BRADFORD WHITE®
WATER HEATERS

BACnet Building Management System Startup Manual for eF Series® Turbo Models

	⚠ WARNING
	Read and understand the instruction manual and safety messages before installing, operating, or servicing the water heater.

WARNING
CANCER AND REPRODUCTIVE HARM
WWW.P65WARNINGS.CA.GOV

As required by the state of California Proposition 65.

For your family's comfort, safety, and convenience we recommend this water heater be installed and serviced by a plumbing professional.

Table of Contents

Tools Required

- A laptop computer (Windows, MacOS, or Chrome OS) with Wi-Fi capability
- 1/4" Nut Driver

Overview

CGT-120 water heaters can communicate with a BACnet building management system (BMS) by adding a BACnet BMS Kit. Communication is accomplished using a FieldServer ProtoAir ("FieldServer") gateway. The FieldServer is a high-performance building automation multi-protocol gateway that is preconfigured to automatically communicate with CGT-120 water heaters and allows for connection to a BACnet BMS.

The FieldServer is pre-loaded with approved profiles/configurations for the supported devices. It is not necessary to download any product configuration files to support the required applications.
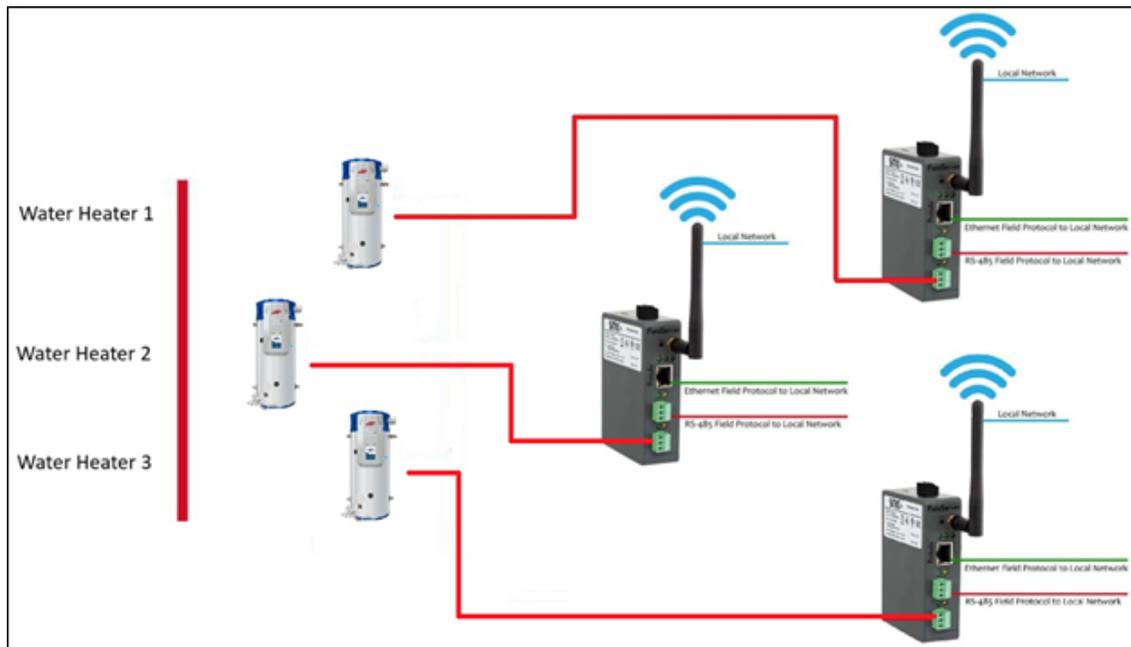
FieldServer ProtoAir Connectivity Diagram:

Fig. 1

Pre-Installation

The process of connecting a CGT-120 water heater to BACnet requires minimal preparation. However, it is highly recommended to plan as much as possible to ensure an efficient installation. To summarize, preparations shall include the following items.

While this start-up guide should be sufficient, if more specific information regarding the FieldServer ProtoAir FPA-W44 is required, call Bradford White Corporation technical support at 1-888-443-4394.

- Download the FieldServer Toolbox. This is a precautionary step in case there are issues with connecting to the unit with a web browser. The Toolbox can be downloaded at the link below or by searching "FieldServer Toolbox" from any internet browser.
    - https://media.msanet.com/NA/USA/SMC/SoftwareDownloads/FieldServer%20Toolbox-1.08aC-Setup.zip
- A laptop computer (Windows, MacOS, or Chrome OS) with Wi-Fi capability is required for setup.
- All local electrical codes must be followed. In the absence of a local code, use the National Electric Code, NFPA 70, or the Canadian Electrical Code, CSA C22.1.

