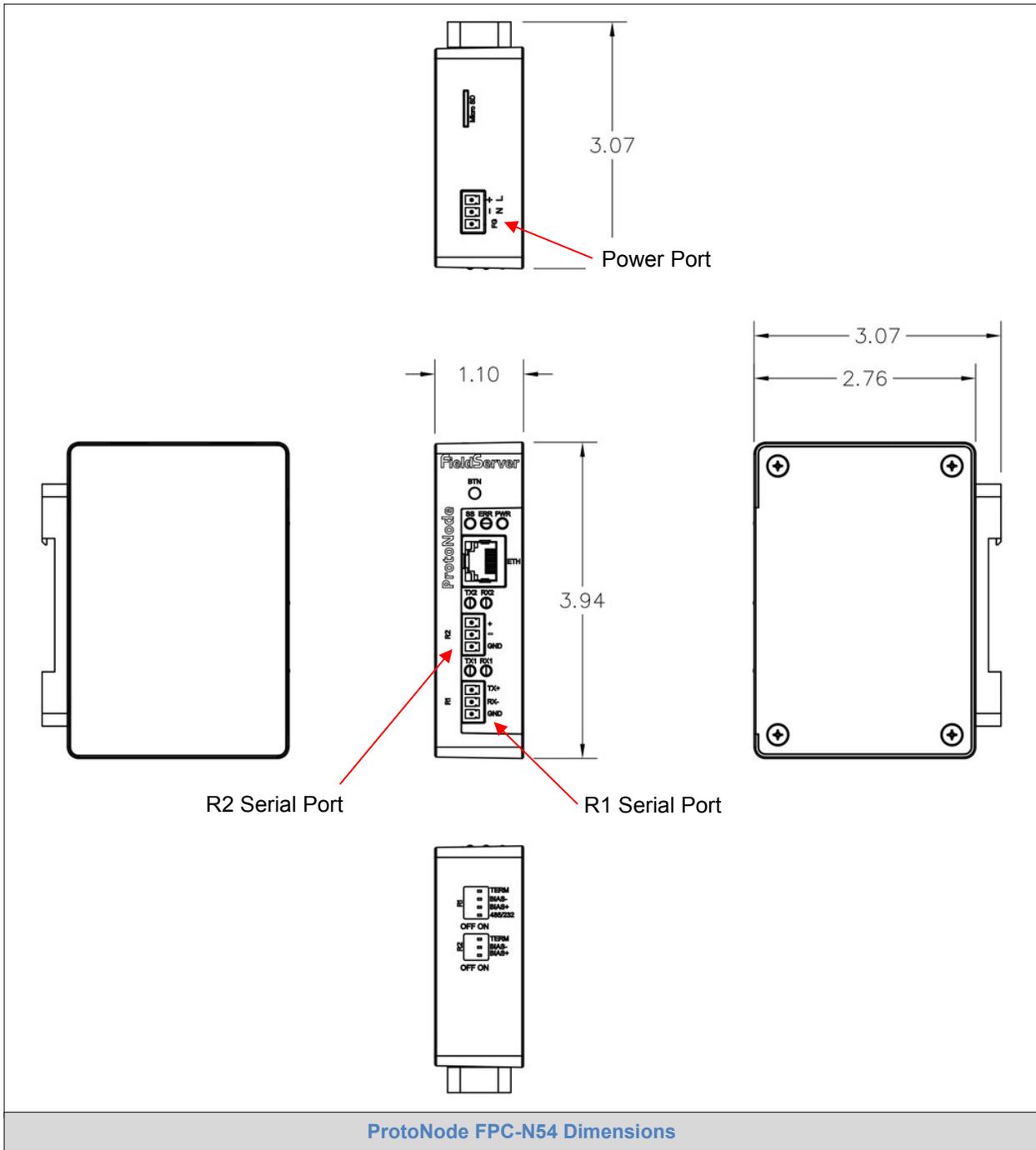
The password needs to be a minimum of eight characters and **is case sensitive**.

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

The screenshot shows the 'Passwords' configuration page in the FS-GUI. On the left is a navigation menu with 'Passwords' selected. The main area contains a 'Note' about password requirements and a form with fields for 'Account Name', 'Current Admin Password', 'New Password', and 'Confirm New Password'. 'Cancel' and 'Update Password' buttons are at the bottom of the form. A footer bar contains 'Home', 'HELP (F1)', and 'Contact Us' buttons.

The screenshot displays the 'Unauthorized' password recovery page. It includes the SMC Sierra Monitor logo, the heading 'Unauthorized', and instructions to contact support@sierramonitor.com for password recovery. A 'Password Recovery Token: zMtvwSDf4A==' is provided, along with a 'LOGIN' link and the website URL www.sierramonitor.com. The footer of the page is labeled 'Password Recovery Page'.

