FieldServer

BACnet Router FS-ROUTER-BACX

Start-up Guide

BAS Router (BACnet Multi-Network Router)

Technical Support

Please call us for any technical support needs related to the FieldServer product.

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

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

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

2   CERTIFICATION

2.1   BTL Mark – BACnet Testing Laboratory

The BTL Mark on the BACnet Router 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.

3   BACNET ROUTER SETUP

3.1   Mounting

The following mounting options are available:

- Product comes with tabs for wall or surface mount. These can be snapped off if not required.

- DIN rail mounting bracket – included in the accessory kit or ordered separately (part # FS-8915-35-QS).

Din Rail

Tab

<p align="center">Figure 1: DIN Rail</p>
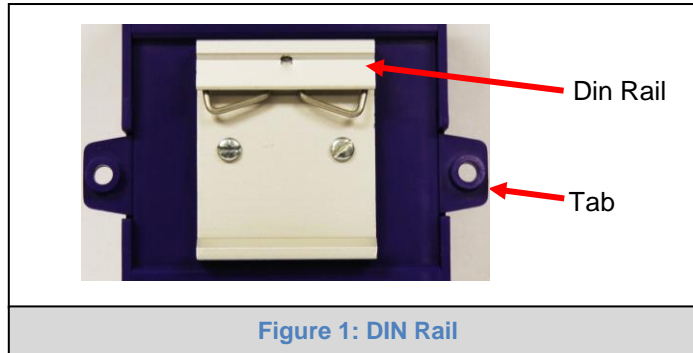
WARNING: Install only as instructed, failure to follow the installation guidelines or using screws without the DIN rail mounting bracket could result in permanent damage to the product. If the FieldServer is removed from the DIN rail, use the original screws to reattach. Only screws supplied by SMC should be used in the holes found on the back of the unit when attaching the optional DIN Rail bracket. USE OF ANY OTHER SCREWS MAY DAMAGE THE UNIT.

3.2   Dimensions

3.2.1 Dimension Drawing FS-ROUTER-BAC1

Figure 2: FS-ROUTER-BAC1
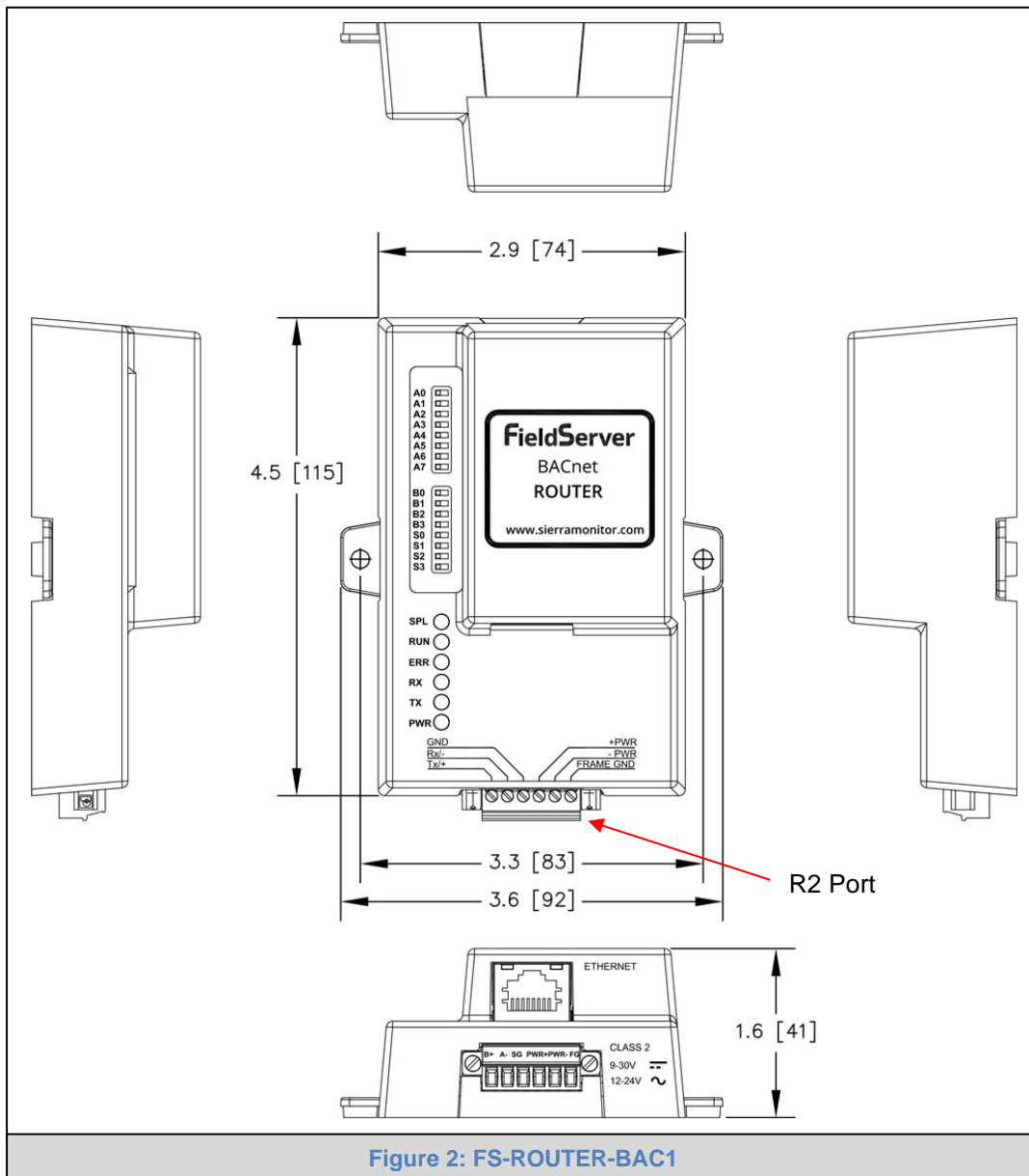
3.2.1 Dimension Drawing FS-ROUTER-BAC
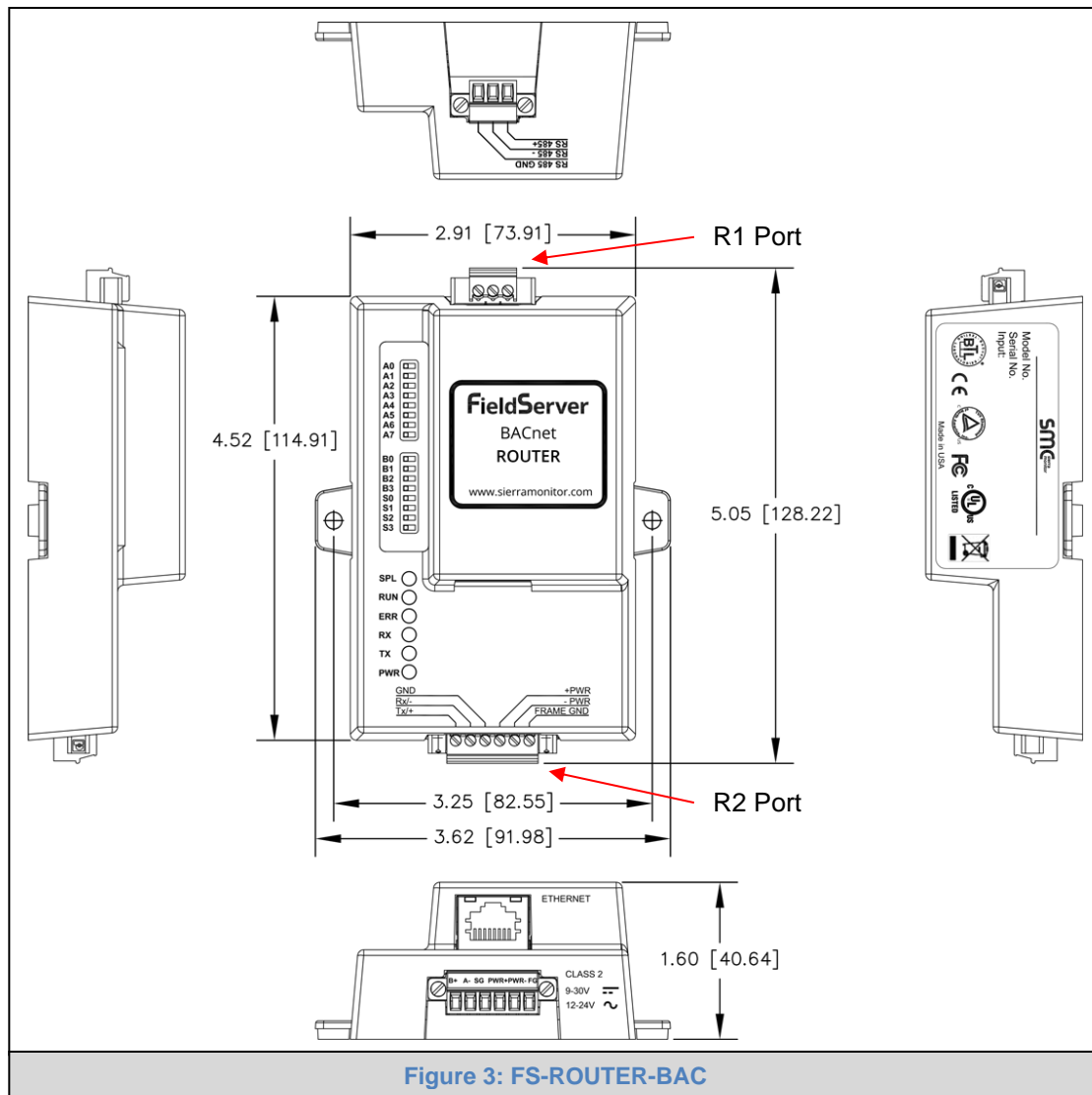
Figure 3: FS-ROUTER-BAC

