FieldServer

BACnet Router Wi-Fi FS-ROUTER-BACW

Start-up Guide

BAS Router (BACnet Multi-Network Router)

APPLICABILITY & EFFECTIVITY

The instructions are effective for the above as of January 2019.

Document Revision: 1.C
T18621

Technical Support

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1 BACNET ROUTER DESCRIPTION

The BACnet Router provides stand-alone routing between BACnet networks such as BACnet/IP, BACnet Ethernet, and BACnet MS/TP – thereby allowing the system integrator to mix BACnet network technologies within a single BACnet internetwork. There are three physical communication ports on the BAS Router. One is a 10/100 Mbps Ethernet port and the other two are RS-485 MS/TP ports. Configuration is accomplished via a web page.

The BACnet Router with Wi-Fi (FS-ROUTER-BACW) model has one RS-485 port, one Ethernet 10/100 port and supports Wi-Fi network connection. Additionally, the Router acts as a Wi-Fi access point for modern web based configuration and remote access from any mobile device without user restrictions.

The BACnet Router is cloud ready and connects with Sierra Monitor's SMC Cloud.

NOTE: A cellular version of the BACnet Router is not available.

NOTE: For SMC Cloud information, refer to the SMC Cloud Start-up Guide online.

NOTE: The latest versions of instruction manuals, driver manuals, configuration manuals and support utilities are available online at the Sierra Monitor website.

2 EQUIPMENT SETUP

2.1 Mounting

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

Figure 1: DIN Rail

NOTE: For dimension details see Appendix B.2.

2.2 Attaching the Wi-Fi Antenna

Screw in the Wi-Fi antenna to the front of the unit as shown in Appendix B.2.

3 INSTALLING THE BACNET ROUTER

3.1 RS-485

3.1.1 Connection P1 Port

NOTE: Ensure RS-485 is selected by checking that the number 4 DIP Switch is set to the left side.

Connect to the 3-pin connector as shown below.

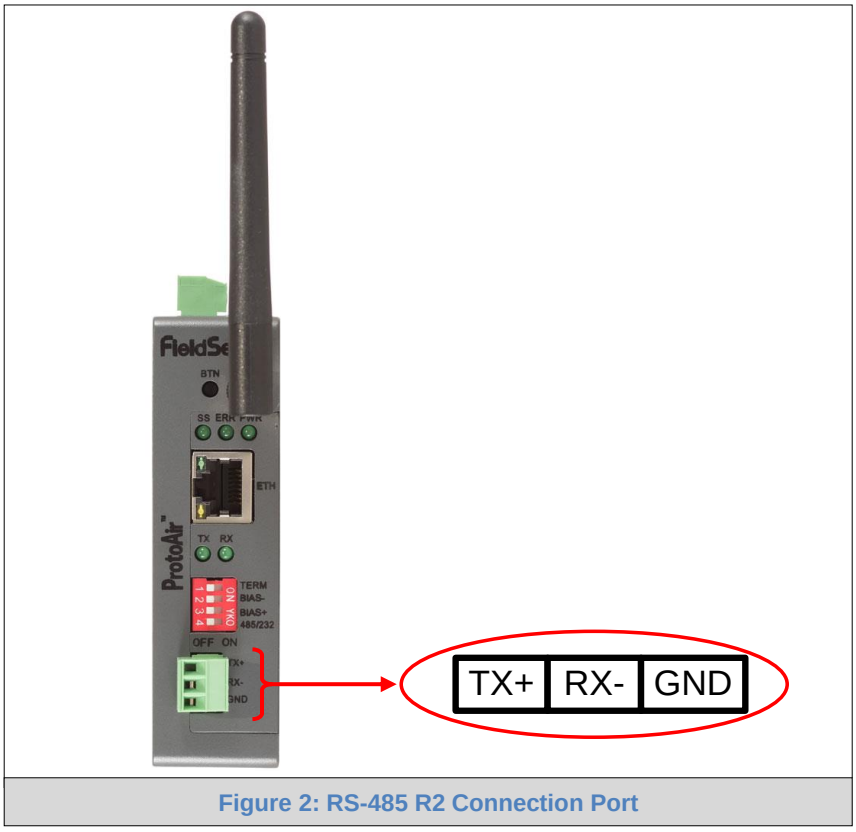


Figure 2: RS-485 R2 Connection Port

The following baud rates are supported on the P1 Port:
9600, 19200, 38400, 76800

3.1.1.1 Wiring

RS-485	
BMS RS-485 Wiring	**BACnet Router Pin Assignment**
RS-485 +	TX +
RS-485 -	RX -
GND	GND

NOTE: Use standard grounding principles for GND.

3.2 10/100 Ethernet Connection Port

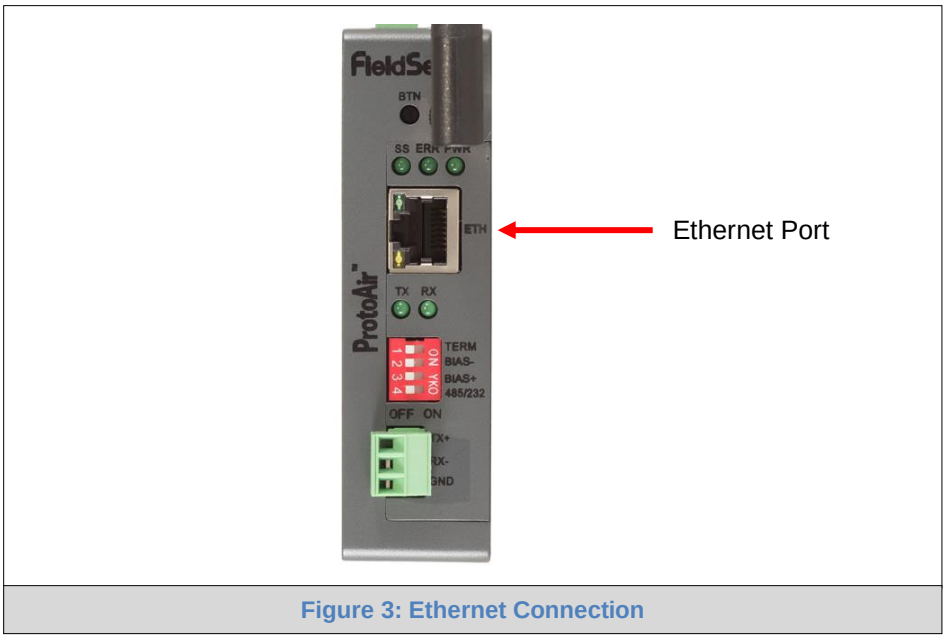


Figure 3: Ethernet Connection

The Ethernet Port is used both for BACnet/IP communications and for configuring the BACnet Router via the Web App. To connect the BACnet Router, either connect the PC to the Router's Ethernet port or connect the Router and PC to an Ethernet switch. Use CAT5 cables for the connection.

NOTE: The Default IP Address of the BACnet Router is 192.168.1.24, Subnet Mask is 255.255.255.0.

4 OPERATION

4.1 Power Up the Device

Check power requirements in the table below:

Power Requirement for BACnet Router External Gateway		
	Current Draw Type	
BACnet Router Family	12V DC	24V DC
FS-ROUTER-BACW (Typical)	170mA	100mA
FS-ROUTER-BACW (Maximum)	240mA	140mA
NOTE: These values are 'nominal' and a safety margin should be added to the power supply of the host system. A safety margin of 25% is recommended.		

Figure 4: Required Current Draw for the BACnet Router

Apply power to the device as show below in **Figure 5**. Ensure that the power supply used complies with the specifications provided in **Appendix B.1**. Ensure that the cable is grounded using the FG or "Frame GND" terminal. The BACnet Router is powered by 12-24V DC.

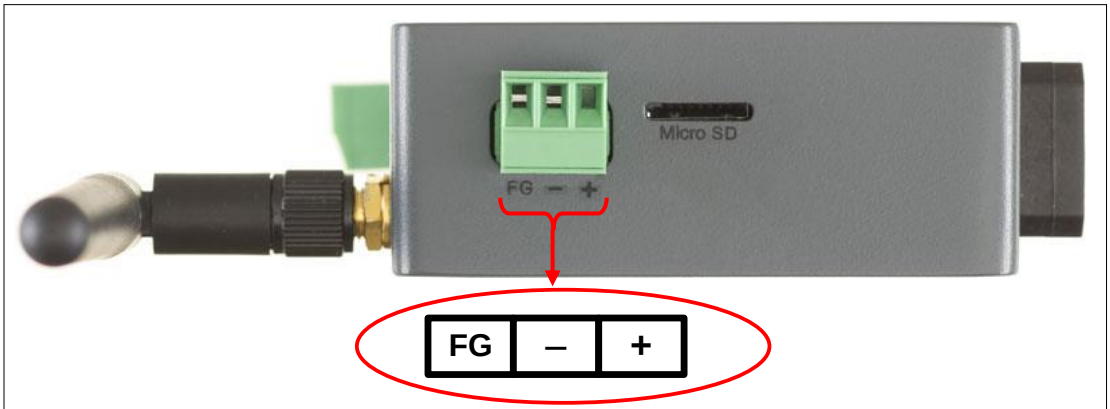


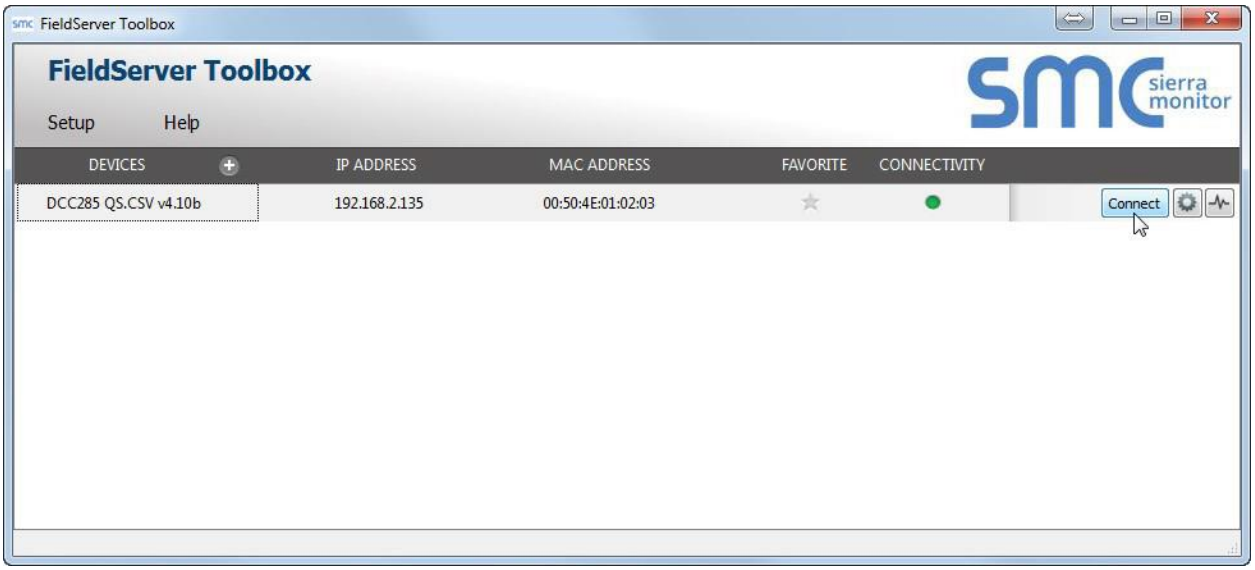
Figure 5: Connecting Power

5 CONNECTING TO THE BACNET ROUTER

The FieldServer Toolbox Application can be used to discover and connect to the BACnet Router on a local area network. To connect to the BACnet Router over the Internet using Toolbox, add the Internet exposed IP Address of the Router by clicking on the ⊕ button, or alternatively enter the Internet exposed IP Address in a web browser directly.