Installation

The service kit contains all hardware, wiring, and fasteners required for installation. For location of hardware, refer to the illustration below. **Please note the special instruction regarding the position of the S4 switch on the main control.** Wiring must be completed in accordance with the wiring diagram on page 4.
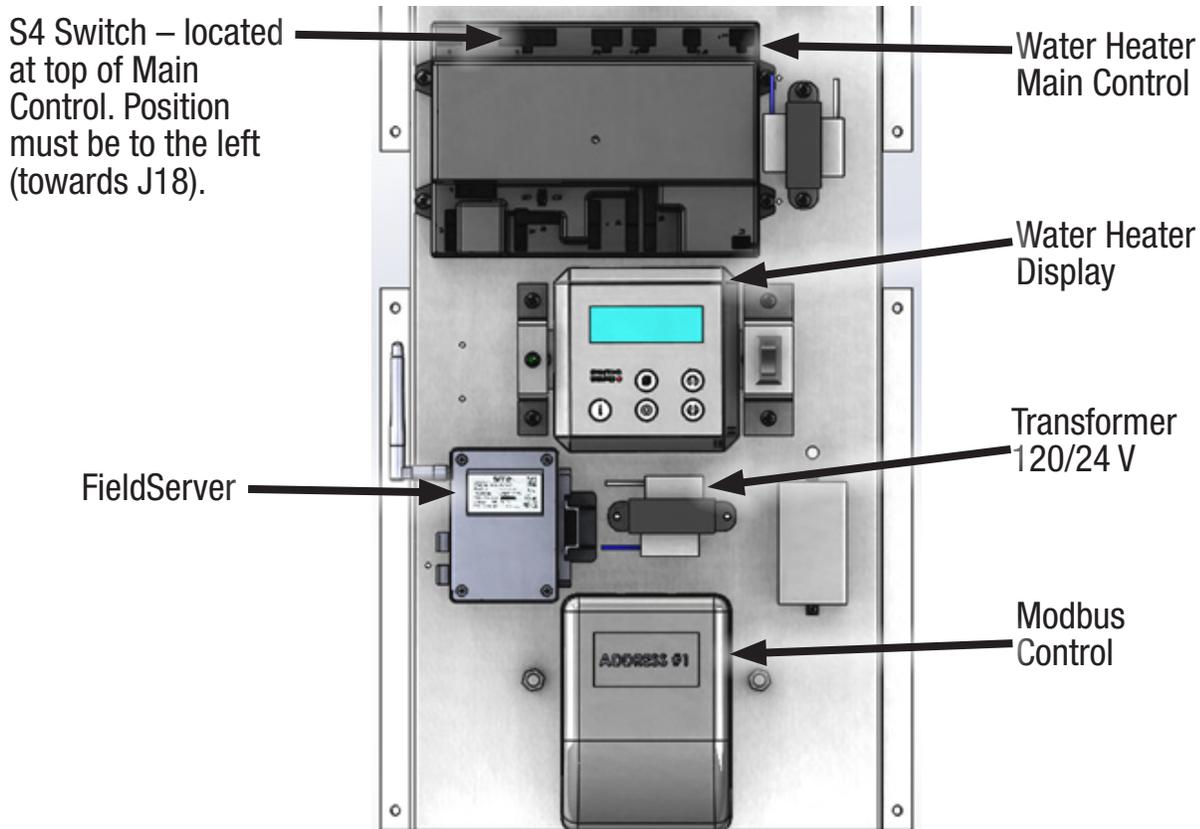

S4 Switch – located at top of Main Control. Position must be to the left (towards J18).

Water Heater Main Control

Water Heater Display

Transformer 120/24 V

FieldServer

Modbus Control

Fig. 2

Modbus Control – Device for translating Water Heater Main Control protocol to Modbus RTU (serial connection). This control is powered from the main terminal block and communicates to the FieldServer via RS485 serial connection. The Modbus Control contains an address number (i.e. single digit integer, 1, 2, 3, etc.), which is visible on the control cover.

FieldServer - Building automation multi-protocol gateway that is preconfigured to automatically communicate with CGT-120 water heaters and allows for connection to BACnet Building Management Systems (BMS). This device receives its power supply from the secondary side (24 VAC) of the transformer.

