



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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TABLE OF CONTENTS

1	About ProtoNode Modbus-BACnet Gateway.....	4
1.1	ProtoNode FPC-54 Capabilities	4
1.2	Connectivity	4
2	Integrating Modbus fans with BACnet BMS - Overview	6
3	Setting up Modbus Fans	7
4	Installing the ProtoNode	8
4.1	Powering-up ProtoNode	8
4.2	Modbus RTU Fan Connections to ProtoNode.....	8
4.3	Bias Resistors.....	9
4.4	Termination Resistor	10
5	Connect the PC to the ProtoNode.....	11
5.1	Connecting to the ProtoNode via Ethernet.....	11
5.1.1	Enable Access Through the Local Browser	11
5.1.1.1	Changing the Subnet of the Connected PC.....	11
5.1.1.2	Changing the IP Address of the ProtoNode with FieldServer Toolbox.....	12
6	Configuring the ProtoNode	13
6.1	Accessing the ProtoNode Web Configurator GUI	14
6.1.1	Controls, Status and Log Functions	14
6.2	Setting up the Connections	15
6.3	Setting up Fan Profile	16
6.4	Importing a Device Profile	21
6.5	Assigning Profiles to Fans.....	22
6.6	Test and Commission the ProtoNode	23
7	Using the Embedded BACnet Explorer	24
7.1	Discover BACnet Device List	25
7.2	View BACnet Device Objects and Explore Object properties	26
7.2.1	Editing the Present Value Field.....	28
Appendix A	Troubleshooting.....	30
Appendix A.1.	Lost or Incorrect IP Address	30
Appendix A.2.	Viewing Diagnostic Information	31
Appendix A.3.	Check Wiring and Settings	32
Appendix A.4.	LED Functions	33
Appendix A.5.	Taking a Diagnostic Capture	34
Appendix A.5.1.	Using FieldServer Toolbox.....	34
Appendix A.5.2.	Using FS-GUI.....	37
Appendix A.6.	Notes Regarding Subnets and Subnet Masks.....	38
Appendix A.7.	Update Firmware	38
Appendix A.8.	Mounting	38
Appendix A.9.	Securing ProtoNode with Passwords	39
Appendix A.10.	Physical Dimension Drawing	40
Appendix B	Reference.....	41
Appendix B.1.	Specifications.....	41
Appendix B.2.	Compliance with UL Regulations.....	42
Appendix B.3.	Address Types and Data Types for ebm-papst fans	42
Appendix B.4.	Calculating Scaling Parameters	42
Appendix B.5.	Reference documents.....	43
Appendix C	Limited 2 Year Warranty.....	44

1 ABOUT PROTONODE MODBUS-BACNET GATEWAY

1.1 ProtoNode FPC-54 Capabilities

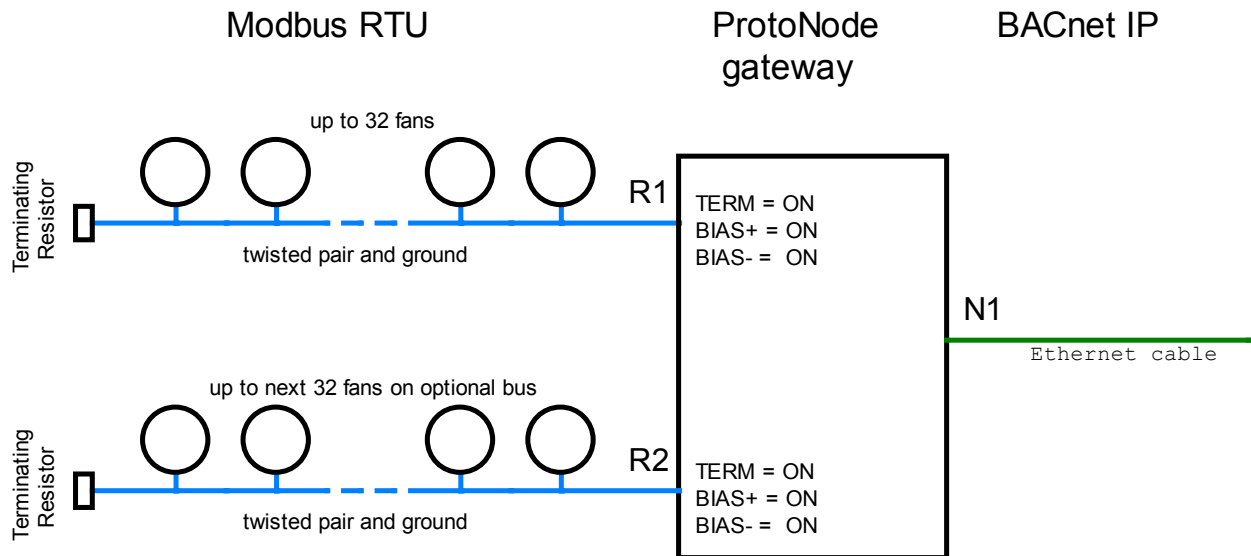
ProtoNode is a high performance, cost effective gateway providing protocol translation between ebm-papst EC Fans using Modbus RTU protocol and either BACnet IP or BACnet MSTP protocol used in building automation systems. It also can support (not described in this document) Modbus TCP and RS-232 connectivity.

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

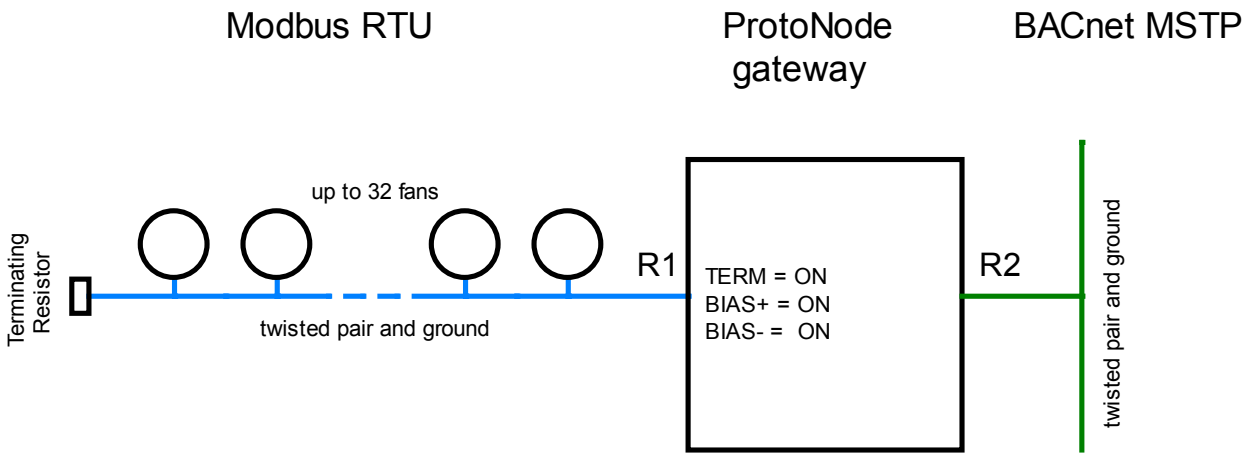
- RS-485 (designated as R1) for either ModbusRTU or BACnet MSTP
- RS-485 (designated as R2) for either ModbusRTU or BACnet MSTP
- Ethernet (designated as N1) for either BACnet IP or Modbus TCP

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

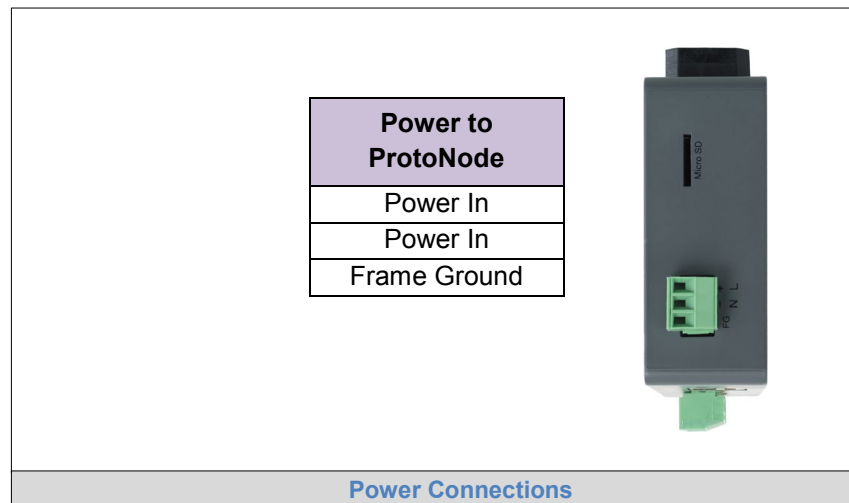
4.1 Powering-up ProtoNode

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).

