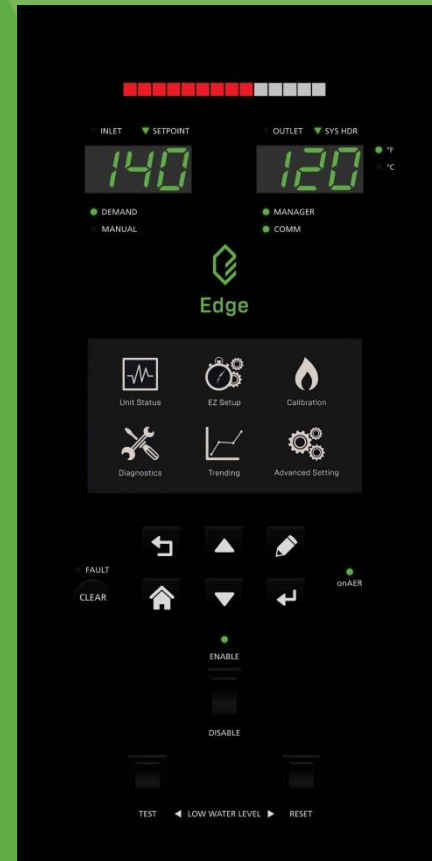


Operation Manual

Edge[®] Controller for Benchmark[®] and CFR[®] Boilers

Other documents for this product include:

OMM-0136, Benchmark Installation and Startup Manual
OMM-0137, Benchmark Operation-Service Manual
OMM-0138, Benchmark Reference Manual
OMM-0140, Edge Communication Manual



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Heating and Hot Water Solutions

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TABLE OF CONTENTS

SECTION 1: GENERAL INFORMATION	4
1.1 INTRODUCTION.....	4
1.1.1 Benchmark Boilers	4
1.1.2 CFR Boilers	4
1.2 SAFETY PRECAUTIONS AND WARNINGS.....	4
1.3 POWER UP	1
1.4 DOWNLOAD LATEST FIRMWARE.....	1
1.5 PASSWORDS.....	1
1.5.1 Screensaver Password.....	2
1.6 MAIN MENU.....	2
1.7 EDGE CONTROLLER FRONT PANEL FUNCTIONALITY	3
1.8 TOUCHSCREEN BUTTON FUNCTIONALITY.....	5
1.9 SELECTIONS	5
1.10 ABORTING AN ACTION.....	7
1.11 TIMEOUT	7
1.12 UNIT & PLANT STATUS SCREENS	7
1.12.1 Plant Status Screen.....	8
SECTION 2: EZ SETUP (BENCHMARK ONLY).....	9
2.1 BACKING UP AND RESTORING SETTINGS.....	10
2.2 EZ SETUP: STANDALONE	10
2.2.1 EZ Setup: Standalone – Space Heating Application	12
2.2.2 EZ Setup: Standalone – DWH (Domestic Hot Water) Application	16
2.2.3 EZ Setup: Standalone – Other Application	18
2.3 EZ SETUP: BOILER SEQUENCING TECHNOLOGY CASCADE	21
2.3.1 EZ Setup: BST Client Units	21
2.3.2 EZ Setup: BST Manager Unit.....	23
2.4 COMPLETING THE INSTALLATION	51
2.5 EZ SETUP – RESTORING A PREVIOUS SETUP	53
SECTION 3: CALIBRATION.....	56
3.1 ASSISTED COMBUSTION CALIBRATION (BENCHMARK ONLY)	57
3.2 MANUAL COMBUSTION CALIBRATION OVERVIEW (BENCHMARK ONLY).....	59
3.3 INPUT/OUTPUT.....	62
3.3.1 Temperature Sensors.....	62
3.3.2 O2 Sensor (Benchmark Only)	63
3.3.3 Analog Inputs.....	64
3.3.4 Analog Outputs.....	65
3.4 SUBSYSTEM	66
3.4.1 Air Fuel Valve Calibration	67
3.4.2 Spark Monitor Calibration (Benchmark Units Only)	68
3.5 COMBUSTION SUMMARY	68
3.6 COMBUSTION VALUES.....	68
SECTION 4: DIAGNOSTICS	69
4.1 MANUAL RUN	69
4.2 FRONT PANEL	70
4.3 ANALOG OUTPUTS AND RELAYS	72
4.3.1 Relays.....	72
4.3.2 Analog Outputs.....	73
4.4 SUBSYSTEMS.....	74

SECTION 1: General Information

4.4.1 Testing the Air/Fuel Valve Stepper Motor	75
4.4.2 Testing the Blower Motor	75
4.4.3 Ignition	76
4.5 SYSTEM	77
4.5.1 Pre-Start Up.....	77
4.5.2 Versions.....	78
4.6 COMMUNICATION & FAILSAFE	78
4.6.1 IP Network	79
4.6.2 BAS.....	79
4.6.3 onAER (Benchmark Units Only)	80
4.6.4 Smart Device (Benchmark Only)	80
4.6.5 USB Storage.....	81
4.7 INPUT/OUTPUT SUMMARY	81
SECTION 5: TRENDING.....	83
5.1 FAST LOGGING SETTINGS AND GRAPH.....	84
5.2 SLOW LOGGING SETTINGS AND GRAPH	85
SECTION 6: ADVANCED SETUP	87
6.1 ACCESS	88
6.2 UNIT	88
6.2.1 Unit Settings	88
6.2.2 Front Panel Configuration	91
6.2.3 Save and Transfer Settings	92
6.2.4 Fault Management.....	94
6.2.5 Freeze Protection	95
6.2.6 Unit Application Configuration	96
6.2.7 Firmware Update	102
6.2.8 Maintenance	109
6.3 BST CASCADE.....	110
6.3.1 Cascade Configuration	111
6.3.2 Cascade Communication	116
6.3.3 BST Application Configuration	117
6.3.4 Operating Controls	122
6.3.5 SmartPlate Communication.....	135
6.4 COMMUNICATION & FAILSAFE	136
6.4.1 BAS (Building Automation System).....	136
6.4.2 onAER (Benchmark Only)	138
6.4.3 Smart Devices (Benchmark Only)	139
6.4.4 Ethernet	140
6.4.5 Communication Failsafe	141
6.5 ANCILLARY DEVICES	141
6.5.1 Interlocks	141
6.5.2 Relays.....	142
6.5.3 Analog Outputs.....	144
6.5.4 Analog Inputs.....	144
6.6 PERFORMANCE	145
6.6.1 AERtrim (Benchmark Only)	146
6.6.2 Temperature Control	148
6.6.3 Fire Control.....	151
6.7 STACK GUARD CONFIGURATION (CFR ONLY)	153
SECTION 7: UNIT STATUS.....	156
7.1 IGNITION SEQUENCE	157
7.1.1 Demand	157
7.1.2 Auxiliary Delay Timers.....	157
7.1.3 Purging	158

SECTION 1: General Information

7.1.4 Spark Cleaning	158
7.1.5 Ignition	159
7.2 UNIT STATUS.....	160
7.3 PLANT STATUS (BST MANAGER UNITS ONLY)	161
7.4 BST CASCADE STATUS.....	161
7.5 ISOLATION VALVE STATUS	163
7.6 SMARTPLATE STATUS	163
7.7 RUNTIME STATISTICS	164
7.8 UNIT EVENT HISTORY	164
7.9 PLANT EVENT HISTORY	165
7.10 AERTRIM (BENCHMARK ONLY).....	165
7.11 IGNITION SEQUENCE (SUMMARY)	166
SECTION 8: I/O NOMENCLATURE	167
SECTION 9: EDGE CONTROLLER VIEWS.....	170
SECTION 10: STARTUP, STATUS, FAULT MESSAGES.....	172
10.1 FAULT MESSAGES.....	172
10.2 AERTRIM MESSAGES.....	176
10.3 BST CASCADE MESSAGES	176
10.4 STACK GUARD MESSAGES.....	176
APPENDIX A: INDOOR/OUTDOOR RESET RATIO.....	177
APPENDIX B: I/O BOARD CONNECTIONS – BENCHMARK BOILERS	179
APPENDIX C: I/O BOARD CONNECTIONS – CFR BOILERS.....	184

SECTION 1: GENERAL INFORMATION

1.1 Introduction

This Section provides an overview on operating Benchmark (BMK) and CFR Boilers using the Edge Controller. It provides information on the various external sensors and control devices that can interface with the units using terminals in the boiler's Input/Output (I/O) Box. Information regarding the set-up of all boiler Operating Modes and Boiler Sequencing Technology (BST) Systems is also included.

NOTE: These instructions assume basic familiarity with the Edge Controller - navigating menus and screens, enabling/disabling functions, editing parameters, returning to the Main Menu, etc.

NOTE: Benchmark and CFR Boilers are not intended to operate in the same BST plant. Contact your local AERCO representative for application guidance.

1.1.1 Benchmark Boilers

All features described are applicable to the Benchmark boiler except for Stack Guard Configuration.

1.1.2 CFR Boilers

The CFR uses only specific Analog Inputs and Outputs on the I/O board. The sections of this manual on **Calibration** and **Advanced Setup > Ancillary Device** menus show the I/O's available on the CFR boiler.

The following features and functions are **not** applicable to CFR boilers:

- EZ Setup
- Assisted Combustion
- O2 Sensor and AERtrim
- onAER
- Application Type = Other, Application Type = Swing Valve
- VSP Pump Mode = Return Temp; the CFR only utilizes VSP Pump Mode = Fire Rate
- Bluetooth communication
- Spark Monitor
- Return header sensor
- Valve Balancing

1.2 Safety Precautions and Warnings

It is imperative that initial startup be performed by factory trained personnel. Operation prior to initial startup by factory trained personnel may void the equipment warranty. In addition, the following **WARNINGS** and **CAUTIONS** must be observed at all times.

CAUTION:

All initial installation procedures must be satisfied before attempting to start the unit.

WARNING:

Electrical voltages in Benchmark and CFR boilers may include **120, 230, 450 or 600 volts AC**. Therefore, these units must be serviced only by factory certified service technicians.

WARNING:

Never dry fire the unit! Starting the unit without a full water level can seriously damage the unit, may result in personnel injury or property damage, and will void any warranty.

1.3 Power Up

Upon power-on, the splash screen and **Main Menu** appear. However, if the **Screensaver Password** feature (see [Section 1.5.1](#)) is enabled, the splash screen remains with “LOCKED” at the bottom of the screen. You must enter a password to get past the splash screen (see [1.5](#)).



Figure 1-1: Splash Screen

1.4 Download Latest Firmware

As AERCO is continuously implementing improvements to the Controller firmware, it is possible the Controller firmware on your boiler may be out of date. **You must update the firmware to the latest version before using the Edge Controller for the first time** (see [Section 6.2.7](#)). AERCO certified technicians can download firmware from the AERCO website, or contact your local AERCO rep.

1.5 Passwords

The Edge Controller has multiple levels of password protection.

Level	Password	Description
0	(None)	Some parameters are “Read Only” but user is excluded from most functionality.
1	159	Allows basic setting changes. Appropriate for AERCO Trained Technicians (ATT).

The level 2 password is reserved for AERCO Trained Technicians (ATTs) and AERCO Master Technicians (AMTs). It is distributed on an individual basis as needed. To enter a password:

1. Go to **Main Menu > Advanced Setup**, then press **Access**. The Enter Password screen appears.
2. Use the number keypad to enter the password (each number appears as a *), then press **Save**.

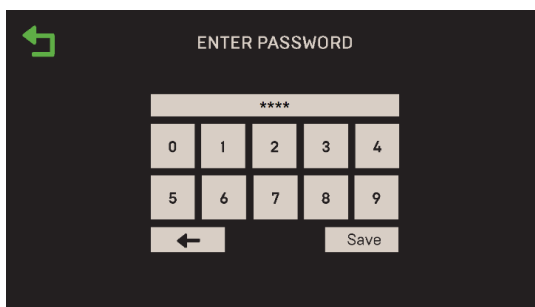


Figure 1-2: Enter Password Screen

1.5.1 Screensaver Password

By default, users that have not been given a password have Level 0 access (this allows them to view parameters but excludes them from most functionality). However, Level 0 access can be restricted to users with an Edge password by enabling **Screensaver Password**.

3. Go to **Main Menu > Advanced Setup**. The **Advanced Setup** screen appears.
1. Press **Access**, then enter your password and press **Save**.
2. Press Unit, then Front Panel Configuration.

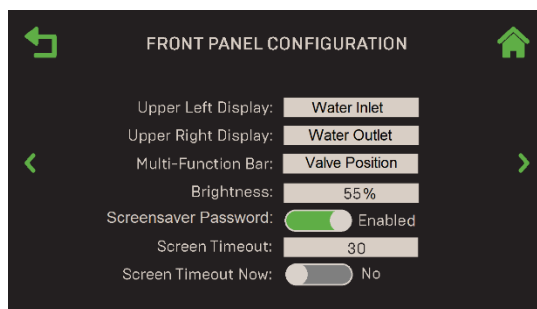


Figure 1-3: Front Panel Configuration Screen

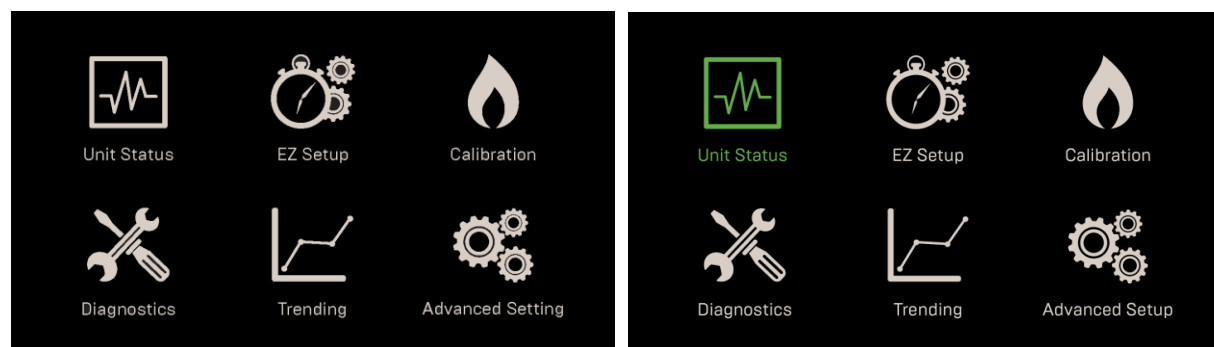
3. Scroll down to **Screensaver Password**, which will be either **Enabled** or **Disabled**.
4. If the current state is **Disabled**, press **Disabled**; the state changes to **Enabled**.
5. Press the **Home** button. The change is saved and a password is now required for all users.

NOTE: Once Screensaver Password is **Enabled** users are prompted to enter a password.

1.6 Main Menu

Once the unit has completed powering up, the touchscreen displays the **Main Menu**. All Controller menus and operating parameters are accessed through the six Main Menu options.

NOTE: EZ Setup is only available on Benchmark boilers (on CFR units the icon is greyed out).



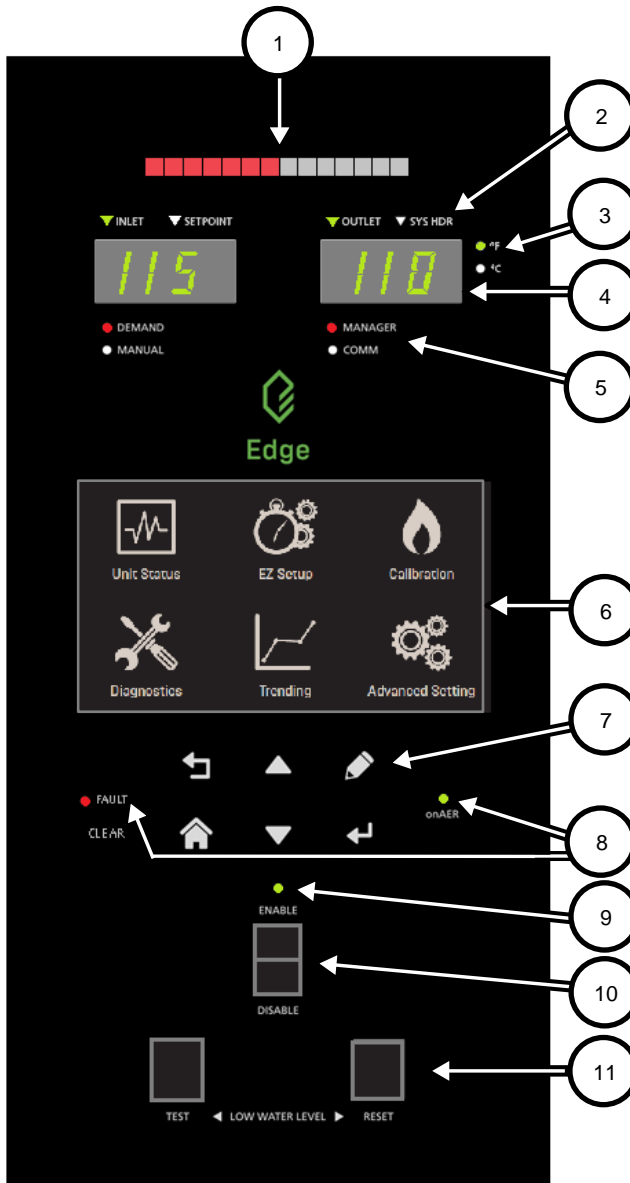
NO SELECTION

UNIT STATUS SELECTED

Figure 1-4: Touchscreen Main Menu

1.7 Edge Controller Front Panel Functionality

The Edge Controller contains a highly sensitive capacitive touchscreen that continuously checks for user interaction at a high frequency. The Controller's front panel consists of a touchscreen display along with a variety of indicators and buttons, as shown below.



The diagram shows the front panel of the Edge Controller with the following numbered callouts:







- 1: Multi-Function Bar (top)
- 2: Temperature read-outs (left and right)
- 3: Temperature scale indicator (°F/°C)
- 4: Configurable temperature read-outs (left and right)
- 5: Operation Mode Indicators (left and right)
- 6: Edge Controller Touchscreen (main display area)
- 7: Soft Keys (bottom of touchscreen)
- 8: onAER Indicator Light (top right)
- 9: Ready Light (bottom center)
- 10: Enable/Disable Switch (bottom center)
- 11: Low Water Level Test buttons (bottom)

1	Multi-Function Bar, shows either: <ul style="list-style-type: none"> Fire Rate Valve Position
2	Parameter Indicator for both temperature read-outs: <ul style="list-style-type: none"> LEFT: Inlet or Setpoint temperature RIGHT: Outlet or System Header temperature
3	Temperature scale indicator: Fahrenheit or Celsius
4	Configurable temperature read-outs (2): <ul style="list-style-type: none"> LEFT: Inlet or Setpoint temperature RIGHT: Outlet or System Header temperature
5	Operation Mode Indicators (2): <ul style="list-style-type: none"> LEFT: Demand or Manual RIGHT: Manager (BST only), COMM when communicating
6	Edge Controller Touchscreen: see Section 1.8, below
7	Soft Keys: see below
8	onAER Indicator Light Fault Indicator Light
9	Ready Light
10	Enable/Disable Switch
11	Low Water Level Test buttons (2): <ul style="list-style-type: none"> TEST: Initiates Low Water test RESET: Resets unit after Low Water test

Figure 1-5: Edge Controller Front Panel Layout

All completed settings and the Unit Event History are maintained throughout the power cycle.












The Soft-Keys on the Controller's front face function as follows:

Controller Front Panel Controls		
Icon	Name	Description
	Previous	Takes you to the previous screen.
	Home	Takes you to the touchscreen's Main Menu (see Figure 1.6). If pressed during a procedure, it aborts the procedure.
	Up/Down	These buttons activate a selection box that can then be moved sequentially through the editable/selectable parameters starting from top left (not the title bar with home/previous icons) and moving right and then down as in reading a book.
	Edit	This button allows the editing of the parameter that is currently selected through use of up/down arrows.
	Enter	This button allows you to finalize a selection (for instance, a selected from a menu or from a pop-up (for example, password entry input completion). Note, all alphanumeric data entry is entered in the touchscreen.
	Clear	Clears a fault – the red Fault light goes out.

The Controller includes touchscreen reset functionality on the front panel. If the touchscreen becomes non-responsive at any time, simply press the **FAULT CLEAR** button; this will reset the touchscreen and should clear the problem.

1.8 Touchscreen Button Functionality

The touchscreen buttons function as follows:

Touchscreen Controls		
Icon	Name	Description
	Previous	Takes you to the previous screen.
	Home	Takes you to the touchscreen's Main Menu (see Figure 1.6). If pressed during a procedure, it aborts the procedure.
	Left Right	The LEFT arrow moves to previous point in the array or list and RIGHT arrow moves to next point in the array or list.
	Up/Down	The UP arrow increases a value, DOWN decreases value.
	Page Left Page Right	The arrows on left and right edges of the touchscreen scroll Page Left or Page Right in a round-robin sequence.
	Page Up Page Down	On screens with multiple pages, the Page Up and Page Down buttons moves up and down the pages.
	Abort	The Abort button appears when a process may need to be exited prior to completion.
	Next	Pressing Next takes you to the next screen in a multi-step procedure. Some procedures have a Proceed button instead.
	Save	<ol style="list-style-type: none"> Pressing SAVE on a pop-up screen saves the entered data and returns you to the previous screen. Pressing SAVE on a non-popup screen saves the entered data and takes you to the next screen.
	Retry	Pressing Retry takes you to the previous screen and re-attempts the process step that caused the notification message to appear.
	Help	Takes you to a Help screen specific to the subject.

1.9 Selections

When you press on an item, it turns green; pressing the button a second time de-selects that option. On some screens, this opens the screen you chose. On other screens, the screen remains until you press **Next** or **Proceed**.

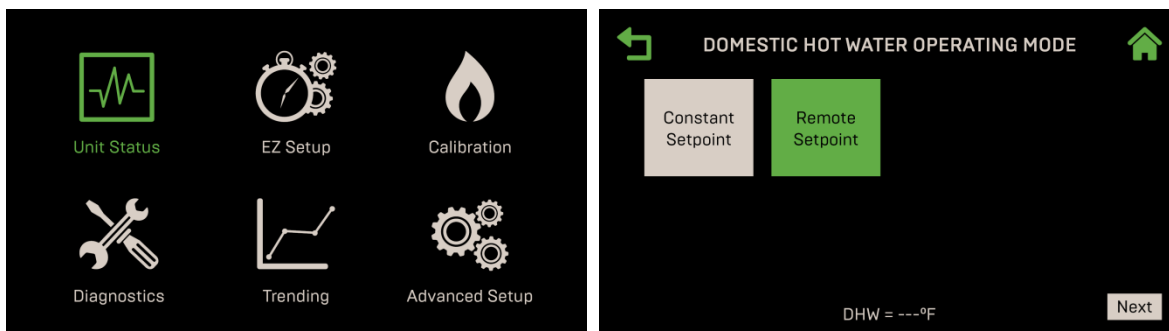
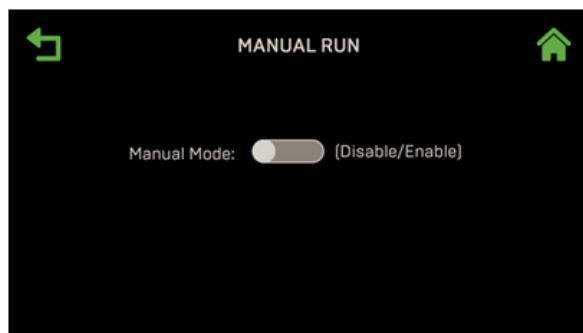


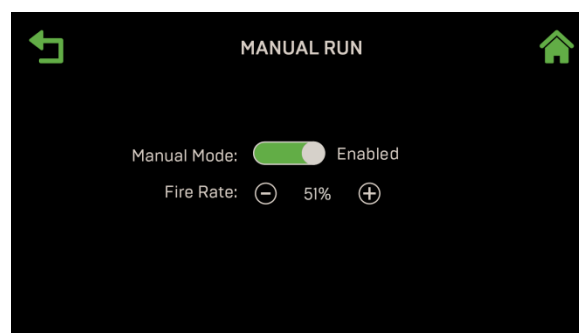
Figure 1-6: Selected Item Indication – Color Change

SECTION 1: General Information

Some controls that have only two options have a sliding “toggle” control that indicates the current selection. In the example below on the left, **Manual Mode** is Disabled. To enable it, simply press on the control; it switches to the opposite option, the background color changes, and the label indicates the current state, as shown on the right-hand image.



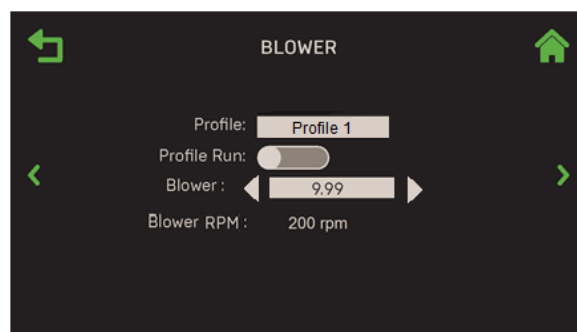
Manual Mode Disabled



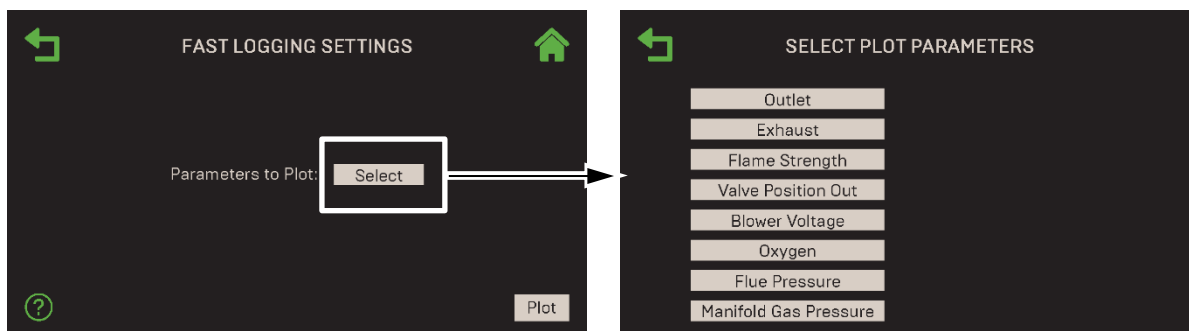
Manual Mode Enabled

Figure 1-7: Toggle Controls

Some screens include a combination of “read only” and “user-selectable” parameters. Read-Only parameters appear as plain text on a back background.

