



## BACnet Explorer Next Generation (NG) FS-BENG-X Start-up Guide

### APPLICABILITY & EFFECTIVITY

Effective for all systems manufactured after March 2017.

Document Revision: 1.C

## Technical Support

Thank you for purchasing the BACnet Explorer from Sierra Monitor Corporation.

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

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## **1 BACNET EXPLORER DESCRIPTION**

The BACnet Explorer NG provides a discovery tool for any BACnet/IP or BACnet MS/TP network without any additional dongles or installations needed. BBMD BACnet network discovery is also supported.

The BACnet Explorer comes in two models. The FS-BENG-W model has one RS-485 port, one Ethernet 10/100 port and supports Wi-Fi network connection. The FS-BENG-C model supports cellular connections as well as all ports and support offered by the FS-BENG-W model.

Additionally, the Explorer acts as a Wi-Fi access point for modern web based configuration and remote access from any mobile device without user restrictions.

The BACnet Explorer NG also includes Monitor View and Historian data analysis features that allow tracking and logging of individual device data points across the connected network in real-time.

## 2 EQUIPMENT SETUP

### 2.1 Physical Dimensions

#### 2.1.1 FS-BENG-C Drawing

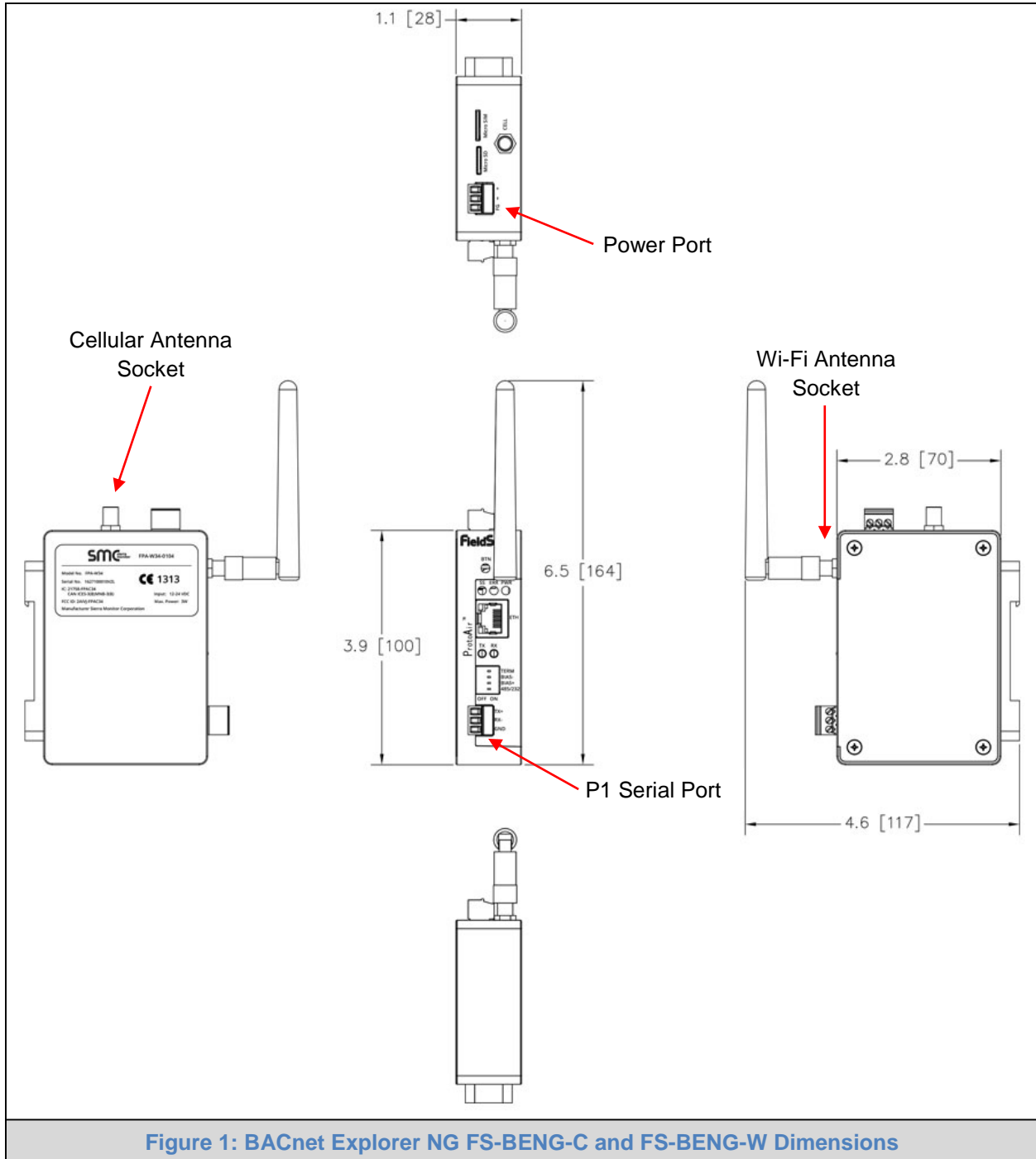


Figure 1: BACnet Explorer NG FS-BENG-C and FS-BENG-W Dimensions

**NOTE:** The drawing above includes the cellular antenna and SIM card slot on the top side of the unit. These only exist on the FS-BENG-C and not on the FS-BENG-W.

## 2.1 Mounting

The BACnet Explorer NG can be mounted using the DIN Rail Mounting Bracket on the back of the unit.

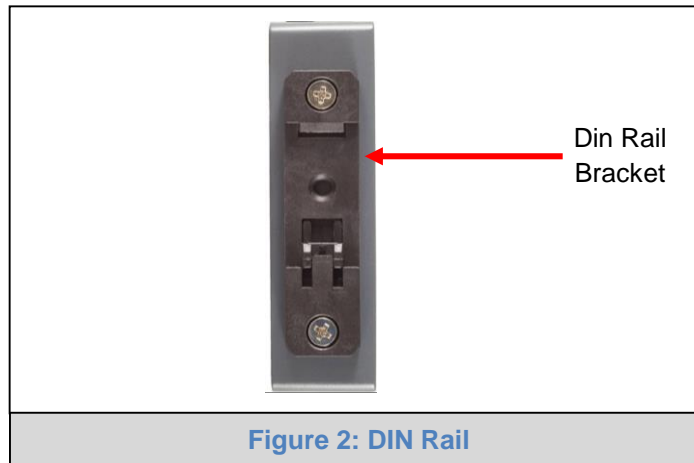


Figure 2: DIN Rail

## 2.2 Attaching the Antenna(s)

### Wi-Fi Antenna:

If using the FS-BENG-W (Wi-Fi) or FS-BENG-C (Cellular & Wi-Fi) models, screw in the Wi-Fi antenna to the front of the unit as shown in [Figure 1](#).

### Cellular Antenna:

If using the FS-BENG-C model, screw in the long cellular antenna on the top of the unit as shown in [Figure 1](#).

### 3 INSTALLING THE BACNET EXPLORER

#### 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.

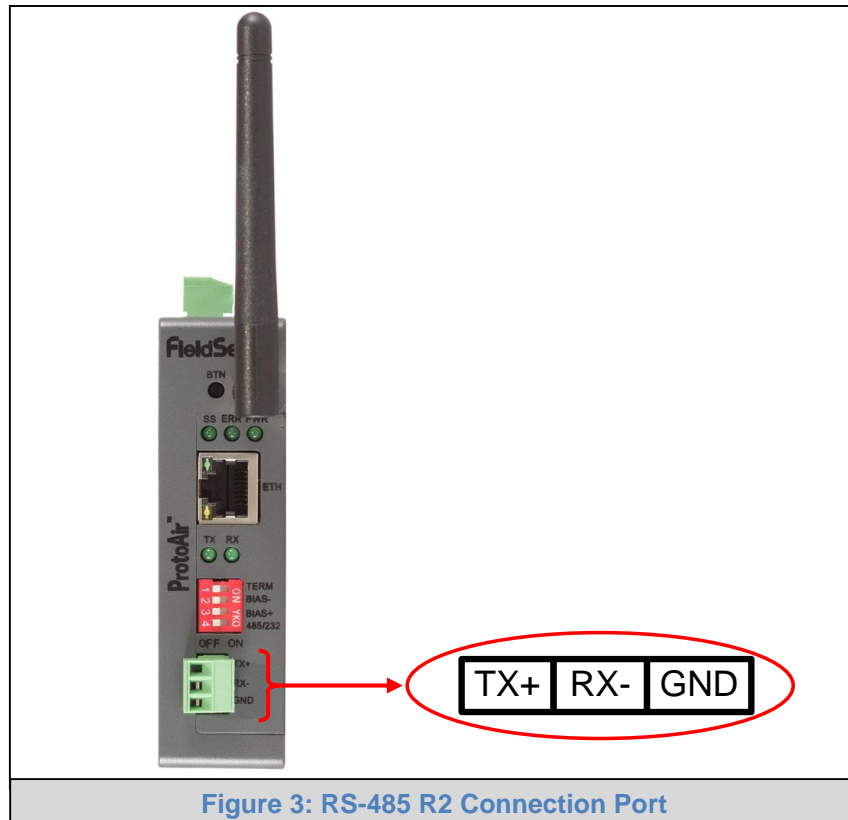


Figure 3: RS-485 R2 Connection Port

The following Baud Rates are supported on the P1 Port:  
9600, 19200, 38400, 57600, 76800

##### 3.1.1.1 Wiring

RS-485	
BMS RS-485 Wiring	BACnet Explorer NG Pin Assignment
RS-485 +	TX +
RS-485 -	RX -
GND	GND

**NOTE: Use standard grounding principles for GND.**



3.2 10/100 Ethernet Connection Port

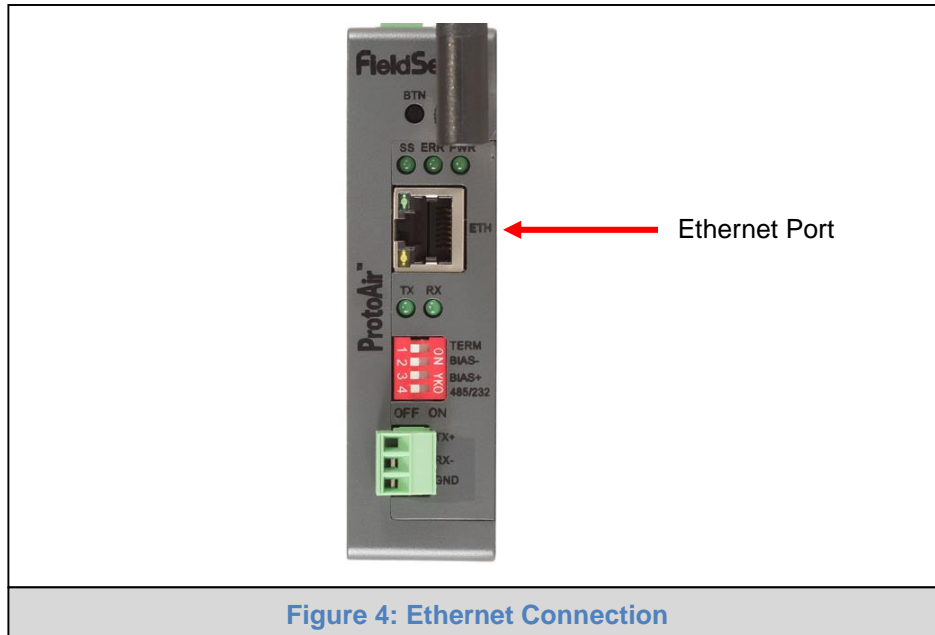


Figure 4: Ethernet Connection

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

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

## 4 OPERATION

### 4.1 Power up the Device

Apply power to the device. Ensure that the power supply used complies with the specifications provided. Ensure that the cable is grounded using the FG or “Frame GND” terminal. The BACnet Explorer NG is powered by 12-24V DC.