5.1 Using the FieldServer Toolbox

- Install the FS Toolbox application from the USB drive or download it from the Sierra Monitor website.
- Use the FS Toolbox application to find the BACnet Router, change the IP Address details (if required) and launch the Web App (by clicking the Connect button).



5.2 Using a Web Browser Directly

- Open a Web Browser and connect to the BACnet Router's Default IP Address. The Default IP Address of the BACnet Router is 192.168.2.101, Subnet Mask is 255.255.255.0
- If the PC and the BACnet Router are on different IP Networks, assign a Static IP Address to the PC on the 192.168.2.X network.

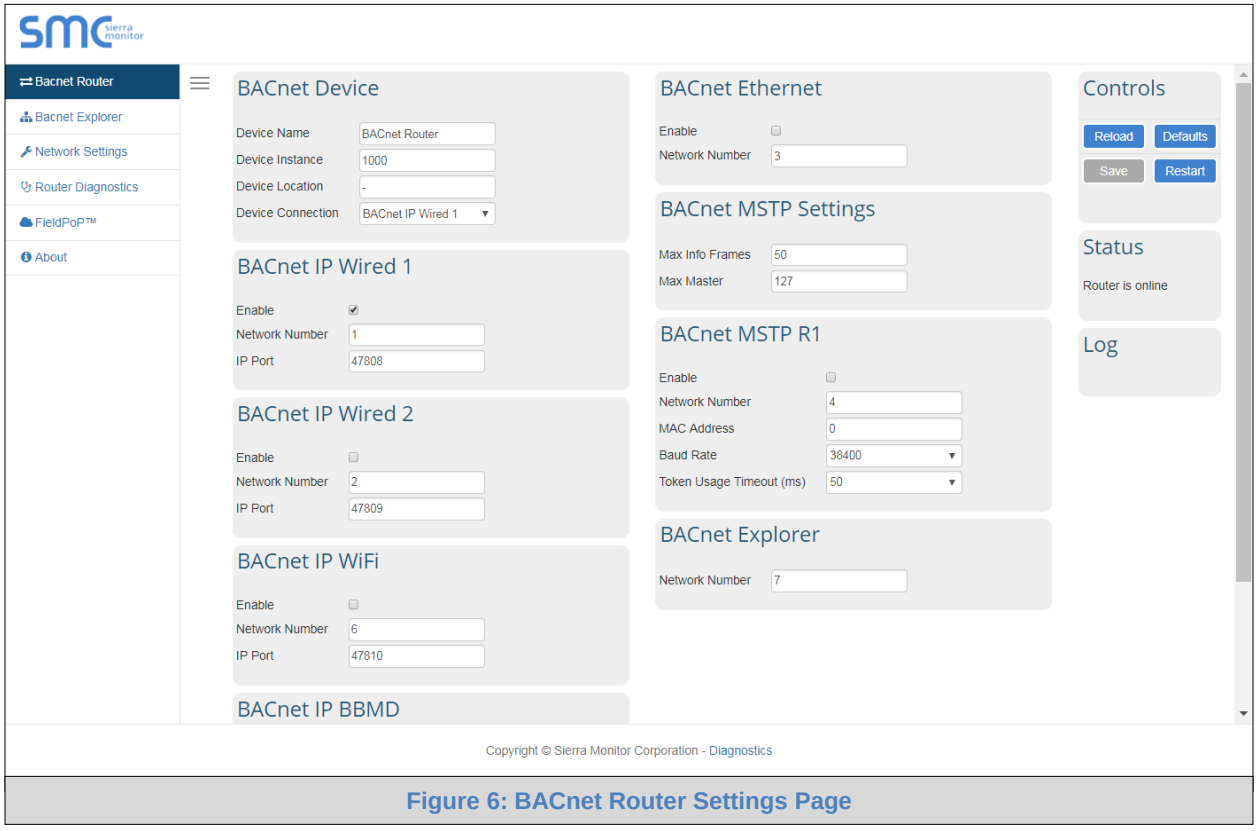


Figure 6: BACnet Router Settings Page

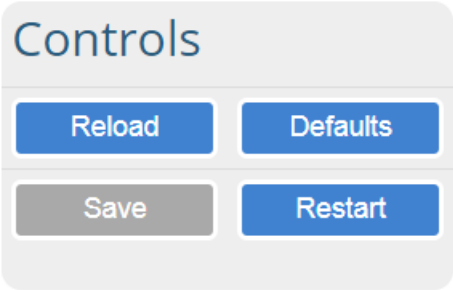
NOTE: The FieldPoP™ tab 

(see Figure 6) allows users to connect to the SMC Cloud, Sierra Monitor's device cloud solution for IIoT. The SMC Cloud enables secure remote connection to field devices through a FieldServer and its local applications for configuration, management, maintenance. For more information about the SMC Cloud, refer to the SMC Cloud Start-up Guide.

6 CONFIGURING THE BACNET ROUTER

6.1 Settings

6.1.1 Button Functions

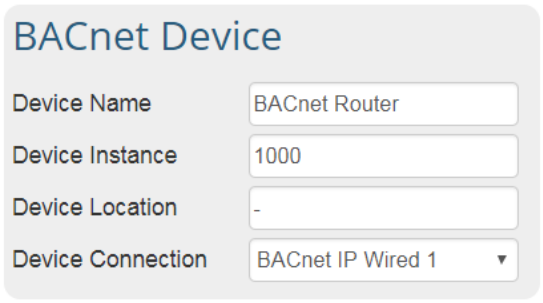


- **Save** – write the currently displayed settings to the device. A restart will be required to apply the updated settings.
- **Reload** – discard the currently displayed settings and reload the settings stored on the device. This will undo any unsaved edits.
- **Defaults** – discard the currently displayed settings and load default settings. This must still be saved and the device must be restarted for the default settings to be applied.
- **Restart** – restarts the device.

6.1.2 Multiple Connections

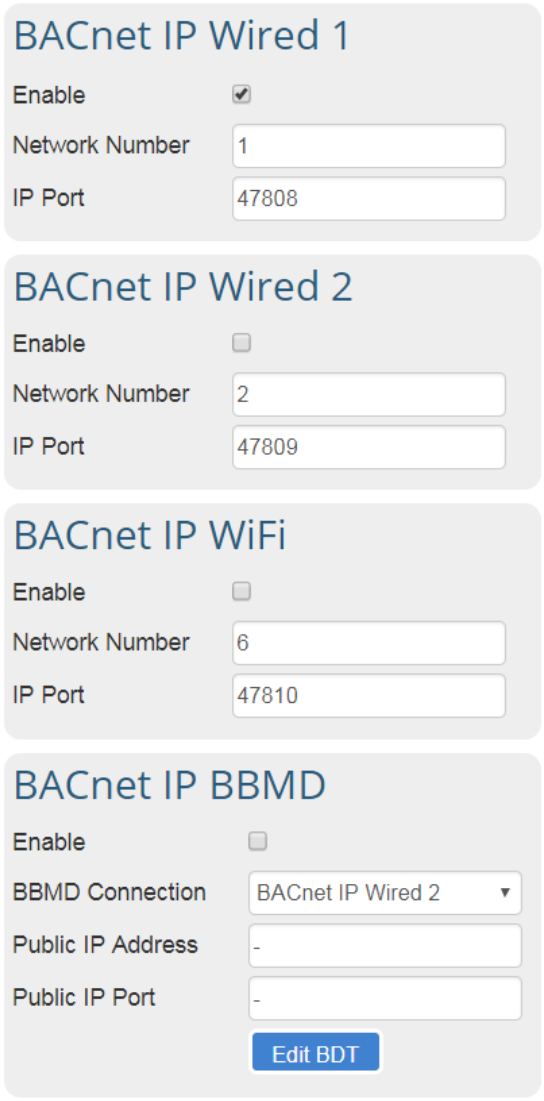
- **Network Number** – set up the BACnet network number for the connection. Legal values are 1-65534. Each network number must be unique across the entire BACnet internetwork.
- **Enable** – enable or disable the connection; note that BACnet/IP Primary is always enabled.

6.1.3 BACnet Device



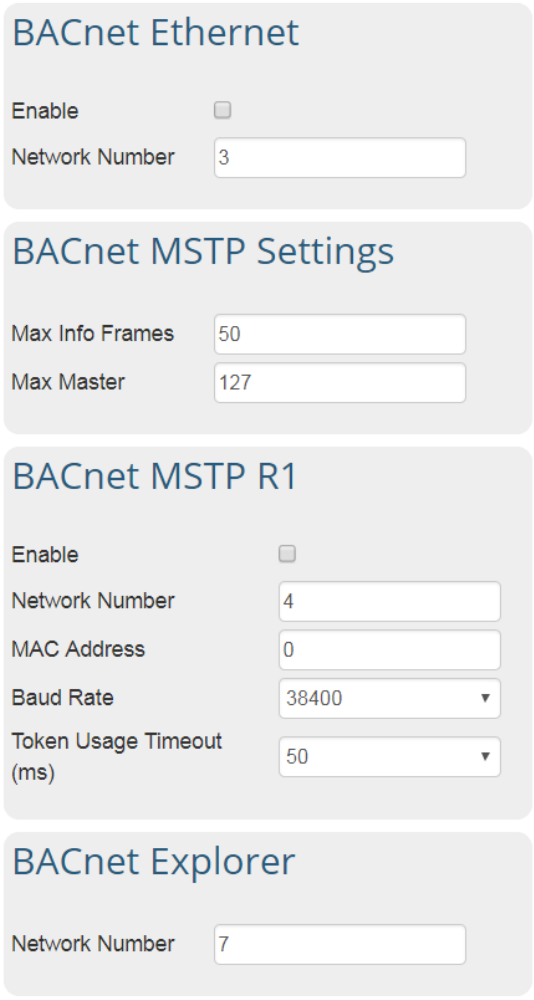
- **Device Instance** and **Device Name** – a BACnet Router must provide a Device Object. Configure its name and Instance Number here. Take care to select a Device Instance Number that is unique across the entire BACnet internetwork.
- **Device Location** – enter a location for the Device. The location may not contain any commas.
- **Device Connection** – select which connection to bond the BACnet device settings.