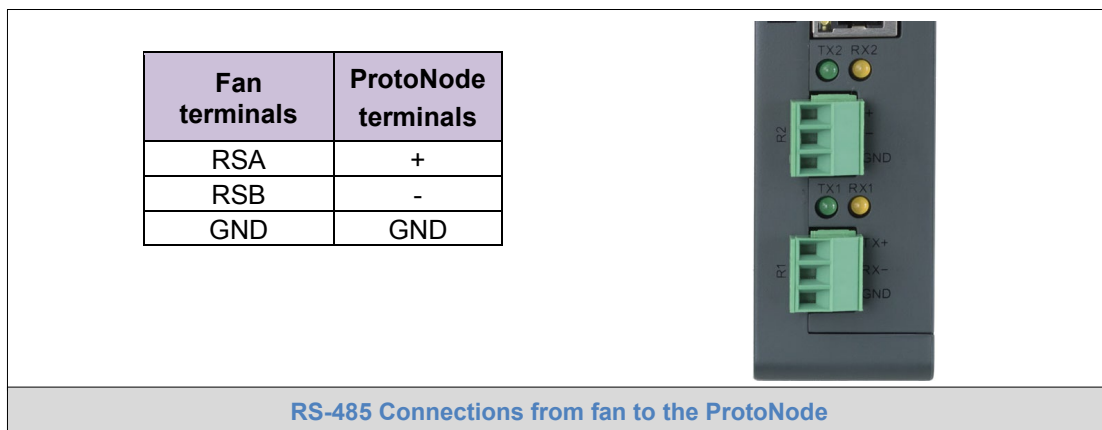


4.2 Modbus RTU Fan Connections to ProtoNode

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.

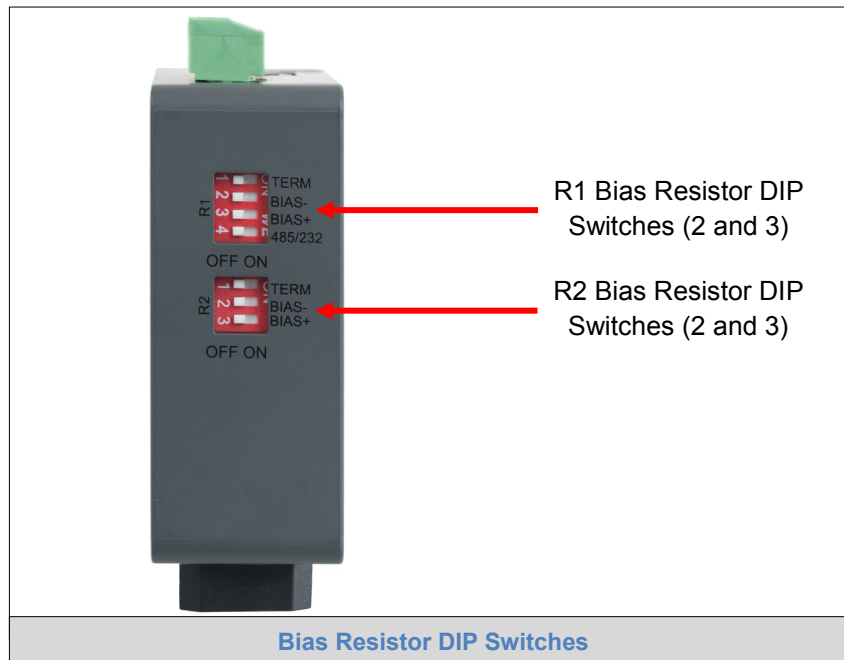
The ebm-papst Application Note following Modbus standard require that fans connected to R1 port have GND terminals connected to R1 GND terminal. Similary, fans connected to R2 port have GND terminals connected to R2 GND terminal.

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.

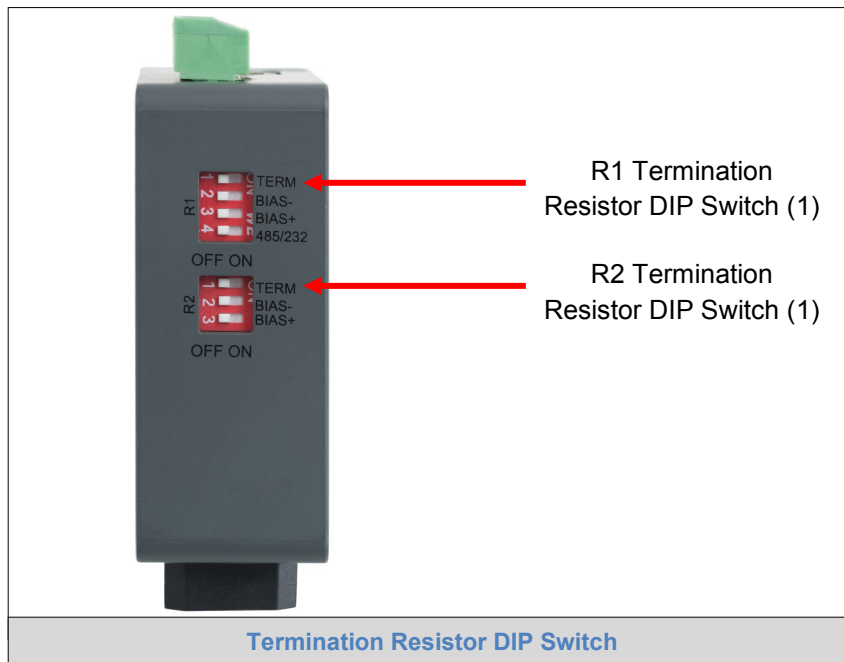
Bias resistors on BACnet MSTP

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

NOTE: See www.ni.com/support/serial/resinfo.htm 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).

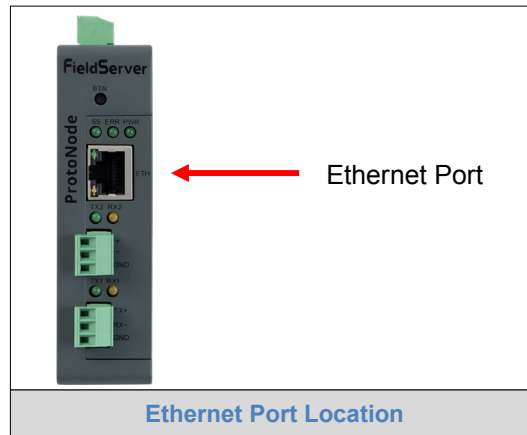
If the ProtoNode is the last device on the serial trunk, then the End-Of-Line Termination Switch needs to be turned on. **To enable the Termination Resistor, move the TERM dip switch to the right (ON state).**

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:

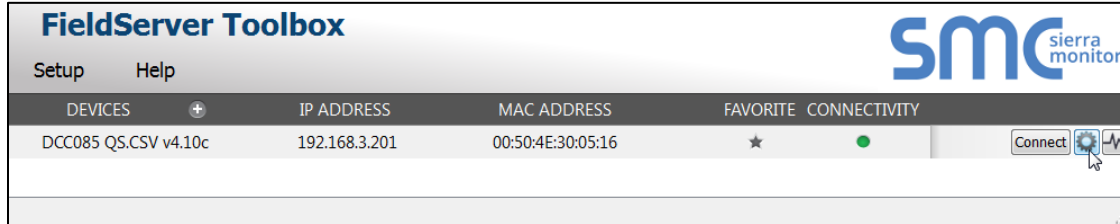
IP address:	192 . 168 . 1 . 11
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	. . .

Click OK twice.

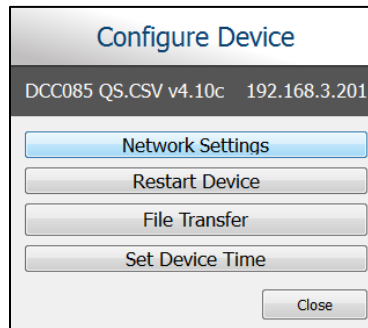
5.1.1.2 Changing the IP Address of the ProtoNode with FieldServer Toolbox

- 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.

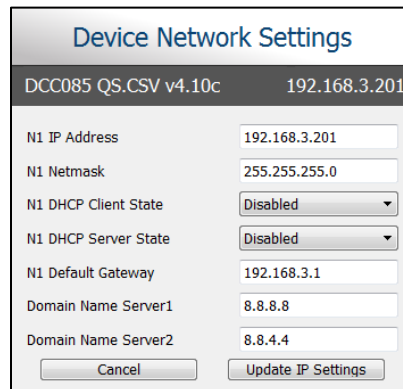
NOTE: If connectivity status is green, then the IP Address doesn't need to be changed (the ProtoNode is already on the same subnet). Skip the rest of the section and go to Section 6.



- 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.

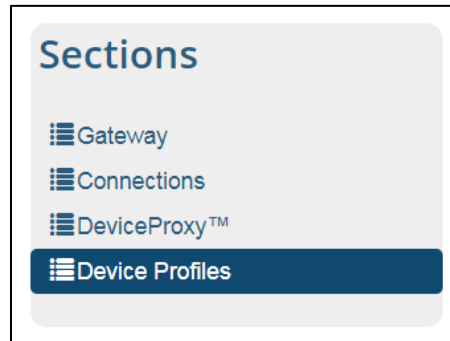
NOTE: Do not change the DHCP Server State (N1 DHCP Server State field).