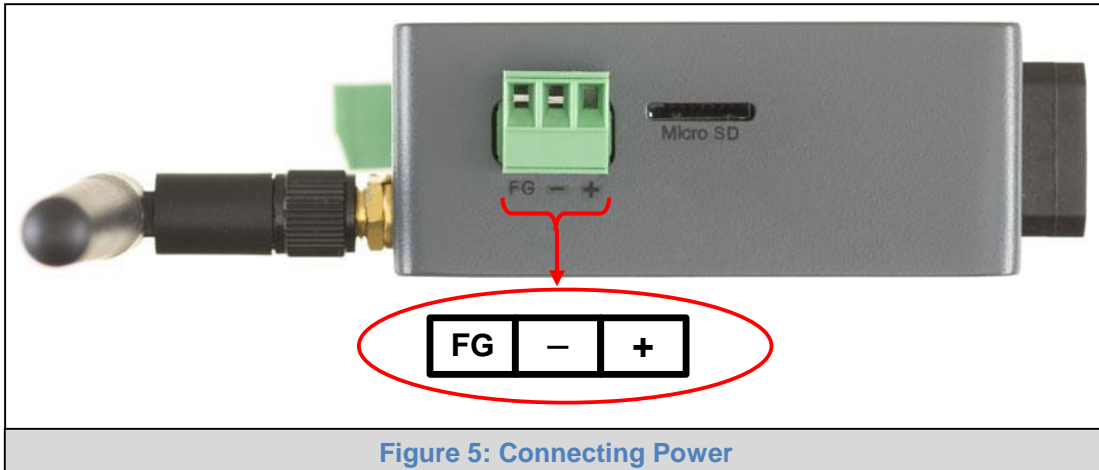


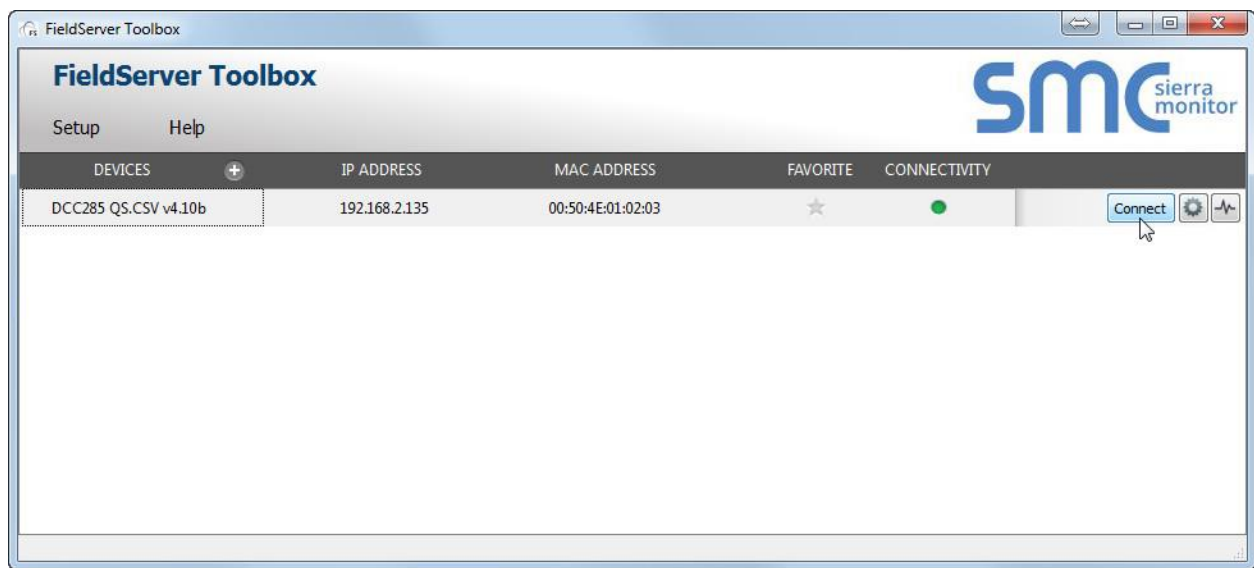
Figure 5: Connecting Power

## 5 CONNECTING TO THE BACNET EXPLORER

The FieldServer Toolbox Application can be used to discover and connect to the BACnet Explorer on a local area network. To manually connect to the BACnet Explorer using the Toolbox, click on the plus icon (+) and enter the IP Address, or enter the Internet IP Address into a web browser.

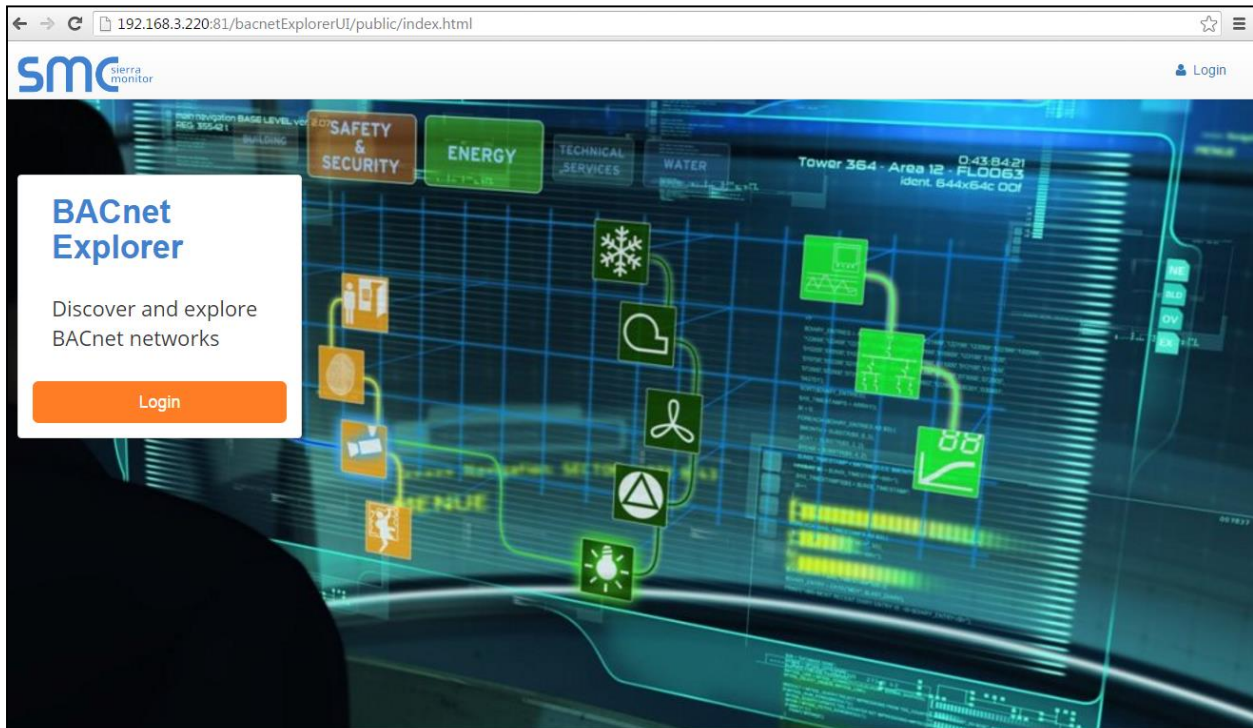
### 5.1 Using the FieldServer Toolbox

- Install the Toolbox application from the USB drive or get it from the Sierra Monitor website <http://www.sierramonitor.com/customer-care/resource-center?filters=software-downloads>
- Use the Toolbox application to find the BACnet Explorer, change the IP Address details (if required) and launch the Web App (by clicking the Connect button).



## 5.2 Connect Using a Web Browser

- Open a Web Browser and input the BACnet Explorer's IP Address. The Default IP Address of the BACnet Explorer is **192.168.1.24**, Subnet Mask is **255.255.255.0**.
- If the PC and the BACnet Explorer are on different IP Networks, assign a Static IP Address to the PC on the 192.168.2.X network.



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Figure 6: BACnet Explorer Login Page

### 5.3 Logging into BACnet Explorer

- Click the orange “Login” button and enter user name and password information into the Login Window.

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

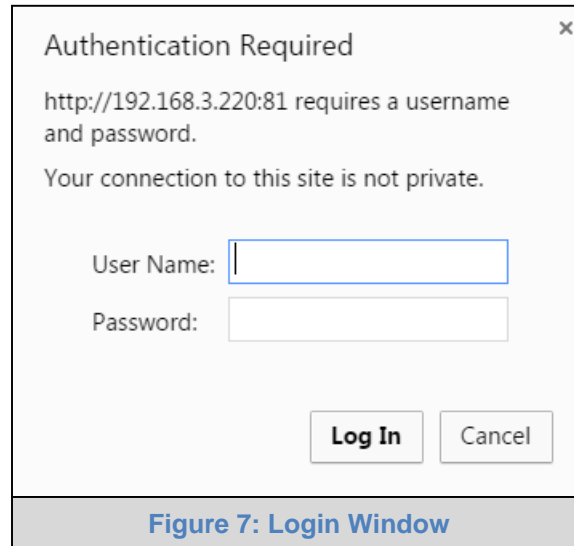


Figure 7: Login Window

- The BACnet Explorer landing page will open once valid user information has been entered and the “Log In” button is clicked.

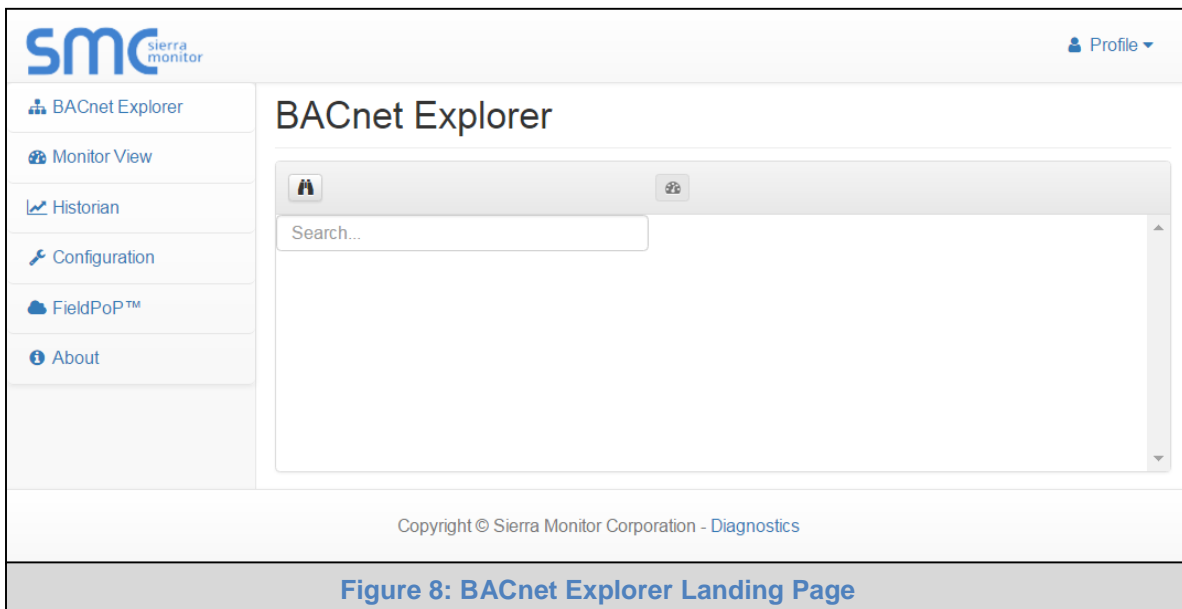





Figure 8: BACnet Explorer Landing Page

**NOTE:** The FieldPoP™ tab  (see Figure 8) allows users to connect to FieldPoP, Sierra Monitor’s device cloud solution for the IIOT. FieldPoP enables secure remote connection to field devices through a FieldServer and its local applications for configuration, management, maintenance. For more information about FieldPoP, refer to the [FieldPoP™ Device Cloud Start-up Guide](#).

### 5.3.1 Change Password

- Once logged in, click on the profile dropdown menu (  ) in the top right corner of any page.
- Then click on Settings (  ) to open the Profile Settings window.