6.1.4 BACnet/IP



- **IP Port** – the BACnet/IP default is 47808 (0xBAC0), but a different port number may be specified here.
- **IP Port** – this MUST be different to the IP Port used on the BACnet/IP Primary connection. Default is 47809 (0xBAC1).
- **BBMD Connection** – select which connection to bond the BACnet/IP BBMD settings.
- **Public IP Address** and **Port** – if the BBMD is being accessed across a NAT Router, then these values must be configured with the public IP Address and Port by which the BBMD can be reached from across the NAT Router. The Public IP Address and Port would also be used in the BDT of remote BBMD's that need to reach this BBMD across the NAT Router. If no NAT Router is being used, these fields can be left blank. For example, type into a Google browser “my IP Address” to see the local PC’s Public IP Address.

6.1.5 BACnet MS/TP, BACnet Ethernet and BACnet Explorer



- **Max Info Frames** – the number of transactions the Router may initiate while it has the MS/TP token. Default is 50.
- **Max Master** – the highest MAC address to scan for other MS/TP master devices. The default of 127 is guaranteed to discover all other MS/TP master devices on the network.
- **MAC Address** – legal values are 0 to 127, must be unique on the physical network.
- **Baud Rate** – the serial baud rate used on the network.
- **Token Usage Timeout (ms)** – the number of milliseconds the router will wait before deciding that another master has dropped the MS/TP token. This value must be between 20ms and 100ms. Choose a larger value to improve reliability when working with slow MS/TP devices that may not be able to meet strict timing specifications.

6.2 Network Settings

The IP Settings for the BACnet Router are used by BACnet/IP. The IP Settings can be edited in the Network Settings section as shown.

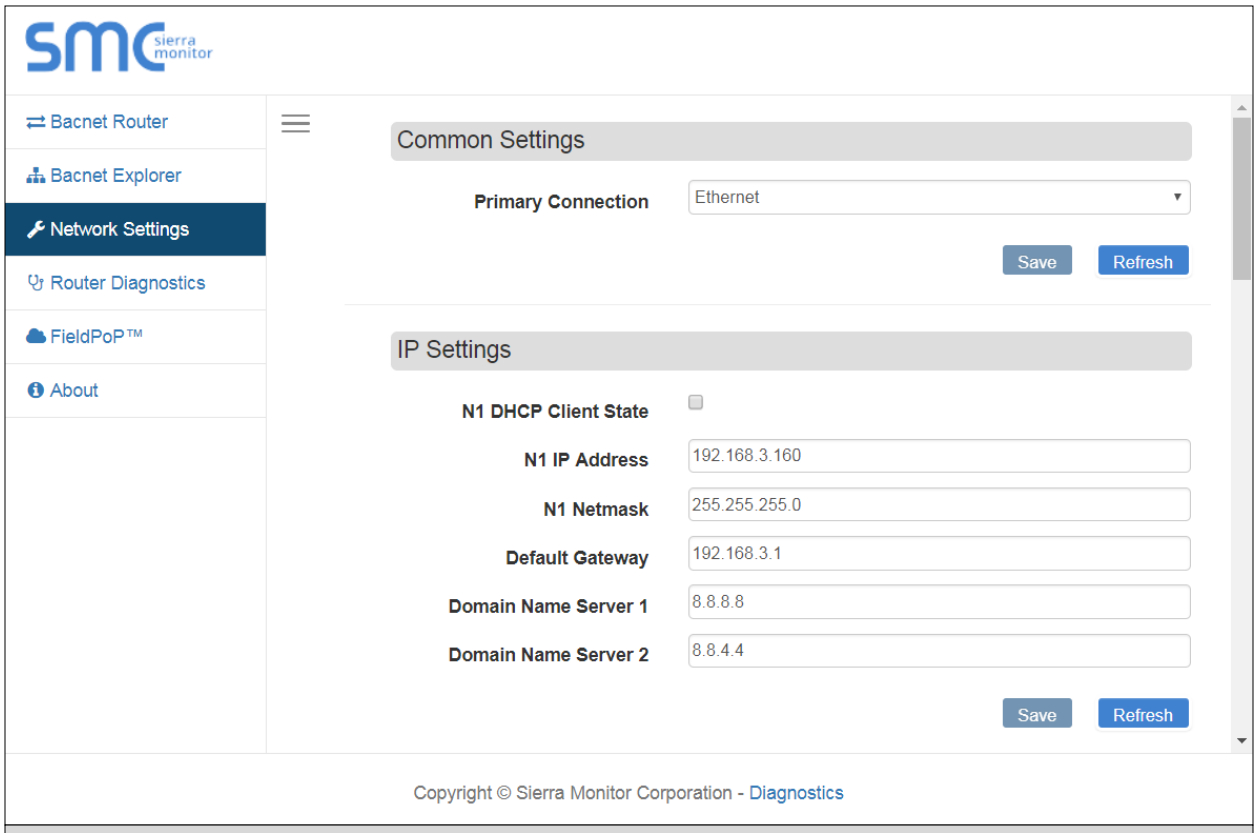


Figure 7: Network Settings – IP Settings

NOTE: Common Settings make it possible to choose the primary connection when both Ethernet and Wi-Fi Client connections are available.

Scroll down to view and edit the Wi-Fi Client or Wi-Fi Access Point Settings.

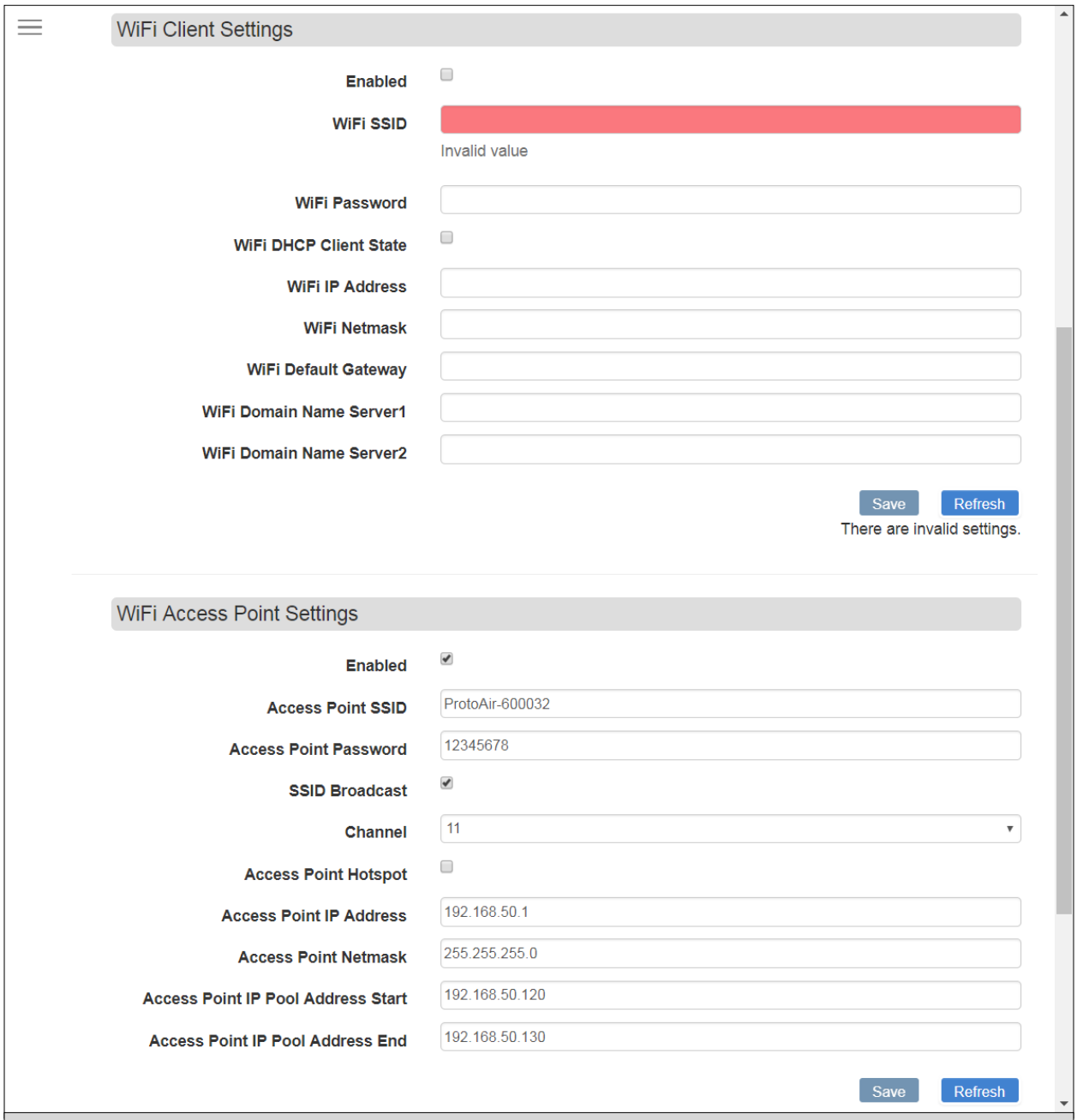


Figure 8: Network Settings – Wi-Fi Client and Wi-Fi Access Point Settings

6.3 Router Diagnostics

By clicking on the Router Diagnostics tab all the connection communication details can be viewed to ensure the BACnet Router is working correctly.