3.3   R2 Port Jumper Settings

Gently remove the BACnet Router enclosure to access the jumpers on the unit.

3.3.1 Bias Resistors

Bias Resistor Jumper

Figure 4: Bias Resistor Jumper
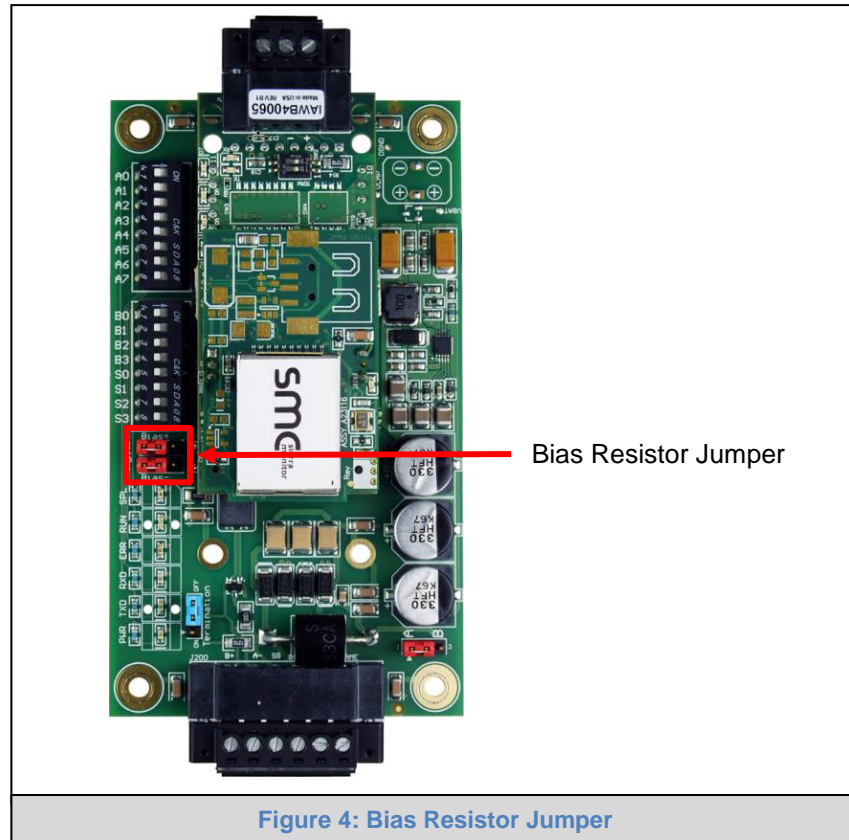
The FieldServer bias resistors are used to keep the RS-485 bus to a known state, when there is no transmission on the line (bus is idling), to help prevent false bits of data from being detected. The bias resistors typically pull one line high and the other low - far away from the decision point of the logic.

In the RS-485 carrier, the bias resistor is 510 ohms which is in line with the BACnet spec. It should only be enabled at one point on the bus (on the field port were there are very weak bias resistors of 100k). Since there are no jumpers, many FieldServers can be put on network without running into the bias resistor limit which is < 500 ohms.

NOTE: See www.ni.com/support/serial/resinfo.htm for additional pictures and notes.

3.3.2 Termination Resistor

Termination Resistor
Jumper
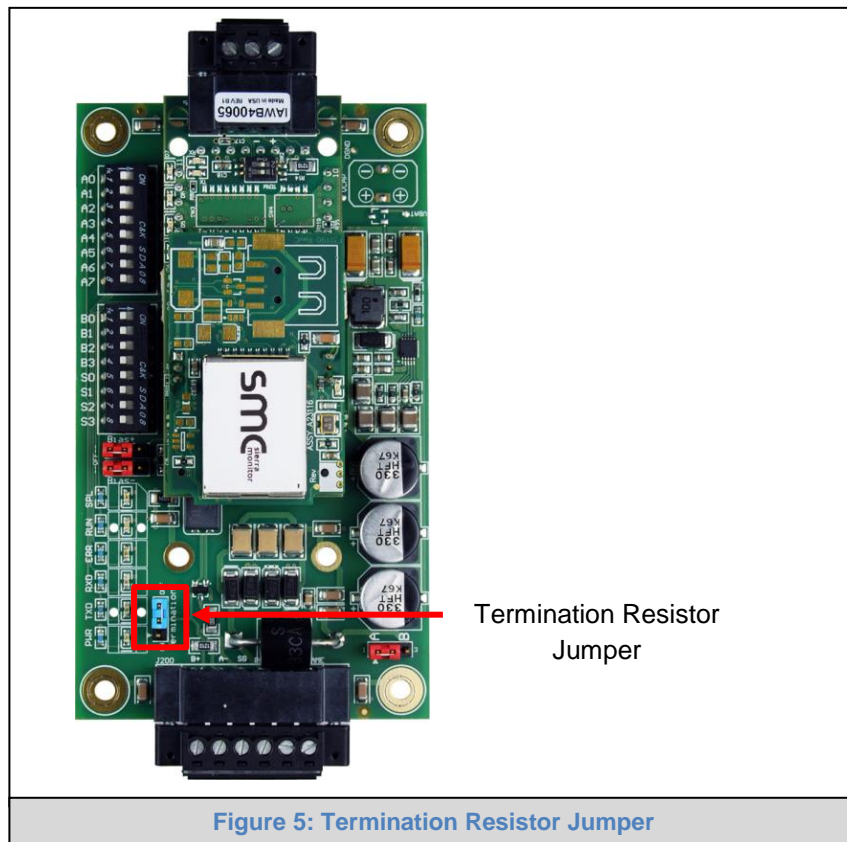
Termination resistors are also used to reduce noise. These pull the two lines of an idle bus together. However, they would override the effect of any bias resistors, if connected.

3.3.3 Power Jumper Settings

Power Jumper Switch in position "A"

Figure 6: Power Jumper Switch
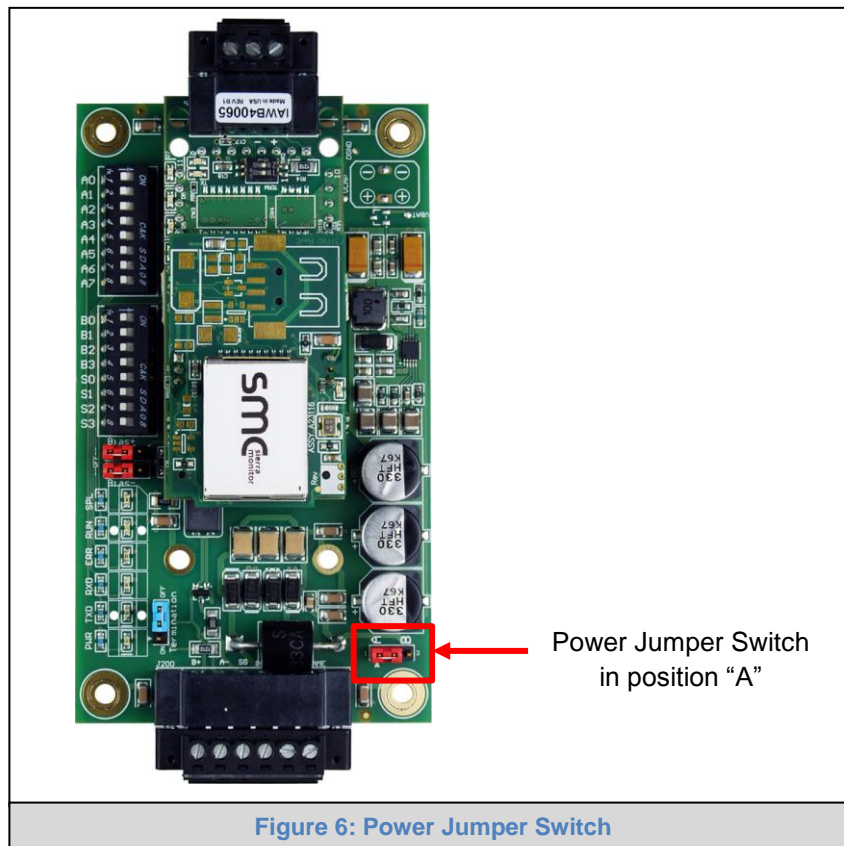
The FieldServer Carrier Board power jumper is set to position A by default but can be changed to position B for other power supply requirements.