**Figure 1-8: List Controls**

To make a selection in a user-selectable parameter, press on the field you want to change (the word **Select** in the figure below); a list of options appears. When you select an option, the original screen reappears with your selection displayed in the field.

**Figure 1-9: List Controls**

1.10 Aborting an Action

The **abort** action is available when a process needs to be terminated prior to completion. This is initiated by pressing the **Abort** button, if available, or pressing the **Home** button in the upper-right corner. The following occurs when a process is aborted:

1. A confirmation screen appears. Select **Yes** to abort the process. If no action is taken within 15 seconds, or if you select **No**, the abort is cancelled, and the process continues.

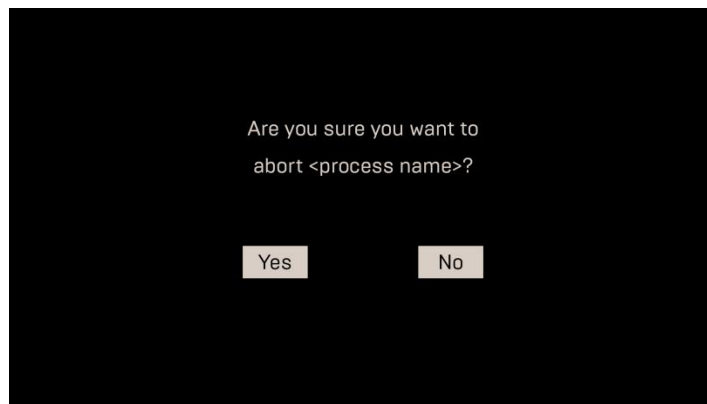


Figure 1-10: Abort Confirmation Screen

2. When an abort is successful, the process terminates, and you are returned to the original screen.
3. If the process completes while the confirmation screen is displayed, the Abort action is nullified.

1.11 Timeout

There is one timeout for both screen sleep mode and password level exit. The timeout is defined as inactivity on the touchscreen and all front panel buttons. The default timeout period is 60 minutes. When a timeout occurs, the touchscreen goes into sleep mode and resets the access level to the default.

Any activity on the control panel (including a tap on the touchscreen) will activate the touchscreen and display the **Enter Password** screen.

1.12 Unit & Plant Status Screens

The **Unit Status** screen is the touchscreen's default screen for Benchmark boilers. It is selected by pressing **Unit Status** on the **Main Menu**.

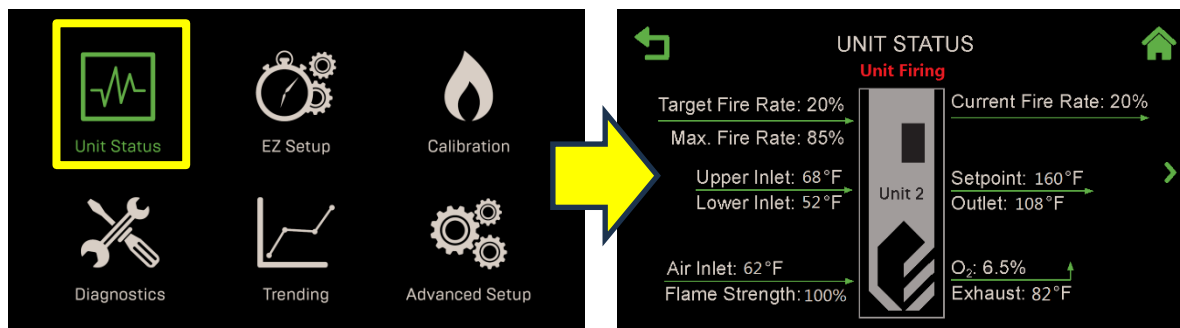


Figure 1-11: Example Unit Status Screen – Status Message Displayed

SECTION 1: General Information

This screen also appears when the unit powers on (after the splash screen), comes out of sleep mode and has a successful flame ignition. You can manually navigate away from this screen at any time, or the system will automatically transition to Ignition screen during the Ignition sequence.

In normal operation, the area just below the screen heading displays operating status and fault messages. Status messages have white lettering, Warning messages have yellow lettering and Fault messages have red lettering.

- **Setpoint** is not displayed on the unit if BST mode is enabled.
- The **Max. Fire Rate** parameter is displayed when the max fire rate is set to a quantity other than 100% and the unit Target Fire Rate is -1% or more from the Max Fire Rate.

For a full description of this screen, see Section 7.2 .

1.12.1 Plant Status Screen

If the unit is designated as the “Manager” in a Boiler Sequencing Technology (BST) cascade, the Plant Status screen can also be displayed by pressing the **Page Right** arrow. This screen appears only on the BST Manager.

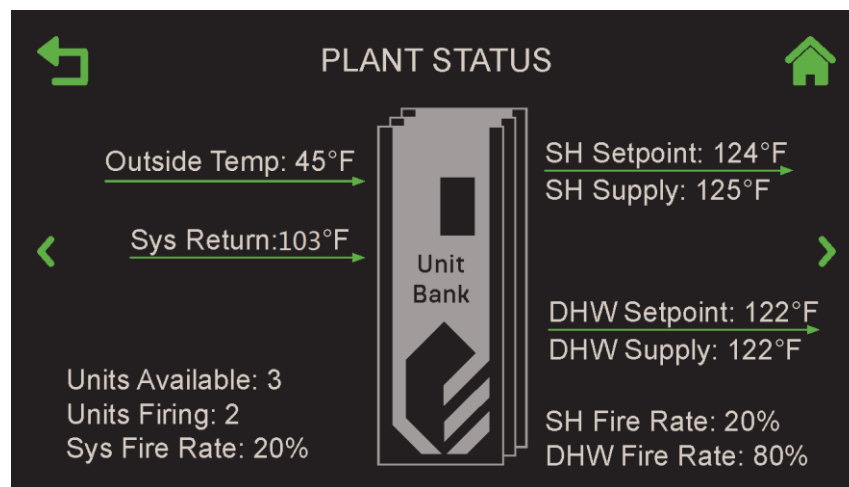


Figure 1-12: Plant Status Screen

From this screen, you can navigate between this and the Unit Status Screen using the **Left Page** and **Right Page** arrows.

For a full description of this screen, see Section 7.3.

SECTION 2: EZ SETUP (BENCHMARK ONLY)

The **EZ Setup** screen is accessed by pressing **EZ Setup** on the Main Menu. The function configures the unit as either a Standalone unit or as a Client or Manager in a Boiler Sequencing Technology (BST) Cascade group. If the current unit is the “Manager” of a group, it sets the operating mode for the “Manager” unit. If it is a “Client” in a BST Cascade group, it sets the operating mode for the “Client” unit.

NOTE: EZ Setup is not available for the CFR boilers (icon is greyed out).

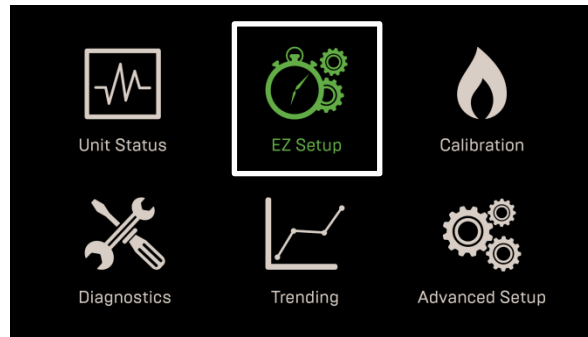


Figure 2-1: Main Menu with EZ Setup Selected

This Section includes the following topics:

[2.1: Backing Up and Restoring Settings](#)

[2.2: EZ Setup - Standalone](#)

[2.2.1 EZ Setup – Standalone – Space Heating Application](#)

[2.2.2 EZ Setup – Standalone – Domestic Hot Water Application](#)

[2.2.3 EZ Setup – Standalone – Other Application](#)

[2.3: EZ Setup - Boiler Sequencing Cascade](#)

[2.3.1: EZ Setup – BST Cascade – Client Units](#)

[2.3.2: EZ Setup – BST Cascade – Manager Units](#)

[2.3.2.1 EZ Setup: BST Manager – Single Application](#)

[2.3.2.1.1 EZ Setup: BST Manager – Space Heating Application](#)

[2.3.2.1.2 EZ Setup: BST Manager – Domestic Hot Water Application](#)

[2.3.2.1.3 EZ Setup: BST Manager – Other Application](#)

[2.3.2.2 EZ Setup: BST Manager – Two Applications](#)

[2.3.2.2.1 EZ Setup: BST Manager – Space Heating and DHW Applications](#)

[2.3.2.2.2 EZ Setup: BST Manager – DHW and Other Applications](#)

[2.3.2.2.3 EZ Setup: BST Manager – Space Heating and Other Applications](#)

[2.4: EZ Setup - Restoring a Previous Setup](#)

⚠ WARNING:

Before starting the instructions in this section for the first time, you must ensure that the unit has the latest Edge Controller firmware. Complete the instructions in *Section 6.2.7: Firmware Update* to obtain and install the latest firmware.

2.1 Backing Up and Restoring Settings

The Edge Controller provides the option of saving the value of all parameters configured during setup to either the Controller's internal memory or to an external USB device plugged into the side of the Controller. The saved settings can then be restored at any time, ensuring that the time spent setting up and fine tuning the parameters is not lost.

This is a useful step for two reasons:

- It provides a copy of the original setup, in case it becomes corrupted either through hardware malfunction or operator error.
- The saved settings can be exported and then uploaded on other units of the same type in the plant, greatly reducing the time needed to setup other units.

AERCO recommends using this option to guard against the need to recreate a setup from scratch. Instructions are in [Section 6.2.3: Save and Transfer Settings](#) and [Section 2.5: EZ Setup – Restoring a Previous Setup](#).

If a setup was already performed on this (or another similar) unit, and you want to re-load that setup, see [Section 2.5: EZ Setup – Restoring a Previous Setup](#).

2.2 EZ Setup: Standalone

Complete the instructions below only if the boiler is a standalone unit.

1. Go to: Main Menu → EZ Setup.
2. If the unit was previously setup, the **EZ Setup** screen appears showing a summary of the previous setup. Press **Abort** to retain the previous setup or press **Next** to continue.

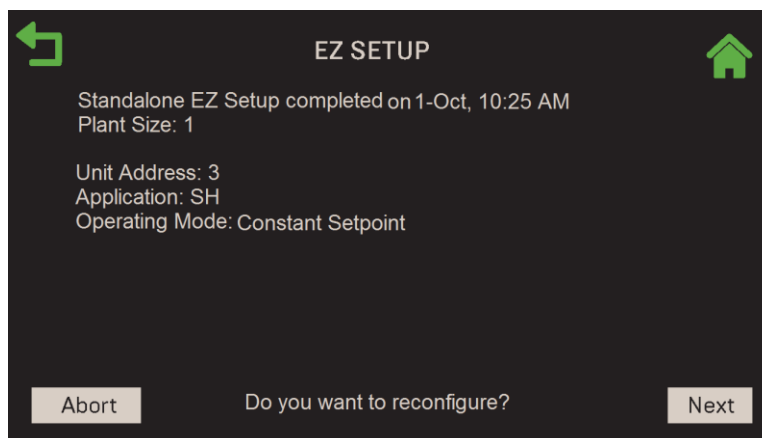


Figure 2-2: Standalone: EZ Setup Screen

3. The **Select Configuration** screen appears. Press **Standalone**. Press **Next** to continue.

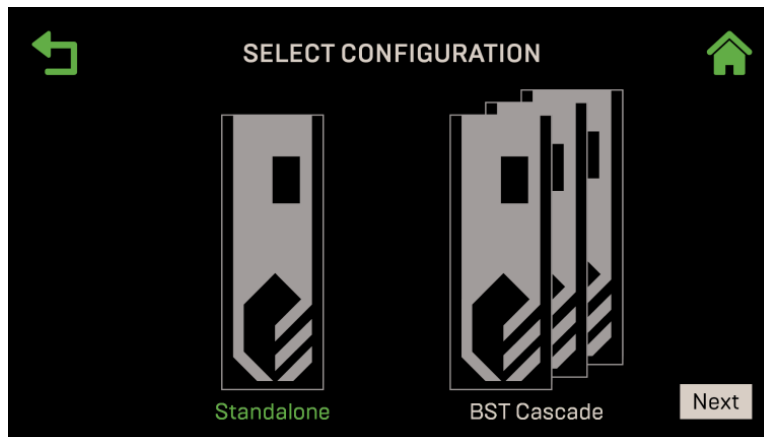


Figure 2-3: Standalone: Select Configuration Screen

4. The **Time And Date** screen appears. If both are correct, press **Next** to continue. If not, press either field and enter the correct time (4 digits) or date (8 digits) and then press **Save**.

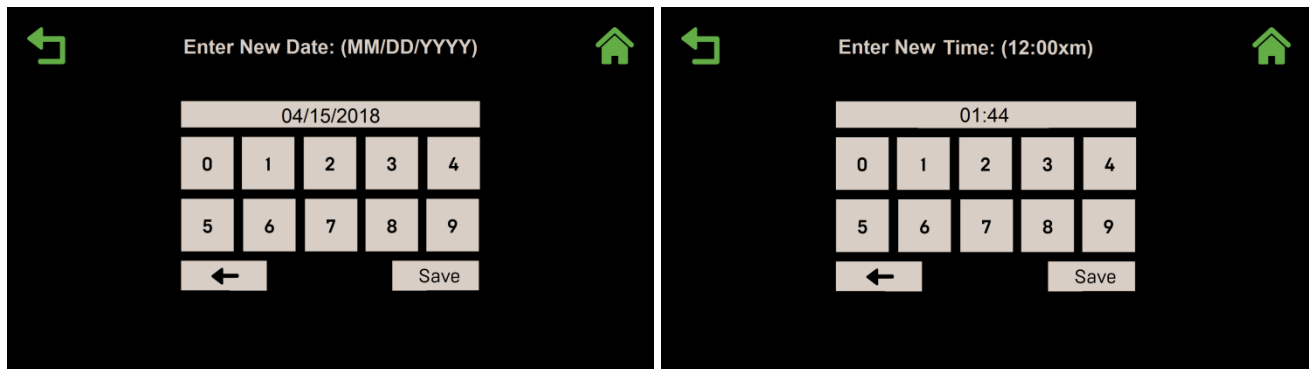


Figure 2-4: Standalone: Enter Date Screen

5. If a previous setup was saved, the **Load Settings** screen appears. To re-load that setup, press **Yes** and see [Section 2.5](#) for instructions. Press **No** to continue to the next step.

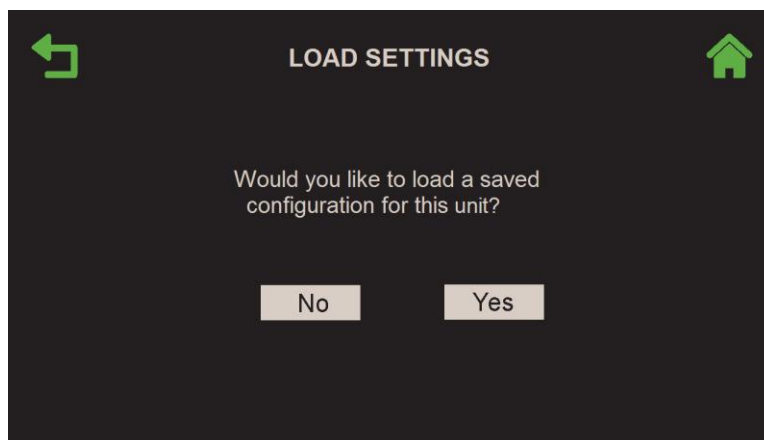


Figure 2-5: Standalone: Load Settings Screen

6. Press on the boiler application that this unit will employ. The selected application turns green. Press **Next** and then complete the instructions in the section below that applies to your choice.

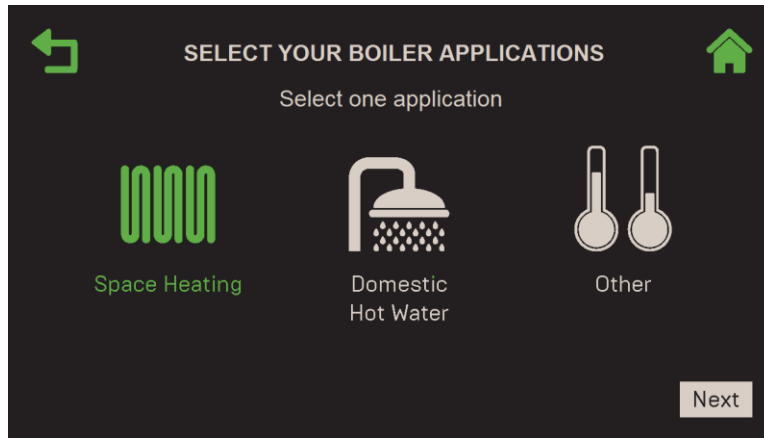


Figure 2-6: Standalone: Select Boiler Application(s) Screen

2.2.1 EZ Setup: Standalone – Space Heating Application

Complete these instructions only if you chose **Space Heating** at the end of the previous Section.



Figure 2-7: Standalone – Space Heating: Select Your Boiler Application Screen

1. The **SH Operating Mode** screen appears. Choose the **Operating Mode** then press **Next**.
 - If you chose **Constant Setpoint**, proceed to Step 2.
 - If you chose **Remote Setpoint**, skip to Step 3.
 - If you chose **Direct Drive**, skip to Step 4.
 - If you chose **Combo Unit**, skip to Step 5.
 - If you chose **Outdoor Air Temperature Reset**, skip to Step 6.

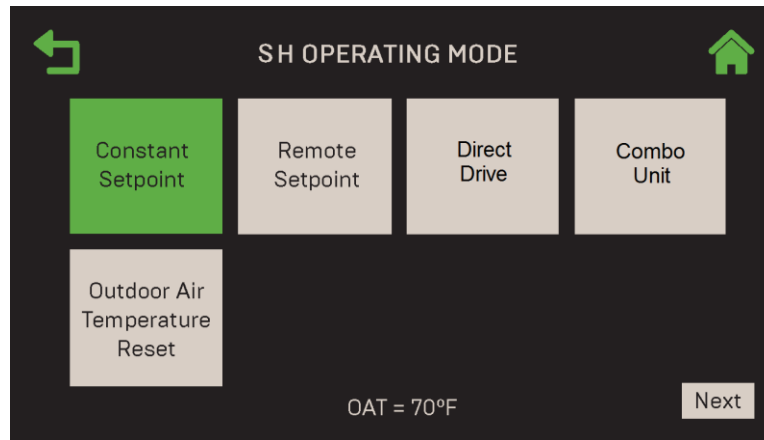


Figure 2-8: Standalone – Space Heating: Operating Mode Screen

NOTE: If the outdoor air sensor is not connected, Outdoor Air Temperature Reset is disabled.

- If you chose **Constant Setpoint** in Step 1, specify it in the **Unit SH Setpoint** parameter. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#) for instructions.

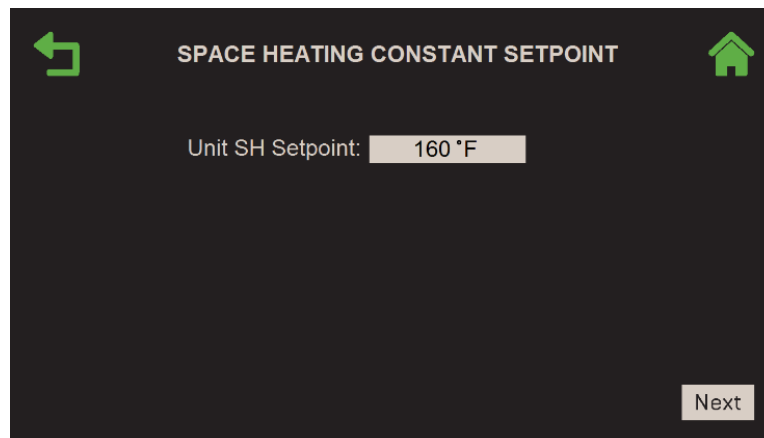


Figure 2-9: Standalone – Space Heating: Space Heating Constant Setpoint

- If you chose **Remote Setpoint** in Step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

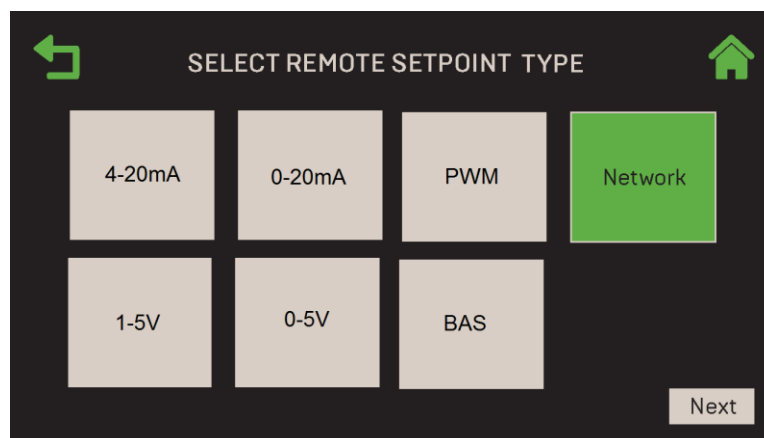


Figure 2-10: Standalone – Space Heating: Select Remote Setpoint Type Screen

- A. If you chose **4-20mA**, **0-20mA**, **1-5V** or **0-5V**, the **SH Analog Input** screen appears. Enter the upper and lower limits of the SH setpoint in the **Unit SH Setpt Low Limit** and **Unit SH Setpt High Limit** fields. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#).

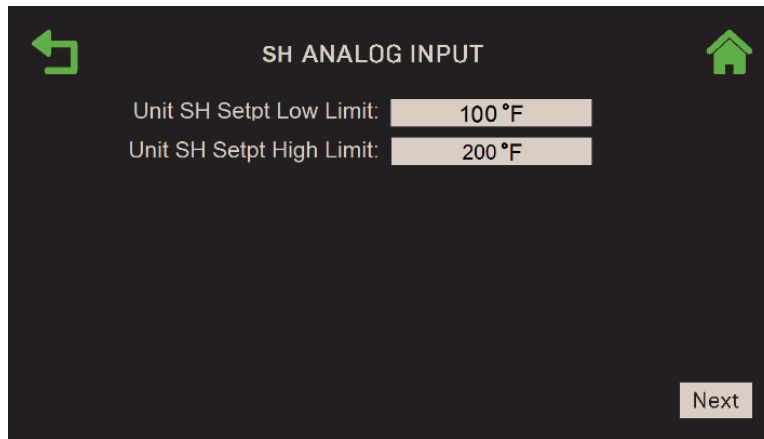
The screenshot shows the 'SH ANALOG INPUT' screen. It has a dark background with a green back arrow icon in the top left and a green home icon in the top right. The title 'SH ANALOG INPUT' is centered at the top. Below the title, there are two input fields: 'Unit SH Setpt Low Limit:' with a value of '100 °F' and 'Unit SH Setpt High Limit:' with a value of '200 °F'. A 'Next' button is located in the bottom right corner.

Figure 2-11: Standalone – Space Heating: SH Analog Input Screen

- B. If you chose **Network**, the **Comm Settings** screen appears. Enter the **Unit Address** and **Unit Baud Rate**. Press **Next** to go to the **Select BAS Mode** screen; skip to [Section 2.4](#).

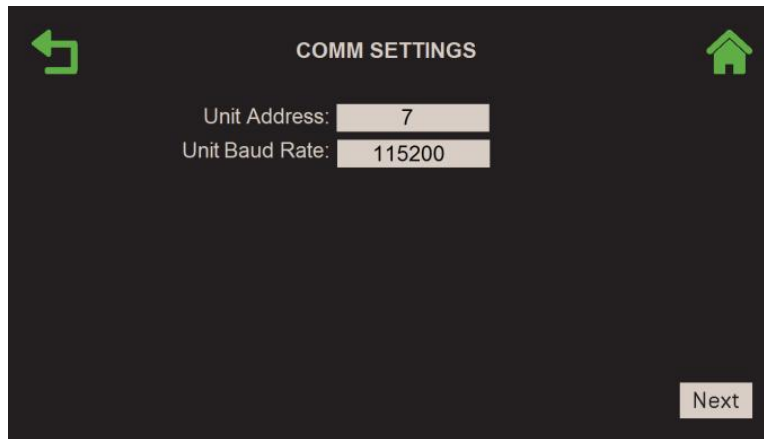
The screenshot shows the 'COMM SETTINGS' screen. It has a dark background with a green back arrow icon in the top left and a green home icon in the top right. The title 'COMM SETTINGS' is centered at the top. Below the title, there are two input fields: 'Unit Address:' with a value of '7' and 'Unit Baud Rate:' with a value of '115200'. A 'Next' button is located in the bottom right corner.

Figure 2-12: Standalone – Space Heating: Comm Settings Screen

- C. If you chose either **BAS** or **PWM**, the **Select BAS Mode** screen appears; skip to [Section 2.4: Completing the Installation](#) for instructions.

4. If you chose **Direct Drive**, the **Select Direct Drive** screen appears. Choose the Direct Drive Type.



Figure 2-13: Standalone – Space Heating: Select Direct Drive Type Screen

- A. If you chose **4-20mA**, **0-20mA**, **0-5V**, **1-5V**, or **BAS**, the **Select BAS Mode** screen appears (skip to [Section 2.4: Completing the Installation](#)).
- B. If you chose **ACS**, the **Comm Settings** screen appears. Enter the **Unit Address** and **Unit Baud Rate** (**9600**, **19200**, **38400** or **115200**). Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#) for instructions.
5. If you chose **Combo Unit** in Step 1, the **Combo Unit Setpoint** screen appears showing one parameter, **Unit DHW Setpoint**. Specify the setpoint for the DHW application in this parameter. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).