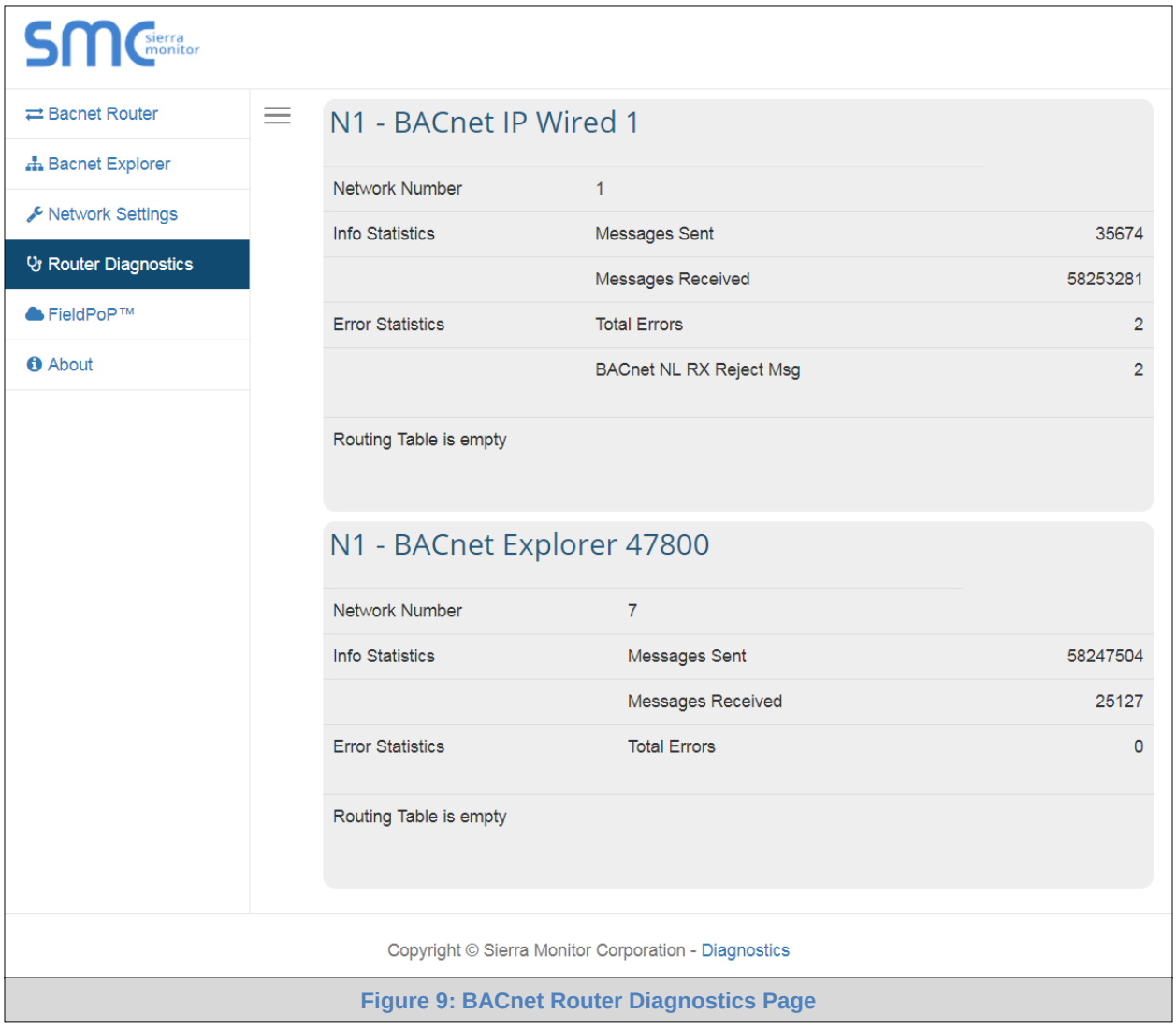


Figure 9: BACnet Router Diagnostics Page

7 BACNET EXPLORER

The Bacnet Explorer tab allows installers to validate that 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.

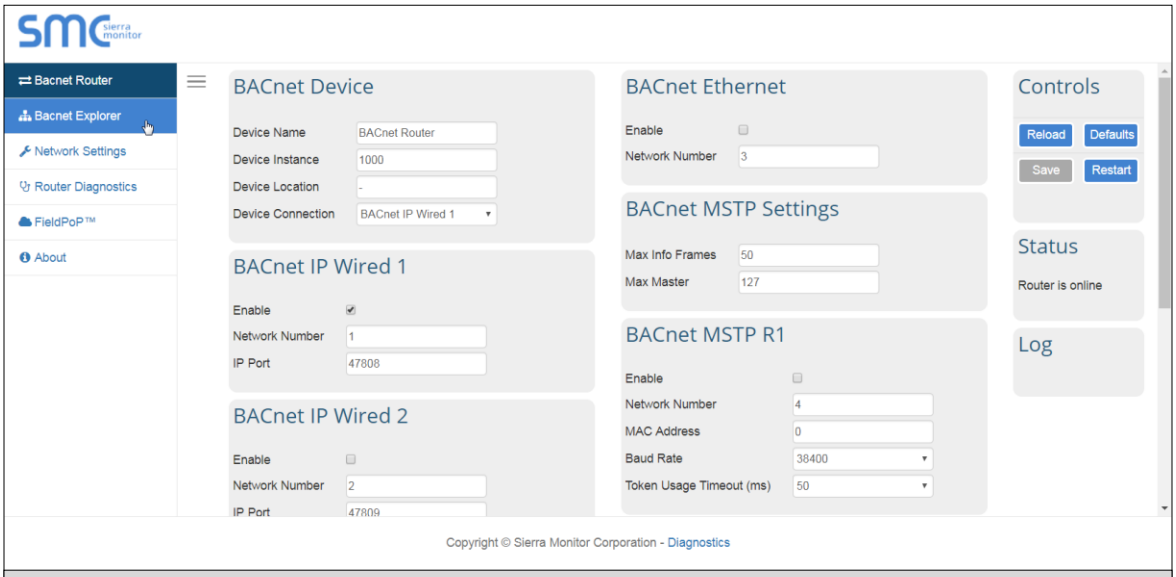


Figure 10: FS-GUI BACnet Explorer Button

- 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".

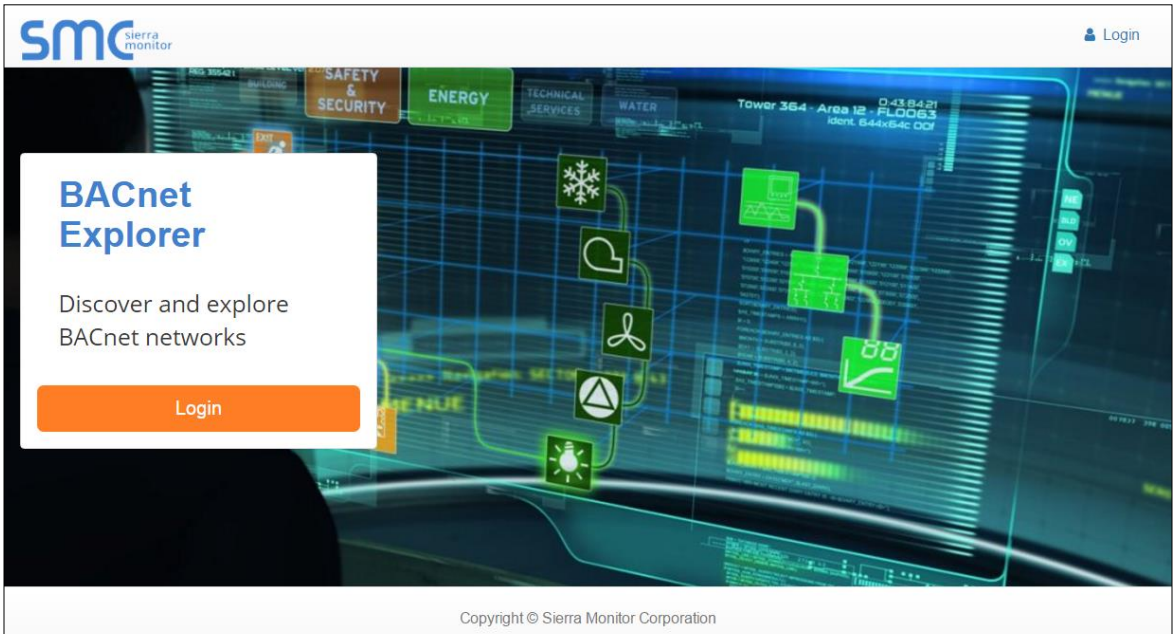


Figure 11: BACnet Explorer Login Page

NOTE: For BACnet/IP, click on the Settings button on the left side of the landing page to ensure the BACnet Router is on the BACnet/IP network subnet or to configure BBMD.

7.1 Discover 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.

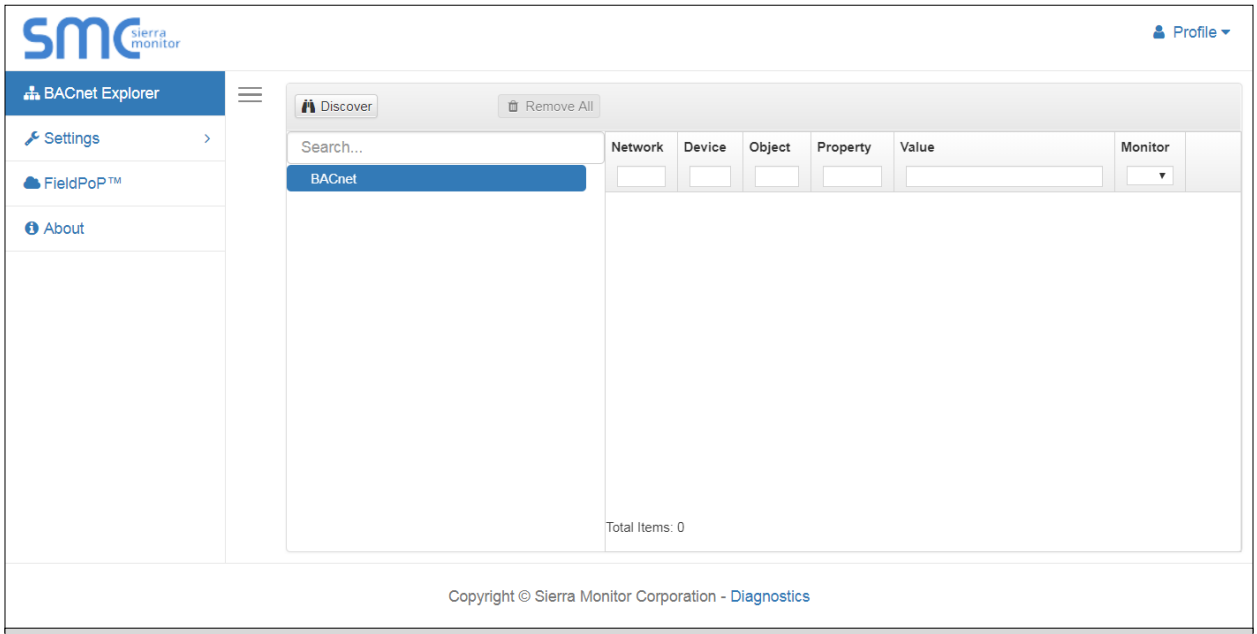


Figure 12: BACnet Explorer Page

- To discover the devices 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.