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:

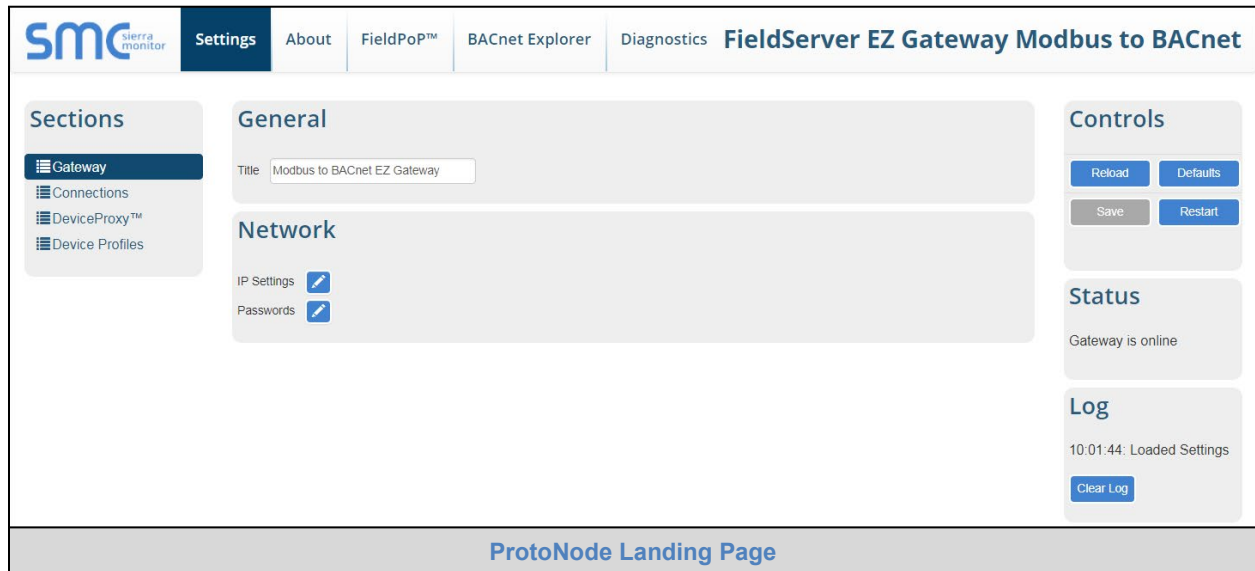


1. Use the Gateway page to name the ProtoNode and set the IP Address of the gateway on the field Ethernet network. (**Section 6.1**)
2. Use the Connections page to select device protocols, field protocol and the COM settings for each protocol. (**Section 6.2**)
3. Use the Device Profiles page to edit, 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 interface is organized into several sections:

- Left Sidebar (Sections):** Contains links for Gateway, **Connections** (active), DeviceProxy™, and Device Profiles.
- Top Navigation:** Includes 'Settings' (active), About, FieldPoP™, BACnet Explorer, Diagnostics, and the page title 'FieldServer EZ Gateway Modbus to BACnet'.
- Main Configuration Area:**
 - Modbus RTU R1:** Enabled. Port: R1, Baud Rate: 19200, Parity: Even, Data Bits: 8, Stop Bits: 1, Poll Delay: 0.1.
 - Modbus RTU R2:** Disabled. Port: R2, Baud Rate: 9600, Parity: None, 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: -, Public IP Port: -, Broadcast Distribution Table: Checked.
 - 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.
- Right Sidebar:**
 - Controls:** Reload, Defaults, Save, Restart buttons.
 - Status:** Gateway is online.
 - Log:** 17:53:00: Loaded Settings, Clear Log button.

The bottom of the page is labeled 'Connections Page'.

- 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.

The screenshot displays the 'FieldServer EZ Gateway Modbus to BACnet' web interface. The top navigation bar includes 'Settings', 'About', 'FieldPoP™', 'BACnet Explorer', and 'Diagnostics'. The left sidebar shows 'Sections' with options: Gateway, Connections, DeviceProxy™, and Device Profiles (selected). The main content area is titled 'Device Profiles' and features a list of profiles: V5_Complete, V5_Monit_Min, V5Lite_Complete, V5Lite_Monit_Min, and V6_Complete. Each profile has edit, delete, and export icons. An 'Add' button is at the bottom of the list. A pagination bar shows 'First', 'Previous', '1' (selected), '2', 'Next', and 'Last'. On the right, the 'Controls' section has 'Reload', 'Defaults', 'Save', and 'Restart' buttons. The 'Status' section indicates 'Gateway is online'. The 'Log' section shows '18:40:46: Loaded Settings' and a 'Clear Log' button. The footer of the interface reads 'Device Profiles Page'.

- 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	-		
1	202	D011 Motor status	Analog Input	-	-		
2	203	D012 Warning	Analog Input	-	-		
3	204	D013 DC-link voltage	Analog Input	volts	-		
4	205	D014 DC-link current	Analog Input	amperes	-		

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
0

Low Alarm
0

Bit Extraction

Enable
☐

Bit Offset
0

Length
1

Other

COV Increment
0

Relinquish Default
0

Predefined Scaling
None

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.

Edit Profile

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

Table Name: New_Table

State Value	State Text	State Class
1	State 1	Normal
1	State 2	Specify the state class
3	State 3	Fault

Add

First Previous 1 Next Last

Add

First Previous 1 Next Last

There are unsaved settings.

State Table Window

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

Edit Profile

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

Object Name	Object Type	Object Instance	Ack Required	Off Normal Priority	Fault Priority	Normal Priority
New_Notification	Notification Class	1	Yes	90	100	110

Add

First Previous 1 Next Last

There are unsaved settings.

Notification Class Window

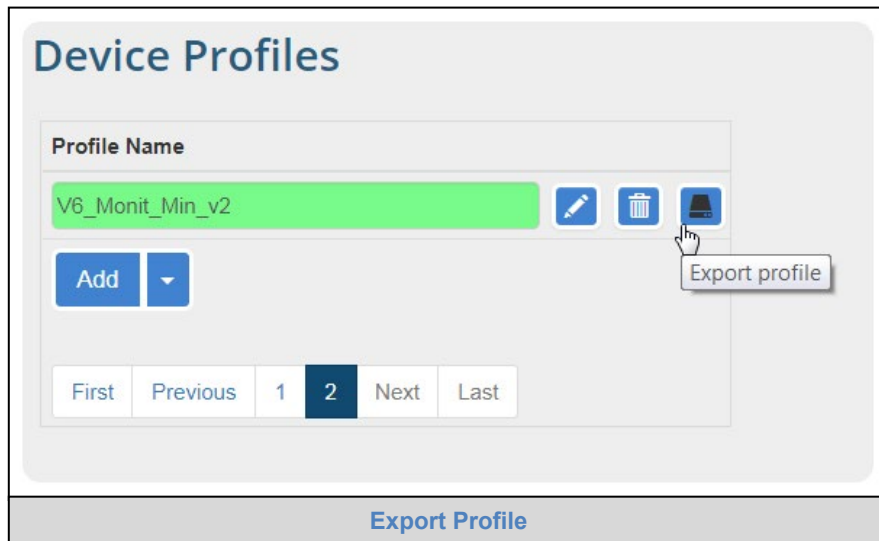
- Once all mappings and settings are changed as desired, click the “Save” button in the bottom left corner of the window to record the Profile.

Save Profile

There are unsaved settings.

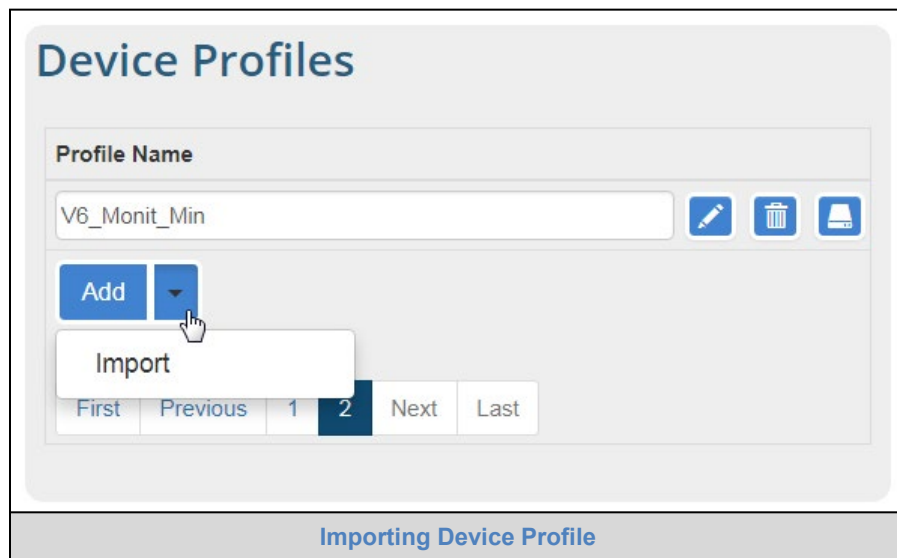
Save Button

- 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

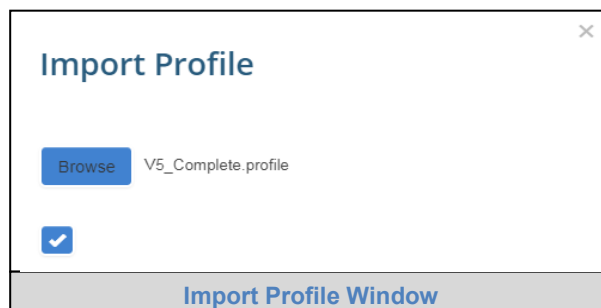


6.4 Importing a Device Profile

- 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.

DeviceProxy™

Device Profile	Modbus Connection	BACnet Connection	Modbus Node ID	Modbus Node IP Address	Modbus Node IP Port	BACnet Device Instance	BACnet Device Name	Advanced
1 V8_Monit_Min	R1 (Modbus RTU)	N1 (BACnet IP)	1		502	0	Device_1	

Buttons: Add, First, Previous, 1, Next, Last

Controls: Reset, Defaults, Save, Restart

Status: Gateway is online

Log: 10:24:51, Loaded Settings, Clear Log

DeviceProxy screen – mapping Modbus Fan into a BACnet Device

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

Advanced

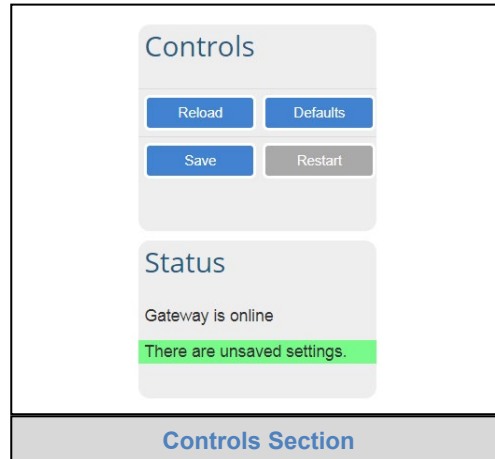
BACnet Device

Device Description: Exhaust fan 2

Device Location: West wing

☒

- 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](#).