Water Heater Main Control – Temperature and ignition safety control responsible for all water heater operation. For FieldServer applications, the S4 switch must be in the left position (towards J18). When the FieldServer is factory wired, the S4 switch is factory set.
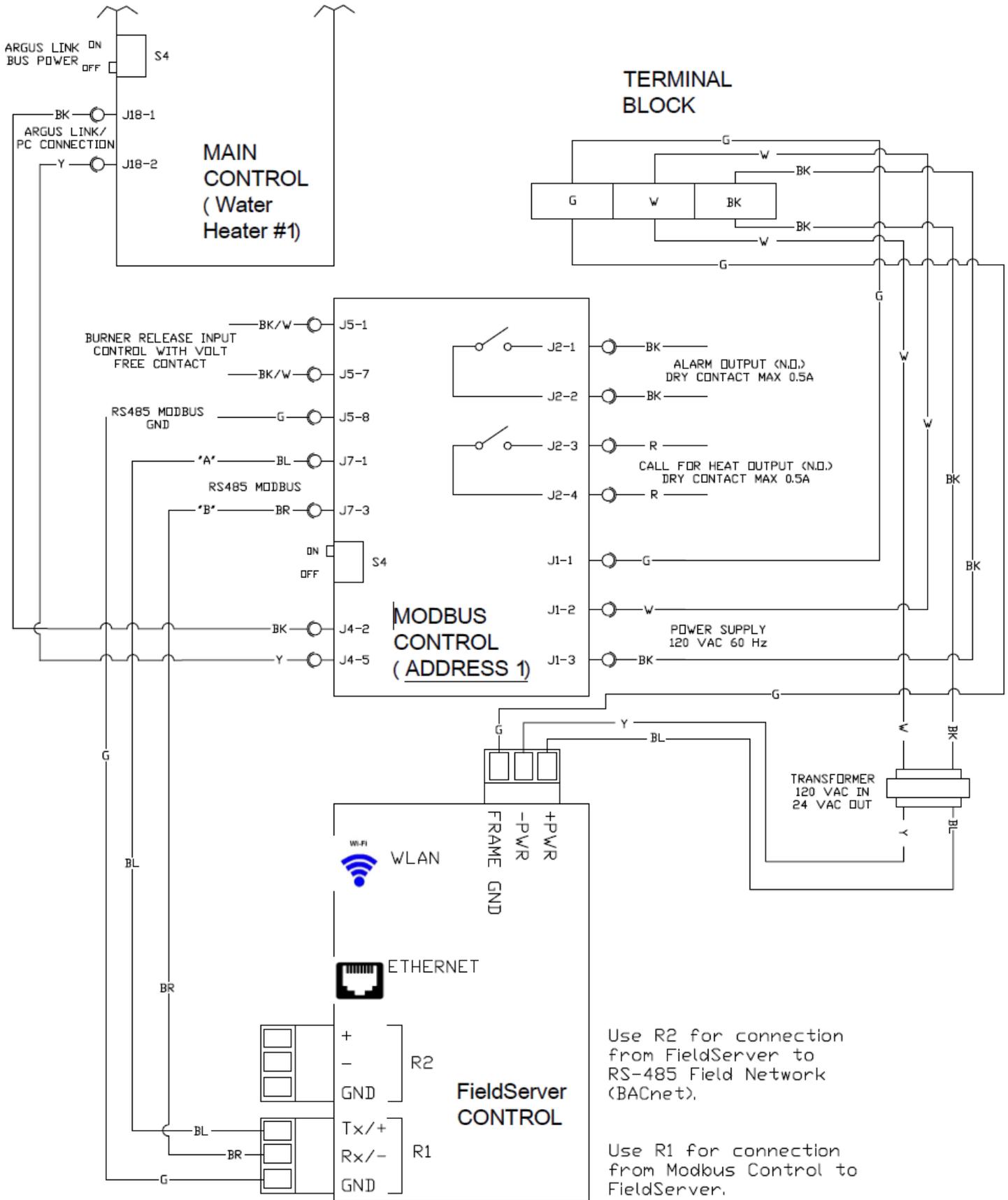
Single Water Heater Component Wiring

Fig. 3

Connect a Computer to FieldServer

Use a computer to make a wireless connection to the FieldServer. The Wi-Fi Access Point setting on the FieldServer is factory enabled.

Before proceeding, remove the blue cover from the front of the water heater and make sure that the water heater is turned on. Confirm that the FieldServer "PWR" LED is solid green and the "SS" LED is blinking green. It may take up to two minutes for the "SS" LED to start blinking.