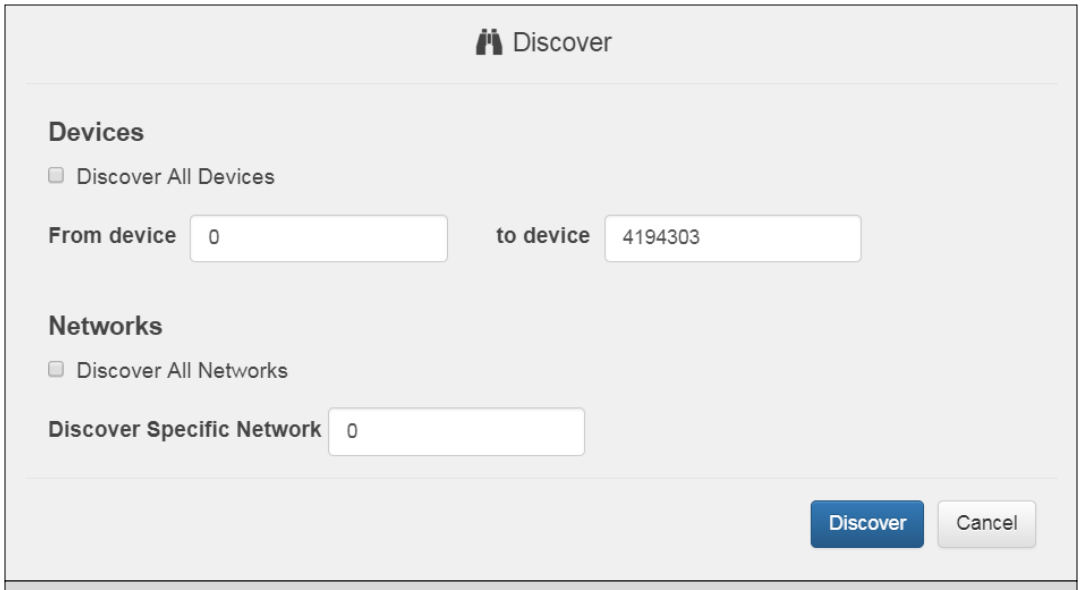


Figure 13: Discover Window

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 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.

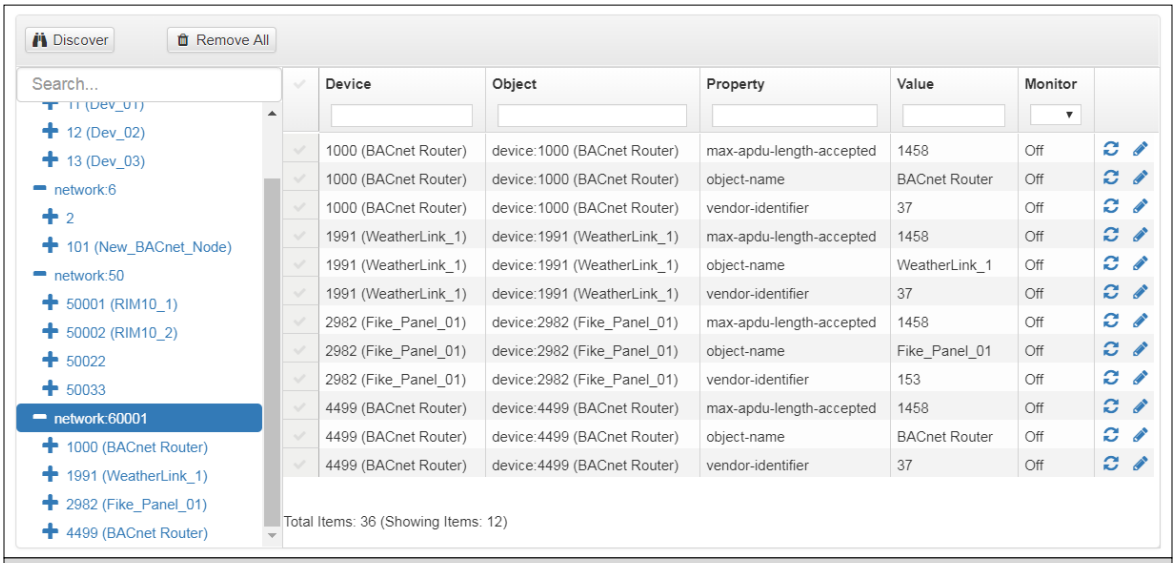


Figure 14: Device List

7.2 View Device Details and Explore Points/Parameters

- To view the device details, click the blue plus sign (+) next to the desired device in the list.
  - This will show only some of the device properties for the selected aspect of a device

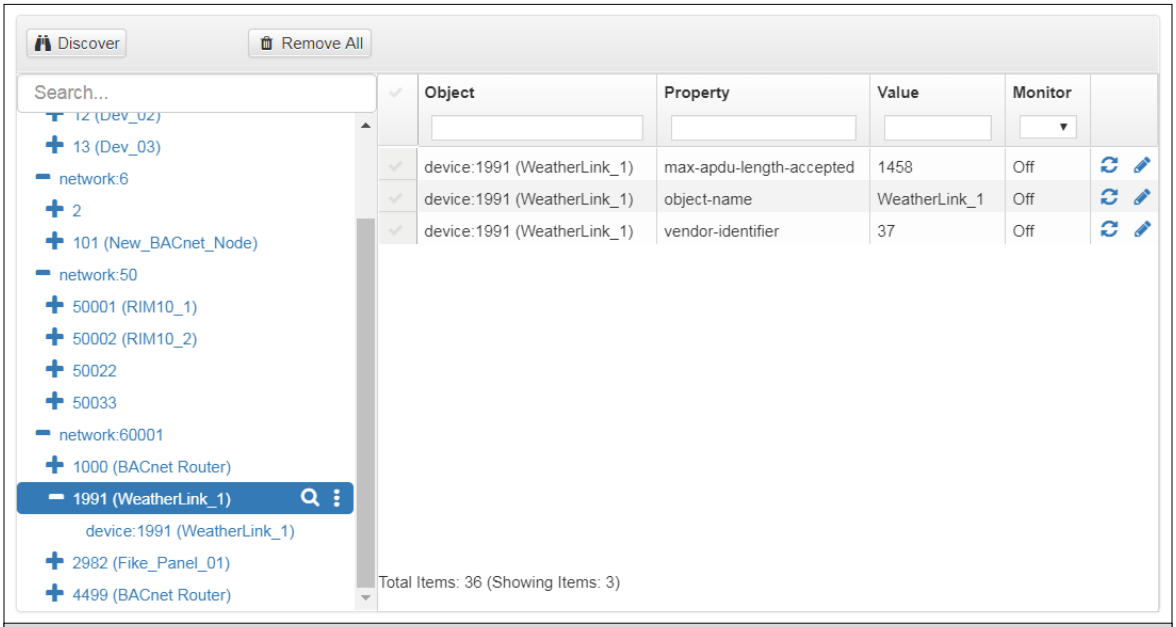


Figure 15: Device Sub-items

- To view the full details of a device, go back to highlighting the device directly (in **Figure 16** "1991 WeatherLink_1") and click the Explore button ( ) that appears to the right of the highlited device as a magnifying glass icon or double-click the highlighted device.

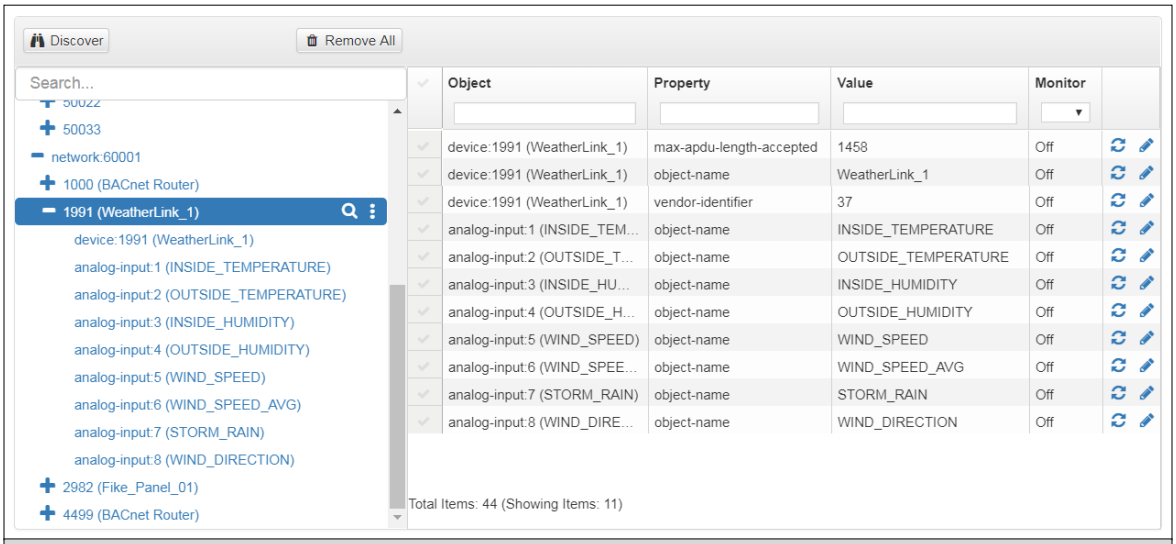


Figure 16: Full Device Sub-items

  - Now additional device details are viewable; however, the device can be explored even further

- Click on one of the device details.

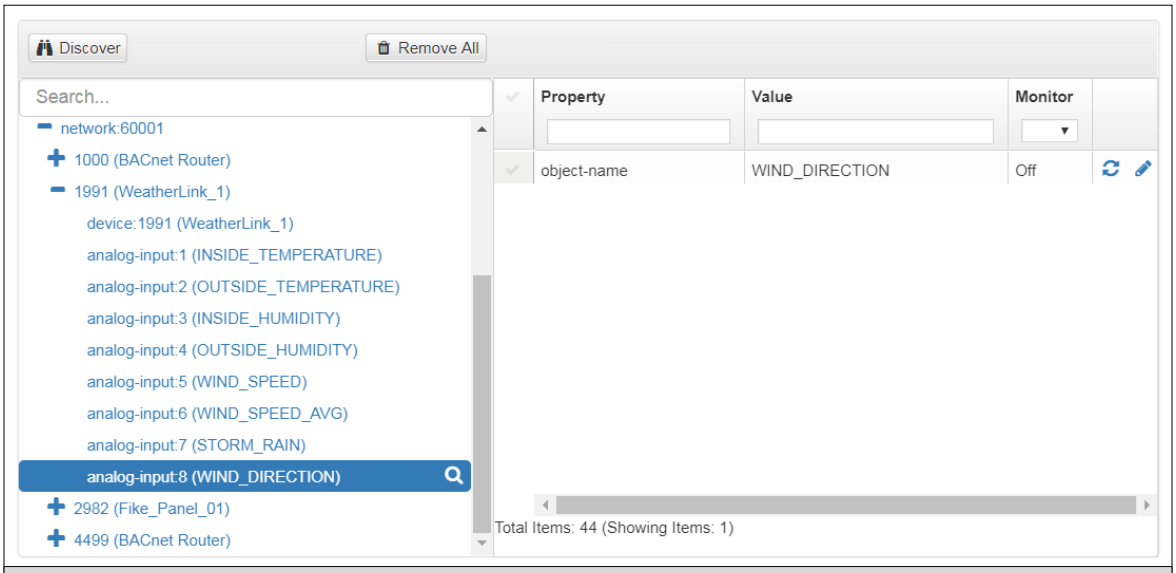


Figure 17: Simplified Device Details

- Then click on the Explore button or double-click the device object.