Navigation

- Modbus to BACnet EZ Gateway
 - About
 - Setup
 - View
 - Connections**
 - R1 - MODBUS_RTU
 - N1 - Modbus/TCP
 - N1 - BACnet_IP
 - R2 - BACnet_MSTP
 - N1 - BACnet_IP 47800
 - Data Arrays
 - Nodes
 - Map Descriptors
 - User Messages
 - Diagnostics

Connections

Overview

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

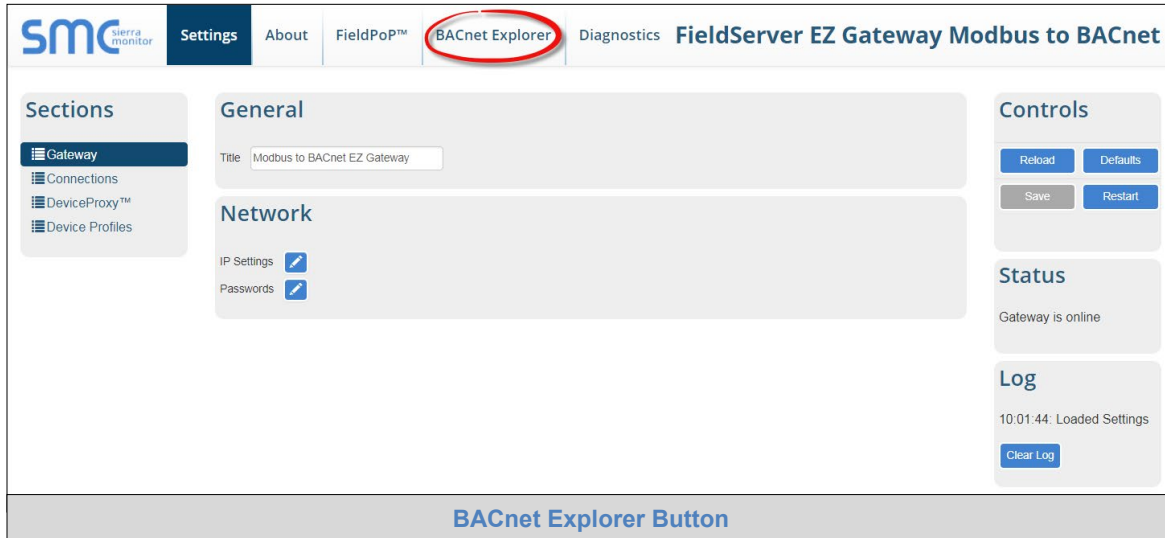
Home HELP (F1) Contact Us Reset Statistics

FS-GUI Connections Screen

7 USING THE EMBEDDED BACNET EXPLORER

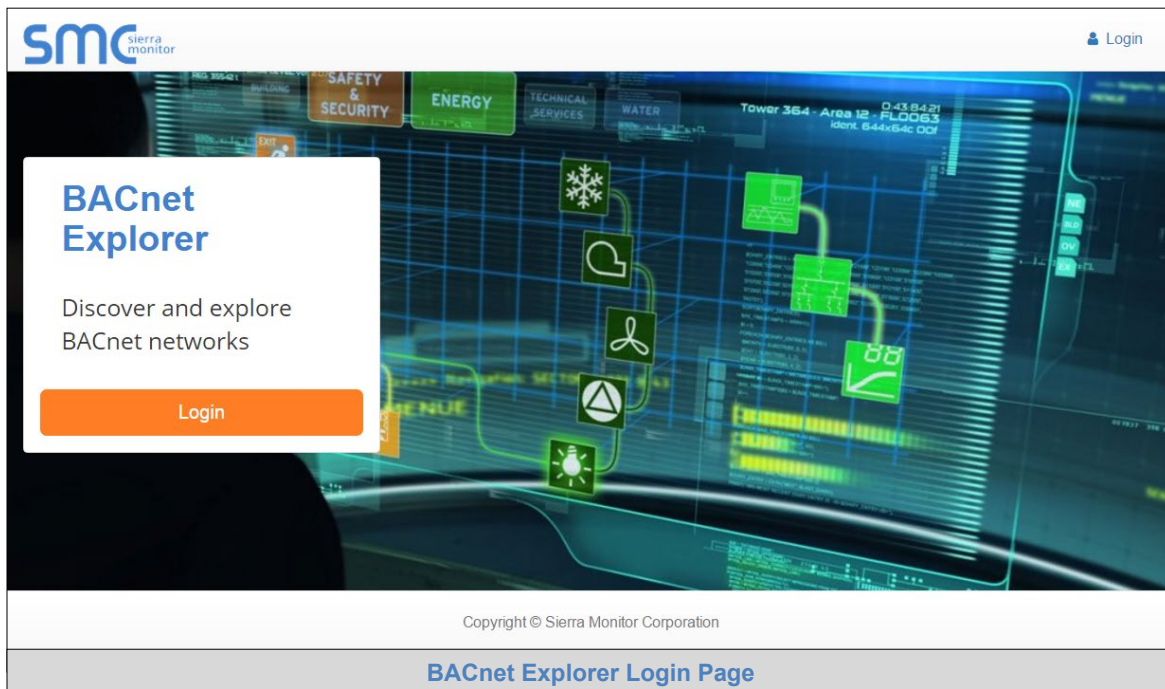
The Embedded BACnet Explorer allows installers to validate their equipment is working on BACnet without having to ask the BMS integrator to test the unit.

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



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

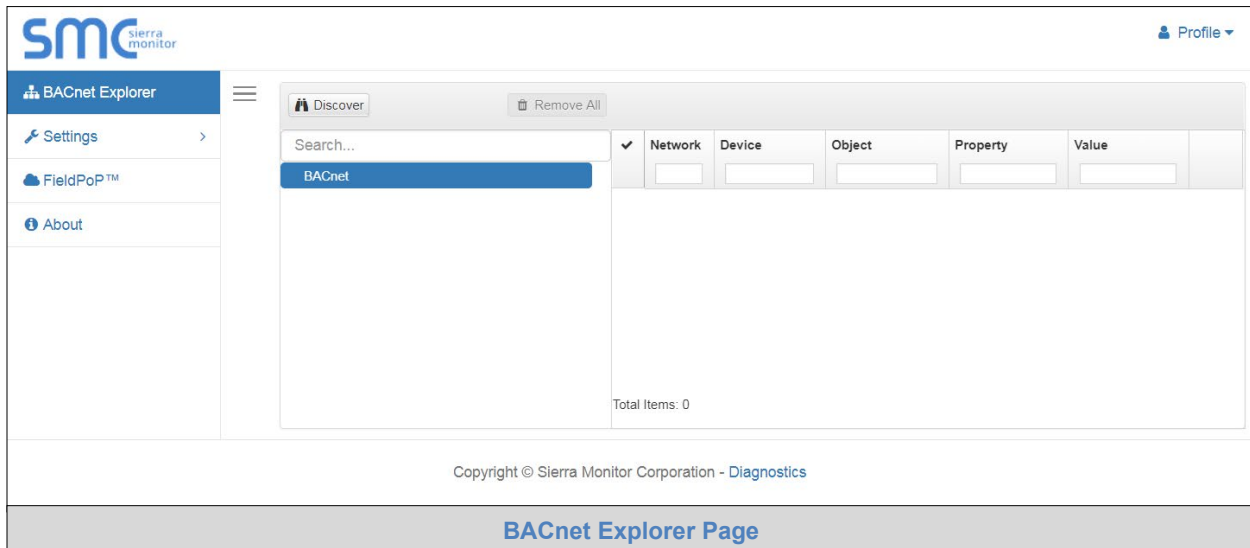
NOTE: The default user name is “admin” and default password is “admin”.




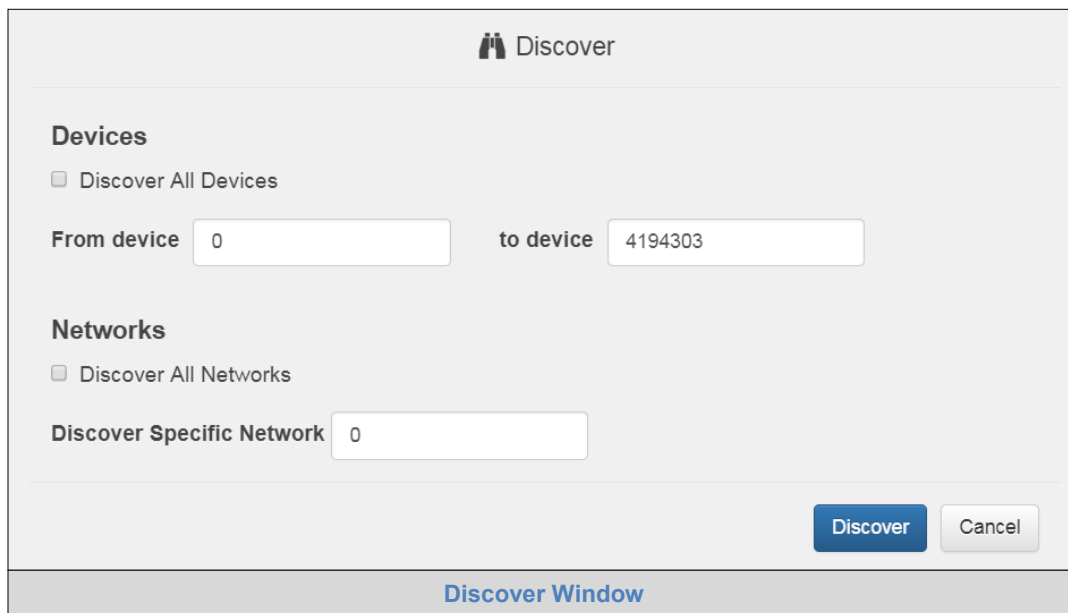
NOTE: For BACnet/IP, click on the Settings button on the BACnet Explorer Page to ensure the ProtoNode is on the BACnet/IP network subnet or to configure BBMD.