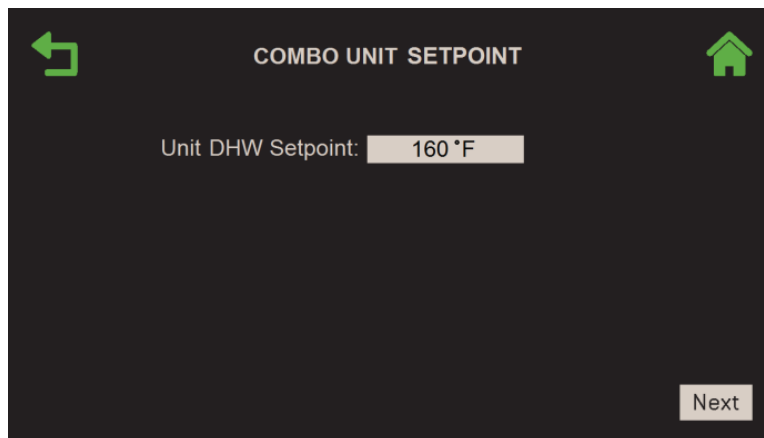
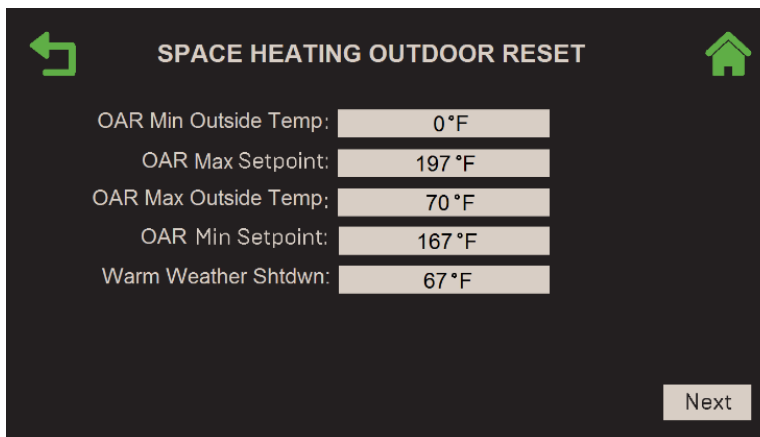


Figure 2-14: Standalone – Space Heating: Combo Unit Setpoint Screen

6. If you chose **Outdoor Air Temperature Reset** in Step 1, fill in the four **OAR** (outdoor air reset) temperature and setpoint parameters, and **Warm Weather Shutdown** temperature. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#) for instructions.



SPACE HEATING OUTDOOR RESET

OAR Min Outside Temp: 0°F

OAR Max Setpoint: 197°F

OAR Max Outside Temp: 70°F

OAR Min Setpoint: 167°F

Warm Weather Shtdwn: 67°F

Next

Figure 2-15: Standalone – Space Heating: Space Heating Outdoor Reset Screen

2.2.2 EZ Setup: Standalone – DWH (Domestic Hot Water) Application

Complete these instructions only if you chose **Domestic Hot Water** at the end of Section 2.2.



SELECT YOUR BOILER APPLICATION

Select one application

Space Heating

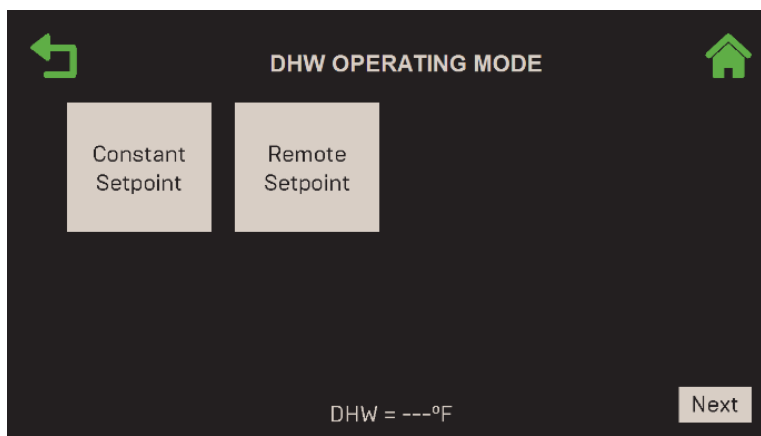
Domestic Hot Water

Other

Next

Figure 2-16: Standalone – DHW: Select Your Boiler Application Screen

1. The **Domestic Hot Water Operating Mode** screen appears. Choose the **DHW Operating Mode**. If you chose **Constant Setpoint**, go to Step 2; if you chose **Remote Setpoint**, skip to Step 3.



DHW OPERATING MODE

Constant Setpoint

Remote Setpoint

DHW = ---°F

Next

Figure 2-17: Standalone – DHW: DHW Operating Mode Screen

2. If you chose **Constant Setpoint** in Step 1, the **DHW Constant Setpoint** screen appears. Specify the domestic hot water **Setpoint**. Press **Next** to go to the **Select BAS Mode** screen; skip to [Section 2.4:](#).

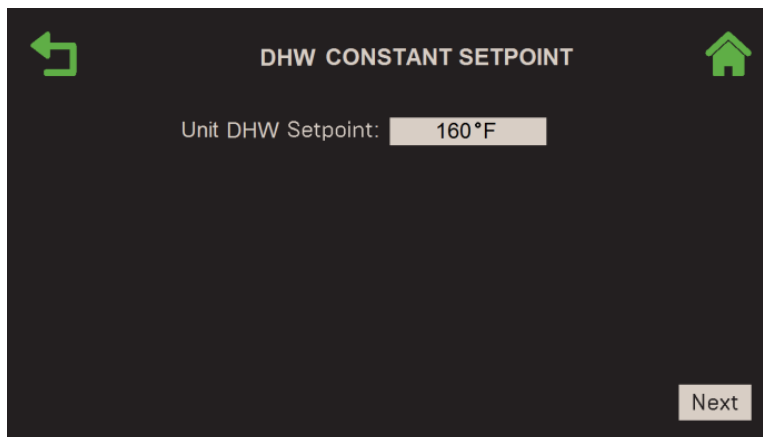
The screenshot shows the 'DHW CONSTANT SETPOINT' screen. At the top, there is a green back arrow on the left and a green home icon on the right. The title 'DHW CONSTANT SETPOINT' is centered. Below the title, the text 'Unit DHW Setpoint:' is followed by a text box containing '160 °F'. At the bottom right, there is a 'Next' button.

Figure 2-18: Standalone – DHW: DHW Constant Setpoint Screen

3. If you chose **Remote Setpoint** in Step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

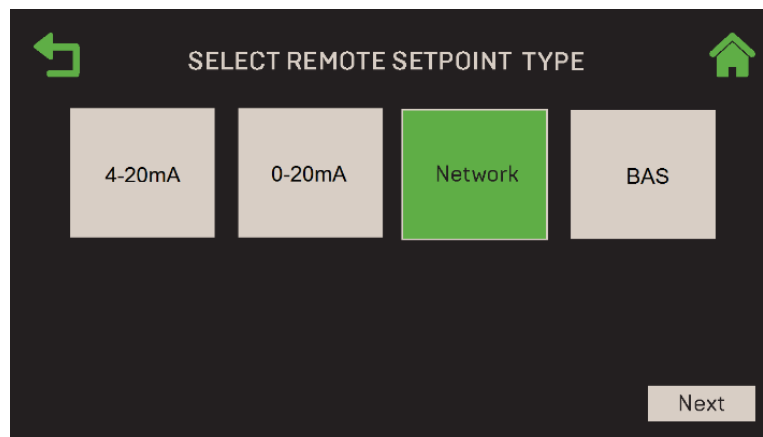
The screenshot shows the 'SELECT REMOTE SETPOINT TYPE' screen. At the top, there is a green back arrow on the left and a green home icon on the right. The title 'SELECT REMOTE SETPOINT TYPE' is centered. Below the title, there are four buttons: '4-20mA', '0-20mA', 'Network', and 'BAS'. The 'Network' button is highlighted in green. At the bottom right, there is a 'Next' button.

Figure 2-19: Standalone – DHW: Select Remote Setpoint Type Screen

- A. If you chose either **4-20mA** or **0-20mA**, the **DHW Analog Input** screen appears. Enter **Unit DHW Setpt Low Limit** and **Unit DHW Setpt High Limit**. Pressing **Next** takes you to the **Select BAS Mode** screen (skip to [Section 2.4: Completing the Installation](#)).

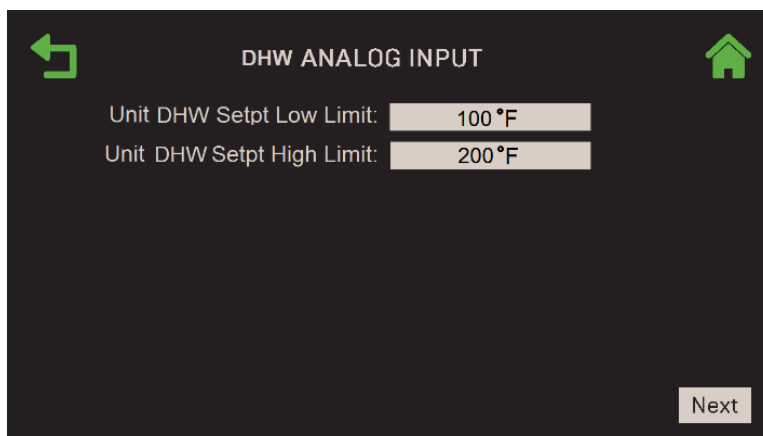
The screenshot shows the 'DHW ANALOG INPUT' screen. At the top, there is a green back arrow on the left and a green home icon on the right. The title 'DHW ANALOG INPUT' is centered. Below the title, there are two text boxes: 'Unit DHW Setpt Low Limit:' followed by '100 °F', and 'Unit DHW Setpt High Limit:' followed by '200 °F'. At the bottom right, there is a 'Next' button.

Figure 2-20: Standalone – DHW: DHW Analog Input Screen

- B. If you chose **Network**, the **Comm Settings** screen appears. Enter the **Unit Address** and **Unit Baud Rate** (9600, 19200, 38400 or 115200). Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#) for instructions.

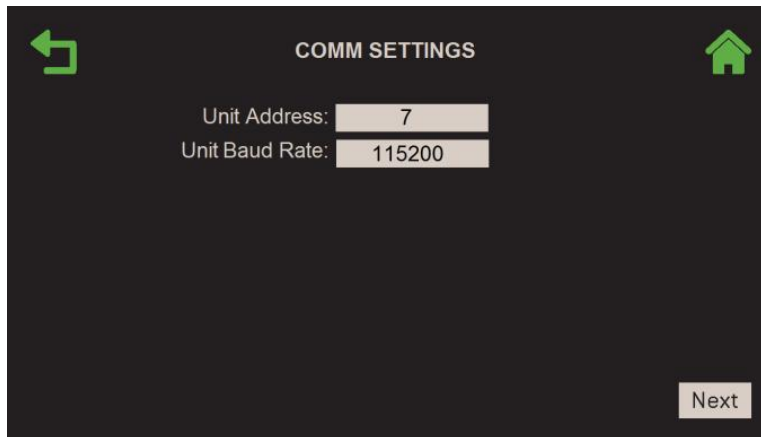
The image shows the 'COMM SETTINGS' screen. At the top, there is a green back arrow icon on the left and a green home icon on the right. The title 'COMM SETTINGS' is centered. Below the title, there are two input fields: 'Unit Address:' with the value '7' and 'Unit Baud Rate:' with the value '115200'. At the bottom right, there is a 'Next' button.

Figure 2-21: Standalone – DHW: Comm Settings Screen

- C. If you chose **BAS**, the **Select BAS Mode** screen appears. Skip to [Section 2.4](#).

2.2.3 EZ Setup: Standalone – Other Application

Complete these instructions only if you chose **Other** at the end of Section 2.2.

The image shows the 'SELECT YOUR BOILER APPLICATION' screen. At the top, there is a green back arrow icon on the left and a green home icon on the right. The title 'SELECT YOUR BOILER APPLICATION' is centered. Below the title, the text 'Select one application' is displayed. There are three options, each with an icon and a label: 'Space Heating' with a coil icon, 'Domestic Hot Water' with a showerhead icon, and 'Other' with two thermometer icons. The 'Other' option is highlighted in green. At the bottom right, there is a 'Next' button.

Figure 2-22: Standalone – Other: Select Your Boiler Application Screen

1. The **Other Operating Mode** screen appears. Choose the **Other Operating Mode** (its square turns green) then press **Next** to go to that option's screen. If you chose **Constant Setpoint**, proceed to Step 2. If you chose **Remote Setpoint**, skip to Step 3.

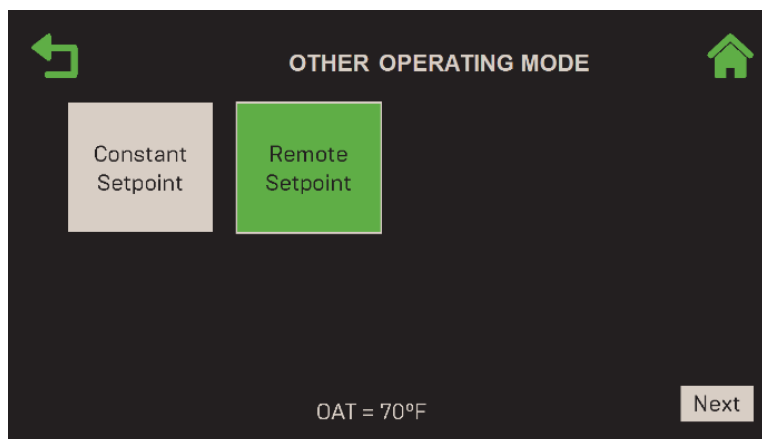


Figure 2-23: Standalone – Other: Other Operating Mode Screen

2. If you chose **Constant Setpoint** in Step 1, the **Other Heating Constant Setpoint** screen appears. Specify the **Unit Other Setpoint**. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#) for instructions.

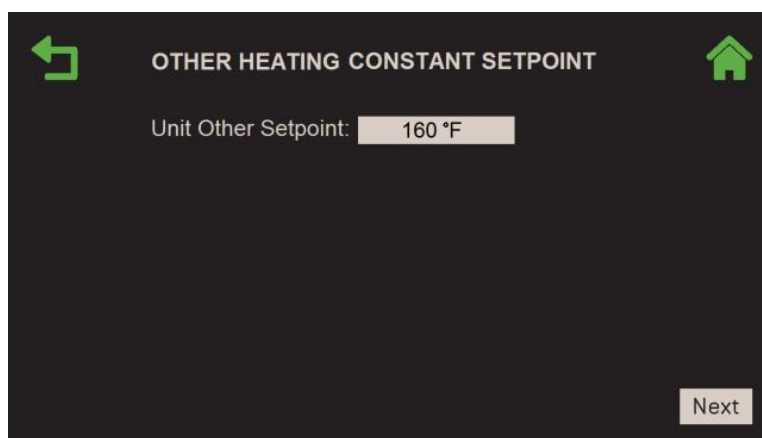


Figure 2-24: Standalone – Other: Other Heating Constant Setpoint Screen

3. If you chose **Remote Setpoint** in step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

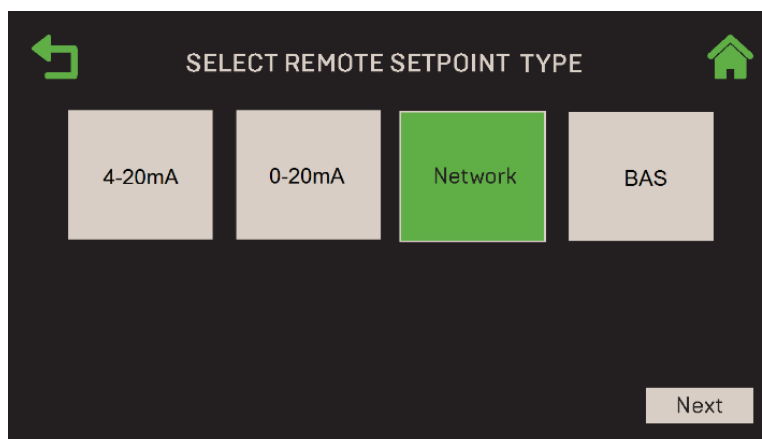


Figure 2-25: Standalone – Other: Select Remote Setpoint Type Screens

- A. If you chose either **4-20mA** or **0-20mA** the **Other Analog Input** screen appears. Configure the following parameters:

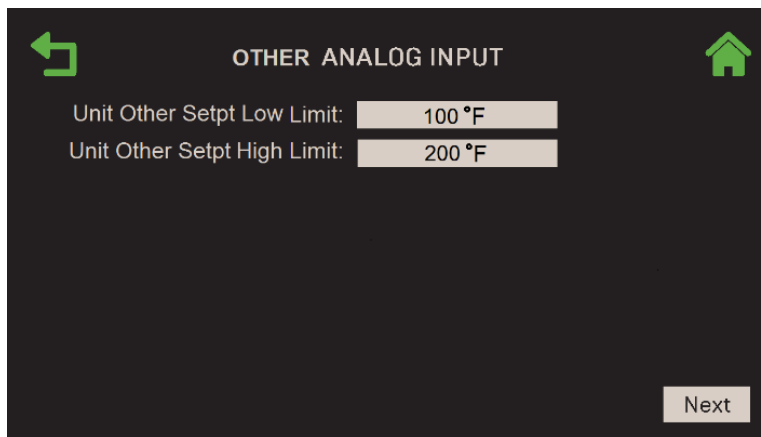


Figure 2-26: Standalone – Other: Other Analog Input Screen

- Enter the upper and lower limits of the “other” setpoint in the **Unit Other Setpt Low Limit** and **Unit Other Setpt High Limit** parameters.
 - Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).
- B. If you chose **Network**, the **Comm Settings** screen appears. Enter the **Unit Address** and **Unit Baud Rate** (9600, 19200, 38400 or 115200). Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#) for instructions.

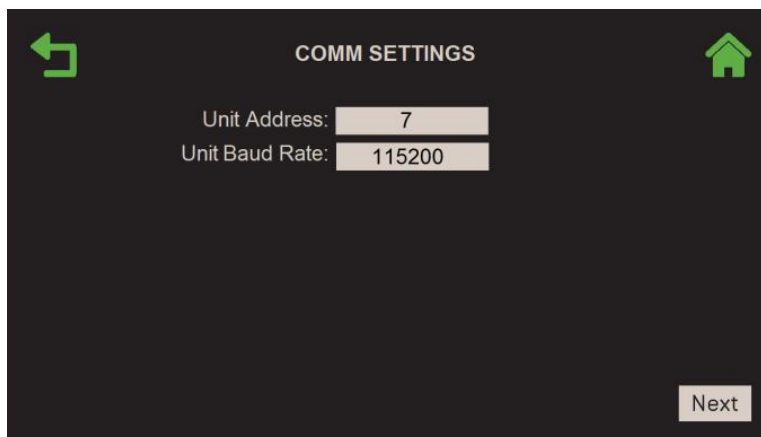


Figure 2-27: Standalone – Other: Comm Settings Screen

- C. If you chose **BAS**, the **Select BAS Mode** screen appears; skip to [Section 2.4](#).

2.3 EZ Setup: Boiler Sequencing Technology Cascade

NOTE: All “Client” units are typically setup before starting the BST “Manager” setup, so their addresses are available when setting up the “Manager.”

2.3.1 EZ Setup: BST Client Units

Complete the instructions below on all “client” units in a BST cascade. Note, if a BST-Client setup was already performed on this or another unit, and you want to load/re-load that setup, see [Section 2.5: EZ Setup – Restoring a Previous Setup](#).

1. Go to: **Main Menu → EZ Setup**.
2. If the unit was previously setup, the **EZ Setup** screen appears showing a summary of the previous setup. You can **Abort** and retain the previous setup or press **Next** to continue.

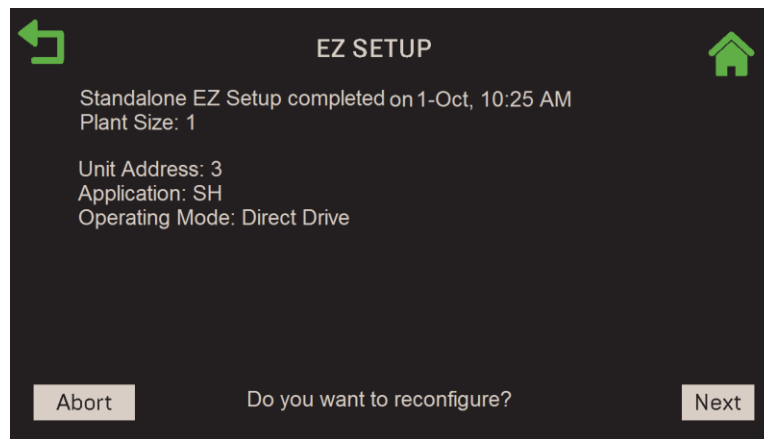


Figure 2-28: BST Client: EZ Setup Screen

3. On the **Select Configuration** screen press **BST Cascade**, then press **Next**.

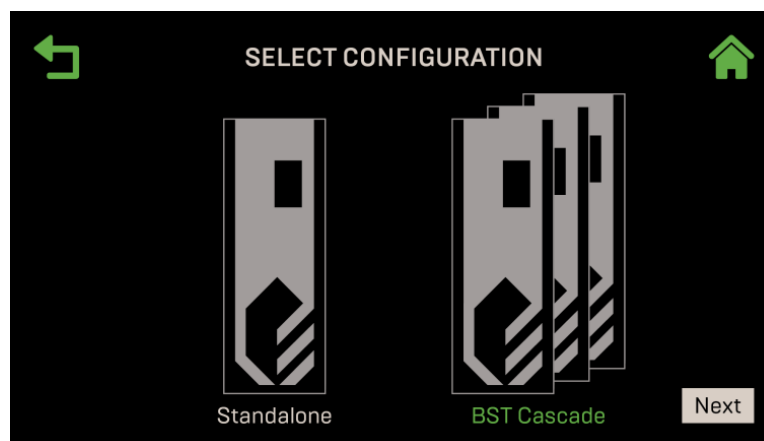


Figure 2-29: BST Client: Select Configuration Screen

4. The **Cascade Role** screen appears. Set **Unit Mode** to **BST Client**, then press **Next**.

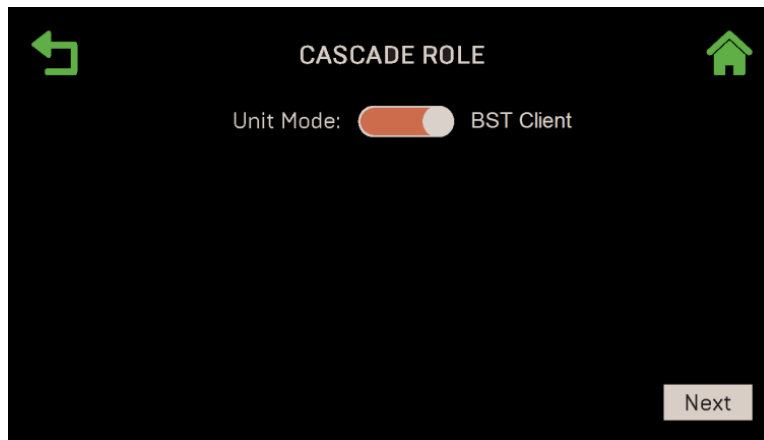


Figure 2-30: BST Client: Cascade Role Screen

5. The Client Communication screen appears. Configure the following parameters, then press **Next**.
- **Unit Address:** Enter a unique address for this unit in the BST Cascade, from 1 to 16.
 - **Cascade Baud Rate:** Choose **19200**, **38400** or **57600**.

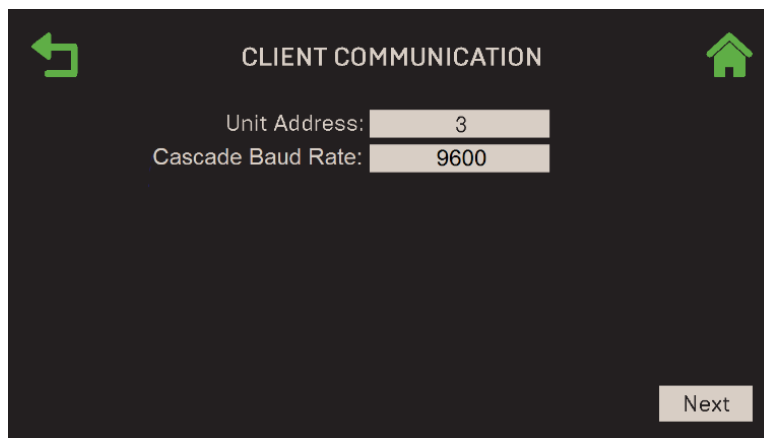


Figure 2-31: BST Client: Client Communication Screen

6. If a previous setup was created and saved, the **Load Settings** screen appears. If you want to re-load that setup, press **Yes** and see [Section 2.5: EZ Setup – Restoring a Previous Setup](#) for instructions. Press **No** to proceed to the next step.

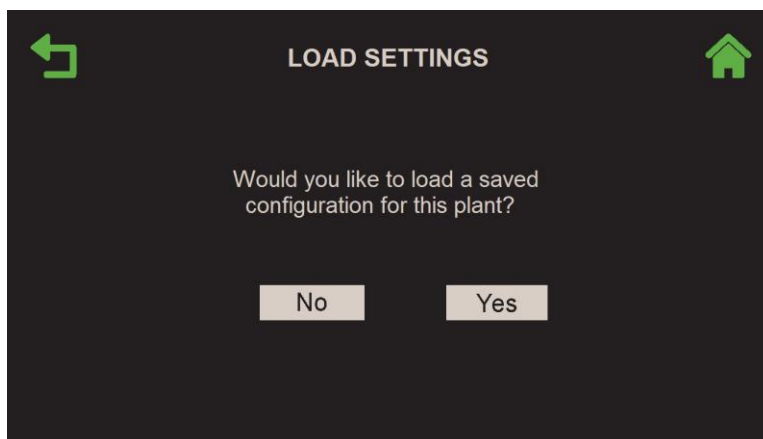


Figure 2-32: BST Client: Load Settings Screen

7. When you pressed **No** on the previous screen, the **Client EZ Setup Complete** screen appears indicating completion or failure (if it failed, you can press **Next** to re-run the setup). This screen includes a reminder that BST Cascade Setup must be run on the BST Manager.

