BACnet IoT Gateway FS-IOT-BACX

Start-up Guide

APPLICABILITY & EFFECTIVITY

Effective for all systems manufactured after April 2019.

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T18620

Technical Support

Thank you for purchasing the BACnet IoT Gateway from Sierra Monitor Corporation.

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

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1 BACNET IOT GATEWAY DESCRIPTION

The BACnet IoT Gateway provides a connection from BACnet devices and networks to the cloud. This is achieved via a discovery tool built into the hardware 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 IoT Gateway comes in three models. The FS-IOT-BAC model offers two RS-485 ports and one Ethernet 10/100 port. The FS-IOT-BACW model has one RS-485 port, one Ethernet 10/100 port and supports Wi-Fi network connection. The FS-IOT-BACC model supports cellular connections as well as all ports and support offered by the FS-IOT-BACW model.

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

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

The BACnet IoT Gateway 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 through the Sierra Monitor website.

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

2 EQUIPMENT SETUP

2.1 Physical Dimensions

2.1.1 FS-IOT-BAC Drawing

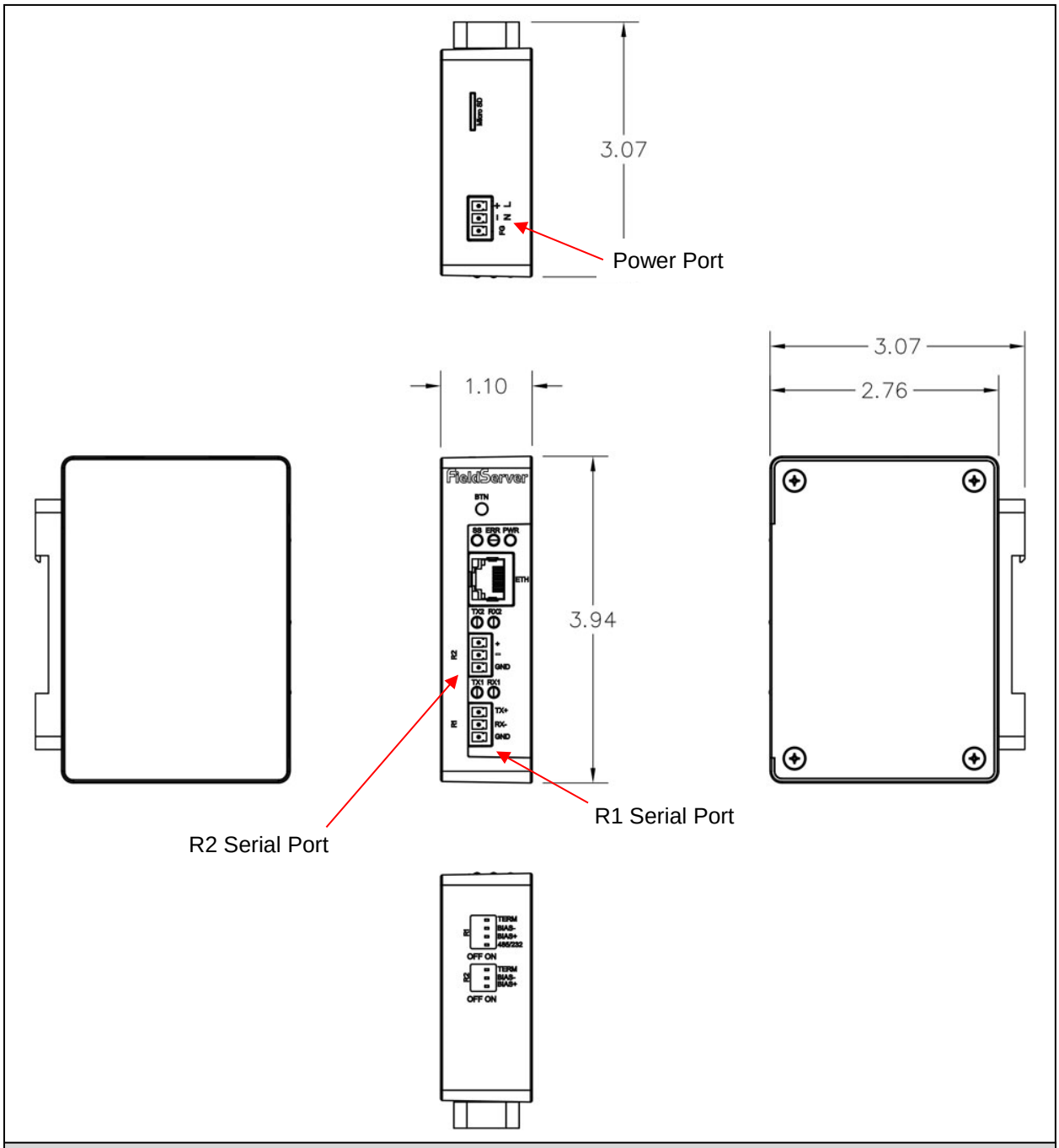


Figure 1: BACnet IoT Gateway FS-IOT-BAC Dimensions

2.1.2 FS-IOT-BACW Drawing

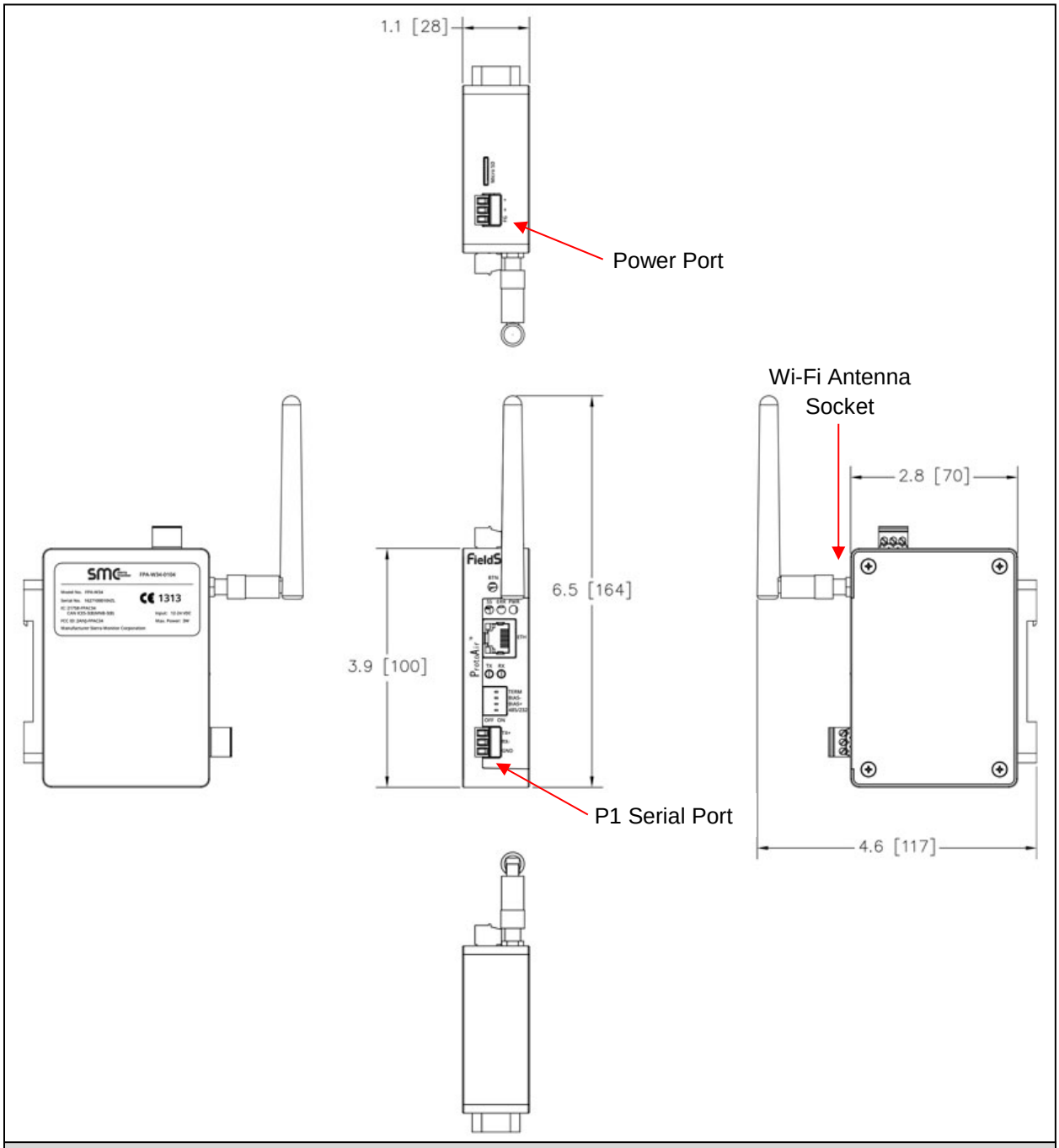


Figure 2: BACnet IoT Gateway FS-IOT-BACW Dimensions

2.1.3 FS-IOT-BACC Drawing

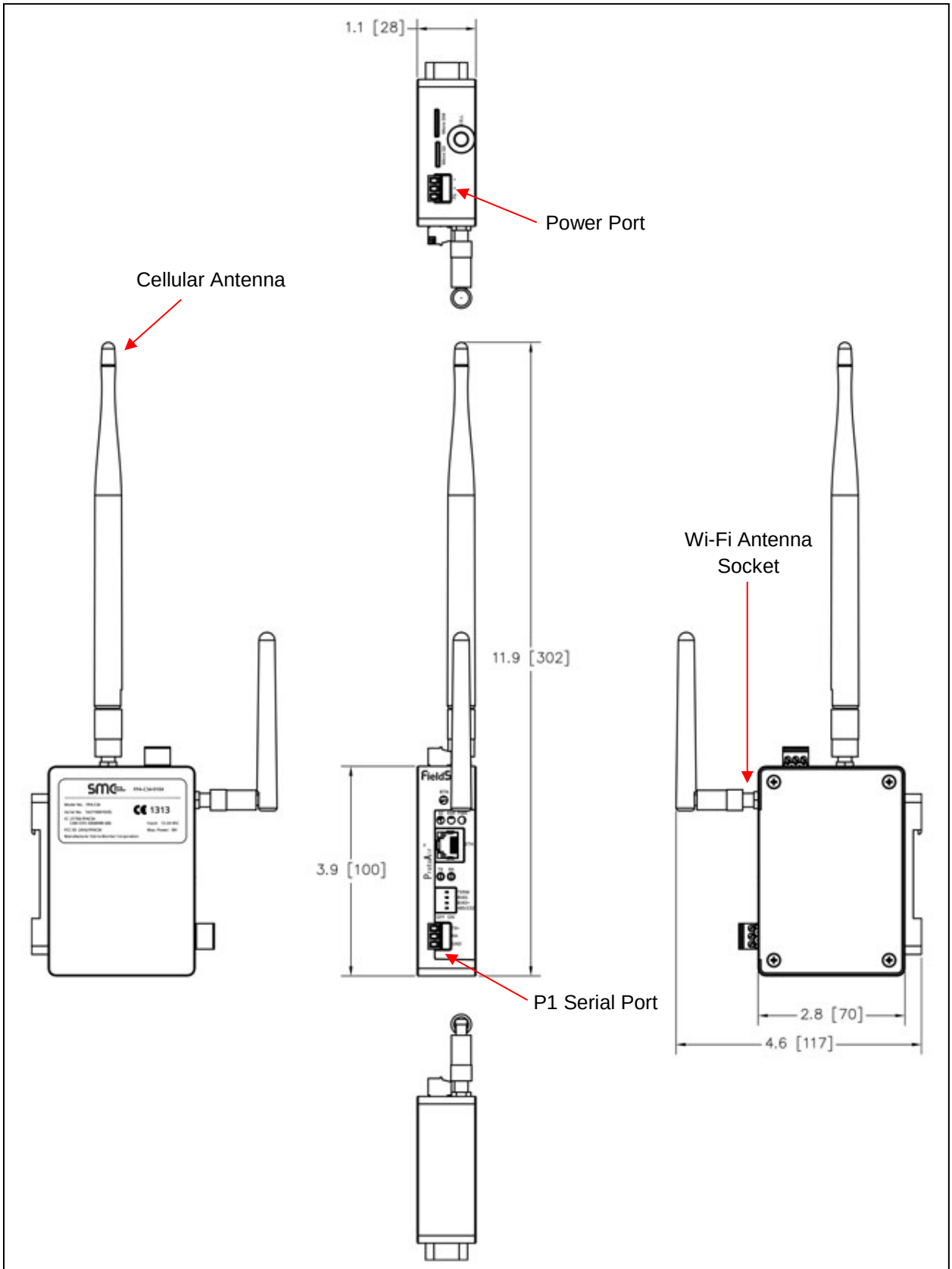


Figure 3: BACnet IoT Gateway FS-IOT-BACC Dimensions

2.2 Mounting

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

Figure 4: DIN Rail

2.3 Attaching the Antenna(s)

NOTE: This Section does not apply to the FS-IOT-BAC model BACnet IoT Gateway.

Wi-Fi Antenna:

If using the FS-IOT-BACW (Wi-Fi) or FS-IOT-BACC (Cellular & Wi-Fi) models, screw in the Wi-Fi antenna to the front of the unit as shown in Figure 2.

Cellular Antenna:

If using the FS-IOT-BACC model, screw in the long cellular antenna on the top of the unit as shown in Figure 3.

2.4 FS-IOT-BACC: Inserting the SIM Card

NOTE: A micro 3G SIM card (data only for commercial products IMEI 357178070517852) must be purchased from an AT&T, Kore Telematics or Vodafone cellular provider to set up cellular functionality and create a data plan for the ProtoAir. SIM card vendor contact information is available at the end of the section.

Insert the SIM card into the Micro SIM card slot with the chip on the SIM card facing away from the cellular antenna as shown below.

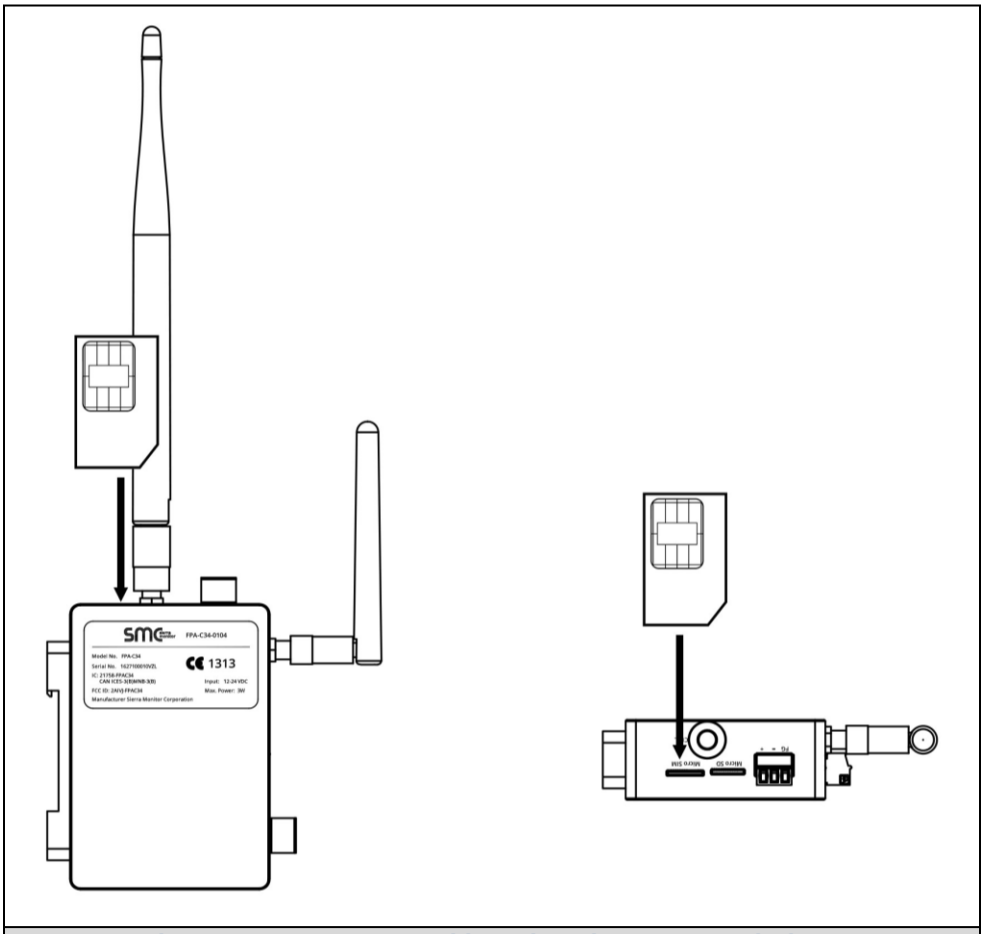


Figure 5: Insert SIM Card into the Micro SIM Card Slot – Label Side View (Left) and Top Down View (Right)

See **Section 6** to complete cellular setting configuration.

SIM Card Vendor Contact Information:

Kore Telematics
Joao Freitas
KORE Wireless
Office: (669) 600-5360
jfreitas@korewireless.com
www.koretelematics.com

AT&T
Please call AT&T Customer Service at 800.331.0500 or find the nearest AT&T store.

3 INSTALLING THE BACNET IOT GATEWAY

3.1 FS-IOT-BAC: Connecting the R1 & R2 Ports

NOTE: Ensure RS-485 is selected for R1 by checking that the number 4 DIP Switch is set to the left side.

Connect to the 3-pin connector(s) as shown below.

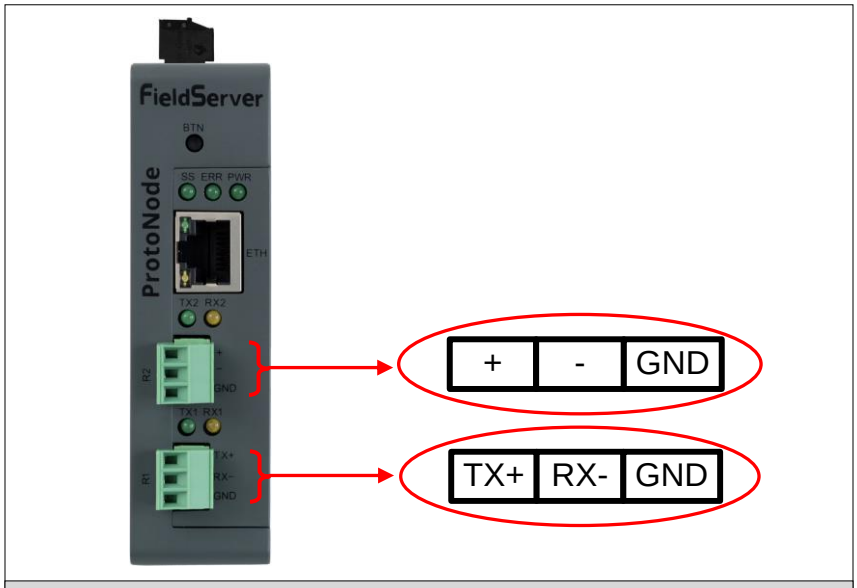


Figure 6: R1 & R2 Connection Ports

The following baud rates are supported for both ports:
9600, 19200, 38400, 76800

3.1.1 Wiring

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

NOTE: Use standard grounding principles for GND.