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.



- 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.



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.

Discover					
Remove All					
Search...	Network...	Device	Object	Property	Value
BACnet					
network:1101					
+ 0	1101	2001 (EC_Fan 5)	device:2001 (EC_Fan 5)	object-name	EC_Fan 5
+ 2001 (EC_Fan 5)	1101	2001 (EC_Fan 5)	device:2001 (EC_Fan 5)	vendor-identifier	37
+ 2002 (EC_Fan 6)	1101	2002 (EC_Fan 6)	device:2002 (EC_Fan 6)	max-apdu-length-accepted	1458
+ 2003 (EC_Fan 7)	1101	2002 (EC_Fan 6)	device:2002 (EC_Fan 6)	object-name	EC_Fan 6
+ 2004 (EC_Fan 8)	1101	2002 (EC_Fan 6)	device:2002 (EC_Fan 6)	vendor-identifier	37
+ 3000	1101	2003 (EC_Fan 7)	device:2003 (EC_Fan 7)	max-apdu-length-accepted	1458
network:1103					
+ 1001 (EC Fan 1)	1101	2003 (EC_Fan 7)	device:2003 (EC_Fan 7)	object-name	EC_Fan 7
+ 1002 (EC Fan 2)	1101	2003 (EC_Fan 7)	device:2003 (EC_Fan 7)	vendor-identifier	37
+ 1003 (EC Fan 3)	1101	2004 (EC_Fan 8)	device:2004 (EC_Fan 8)	max-apdu-length-accepted	1458
+ 1004 (EC Fan 4)	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
Total Items: 28					
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.

Discover			
Remove All			
Search...	Object	Property	Value
BACnet			
network:1100			
+ 1	device:3000 (Fan10)	max-apdu-length-accepted	1458
network:2101			
+ 2001	device:3000 (Fan10)	object-name	Fan10
+ 2002	device:3000 (Fan10)	vendor-identifier	37
+ 2003			
+ 2004			
network:2103			
+ 1001			
+ 1002			
+ 1003			
+ 1004			
network:3101			
+ 3000 (Fan10)			
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:16 (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	

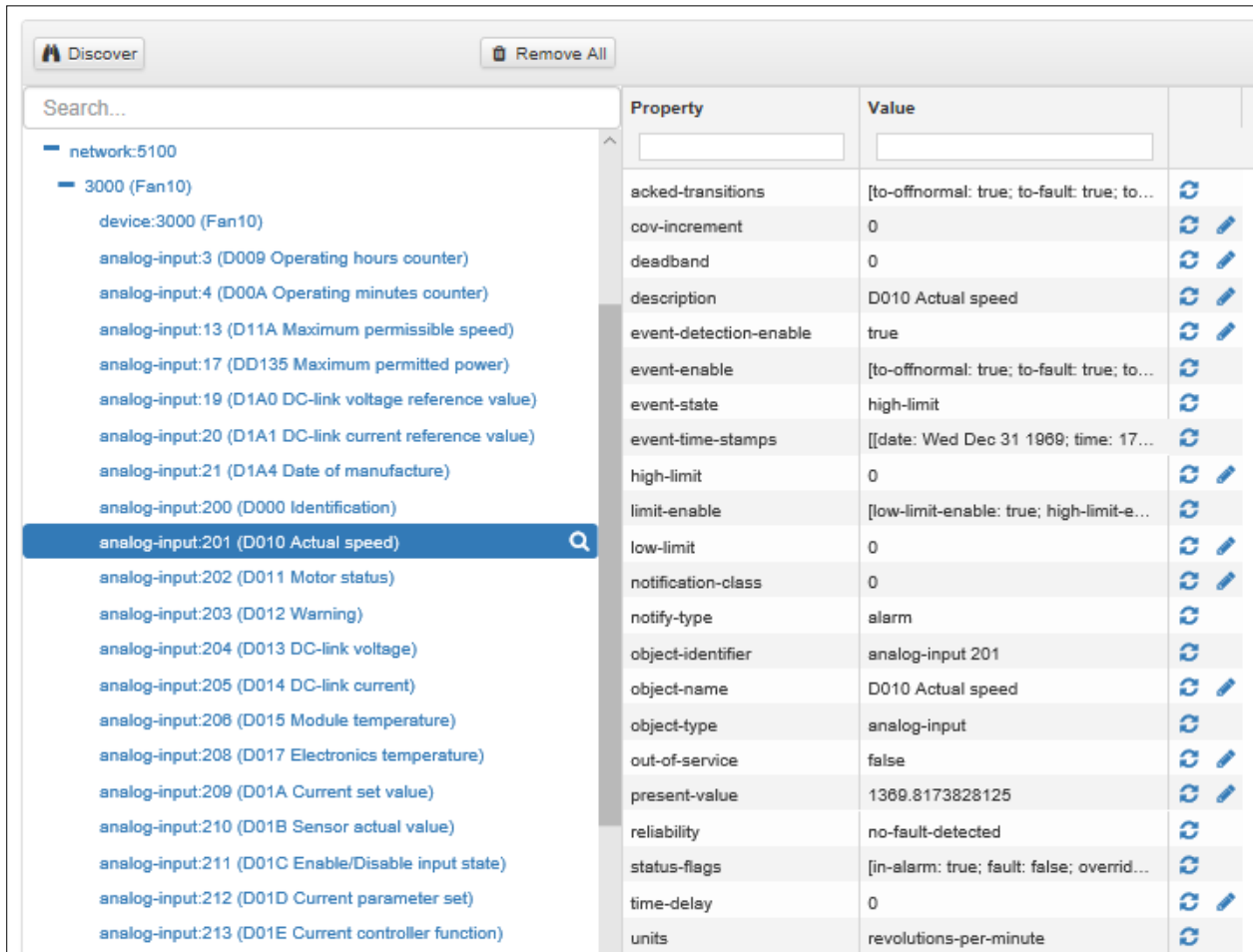
Device Objects List

- 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**



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	


Specific object properties

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

Search...

- 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)**
- 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; 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

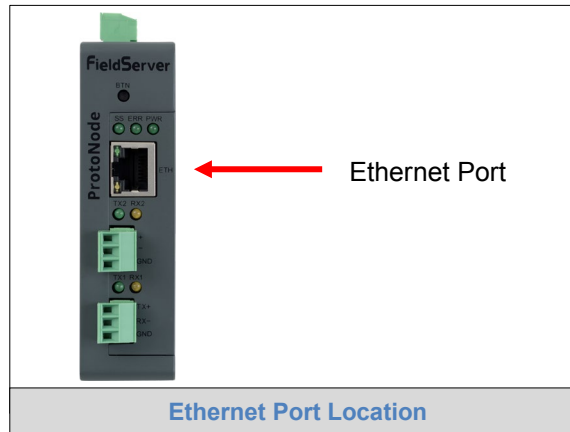
Write Cancel

Write Property Window

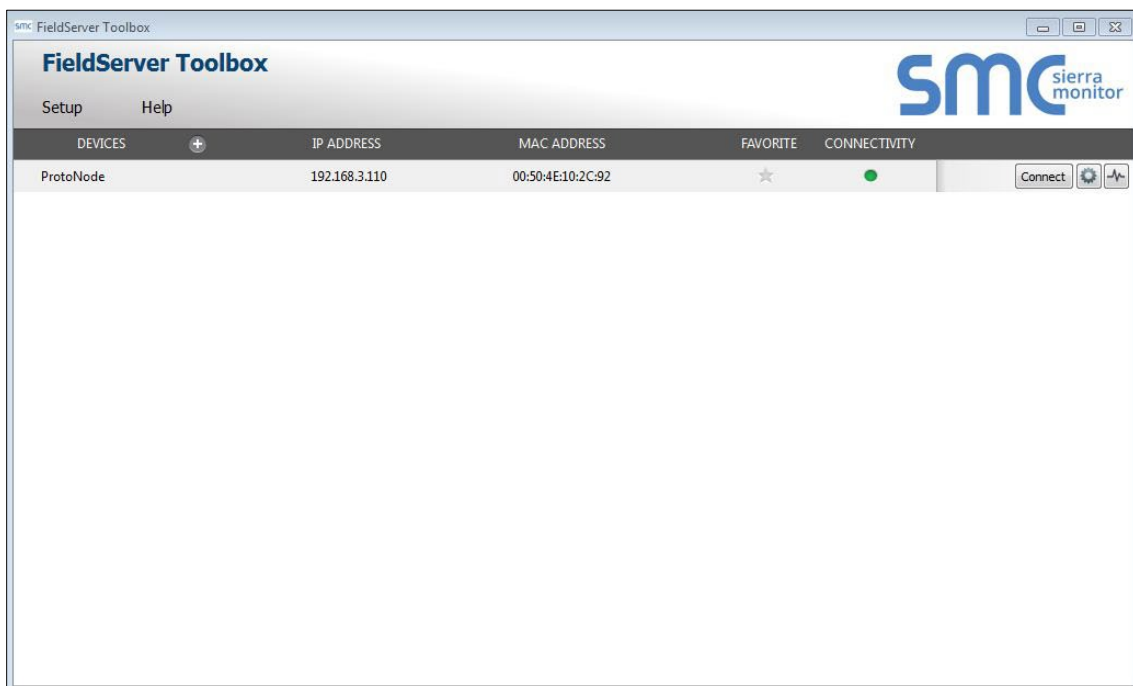
Appendix A Troubleshooting


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.