Position A: The Carrier makes use of a full-wave rectifying bridge. Can be used for 12-24VAC input or 9 – 30VDC input. At 9VDC this becomes marginal.

Position B: The Carrier makes use of a half-wave rectifying bridge. Best position for grounded AC transformers and for using DC voltage down to 9VDC.

3.4   R1 Port Small DIP Switches

NOTE: Only applies to FS-ROUTER-BAC models.

Gently remove the BACnet Router enclosure to access the small DIP switches for the R1 Port.

Bias Resistor Switch
End of Line Switch
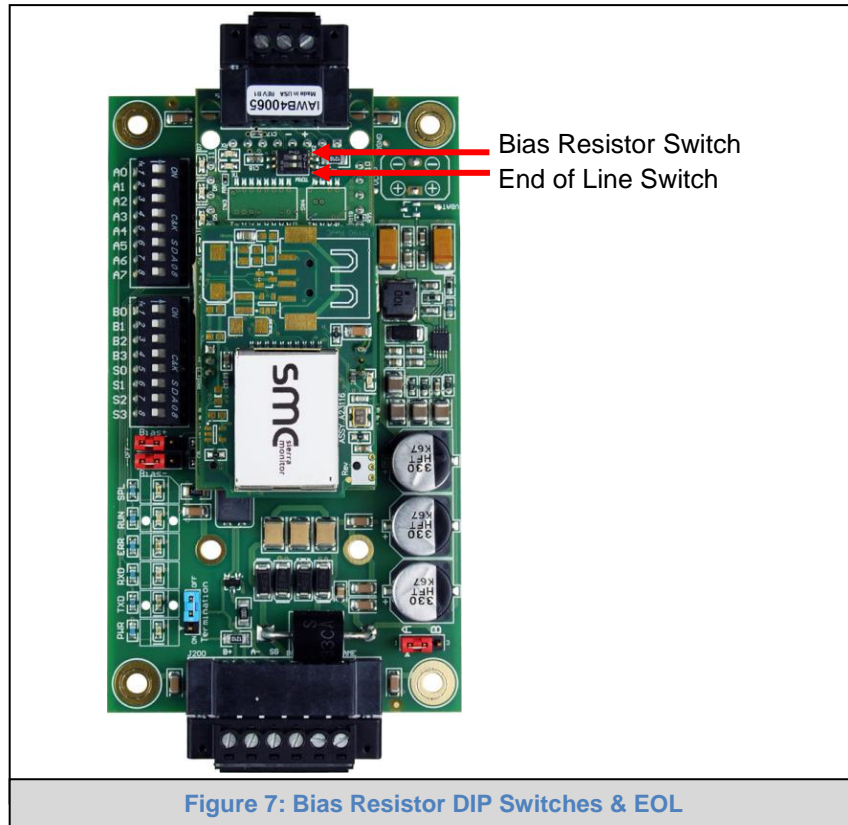
Figure 7: Bias Resistor DIP Switches & EOL

- If more than one RS-485 device is connected to the network, then the field bias resistor switch needs to be enabled to ensure proper communication. **See Figure 7 for the orientation of switch positions referenced below.**
  - ○ The default factory setting is OFF (switch position = right side)
  - ○ To enable biasing, turn the bias switch ON (switch position = left side)

NOTE: Biasing only needs to be enabled on one device. The BACnet Router has 510 ohm resistors that are used to set the biasing.

- If the FieldServer is the last device on the trunk, then the end of line (EOL) termination switch needs to be enabled. **See Figure 7 for the orientation of switch positions referenced below.**
  - ○ The default factory setting is OFF (switch position = right side)
  - ○ To enable the EOL termination, turn the EOL switch ON (switch position = left side)

4   INSTALLING THE BACNET ROUTER

NOTE: Only the 2 port FS-ROUTER-BAC model BACnet Router utilizes the R1 port.

4.1   RS-485 Connection R1 Port

Connect to the 3-pin connector as shown.

Figure 8: Port 1 RS-485 Connection
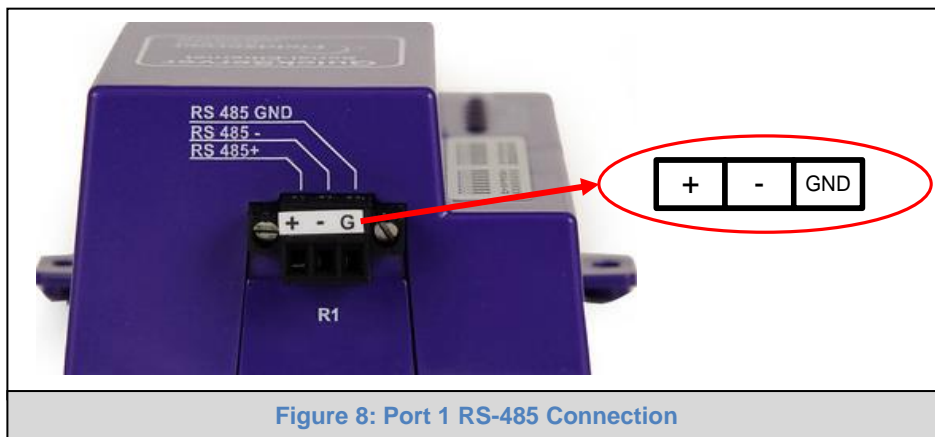
The following Baud Rates are supported on the R1 Port:
9600, 19200, 38400, 57600, 76800, 115200

4.2   RS-485 Connection R2 Port

Figure 9: Port 2 RS-485 Connection
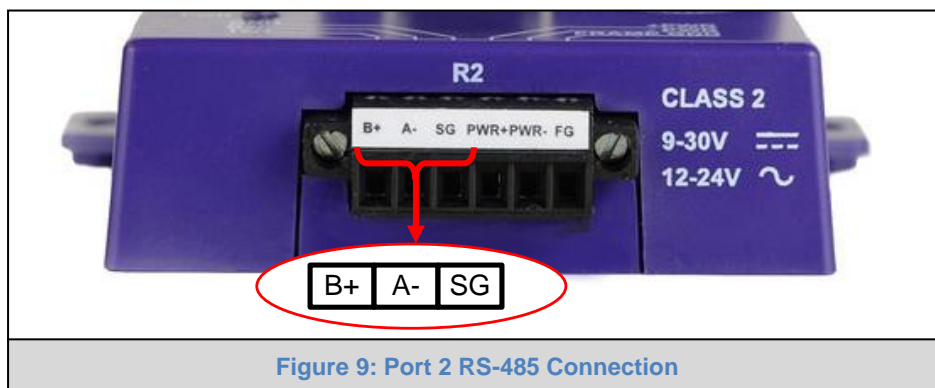
Connect to the 3 pins on the left-hand-side of the 6 pin connector as shown.