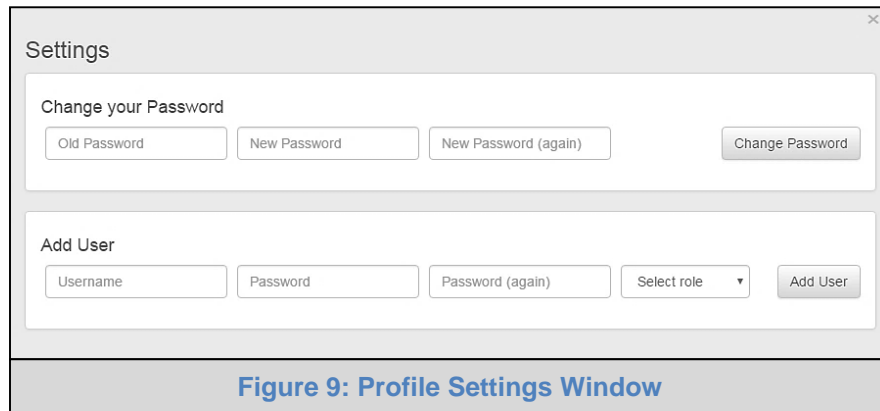


Figure 9: Profile Settings Window

- Fill in the old password and the two new password fields, then click the change password button.
- A successful password update message will appear, click the “x” in the upper right corner of the window to exit the Profile Settings window.

### 5.4 Add Additional Users

- Once in the Profile Settings window, fill in the username, the two password and role fields.

**NOTE: An administrator role has full access to the BACnet Explorer and user management, while a user role does not have user management capability.**

- Click the Add User button to save the new user.

### 5.5 Manage Users

- When more than one user is generated for the BACnet Explorer, the Manage Users field will appear in the Profile Settings window.

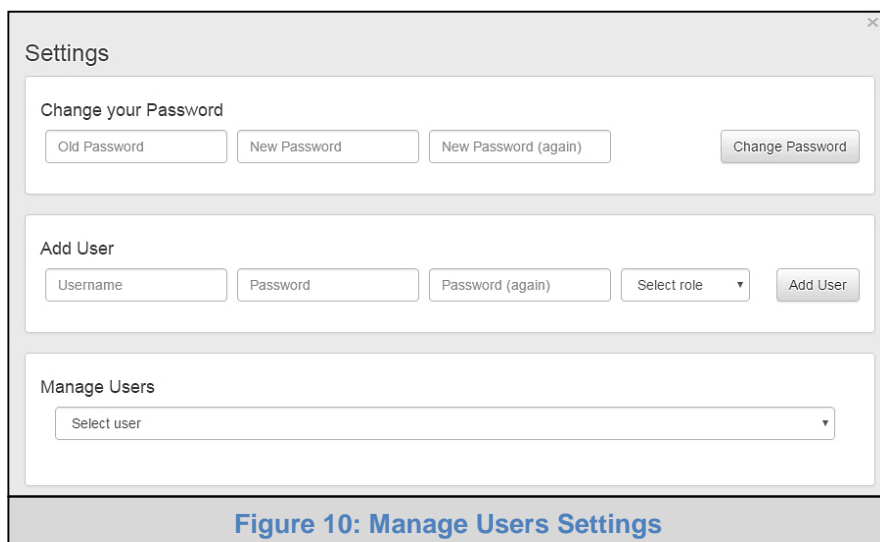
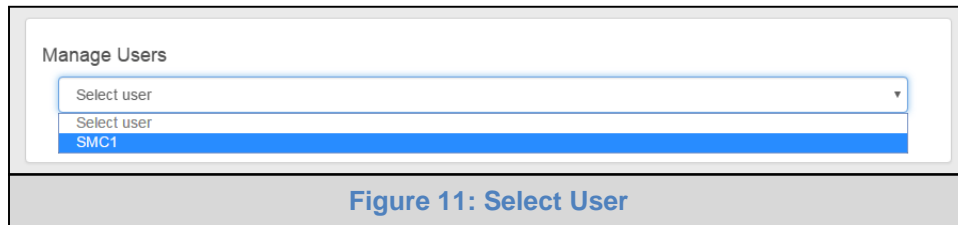


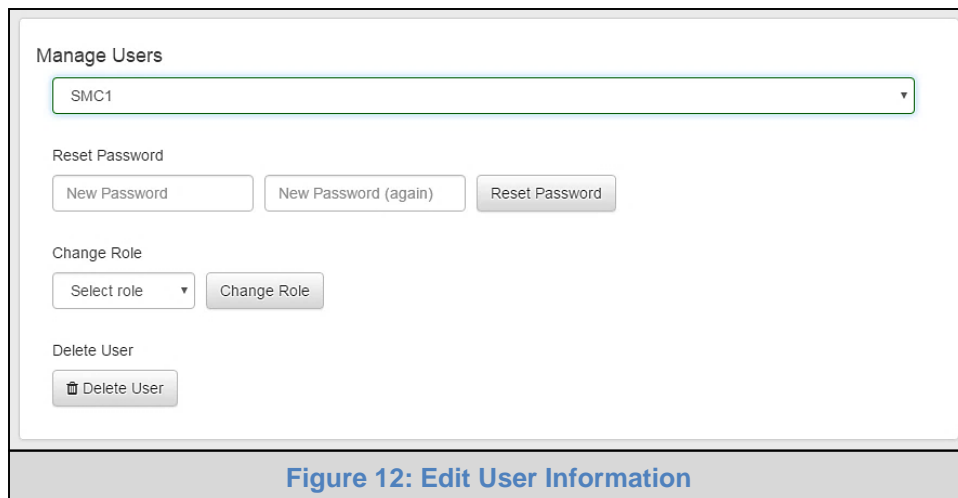
Figure 10: Manage Users Settings

**NOTE: Only administrators are able to see and edit the Manage User fields.**

- To edit a user entry, select a specific user from the dropdown menu.



- This opens up multiple fields that allow editing of user information.



- Select the action to perform:
  - Reset user password – Fill in the two password fields and click the Reset Password button
  - Change user role – Select the desired role in the dropdown menu and click the Change Role button
  - Delete user – Simply click the Delete User button and the user entry will be deleted

## 6 CONFIGURING THE BACNET EXPLORER

### 6.1 Configuration

By default the BACnet Explorer will open up on the BACnet Explorer page (Figure 8). Navigate to Configuration by clicking on the Configuration button, found along the left side of the page. The BACnet Explorer settings are split up into three types: Local Settings, Remote Settings and Network Settings.

The table below describes how the buttons at the bottom of each page function.

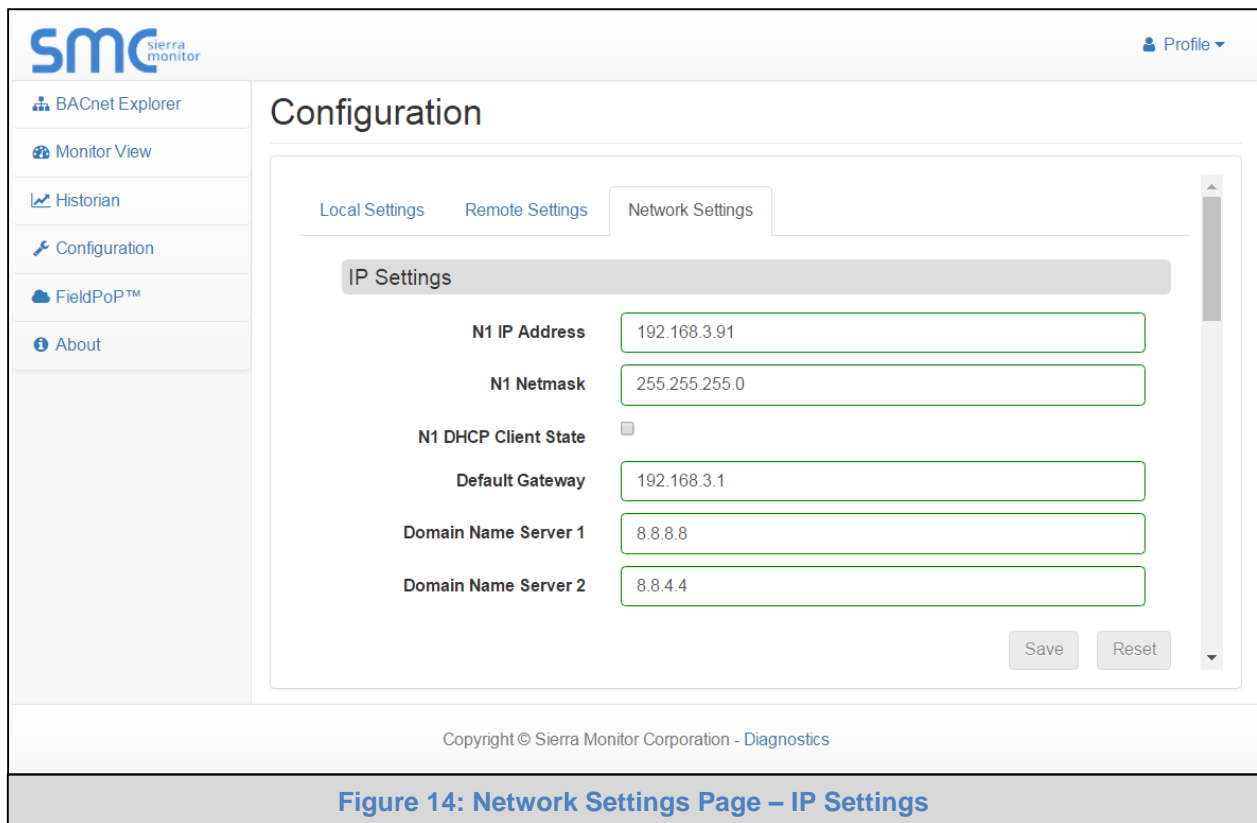
Button	Definition
Save	Click to save settings. Saving will require the device to be restarted.
Reset	Click to clear the current settings before saving; if settings have been saved the Reset button is unavailable.
Defaults	Click to change settings back to factory defaults.

**Figure 13: Configuration Button Functions**

The following sections explain the setting parameters by type for BACnet Explorer configuration.