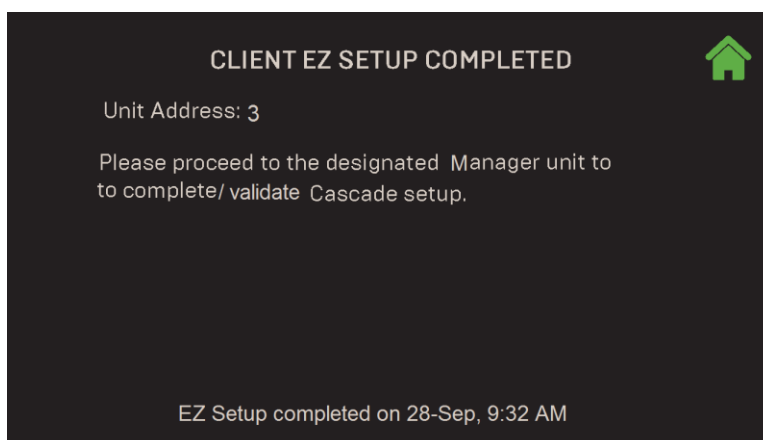


Figure 2-33: BST Client: Client EZ Setup Complete Screen

2.3.2 EZ Setup: BST Manager Unit

The Manager unit will sync with all Client boilers once this process is completed. Note, if a BST Manager setup was already performed on this or another unit, and you want to load/re-load that setup, see [Section 2.5: EZ Setup – Restoring a Previous Setup](#).

NOTE: All “Client” units are typically setup before starting the BST Manager setup, so their addresses are available during this process. If they are not all setup, you will have to pause and setup all Client units before completing the BST Manager setup.

1. Go to: **Main Menu → EZ Setup**.
2. If the unit was previously setup, the **EZ Setup** screen appears showing a summary of the previous setup. You can **Abort** and retain the previous setup or press **Next** to continue.
3. On the **Select Configuration** screen press **BST Cascade**, then press **Next**.

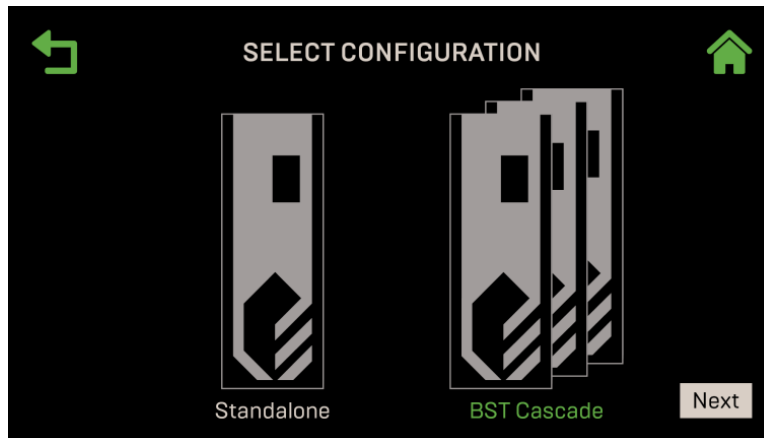


Figure 2-34: BST Manager: Select Configuration Screen

4. On the **Cascade Role** screen select **BST Manager** and then press **Next**. The Manager LED will light on the front panel signifying the role of the unit.

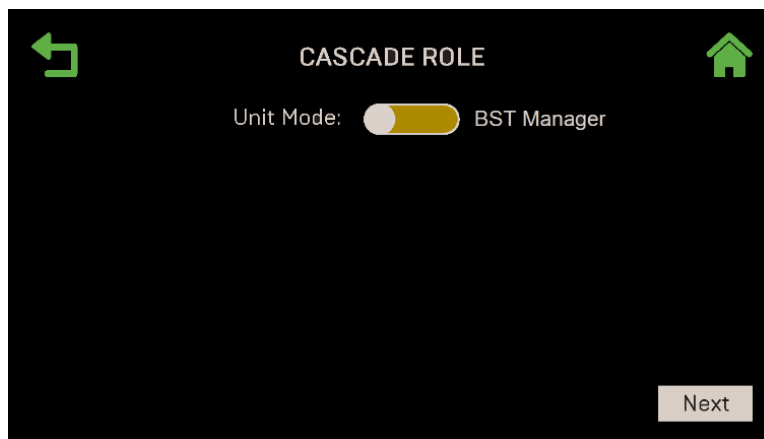


Figure 2-35: BST Manager: Cascade Role Screen

5. The next screen displays the current time and date. If both are correct, press **Next** to continue. If not, press either field and enter the correct time or date and then press **Save**.

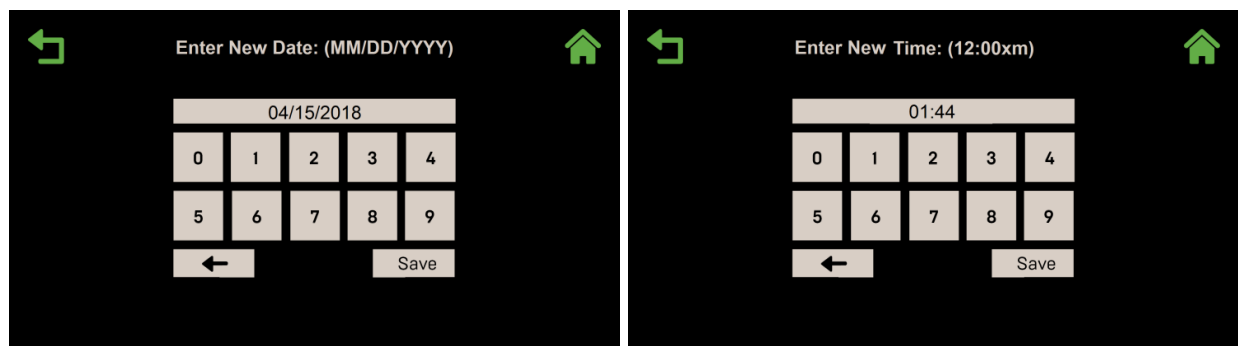


Figure 2-36: BST Manager: Date and Time Screen

6. Fill in the settings on the **Cascade Communication** screen below and press **Next** to continue.

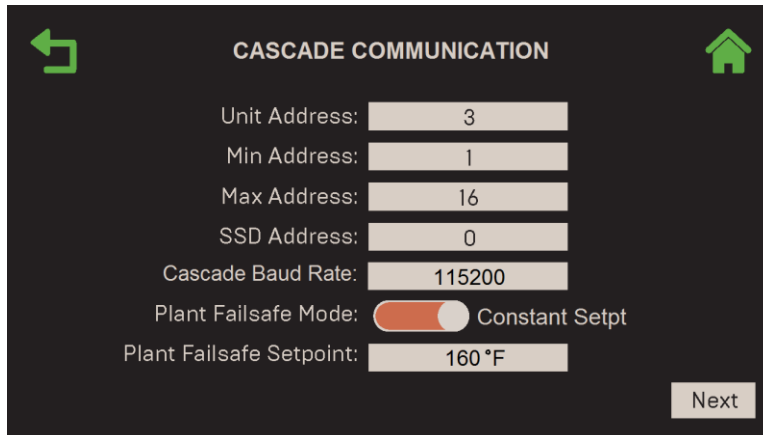


Figure 2-37: BST Manager: Manager Communication Screen

NOTE: These parameters also appear in [Section 6.3.2](#), where individual settings can be changed at a later time.

- **Unit Address:** The communication address of the current (Manager) unit (1 - 127).
 - **Min & Max Address:** The address range in the BST cascade, **1** up to the total number of units in the cascade; for example, **1** and **10** (**Max Address** maximum = **16**).
 - **SSD Address:** The Client/Client Device address. This parameter is for backwards compatibility with the C-More Control system.
 - **Cascade Baud Rate:** Select the rate at which information is transferred in a communication channel: **9600**, **19200**, **38400**, **115200** bits per second.
 - **Plant Failsafe Mode:** The Manager's operating mode if there is a loss of communication between the Manager and Client units, or to the BAS or external signal/sensor, such as an outdoor sensor (default = **Constant Setpoint**).
 - **Plant Failsafe Setpoint:** (only if **Plant Failsafe Mode** = **Constant Setpoint**) Specify the Setpoint for all units in the cascade.
7. The **Client Address** screen appears as a reminder to setup all Client units in the BST Cascade before continuing. Once all Client units are setup, press **Next** to continue.

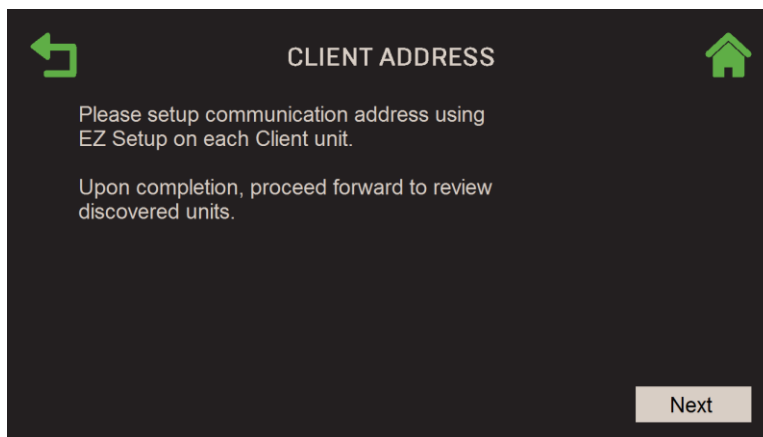


Figure 2-38: BST Manager: Client Address Screen

8. The **Unit Address** screen appears. This screen shows a color-coded square of each unit discovered in the cascade and a code indicating its current status. Before continuing you should verify that this screen confirms your understanding of the state of all units in the cascade. Press **Next** to continue.

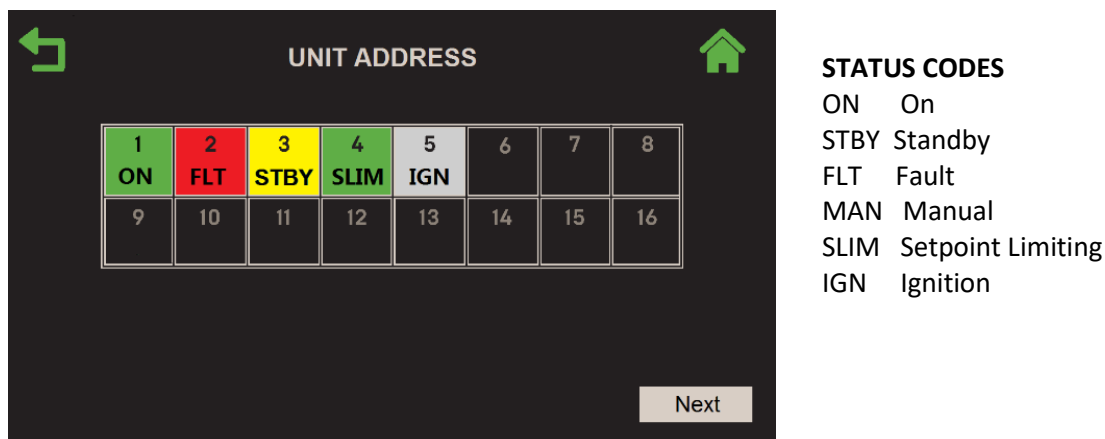


Figure 2-39: *BST Manager: Unit Address Screen*

IMPORTANT!

Do not continue past this screen unless it accurately represents the cascade you are creating.

9. If a previous setup was performed and saved on this unit, and you want to re-load that setup, press **Yes** and see [Section 2.5: EZ Setup – Restoring a Previous Setup](#) for instructions. To create a new setup, press **No** to continue.



Figure 2-40: *Standalone: Load Settings Screen*

10. **Select Your Boiler Application** appears. Choose one or any two boiler applications that this BST cascade will run; the selected application(s) turn green. The **Other** option could be for a snowmelt, radiated heating or any tertiary boiler water application. Press **Next**, then complete the instructions in the **one** section below that corresponds to the application(s) you chose:

- For a single application, go to:
 - [Section 2.3.2.1.1: Space Heating \(SH\)](#)
 - [Section 2.3.2.1.2: Domestic Hot Water \(DHW\)](#)
 - [Section 2.3.2.1.3: Other](#)

- For two applications, go to:
 - [Section 2.3.2.2.1: Space Heating & Domestic Hot Water](#)
 - [Section 2.3.2.2.2: Domestic Hot Water & Other](#)
 - [Section 2.3.2.2.3: Space Heating & Other](#)

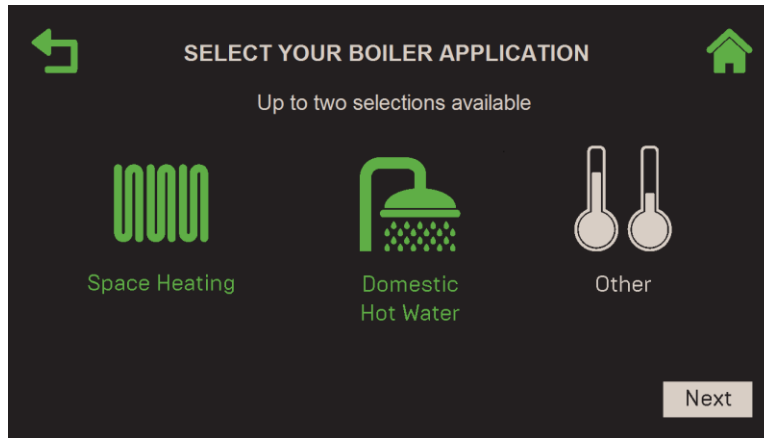


Figure 2-41: BST Manager: Select Boiler Applications Screen

2.3.2.1 EZ Setup: BST Manager – Single Application

If a **single** application was chosen above, complete the instructions in the **one** section below that matches that Application.

2.3.2.2 EZ Setup: BST Manager – Space Heating Application

Complete these instructions only if you chose **Space Heating** at the end of Section 2.3.2.



Figure 2-42: BST Manager – Space Heating: Select Your Boiler Application

1. The **SH Operating Mode** screen appears. Choose the **Operating Mode** for the Space Heating application, then press **Next** to continue:
 - Constant Setpoint
 - Remote Setpoint
 - Outdoor Air Temperature Reset (OATR)

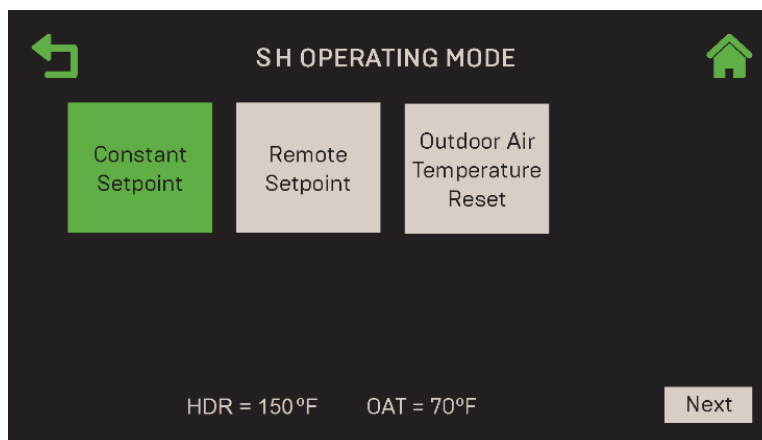


Figure 2-43: *BST Manager – Space Heating: SH Operating Mode Screen*

NOTE: If the outdoor air sensor is not connected, the display of the OAT (Outdoor Air Temperature) at the bottom of the screen is disabled.

NOTE: If the header sensor is not connected, the bottom of the screen displays **HDR = --- °F**. For the header sensor to function without previous setup, the default for **Outdoor Air Temp Sens** parameter must set to **Direct** (see [Section 6.3.1: Cascade Configuration](#)).

2. If you chose **Constant Setpoint** in step 1, specify the **SH Setpoint**. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#) for instructions.

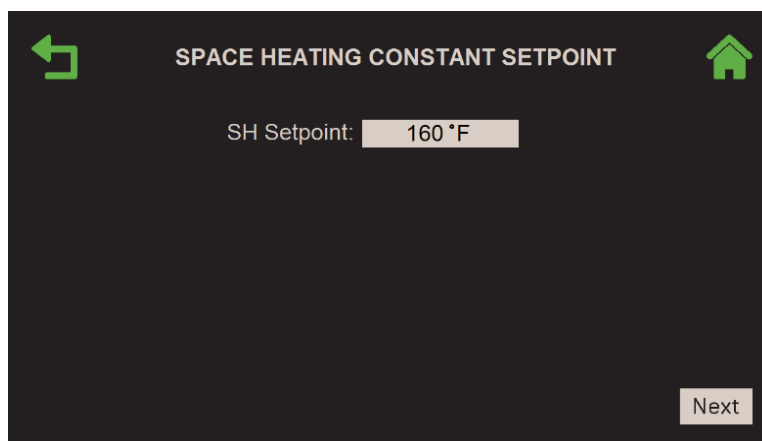


Figure 2-44: *BST Manager – Space Heating: Constant Setpoint Screen*

3. If you chose **Remote Setpoint** in step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

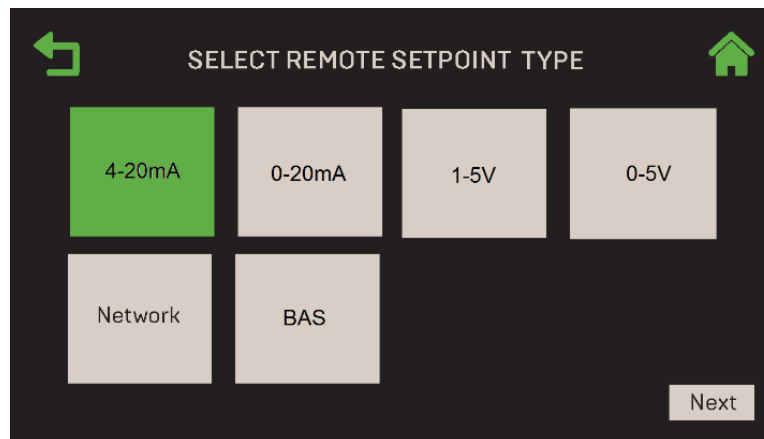


Figure 2-45: BST Manager – Space Heating: Select Remote Setpoint Screen

- A. If you chose **4-20mA**, **0-20mA**, **1-5V**, or **0-5V**, the **SH Analog Input** screen appears.
- Enter the upper and lower limits of the SH setpoint in the **BST SH Setpt Low Limit** and **BST SH Setpt High Limit** fields.
 - Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4: Completing the Installation](#) for instructions.

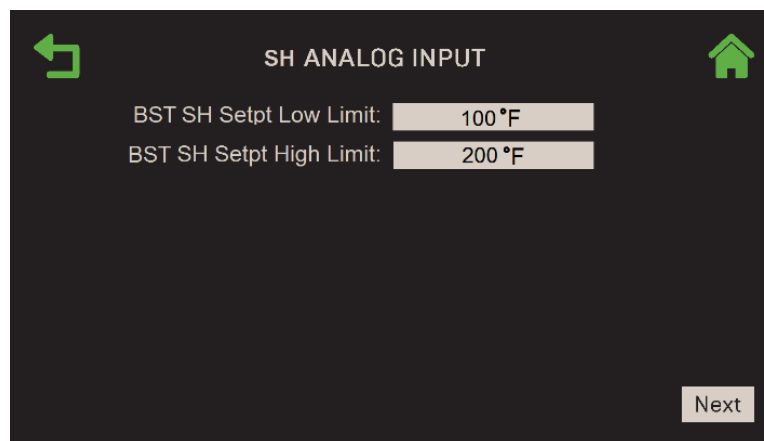


Figure 2-46: BST Manager – Space Heating: SH Analog Input Screen

- B. If you chose either **Network** or **BAS**, the **Select BAS Mode** screen appears; skip to [Section 2.4: Completing the Installation](#) for instructions.

4. If you chose **Outdoor Air Temperature Reset** in Step 1, the **Select Outdoor Reset Mode** screen appears. Choose the Outdoor Reset Mode and then press **Next** to continue.

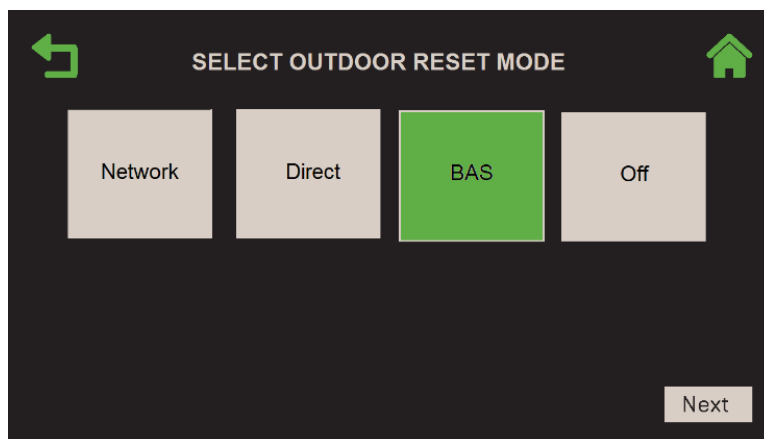


Figure 2-47: BST Manager – Space Heating: Select Outdoor Reset Mode

- A. If you chose Network, Direct or BAS, the Space Heating Outdoor Reset screen appears.
- Fill in the four **OAR** temperature and setpoint settings, and the **Warm Weather Shutdown** temperature; they will be used to create the associated OATR curve, which the controller will use to compute the setpoint based on outside temperature.
 - Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).

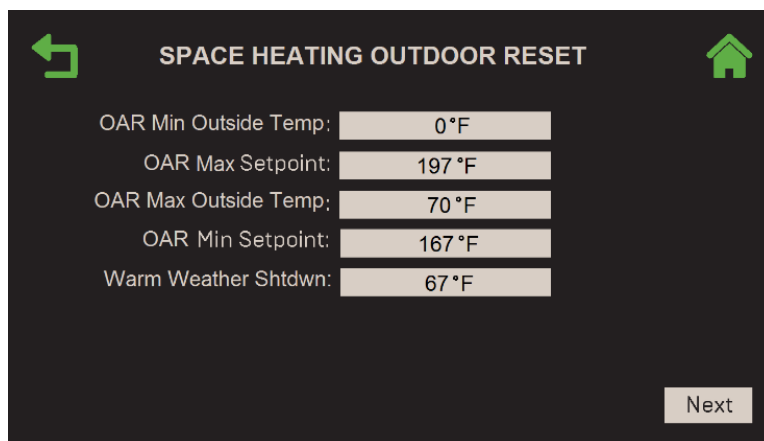


Figure 2-48: BST Manager – Space Heating: Space Heating Outdoor Reset

- B. If you chose **Off**, the **Select BAS Mode** screen appears. Skip to [Section 2.4](#).

2.3.2.3 EZ Setup: BST Manager – Domestic Hot Water Application

Complete these instructions only if you chose **Domestic Hot Water** (DHW) at the end of Section 2.3.2.

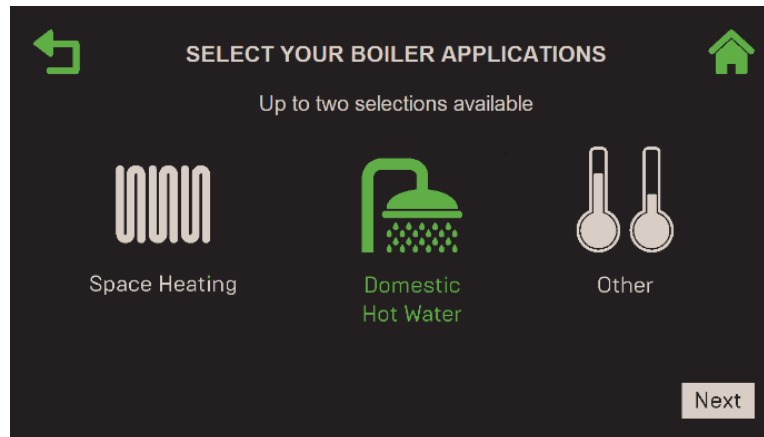


Figure 2-49: BST Manager – DHW: Select Your Boiler Application

1. The **DHW Operating Mode** screen appears. Choose the **Operating Mode** for the DHW application, either **Constant Setpoint** or **Remote Setpoint**, then press **Next** to continue.

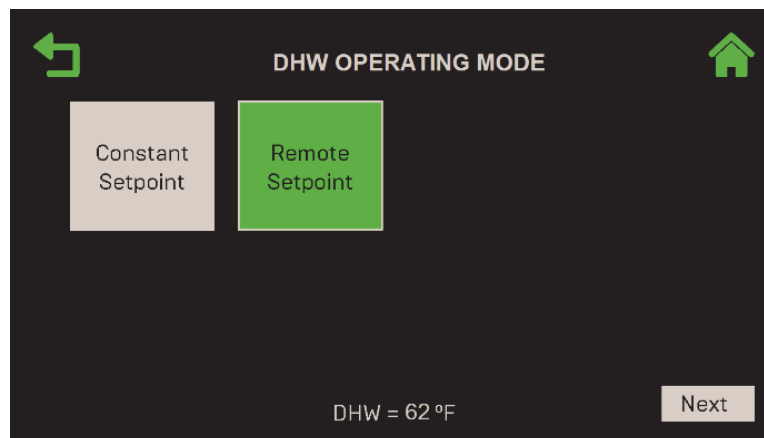


Figure 2-50: BST Manager – DHW: DHW Operating Mode Screen

2. If you chose **Constant Setpoint**, specify the **DHW Constant Setpoint**. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).