The following Baud Rates are supported on the R2 Port:
9600, 19200, 38400, 57600, 76800, 115200

4.3   10/100 Ethernet Connection Port

Figure 10: Ethernet Connection
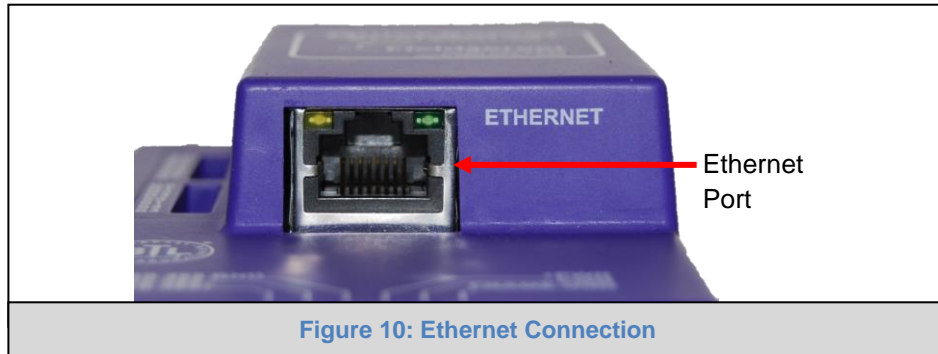
The Ethernet Port is used both for BACnet Ethernet and BACnet/IP communications. It is also used for configuring the router from a Web page.

Connect the router to a BACnet network and optionally to a PC for configuration purposes via an Ethernet cable between the PC and the BACnet Router or connect the BACnet Router and the PC to the switch using a straight CAT5 cable.

5   OPERATION

5.1   Power Up the Device

Apply power to the device. Ensure that the power supply used complies with the specifications provided in **Appendix B**. Ensure that the cable is grounded using the "Frame GND" terminal. The BACnet Router is factory set for 9-30VDC or 12-24VAC.

Figure 11: Power Connection
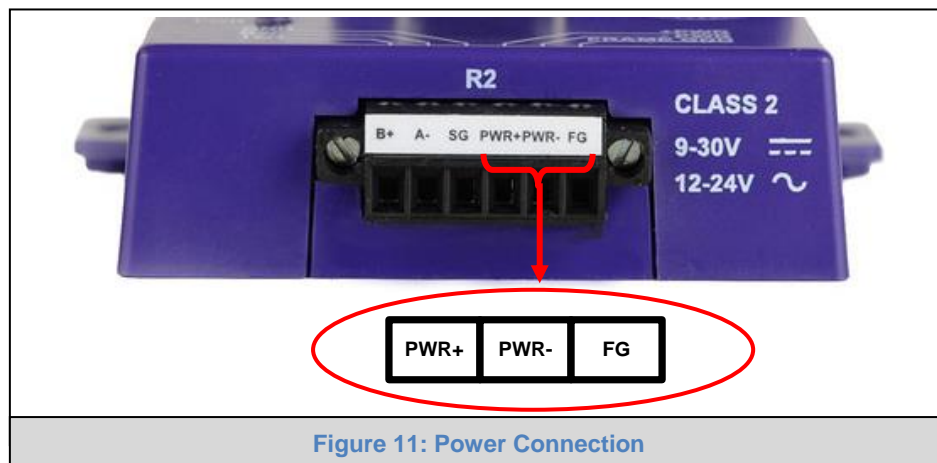
6   CONNECTING TO THE BACNET ROUTER

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.

6.1   Using the FieldServer Toolbox
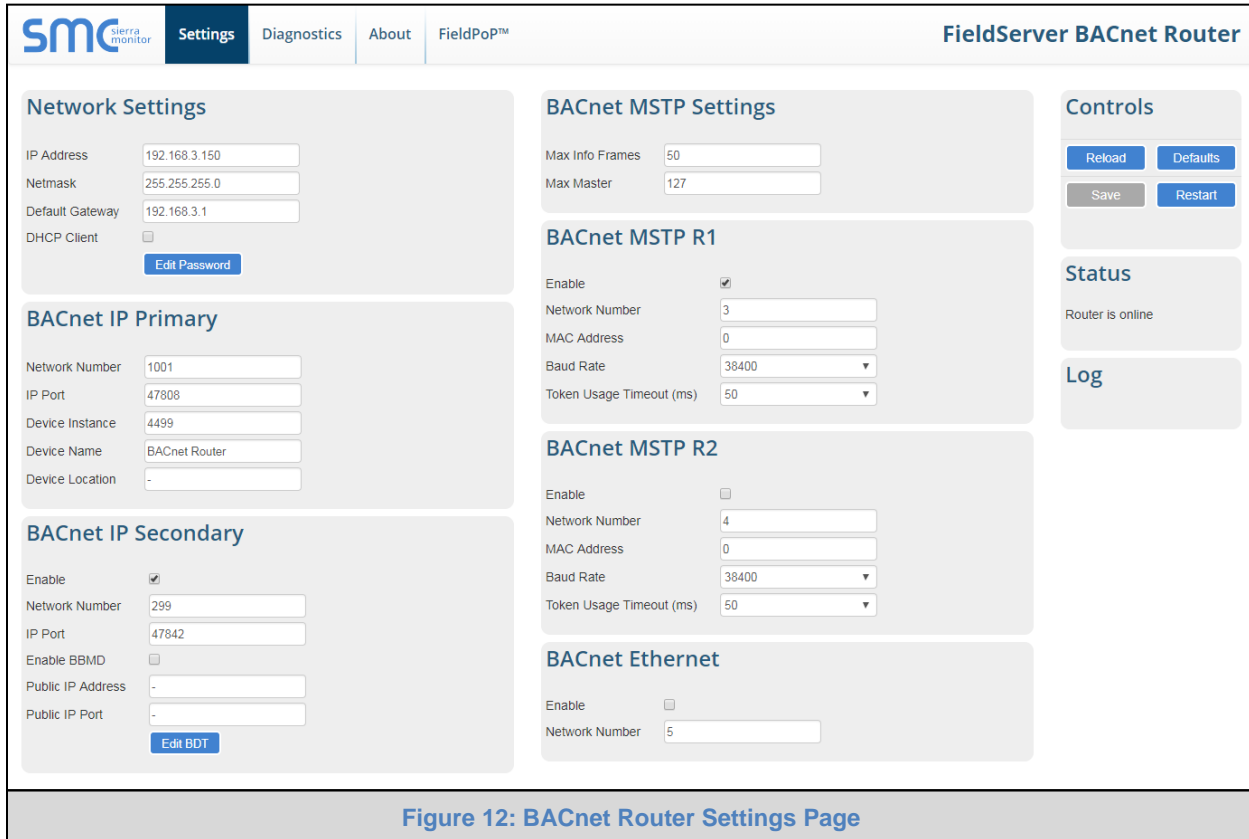
- Install the FS Toolbox application from the USB drive or download it from SMC's website.
- Use the FS Toolbox application to find the BACnet Router, change the IP Address details if required and launch the Web Configurator.

DEVICES	IP ADDRESS	MAC ADDRESS	FAVORITE	CONNECTIVITY	
DCC285 QS.CSV v4.10b	192.168.2.135	00:50:4E:01:02:03	★	●	Connect ⚙ ⎍
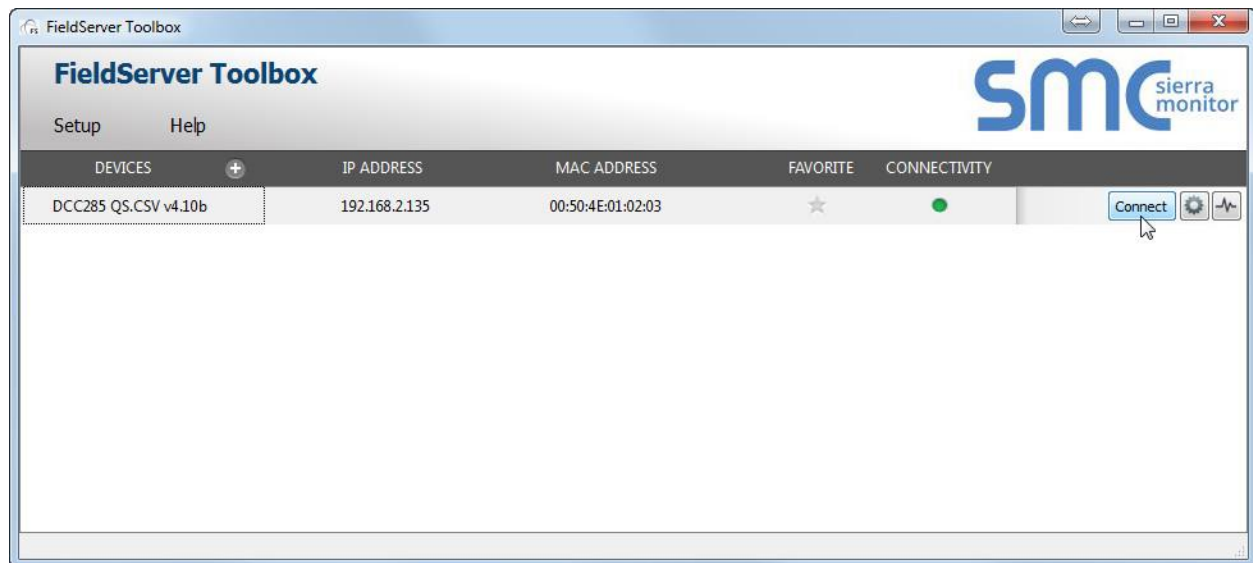
6.2   Using a Web Browser Directly

- 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 12: BACnet Router Settings Page

NOTE: The FieldPoP™ tab FieldPoP™ (see Figure 12) 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**.