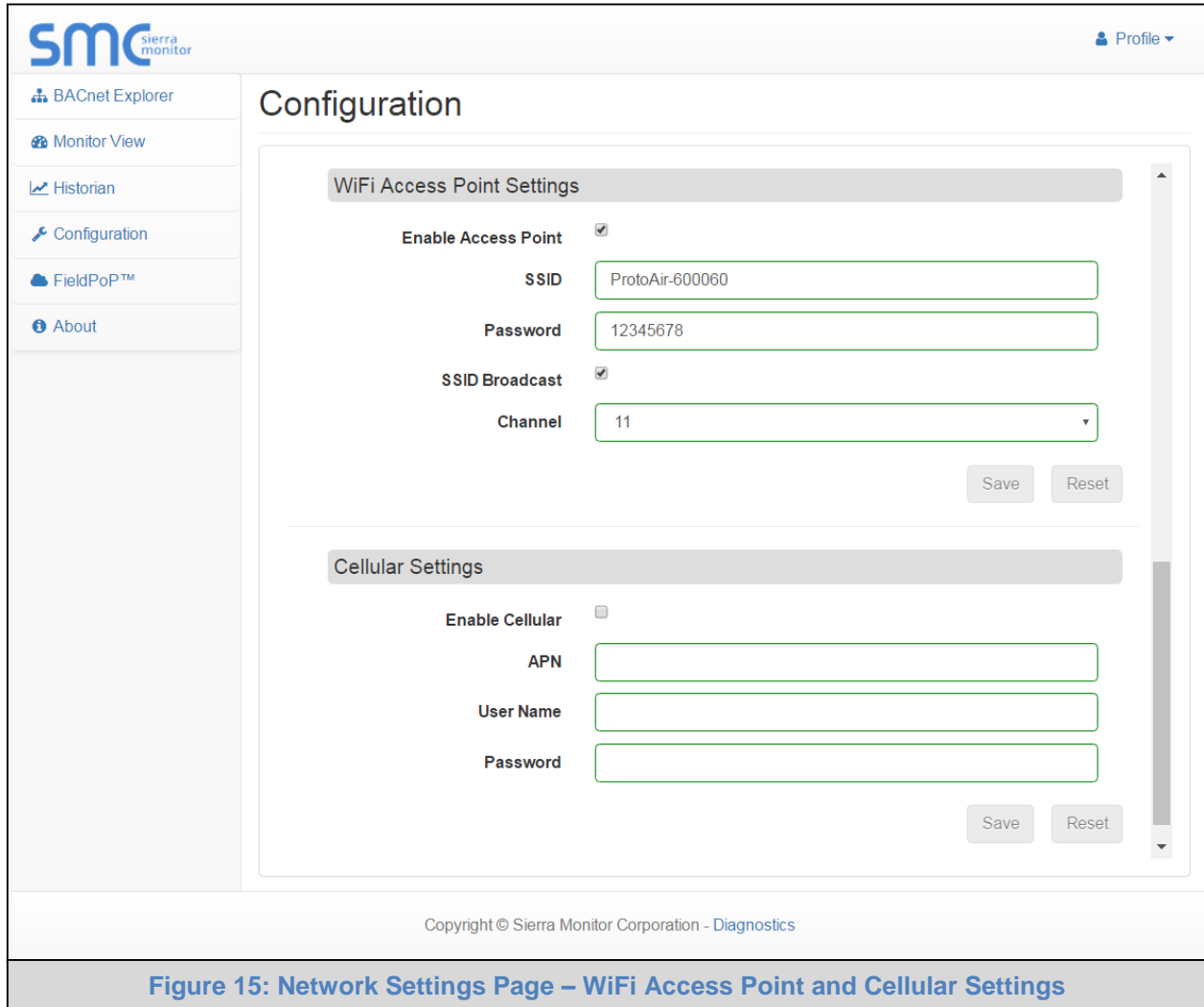
#### 6.1.1 Network Settings

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





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



**NOTE: Cellular Settings only available on FS-BENG-C models.**

### 6.1.2 Local Settings – BACnet

Enter the fields for the settings described below as needed:

Figure 16: Connection Settings

Parameter	Definition
<b>All Connections</b>	
Network Number	The BACnet network number for the connection. Legal values are 1-65534. Each network number must be unique across the entire BACnet internetwork. The <b>Internal Network Number</b> is used for internal BACnet traffic and has to be unique across the BACnet network.
<b>BACnet/IP Settings</b>	
IP Port	The BACnet/IP default is 47808 (0xBAC0), but other port numbers can may be specified.
<b>BACnet MS/TP Settings</b>	
MAC Address	Legal values are 0-127, must be unique on the physical network.
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.
Max Info Frames	The number of transactions the BACnet Explorer may initiate while it has the MS/TP token. Default is 50.
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.

Figure 17: Connection Parameters

### 6.1.3 Remote Settings – Foreign Device Registration for BBMD Support

The BACnet Explorer uses “Foreign Device Registration” or “FDR” to communicate to BACnet/IP devices on another network. Follow the instructions below to enable FDR between the BACnet Explorer and a remote network:

- Click the “Enabled” checkbox under the Foreign Device Registration section of the BACnet Settings.

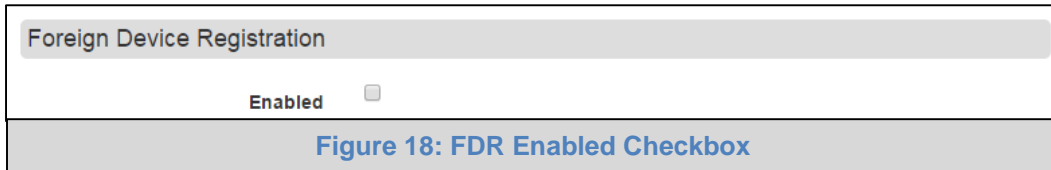


Figure 18: FDR Enabled Checkbox

- Enter the Remote BACnet Router’s externally mapped IP Address and BACnet/IP Port to the appropriate Foreign Device Registration fields. This allows the BACnet Explorer to discover BACnet devices on the remote network.

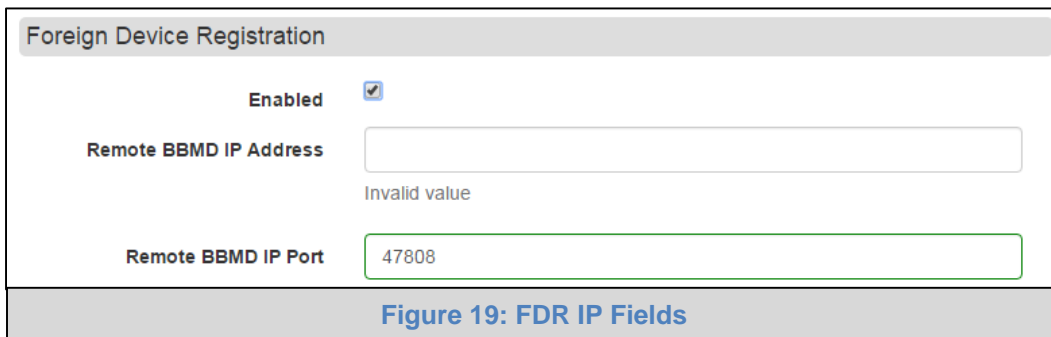


Figure 19: FDR IP Fields

**NOTE:** The user must uncheck the “Enabled” checkbox to allow the BACnet Explorer to discover on the local network.

**NOTE:** See [Appendix B](#) for additional details concerning FDR and BBMD.

## 7 USING THE BACNET EXPLORER

- Click on the BACnet Explorer button on the left side of the screen to go to the BACnet Explorer page.

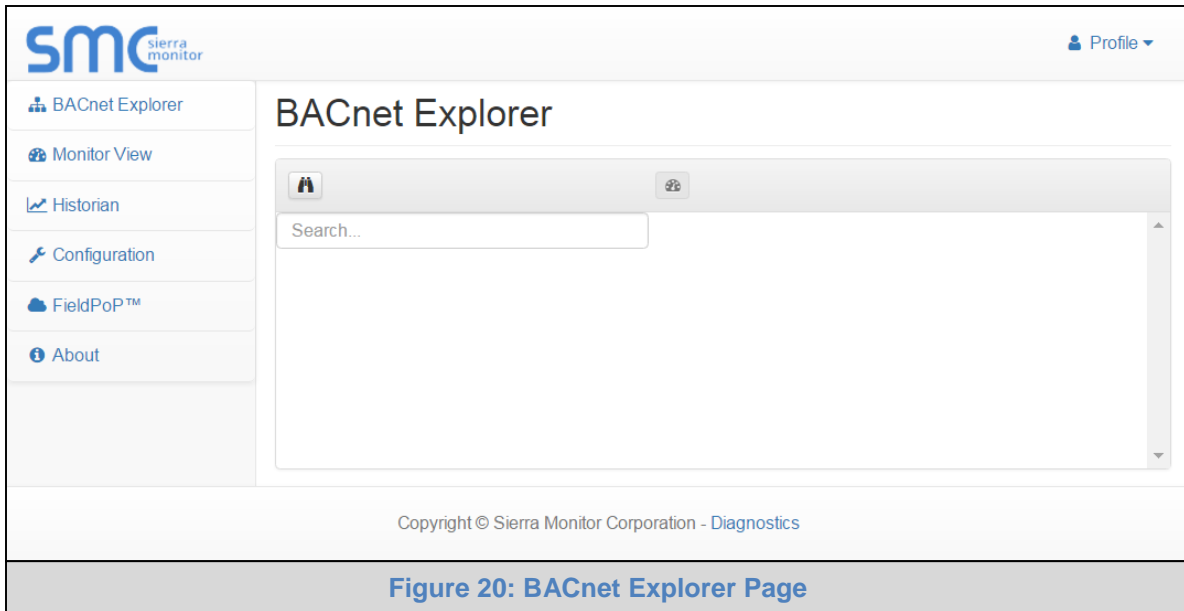


Figure 20: BACnet Explorer Page

### 7.1 Discover the Device List


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



Figure 21: Discovery Window

**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.

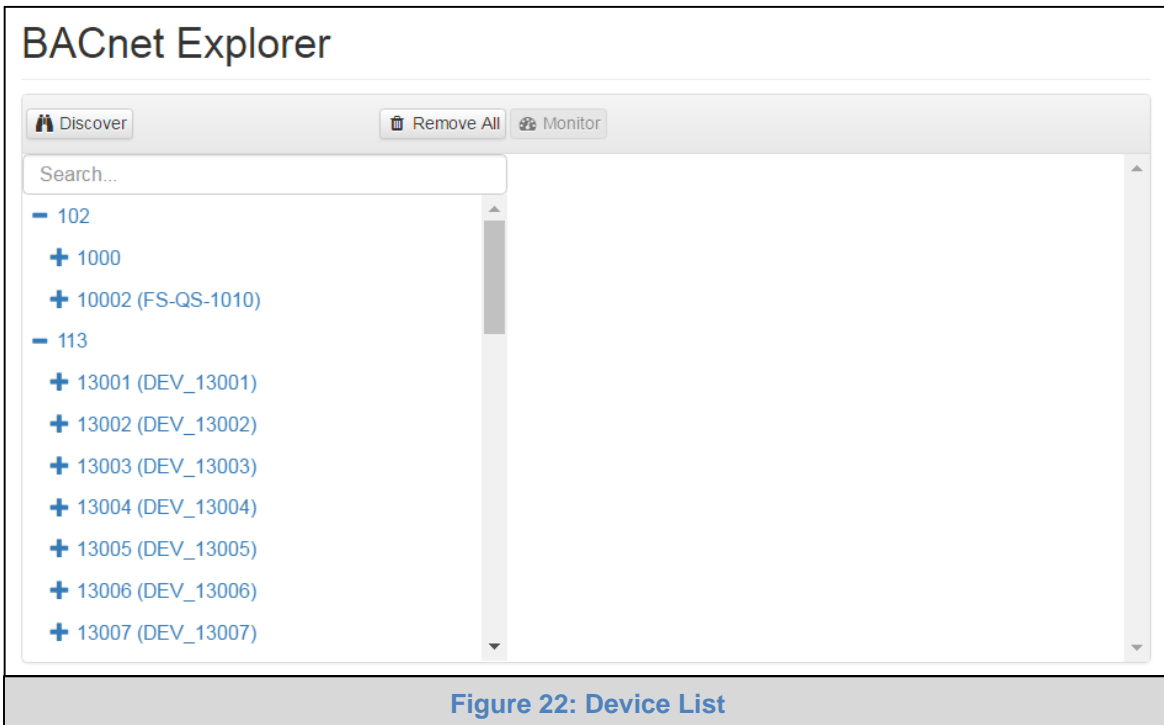


Figure 22: Device List

## 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

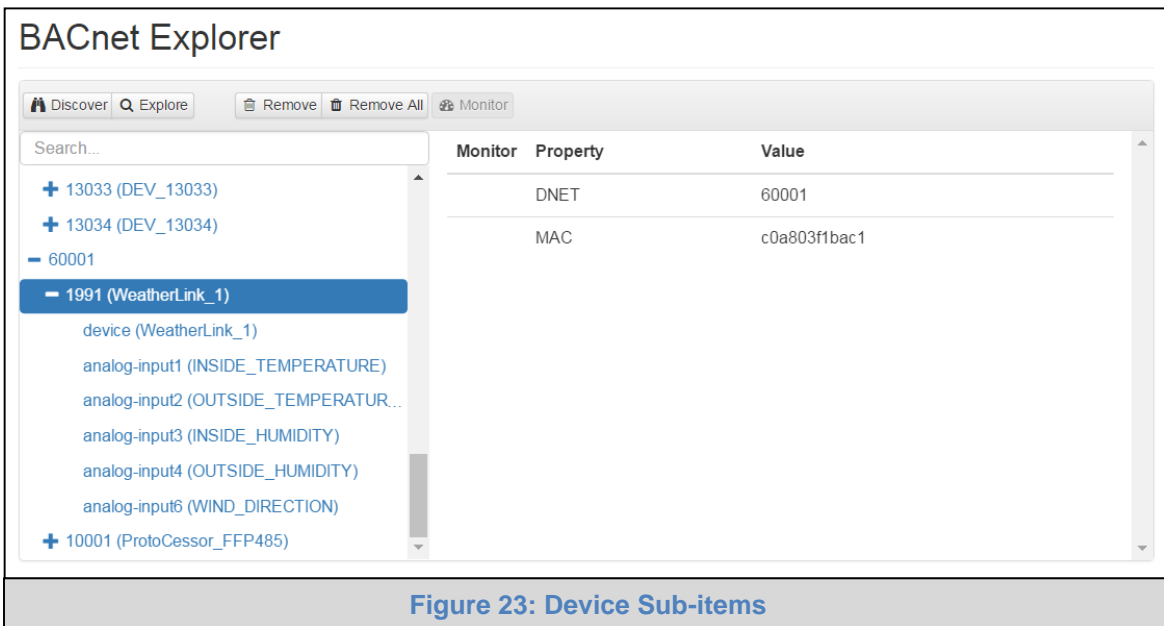



Figure 23: Device Sub-items

- To view the full details of a device, go back to highlighting the device directly (in [Figure 24](#) “50001”) and click the Explore button  Explore or double-click the device/object.