3.2 FS-IOT-BACW/BACC: Connecting the 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.

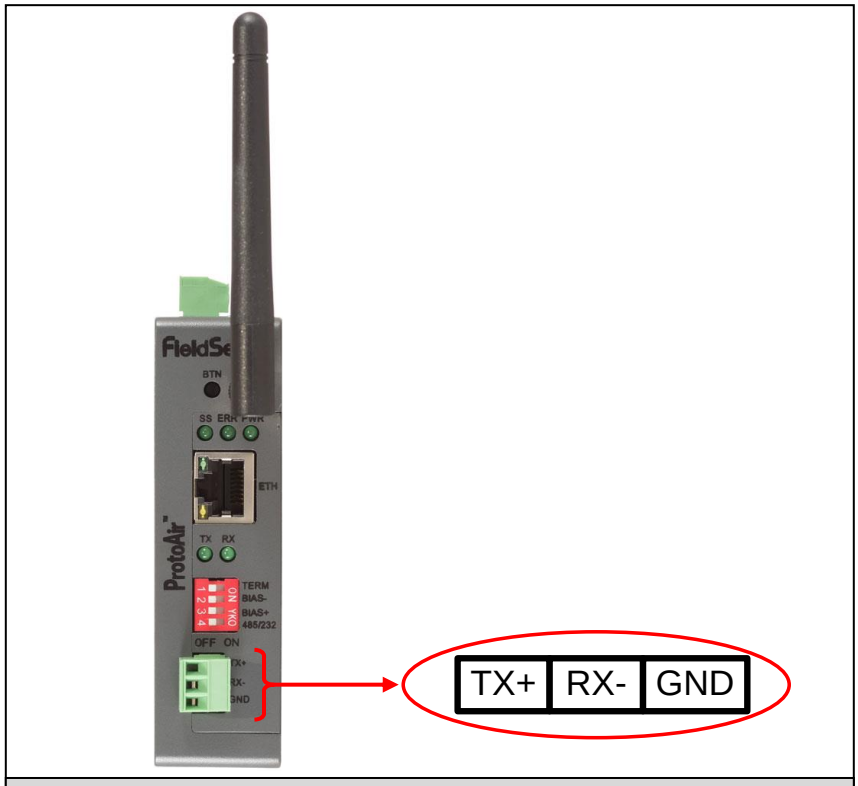


Figure 7: RS-485 R2 Connection Port

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

3.2.1 Wiring

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

NOTE: Use standard grounding principles for GND.

3.3 10/100 Ethernet Connection Port

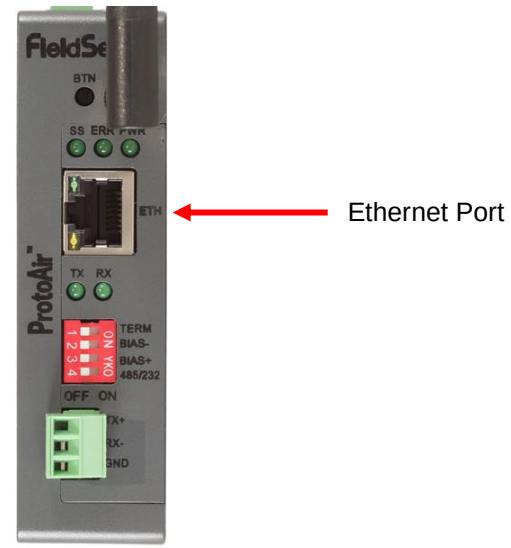


Figure 8: Ethernet Connection

The Ethernet Port is used both for BACnet/IP communications and for configuring the BACnet IoT Gateway via the Web App. To connect the BACnet IoT Gateway, either connect the PC to the Gateway's Ethernet port or connect the Gateway and PC to an Ethernet switch. Use Cat-5 cables for the connection.

NOTE: The Default IP Address of the BACnet IoT Gateway is 192.168.2.101, 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 IoT Gateway External Gateway			
	Current Draw Type		
BACnet IoT Gateway Family	12V DC	24V DC	24 AC
FS-IOT-BAC (Typical)	250mA	125mA	125mA
FS-IOT-BACW (Typical)	170mA	100mA	N/A
FS-IOT-BACW (Maximum)	240mA	140mA	N/A
FS-IOT-BACC (Typical)	320mA	185mA	N/A
FS-IOT-BACC (Maximum)	670mA	390mA	N/A
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 9: Required Current Draw for the BACnet IoT Gateway

Apply power to the BACnet IoT Gateway as shown below. 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 **FS-IOT-BAC** BACnet IoT Gateway accepts 12-24VDC or 24VAC.
- The **FS-IOT-BACW/BACC** BACnet IoT Gateways accept 12-24VDC.

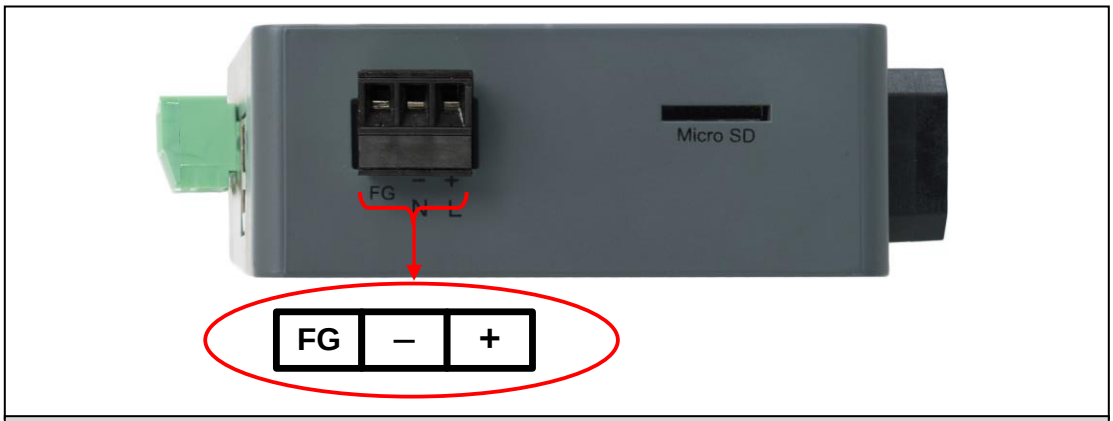


Figure 10: Connecting Power for FS-IOT-BAC

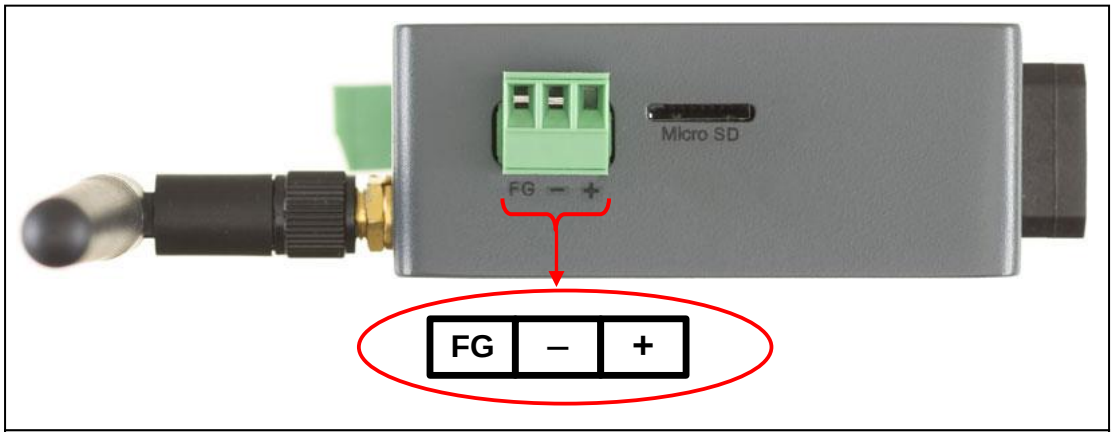


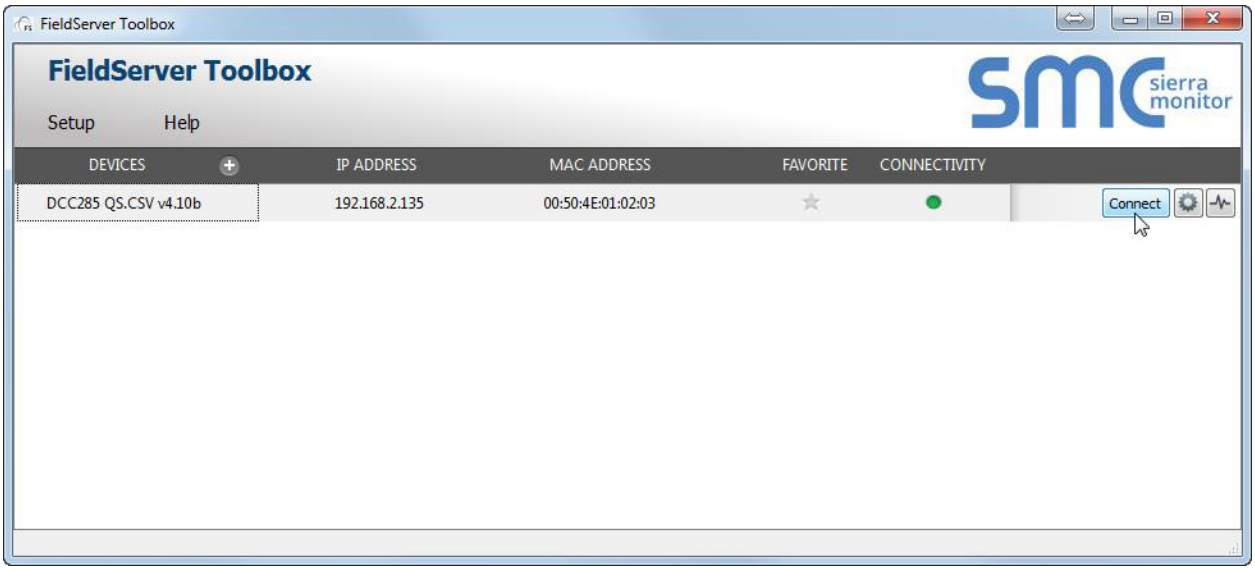
Figure 11: Connecting Power for FS-IOT-BACW

5 CONNECTING TO THE BACNET IOT GATEWAY

The FieldServer Toolbox Application can be used to discover and connect to the BACnet IoT Gateway on a local area network. To manually connect to the BACnet IoT Gateway 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.
- Use the Toolbox application to find the BACnet IoT Gateway, 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 IoT Gateway's IP Address. The Default IP Address of the BACnet IoT Gateway is **192.168.2.101**, Subnet Mask is **255.255.255.0**.
- If the PC and the BACnet IoT Gateway are on different IP Networks, assign a Static IP Address to the PC on the 192.168.2.X network.

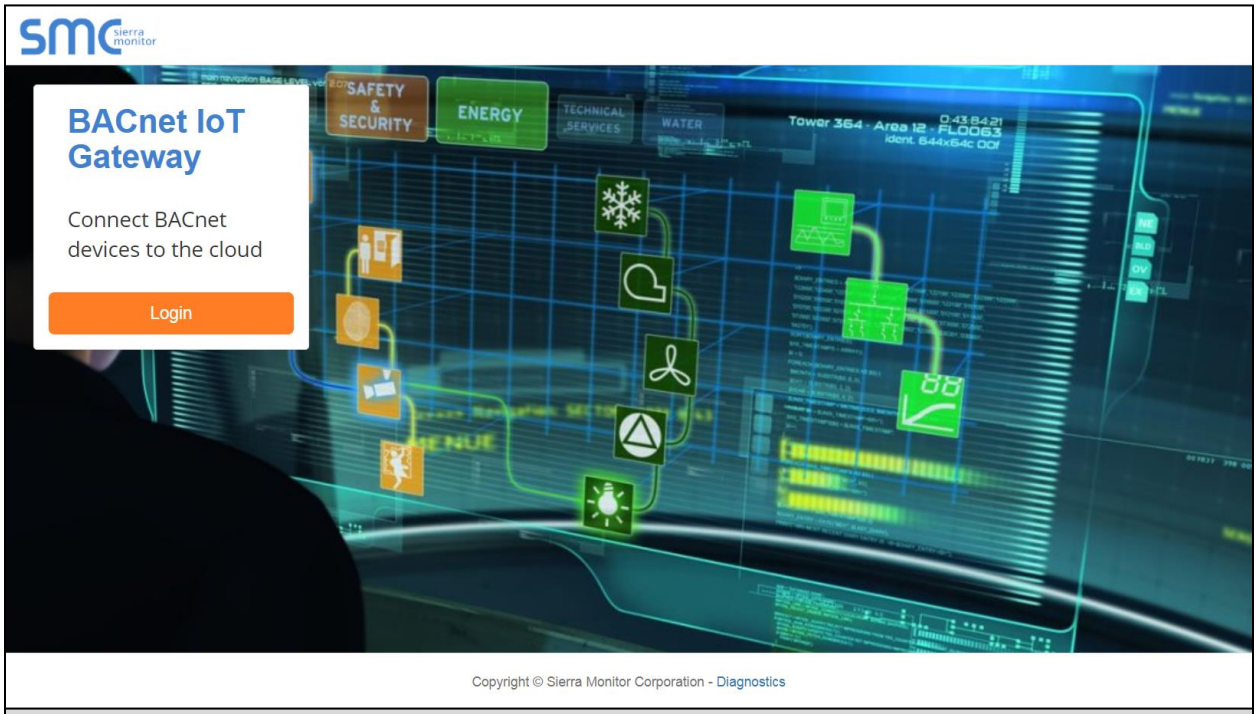


Figure 12: BACnet IoT Gateway Login Page

5.3 Logging into BACnet IoT Gateway

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

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

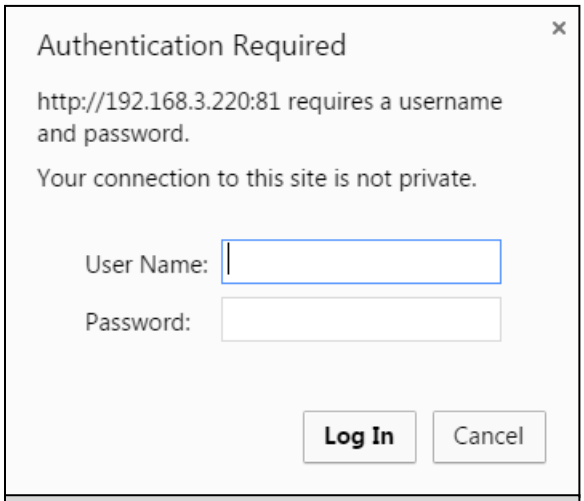


Figure 13: Login Window

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

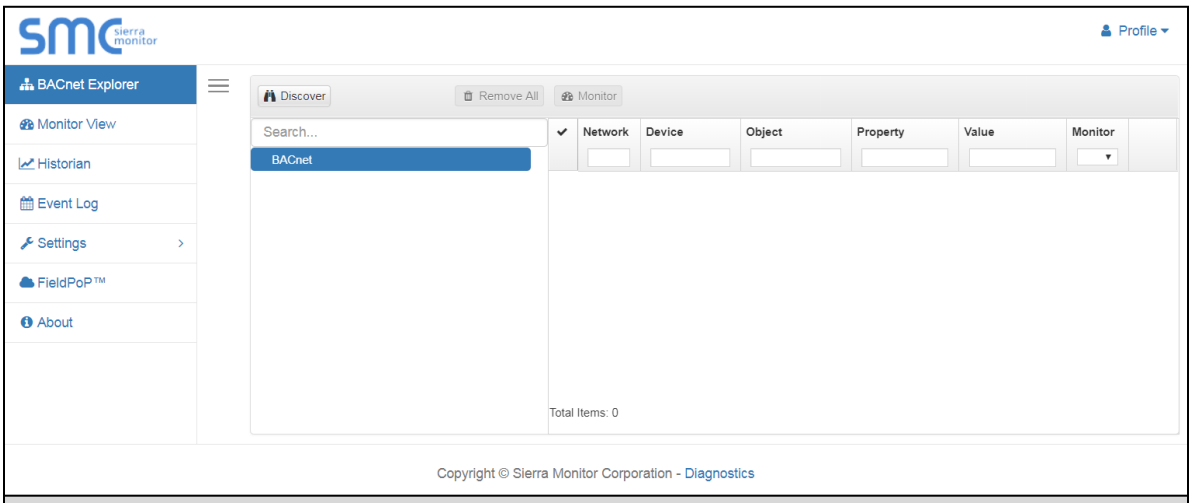


Figure 14: BACnet IoT Gateway Landing Page

5.3.1 Change Password

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

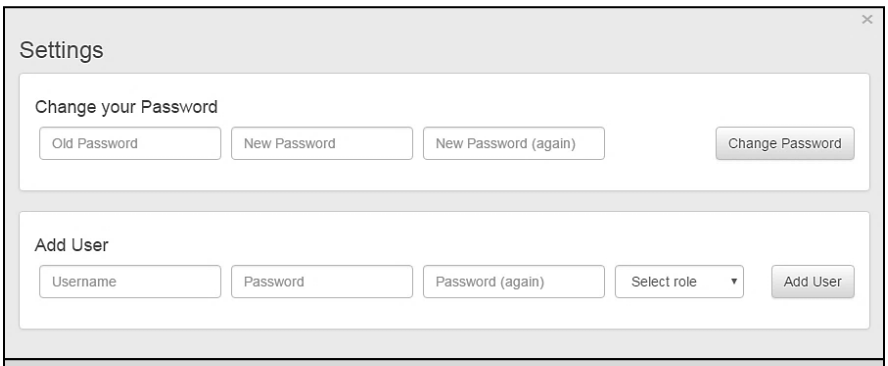


Figure 15: Profile Settings Window

- Fill in the old password and the two new password fields, then click the change password button.
- A sucessful 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 IoT Gateway 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 IoT Gateway, the Manage Users field will appear in the Profile Settings window.

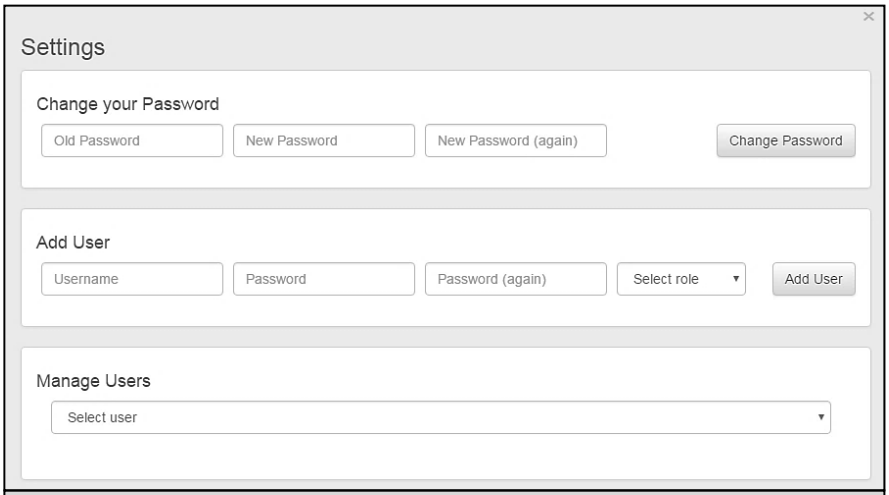


Figure 16: Manage Users Settings

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.

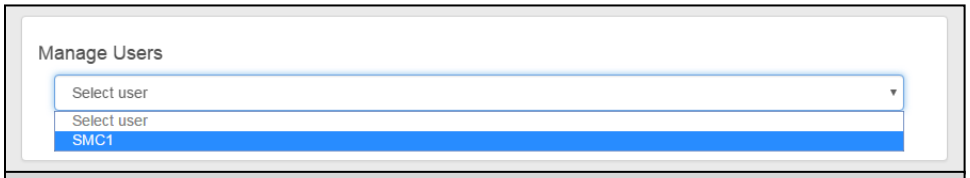


Figure 17: Select User

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

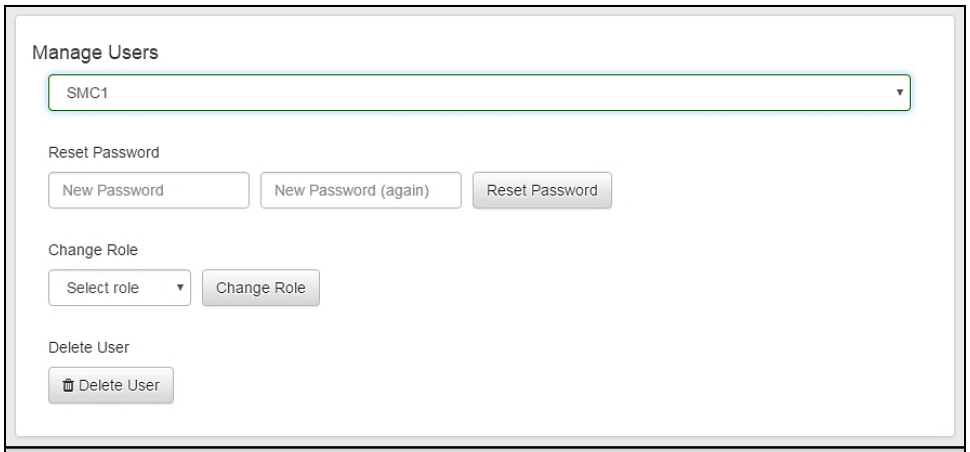


Figure 18: Edit User Information

- 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 IOT GATEWAY

6.1 Settings

By default, the BACnet IoT Gateway will open up on the BACnet Explorer page (Figure 14). Navigate to the settings by clicking on the Settings button, found along the left side of the page. The BACnet IoT Gateway 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.
Refresh	Click to clear the current settings before saving; if settings have been saved the Refresh button is unavailable.
Defaults	Click to change settings back to factory defaults.