7   CONFIGURING THE BACNET ROUTER

7.1   Settings

7.1.1 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.

7.1.2 Network Settings
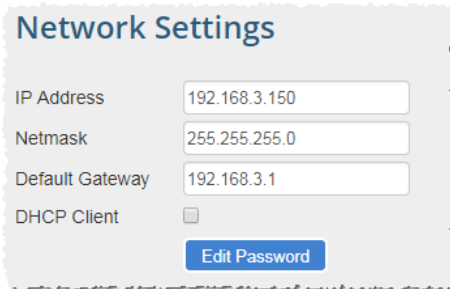
The IP settings for the router are also used by both BACnet/IP connections. The IP settings can be changed in the Network Settings section as shown.

7.1.3 Multiple Connections
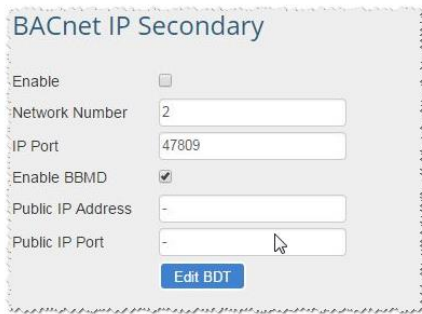
- **Network Number** – set up the BACnet network number for the connection. Legal values are 1-65534. Each network number must be unique across the entire BACnet internetwork.

- **Enable** – enable or disable the connection; note that BACnet/IP Primary is always enabled.

7.1.4 BACnet/IP Primary

- **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.

- **IP Port** – the BACnet/IP default is 47808 (0xBAC0), but a different port number may be specified here.

7.1.5 BACnet/IP Secondary

BACnet IP Secondary

Enable	☐
Network Number	2
IP Port	47809
Enable BBMD	☑
Public IP Address	-
Public IP Port	-

[Edit BDT]

- **Enable BBMD** – select this checkbox to enable the Router to act as a BBMD.

- **IP Port** – this MUST be different to the IP Port used on the BACnet/IP Primary connection. Default is 47809 (0xBAC1).

- **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.

7.1.6 BACnet MS/TP and BACnet Ethernet

BACnet MSTP Settings

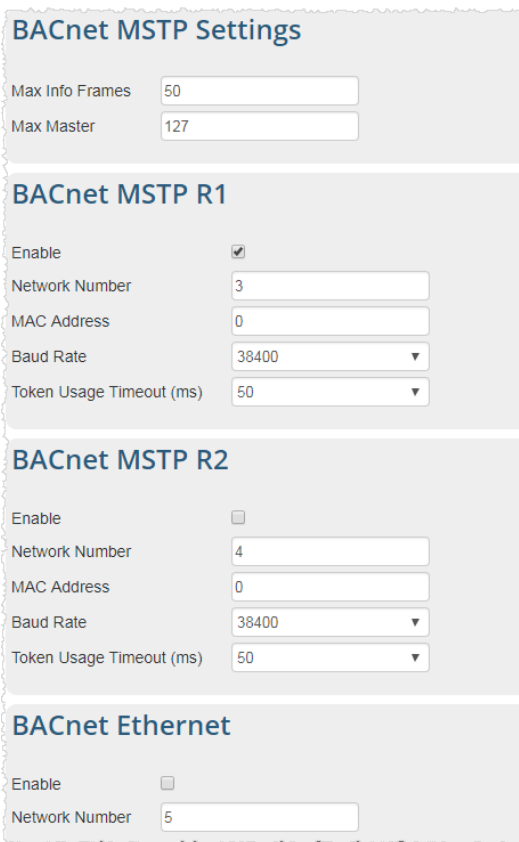|	
Max Info Frames	50
Max Master	127

BACnet MSTP R1

Enable	☑
Network Number	3
MAC Address	0
Baud Rate	38400
Token Usage Timeout (ms)	50

BACnet MSTP R2

Enable	☐
Network Number	4
MAC Address	0
Baud Rate	38400
Token Usage Timeout (ms)	50

BACnet Ethernet
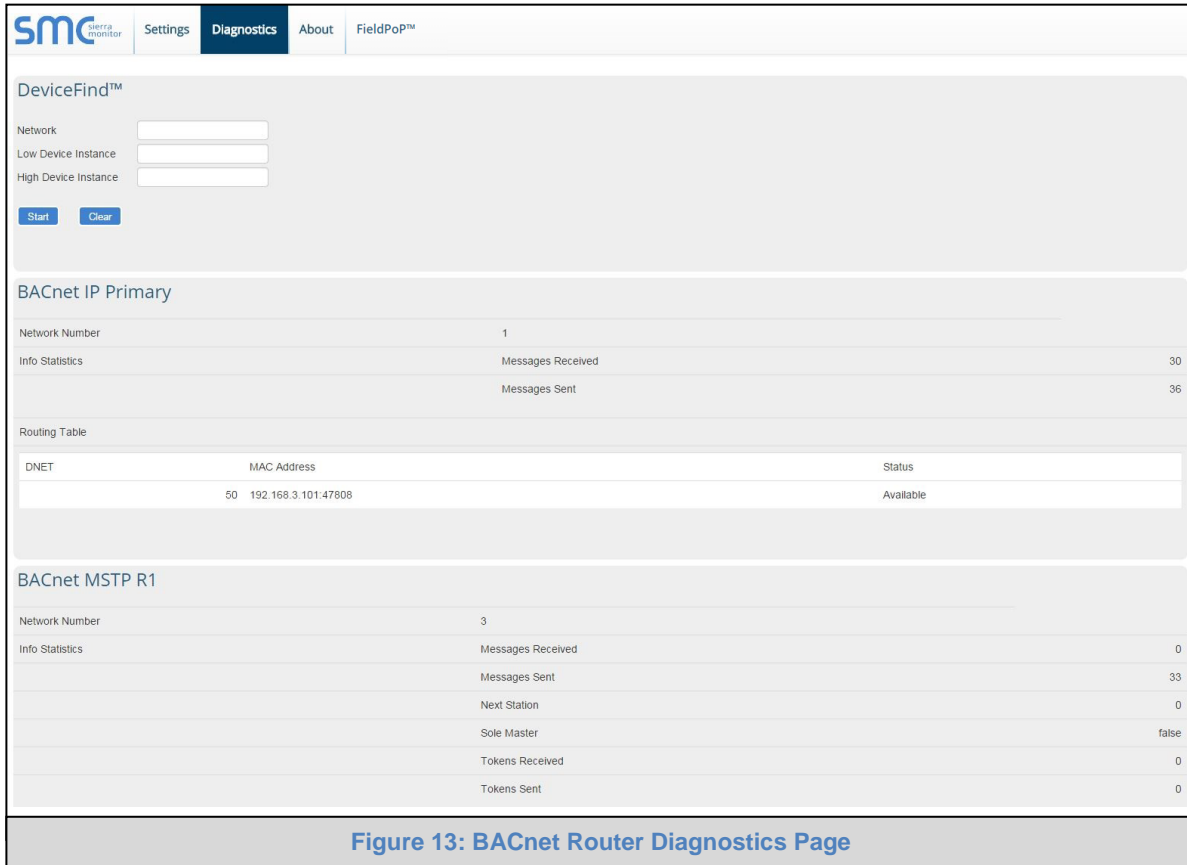
Enable	☐
Network Number	5

- **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.

7.2 Diagnostics

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

Figure 13: BACnet Router Diagnostics Page

7.2.1 DeviceFind™

The diagnostics page offers a DeviceFind™ function for listing BACnet devices that are visible to the router. A configurable Who-Is broadcast is sent out when the 'Start' button is pressed, and I-Am responses received back from the field are listed, along with the name of the router port by which each device can be reached.

DeviceFind™ is limited to 300 devices. There may be more devices on a large BACnet network, and the Who-Is request can be limited to devices of interest by configuring discovery parameters.