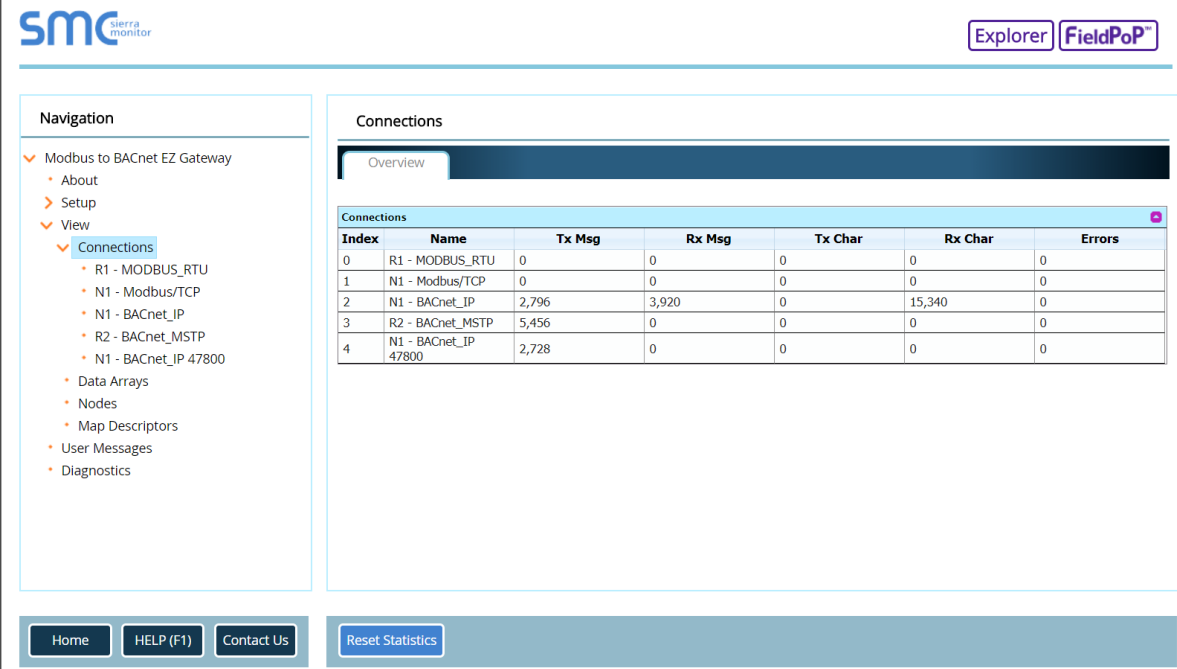
- Connect a standard CAT5 Ethernet cable between the user's PC and ProtoNode.
- Double click on the FS Toolbox Utility and click Discover Now on the splash page.
- Check for the IP Address of the desired gateway.



- 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', 'About', 'Setup', 'View', 'Connections', 'R1 - MODBUS_RTU', 'N1 - Modbus/TCP', 'N1 - BACnet_IP', 'R2 - BACnet_MSTP', 'N1 - BACnet_IP 47800', 'Data Arrays', 'Nodes', 'Map Descriptors', 'User Messages', and 'Diagnostics'. The 'Connections' section is active, showing a table of connections. The table has columns for Index, Name, Tx Msg, Rx Msg, Tx Char, Rx Char, and Errors. The data shows four connections: R1 - MODBUS_RTU, N1 - Modbus/TCP, N1 - BACnet_IP, and R2 - BACnet_MSTP. The bottom of the interface features buttons for Home, HELP (F1), Contact Us, and Reset Statistics, and a footer labeled 'Error Messages Screen'.

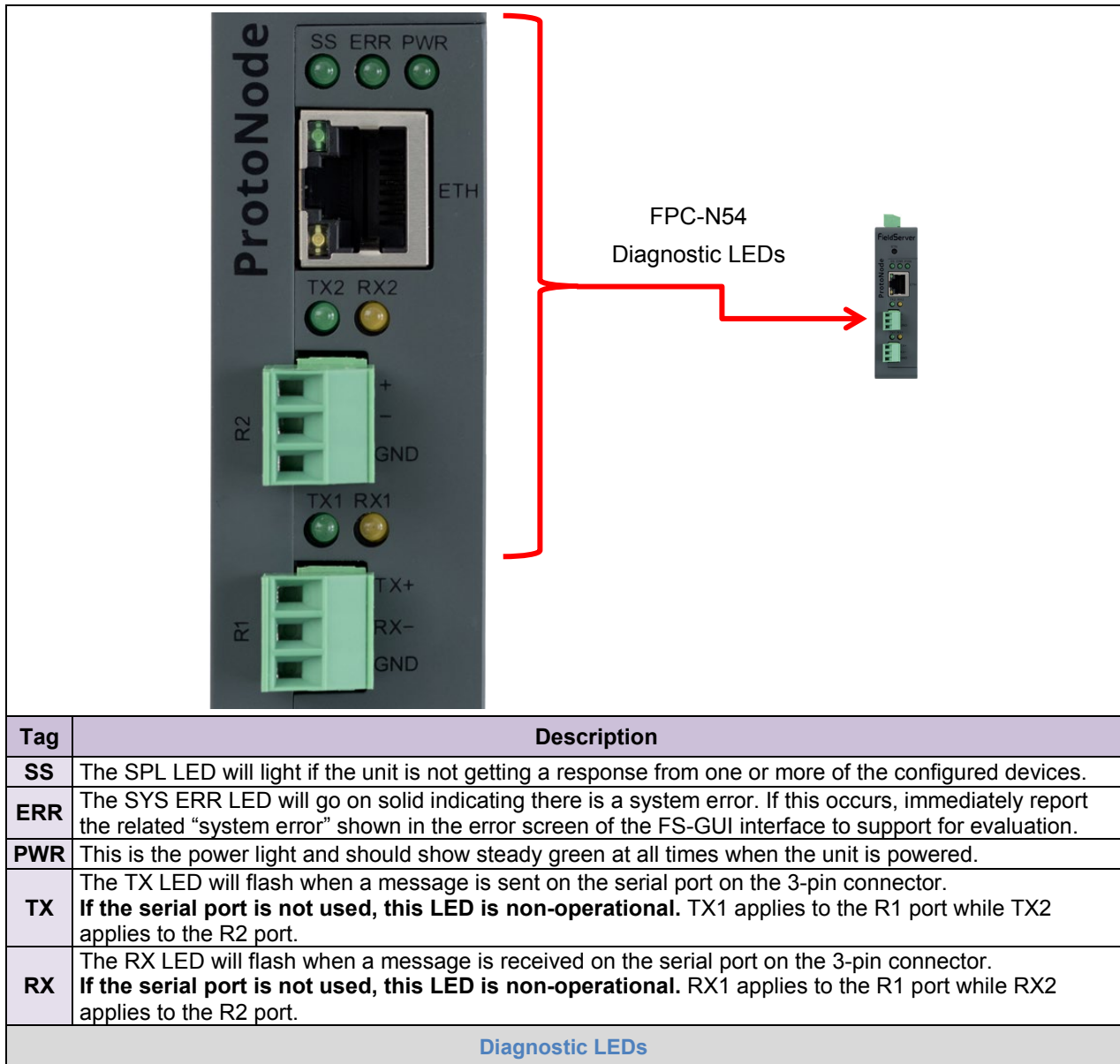
Index	Name	Tx Msg	Rx Msg	Tx Char	Rx Char	Errors
0	R1 - MODBUS_RTU	0	0	0	0	0
1	N1 - Modbus/TCP	0	0	0	0	0
2	N1 - BACnet_IP	2,796	3,920	0	15,340	0
3	R2 - BACnet_MSTP	5,456	0	0	0	0
4	N1 - BACnet_IP 47800	2,728	0	0	0	0

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.



Appendix A.5. Taking a Diagnostic Capture

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

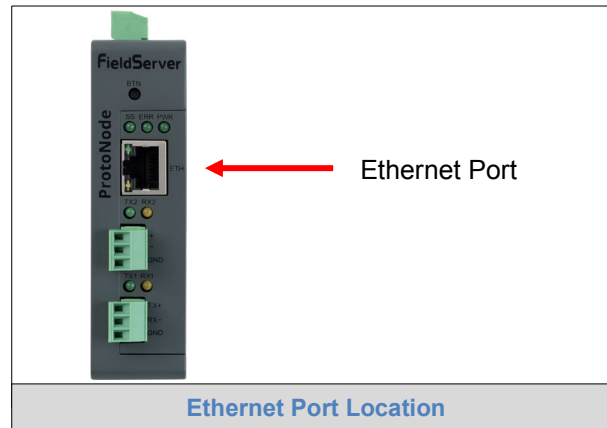
- Use the FieldServer Toolbox program on a connected PC ([Appendix A.5.1](#)).
- Use the new diagnostics feature on the FS-GUI page ([Appendix A.5.2](#)).