Figure 19: Configuration Button Functions

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

6.1.1 Network Settings

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

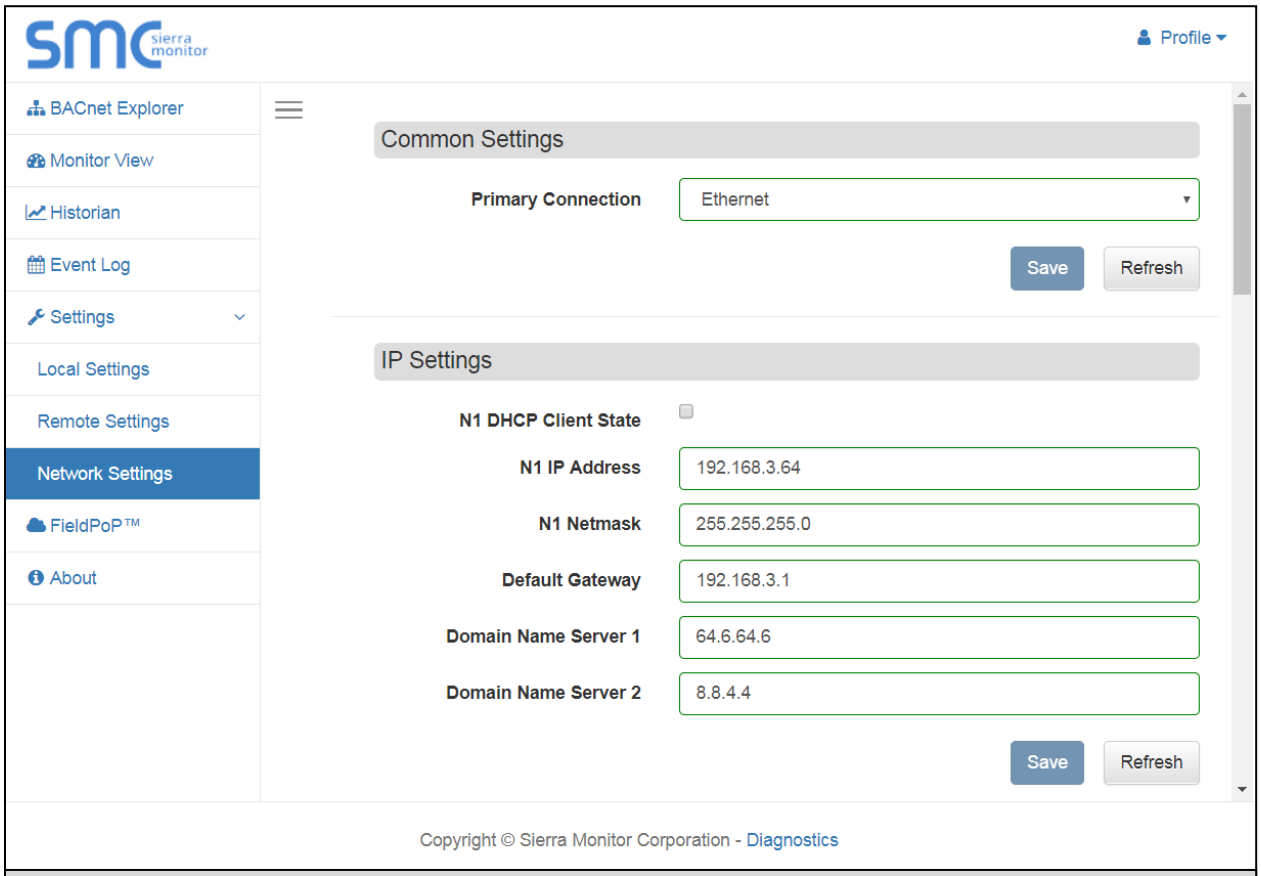


Figure 20: Network Settings – Common and IP Settings

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, Wi-Fi Access Point, and Cellular Settings.

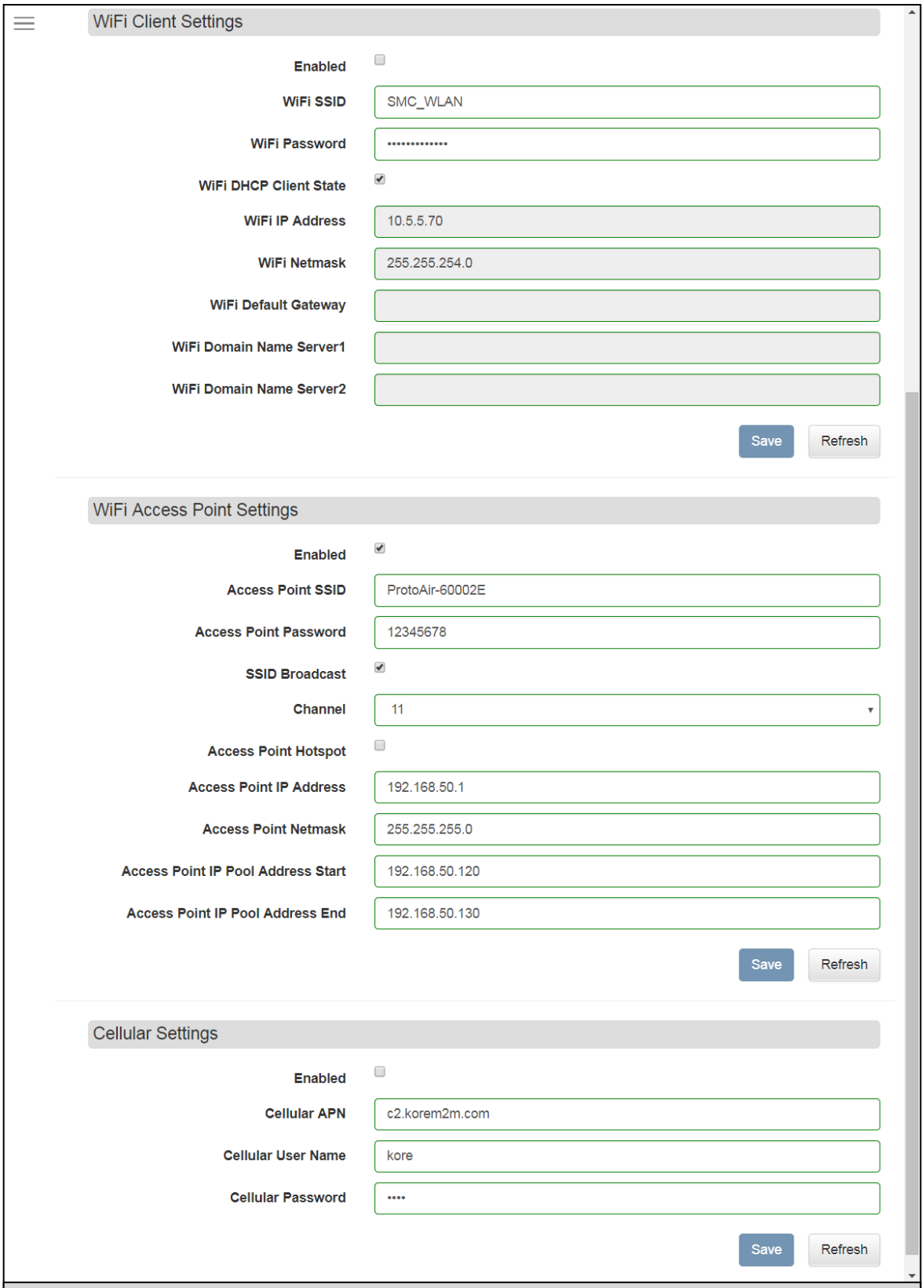


Figure 21: Network Settings – Wi-Fi Client, Wi-Fi AP, and Cellular Settings

NOTE: Cellular Settings are only available on FS-IOT-BACC models.

6.1.2 Local Settings – BACnet

Enter the fields for the settings described below as needed:

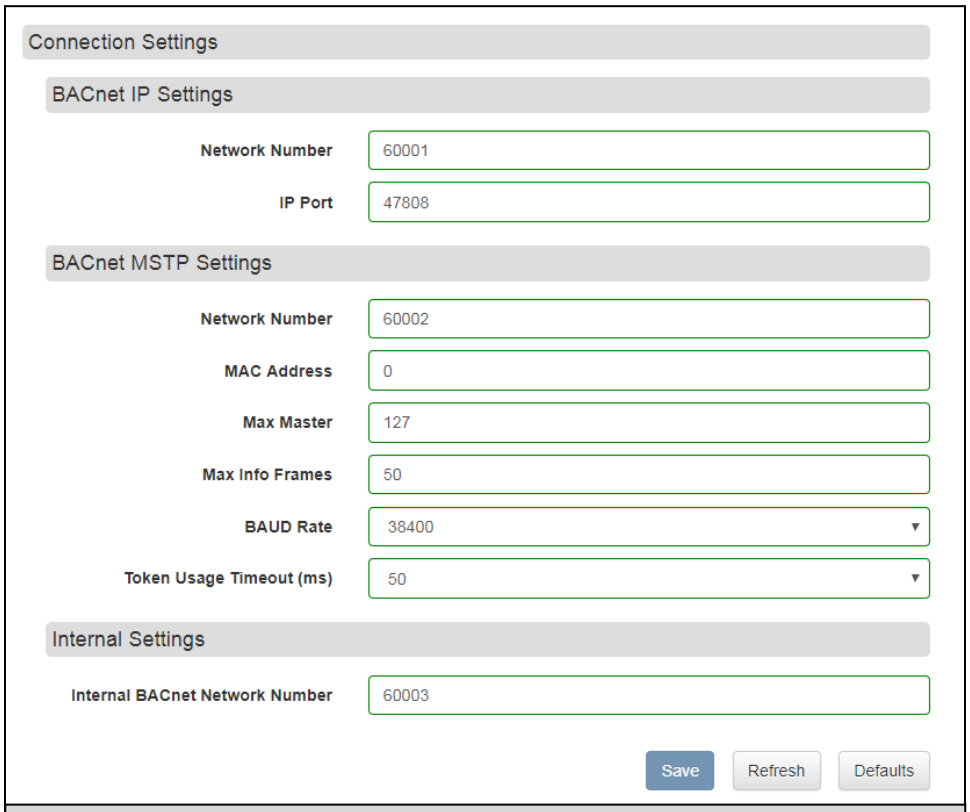


Figure 22: Connection Settings

Parameter	Definition
All Connections	
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 **Internal Network Number** is used for internal BACnet traffic and has to be unique across the BACnet network.
BACnet/IP Settings	
IP Port	The BACnet/IP default is 47808 (0xBAC0), but other port numbers can may be specified.
BACnet MS/TP Settings	
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 IoT Gateway 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 23: Connection Parameters

6.1.3 Remote Settings – Foreign Device Registration for BBMD Support

The BACnet IoT Gateway 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 IoT Gateway and a remote network:

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

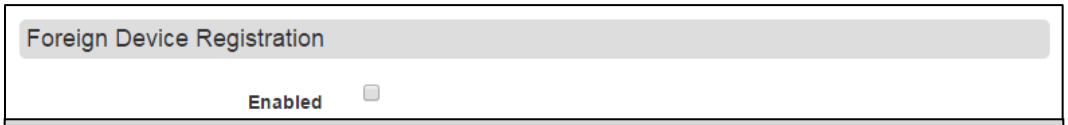


Figure 24: FDR Enabled Checkbox

- 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 IoT Gateway to discover BACnet devices on the remote network.

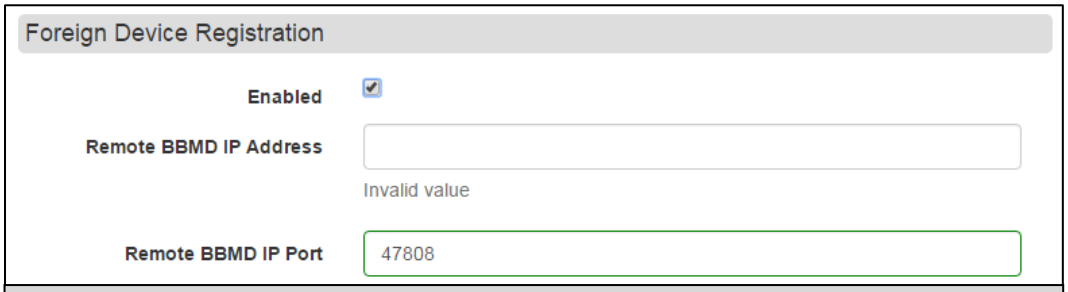


Figure 25: FDR IP Fields

NOTE: The user must uncheck the "Enabled" checkbox to allow the BACnet IoT Gateway to discover on the local network.

NOTE: See Appendix B for additional details concerning FDR and BBMD.

7 USING THE BACNET IOT GATEWAY

Sections 7.1 – 7.4 represent each of the first four tabs that appear across the left side of the page once logged into the BACnet IoT Gateway and describe their functions.

7.1 BACnet Explorer

Click on the BACnet Explorer tab on the left side of the page to open the BACnet Explorer page.

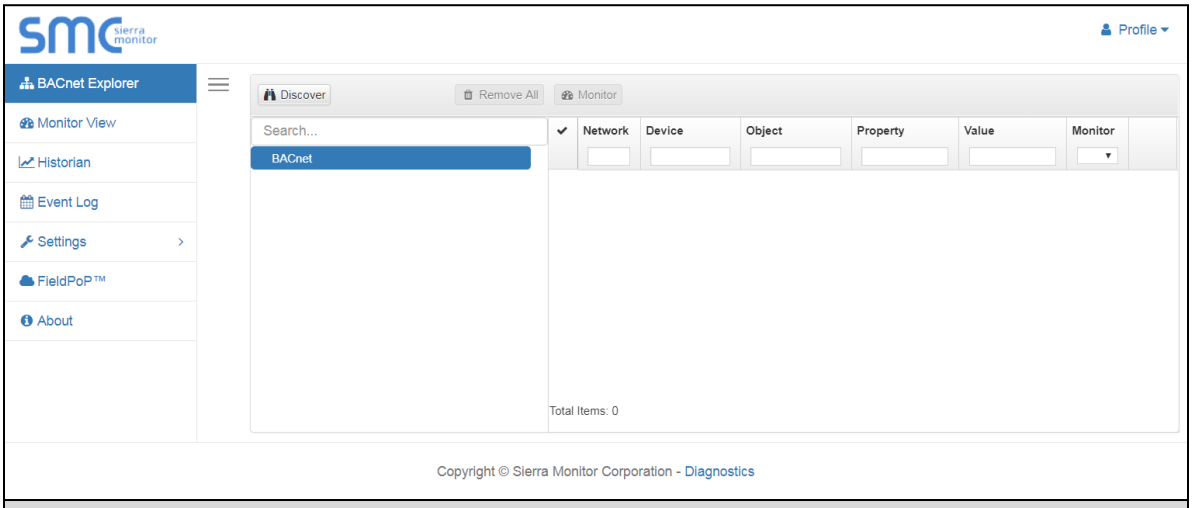


Figure 26: BACnet Explorer Page

7.1.1 Discover the Device List

- To discover the devices connected to the same subnet as the BACnet IoT Gateway, 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.

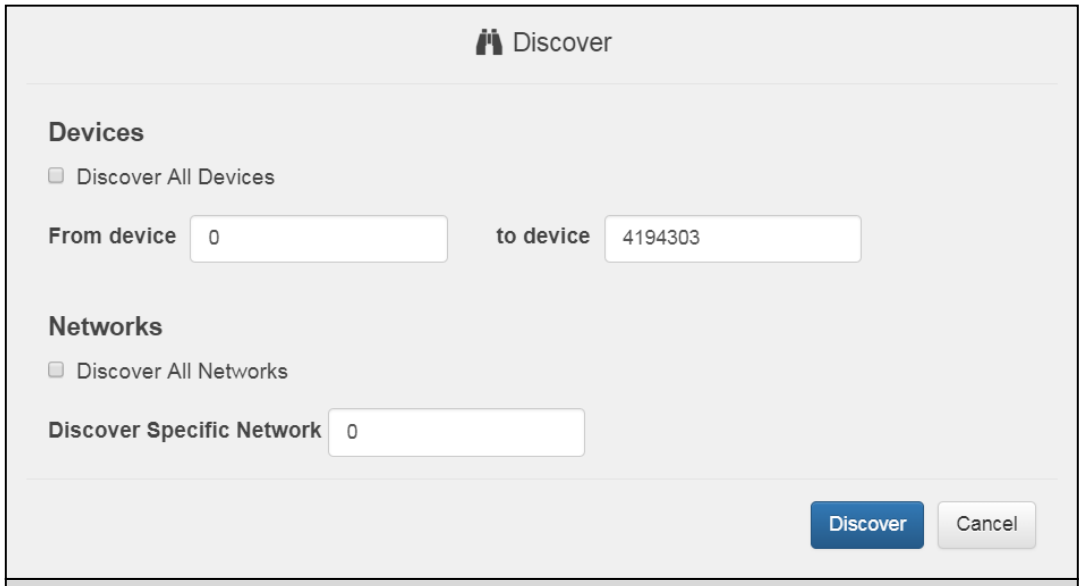


Figure 27: Discovery Window

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.