Figure 14: BACnet Router DeviceFind™
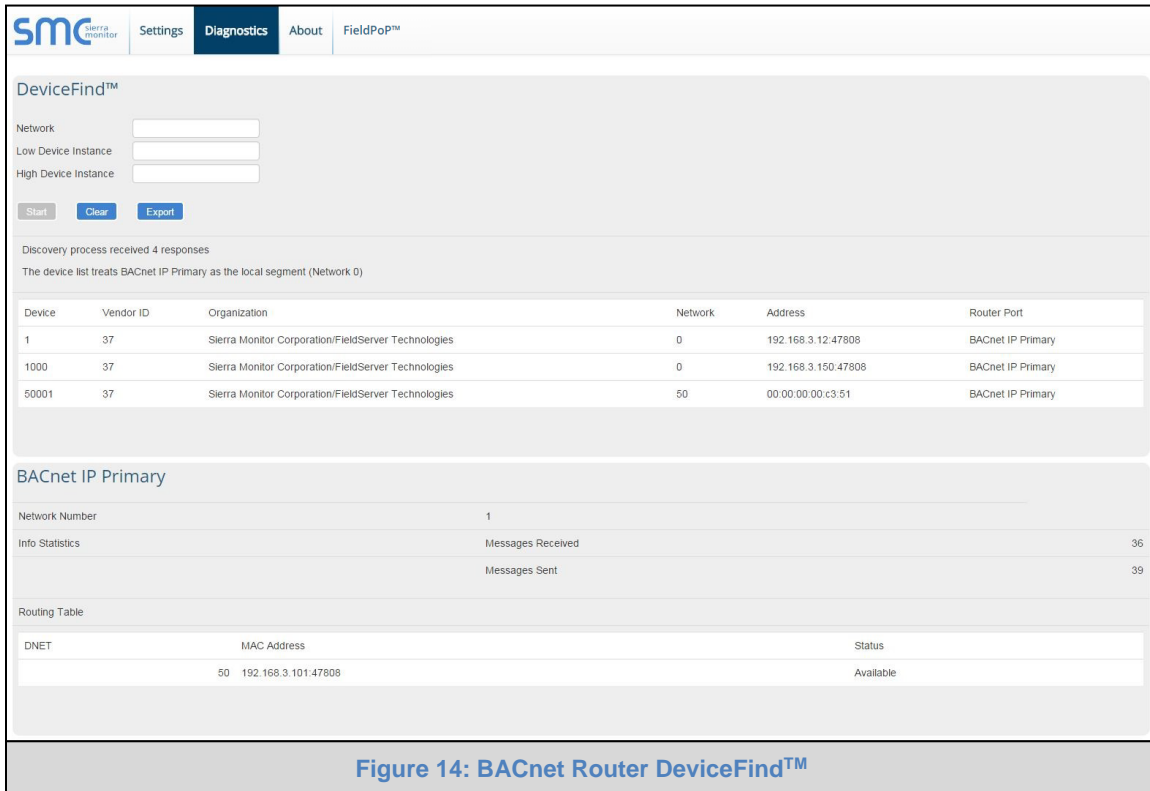
The following fields exist for configuring the Who-Is broadcast (all are optional):

- **Low Device Instance** – sets a low limit for the Device Instance. Devices with a lower instance number will ignore the Who-Is request.

- **High Device Instance** – sets a high limit for the Device Instance. Devices with a higher instance number will ignore the Who-Is request.

- **Network** – broadcasts the Who-Is request only on the BACnet network segment with the specified network number. This depends on the router being able to find the specified network.

DeviceFind™ is performed by the device object configured on the router. Since this device is bound locally to the BACnet/IP Primary segment, all devices present on this BACnet segment will appear as local devices with network number 0. Also, to discover only the devices present on this BACnet segment, set the Network parameter to 0.
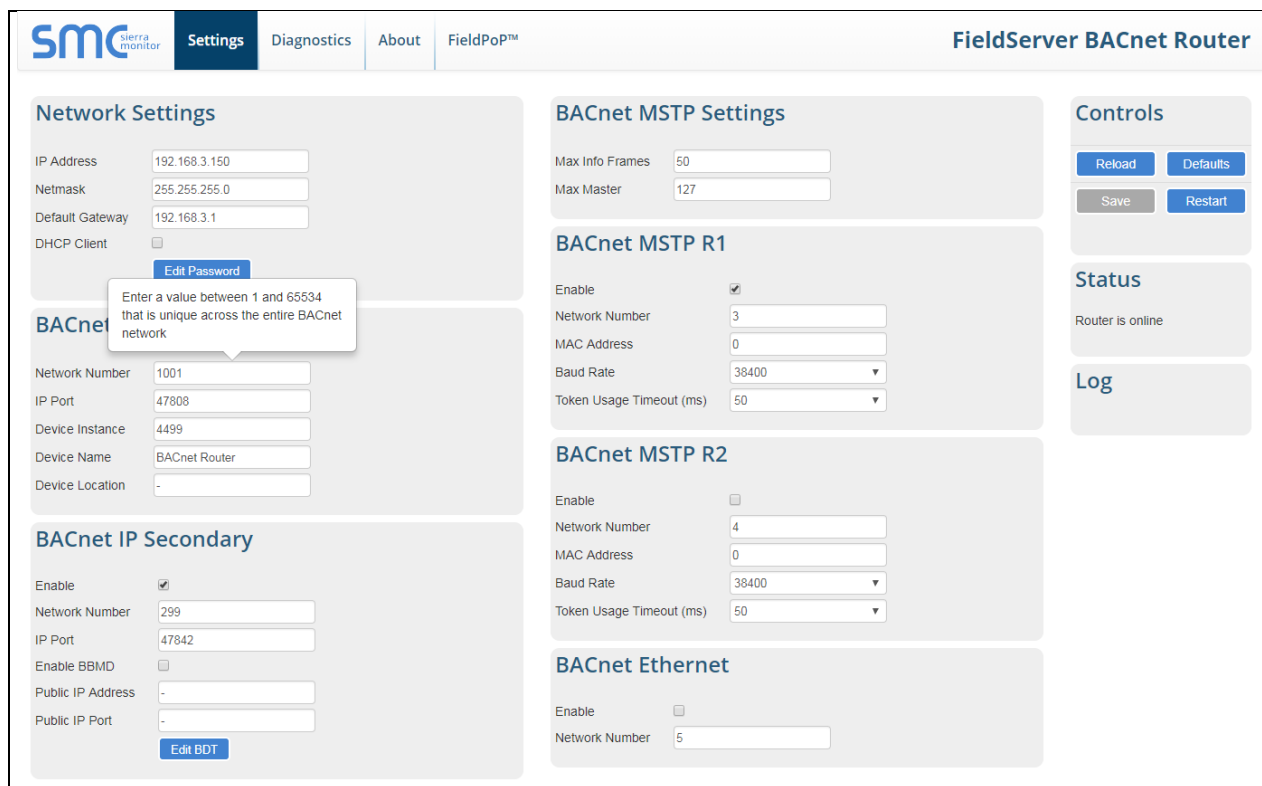
7.2.1.1 Export Button

This button appears when some devices have been discovered. The user may click this button to save the list of discovered devices to a file called "BACnet Devices.csv".

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 except Network Settings input fields.


Parameter	Corresponding Tooltips
IP Address	Configure the IP Address used by BACnet/IP and the web server.
Netmask	Configure the Netmask used by BACnet/IP and the web server.
Default Gateway	Configure the Default Gateway used by BACnet/IP and the web server.
DHCP Client	Note that the IP Address may change and you may need to rediscover the router if the DHCP Client is enabled.
Network Number	Enter a value between 1 and 65534 that is unique across the entire BACnet network.
IP Port	The IP Port number to be used for this BACnet/IP connection. Common values: 47808, 47809.
Device Instance	Enter a value between 0 and 4194302. The Device Instance must be unique across the entire BACnet network.
Device Name	Enter a name for the Device. The name may not contain any commas.
Device Location	Enter a location for the Device. The location may not contain any commas.
MAC Address	Enter a value between 0 and 127 that is unique for this MS/TP segment.
Max Master	Sets the highest allowable address for MS/TP master nodes on the network. Set a value between 0 and 127.
Max Info Frames	The number of frames that can be sent by this device during a single token hold. Set a value between 1 and 100.
Token Usage Timeout (ms)	Set a larger value to improve network reliability with slow devices.

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

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 will allow technical support to rapidly diagnose the problem.