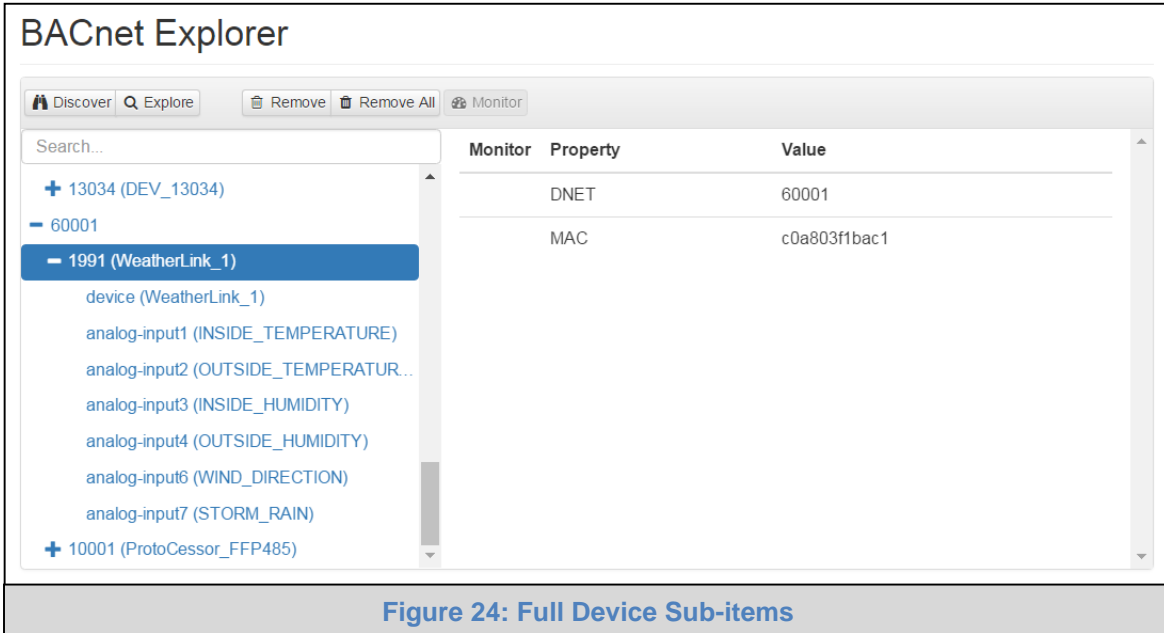


Figure 24: Full Device Sub-items

- Now additional device details are viewable; however, the device can be explored even further.
- Click on one of the device details.

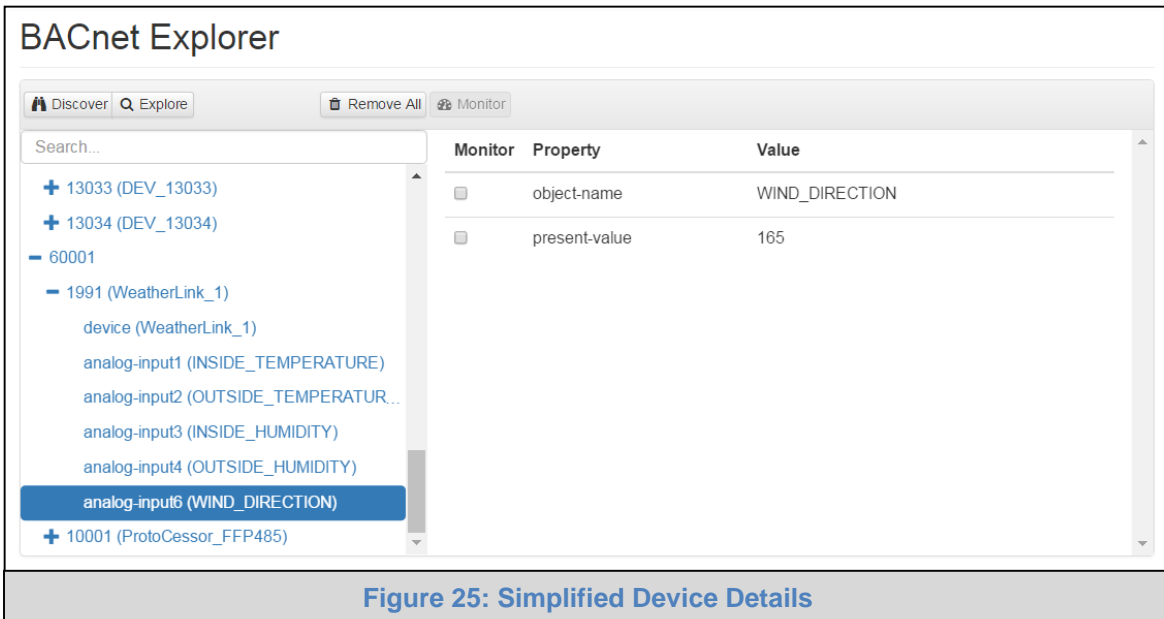
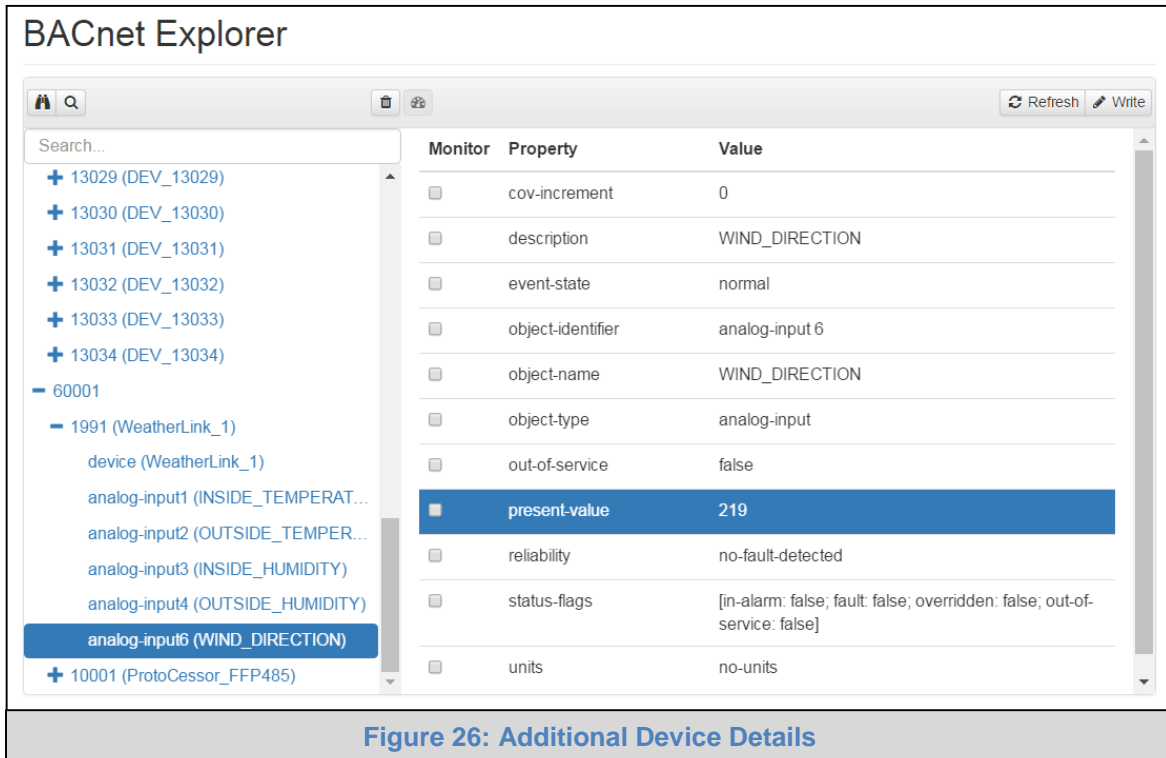



Figure 25: Simplified Device Details

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



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  Refresh that appears on the upper right side of the screen when highlighting individual properties to refresh all the values.

**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**

### 7.3 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.

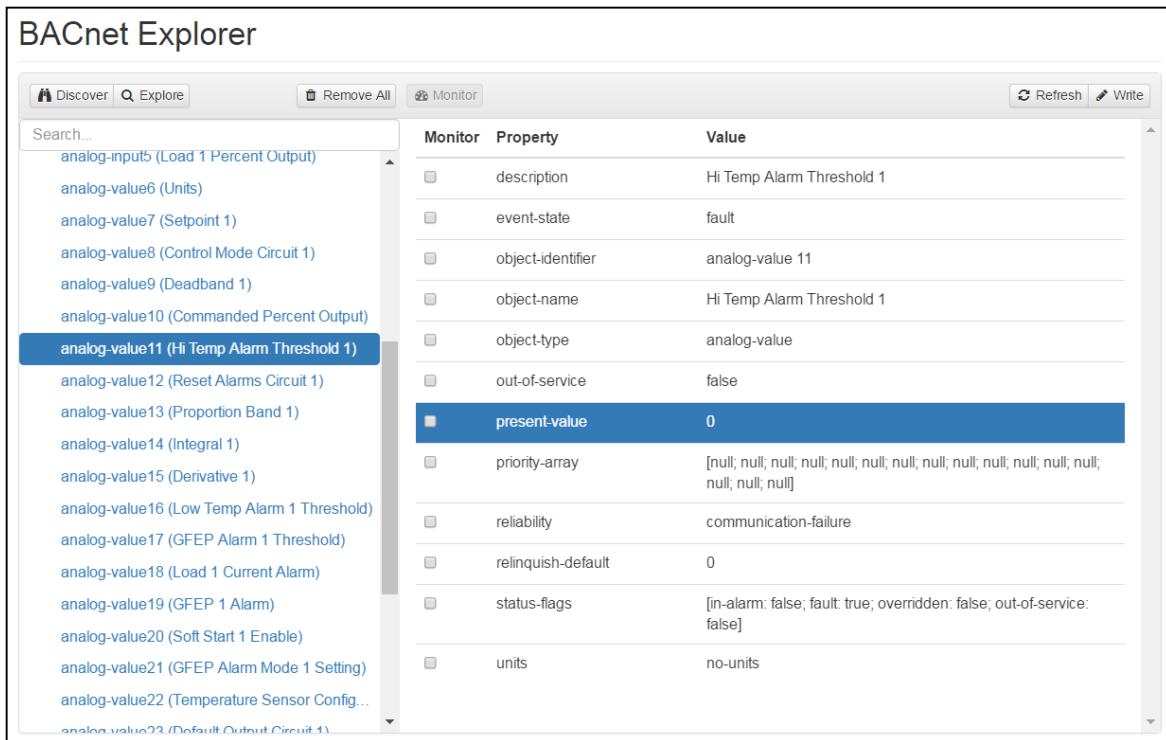


Figure 27: Highlighted Present Value

- Then click the write button (found in the upper right corner of the screen) to bring up the Write Property window.