Follow these steps to wirelessly connect to the FieldServer using a laptop computer. The basic steps are relevant for Windows, MacOS, and Chrome OS. However, the images are specific to Windows 10.
1. Click on the Internet Access icon located on the right side of the desktop toolbar.
2. Locate the FieldServer in the list of available Internet access points. The network name for the FieldServer is "ProtoAir AP". When prompted, enter the password "hotw@ter25!".

    If you cannot locate "ProtoAir AP" in the list of networks, skip to step 4.
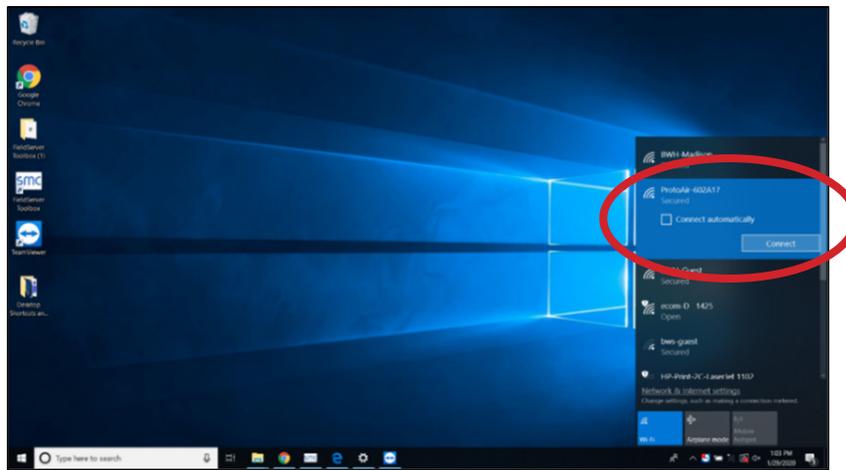

Fig. 4

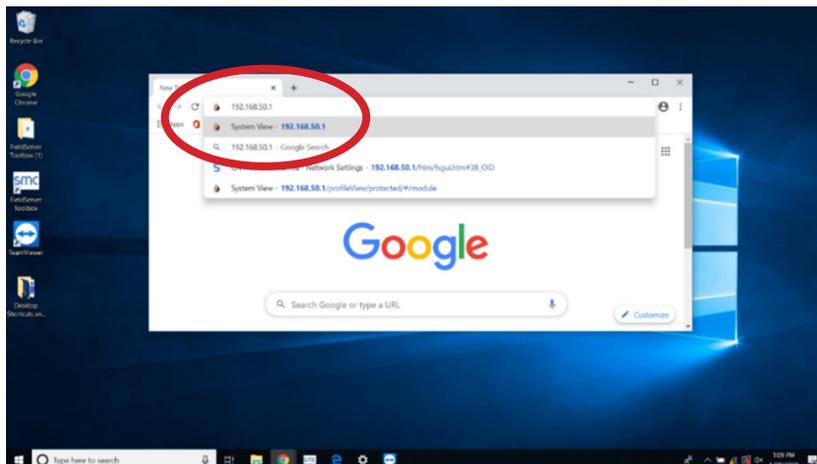3. Open a browser and enter the default Wi-Fi Access Point IP address, 192.168.50.1, in the address bar.

Fig. 5

4. Skip this step if you were able to connect to "ProtoAir AP."

Use the FieldServer Toolbox to connect to the FieldServer. The Toolbox can be downloaded at https://media.msanet.com/NA/USA/SMC/SoftwareDownloads/FieldServer%20Toolbox-1.08aC-Setup.zip.

When the Toolbox opens, click "Discover Now" and it will automatically detect the FieldServer.
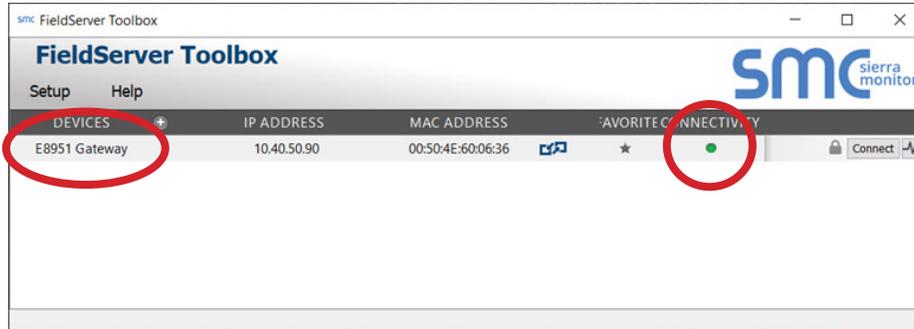

Fig. 6

If you are at this point, the connectivity icon will likely be red, yellow, or blue depending on the network settings and device capabilities.