NOTE: **While all necessary documentation is shipped with the FieldServer on the USB flash drive, these documents are constantly being updated. Newer versions may be available on the Sierra Monitor website.**

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor website website's Software Downloads.

- Extract the executable file and complete the installation.

Ethernet Port

Figure 15: Ethernet Port Location
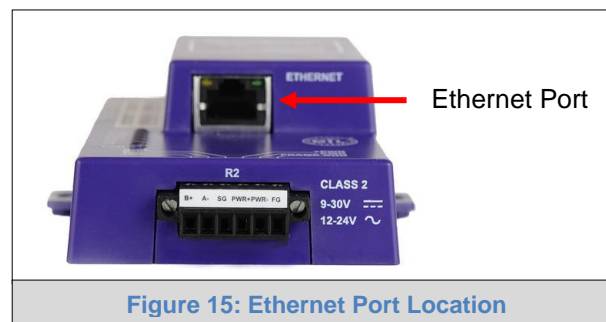
- Connect a standard CAT5 Ethernet cable between the PC and FieldServer.

- Double click on the FS Toolbox Utility.

Step 1: Take a Log

o Click on the diagnose icon 〽 of the desired device
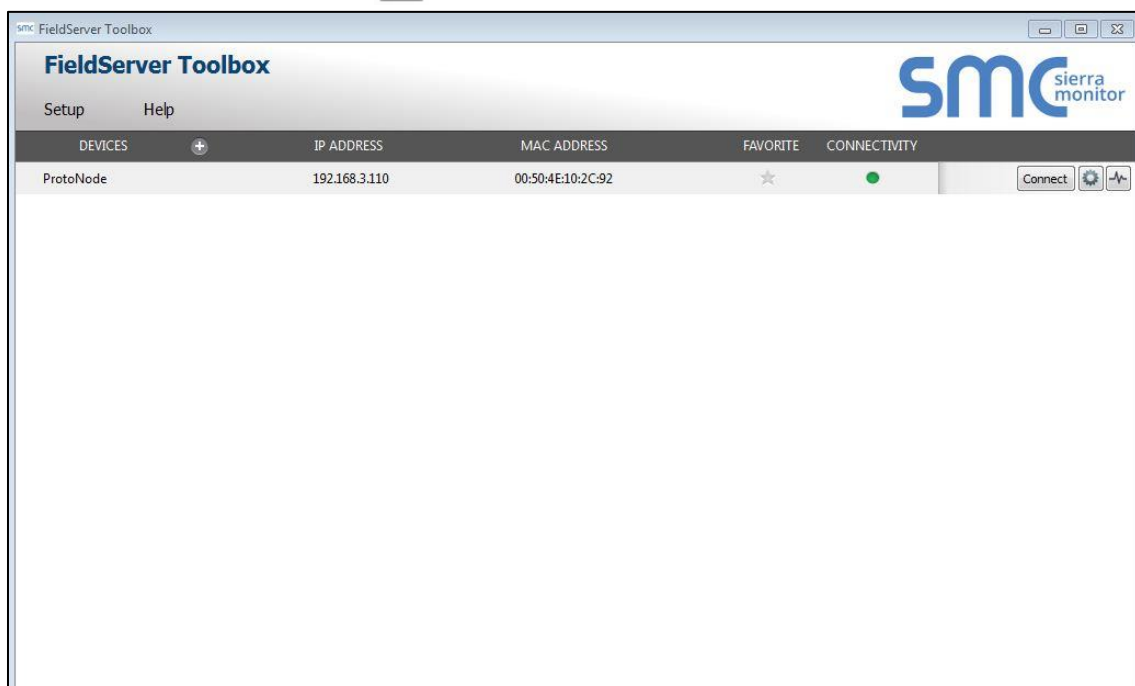
o   Ensure "Full Diagnostic" is selected (this is the default)
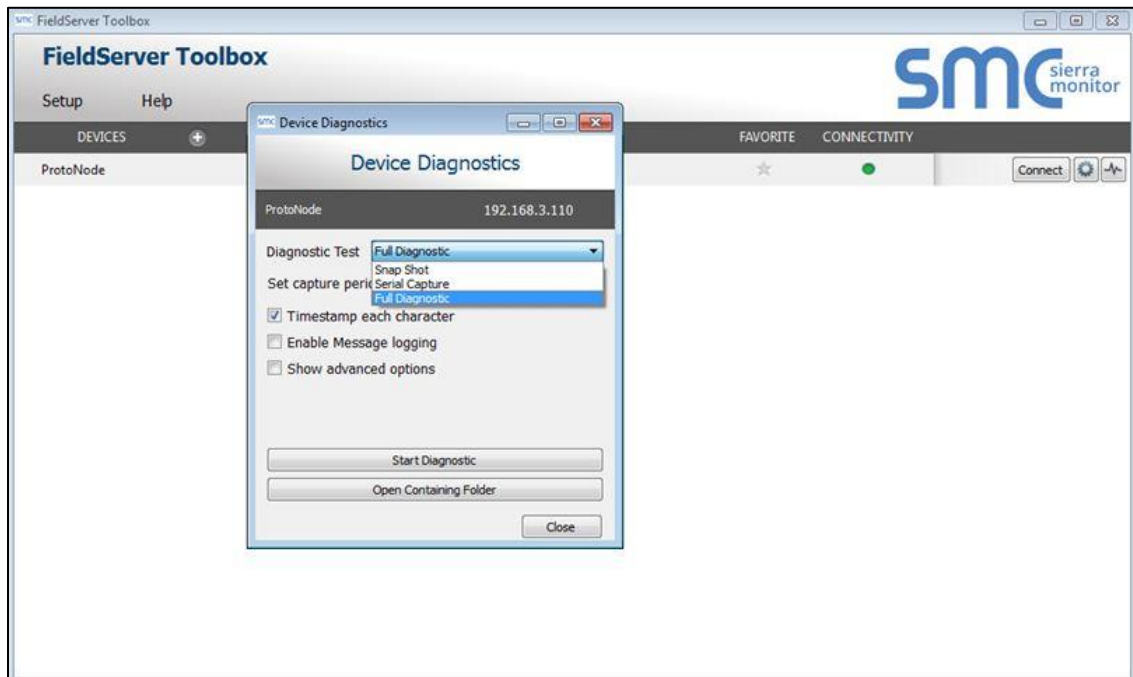
NOTE: If desired, the default capture period can be changed.

o   Click on "Start Diagnostic"
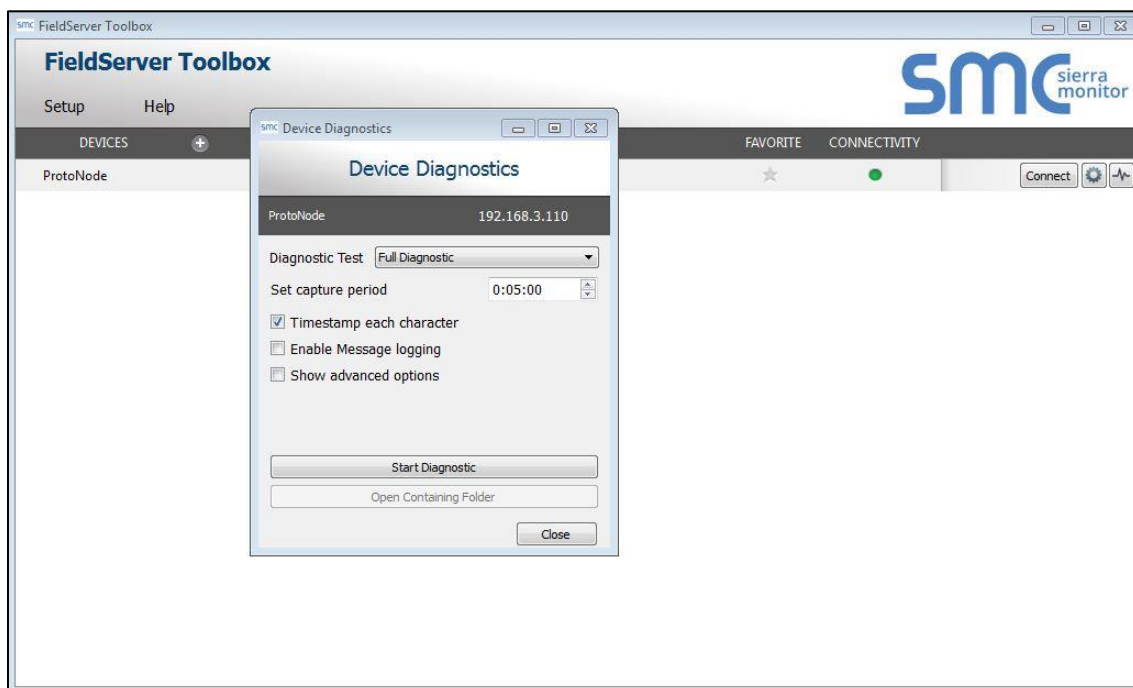
o   When the capture period is finished, the "Diagnostic Test Complete" window will appear