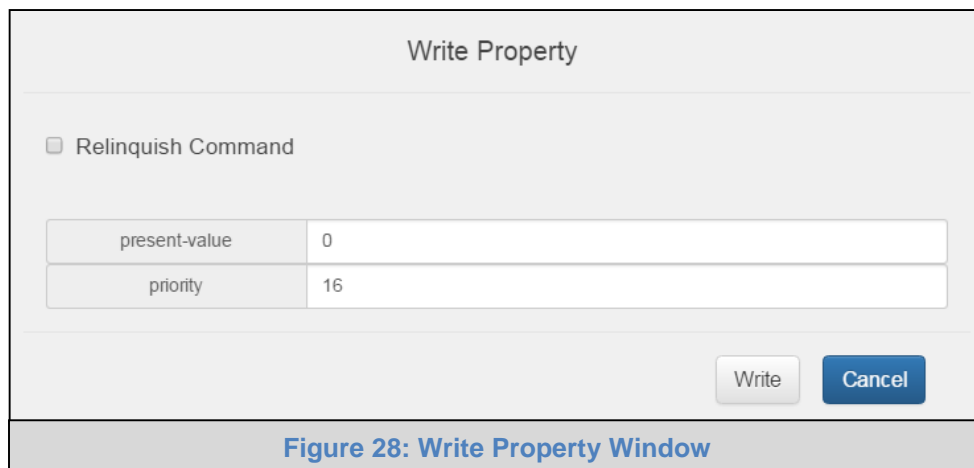
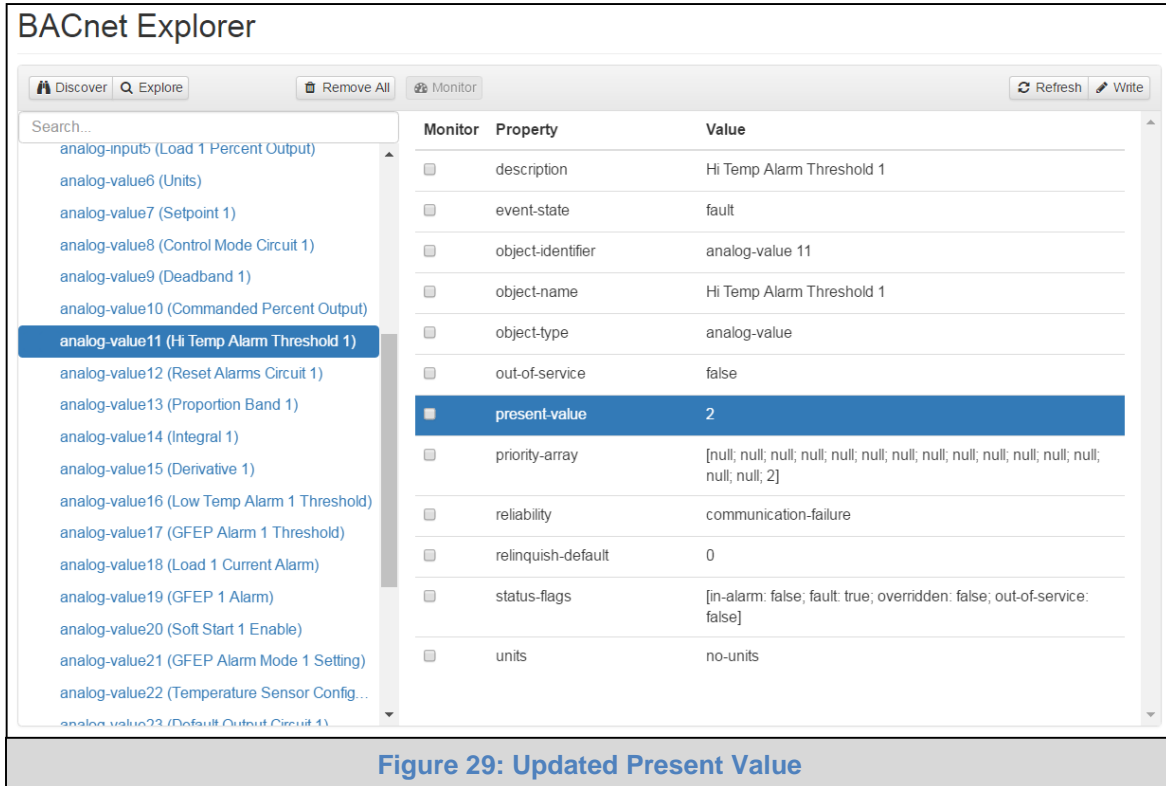


Figure 28: Write Property Window



- Enter the appropriate change and click write.

A check will appear inside the save button and the window will close. When the BACnet Explorer page appears the present value will be changed as specified.



## 7.4 Track Devices via Monitor View

Before using the Monitor View page, device properties must be selected to be monitored for analysis and testing. To do so follow the instructions below:

- When viewing the expanded device properties on the BACnet Explorer page, click the checkbox under Monitor for any property to track.

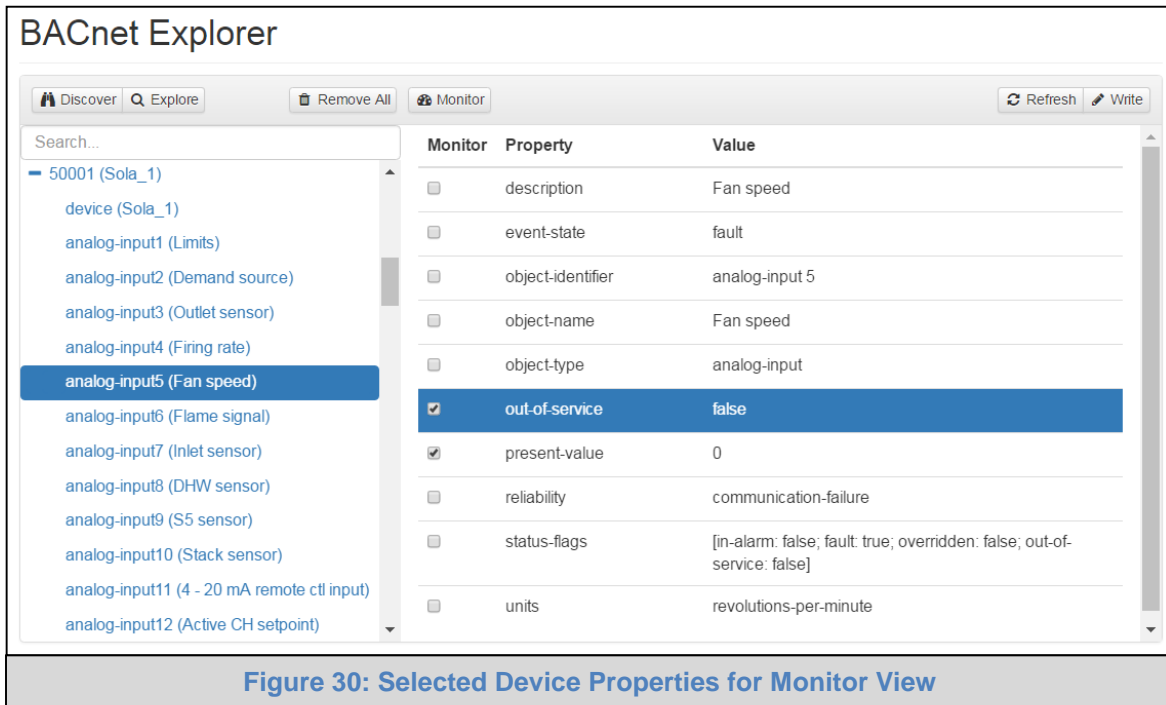
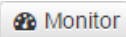


Figure 30: Selected Device Properties for Monitor View

- Once all properties are selected for that data type, click the monitor button  Monitor .
- Wait for the configuration to complete, then click on the Monitor View tab.

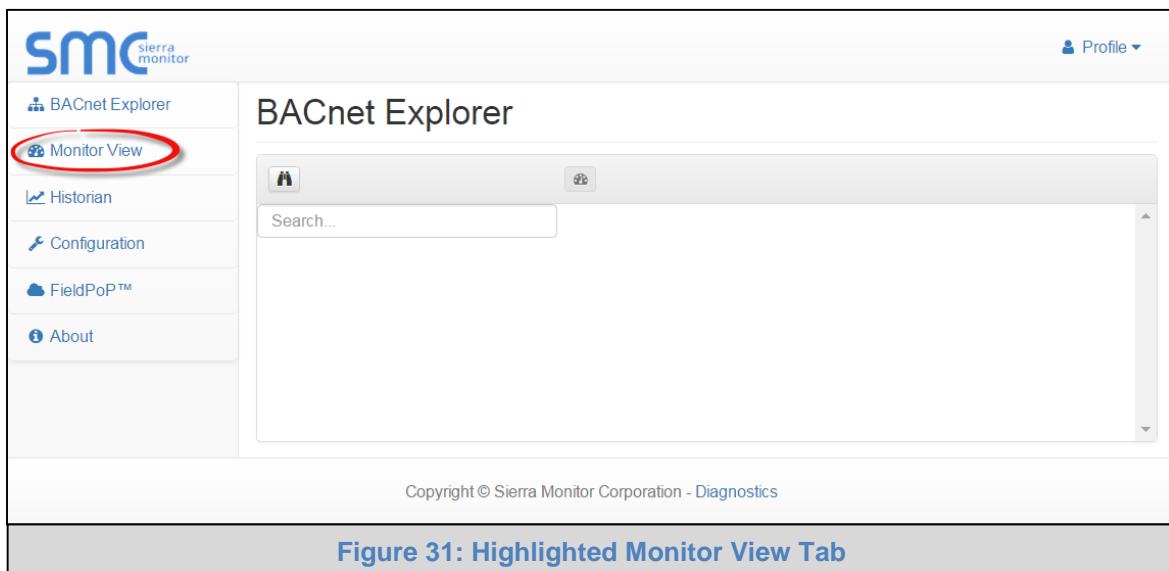


Figure 31: Highlighted Monitor View Tab

- To log data for Historian or FieldPoP, click the checkbox under the Log column.

Monitor View

Device Address	Device Name	Object Type	Object Instance	Object Name	Property	Status	Live Value	Last Read	Log	Actions
11	Dev_01	multi-state-input	2	SMD_AI_11	present-value	✓	0	2017-02-08 00:08:36	<input checked="" type="checkbox"/>	
50001	Sola_1	analog-input	2	Setpoint 1	present-value	✓	0	2017-02-08 00:08:36	<input checked="" type="checkbox"/>	
50001	Sola_1	analog-value	7	Setpoint 1	present-value	✓	-		<input checked="" type="checkbox"/>	
50001	Sola_1	analog-input	5	Fan speed	present-value	✓	0	2017-02-08 00:08:36	<input type="checkbox"/>	
50001	Sola_1	analog-input	5	Fan speed	out-of-service	✓	false	2017-02-08 00:08:36	<input type="checkbox"/>	
50033	ITC_33	analog-value	10	Commanded Per...	present-value	✗	0	2017-02-07 21:30:47	<input checked="" type="checkbox"/>	
50033	ITC_33	analog-value	16	Low Temp Alarm...	present-value	✗	0	2017-02-07 21:30:48	<input checked="" type="checkbox"/>	
50033	ITC_33	analog-input	1	Sensed Temperat...	present-value	✗	0	2017-02-07 21:30:48	<input checked="" type="checkbox"/>	
50033	ITC_33	analog-input	2	Setpoint 1	present-value	✗	0	2017-02-07 21:30:48	<input checked="" type="checkbox"/>	

Figure 32: Monitor View Showing Tracked Device Properties

- Click on the graph icon () to the right of the listed data elements to open the Data Logging window.