Fig. 7

If the connectivity icon is green or blue, click on the "Connect" button (to the right of the connectivity icon). A web browser window will open, and you will be prompted to login. Proceed to Step 5.

The first time the FieldServer GUI is opened in a browser, the IP Address for the gateway will appear as untrusted. This will cause the following pop-up windows to appear.

- When the Web Server Security Unconfigure window appears, read the text and choose whether to move forward with HTTPS or HTTP.
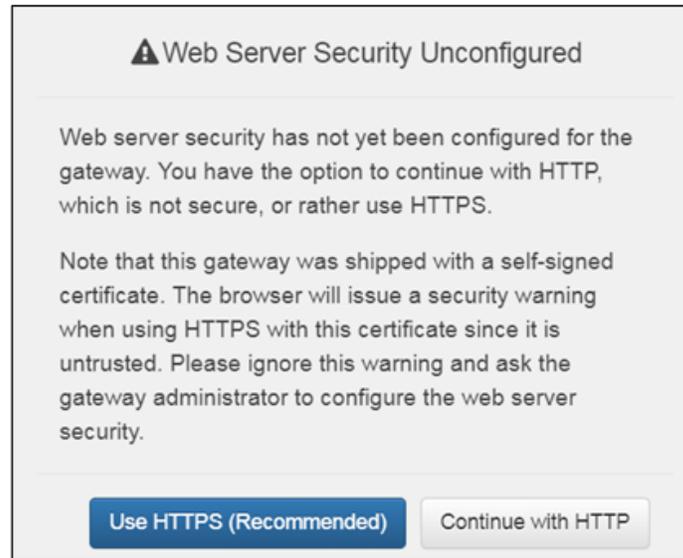
Fig. 8

- When the warning that "Your connection is not private" appears, click the advanced button on the bottom left corner of the screen.
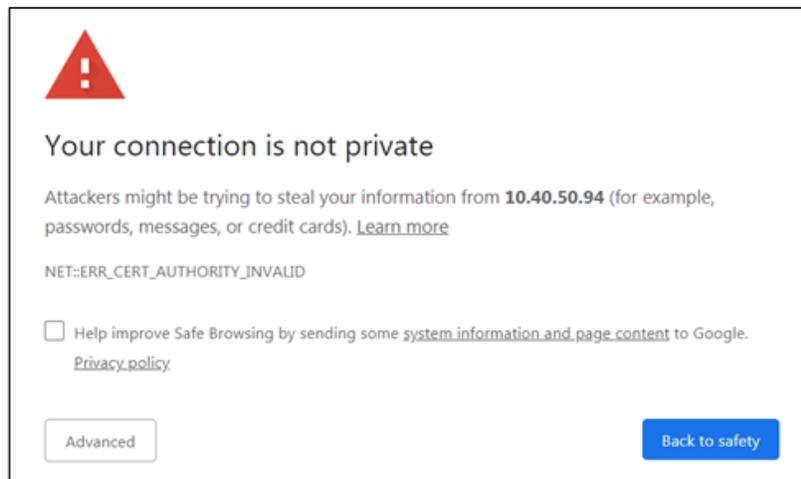
Fig. 9

- Additional text will expand below the warning, click the underlined text to go to the IP Address. In the example below this text is "Proceed to 10.40.50.94 (unsafe)".

Fig. 10

5. When prompted, enter "admin" for the Username. The password is a unique default password that is printed on the FieldServer device label. The image below shows the location of the default password.

Note: There is also a QR code in the corner of the FieldServer label that shows the default unique password when scanned.