Step 2: Send Log

- o Once the diagnostic test is complete, a .zip file will be saved on the PC
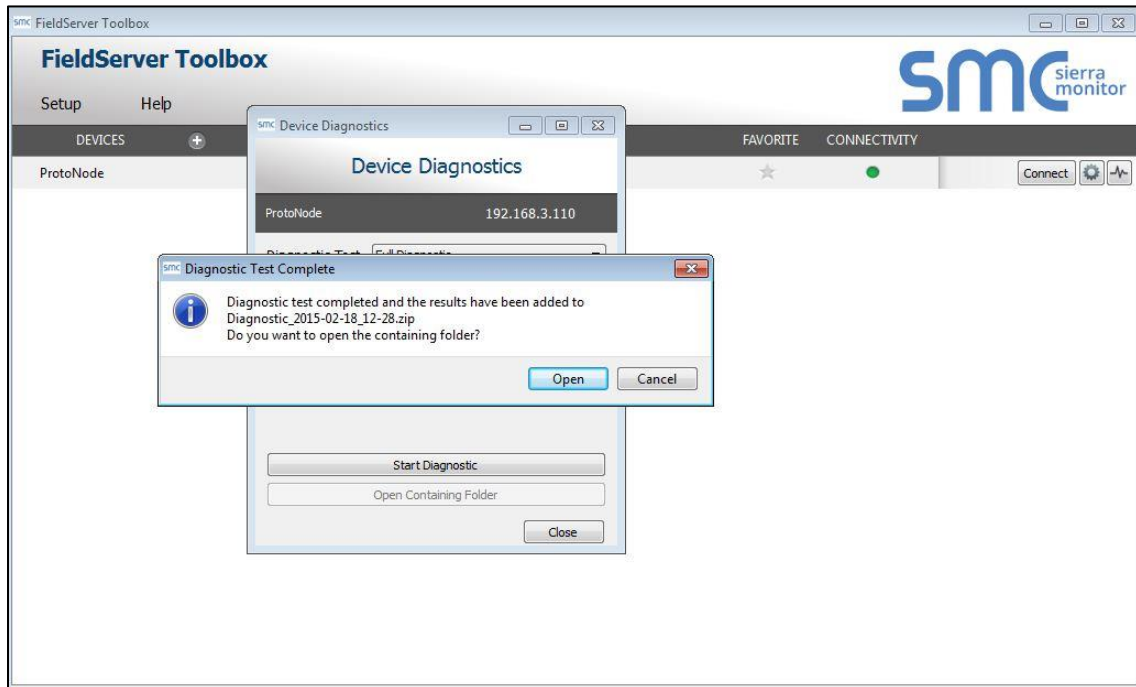
- o Click "Open" to launch explorer and have it point directly at the correct folder

- o Email the diagnostic zip file to **support@sierramonitor.com**
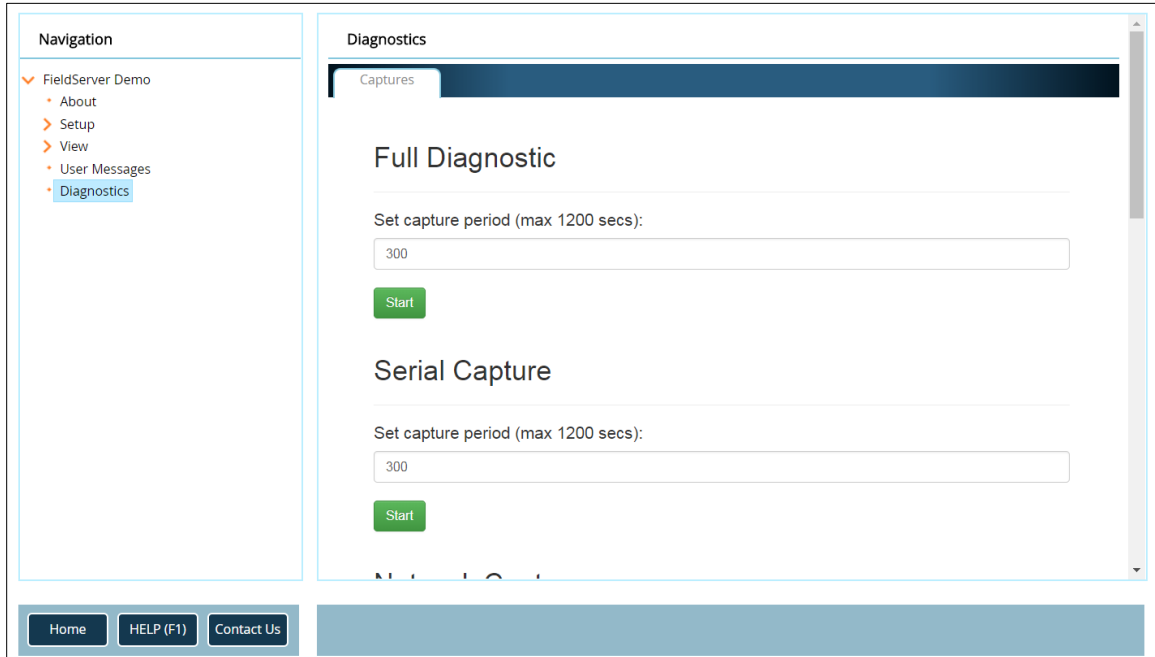
Appendix A.3. Take a Diagnostic Capture with FS-GUI
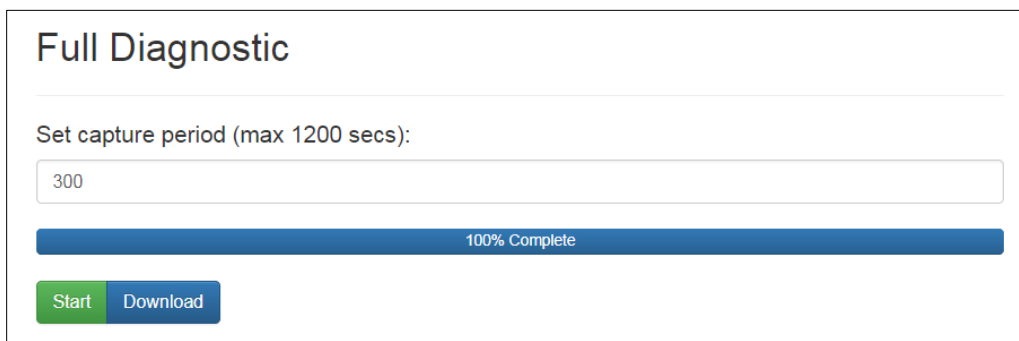
Diagnostic Capture with FS-GUI is only available on FieldServers with a bios updated/released on November 2017 or later. Completing a Diagnostic Capture through the FieldServer allows network connections (such as Ethernet and Wi-Fi) to be captured.

**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 caputure to be downloaded to the local PC.

- Send the diagnostic zip file to technical support.

Appendix B Specifications

	FS-ROUTER-BACX[1]
Available Ports	One 6-pin Phoenix connector: RS-485 +/- ground port, power +/- frame ground port One 3-pin RS-485 Phoenix connector: RS-485 +/- ground port One Ethernet-10/100 port
Power Requirements	Input Voltage: 9-30VDC or 12-24VAC Input Power: Frequency 50/60 Hz. Power Rating: 2.5 Watts Current draw @ 12V, 150 mA
Approvals	UL 916 approved WEEE compliant RoHS compliant FCC part 15 compliant BTL certified - level 12 CE certified
Surge Suppression	
EN61000-4-2 ESD EN61000-4-3 EMC EN61000-4-4 EFT	
Physical Attributes[2]	
Dimensions[3]	5.05 x 2.91 x 1.6 in. (12.82 x 7.39 x 4.06 cm)[4]
Weight	0.4 lbs. (0.2 Kg)
Environment	
Operating Temperature	-40°C to 75°C (-40°F to167°F)
Humidity	5 - 90% RH (non-condensing)

"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."

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[1] Specifications subject to change without notice
[2] Excluding external power supply
[3] Excluding mounting tabs
[4] WxDxH

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.