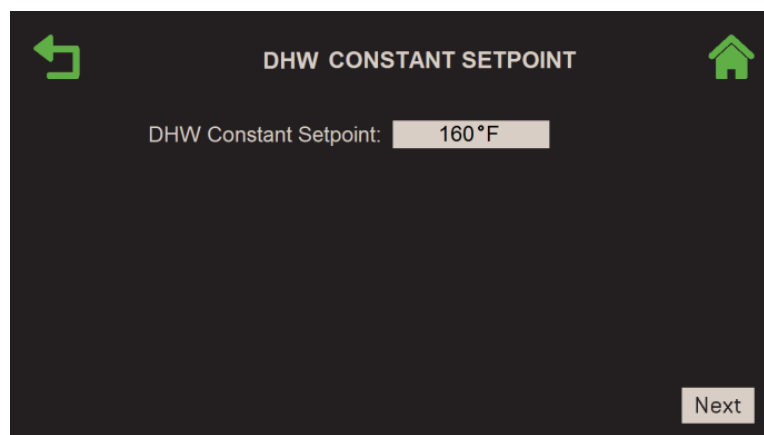


Figure 2-51: BST Manager – DHW Constant Setpoint Screen

3. If you chose **Remote Setpoint** in step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

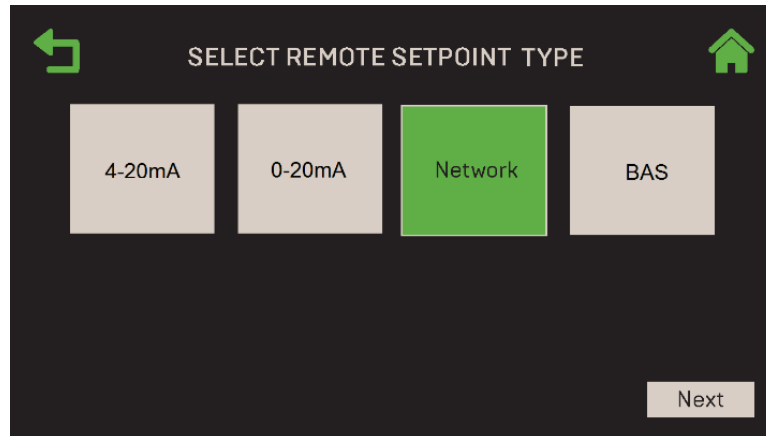


Figure 2-52: BST Manager – DHW: Select Remote Setpoint Screen

4-20mA, or **0-20mA**: the **DHW Analog Input** screen appears. Enter parameters below:

- Press **DHW Rmt Setpt Source** and choose the source of the remote setpoint: **Spare Analog in 1**, **Spare Analog in 2** or **Spare Analog in 3**.
- Enter the upper and lower limits of the DHW setpoint in the **DHW Setpt Low Limit** and **DHW Setpt Hi Limit** fields.
- Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).

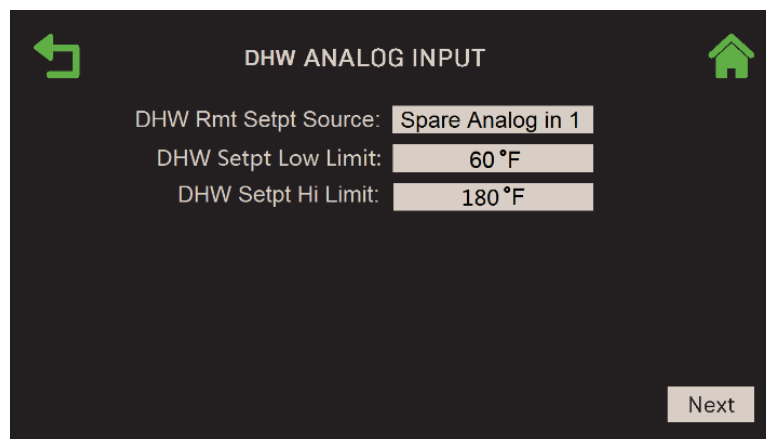


Figure 2-53: BST Manager – DHW: DHW Analog Input Screen

4. If you chose **Network** or **BAS**, the **Select BAS Mode** screen appears. Skip to [Section 2.4](#).

2.3.2.4 EZ Setup: BST Manager – Other Application

Complete these instructions only if you chose **Other** at the end of Section 2.3.2.



Figure 2-54: BST Manager – Other: Select Your Boiler Application

1. The **Other Operating Mode** screen appears. Choose the operating mode for the “other” application, either **Constant Setpoint** or **Remote Setpoint**, then press **Next** to continue.

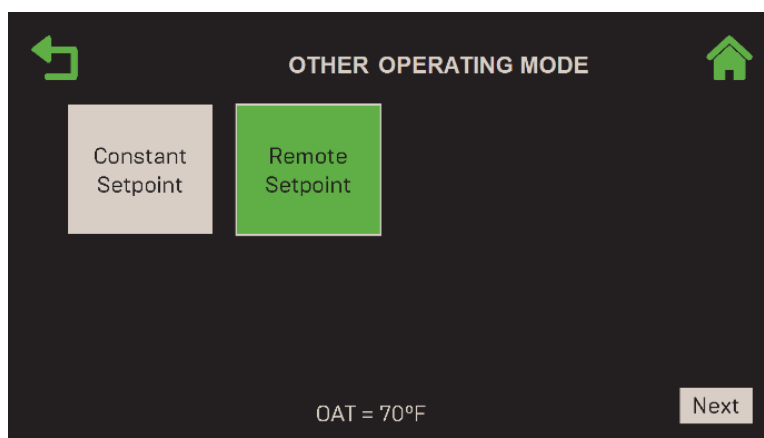


Figure 2-55: BST Manager – Other: Other Operating Mode Screen

2. If you chose **Constant Setpoint**, specify the **Other Setpoint**. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).



Figure 2-56: BST Manager – Other: Other Heating Constant Setpoint Screen

3. If you chose **Remote Setpoint** in step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

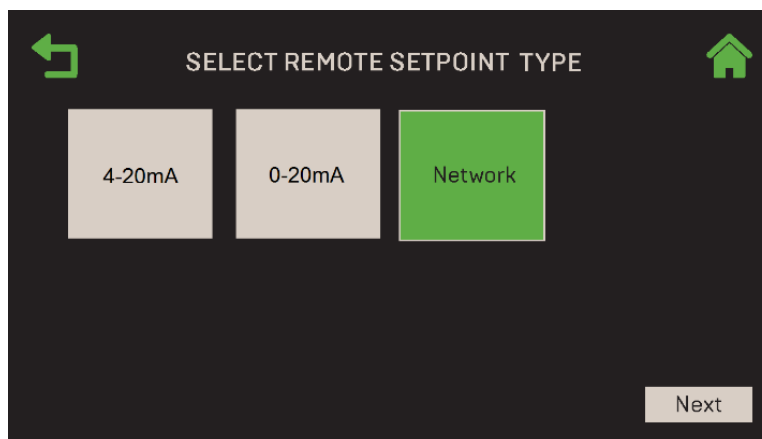


Figure 2-57: BST Manager – Other: Select Remote Setpoint Type Screen

If you chose either **4-20mA** or **0-20mA**, the **Other Analog Input** screen appears.

- Press **Other Rmt Setpt Source** and choose the source of the remote setpoint: Spare Analog in 1, Spare Analog in 2 or Spare Analog in 3.
- Enter the upper and lower limits of the “other” setpoint in the **BST Other Setpt Lo Limit** and **BST Other Setpt Hi Limit** fields.
- Press **Next** to go to the **Select BAS Mode** screen; skip to Section 2.4.

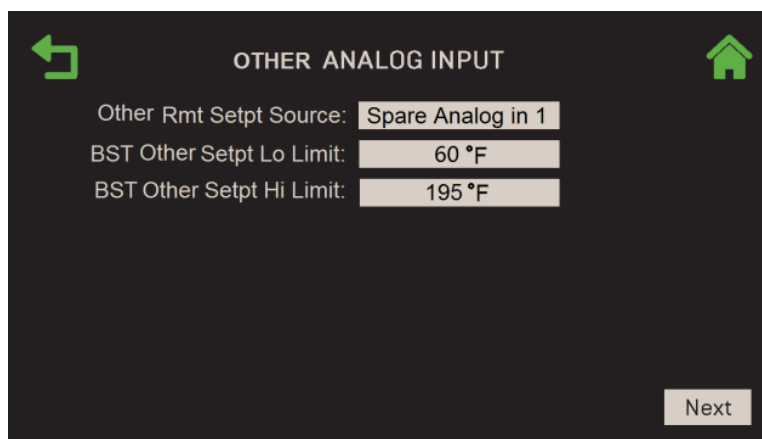


Figure 2-58: BST Manager – Other: Other Analog Input Screen

If you chose **Network**, the **Select BAS Mode** screen appears. Skip to [Section 2.4](#).

2.3.2.5 EZ Setup: BST Manager – Two Applications

Complete the instructions in **one** of the three Sections below on the BST Manager if the unit was configured to run **two** applications. If it will run a single application, see [Section 2.3.2.1](#).

Complete the instructions below only if you chose **both** Space Heating and DHW in Section 2.3.2.

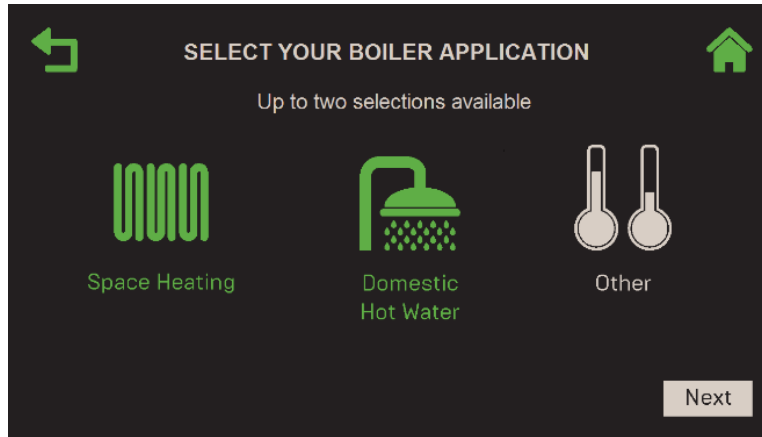


Figure 2-59: BST Manager – SH & DHW: Select Your Boiler Application

- When both **Domestic Hot Water** and **Space Heating** applications are chosen, Domestic Hot Water priority mode is automatically activated and the **DHW Priority** screen appears (a green border appears on the previous choice, if there was one). Set **DHW Priority Mode** to one of the following then press **Next** to continue. (your choice will affect which options appear in Step 10.)

- 1 Swing Valve
- 2 Swing Valves
- Setpoint Boost

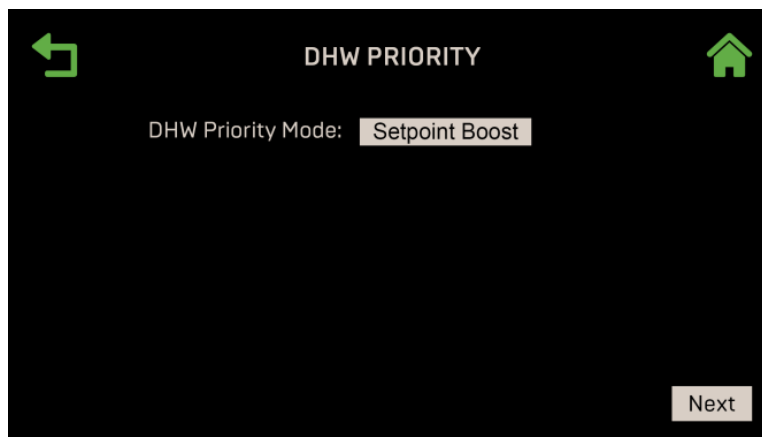


Figure 2-60: BST Manager – SH & DHW: DHW Priority Screen

- The **SH Operating Mode** screen appears. Choose the desired **Operating Mode** for the Space Heating application, then press **Next** to continue.

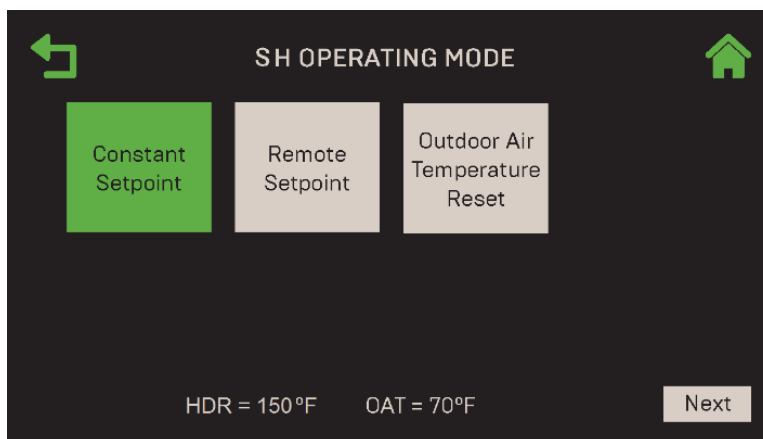


Figure 2-61: BST Manager – SH & DHW: SH Operating Mode Screen

NOTE: If the outdoor air sensor is not connected, the **OAT** (Outdoor Air Temperature) parameter is disabled.

NOTE: If the header sensor is not connected, the bottom of the screen will display **HDR = --- °F**. For the header sensor to function without previous setup, the default for HDR sensor must be sensor enabled and the source is **Direct**. For information on adjusting the defaults see [Section 6.3.1](#).

- If you chose **Constant Setpoint** in Step 2, specify the **SH Setpoint**. When you press **Next** the **DHW Operating Mode** screen appears (skip to Step 6, below).

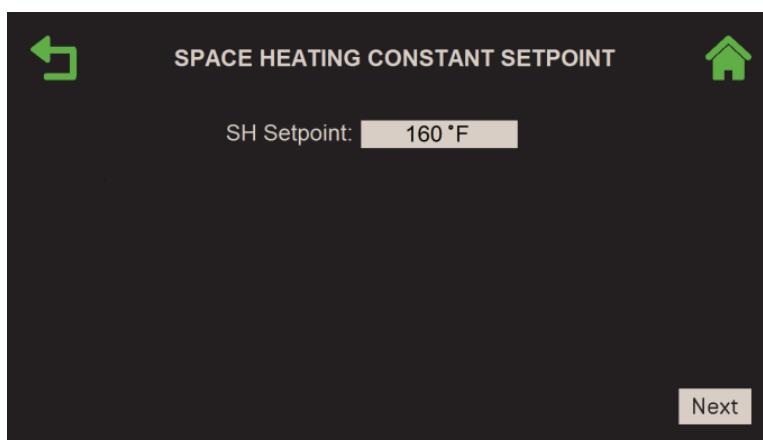


Figure 2-62: BST Manager – SH & DHW: Space Heating Constant Setpoint

4. If you chose **Remote Setpoint** in Step 2, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

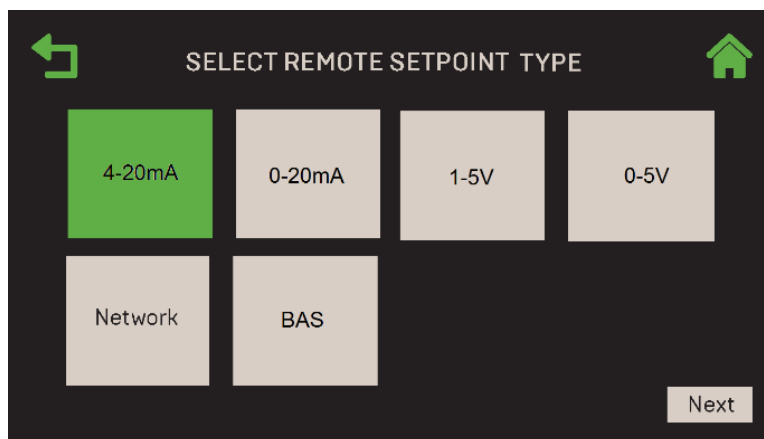


Figure 2-63: BST Manager – SH & DHW: Select Remote Setpoint Type

- A. If you chose **4-20mA**, **0-20mA**, **1-5V** or **0-5V**, the **SH Analog Input** screen appears. Configure the following parameters:
- Enter the upper and lower limits of the SH setpoint in the **BST SH Setpt Low Limit** and **BST SH Setpt High Limit** fields.
 - Press **Next**; the **DHW Operating Mode** screen appears (go to Step 6).

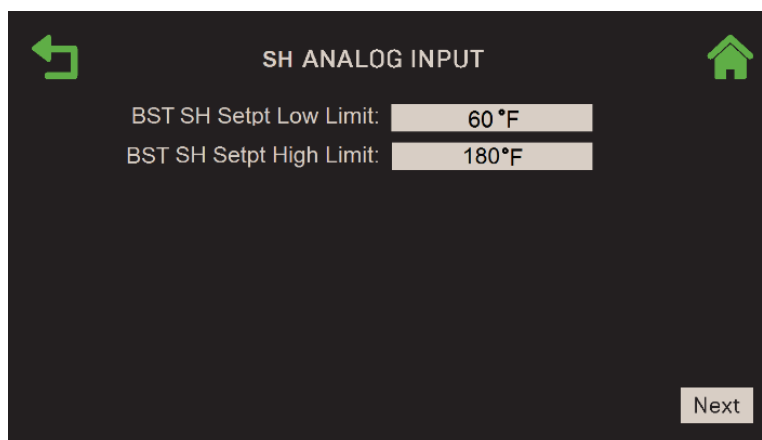


Figure 2-64: BST Manager – SH & DHW: SH Analog Input Screen

- B. If you chose **Network** or **BAS**, the **DHW Operating Mode** screen appears (skip to Step 6).

5. If you chose **Outdoor Air Temperature Reset (OATR)** in Step 2, the **Select Outdoor Reset Mode** screen appears. Choose the outdoor reset mode then press **Next**.

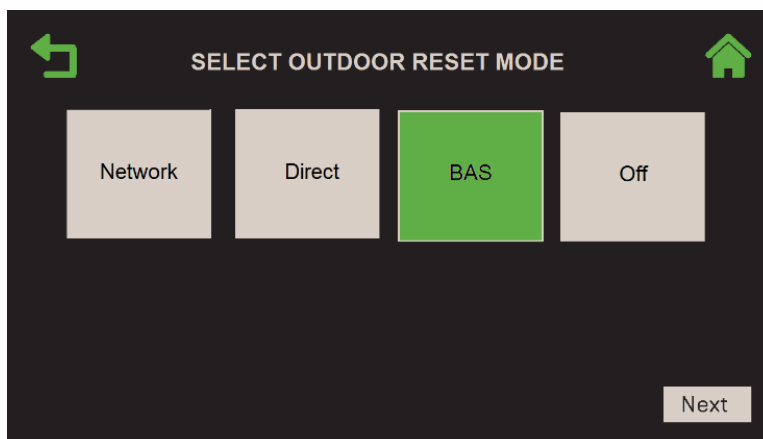


Figure 2-65: BST Manager – SH & DHW: Select Outdoor Reset Mode

- A. If you chose **Off**, the **DHW Operating Mode** screen appears (skip to Step 6).
- B. If you chose **Network**, **Direct** or **BAS**, the **Space Heating Outdoor Reset** screen appears. Configure following parameters:
 - **OAR Min** and **OAR Max**: These four parameters are used to create the associated OATR curve. Once the curve has been setup, the controller will compute the setpoint based on outside temperature.
 - **Warm Weather Shutdown**: Threshold outside temperature above which the unit shuts down.
 - Pressing **Next** takes you to the **DHW Operating Mode** screen (see Step 6).

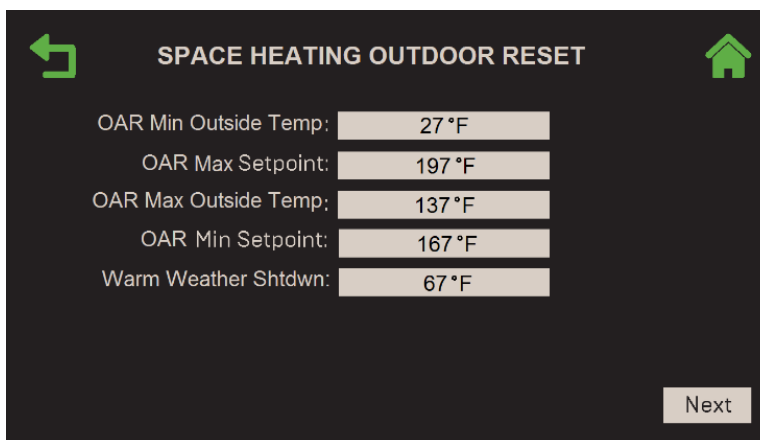


Figure 2-66: BST Manager – SH & DHW: Space Heating Outdoor Reset

1. Once all Space Heating parameters have been entered, the **DHW Operating Mode** screen appears. Choose either **Constant Setpoint** or **Remote Setpoint** then press **Next**.

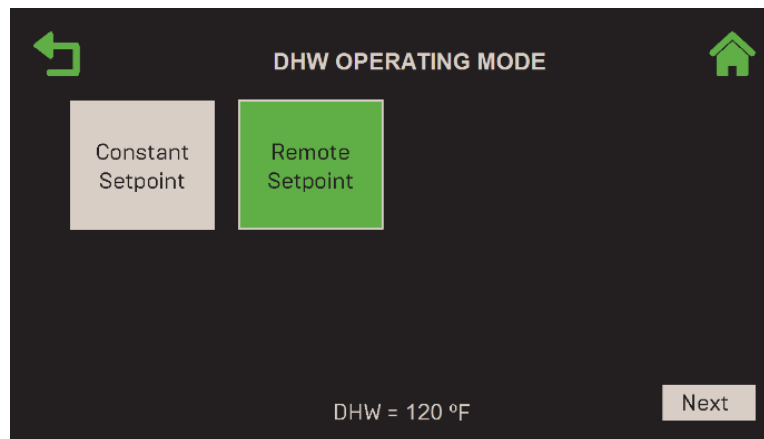


Figure 2-67: BST Manager – SH & DHW: DHW Operating Mode Screen

2. If you chose **Constant Setpoint** in Step 6, the **DHW Constant Setpoint** screen appears. Specify the setpoint, then press **Next** and skip to Step 9.

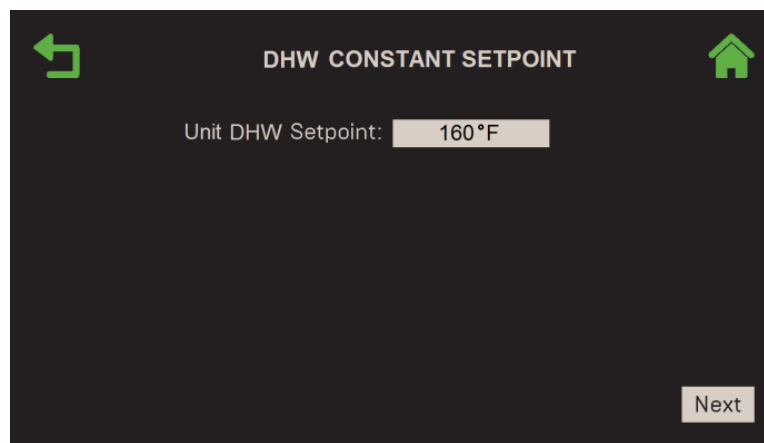


Figure 2-68: BST Manager – SH & DHW: DHW Constant Setpoint Screen

3. If you chose **Remote Setpoint** in step 6, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

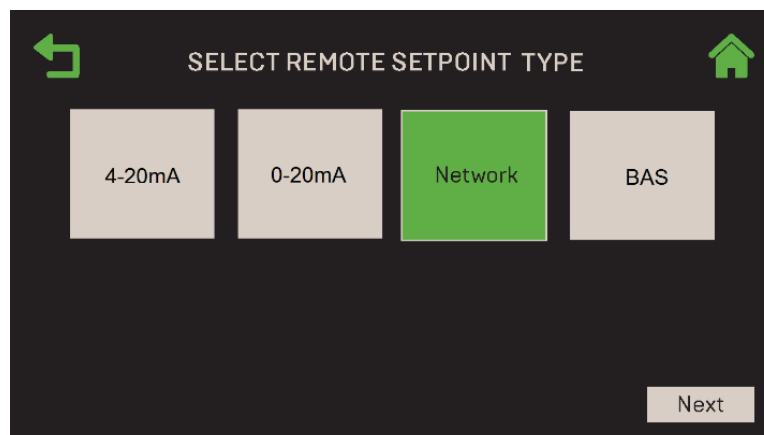


Figure 2-69: BST Manager – SH & DHW: Select Remote Setpoint Type

If you chose either **4-20mA** or **0-20mA**, the **DHW Analog Input** screen appears. Configure the following parameters:

- Choose the remote setpoint source in the **DHW Rmt Setpt Source** field (the previous choice, if there was one, has a green border): **Spare Analog in 1**, **Spare Analog in 2** or **Spare Analog in 3**
- Enter the upper and lower limits of the DHW setpoint in the **DHW Setpt Low Limit** and **DHW Setpt Hi Limit** fields.
- Press **Next** to continue (skip to Step 9).

DHW ANALOG INPUT

DHW Rmt Setpt Source: Spare Analog in 1

DHW Setpt Low Limit: 60 °F

DHW Setpt Hi Limit: 180 °F

Next

Figure 2-70: BST Manager – SH & DHW: DHW Analog Input Screen

If you chose **Network** or **BAS**, proceed to Step 9.

4. If **DHW Priority Mode** was set to **Setpoint Boost** in Step 1, the **Select BAS Mode** screen now appears; skip to [Section 2.4: Completing the Installation](#) for instructions. If **DHW Priority Mode** was set any of the Swing Valve options, continue to the next step.
5. If **DHW Priority Mode** was set to either **1 Swing Valve** or **2 Swing Valves** in Step 1, Domestic Hot Water Priority mode is automatically activated and the **DHW Priority Swing Settings** screen appears. Each unit in the cascade is represented by one square in the grid. Use this screen to specify which boiler(s) are dedicated to SH and DHW, and which are Swing boilers.