Fig. 11
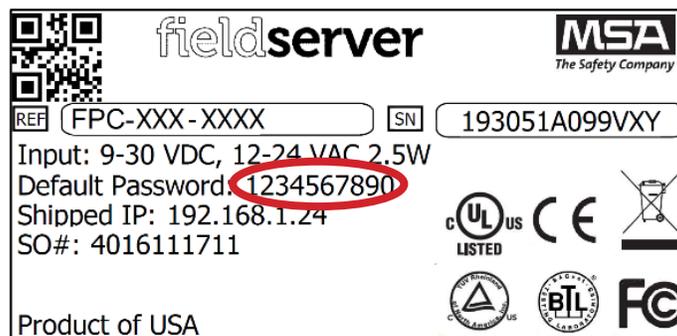
Fig. 12

Adding Water Heaters to the FieldServer

Next, it is necessary to confirm data communication with the water heater(s).
1. In the browser window, select Device List from the options on the left.
2. If a device is visible, then a profile has already been configured. Confirm that the visible data is accurate.
3. If no devices are listed, select Settings and then Configuration from the options on the left.
4. Select Profiles Configuration.
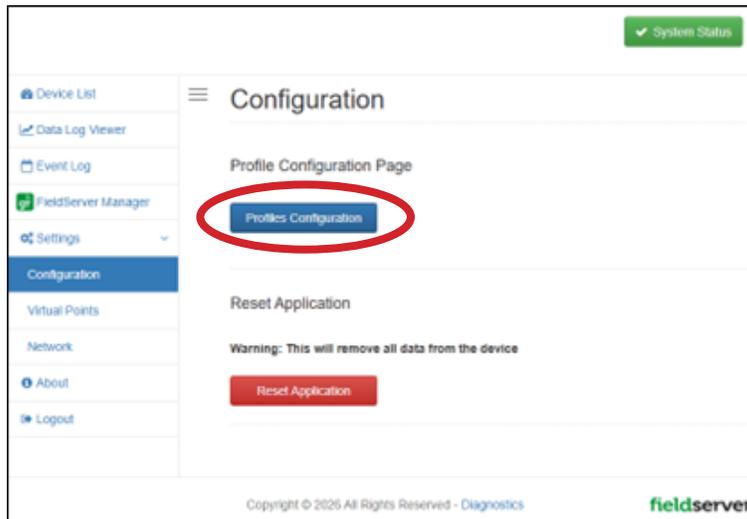
Fig. 13

- On the Configuration page, the first parameter is Protocol Selector. Based on the particular installation, enter the appropriate number into the Protocol Selector Value. Click the Submit button, and then select "System Restart" at the bottom of the page to save the configuration.

Fig. 14

Fig. 15

- The other protocol specific parameters are dependent on the Protocol Selector Value. Enter appropriate values for the remaining parameters as required by the specific installation requirements.

5. Next, an Active Profile must be added for each water heater. Select the Discovery Mode button at the bottom of the webpage and allow the discovery feature to identify all water heaters connected to the FieldServer. This process will take approximately five minutes.
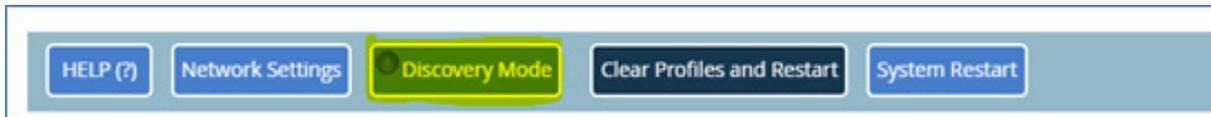
Fig. 16

- **For single water heater installations,** a single active profile will be visible under Active Profiles.
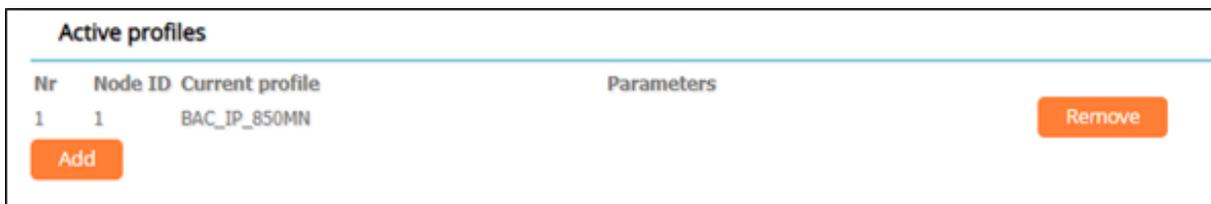
Fig. 17