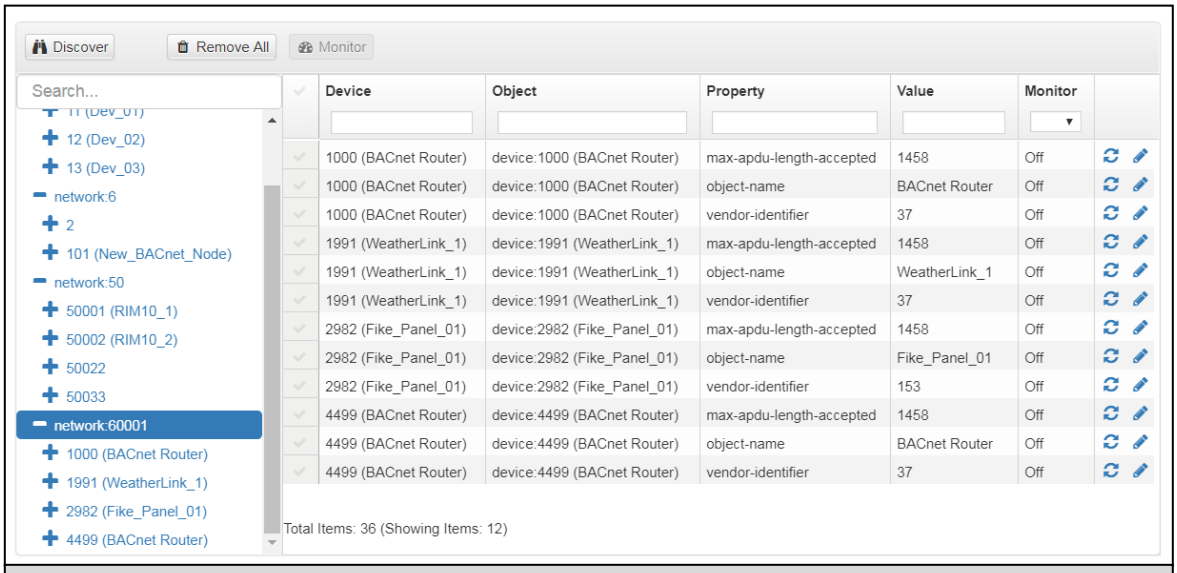


Figure 28: Device List

7.1.2 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

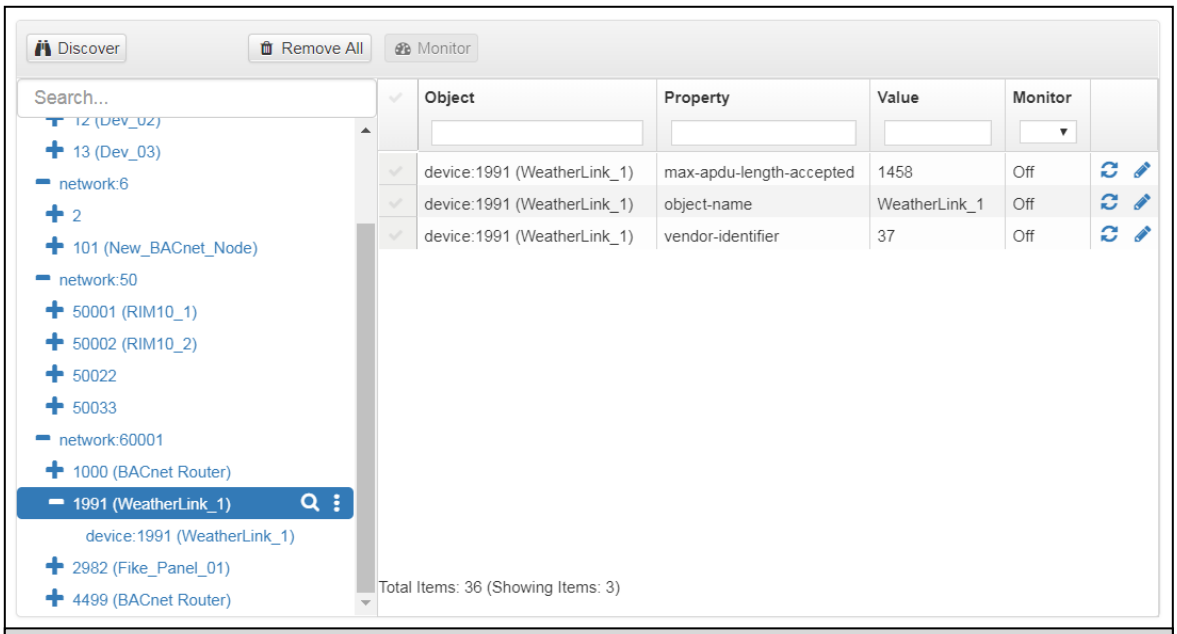


Figure 29: Device Sub-items

- To view the full details of a device, highlight the device directly (in Figure 30 "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.

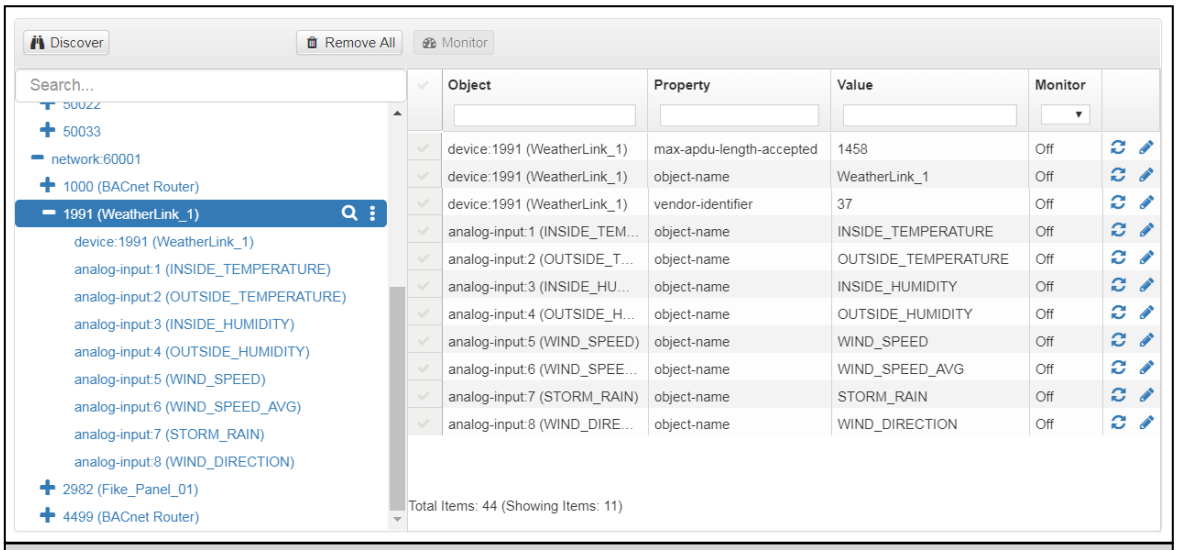


Figure 30: Full Device Sub-items

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

- Click on one of the device details.

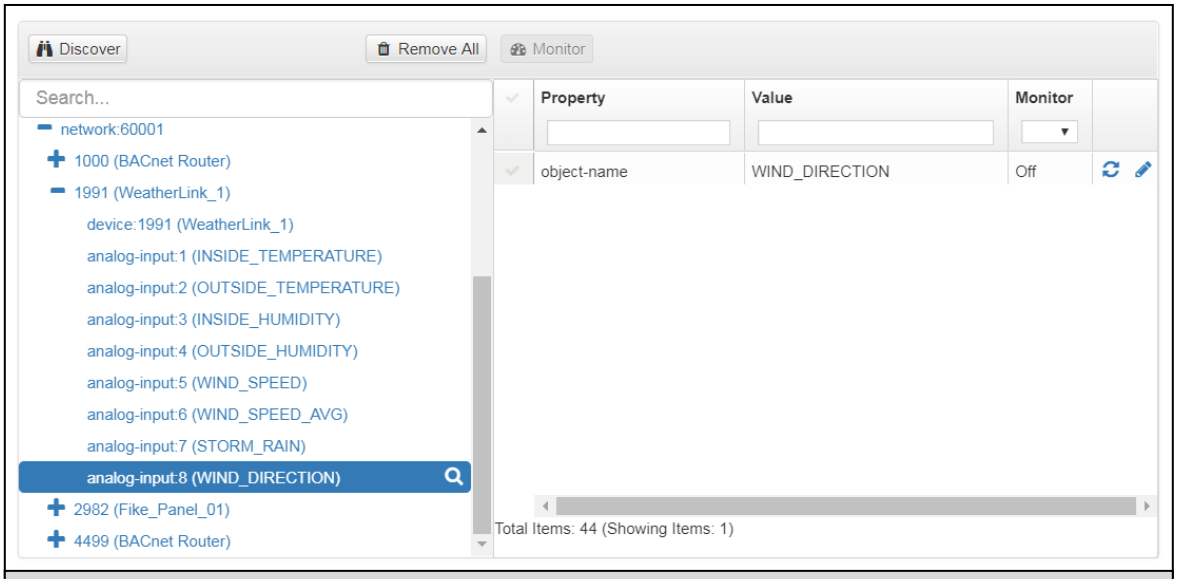


Figure 31: Simplified Device Details

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

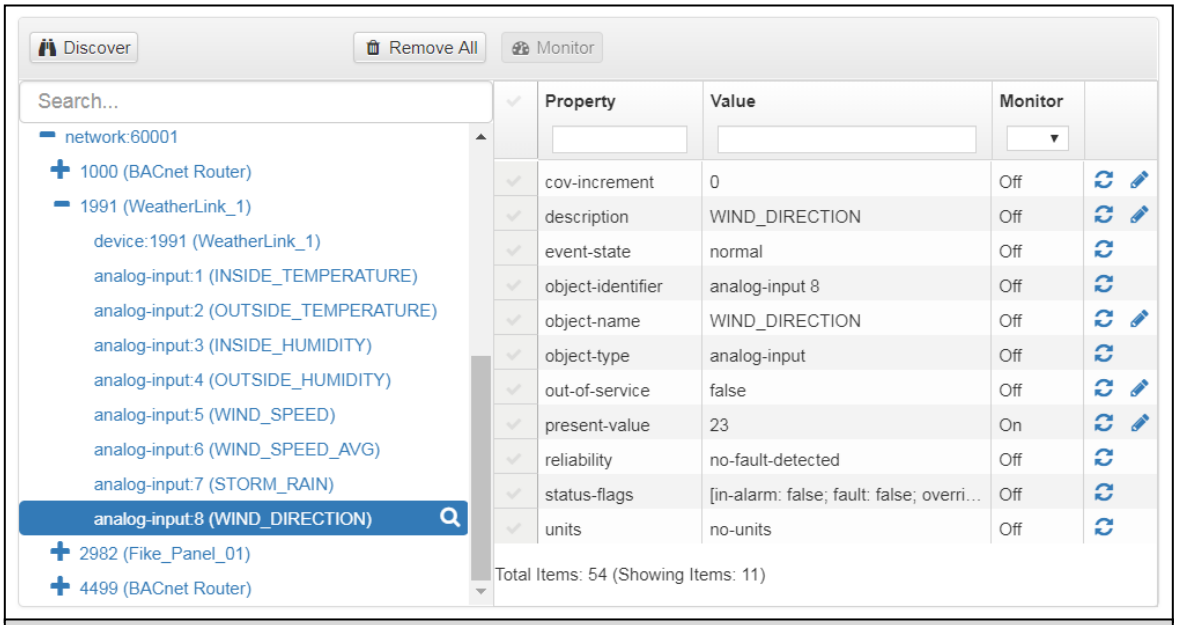


Figure 32: Additional Device Details

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.

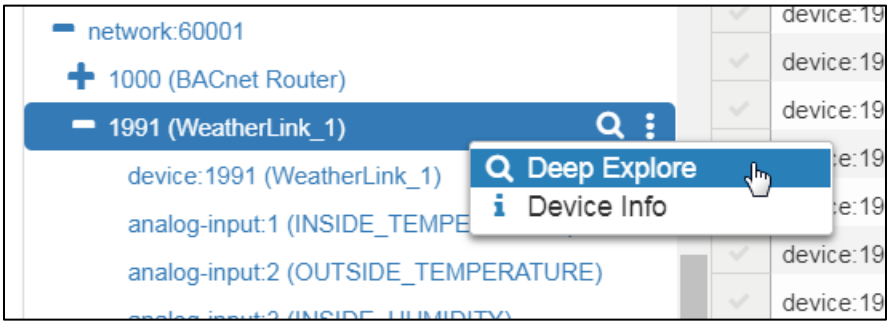
NOTE: The Gateway Search Bar will find devices based on their Device ID.

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

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

7.1.3 Explore All of a Device's Points – Deep Explore

- To explore all device objects under a specific device with one search, click the desired device to highlight it.
- Then click the three white dots (⋮) that appear to the right of the highlighted device to open a dropdown menu.



- Click Deep Explore to open the Deep Explore window.

- Select which property types to find in the search.

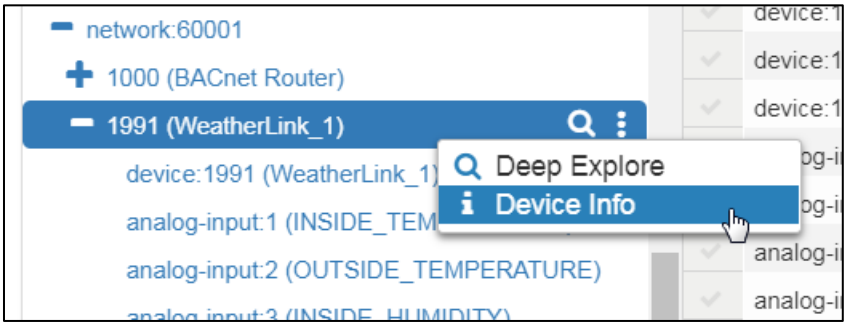
NOTE: The "all" selection must be unchecked to show object-name, present-value and status-flags as options.

NOTE: Object-name will always be checked in a Deep Explore search.

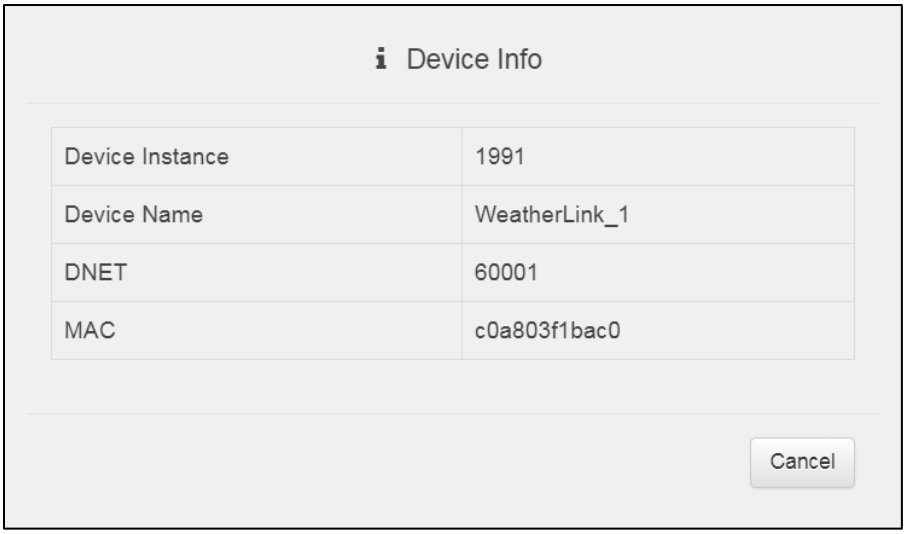
- Click the Explore button and wait for the green explore complete message to comfirm all points have been discovered.

7.1.4 Checking Device Information – Device Info

- To check a device's properties/information, click the desired device to highlight it.
- Then click the three white dots (⋮) that appear to the right of the highlighted device to open a dropdown menu.



- Click Device Info to open the Device Info window and get the device information needed.



7.1.5 Edit the Present Value Field

The only recommended field to edit via BACnet IoT Gateway 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 IoT Gateway is not a Building Management System (BMS).

- To edit the present value, select it in the property listings.

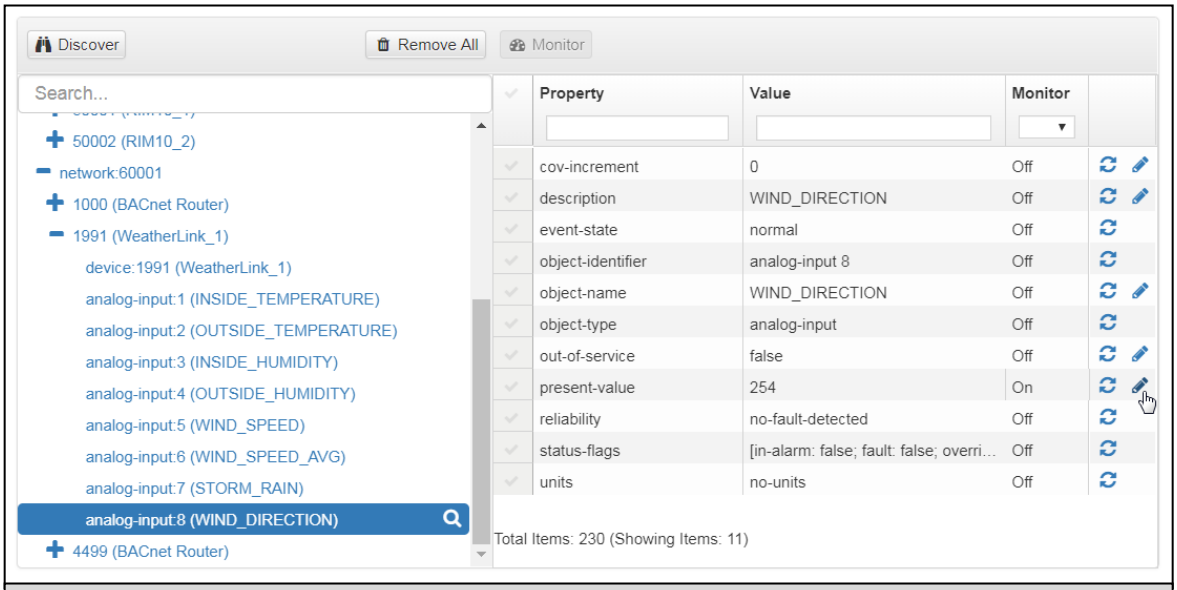


Figure 33: Highlighted Present Value

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

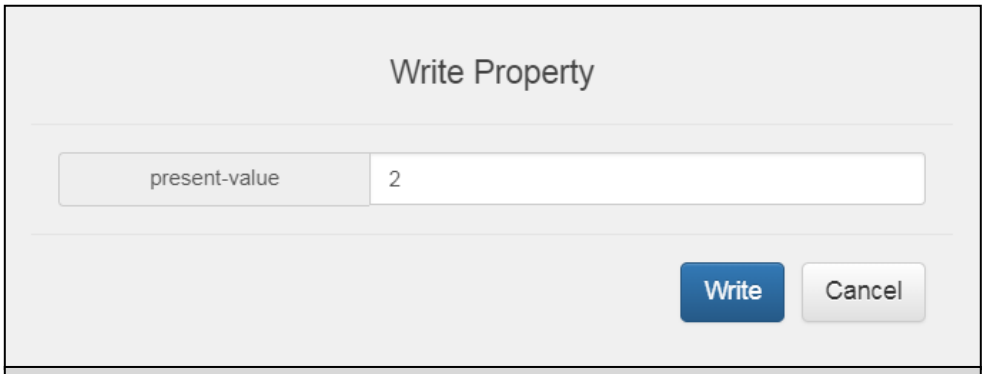


Figure 34: Write Property Window

- Enter the appropriate change and click the Write button.

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

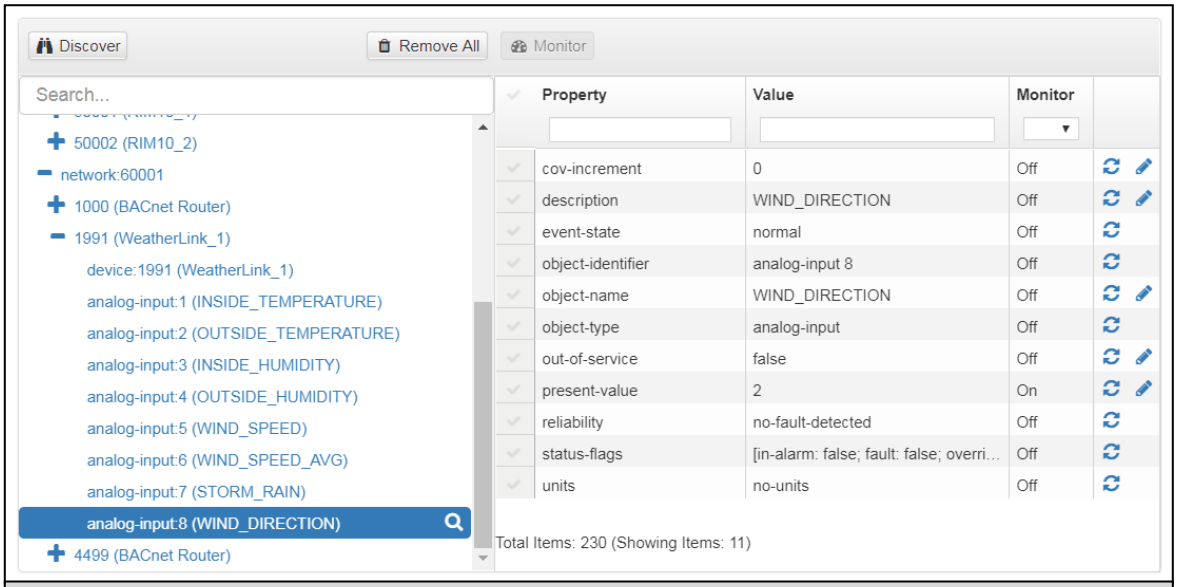


Figure 35: Updated Present Value

7.2 Monitor View

7.2.1 Set Devices to Track

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

- When viewing the expanded device properties on the BACnet Explorer page, click the checkbox to the left of any property to track.