Appendix A.10. Physical Dimension Drawing



Appendix B Reference

Appendix B.1. Specifications



| ProtoNode FPC-N54 <sup>1</sup> |  |
|--------------------------------|--|
| <b>Electrical Connections</b>  | R1: One 3-pos terminal block: RS-485 (+ / - / GND)<br>R2: One 3-pos terminal block: RS-485 (+ / - / GND)<br>Power: One 3-pos terminal block: Power port (+ / - / FG)<br>One Ethernet 10/100 BaseT port |
| <b>Power Requirements</b>      | <i>Input Voltage:</i> 12-24VDC or 24VAC <i>Current draw:</i> @ 12V, 240 mA<br><i>Power Rating:</i> 2.5 Watts   |
| <b>Approvals</b>               | CE and FCC Class B & C Part 15, UL 60950, WEEE compliant, IC Canada, RoHS compliant, PTCRB and CTIA  |
| <b>Power Requirements</b>      | 12-24VDC or 24VAC  |
| <b>Physical Dimensions</b>     | 4 x 1.1 x 2.7 in (10.16 x 2.8 x 6.8 cm)  |
| <b>Weight</b>                  | 0.4 lbs (0.2 Kg)   |
| <b>Operating Temperature</b>   | -20°C to 70°C (-4°F to 158°F)  |
| <b>Humidity</b>                | 10-95% RH non-condensing   |
| <b>Specifications</b>          |  |

“This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.

Modifications not expressly approved by Sierra Monitor could void the user's authority to operate the equipment under FCC rules.



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

Go to [www.BACnetInternational.net](http://www.BACnetInternational.net) for more information about the BACnet Testing Laboratory. Click [here](#) for the BACnet PIC Statement.

<sup>1</sup> Specifications subject to change without notice.

## Appendix B.2. Compliance with UL Regulations

For UL compliance, the following instructions must be met when operating the 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 the ProtoNode
- Furthermore, the interconnecting power cable shall:
  - Be of length not exceeding 3.05m (118.3")
  - Be constructed of materials rated VW-1, FT-1 or better
- If the unit is to be installed in an operating environment with a temperature above 65 °C, it should be installed in a Restricted Access Area requiring a key or a special tool to gain access.
- This device must not be connected to a LAN segment with outdoor wiring.

## Appendix B.3. Address Types and Data Types for ebm-papst fans

For ebm-papst fans use only the following address and data types.

**Address Type** = Protocol Data Unit. The Application Data Unit type and The Modicon 5 Digit type are not used.

**Data Types:** Input Register and Holding Register. Discrete Inputs and Coils are not used.

For Address Type PDU:

| Data Type        | Function Code (Write) | Function Code (Read) |
|------------------|-----------------------|----------------------|
| Input Register   | N/A                   | 4                    |
| Holding Register | 16                    | 3                    |

Input and holding registers addresses start at 53248 (decimal) or D000 (hexadecimal). Both types use the same address space and are differentiated only by data type.

## Appendix B.4. Calculating Scaling Parameters

Values read from fan Modbus input registers for physical parameters such as fan speed, voltage, current and power require calculations which are described in ebm-papst fan Modbus specifications. The ProtoNode gateway can convert Modbus values to physical units via scaling. Use Excel spreadsheet “Scaling Parameters.xlsx” to calculate scaling parameters: Source Low, Source High, Target Low and Target High. As are result of scaling function integer values read by Modbus (source) are converted to real number (with fractions) BACnet object values (target).

1. Read values from listed Modbus registers and enter them in “Arguments” cells.

| Modbus registers containing arguments |             |               |                                 | Arguments  |
|---------------------------------------|-------------|---------------|---------------------------------|--|
|                                       |             |               |                                 | Enter values from Modbus registers on the left to this column. |
| Register Address                      |             | Register Type | Register Description            |  |
| decimal                               | hexadecimal |               |                                 |  |
| 53529                                 | D119        | holding       | Maximum speed                   | 1850   |
| 53664                                 | D1A0        | holding       | DC-link voltage reference value | 22500  |
| 53665                                 | D1A1        | holding       | DC-link current reference value | 2050   |

The results will appear as Source Low and High and Target Low and High values. Enter calculated results into BACnet object scaling parameters of the Modbus registers shown below.

| Modbus registers with values to be scaled |             |               |                         | Calculated scaling parameters specific to the fan to be entered into BACnet/Modbus gateway. |       |        |        |
|---|-------------|---------------|-------------------------|---|-------|--------|--------|
| Register Address                          |             | Register Type | Register Description    | Source  |       | Target |        |
| decimal                                   | hexadecimal |               |                         | Low   | High  | Low    | High   |
| 53264                                     | D010        | input         | Actual speed            | 0   | 65520 | 0      | 1894   |
| 53267                                     | D013        | input         | DC-link voltage         | 0   | 65535 | 0      | 115198 |
| 53268                                     | D014        | input         | DC-link current         | 0   | 65535 | 0      | 1050   |
| 53281                                     | D021        | input         | Current power           | 0   | 65535 | 0      | 1845.0 |
| 53557                                     | D135        | holding       | Maximum permitted power | 0   | 65535 | 0      | 1845.0 |
| 53589                                     | D155        | holding       | Maximum power           | 0   | 65535 | 0      | 1845.0 |
| 53563                                     | D13B        | holding       | Maximum winding current | 0   | 65535 | 0      | 1050   |

- Write down results for record keeping and copy them to scaling Parameters in Data Map Advanced menu.

## Appendix B.5. Reference documents

[http://www.modbus.org/docs/Modbus\\_Application\\_Protocol\\_V1\\_1b3.pdf](http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf)  
[http://www.modbus.org/docs/Modbus\\_over\\_serial\\_line\\_V1\\_02.pdf](http://www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf)

Documents provided upon request:

MODBUS parameter specification for “ebm-papst series 84/112/150/200” V5.00  
 MODBUS parameter specification for ebm-papst series 84/112/150/200 Lite V5.01 Lite  
 MODBUS parameter specification for “ebm-papst product range” V6.00  
 EC-Control Manual V3.12  
[EC-Control software](#)

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## Appendix C 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.