DHW PRIORITY SWING SETTINGS

Tap through units to designate role - consult piping diagram.

1 SH	2 SH	3 SH	4 SH	5 SWG	6	7	8
9	10	11	12	13	14	15	16

SH Side Swing Valve Unit Address: 0

Next

DHW PRIORITY SWING SETTINGS

Tap through units to designate role - consult piping diagram.

1 SH	2 SH	3 SH	4 SWG	5 DHW	6	7	8
9	10	11	12	13	14	15	16

SH Side Swing Valve Unit Address: 0

DHW Side Swing Valve Unit Address: 0

Next

DHW Priority Mode = **1 Swing Valve**

DHW Priority Mode = **2 Swing Valves**

Figure 2-71: BST Manager – SH & DHW: DHW Priority Swing Settings

- If **DHW Priority Mode = 1 Swing Valve** in Step 1 (see left image above), each unit has two possible values: **SH** and **SWG** (Swing). Pressing on a unit cycles it through those two options.
 - Designate one unit as a **SWG** (Swing) unit; it can perform as **SH** or **DHW**.
 - Set the **SH Side Swing Valve Unit Address** field to the address of the unit that controls the swing valve. (Range: 1 to 16)
 - If **DHW Priority Mode = 2 Swing Valves** in Step 1 (see right image above), each unit has three possible values: **SH**, **DHW** or **SWG** (Swing). Pressing on a unit cycles it through those three options. In addition, the **DHW Side Swing Valve Unit Address** field appears.
 - Designate one or more units as **DHW**, and one or two as **SWG** units.
 - Set the **SH Side Swing Valve Unit Address** field to the address of the unit that controls Swing Valve 1. (Range: 1 to 16)
 - Set the **DHW Side Swing Valve Unit Address** field to the address of the unit that controls Swing Valve 2. (Range: 1 to 16)
 - Press **Next** to go to the **Swing Boiler Settings** screen.
6. The **Swing Boiler Settings** screen appears. Configure the following parameters:

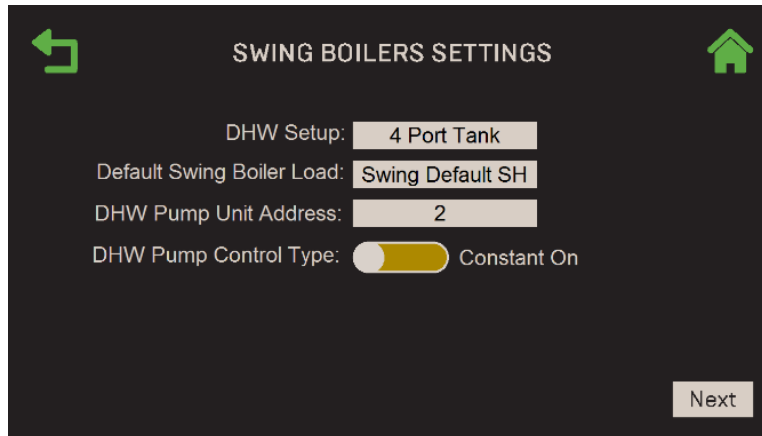


Figure 2-72: BST Manager – SH & DHW: EZ Setup Complete Screen

- **DHW Setup:** Choose 2 Port Tank, 4 Port Tank or Indirect Tank
 - **Default Swing Boiler Load:** Choose **Swing Default SH** or **Swing Default DHW**.
 - **DHW Pump Unit Address:** Enter the address of the unit (1 to 16) with the DHW Pump
 - **DHW Pump Control Type:** Choose either **Constant On** or **Controlled**.
7. Once all parameters are configured, the **Select BAS Mode** screen appears. Skip to [Section 2.4](#).

2.3.2.5.1 EZ Setup: BST Manager – DHW and Other Applications

Complete these instructions only if you chose ***both*** DHW and **Other** at the end of Section 2.3.2.

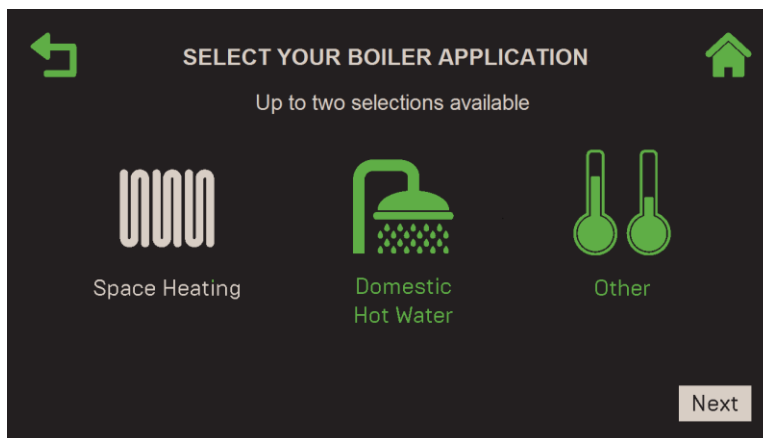


Figure 2-73: *BST Manager – DHW & Other: Select Your Boiler Application*

1. The DHW Operating Mode screen appears. Choose the DHW Operating Mode, either Constant Setpoint or Remote Setpoint. Press Next to continue.

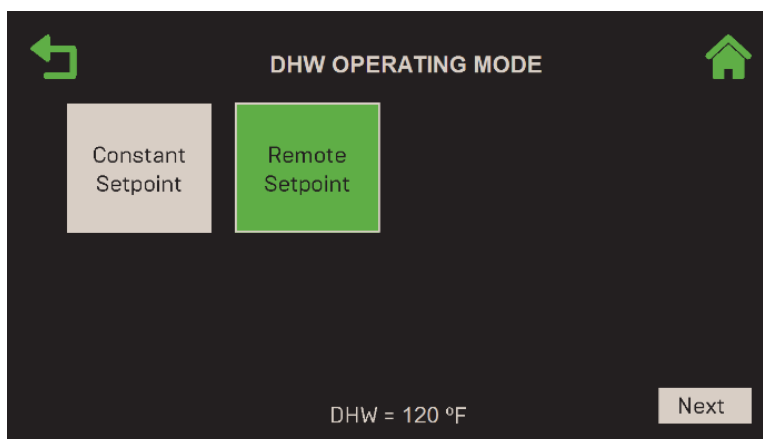


Figure 2-74: *BST Manager – DHW & Other: DHW Operating Mode Screen*

2. If you chose **Constant Setpoint** in Step 1 specify the **Setpoint** for the domestic hot water application. Press **Next**; the **Other Operating Mode** screen appears (skip to Step 4, below).

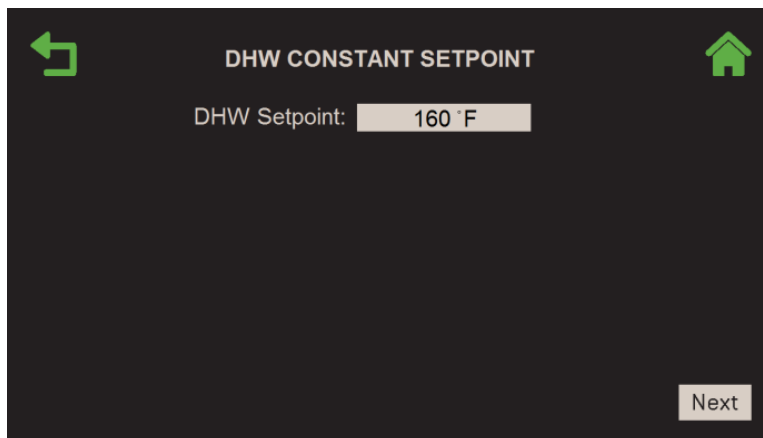


Figure 2-75: *BST Manager – DHW & Other: DHW Constant Setpoint Screen*

3. If you chose **Remote Setpoint** in step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

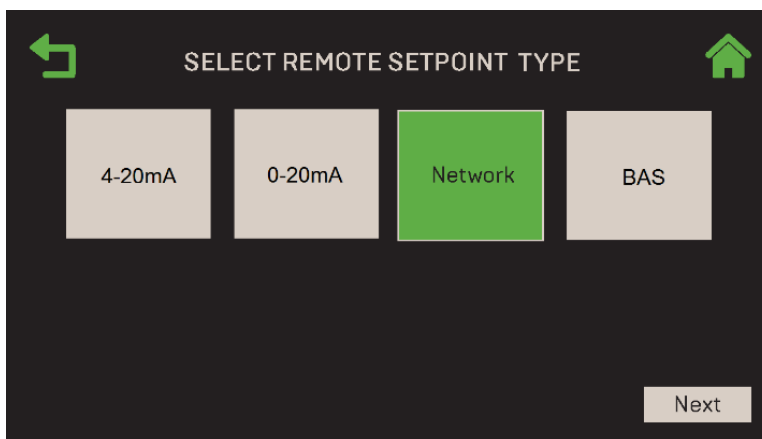


Figure 2-76: BST Manager – DHW & Other: Select Remote Setpoint Type

- A. If you chose either **4-20mA** or **0-20mA**, the **DHW Analog Input** screen appears. Configure the following parameters:
- Choose the remote setpoint source in the **DHW Rmt Setpt Source** field (the previous choice, if there was one, has a green border): **Spare Analog in 1**, **Spare Analog in 2** or **Spare Analog in 3**.
 - Enter the upper and lower limits of the DHW setpoint in the **DHW Setpt Low Limit** and **DHW Setpt Hi Limit** fields.
 - Pressing **Next** takes you to the **Other Operating Mode** screen (skip to Step 4).

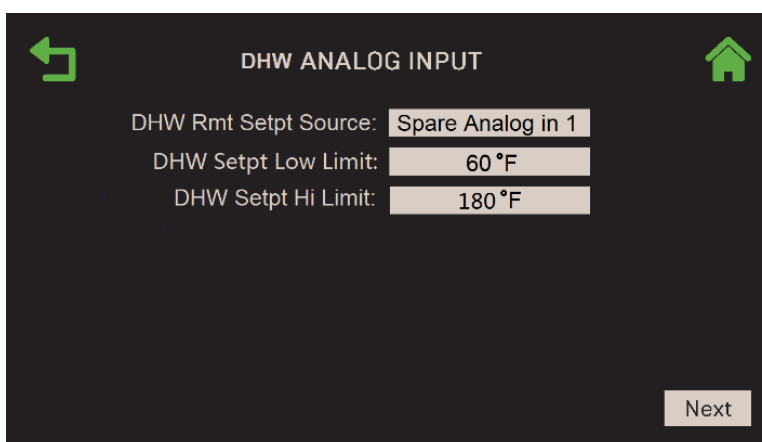


Figure 2-77: BST Manager – DHW & Other: DHW Analog Input Screen

4. If you chose **Network** or **BAS**, the **Other Operating Mode** screen appears. When all DHW parameters have been configured, the **Other Operating Mode** screen appears. Choose either **Constant Setpoint** or **Remote Setpoint**. Press **Next** to continue.

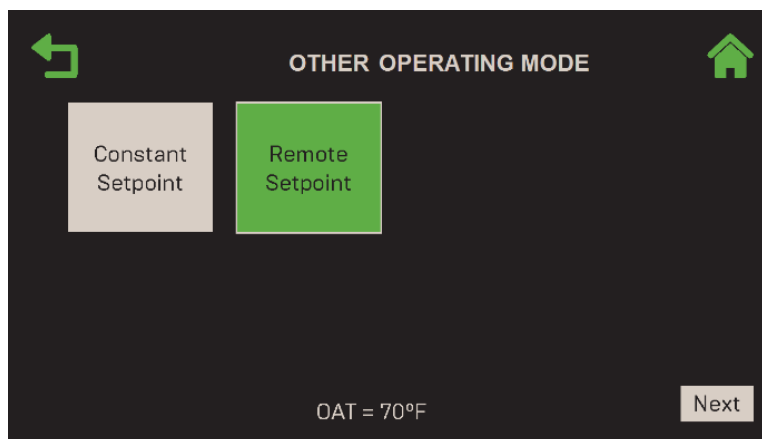


Figure 2-78: BST Manager – DHW & Other: Other Operating Mode Screen

5. If you chose **Constant Setpoint**, specify the setpoint for the “other” application. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).



Figure 2-79: BST Manager – DHW & Other: Other Heating Constant Setpoint

6. If you chose **Remote Setpoint** in step 4, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

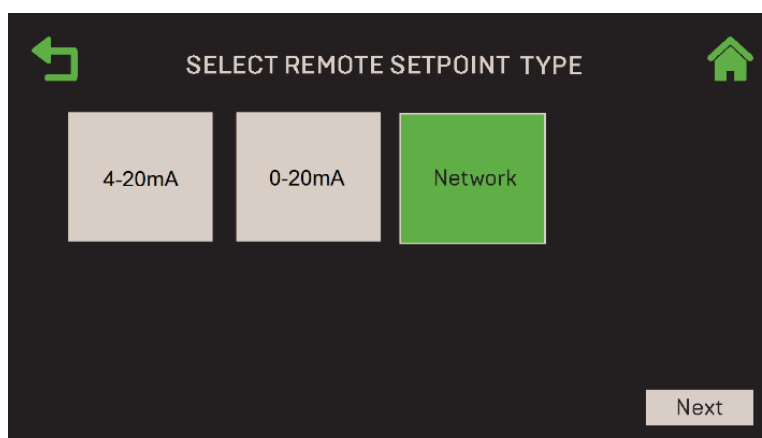


Figure 2-80: BST Manager – DHW & Other: Select Remote Setpoint Type

SECTION 2: EZ Setup (BENCHMARK ONLY)

If you chose either **4-20mA** or **0-20mA**, the **Other Analog Input** screen appears. Configure the following parameters. Press **Next** to go to **Select BAS Mode**; skip to [Section 2.4](#).

- Choose the remote setpoint source in the **Other Rmt Setpt Source** field: **Spare Analog in 1**, **Spare Analog in 2**, **Spare Analog in 3**.
- Enter the upper and lower limits of the “other” setpoint in the **BST Other Setpt Lo Limit** and **BST Other Setpt Hi Limit** fields.
- Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).

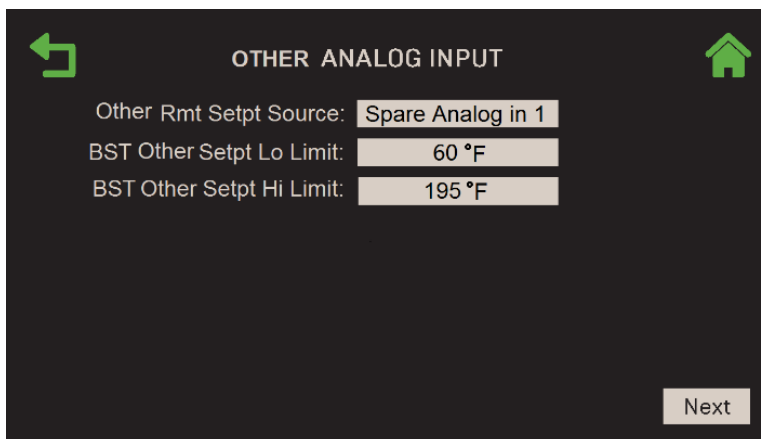


Figure 2-81: BST Manager – DHW & Other: Other Analog Input Screen

If you chose **Network**, the **Select BAS Mode** screen. Skip to [Section 2.4](#).

2.3.2.5.2 EZ Setup: BST Manager – Space Heating and Other Applications

Complete these instructions only if you chose **both** **Space Heating** and **Other** in Section 2.3.2.



Figure 2-82: BST Manager – SH & Other: Select Your Boiler Application

1. The **SH Operating Mode** screen appears. Choose desired operating mode and press **Next**.

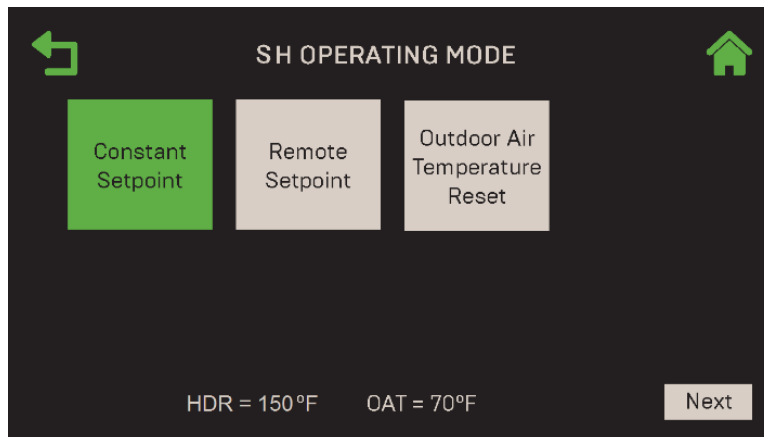


Figure 2-83: BST Manager – SH & Other: SH Operating Mode

- If the outdoor air sensor is not connected, Outdoor Air Temperature parameter is disabled.
 - If the header sensor is not connected, the the screen displays **HDR = — °F**. For the header sensor to function without previous setup, the default for HDR sensor must be sensor enabled and the source is **Direct**. see [Section 6.3.1 Cascade Configuration](#).
2. If you chose **Constant Setpoint** in step 1, specify the **SH Setpoint**. When you press **Next** the **Other Operating Mode** screen appears (skip to Step 5).

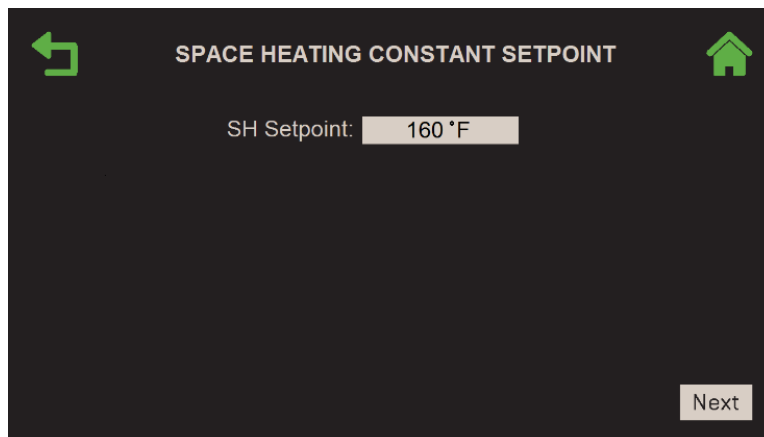


Figure 2-84: BST Manager – SH & Other: Space Heating Constant Setpoint

3. If you chose **Remote Setpoint** in step 1, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

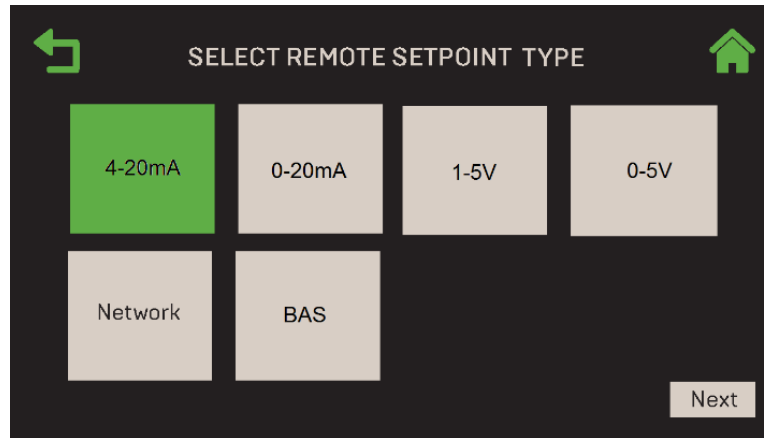


Figure 2-85: BST Manager – SH & Other: Select Remote Setpoint Type

If you chose **4-20mA**, **0-20mA**, **1-5V**, or **0-5V**, the **SH Analog Input** screen appears. Enter the upper and lower limits of the SH setpoint in the **BST SH Setpt Low Limit** and **BST SH Setpt High Limit** fields. Press **Next**; the **Other Operating Mode** screen appears (skip to Step 5).

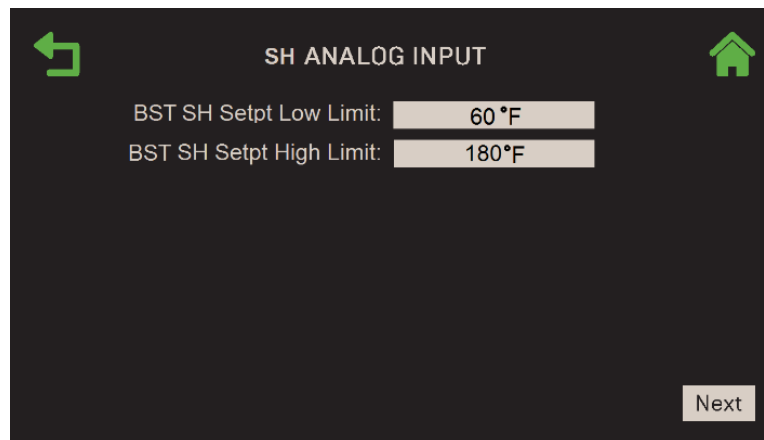


Figure 2-86: BST Manager – SH & Other: SH Analog Input Screen

If you chose either **Network** or **BAS**, the **Other Operating Mode** screen appears (skip to Step 5).

4. If you chose **Outdoor Air Temperature Reset (OATR)** in Step 1, the Select Outdoor Reset Mode screen appears. Choose the **Outdoor Reset Mode** then press **Next**.

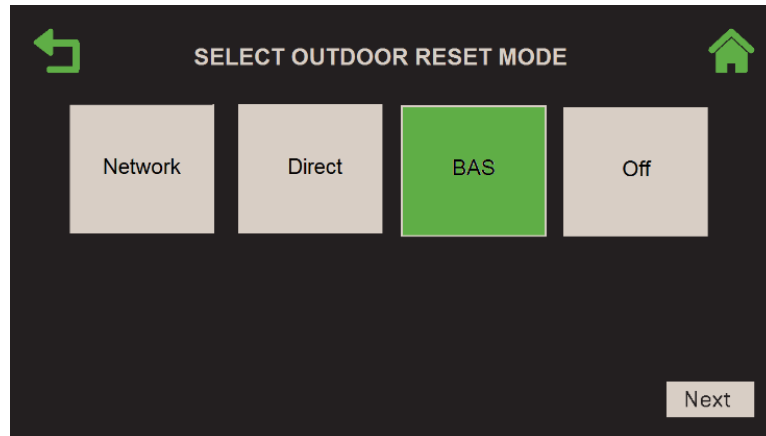


Figure 2-87: BST Manager – SH & Other: Select Outdoor Reset Mode

- A. If you chose **Off**, the **Other Operating Mode** screen appears (skip to Step 5).
- B. If you chose **Network**, **Direct** or **BAS**, configure following parameters:
- **OAR Min** and **OAR Max**: These parameters create the associated OATR curve. Once the curve has been set up, the controller will compute the setpoint based on outside temperature.
 - **Warm Weather Shutdown**: Threshold outside temperature above which the unit shuts down.
 - Pressing **Next** takes you to the **Other Operating Mode** screen (see Step 5).

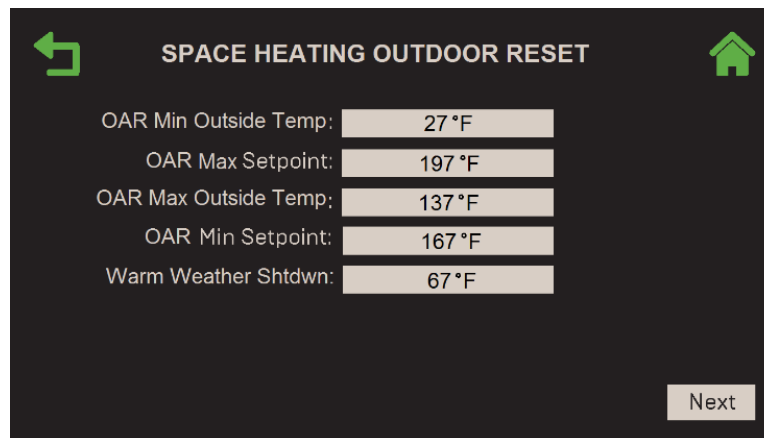


Figure 2-88: BST Manager – SH & Other: Space Heating Outdoor Reset

5. Once all Space Heating parameters are configured, the **Other Operating Mode** screen appears. Choose either **Constant Setpoint** or **Remote Setpoint**. Press **Next** to continue.

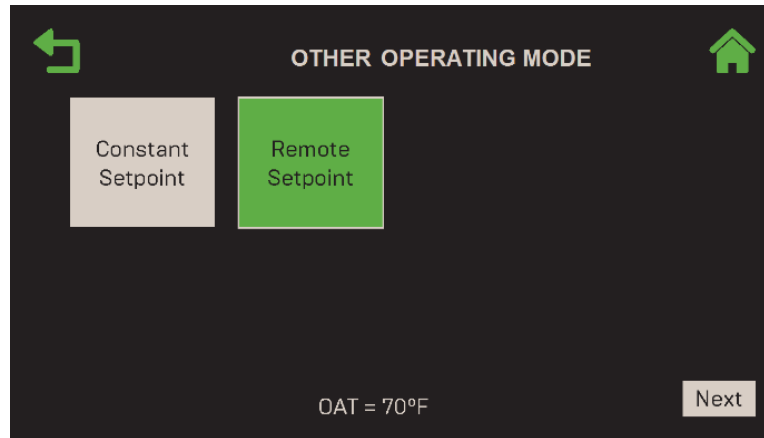


Figure 2-89: BST Manager – SH & Other: Other Operating Mode Screen

6. If you chose **Constant Setpoint** in step 5, specify the setpoint for the “other” application in **Other Setpoint**. Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4.](#)



Figure 2-90: BST Manager – SH & Other: Other Heating Constant Setpoint

7. If you chose **Remote Setpoint** in step 5, the **Select Remote Setpoint Type** screen appears. Choose how the unit will access the setpoint, then press **Next**.