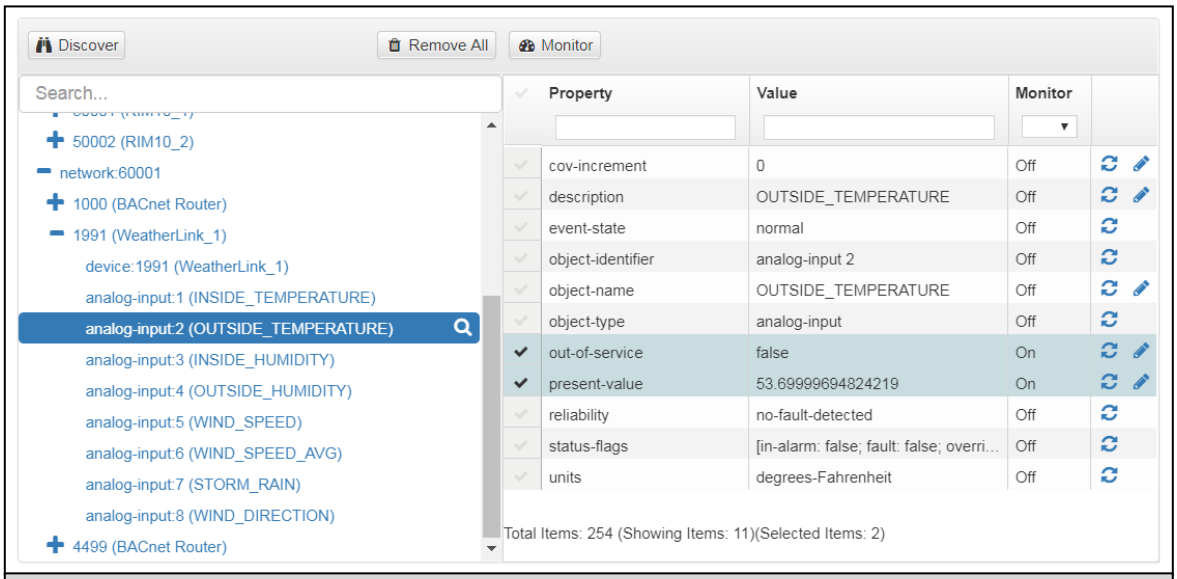


Figure 36: Selected Device Properties for Monitor View

- Once all properties are selected for that data type, click the monitor button Monitor to set the selected properties to be monitored.
  - The Monitor column in the selected property row will change from “Off” to “On”

NOTE: A maximum of 1,000 data points can be monitored.

- Wait for the configuration to complete, then click on the Monitor View tab.

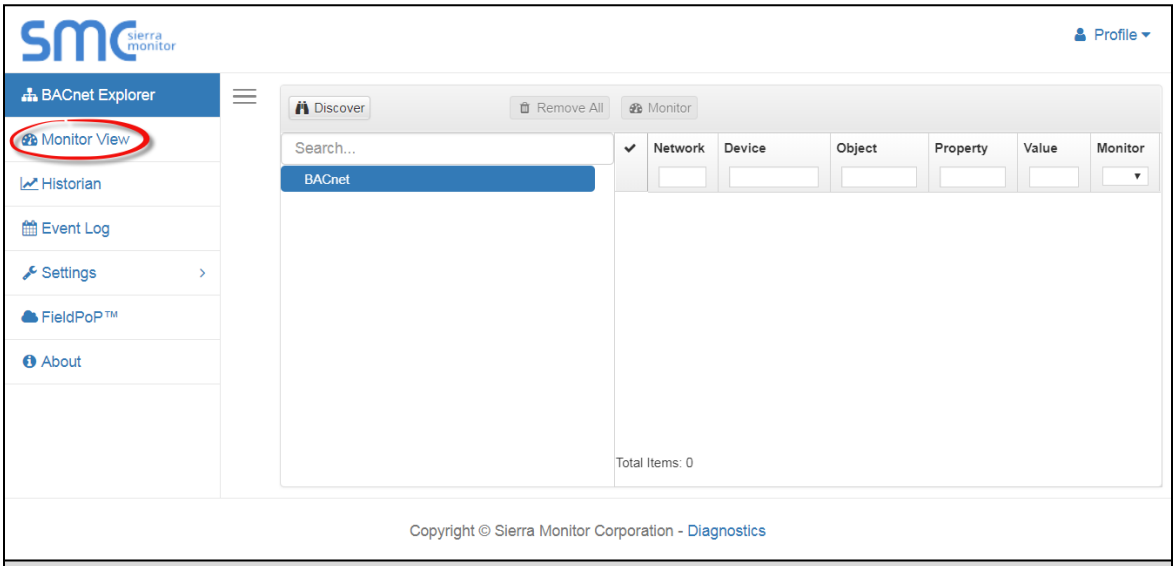
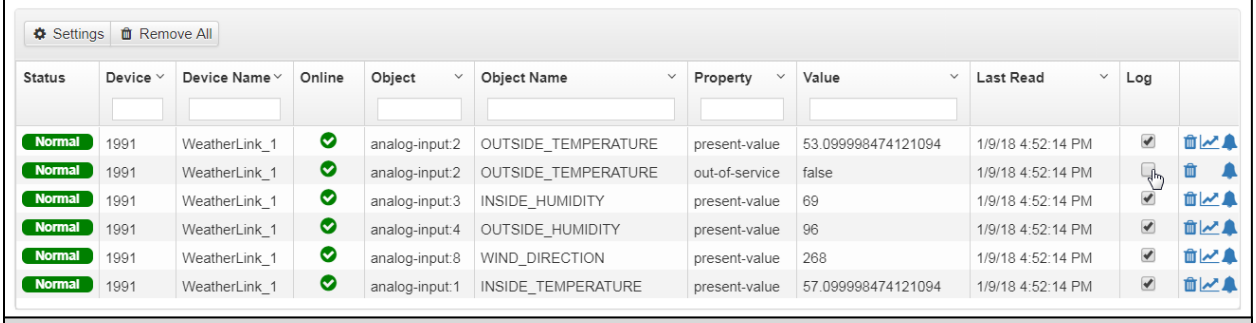


Figure 37: Highlighted Monitor View Tab

7.2.2 Logging Data

- To log data for Historian, Event Log and SMC Cloud, click the checkbox under the Log column.



Settings | Remove All

Status	Device	Device Name	Online	Object	Object Name	Property	Value	Last Read	Log
Normal	1991	WeatherLink_1	✓	analog-input:2	OUTSIDE_TEMPERATURE	present-value	53.099998474121094	1/9/18 4:52:14 PM	☑
Normal	1991	WeatherLink_1	✓	analog-input:2	OUTSIDE_TEMPERATURE	out-of-service	false	1/9/18 4:52:14 PM	☐
Normal	1991	WeatherLink_1	✓	analog-input:3	INSIDE_HUMIDITY	present-value	69	1/9/18 4:52:14 PM	☑
Normal	1991	WeatherLink_1	✓	analog-input:4	OUTSIDE_HUMIDITY	present-value	96	1/9/18 4:52:14 PM	☑
Normal	1991	WeatherLink_1	✓	analog-input:8	WIND_DIRECTION	present-value	268	1/9/18 4:52:14 PM	☑
Normal	1991	WeatherLink_1	✓	analog-input:1	INSIDE_TEMPERATURE	present-value	57.099998474121094	1/9/18 4:52:14 PM	☑

Figure 38: 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.

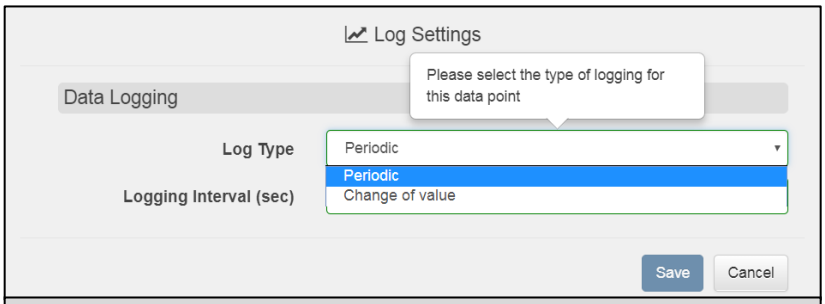


Figure 39: Data Logging Window

- 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 then click the Save button to save the settings.

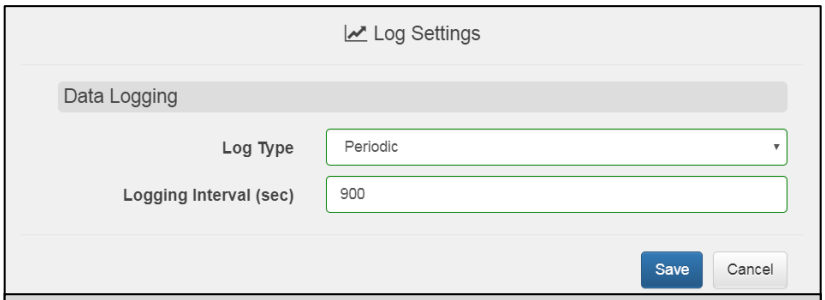


Figure 41: Periodic Log Type

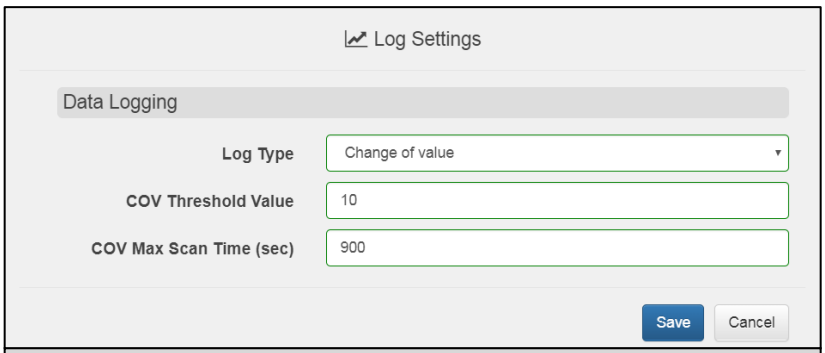


Figure 40: Change of Value Log Type

- To change the poll interval of a device, click the Settings button Settings (see **Figure 38**) to open the Settings window.

Figure 42: Settings Window

- Click the Edit icon to open the Edit Poll Interval window.

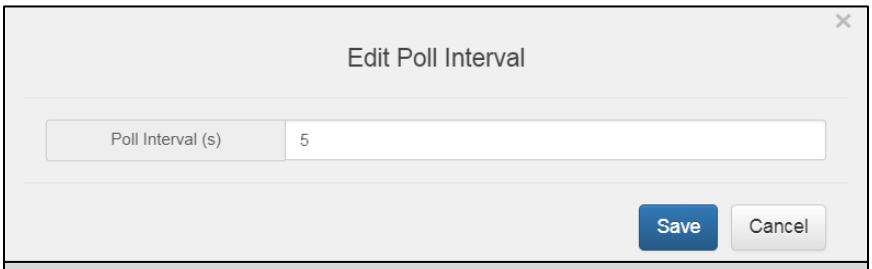


Figure 43: Edit Poll Interval Window

- Make desired changes and click Save.

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

NOTE: Click the Trash icon ( ) to the right of any logged property to remove it from Monitor View.

7.3 Historian

NOTE: The Historian can log up to 1,000 data points.

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

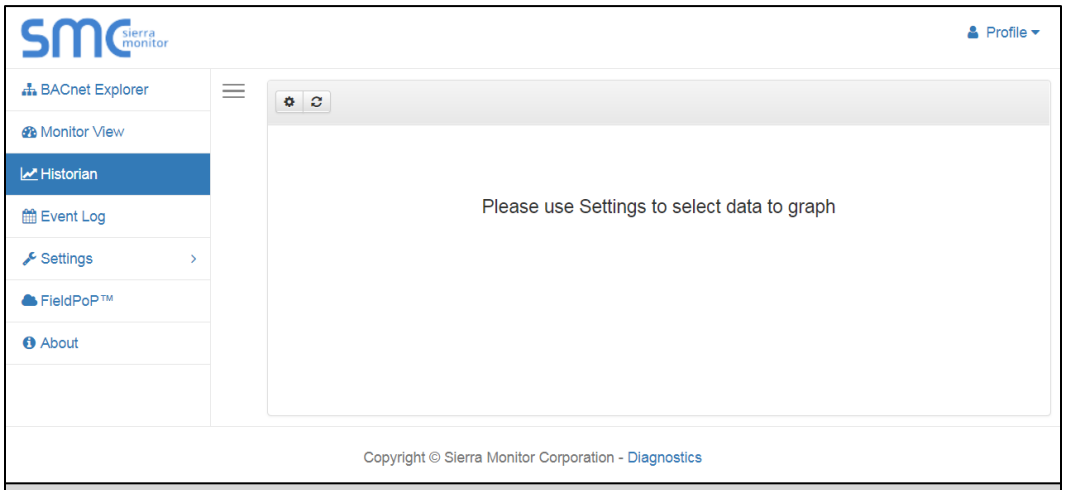


Figure 44: Historian Page

7.3.1 Graph Data Logging Information

- Click on the Settings button ( ) to select data to graph.

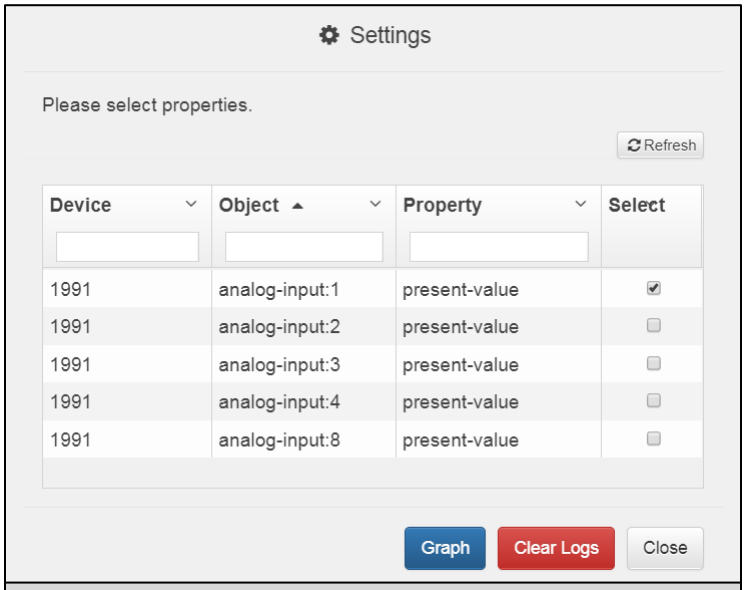


Figure 45: Historian Settings Window

- 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 7.2.

- 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

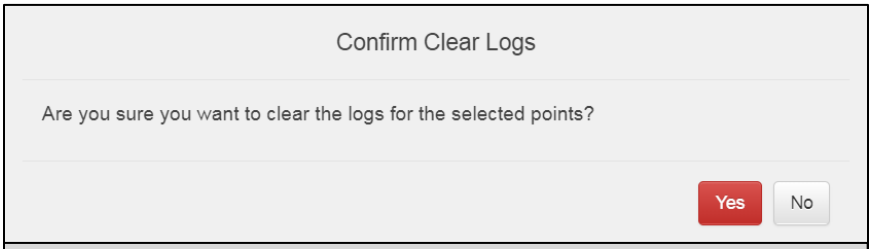


Figure 46: Confirm Clear Logs Window

- After a few seconds the graph should appear.

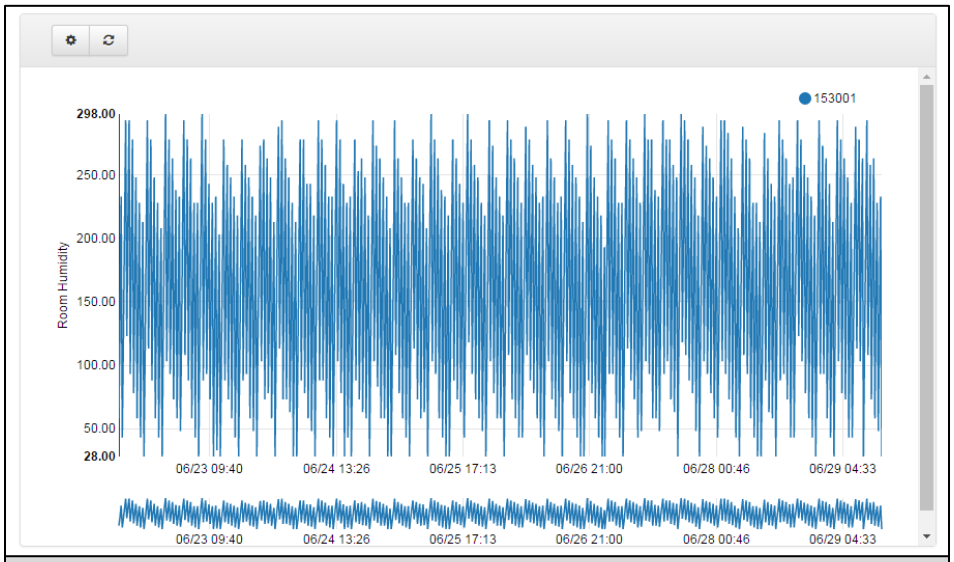
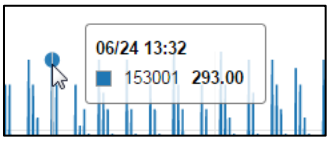
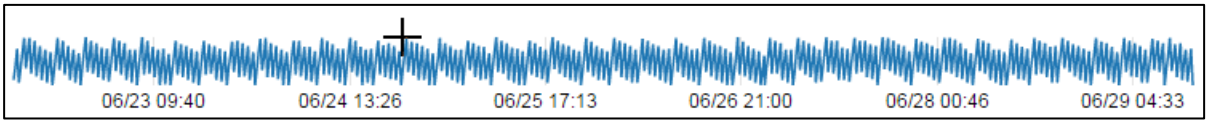


Figure 47: Historian Graph

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 (+).

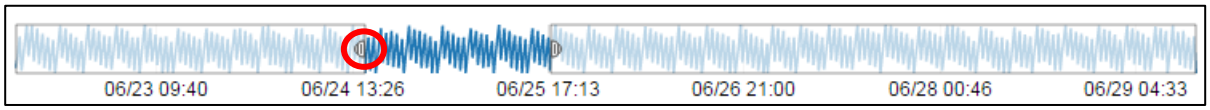


Click and hold near the beginning or ending time frame desired, then drag the crosshair towards the ending or beginning time frame; all within the confines of the miniature graph.

The full-size version of the graph will populate accordingly.

Figure 48: Selected Portion of Historian Graph

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 SMC Cloud RESTful API, contact SMC Technical Support for a copy of the RESTful API Start-up Guide.

7.3.2 Creating an Event Log

- To create an event log for a property, click on the Monitor View tab to go to the Monitor View page.