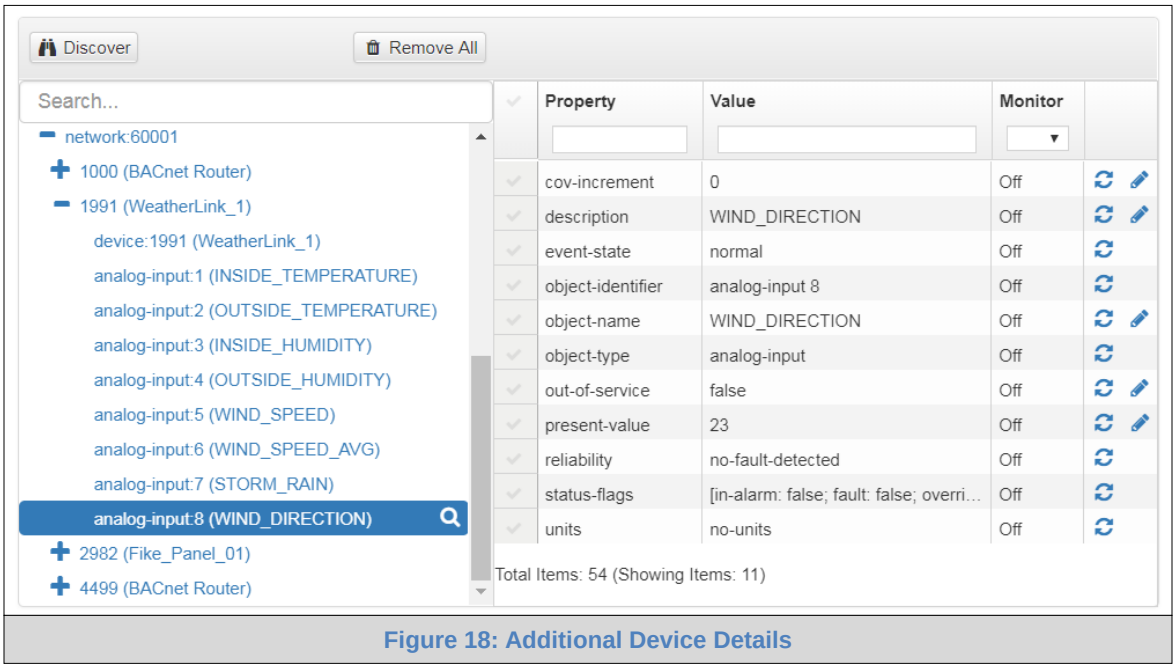


Figure 18: Additional Device Details

A full list of the device details 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 individual properties to refresh the value.

NOTE: The Explorer Search Bar will find devices based on their Device ID.

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

- **Network number**
  - **Device**
    - **Device object**

7.2.1 Edit the Present Value Field

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, select it in the property listings.

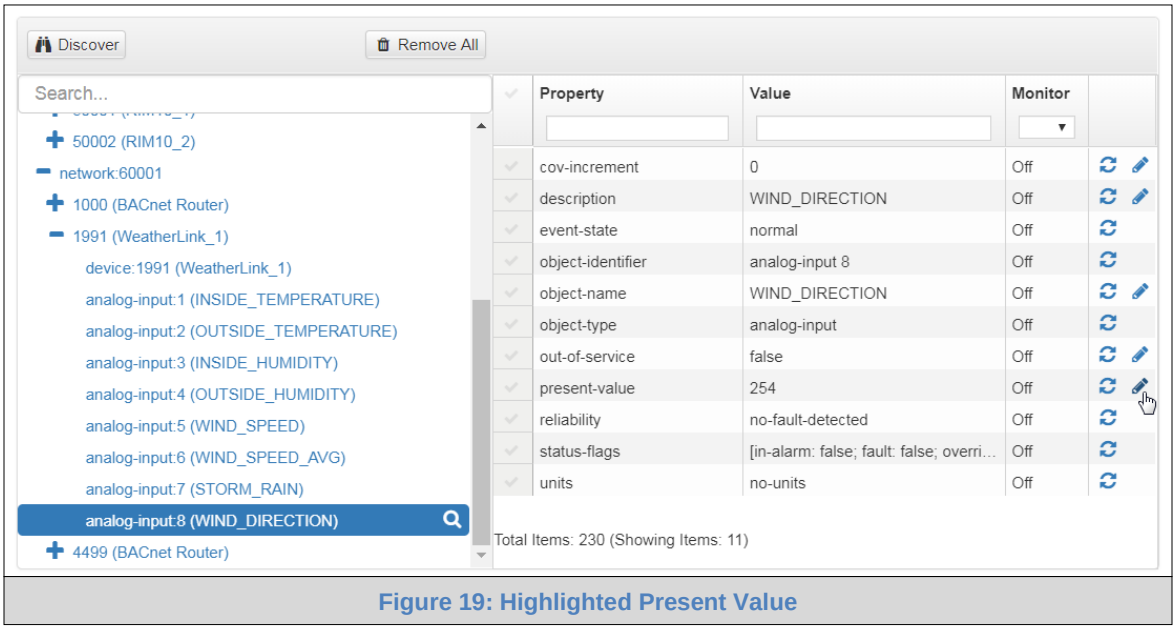


Figure 19: Highlighted Present Value

- Then click the Write button ( ) on the right of the property to bring up the Write Property window.

Figure 20: Write Property Window

- Enter the appropriate change and click write.

  The window will close. When the BACnet Explorer page appears, the present value will be changed as specified.

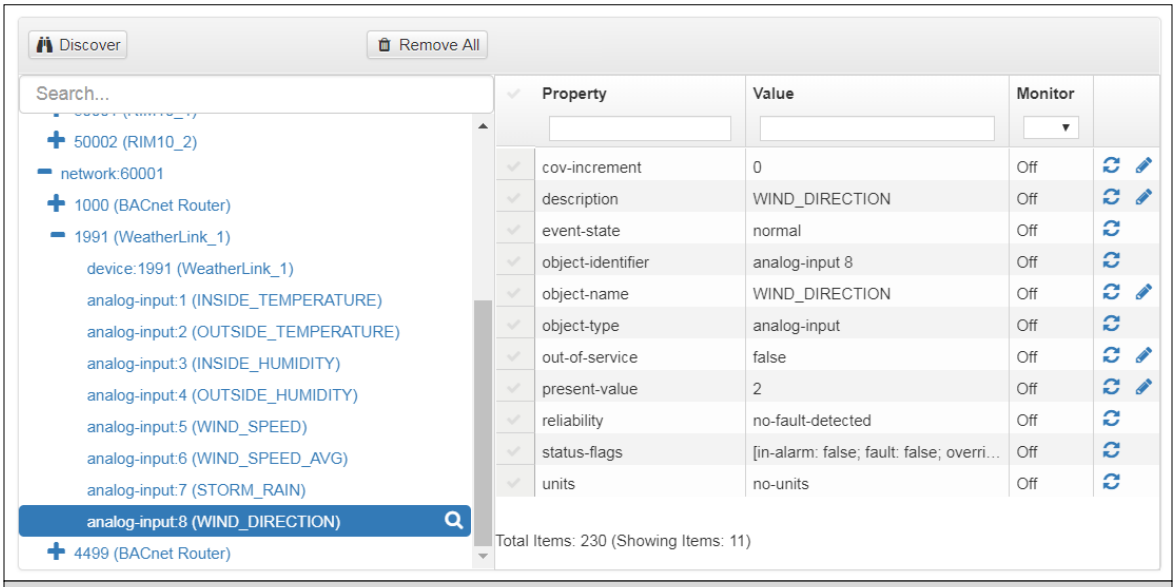


Figure 21: Updated Present Value

APPENDIX A USEFUL FEATURES

Appendix A.1. Tooltips

Tooltips appear when the mouse pointer hovers over the corresponding settings field. A balloon will appear giving a description of that input field. This applies to all input fields.

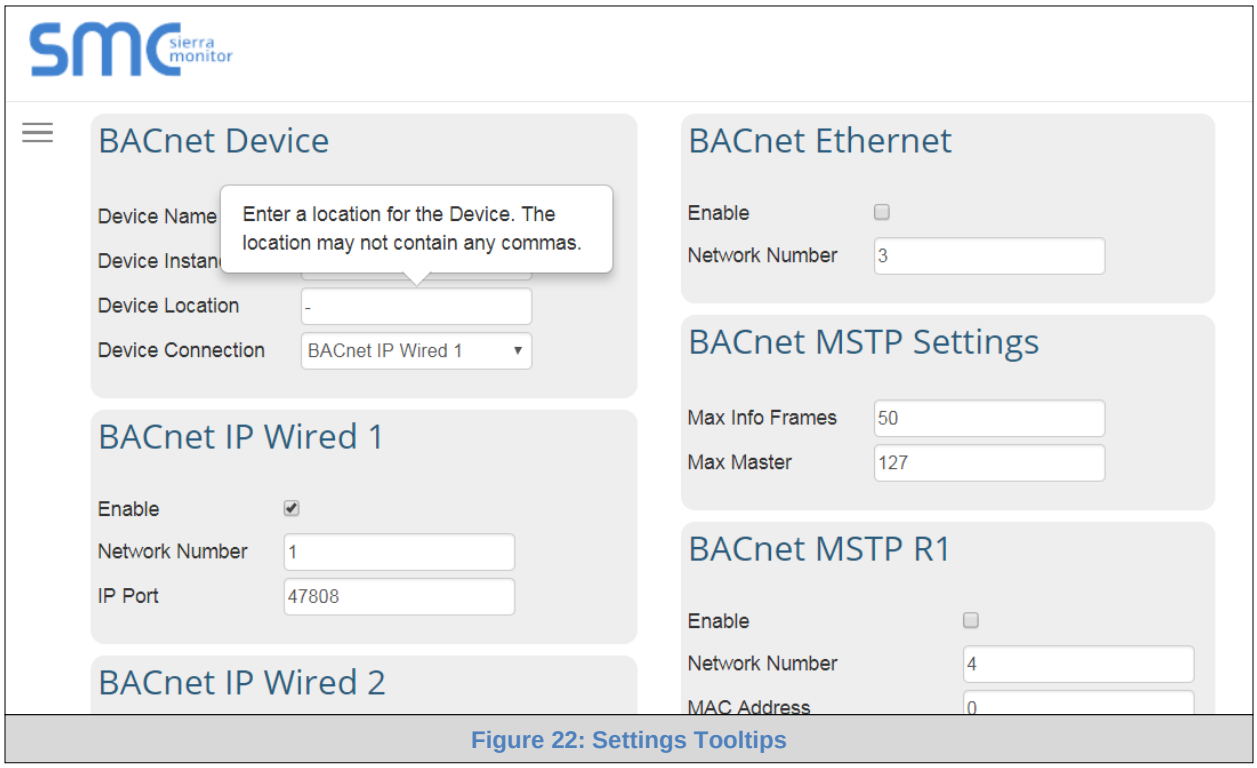


Figure 22: Settings Tooltips

Appendix A.2. Before Contacting Technical Support Take a Diagnostic Capture

When there is a problem on-site that cannot easily be resolved, perform a diagnostic capture before contacting support so that support can quickly solve the problem. There are two methods for taking diagnostic captures:

- **FieldServer Toolbox:**
  This method requires installation of the FS Toolbox program. A FS Toolbox diagnostic capture takes a snapshot of the loaded configuration files and a log of all the communications on the serial ports over a specified period of time. If the problem occurs over an Ethernet connection, then take a Wire Shark capture.
- **Gateway's FS-GUI Page:**
  This method doesn't require downloading software. The diagnostic capture utilities are embedded in the FS-GUI web interface. Starting a diagnostic capture takes a snapshot of the loaded configuration files and a log of all the communications over a specified period of time. This works for both serial and Ethernet connections.