6. Return to the Device List and confirm that all units connected to the FieldServer are displayed. Compare the Status and Top Store Temp for each unit to current conditions on the water heater. There will be a delay when comparing data from the computer to real time changes on the water heater.
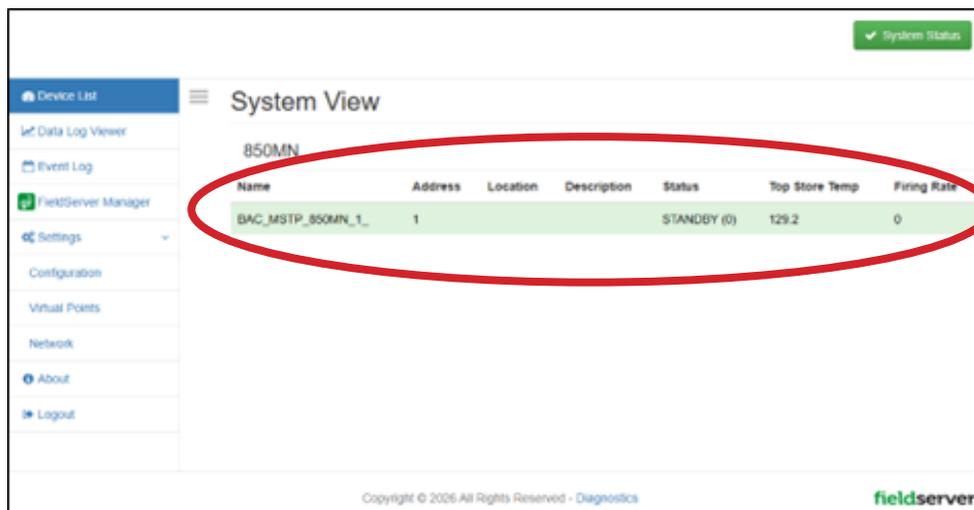
Fig. 18

Frequently Asked Questions

Q: Why are there times when the flame current equals 0 µA when the water heater is in demand status and the firing rate is greater than 0%?
A: The firing rate (%) is reporting the combustion blower fan speed. When the firing rate is greater than 0% and the flame current equals zero, the combustion system is running in post or pre-purge and the burner is off.

Q: Why are there times when the flame current is greater than 0 µA when the water heater is in demand status and the firing rate is 0%?
A: When this occurs, the actual firing rate is 1% and the water heater is operating at minimum input rate.

Q: I've contacted Technical Support and I'm being asked to take a diagnostic capture of the FieldServer. How do I do this?
A: Using a computer, connect to the FieldServer by following the steps in "Section IV. Connect a Computer to the FieldServer."

In the System View window, click on the "Diagnostics" link at the bottom of the page. In the new web browser window, select "Diagnostics" from the menu on the left. Start a Full Diagnostic capture – when finalized, a downloadable ZIP file will be available for sharing.

Technical Support

For technical support, contact Bradford White Corporation by phone or by email to address any problems in setup or operation.

Reference the contact information at the end of this manual to find the phone number or email for your country.

FieldServer is manufactured for Bradford White Corporation by:
MSA Safety Corporation
https://us.msasafety.com/fieldserver

Appendix A: BACnet Points List

Point Name	BACnet Object Type	BACnet Object ID	Description
Modbus Units	AI	1	Bit 0: °C / °F
Status	AI	4	See Appendix B
Error Code	AI	5	See Appendix C
Store DHW SP	AI	6	°C / °F
Top Store Temp	AI	8	°C / °F
Firing Rate	AI	12	0-100%
Flame Current	AI	14	µA
Ignition Count OK	AI	16	Integer, resolution of 16
Ignition Count Failed	AI	17	Integer, resolution of 1
Flame Count Failed	AI	18	Integer, resolution of 1
DHW Hours	AI	19	Hours
1st Lockout in History	AI	20	See Appendix C
Time after 1st Lockout	AI	21	Hours
2nd Lockout	AI	22	See Appendix C
Time after 2nd Lockout	AI	23	Hours
3rd Lockout	AI	24	See Appendix C
Time after 3rd Lockout	AI	25	Hours
4th Lockout	AI	26	See Appendix C
Time after 4th Lockout	AI	27	Hours
1st Blocking Error in History	AI	28	See Appendix C
Time after 1st Blocking Error	AI	29	Hours
2nd Blocking Error	AI	30	See Appendix C
Time after 2nd Blocking Error	AI	31	Hours
3rd Blocking Error	AI	32	See Appendix C
Time after 3rd Blocking Error	AI	33	Hours
4th Blocking Error	AI	34	See Appendix C
Time after 4th Blocking Error	AI	35	Hours
Com Status	BI	36	
Store DHW SP WR	AV	37	

Appendix B: Descriptions of Status Point Values

Value	Status Name	Description
0	Standby	Standing by (waiting for demand)
14	Block	Blocking error
10	Alarm	Lockout error
18	Storage	Demand for hot water
19	Tap	Demand for hot water
21	Store_Warm_Hold	Demand for hot water