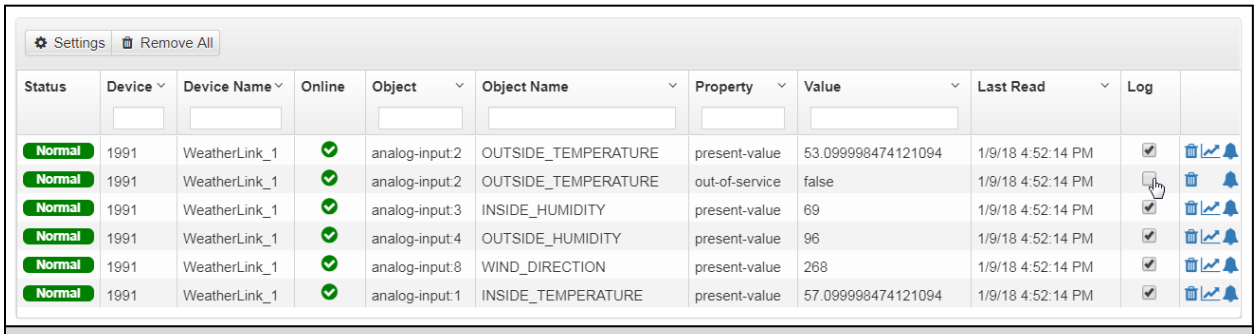


Figure 49: Monitor View Device Properties

- Click the bell icon ( ) to the right of the property to log and the Event Settings window will open.

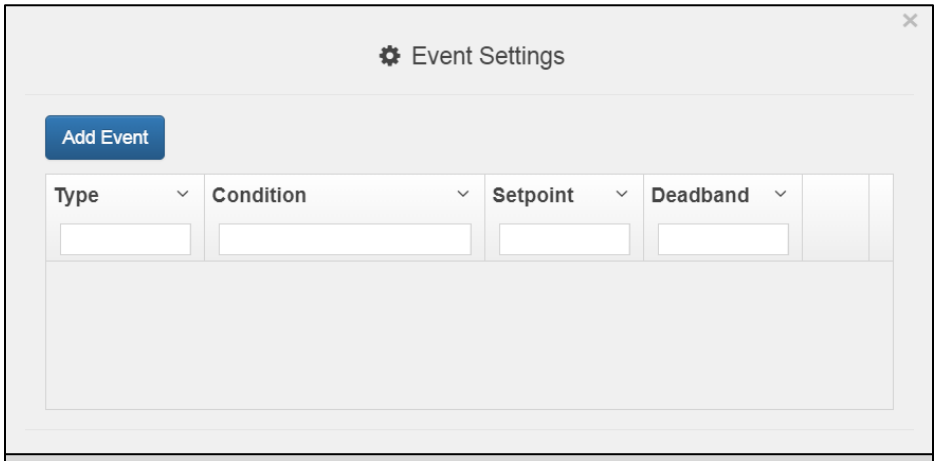


Figure 50: Event Settings Window

- Click on the Add Event button to change the event settings.

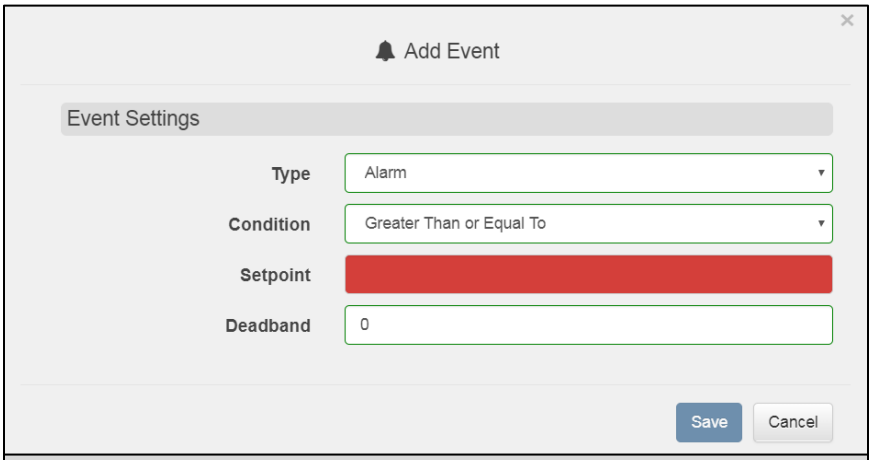


Figure 51: Add Event Settings

- Set the event as needed and click Save.

- Repeat this process to create more events as needed.

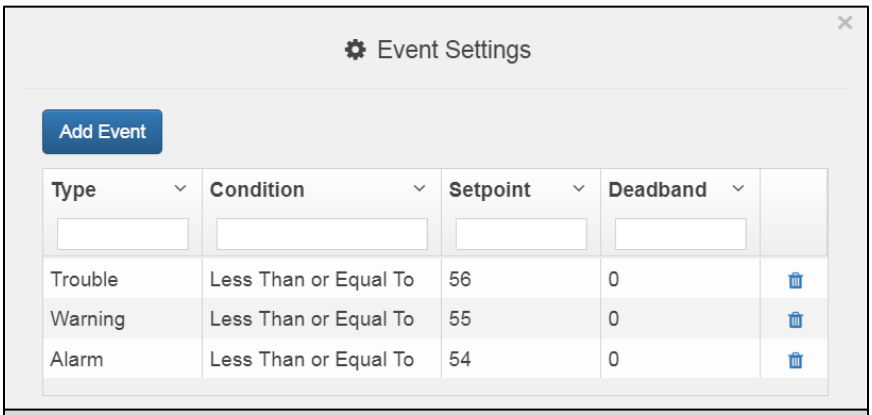


Figure 52: Event Settings Window with Added Events

NOTE: Click the Trash icon (🗑) to the right of any event to remove it.

- Click the "x" in the top right corner of the Event Settings window to close it.
  - The Monitor View page will now update the status column as events take place

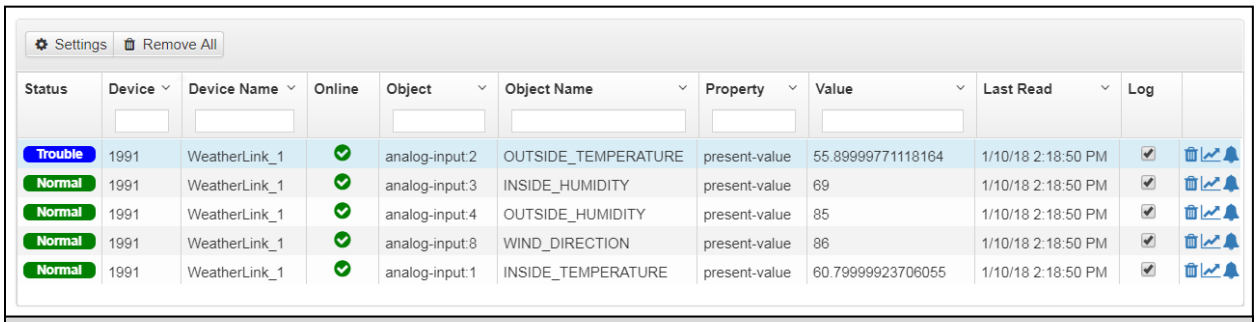


Figure 53: Monitor View Device Properties with Updated Status

7.4 Event Log

Click the Event Log tab on the left side of the page to open the Event Logger and view the events that have been set to track in **Section 7.3.2** (by time and type with a descriptive message).

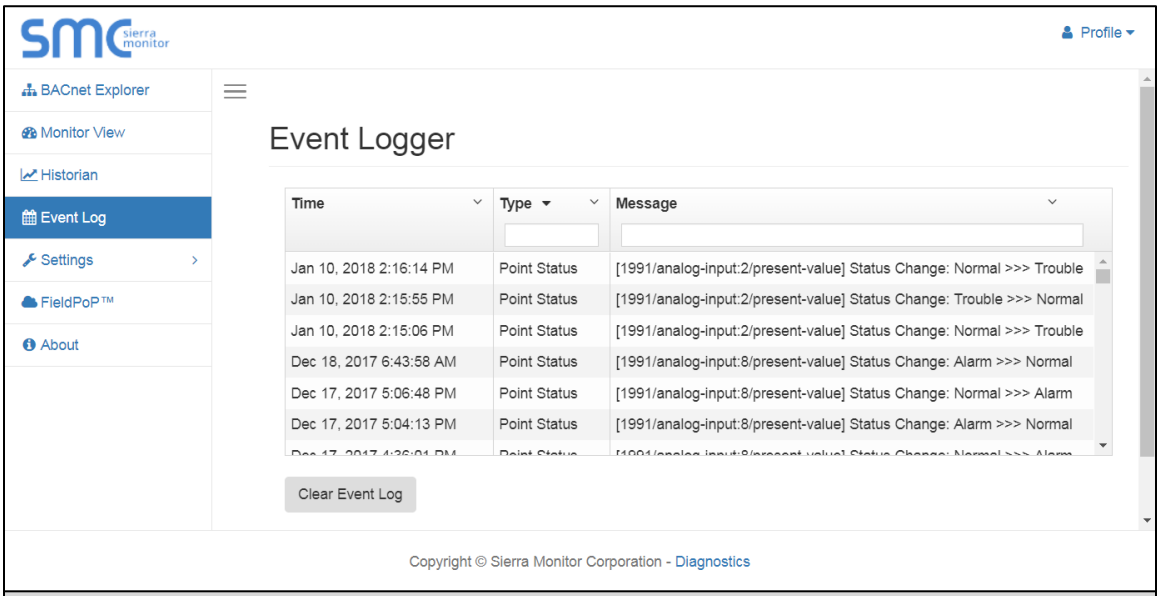


Figure 54: Event Log Page Showing Added Events

8 CONNECTING TO THE SMC CLOUD

8.1 User Setup

Request an invitation to SMC Cloud from the manufacturer's support team and follow the instructions below to set up login details:

- The "Welcome to SMC Cloud" email will appear as shown below.

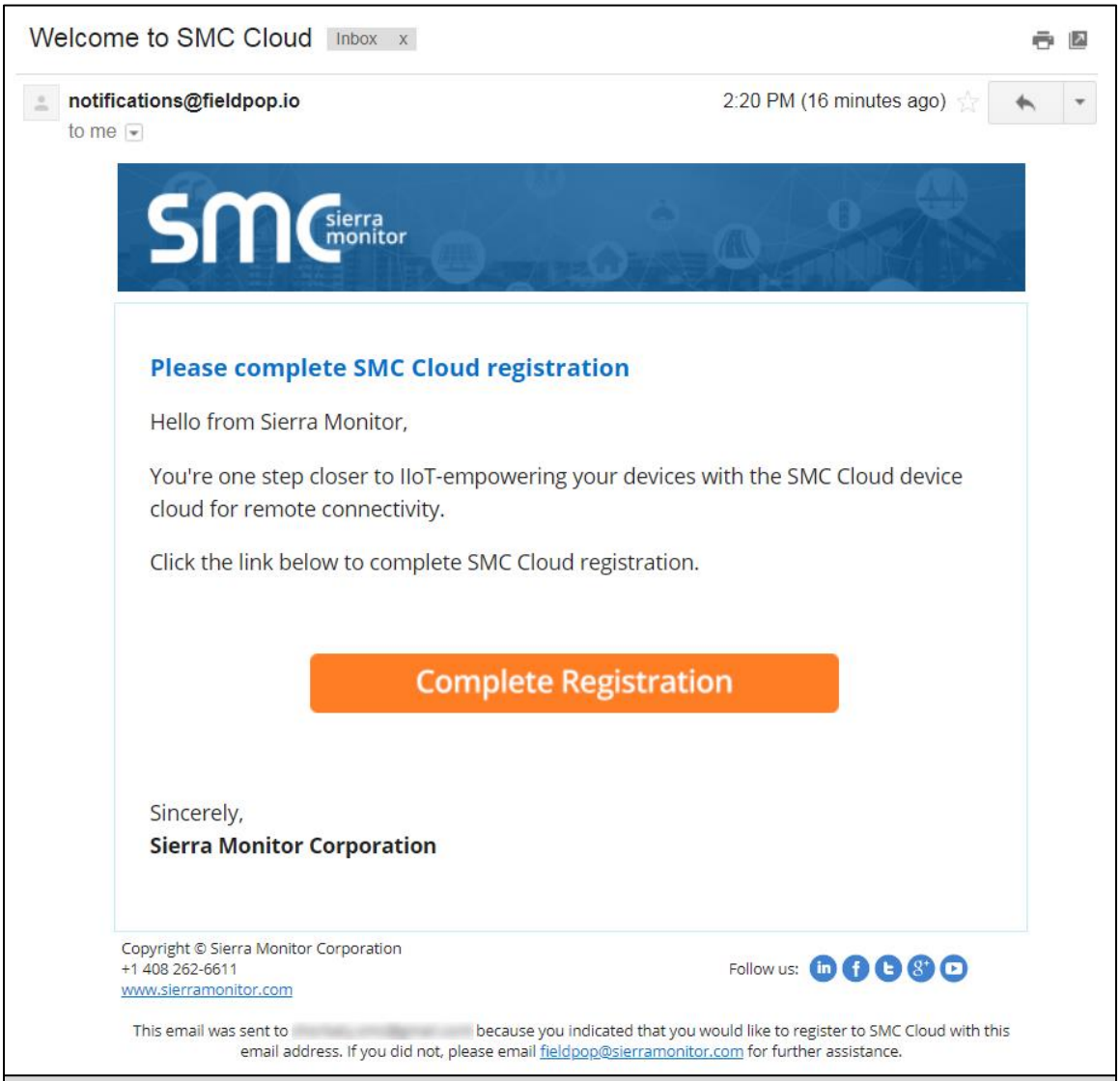


Figure 55: Welcome to SMC Cloud Email

NOTE: If no SMC Cloud email was received, check the spam/junk folder for an email from notification@fieldpop.io. Contact the manufacturer's support team if the email cannot be found.

- Click the “Complete Registration” button and fill in user details accordingly.

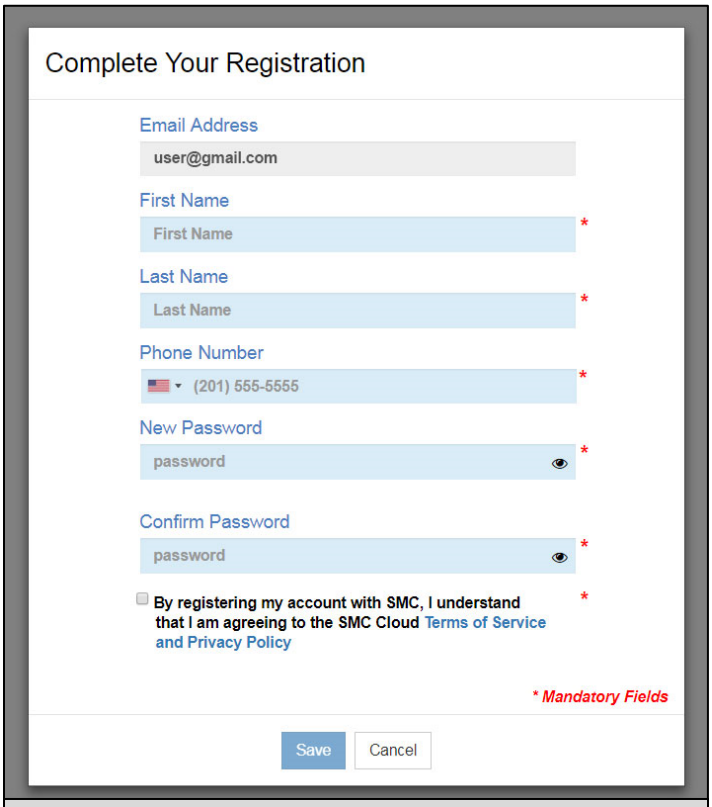


Figure 56: Setting User Details

- Fill in the name, phone number, password fields and click the checkbox to agree to the privacy policy and terms of service.
- Click “Save” to save the user details.
- Click “OK” on when the Success message appears.
- Record the email account used and password for future use.

8.2 Registration Process

Once SMC Cloud user credentials have been generated, the BACnet IoT Gateway can be registered onto the SMC Cloud server.

- Click on the FieldPoP™ tab on the left-hand side of the screen.

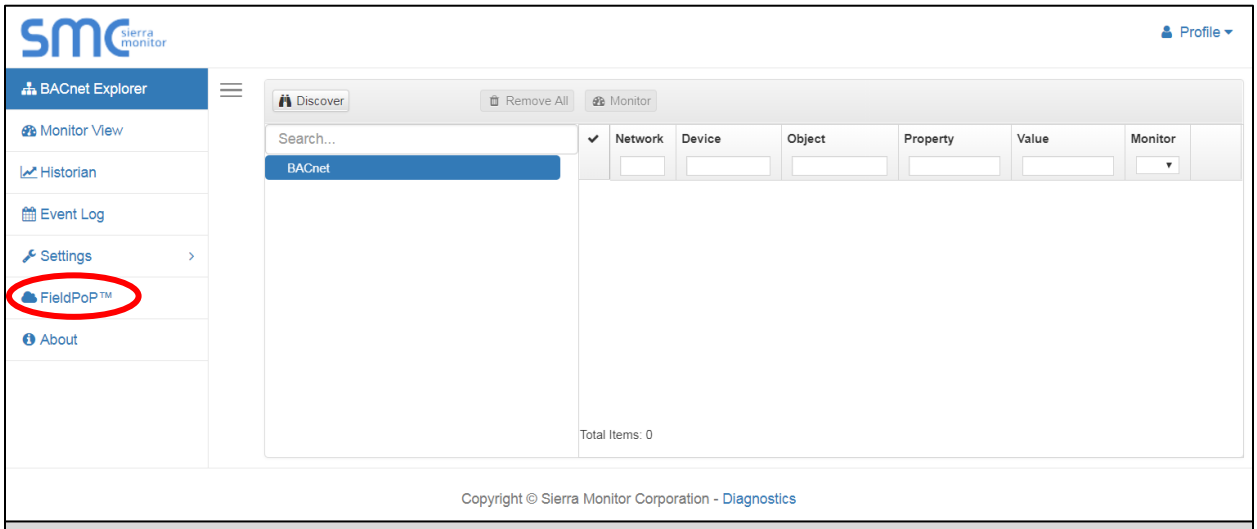


Figure 57: BACnet IoT Gateway Landing Page – FieldPoP Tab

- The following informational splash page will appear, click Close to view the registration page.

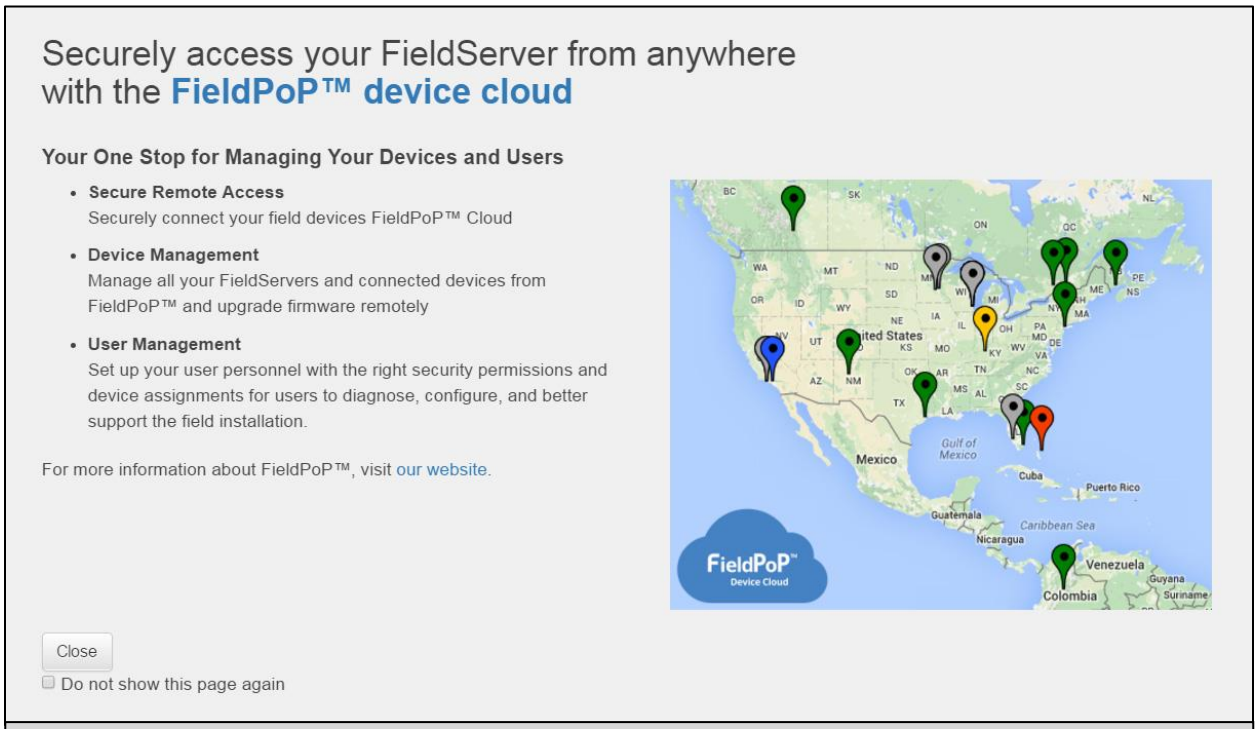


Figure 58: Registration Information Page

- If a warning message appears instead of the splash page, follow the suggestion that appears on screen.
- If the BACnet IoT Gateway cannot reach the SMC Cloud server, the following message will appear.