NOTE: The information in the zipped files contains everything support needs to quickly resolve problems that occur on-site.

Appendix A.2.1. Using the FieldServer Toolbox

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

NOTE: While all necessary documentation is shipped with the FieldServer on the USB flash drive, these documents are updated regularly. New versions may be available on SMC's website.

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor Resource Center Software Downloads.
- Extract the executable file and complete the installation.

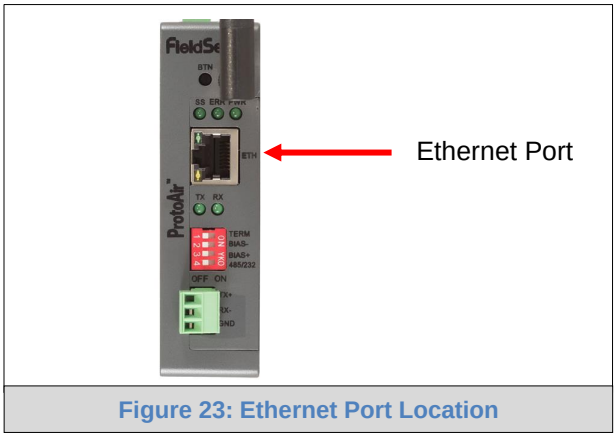
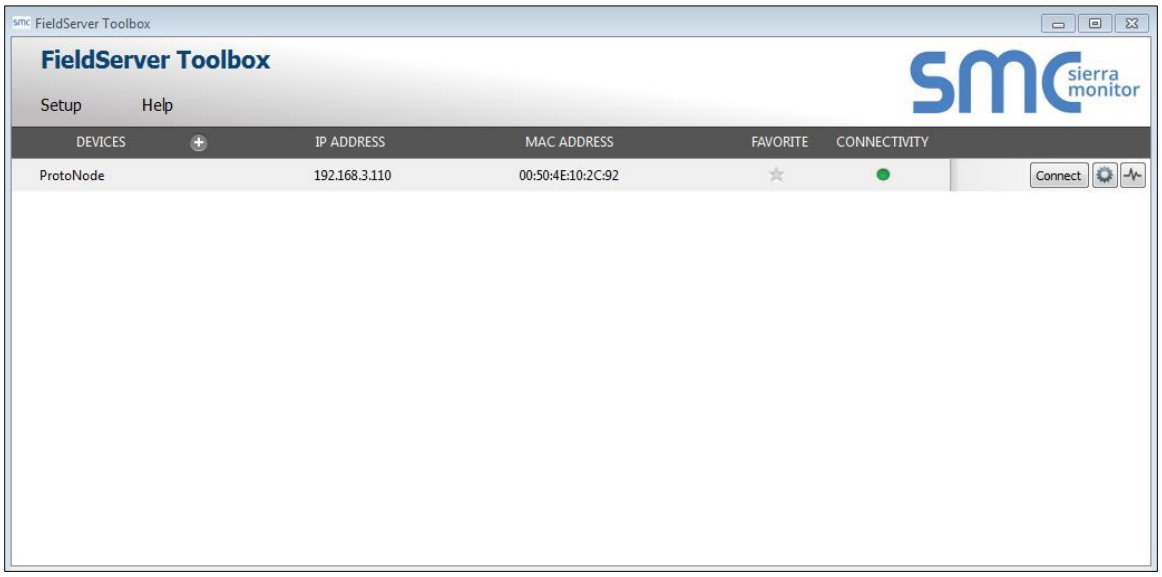


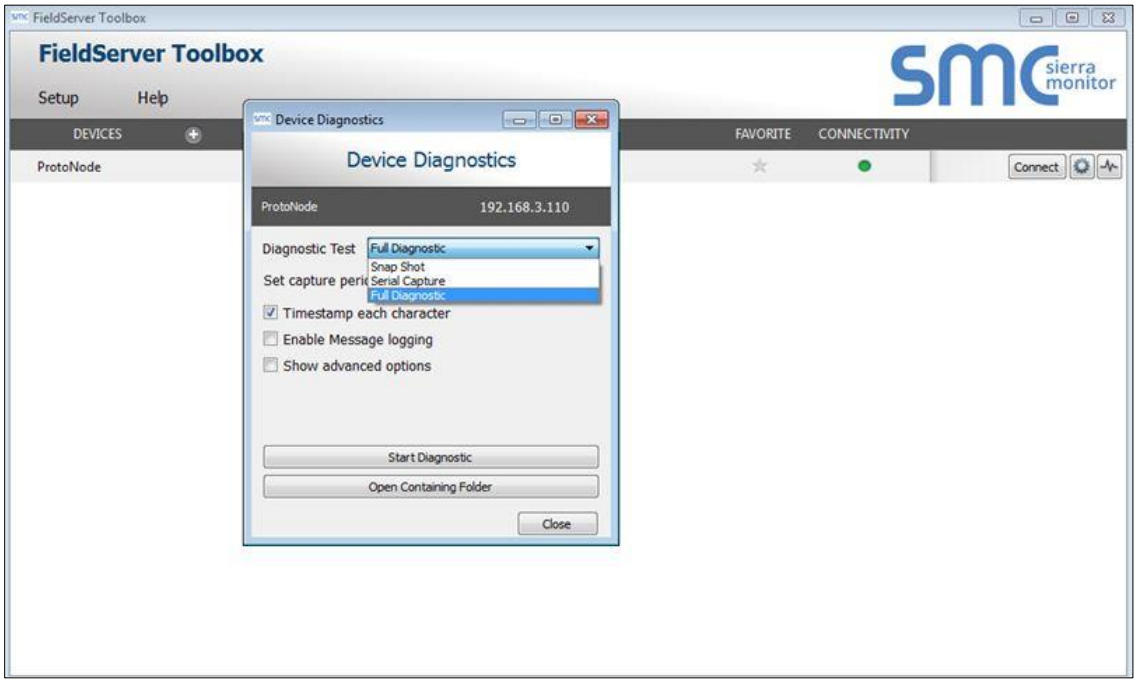
Figure 23: Ethernet Port Location

- Connect a standard CAT5 Ethernet cable between the PC and QuickServer.
- Double click on the FS Toolbox Utility.

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

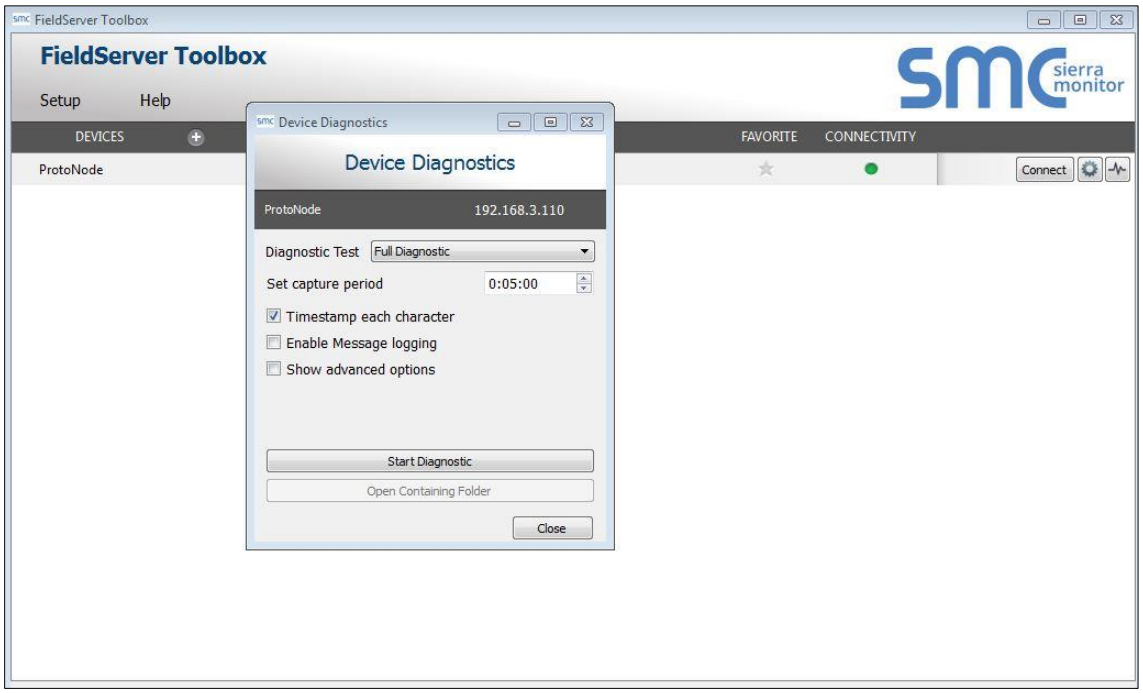


  - Ensure “Full Diagnostic” is selected (this is the default)



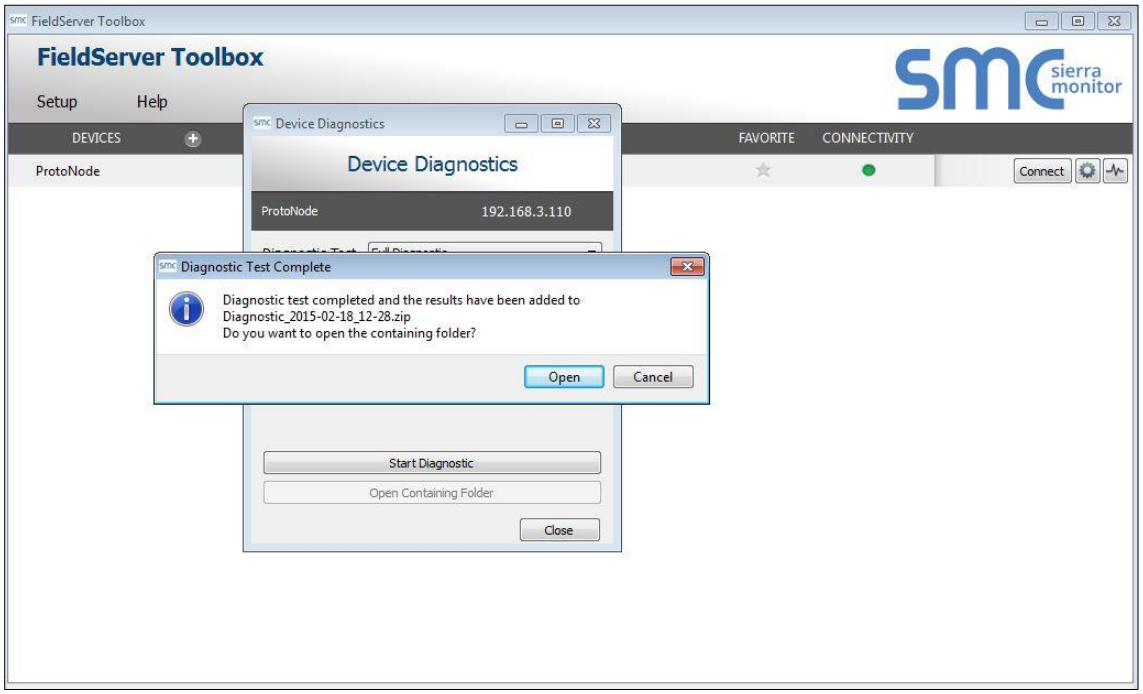
NOTE: If desired, the default capture period can be changed.