Data Logging

Please select the type of logging for this data point

Log Type:

COV Threshold Value:

COV Max Scan Time (msec):

Figure 33: Data Logging Window

- Select the type of logging for the data point and set the logging interval, COV threshold value or COV max scan time as they apply.

Data Logging

Log Type:

Logging Interval (msec):

Figure 34: Periodic Log Type

Data Logging

Log Type:

COV Threshold Value:

COV Max Scan Time (msec):

Figure 35: Change of Value Log Type

- Click Save to set the data logging settings and move on to **Section 7.5**.

**NOTE:** Up to 30 days of data can be recorded and stored.

## 7.5 View Data Logging Information with Historian

**NOTE:** Historian can log up to 8,000 data points.

- Click the Historian tab on the left side of the page.

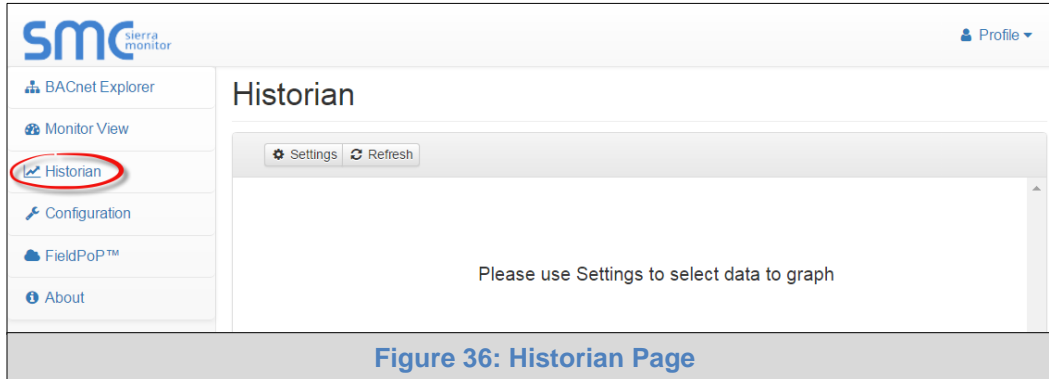


Figure 36: Historian Page

- Click on the Settings button (gear icon) to set up data to graph.

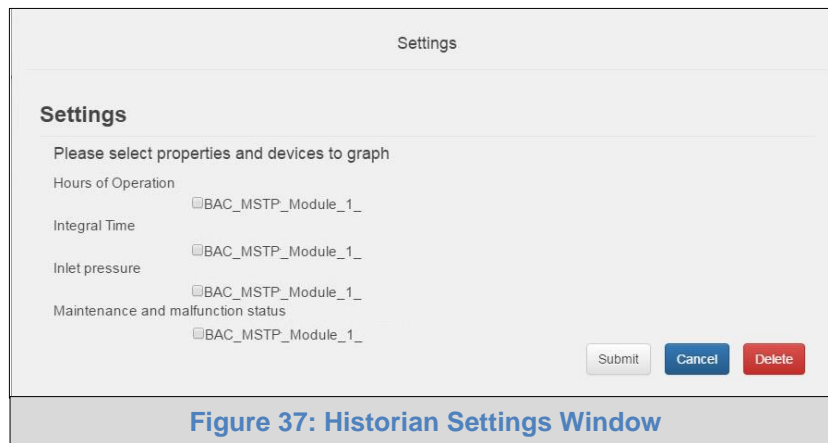


Figure 37: Historian Settings Window

- Click the checkbox next to the data element to graph.
  - Any combination of elements can be selected

**NOTE:** A data element is only visible when it is set for data logging as shown in **Section 7.4**.

- Click Submit to generate a graph for each element selected.
  - To delete a log, check the boxes next to the properties to delete and click the delete button; then click “Yes” to confirm

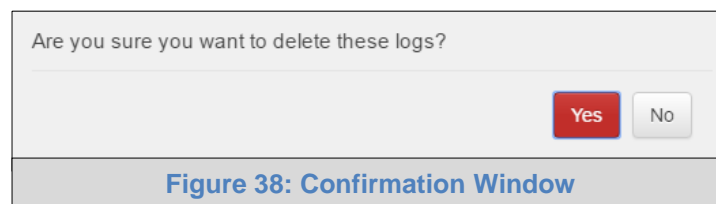


Figure 38: Confirmation Window

- After a few seconds the graph should appear

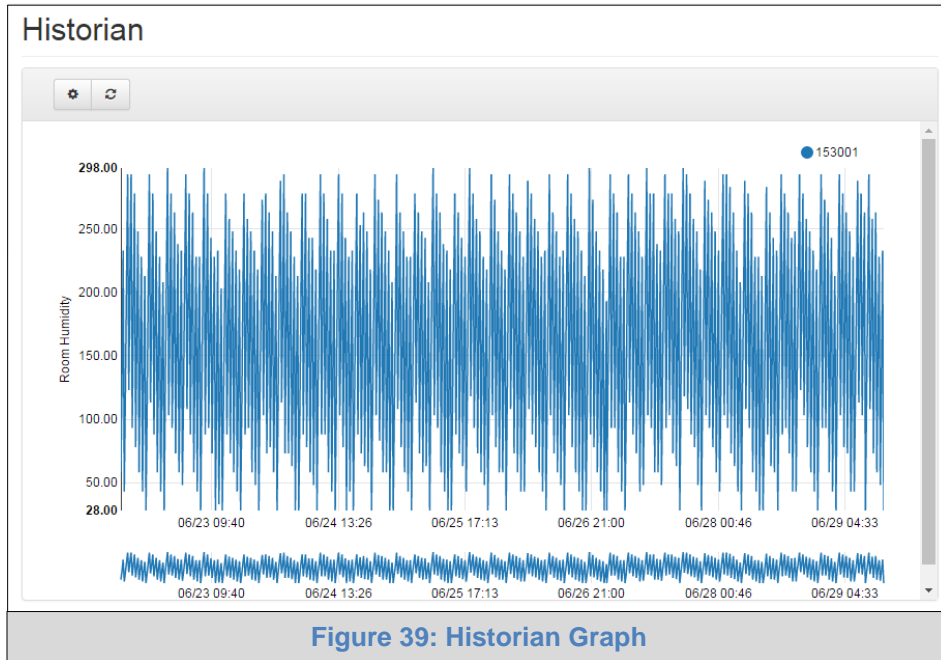
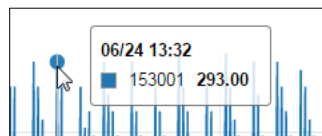
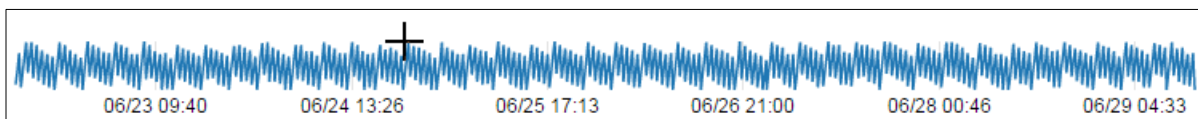


Figure 39: Historian Graph

To view individual values of data, scroll across the graph to show a text box that states each exact point and the location of that point on the graph via a blue dot.

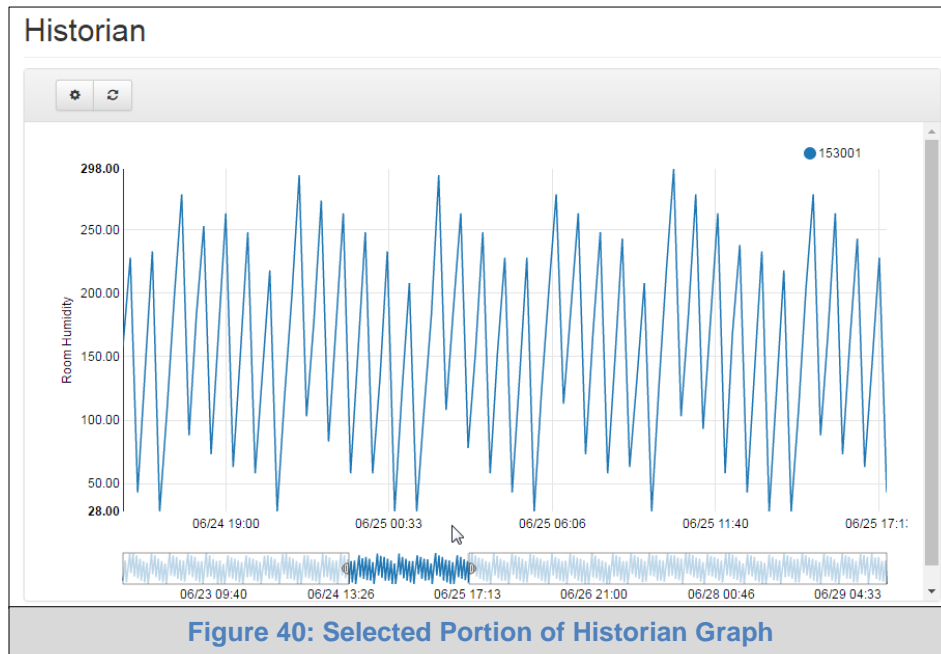


To view a graph of only select dates/time frames, move the cursor towards the miniature version of the graph that is shown just below the full size graph. Hover the cursor over the miniature graph so that the cursor becomes a crosshair (+).



Click and hold near the beginning or ending time frame desired, then drag the crosshair towards the ending or beginning time frame; all within the confines of the miniature graph.

The full size version of the graph will populate accordingly.



Any additional edits to the time frame can be adjusted by clicking and dragging the wedge markers on either side of the highlighted portion of the miniature graph.



To go back to the full graph, click on any faded portion of the miniature graph.

**NOTE: The data selected in Historian is also available via FieldPoP REST API, contact SMC Technical Support for a copy of the REST API Start-up Guide.**

Appendix A Specifications<sup>1</sup>



FS-BENG-W & FS-BENG-C	
<b>Available Ports</b>	One RS-485 +/- ground port One Ethernet 10/100 BaseT port One power +/- frame ground port
<b>Power Requirements</b>	<i>Input Voltage:</i> 12-24V DC <i>Power Rating:</i> 2.5 Watts <i>Current draw:</i> @ 12V, 240 mA
<b>Approvals</b>	CE and FCC Class B & C Part 15, TUV approved to UL 60950 pending, IC Canada, RoHS Compliant, PTCRB and CTIA
<b>Dimensions (WxDxH)</b>	4 x 1.1 x 2.7 in (10.16 x 2.8 x 6.8 cm)
<b>Weight<sup>3</sup></b>	0.4 lbs (0.2 Kg)
<b>Operating Temperature</b>	-20 to 70°C (-4 to 158°F)
<b>Humidity</b>	10-95% RH non-condensing
<b>Cellular<sup>2</sup></b>	<i>Features:</i> 3G & GPS <i>HSDPA:</i> Up to 21.0 Mbps <i>Antenna Type:</i> SMA <i>HSUPA:</i> Up to 5.76 Mbps
<b>Wi-Fi 802.11 b/g/n<sup>3</sup></b>	<i>Frequency:</i> 2.4 GHz <i>Antenna Type:</i> SMA <i>Channels:</i> 1 to 11 (inclusive) <i>Encryption:</i> TKIP, WPA & AES

Figure 41: 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”.