Figure 59: SMC Cloud Connection Problems Message

  - Follow the directions presented in the warning message and check that the DNS settings are set up with the following Domain Name Server (DNS) settings:

    DNS1=8.8.8.8

    DNS2=8.8.4.4
  - Ensure that the BACnet IoT Gateway is properly connected to the Internet

NOTE: If changes to the network settings are done, remember to click "Update IP Settings" and then power cycle the BACnet IoT Gateway.

- On the registration page, fill in user credentials and all other device information fields for registration of each individual BACnet IoT Gateway in the field.

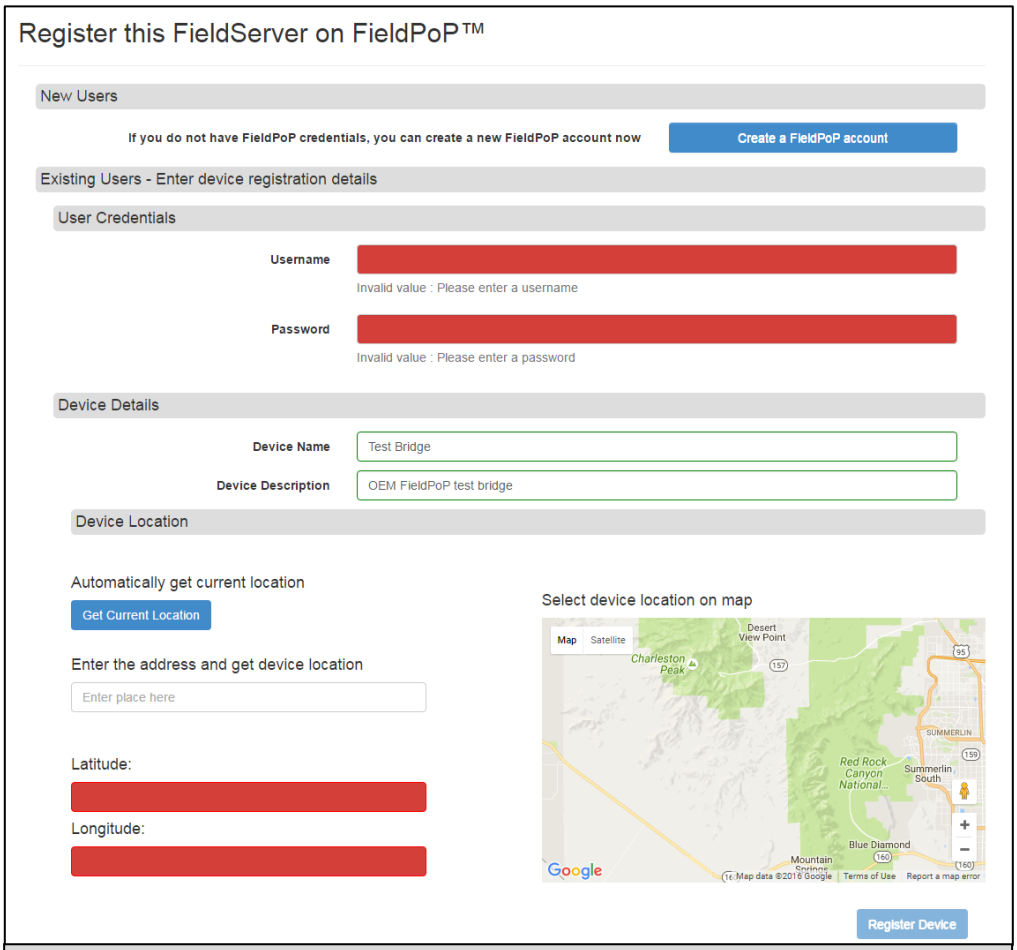


Figure 60: SMC Cloud Registration Page

- To input the device location do one of the following:
  - Enter the address in the address field
  - Click the “Get Current Location” button to auto-populate

NOTE: This button will only work if location services have been enabled on the local browser. If using the Chrome browser and connected via LAN, this method will not work.

  - Drop a location directly on the Google map
  - Enter the latitude and longitude manually
- Click Register Device.

- Once the device has successfully been registered, the following screen will appear listing the device details and additional information auto-populated by the BACnet IoT Gateway.

Figure 61: Device Registered for SMC Cloud

8.3 Login to SMC Cloud

After the BACnet IoT Gateway is registered, go to www.smccloud.net and type in the appropriate login information as per registration credentials.

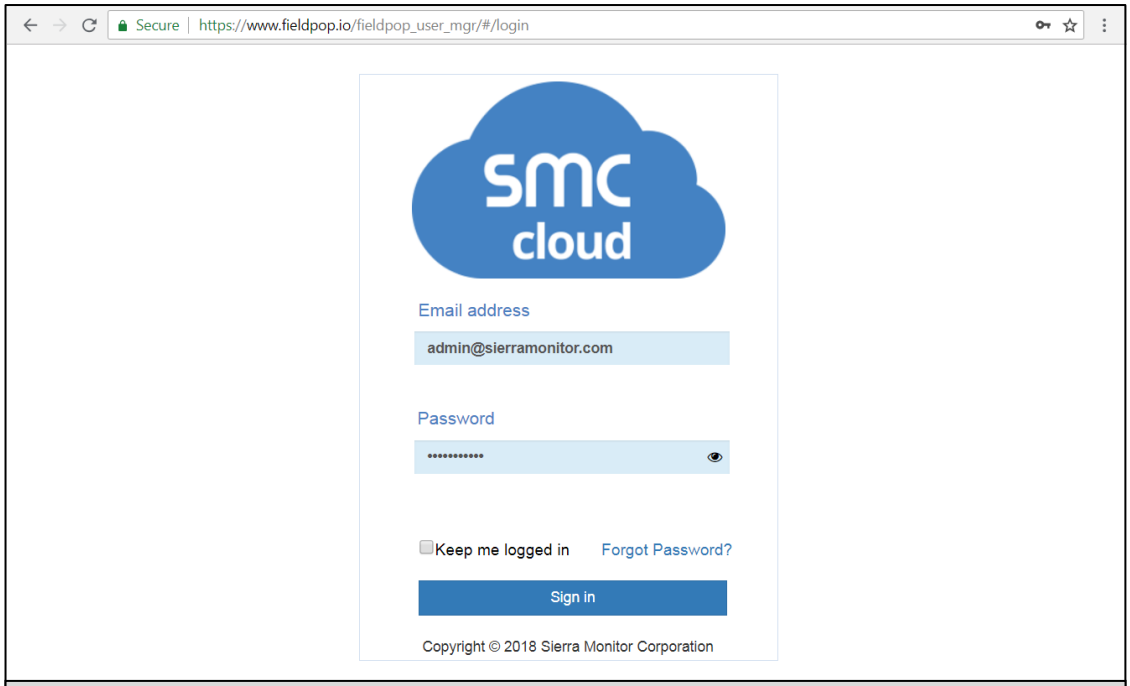


Figure 62: SMC Cloud Login Page

NOTE: If the login password is lost, see the SMC Cloud Start-up Guide for recovery instructions.

On first login, the Privacy Policy window will appear. Read the Terms of Service, click the checkbox to accept the terms and then click the Continue button to access SMC Cloud.

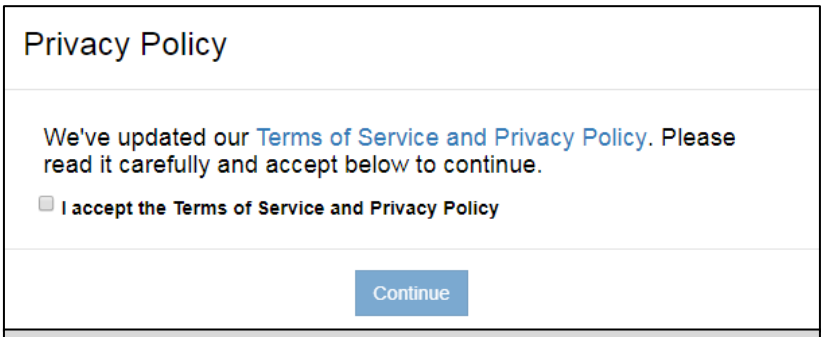


Figure 63: SMC Cloud Privacy Policy

NOTE: For additional SMC Cloud instructions see the [SMC Cloud Start-up Guide](#).

Figure 64: SMC Cloud Landing Page

APPENDIX A SPECIFICATIONS

	FS-IOT-BAC, FS-IOT-BACW & FS-IOT-BACC[1]	
Available Ports	One 3-pin Phoenix connector with: RS-485/RS-232 port (TX+ / RX- / gnd) One 3-pin Phoenix connector with: Power port (+ / - / Frame-gnd) One Ethernet 10/100 BaseT port **BAC includes an additional:** One 3-pin Phoenix connector with: RS-485 port (TX+ / RX- / gnd)	
BAC Power Requirements	*Input Voltage:* 12-24VDC or 24VAC *Max Power:* 3 Watts	*Current draw:* 24VAC 125mA 12-24VDC 250mA @12VDC
BACW Power Requirements	*Input Voltage:* 12-24V DC *Power Rating:* 2.5 Watts	*Current draw:* @ 12V, 240 mA
BACC Power Requirements	*Input Voltage:* 12-24V DC *Power Rating:* 8 Watts	*Current draw:* @ 12V, 670 mA
Approvals	CE and FCC Class B & C Part 15, UL 60950 TUV approved[3], UL 916 approved[2], IC Canada, RoHS Compliant, PTCRB[3] and CTIA[3]	
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 [3]	*Frequency:* 2.4 GHz *Antenna Type:* SMA	*Channels:* 1 to 11 (inclusive) *Encryption:* TKIP, WPA & AES
Cellular [4]	*Features:* 3G & GPS *HSDPA:* Up to 21.0 Mbps *IMEI:* 357178070517852	*Antenna Type:* SMA *HSUPA:* Up to 5.76 Mbps

Figure 65: 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".

[1] Specifications subject to change without notice.
[2] Only for FS-IOT-BAC
[3] Only for FS-IOT-BACW & FS-IOT-BACC
[4] Only for FS-IOT-BACC.

APPENDIX B REFERENCES

Appendix B.1. Understanding FDR

The BACnet IoT Gateway 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 IoT Gateway 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 IoT Gateway does not support NAT routing. However, the BACnet IoT Gateway 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.

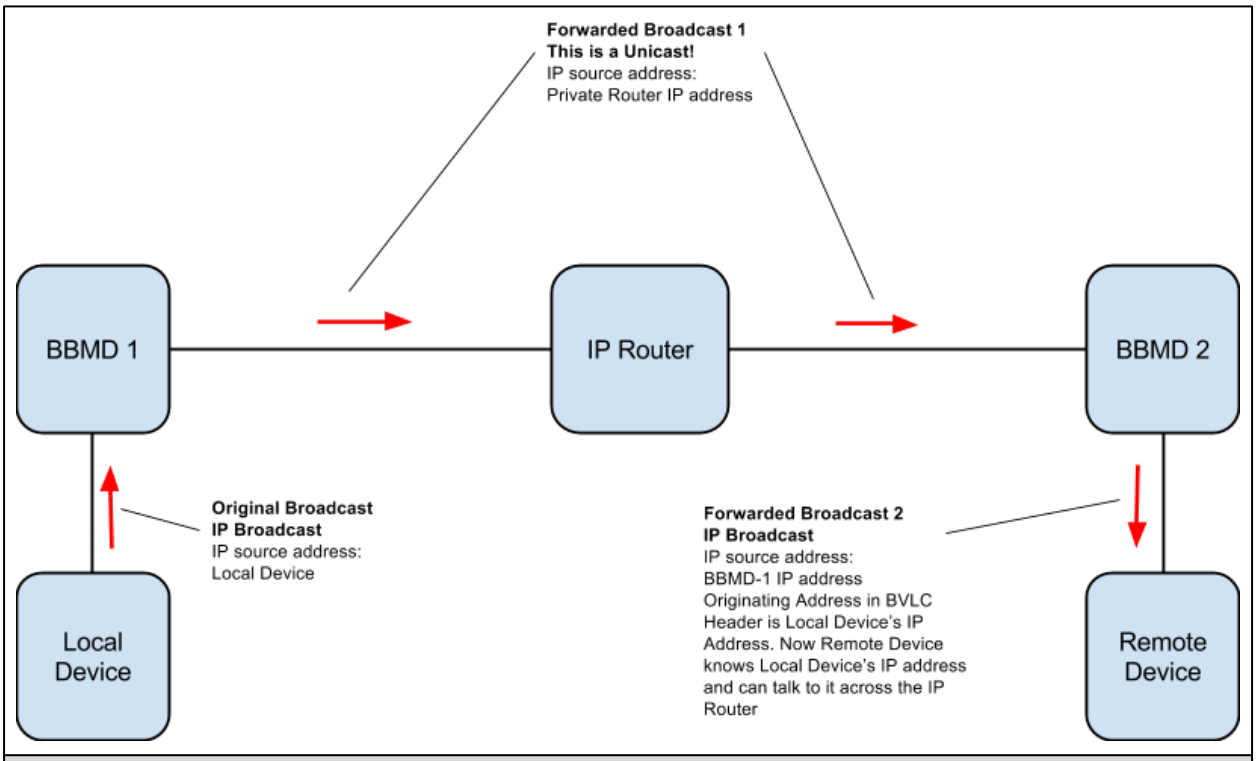


Figure 66: BBMD Scenario 1 – Interconnected IP Network

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 IoT Gateway 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.

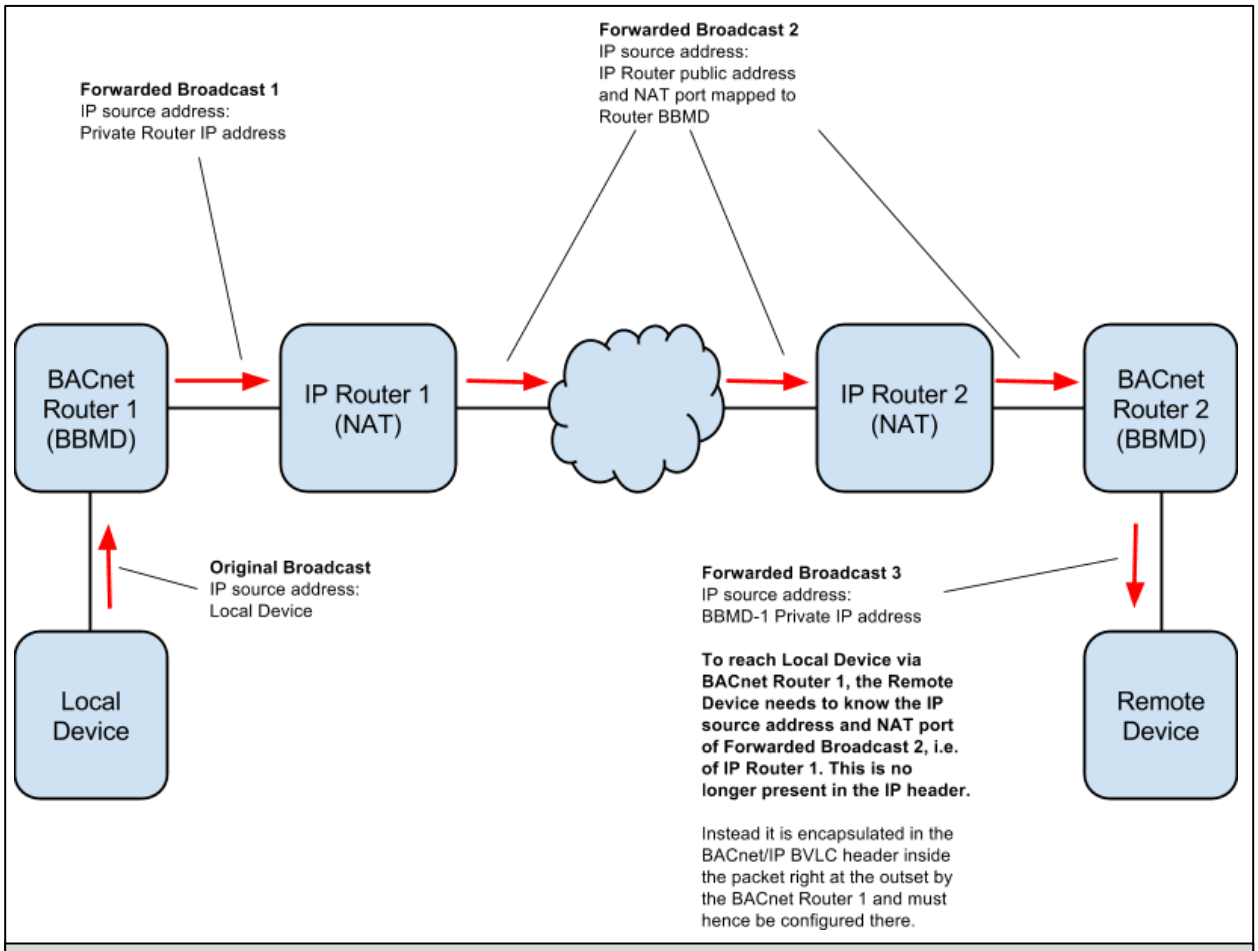


Figure 67: BBMD Scenario 2 – NAT Routing

APPENDIX C TROUBLESHOOTING

Appendix C.1. Communicating with the BACnet IoT Gateway Over the Network

- 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 is configured to run the TCP/IP protocol.
- Check that the IP netmask of the PC matches the BACnet IoT Gateway. The Default IP Address of the BACnet IoT Gateway is 192.168.2.101, 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 192.168.1.X and the netmask 255.255.255.0
- Ensure that the PC and BACnet IoT Gateway are on the same IP Network, or assign a Static IP Address to the PC on the 192.168.1.X network.

Appendix C.2. 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.