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

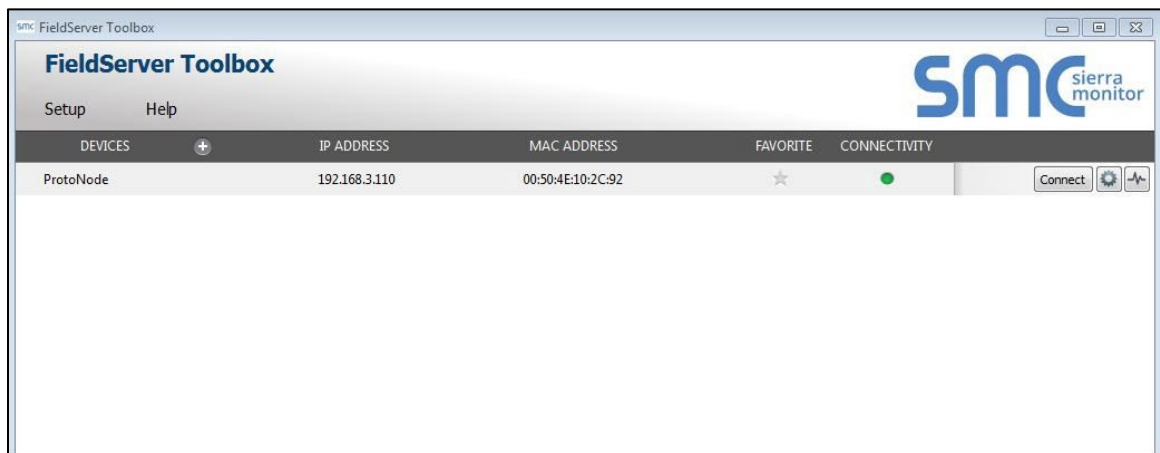
Appendix A.5.1. Using FieldServer Toolbox

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 for evaluation. The diagnostic capture assists technical support to quickly solve the problem.

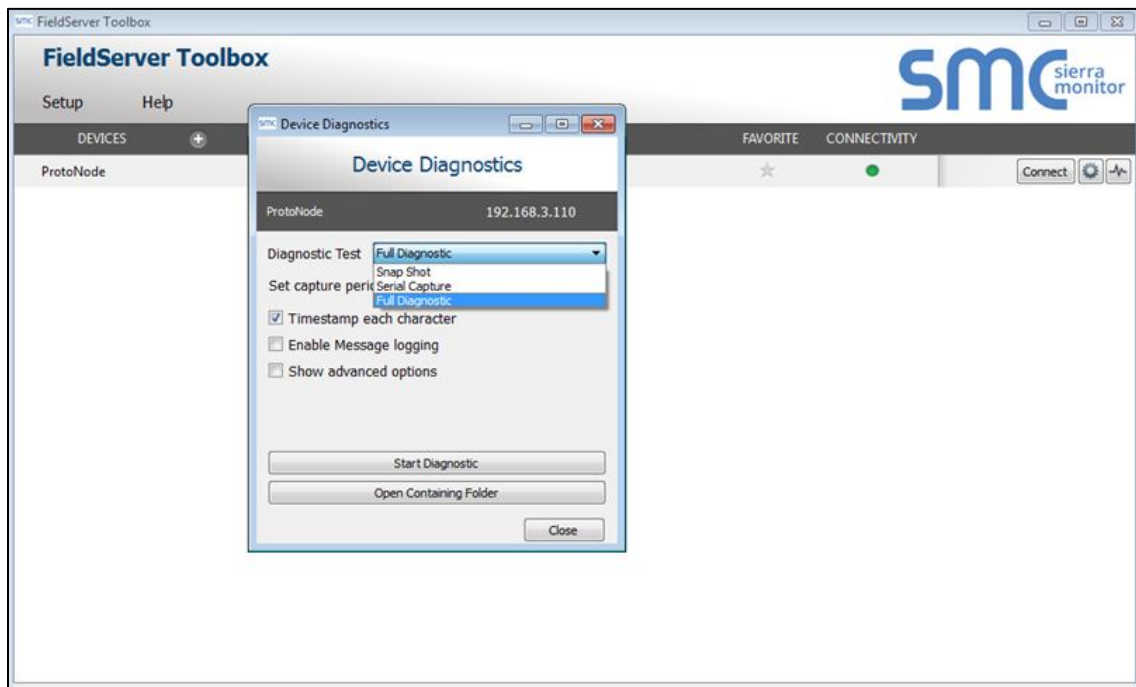
- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor [Software Downloads](#).
- Extract the executable file and complete the installation.



- 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

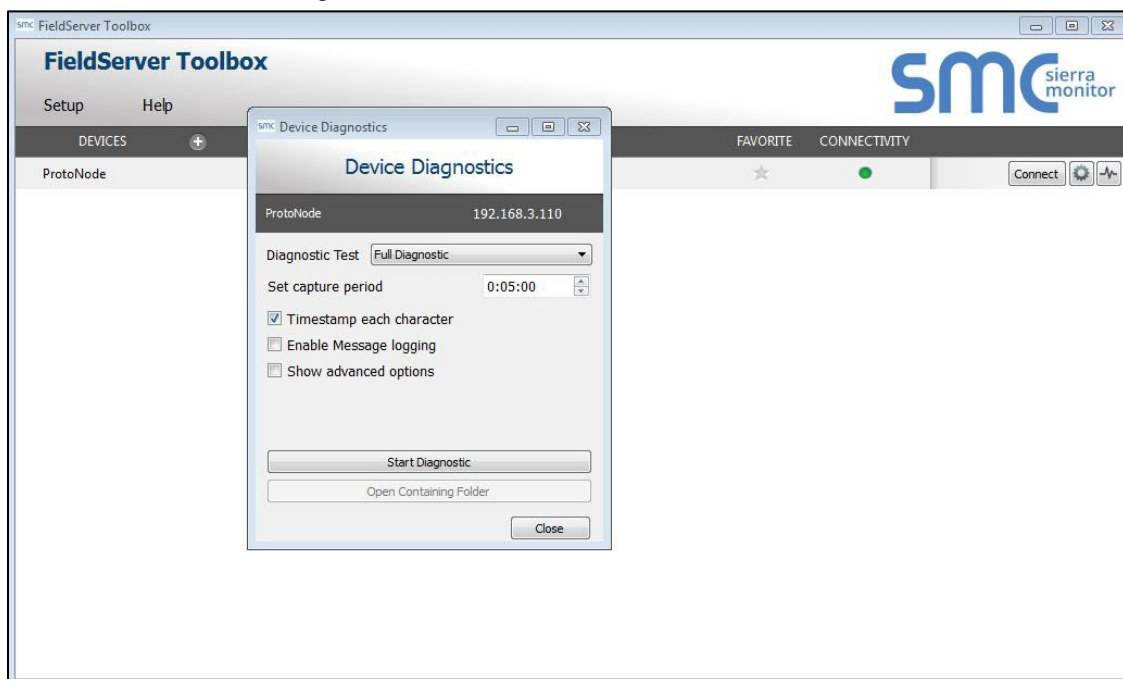


- Ensure "Full Diagnostic" is selected (this is the default)



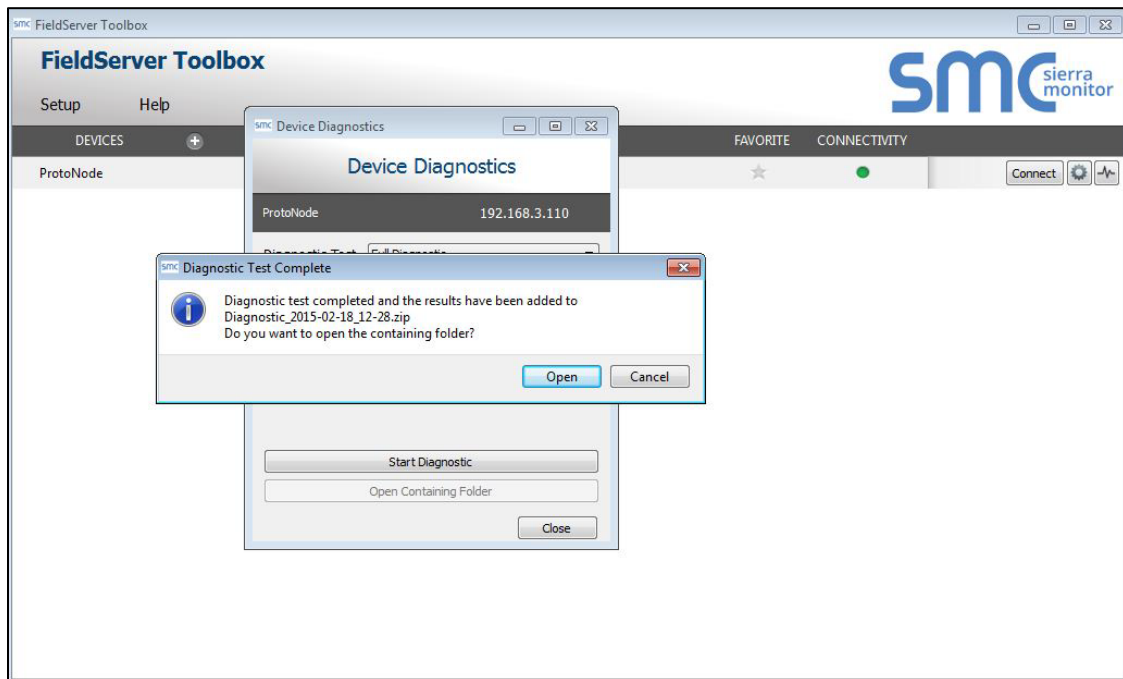
NOTE: If desired, the default capture period can be changed.