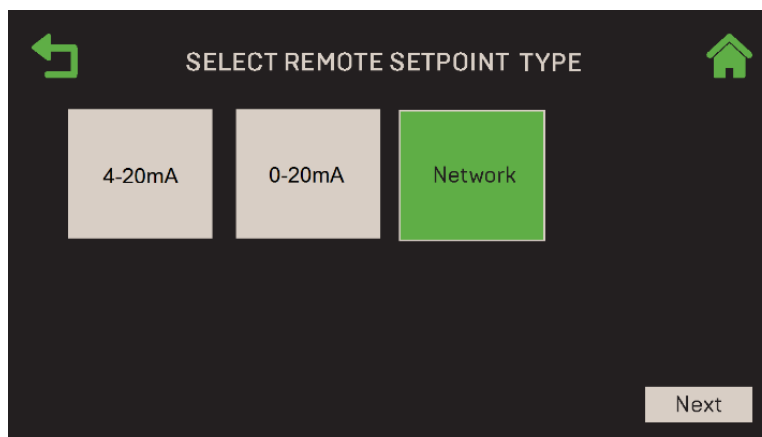


Figure 2-91: BST Manager – SH & Other: Select Remote Setpoint Type

- A. If you chose either **4-20mA** or **0-20mA**, the **Other Analog Input** screen appears. Fill in the following parameters:
- Choose the remote setpoint source in the **Other Rmt Setpt Source** field (the previous choice, if there was one, has a green border): **Spare Analog In 1**, **Spare Analog In 2** or **Spare Analog In 3**.
 - Enter the upper and lower limits of the “other” setpoint in the **BST Other Setpt Lo Limit** and **BST Other Setpt Hi Limit** fields.
 - Pressing **Next** takes you to the **Select BAS Mode** screen; skip to [Section 2.4](#).

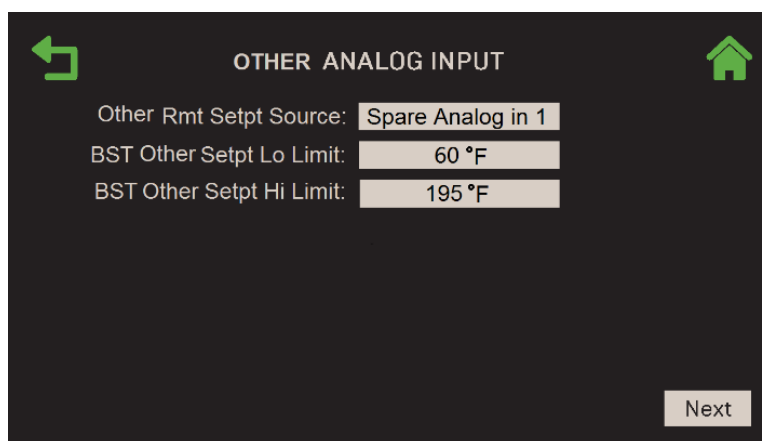


Figure 2-92: BST Manager – SH & Other: Other Analog Input Screen

- B. If you chose **Network**, the **Select BAS Mode** screen appears. Proceed to [Section 2.4](#).

2.4 Completing the Installation

Complete the instructions below to complete the installation. If the unit will communicate with a BAS, you will select and configure the communication protocol as well.

1. If the **EZ Setup Complete** screen appears, skip to Step 7.
2. If the unit will communicate with the site's BAS (Building Automation System), the **Select BAS Mode** screen appears. Press the communication protocol it will use, or else press **Off**. Press **Next** to continue.

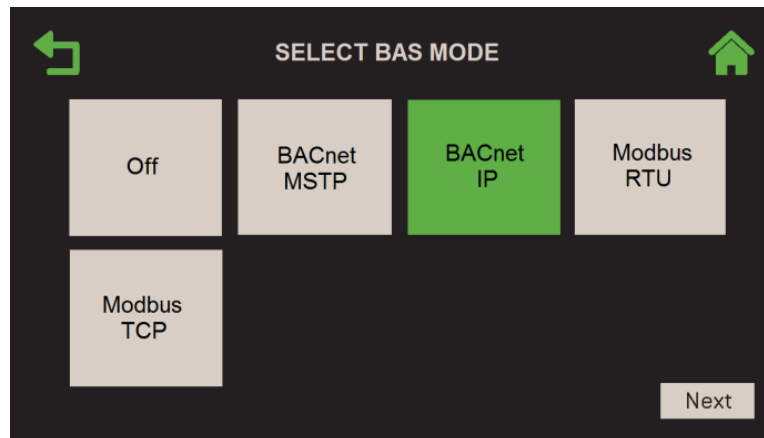


Figure 2-93: Select BAS Mode Screen

3. If you chose **BACnet MSTP**, **BAS BACnet MSTP Settings** appears. Fill in the parameters for communications with BAS via BACnet MSTP. Press **Next** to complete setup (skip to Step 7).

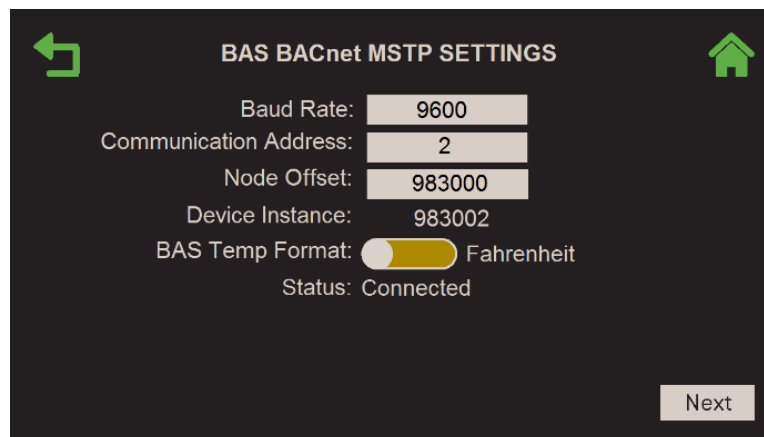
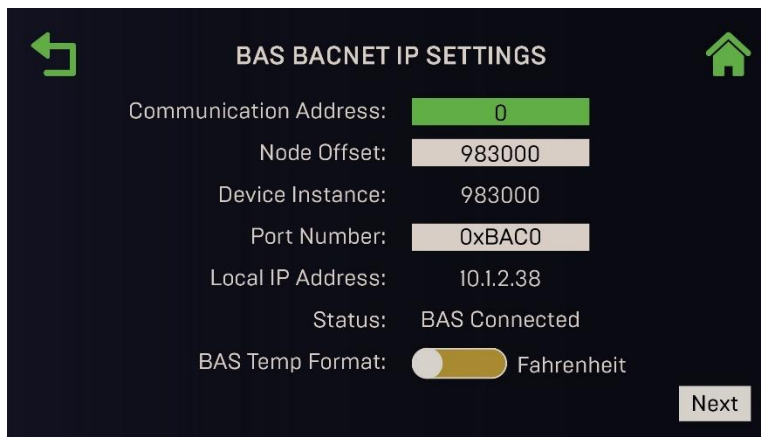


Figure 2-94: BAS BACnet MSTP Settings Screen

4. If you chose **BACnet IP**, the **BAS BACnet IP Settings** screen appears. Fill in the parameters to establish communications with BAS via BACnet IP. Press **Next** to complete setup (skip to Step 7).

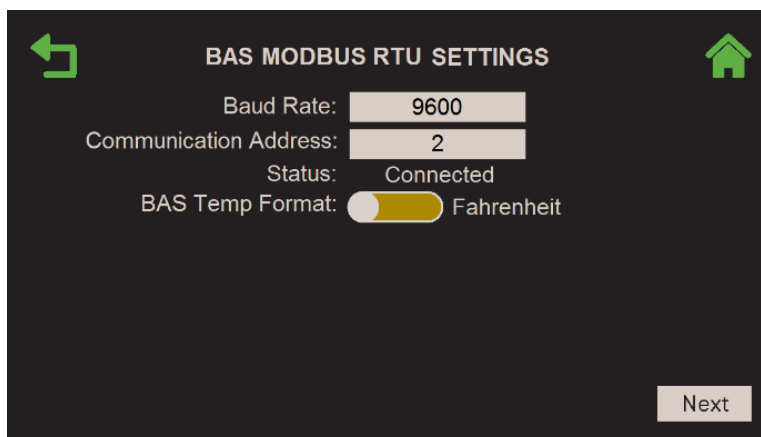
The screenshot shows the 'BAS BACNET IP SETTINGS' screen. It has a dark blue background with white text. At the top, there is a green back arrow on the left and a green home icon on the right. The settings are as follows: 'Communication Address' is 0 (highlighted in green), 'Node Offset' is 983000, 'Device Instance' is 983000, 'Port Number' is 0xBAC0, 'Local IP Address' is 10.1.2.38, 'Status' is 'BAS Connected', and 'BAS Temp Format' is a toggle switch set to 'Fahrenheit'. A 'Next' button is in the bottom right corner.

Communication Address:	0
Node Offset:	983000
Device Instance:	983000
Port Number:	0xBAC0
Local IP Address:	10.1.2.38
Status:	BAS Connected
BAS Temp Format:	<input checked="" type="checkbox"/> Fahrenheit

Next

Figure 2-95: BAS BACnet IP Settings Screen

5. If you chose **Modbus RTU**, the **BAS Modbus RTU Settings** screen appears. Fill in the parameters for communications with BAS via Modbus RTU. Press **Next** to complete the setup (skip to Step 7).

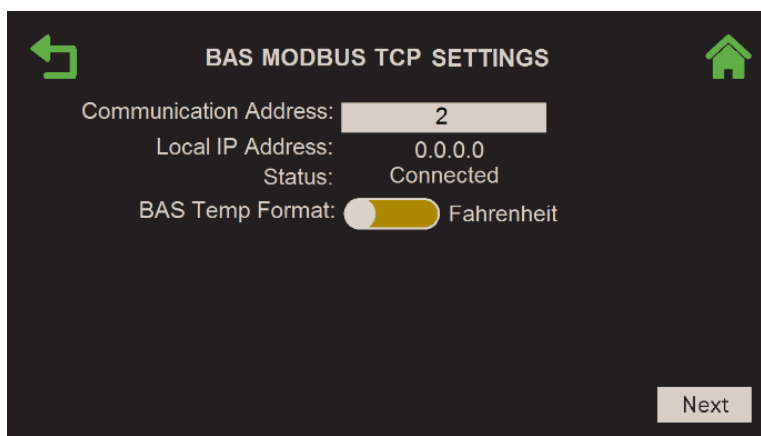
The screenshot shows the 'BAS MODBUS RTU SETTINGS' screen. It has a dark blue background with white text. At the top, there is a green back arrow on the left and a green home icon on the right. The settings are as follows: 'Baud Rate' is 9600, 'Communication Address' is 2, 'Status' is 'Connected', and 'BAS Temp Format' is a toggle switch set to 'Fahrenheit'. A 'Next' button is in the bottom right corner.

Baud Rate:	9600
Communication Address:	2
Status:	Connected
BAS Temp Format:	<input checked="" type="checkbox"/> Fahrenheit

Next

Figure 2-96: BAS Modbus RTU Settings Screen

6. If you chose **Modbus TCP**, the **BAS Modbus TCP Settings** screen appears. Fill in the parameters to establish communications with BAS via Modbus TCP. Pressing **Next** completes the setup.

The screenshot shows the 'BAS MODBUS TCP SETTINGS' screen. It has a dark blue background with white text. At the top, there is a green back arrow on the left and a green home icon on the right. The settings are as follows: 'Communication Address' is 2, 'Local IP Address' is 0.0.0.0, 'Status' is 'Connected', and 'BAS Temp Format' is a toggle switch set to 'Fahrenheit'. A 'Next' button is in the bottom right corner.

Communication Address:	2
Local IP Address:	0.0.0.0
Status:	Connected
BAS Temp Format:	<input checked="" type="checkbox"/> Fahrenheit

Next

Figure 2-97: BAS Modbus TCP Settings Screen

7. Once the setup has been configured, the **EZ Setup Complete** screen displays a summary of the completed setup as verification that the setup is complete and saved.

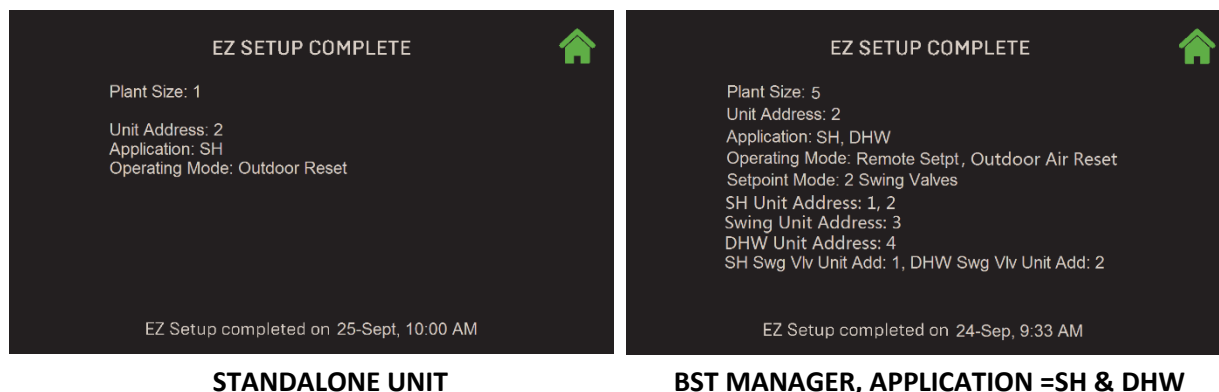


Figure 2-98: Example EZ Setup Complete Screens

2.5 EZ Setup – Restoring a Previous Setup

Complete the instructions below if a setup has already been run on the current unit, or on a different unit and saved to a USB device, and you wish to load that setup on the current unit.

For instructions on saving a setup, see [Section 6.1.3: Save and Transfer Settings](#).

⚠ WARNING:

If you are transferring to/from Client or Manager units in a BST Cascade, note the following:

- Client and Manager units use separate setup files; Client units require a Client setup file, and Manager units require a Manager setup file.
- If loading the setup from a USB device, the device can have only **Client or Manager** setup files but **cannot have both on the same device**.
- If loading the setup from a USB device, the device can have multiple Client files or multiple Manager (but not both, as started above). The system will automatically load the file with the latest date for the particular model (you will not have a choice).

1. Go to: **Main Menu → EZ Setup** and start any EZ Setup configuration routine described above.
2. After the first few steps, when the **Load Settings** screen appears, press **Yes**.

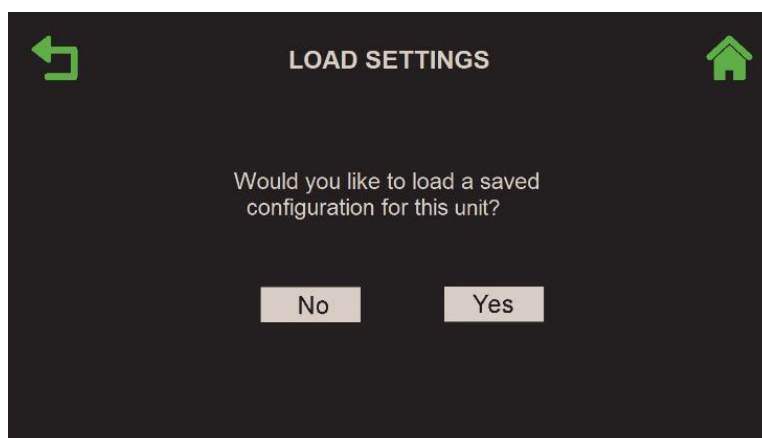


Figure 2-99: EZ Setup: Load Settings Screen

3. The **Settings File Select** screen appears. Choose the location of the setup file:
- If the settings are on a **USB** device, choose **USB**.
 - If the settings are in the Controller's on-board memory, choose **Onboard**.
 - If you want to restore the original factory settings, choose **Factory Settings**.

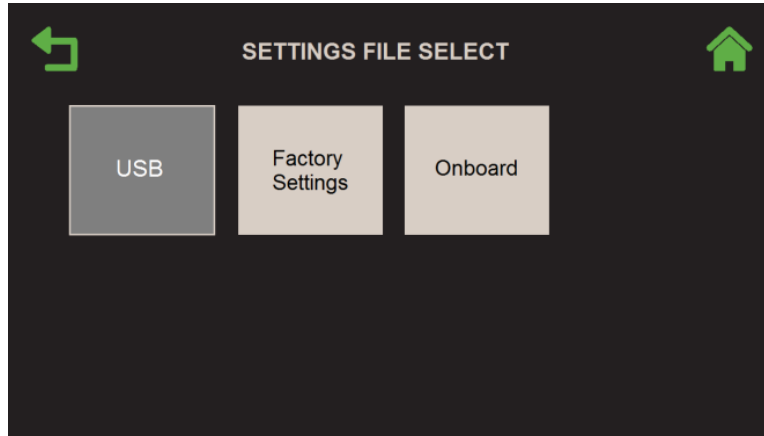


Figure 2-100: EZ Setup: Settings Source Select Screen

4. **Overwrite Calibration** appears. Press **Yes** or **No** to proceed. Pressing **Yes** will overwrite the unit's existing combustion calibration setting, while pressing **No** will retain those settings.

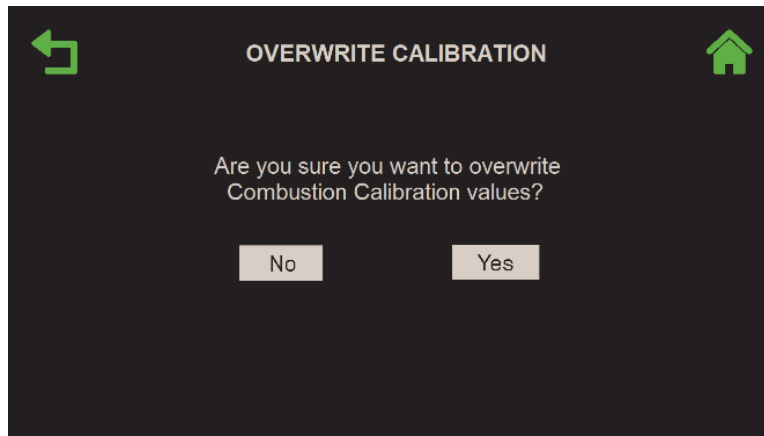


Figure 2-101: EZ Setup: Settings Upload Complete Screen

5. If the settings loaded successfully, **Restore Settings Complete** appears. The unit automatically reboots after ~ 5 seconds. If the upload failed, **Restore Settings Complete** screen displays the error that occurred, and gives you the option to **Retry** the upload.



Figure 2-102: EZ Setup: Settings Upload Complete Screen – Success

SECTION 3: CALIBRATION

The Calibration screen provides a number of tools to calibrate various of the unit's components. It is accessed by pressing **Calibration** on the **Main Menu**.

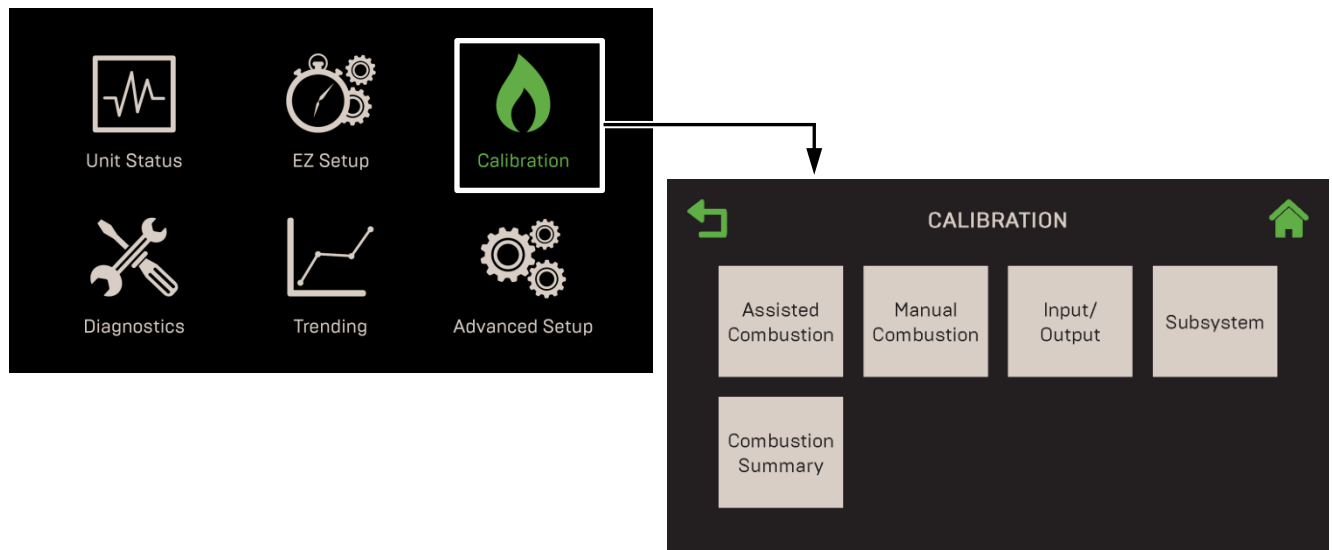


Figure 3.0: Calibration Screen

This Section includes the following topics:

[3.1: Assisted Combustion](#)

[3.2: Manual Combustion](#)

[3.3: Input/Output:](#)

[3.3.1: Temperature Sensors](#)

[3.3.2: O2 Sensor](#)

[3.3.3: Analog Inputs](#)

[3.3.4: Analog Outputs](#)

[3.4: Subsystems](#)

[3.4.1: Air Fuel Valve](#)

[3.4.2: Spark Monitor](#)

[3.5: Combustion Summary](#)

⚠ WARNING:

Before starting the instructions in this section for the first time, you must ensure that the unit has the latest Edge Controller firmware. See [Section 6.2.7](#) to obtain and install the latest firmware.

3.1 Assisted Combustion Calibration (Benchmark Only)

NOTE: Assisted Combustion Calibration is not available on CFR boilers.

Complete the instructions below to perform **Assisted Combustion Calibration** on the current unit. If you press the **Back** or **Home** buttons at any time before completion, the calibration operation is disabled and normal operation resumes. Assisted Combustion Calibration uses the same calibration steps as Manual Combustion Calibration.

1. Ensure the Enable/Disable switch on the unit's front face is in the **Enable** position.
2. Go to: **Main Menu → Calibration → Assisted Combustion**.
3. If the O₂ sensor is not connected, a message appears saying that combustion calibration cannot be performed; this function must abort. In that case, connect the O₂ sensor and repeat Step 2.
4. The **Assisted Combustion Calibration** screen appears listing 3 conditions that must be met or performed before continuing:
 - Verify that the upstream gas supply pressures to unit is between 4.0" and 14" W.C.
 - Install the following devices on the unit, per the Benchmark Edge Operation Manual:
 - A manometer on the high gas pressure switch
 - A combustion analyzer probe in the exhaust manifold
 - A multimeter to read flame strength and combustion analysis
 - Ensure the facility can dissipate the heat generated at full fire, to avoid over temperature conditions. If current heat demand is low (e.g., outside temperature is relatively high), consider performing the entire combustion calibration process as quickly as possible to reduce the amount of heat generated by the test.

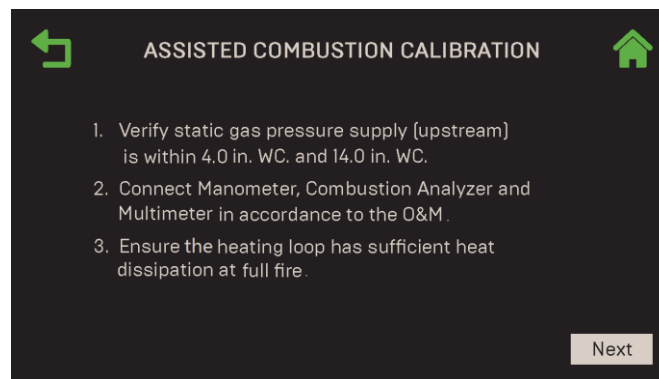


Figure 3-1: Assisted Combustion: Assisted Combustion Calibration Screen

5. Once all three conditions have been verified/met. Press **Next** to continue.
6. The **NOx Requirements** screen appears. Choose the NOx target: **9 ppm**, **20 ppm** or **None**. The combustion calibration target table for the Benchmark model and the selected NOx requirement is loaded into the Controller.

NOTE: The 9-ppm option is only available for Benchmark models BMK750 – 2000 and BMK4000 – 6000.

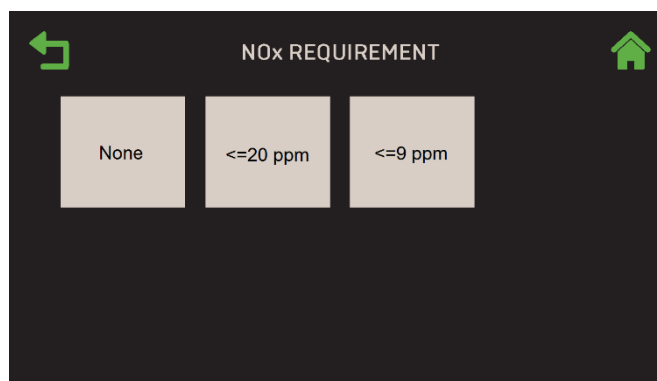


Figure 3-2: Assisted Combustion: NOx Requirement Screen

7. The unit is put in **Manual** mode (but is not yet firing) and a message appears saying **O2 Sensor Calibration in Progress**. Wait 1 to 2 minutes for this step to complete.
8. The unit now begins the ignition sequence (see Section 7.1 for details) and continues until the unit is firing at full valve position (max fire rate). This step may take a minute or more.
9. When the ignition sequence is complete, the **Downstream Gas Pressure** screen appears. Enter the manometer's gas pressure reading. The allowable gas pressure range varies by model. See the *Benchmark Pre-Installation Gas Supply Guide*, TAG-0047 (GF-2030).