- Click on “Start Diagnostic”



- When the capture period is finished, 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



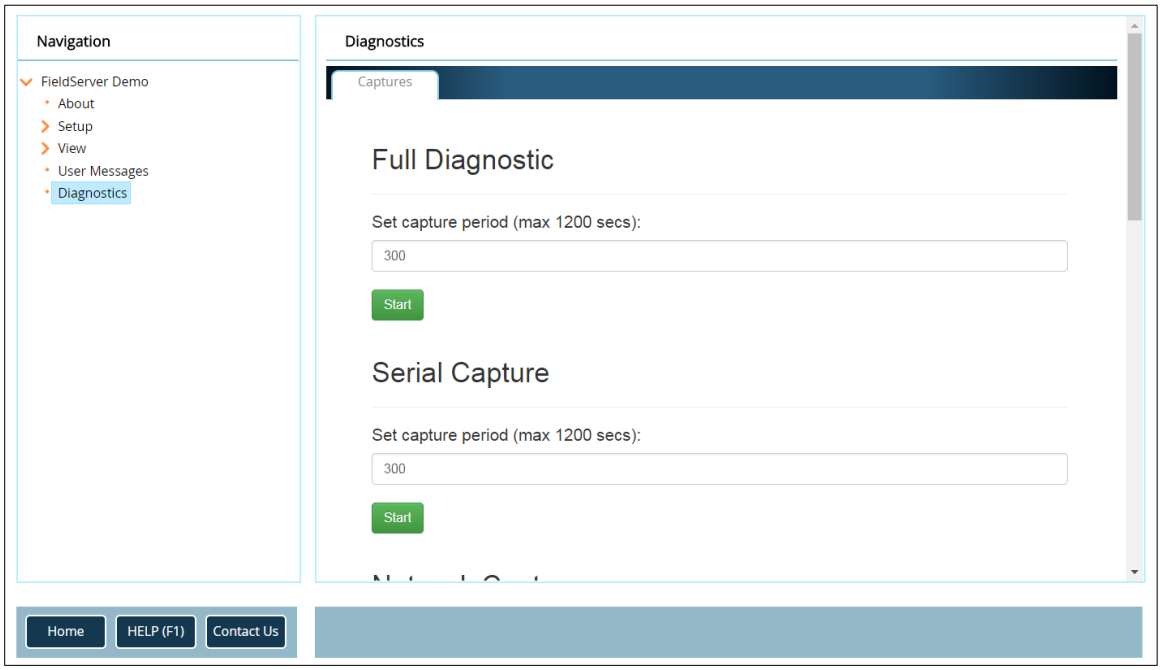
- Click “Open” to launch explorer and have it point directly at the correct folder
- Email the diagnostic zip file to **support@sierramonitor.com**

Appendix A.2.2. Using FS-GUI

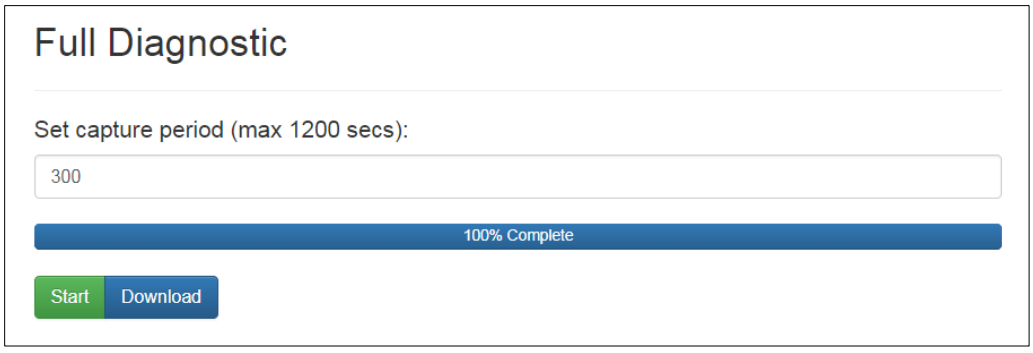
Diagnostic Capture with FS-GUI is only available on FieldServers with a bios updated/released on November 2017 or later. Completing a Diagnostic Capture through the FieldServer allows network connections (such as Ethernet and Wi-Fi) to be captured.

Once the Diagnostic Capture is complete, email it to technical support. The Diagnostic Capture will accelerate 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 support@sierramonitor.com.

NOTE: Diagnostic captures of BACnet MS/TP communication are output in a ".PCAP" file extension which is compatible with Wireshark.

APPENDIX B REFERENCE

Appendix B.1. Specifications

	FS-ROUTER-BACW [1]	
Available Ports	One RS-485 +/- ground port One Ethernet 10/100 BaseT port	One power +/- frame ground port
Power Requirements	*Input Voltage:* 12-24V DC *Power Rating:* 2.5 Watts	*Current draw:* @ 12V, 240 mA
Approvals	CE and FCC Class B & C Part 15, TUV approved to UL 60950, IC Canada, RoHS compliant, WEEE compliant, PTCRB and CTIA	
Dimensions (WxDxH)	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 to 70ºC (-4 to 158ºF)	
Humidity	10-95% RH non-condensing	
Wi-Fi 802.11 b/g/n	*Frequency:* 2.4 GHz *Antenna Type:* SMA	*Channels:* 1 to 11 (inclusive) *Encryption:* TKIP, WPA & AES

Figure 24: 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 FieldServer could void the user's authority to operate the equipment under FCC rules."

[1] Specifications subject to change without notice.

Appendix B.2. FS-ROUTER-BACW Dimension Drawing

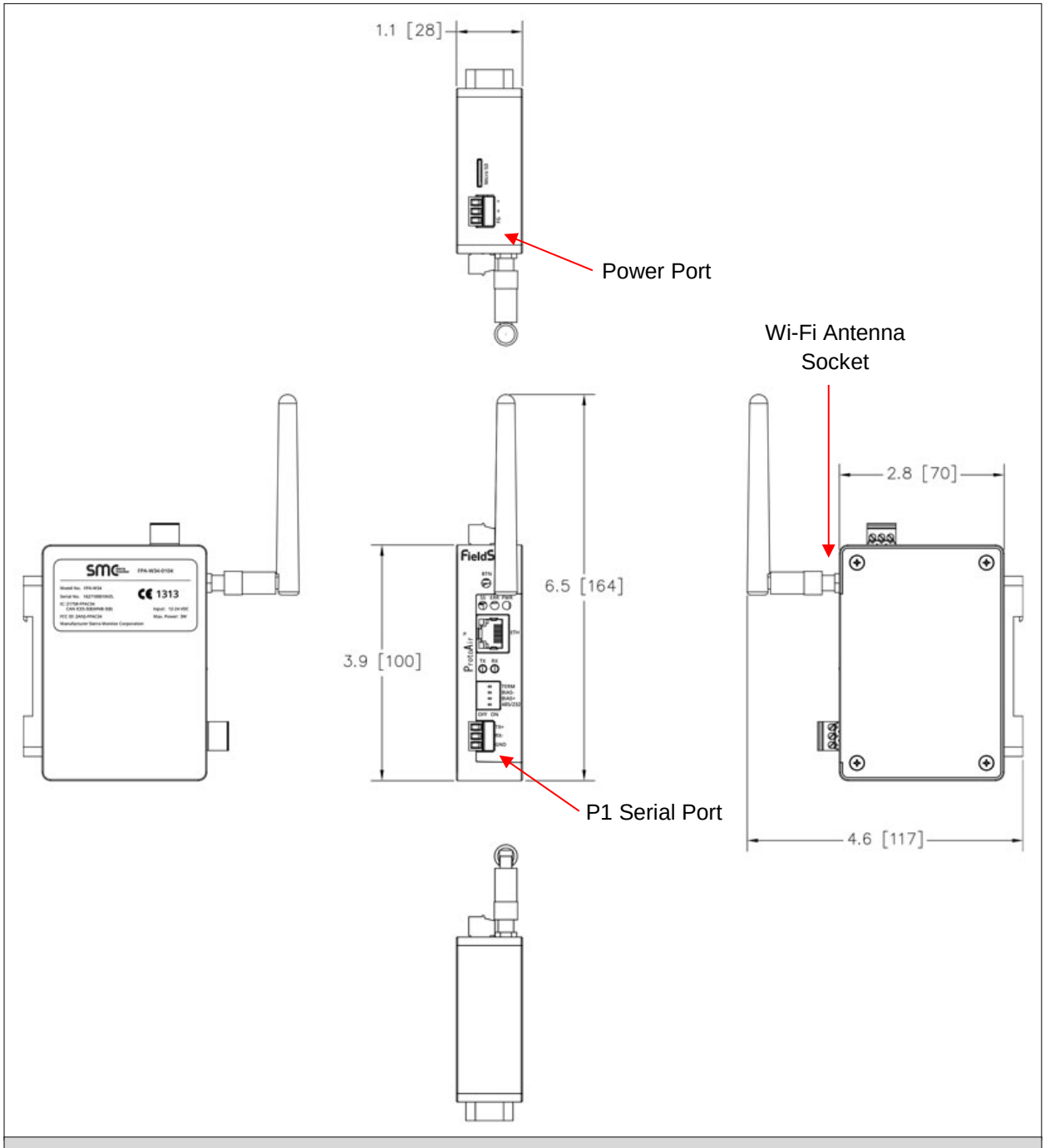


Figure 25: BACnet Router Dimensions

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.