- 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

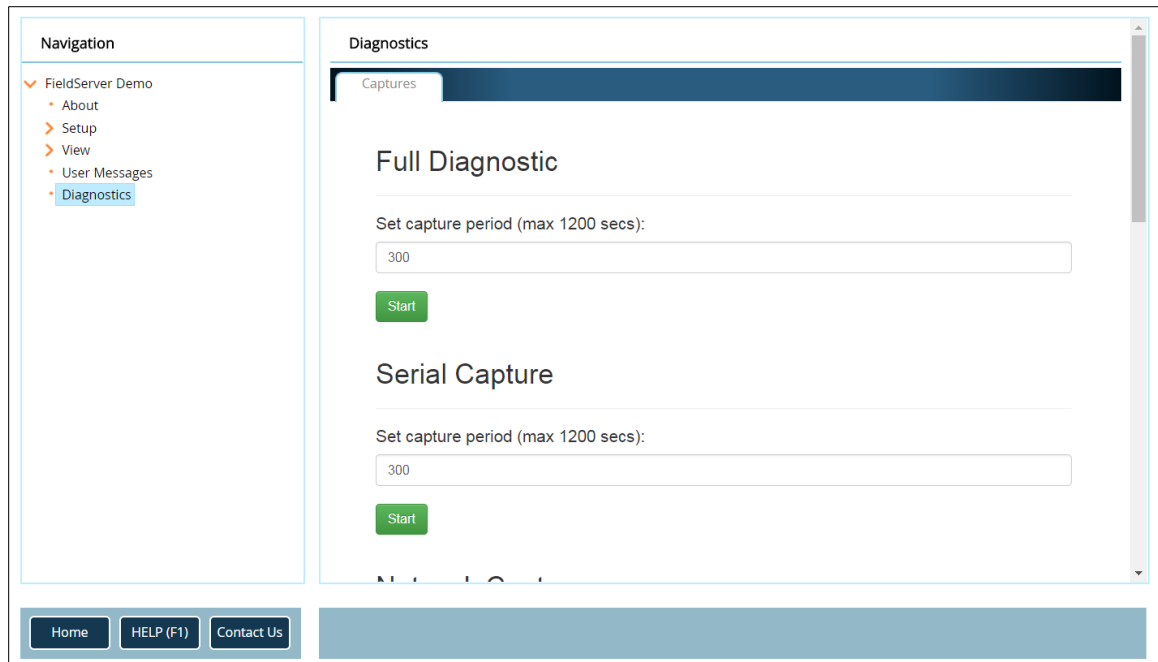
 Diagnostic_2014-07-17_20-15.zip	2014/07/17 20:16	zip Archive	676 KB
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Appendix A.5.2. Using FS-GUI

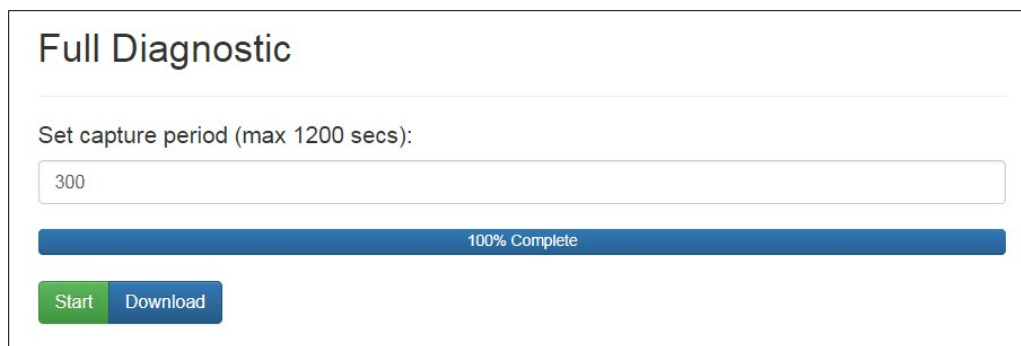
Completing a Diagnostic Capture through the FieldServer allows network connections to be captured.

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.

Navigation

- ✓ ProtoNode Demo
 - About
- ✓ Setup
 - File Transfer
 - Network Settings
 - **Passwords**
 - Time Settings
- > View
 - User Messages

Passwords

Overview

Note

The current Admin password (if set) is required to change all passwords. To disable password protection, set an empty Admin password. IMPORTANT: You may be required to log in again after changing a password.

Account Name: Admin ▼

Current Admin Password:

New Password:

Confirm New Password:

Cancel Update Password

Home HELP (F1) Contact Us

FS-GUI Passwords Page

SMC sierra monitor

Unauthorized

If you are the authorized administrator of this device and need to recover password access, you may contact support@sierramonitor.com and send them the Password Recovery Token shown below.

You will be given a recovery password to enable you to log in as Admin and create a new password.

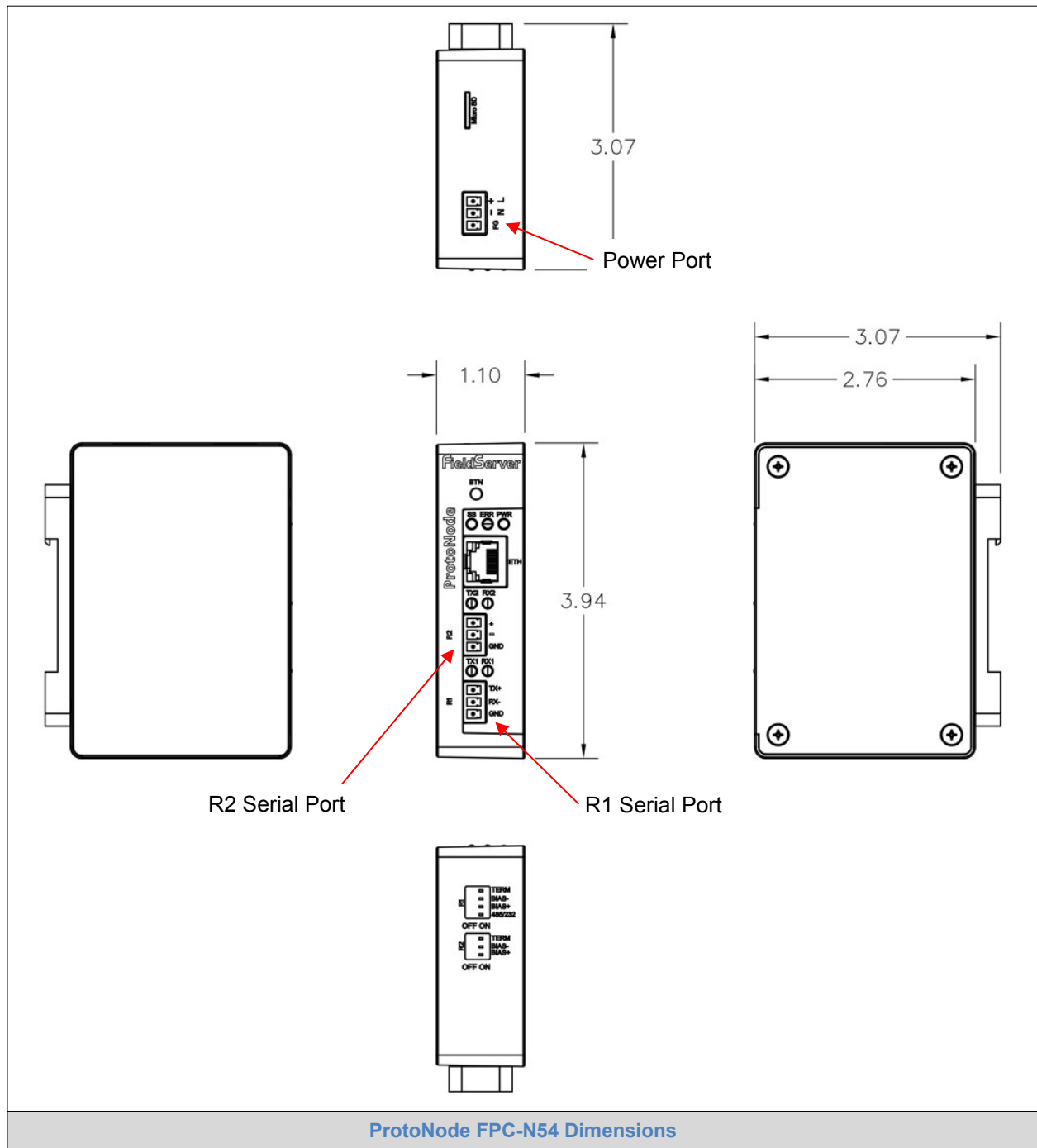
Password Recovery Token: zMtwSDf4A==

[LOGIN](#)

www.sierramonitor.com

Password Recovery Page

Appendix A.10. Physical Dimension Drawing



Appendix B Reference

Appendix B.1. Specifications



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

"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 for more information about the BACnet Testing Laboratory. Click [here](#) for the BACnet PIC Statement.

¹ 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
Register Address				Enter values from Modbus registers on the left to this column.
decimal	hexadecimal	Register Type	Register Description	
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_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](#)

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.