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

<sup>2</sup> Only for FS-BENG-C

<sup>3</sup> Only for FS-BENG-W

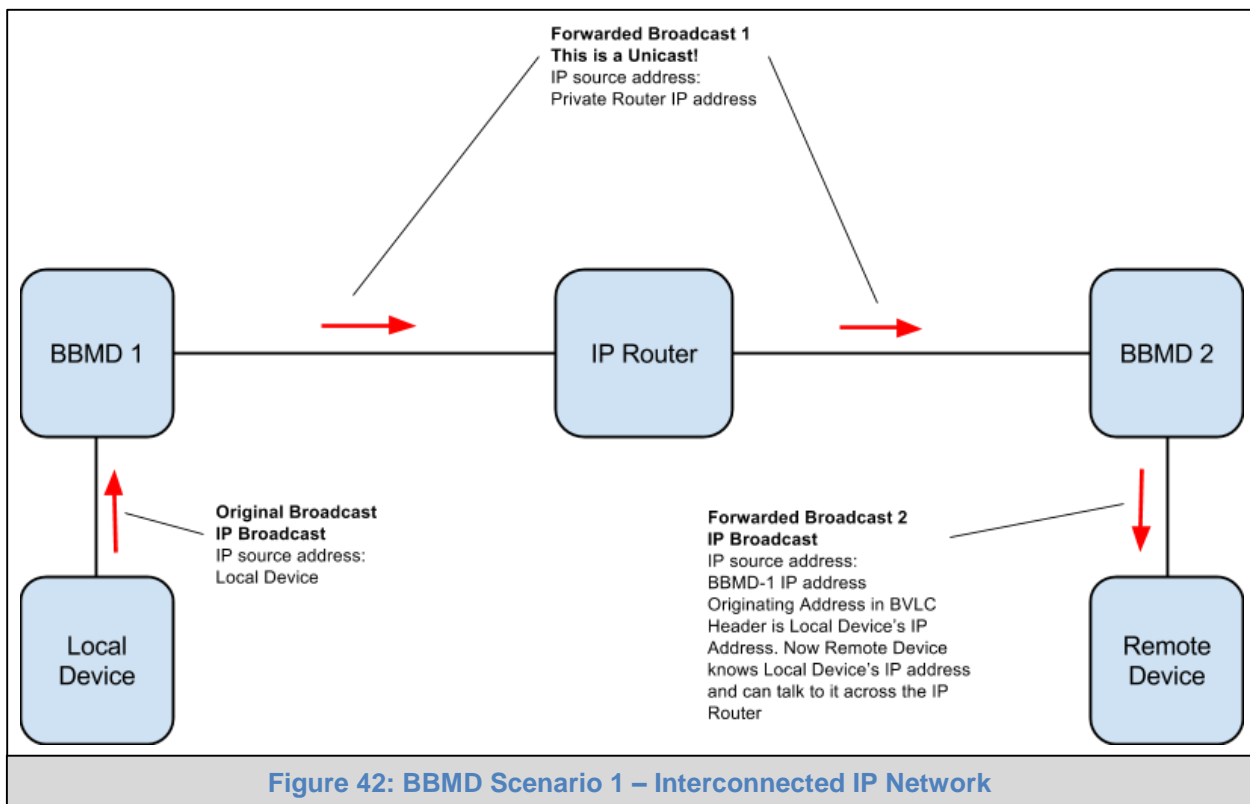
Appendix B References

Appendix B.1. Understanding FDR

The BACnet Explorer doesn't allow FDR, local IP and BACnet MS/TP to co-exist because there is no guarantee that two distinct BACnet networks will have unique Device Instances or Network Numbers. (Unique Device Instances and Network Numbers are a requirement for BACnet to function properly). If local and remote options were allowed concurrently, the BACnet Explorer would connect two networks that are probably not designed to work together. Forcing this situation would create extremely difficult to diagnose problems.

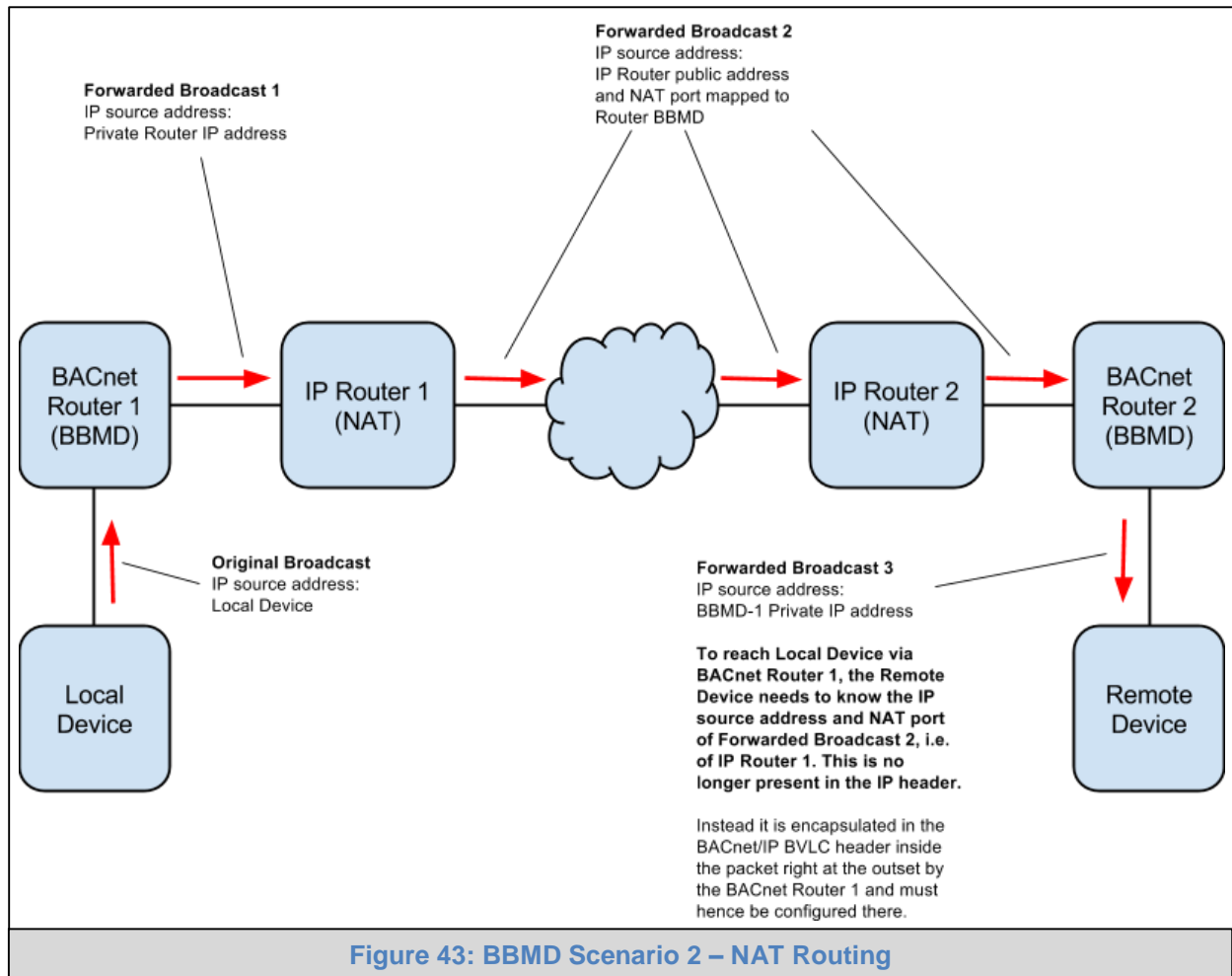
Appendix B.2. Understanding BACnet BBMD and NAT Routing

The BACnet Explorer does not support NAT routing. However, the BACnet Explorer must have the external IP Address and IP Port that the NAT router assigns to it, because these are inserted into the BACnet/IP BVLC header as the source IP Address which a remote recipient can use to reach the BBMD (BACnet Broadcast Management Device). This is necessary because the messages are distributed again by a remote BBMD, and the remote recipient of a distributed broadcast needs to reach the originator of the broadcast.





With NAT Routing, BBMD alone does not work because the Devices cannot reach each other's IP Addresses even if they know them. The only reachable address is the BBMD itself, so this must also act as a BACnet Explorer to forward traffic to the intended device. When this is done, the destination device's IP Address and Port are encoded as the DADR in the network header, so that the Router can forward messages to the correct device.



Appendix C Troubleshooting

Appendix C.1. Kaspersky Endpoint Security 10

If Kaspersky Endpoint Security 10 is installed on the user's PC, the software needs to be modified to allow the PC to register bridges on FieldPoP.

**NOTE:** This problem is specific to KES10, Kaspersky 2017 does not have this problem.

To fix the problem, the BACnet Explorer ([http://192.168.100.85/\\*](http://192.168.100.85/*) in [Figure 45](#)) must be set as a trusted URL to the "Web Anti-Virus"->"Settings" as shown below.

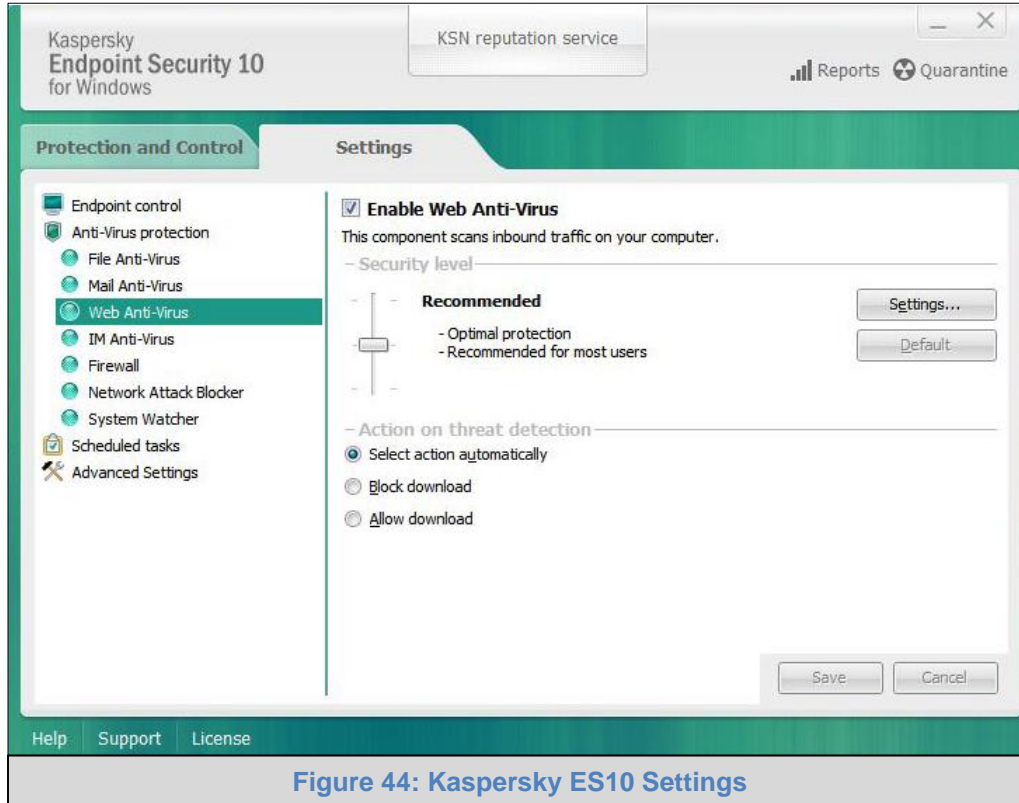


Figure 44: Kaspersky ES10 Settings

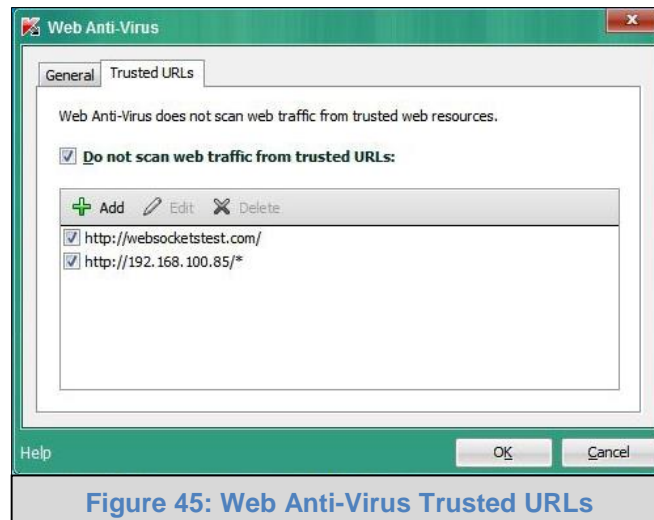


Figure 45: Web Anti-Virus Trusted URLs

## Appendix D 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.