Appendix C: Descriptions of Error Code Point Values

Value	Display code	Error Name
Lockout Errors		
1	A01	Ignition error
2	A05	Gas Valve Relay error
3	A05	Gas Valve Relay not open
4	A05	Gas Valve Relay not closing
5	A06	Safety Relay error
6	A06	Safety Relay open
7	A06	Safety Relay closed
11	A00	Extended Blocking error
12	A08	Fan error
13	A09	Internal software error
14	A10	E2prom error
15	A11	Internal software error
16	A12	E2prom error
17	A12	E2prom error
18	A12	E2prom error
19	A13	Internal software error
20	A14	Internal software error
21	A14	Internal software error
23	A16	Internal software error
25	A18	High Limit error
26	A19	Internal software error
27	A20	Flame error 2
28	A21	Flame error 1
29	A22	Internal software error
30	A23	Internal software error
31	A24	Flame failure
34	A27	Internal software error
35	A28	Internal software error
36	A29	Internal software error
37	A30	Internal software error
44	A30	Internal software error
45	A36	Blocked vent error
46	A38	Gas pressure error

Value	Display code	Error Name
	Blocking Errors	
47	E34	Watchdog error
48	E35	Watchdog error
49	E36	Watchdog error
50	E37	Watchdog error
51	E38	Watchdog error
56	E35	False flame error
57	E36	Blocked vent error
58	E36	Blocked vent error
59	E36	Blocked vent error
61	E38	Gas pressure error
62	E39	Flue gas limit error
66	E43	Watchdog error
67	E44	Phase error
69	E46	Earth ground error
70	E47	Watchdog error
74	E51	Water Temp Sensor open
75	E52	Water Temp Sensor open
82	E59	Water Temp Sensor short
83	E60	Water Temp Sensor short
88	E65	Flue Sensor short
89	E66	Reset Button error
95	E72	Appliance Selection error

Appendix D: Burner Release (Draft System Interlock)

The Burner Release setting provides the option to connect the water heater to a mechanical draft control. Mechanical draft controls shall only be utilized when vent lengths exceed the limits specified in this manual. Note: An Enervex EBC24 modulating fan control was referenced for feature design.

To achieve a proper interlock between the water heater and the draft control, all wiring shall be in accordance with both the draft control and water heater installation manuals. The interlock strategy will utilize a dry set of contacts on the water heater.

Two pairs of wires are needed for the connections to the water heater and are located on the Modbus control (on the control panel).

- The red ("R") pair, labeled "Call for Heat Output", provides a normally open dry contact that closes when a call for heat (i.e., Demand) is initiated by the water heater's main operating control. The red pair will typically be used in series to switch the hot side of a low voltage supply to an input on the draft control.
- The black/white ("BK/W") pair, labeled "Burner Release Input," is controlled by a volt free contact on the draft control and typically connected to an output on the draft control. This circuit is closed when the draft control has satisfied its safety check and is allowing the water heater to proceed with an ignition sequence.

Refer to the wiring diagrams in this manual for wire pair locations and the building draft control manual for detailed connection diagrams.

To adjust the Burner Release setting via the display, perform the following steps.

1. Press "OK", then "M", and hold the two buttons for five seconds.
2. The Installer Menu will appear. Press the Down Arrow to select Heater Config and press OK.
3. Press the Down Arrow twice to select Burner Release and press OK.
4. Select Automatic and press OK. The setting will flash and use the arrows to change the setting.
   a. When Automatic is set to ON, the burner will follow the normal sequence of operation during a call for heat.
   b. When Automatic is set to OFF, the burner will only start when the mechanical draft control releases the burner for operation.
5. Press OK to save the setting.

BRADFORD WHITE ®

W A T E R   H E A T E R S

United States

Sales	1-800-523-2931
Technical Support	1-888-443-4394
Email	techsupport@bradfordwhite.com
Warranty	1-800-531-2111
Email	warranty@bradfordwhite.com
Service Parts	1-800-538-2020
Email	parts@bradfordwhite.com

Canada

Sales	1-866-690-0961 1-905-203-0600
Fax	905-636-0666
Warranty	1-800-531-2111
Email	warranty@bradfordwhite.com
Technical Support	1-888-443-4394
Email	techsupport@bradfordwhite.com
Service Parts and Orders	ca.orders@bradfordwhite.com

For U.S. and Canada field service, contact
your professional installer or local Bradford
White sales representative.

International

General Contact	international@bradfordwhite.com

www.bradfordwhite.com