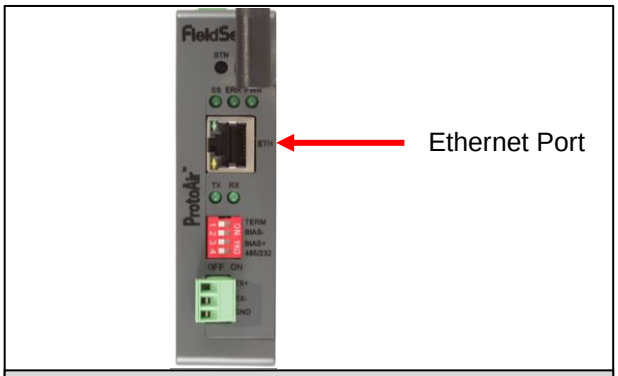
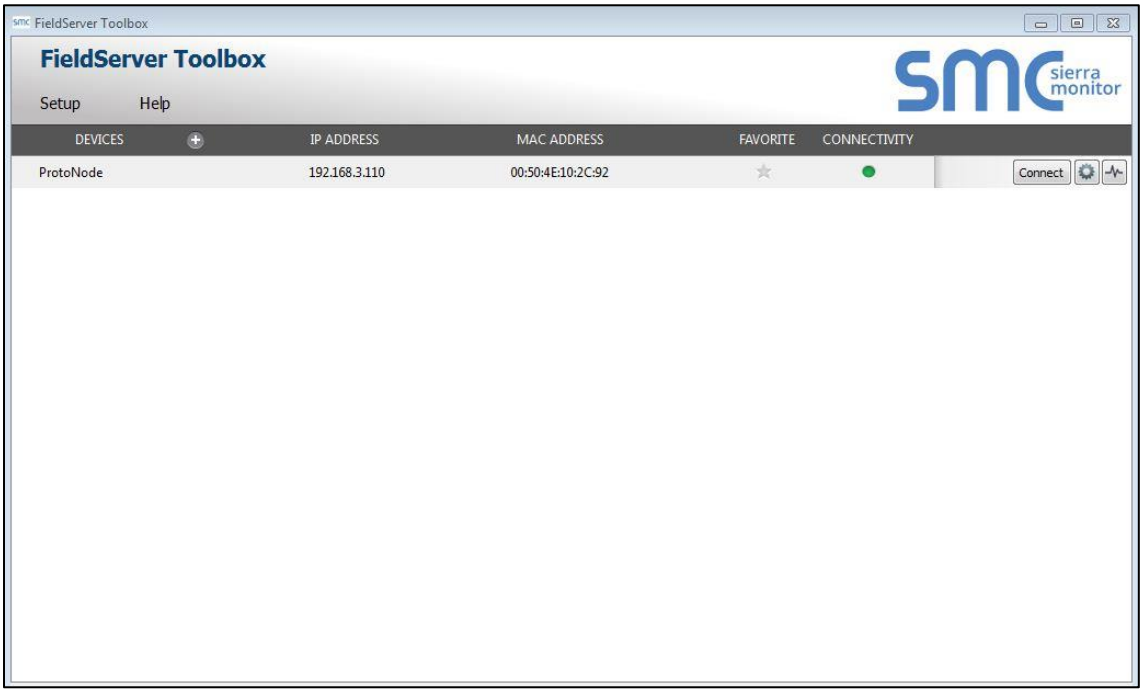


Figure 68: Ethernet Port Location

- Connect a standard Cat-5 Ethernet cable between the user's PC and BACnet IoT Gateway.
- 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 C.3. Viewing Diagnostic Information

- Type the IP Address of the BACnet IoT Gateway into the web browser or use the FieldServer Toolbox to connect to the BACnet IoT Gateway.
- Click on the blue “Diagnostics” text at the bottom of the page, next to the SMC copyright.
- Under the Navigation panel, click on view and then on connections.

NOTE: If there are any errors showing on the Connection page, refer to Appendix C.4 for the relevant wiring and settings.

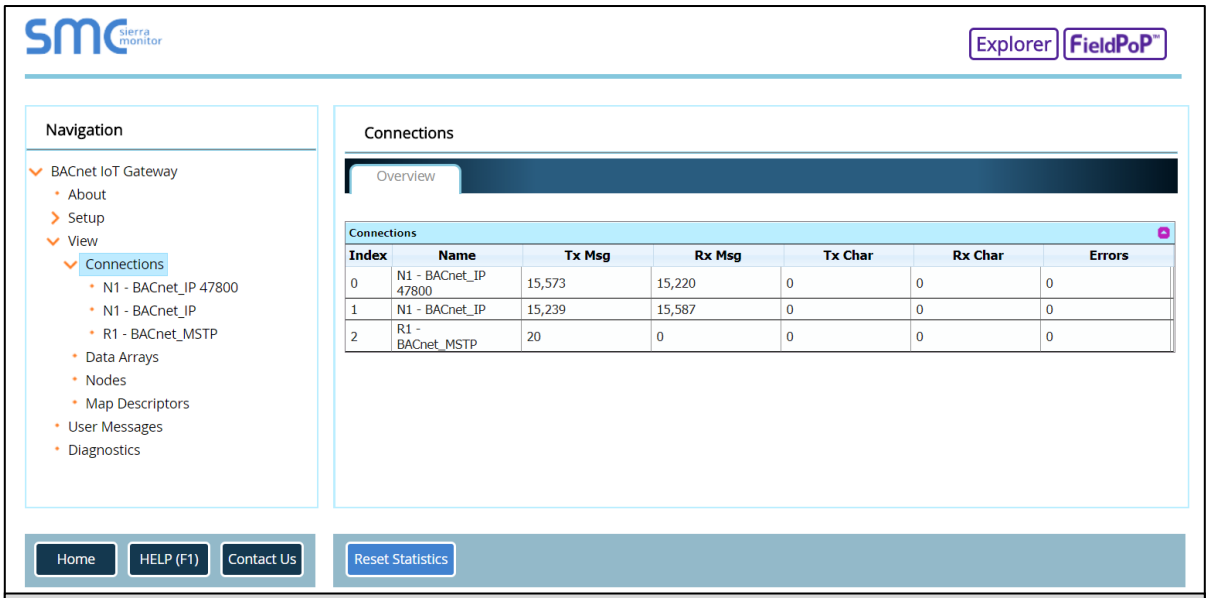


Figure 69: Error Messages Screen

Appendix C.4. Checking Wiring and Settings

No COMS on the Serial side. If the Tx/Rx LEDs are not flashing rapidly then there is a COM issue. To fix this problem, check the following:

- Visual observations of LEDs on the BACnet IoT Gateway (**Appendix C.5**)
- Check baud rate, parity, data bits, stop bits
- Check Sieral device address
- Verify wiring
- Verify device is connected to the same subnet as the BACnet IoT Gateway

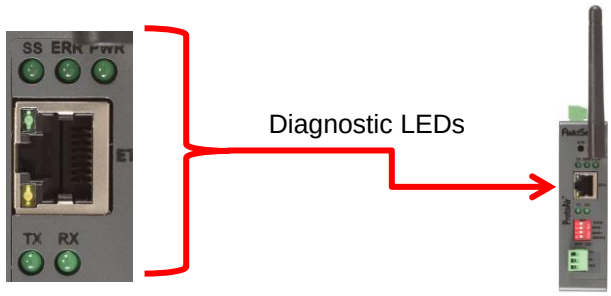
No COMS on the Ethernet protocol. To fix this, check the following:

- Visual observations of LEDs on the BACnet IoT Gateway (**Appendix C.5**)
- Check device address
- Verify wiring
- Verify device is connected to the same subnet as the BACnet IoT Gateway
- Verify IP Address setting

NOTE: If the problem still exists, a Diagnostic Capture needs to be taken and sent to support. (Appendix C.6)

Appendix C.5. LED Diagnostics for Communications Between BACnet IoT Gateway and Devices

See the diagram below for BACnet IoT Gateway LED locations.



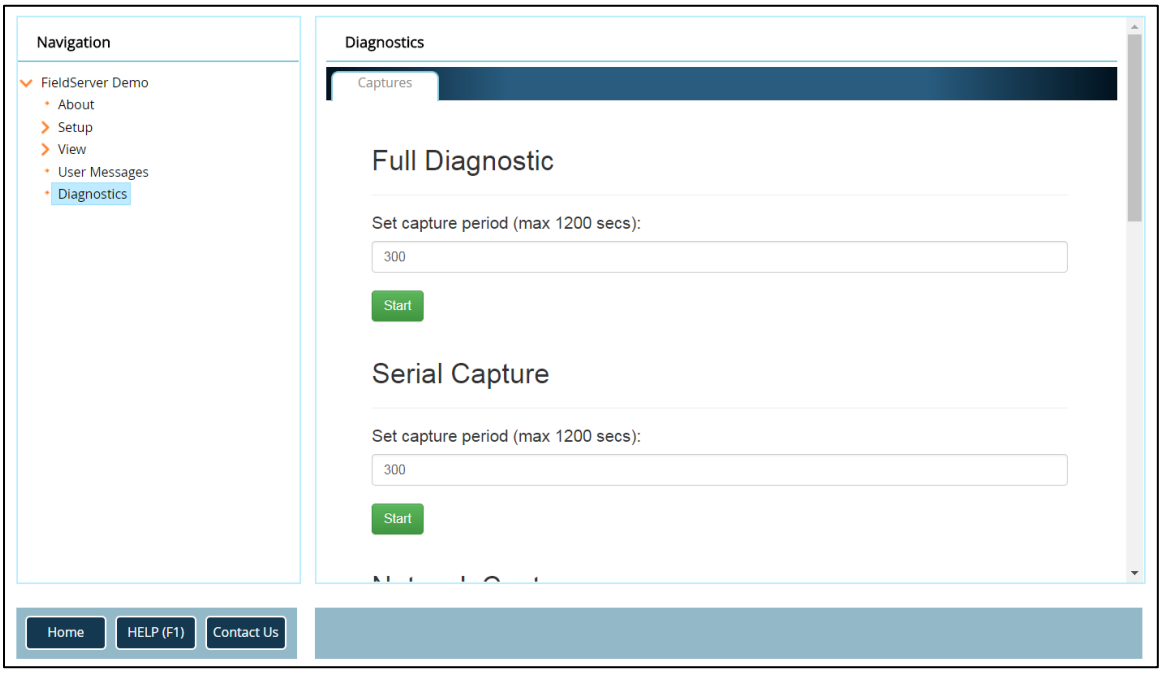
Tag	Description
SS	The SS LED will light if the unit is not getting a response from one or more of the configured devices.
ERR	The SYS ERR LED will go on solid indicating there is a system error on unit. If this occurs, immediately report the related “system error” shown on the error screen of the FS-GUI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

Figure 70: Diagnostic LEDs

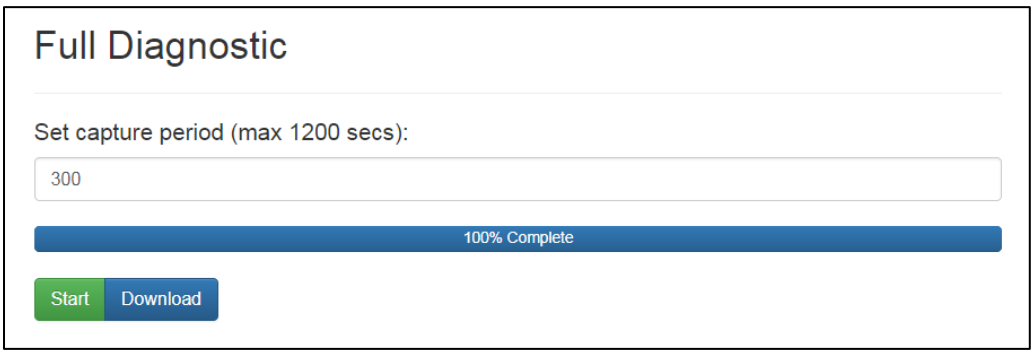
Appendix C.6. Before Contacting Technical Support Take a Diagnostic Capture

When a problem occurs that cannot be resolved with regular troubleshooting, take a log via the FieldServer FS-GUI. Send this log together with a detailed description of the problem to support@sierramonitor.com for evaluation. The Diagnostic Capture will allow us to rapidly diagnose 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.
- Email the diagnostic zip file to technical support (support@sierramonitor.com).

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

Appendix C.7. Updating 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 192.168.2.101
   - Use the FS Toolbox utility if the IP Address is unknown (**Appendix C.2**)
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 firmware 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 C.8. Securing BACnet IoT Gateway with Passwords

Access to the BACnet IoT Gateway can be restricted by enabling a password on the FS-GUI Passwords page – click Setup and then Passwords in the navigation panel. There are 2 access levels defined by 2 account names: Admin and User.

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

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 support@sierramonitor.com to receive a temporary password from the support team. Access the BACnet IoT Gateway to set a new password.

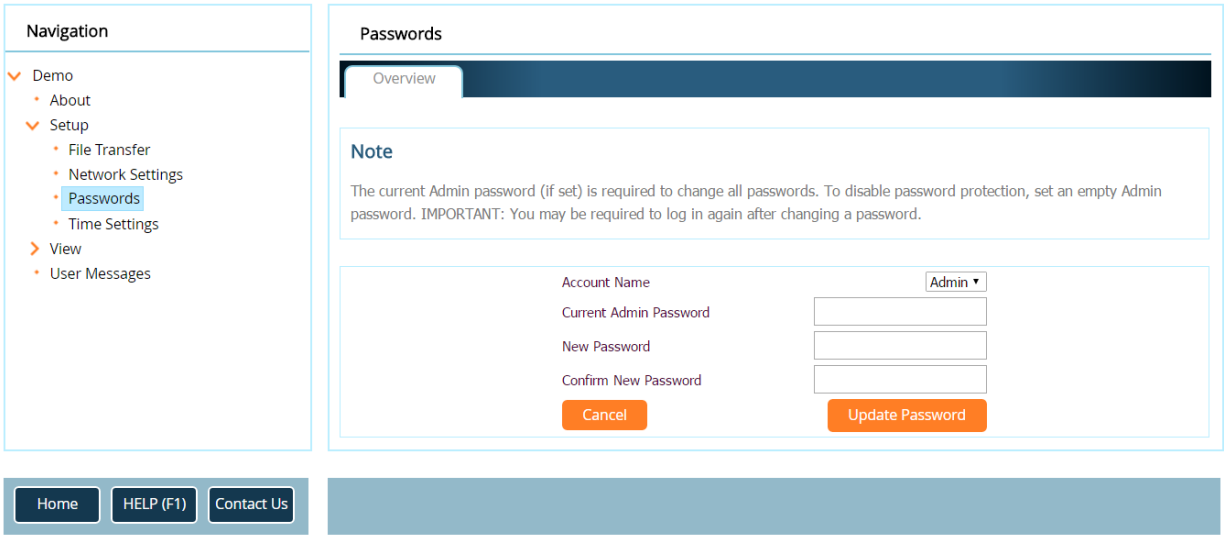


Figure 71: FS-GUI Passwords Page

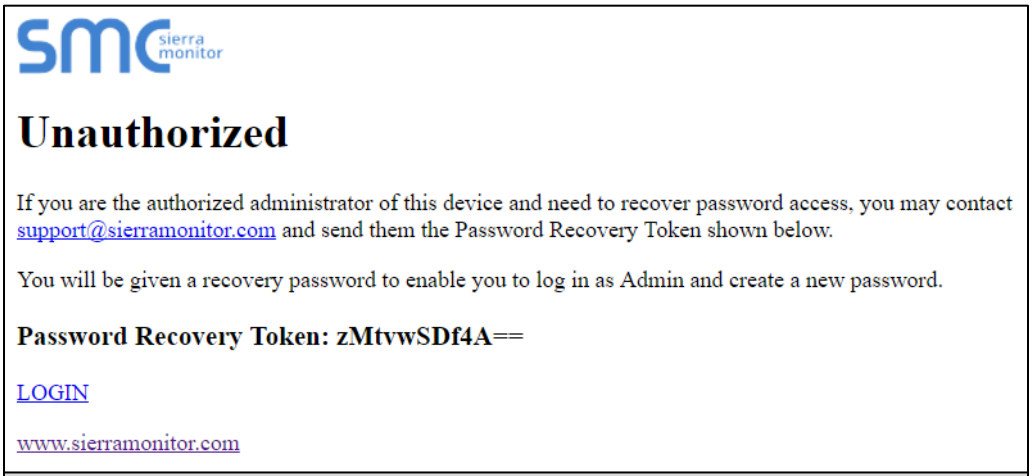


Figure 72: Password Recovery Page

Appendix C.9. 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 SMC Cloud.

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

To fix the problem, the BACnet IoT Gateway (http://192.168.100.85/* in Figure 74) must be set as a trusted URL to the "Web Anti-Virus"->"Settings" as shown below.

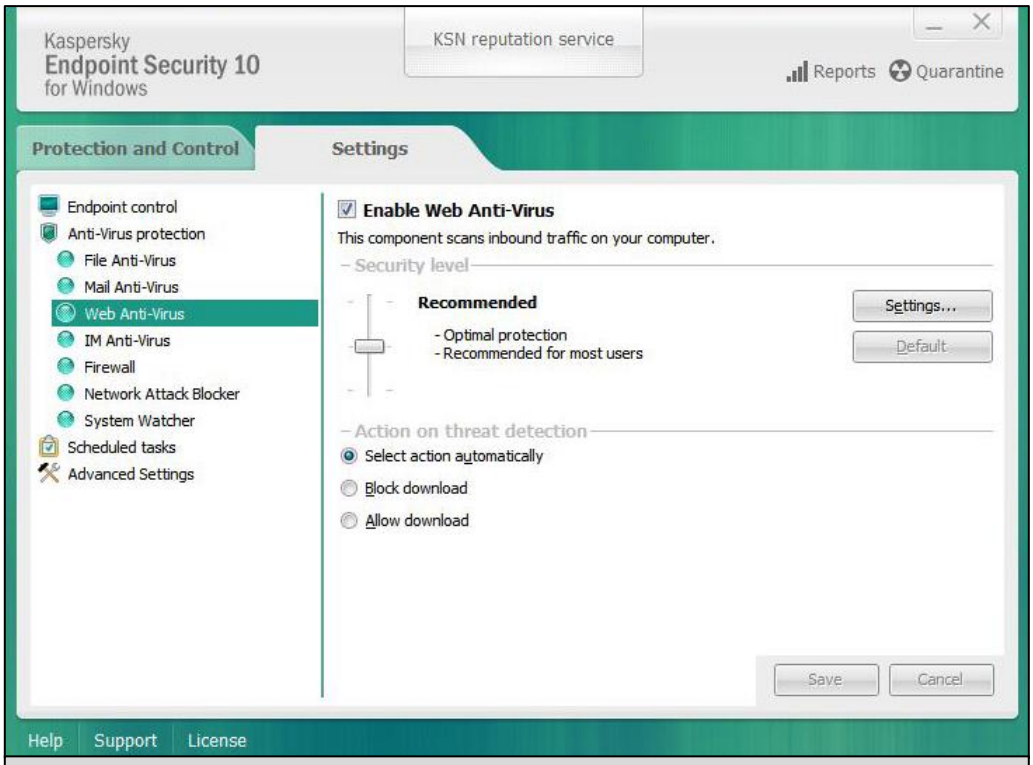


Figure 73: Kaspersky ES10 Settings

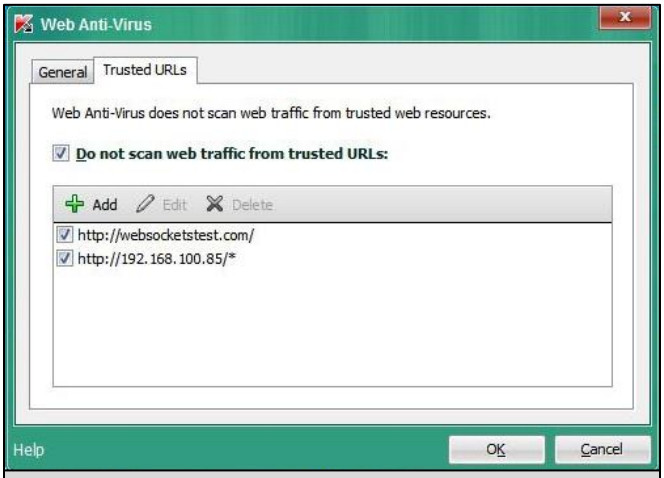


Figure 74: Web Anti-Virus Trusted URLs

Appendix C.10. Wi-Fi and Cellular Signal Strength

Wi-Fi	Cellular
<60dBm – Excellent	< 60dBm – Excellent
<70dBm – Very good	<70dBm – Very good
<80dBm – Good	<80dBm – Good
>80dBm – Weak	<90dBm – Weak
	>90dBm – Spotty; not good for data

Figure 75: Wi-Fi & Cellular Signal Strength Listing

NOTE: If the signal is weak or spotty, try to improve the signal strength by checking the antenna and the ProtoAir position.

Appendix C.11. Factory Reset Instructions

For instructions on how to reset a FieldServer back to its factory released state, see ENOTE - FieldServer Next Gen Recovery.

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.