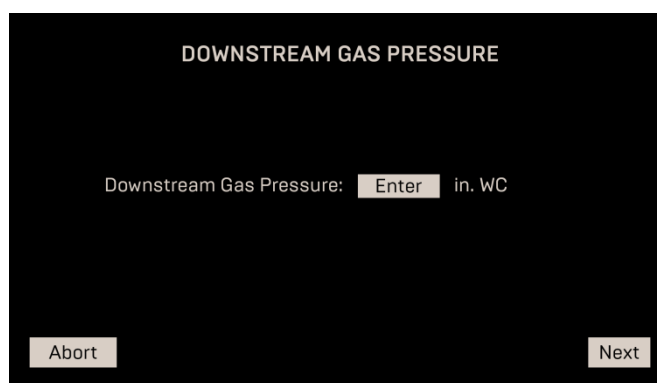


Figure 3-3: Assisted Combustion: Downstream Gas Pressure Screen

10. The system now starts combustion calibration, starting at the 100% valve position.

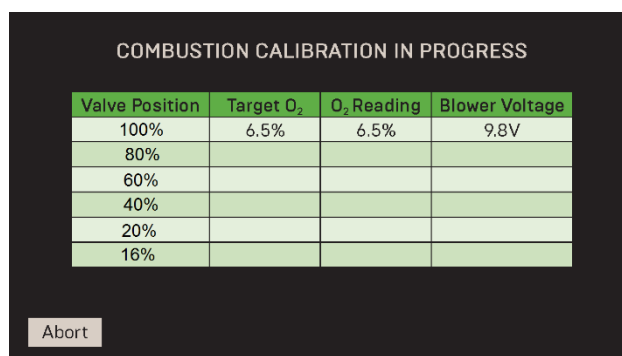


Figure 3-4: Assisted Combustion: Combustion Calibration In Progress Screen

11. Once the O₂ level has been finalized for a given valve position, the **Calibration Data Recording** screen appears. Enter values in the **NOx**, **CO** and **Flame Strength** fields from the multimeter. Press **Next** to continue.

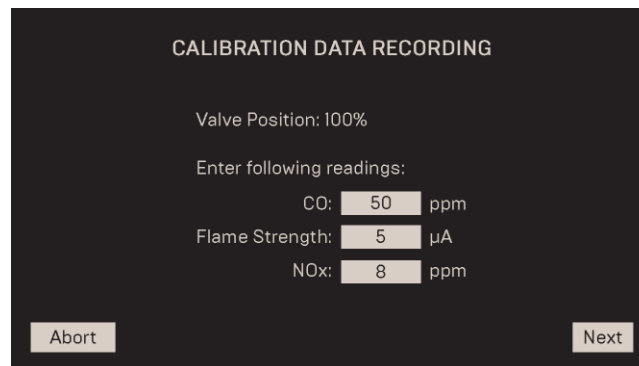


Figure 3.1-5: Assisted Combustion: Calibration Data Recording Screen

- Note the following:
 - Valid NOx range is defined by the NOx requirement chosen in Step 6.
 - Valid CO range is between 1 and 300 ppm
 - Valid Flame Strength is ≥ 2 μA
 - You can move to the next valve position if the NOx and/or Flame Strength values entered are out of range, however a message will appear alerting you to that condition, such as **Flame Strength too low**.
 - You **cannot** proceed if the CO value is out of range. A message will appear saying **Invalid CO value. Abort and manually calibrate to reduce CO**.
 - When transitioning from one valve position to the next, the In-Progress screen (Figure 3.1-4) is displayed showing the O₂ levels and blower voltage for all previously completed valve positions.
 - If there are any problems during the assisted calibration, a screen may appear requesting a user action.
12. After pressing **Next**, the system begins calibrating the next valve position. Repeat the **previous** step at the new Valve Position for this and all other Valve Positions.
13. After completing the last Valve Position, the **Combustion Calibration Complete** screen appears. See Section 3.5 for instructions on accessing this screen.

3.2 Manual Combustion Calibration Overview (Benchmark Only)

The Edge Controller can perform the full combustion calibration process on all Benchmark Boilers.

NOTE: The following is a *general overview* of the combustion calibration process. Combustion calibration instructions vary from model to model, and some may require specific additional steps not included below. For full combustion calibration instructions specific to your unit, consult the OMM manual that shipped with your unit.

SECTION 3: Calibration

1. Go to: **Main Menu → Calibration → Combustion Calibration**. If the O₂ sensor is not connected, a message appears saying that combustion calibration cannot be performed and this function aborts. If that occurs, connect the O₂ sensor and then repeat Step 1.
2. The **Combustion Calibration** screen appears listing 3 conditions that must be met or performed before continuing. Once all three conditions have been met, press **Next**.

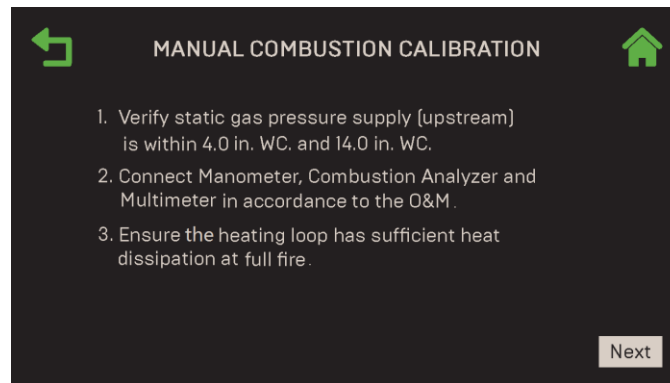


Figure 3-5: Manual Combustion: Manual Combustion Calibration Screen

3. On the **NOx Requirements** screen, select the NOx (Nitrogen Oxide) target to use during combustion calibration. **NOTE:** the **9-ppm** option is only available for BMK750 – 2000 and BMK4000 – 6000 models. It is not available for BMK2500/3000 or CFR Boilers.



Figure 3-6: Manual Combustion: NOx Requirement Screen

4. The unit is put in **Manual** mode and the **Combustion Calibration** screen now appears. It provides two methods to ramp the unit's valve position up or down:
 - **Method 1:** Toggle through the pre-set calibration points till you reach the desired valve position, then press **Go** to go to that point (left image below).
 - **Method 2:** Enable **Fine VP Step**, then manually press the **+** or **–** buttons once per 1% to bring the unit to the desired valve position (right image below).

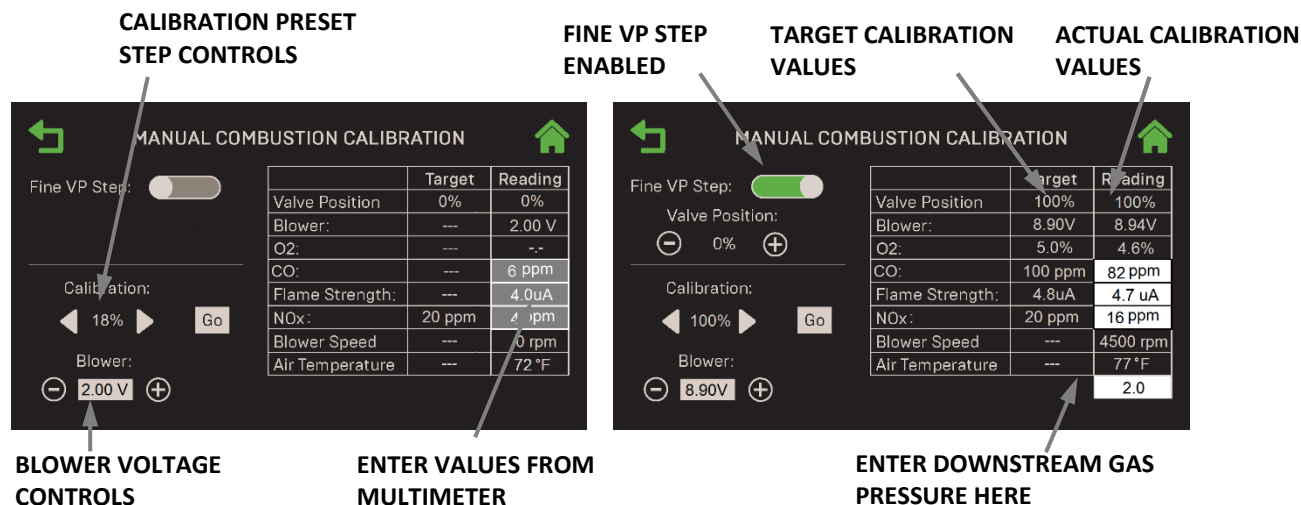


Figure 3-7: Manual Combustion: Manual Combustion Calibration Screen

5. Change the valve position to 30% and press **Go**, verify that the unit has ignited and is operating as expected, then use ► (Right) arrow key to change the valve position to **100%** and press **Go**.
6. Record the downstream manometer's gas pressure reading in the **Downstream Gas Pressure** field, which appears only when **Valve Position** = **100%**.
7. Enter O₂, NO_x, CO and flame strength values from the combustion analyzer and multi-meter at the 100% fire rate in the Reading cells.
8. **Benchmark ONLY:** If the O₂% Reading value doesn't match the Target value, use the Blower voltage control to adjust the combustion process, then repeat this step as needed until the Reading and Target values are a close match.
9. After completing the steps above at 100%, use either method (see Step 4) to reduce the valve position to the next step.
10. Repeat Steps 7 – 9 until you reach the last (lowest) calibration point. At the lowest valve positions, small changes to blower voltage have a large effect.
11. You can press **Back** and re-calibrate one or more points or view the **Combustion Calibration Complete** screen by going to **Main Menu → Calibration → Combustion Summary**. See Section 3.5 for instructions on accessing this screen.

3.3 Input/Output

Complete the instructions below to view the current reading of the system's sensors, and either calibrate the sensor or enter offset values. Note, this does not apply to the two Over-Temperature Limit Switches mounted on the front of the unit just under the I/O board; instructions for checking and configuring those switches are in the *Benchmark Edge: Operation-Service Manual* (OMM-0137, GF-211).

1. Go to: **Main Menu → Calibration → Input/Output**.
2. The Input/Output screen appears showing the sensors that are available. If a sensor is unavailable or disabled, its button is not displayed.

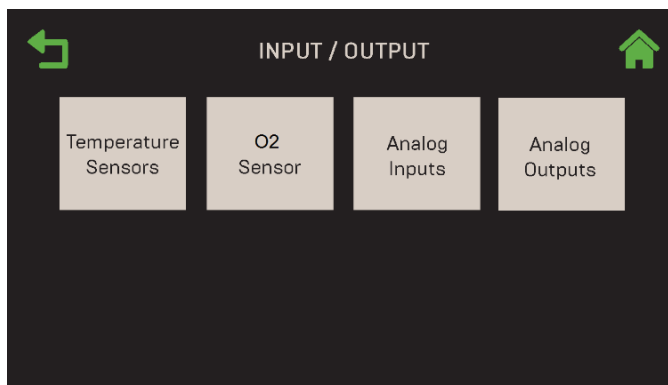


Figure 3-8: Calibration: Input/Output Screen

NOTE: You can navigate from one **Input/Output** screen to the next in round-robin fashion using the **Page Left** and **Page Right** icons on each screen.

3.3.1 Temperature Sensors

This screen allows you to see the current value of all temperature sensors. If reliable feedback or external instrumentation indicates the reading is inaccurate, you can adjust its reading via the **Offset** parameter. This process can be repeated for all available analog inputs.

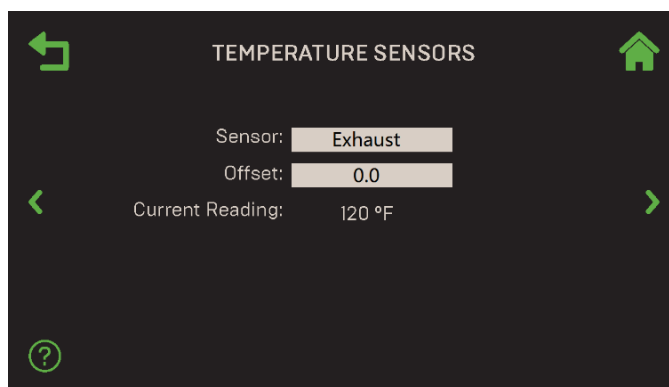


Figure 3-9: Input/Output: Temperature Sensors Screen

1. Go to: **Main Menu → Calibration → Input/Output → Temperature Sensors.**
2. Press the **Sensor** parameter and select the temperature sensor you want to view:
 - Exhaust
 - Air Inlet
 - Outlet
 - Supply Header
 - Return Header
 - Return Loop 2
 - RTD Spare 2
 - Outdoor Temp
 - Lower Inlet
 - DHW Temp
 - Upper Inlet
 - Supply Loop 2
 - RTD Spare 1
3. If necessary, adjust the **Offset** parameter to match a reliable reading or instrument by entering a value in this parameter. (Range: -10.0 to 10.0°F, default = 0.0°F)
4. Repeat Steps 2 and 3 to add offsets to other temperature sensors, as needed.

3.3.2 O₂ Sensor (Benchmark Only)

The **O₂ Sensor** screen displays the current oxygen (O₂) reading, and also allows you to enter an offset, and/or enable Auto Calibration of the O₂ sensor. This sensor is an important part of AERtrim functionality; the **O₂ Sensor** screen is not visible on units that don't have an O₂ sensor.

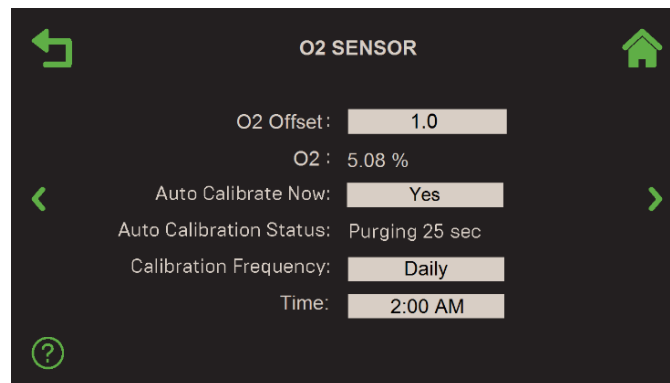


Figure 3-10: Input/Output: O₂ Sensor Screen

1. Go to: **Main Menu → Calibration → Input/Output → O₂ Sensor.**
2. If needed, you can enter an offset value in the **O₂ Offset** field to make the reading match an external meter. The unit must be is operating with sufficient blower speed to measure O₂. The current reading appears before and after entry. (Range: -3.0% to 3.0%, default = 1.0%)
3. The **Auto Calibrate Now** feature was designed for units that run continuously and therefore don't get a chance to calibrate on a defined frequency. To initiate, press **Auto Calibrate Now** and choose **Yes**. The following occurs:
 - Auto Calibration Status shows the progress, including the offset implemented.
 - When completed, **Auto Calibrate Now** reverts to **No**.
4. You can define **Calibration Frequency** as Daily, Weekly, Monthly or Never.
 - If you choose **Weekly**, the next calibration period will be 7 days from today. For **Monthly**, the first day of the month will be the next calibration period.
 - If you choose **Dailey**, the **Time** (time of day) field appears; choose an appropriate time to perform the calibration.

3.3.3 Analog Inputs

The **Analog Inputs** screen allows you to calibrate all the available analog inputs, such as a sensor, a remote signal, or feedback from a device such as a valve. If reliable feedback or external instrumentation indicates the reading is inaccurate, you can adjust its reading via the **Offset** parameter. This process can be repeated for all available analog inputs.

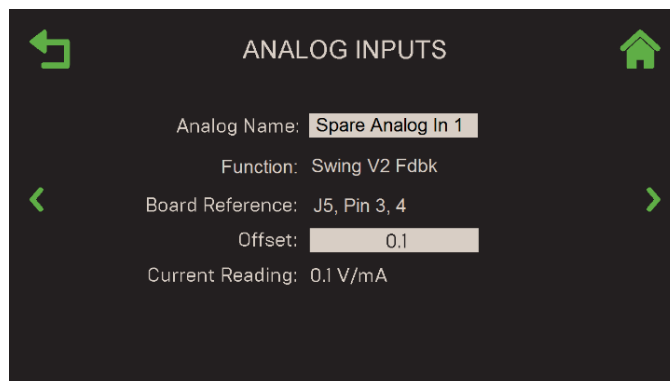


Figure 3-11: Input/Output: Analog Inputs Screen

1. Go to: **Main Menu → Calibration → Input/Output → Analog Inputs**.
2. Press the **Analog Name** field and choose the sensor you want to view. The selected input is displayed along with its current reading. The available Analog Inputs are as follows.

Benchmark Boilers:

- CO/Analog In
- Air Pump
- Spare Analog In 3
- Spare Analog In 2
- Flow
- Remote Analog In
- Spare Analog In 1
- Cas Vlv Fdbk (Cascade Valve Feedback)

CFR Boilers:

- Flow
- Remote Analog In
- Spare Analog In 1
- Cas Vlv Fdbk (Cascade Valve Feedback)

3. If you chose **Remote Analog In** or **Spare Analog In 1, 2 or 3** in step 2, the **Function** parameter appears with a read-only display of the function to which the input is currently assigned (assignments are made in [Section 6.5.4: Analog Inputs](#)).

Benchmark Boilers

- DHW Setpoint
- Swing V1 Feedback
- Swing V2 Feedback
- Blr VSP Feedback
- DHW VSP Fdbk
- SmartPlate VP
- NOx
- Other Setpoint

CFR Boilers

- DHW Setpoint
- Blr VSP Feedback
- SmartPlate VP
- Other Setpoint

4. This screen includes the following additional parameters:
 - **Board Reference:** Displays how the input connects to the Edge Controller, either through the unit's wiring harness or to specific pins on the unit's I/O Board (see the I/O board map in Section 2.11 of the *Edge Installation Manual*, OMM-0136, GF-210).
 - **Offset:** If necessary, you can adjust the **Current Reading** to match a reliable reading or instrument by entering a value in this parameter. (Range: -2.0 to +2.0, default = 0.0)
 - **Current Reading:** A read-only display of the current value. If no input is sensed, it displays either **INVALID** or --- (blank).
5. Repeat Steps 2 through 4 with the other Analog Inputs, as needed.

3.3.4 Analog Outputs

The **Analog Outputs** screen allows you to calibrate all the available analog outputs, such as a valve or pump. If you select a programmable output, its function is displayed. You can also view feedback (if available). If reliable feedback or external instrumentation indicates the reading is inaccurate, you can adjust its reading via the **Offset** parameter. This process can be repeated for all available analog outputs.

1. Go to: **Main Menu → Calibration → Input/Output → Analog Outputs**.

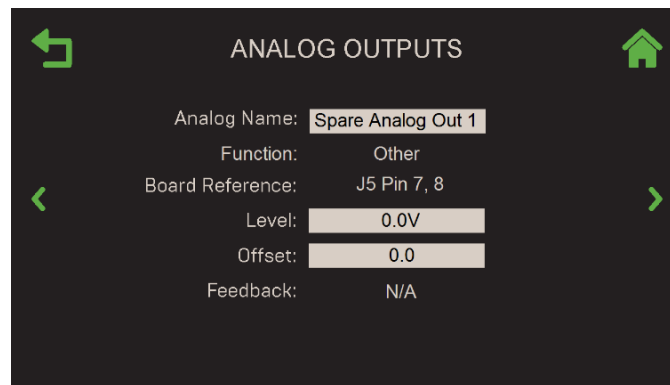


Figure 3-12: Input/Output: Analog Outputs Screen

2. Press the **Analog Name** field and choose the analog output you want to view. The chosen output is displayed along with its current reading.

Benchmark Boilers:

- Spare Analog Out 2
- Spare Analog Out 1
- DHW V.S. Pump
- Cascade Valve
- BLR V.S. Pump
- Spare Analog Out 3

CFR Boilers:

- BLR V.S. Pump
- Cascade Valve
- Spare Analog Out 1

SECTION 3: Calibration

- If you chose **Spare Analog Out 1** or **2** in step 2, the **Function** parameter provides a read-only display of the function the output has been assigned, either **Valve** or **Other**.
- The **Board Reference** shows I/O Board pins to which the output selected in Step 2 is connected or shows "On Harness". For more information, see the I/O board diagram in Section 2.11 of the *Edge Installation Manual* (OMM-0136, GF-210).
- Set the **Level** parameter to the reading from a reliable external instrument. For example, set the Level to 5 V or 10 mA and observe that it matches the external instrumentation or feedback, if available. If not, enter an appropriate value in the **Offset** parameter.
(Range: 0.00 to 10.00V or 0.00 to 20.00 mA)
- If necessary, you can adjust the **Offset** to match a reliable reading or instrument by entering a value in this parameter. (Range: -1.0 to +1.0 or -2.0 to +2.0 mA, default = 0.0)
- If the output selected in Step 2, includes feedback, it is displayed in the **Feedback** parameter (see the **Name** parameter in [Section 6.5.4: Analog Inputs](#)). If no feedback is sensed, the reading is '---' (blank). The feedback signal mapping is:

Analog Output	Analog Input (Feedback)	Display Tag
Cascade Valve	Cas Vlv Fdbk	Valve Feedback
BLR VS (Variable Speed) Pump	BLR VSP Fdbk	Pump Feedback
DHW VS (Variable Speed) Pump	DHW VSP Fdbk	Pump Feedback

- Repeat Steps 2 through 7 with the other Analog Outputs in use in the system.

3.4 Subsystem

The **Subsystem** screen provides access to the **Air/Fuel Valve** and the **Spark Monitor**.

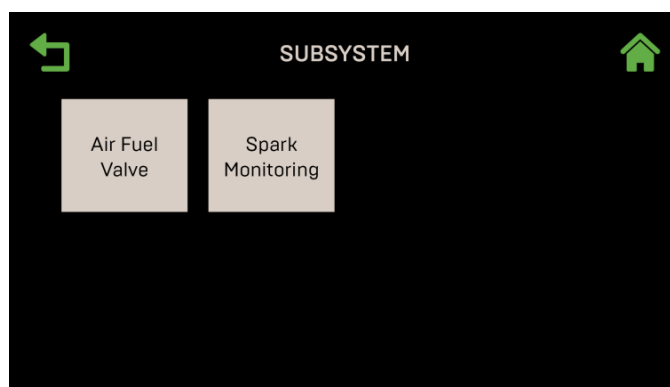


Figure 3-13: Calibration: Subsystem Calibration Menu

- Go to: [Main Menu](#) → [Calibration](#) → [Subsystem](#).
- Press either Air Fuel Valve or Spark Monitoring.

NOTE: You can navigate between the Air Fuel Valve and Spark Monitor screens in round-robin fashion using the **Page Left** and **Page Right** icons on both screens.

3.4.1 Air Fuel Valve Calibration

Complete the instructions below to calibrate the Air/Fuel Valve.

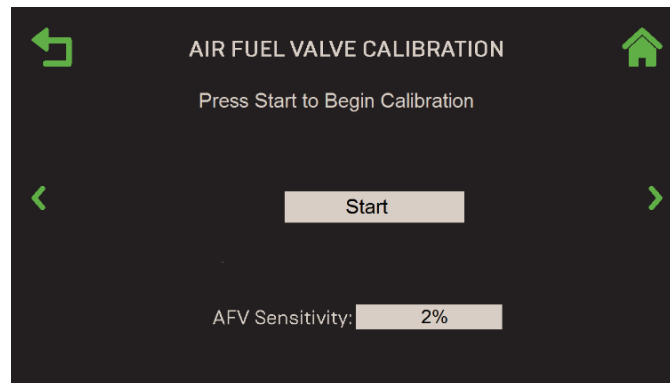


Figure 3-14: Subsystem: Air/Fuel Valve Calibration Screen

1. Go to: **Main Menu → Calibration → Subsystem → Air Fuel Valve**.
2. Before calibration, you have the option of adjusting the **A/F Sensitivity**. (Range: 1% to 5%)
3. To start the calibration, press the **Start** button. The valve position (shown on the Air/Fuel dial) automatically moves to 0%. If it settled at something other than 0%, you can manually move the valve position using the **Up** or **Down** arrows until the Air/Fuel dial reaches 0%.

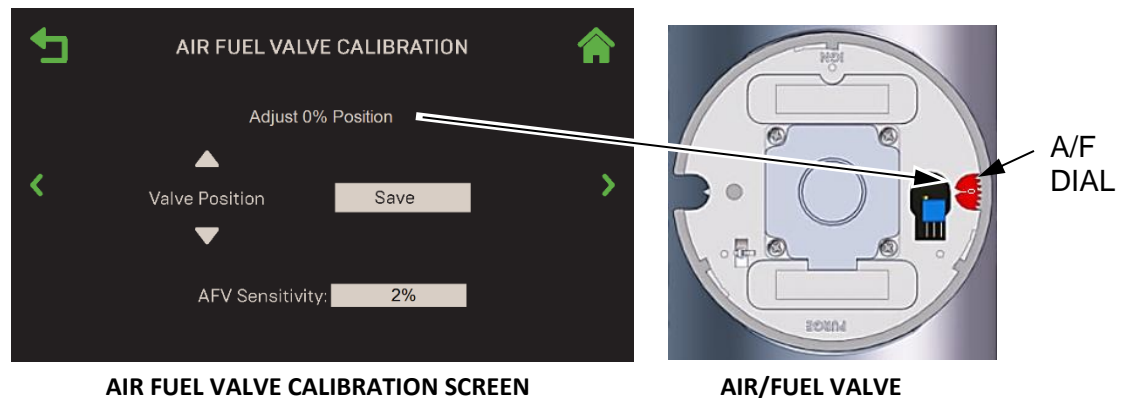


Figure 3-15: Subsystem: Air/Fuel Valve Calibration Screen – After Completion

4. When the Air/Fuel dial has settled at the 0%, the **Save** button appears. Press **Save** when done to save the 0% calibration.
5. The valve now moves to the 100% position and the same options are available. Press **Save** when done to save the 100% calibration.
6. The valve position now automatically moves to the 50% position. The **Save** button is replaced with the **Done** button to signify completion, and a status message is displayed above the valve position adjustment.

NOTE: If the valve does not reach 50%, you can press Done but then repeat the process to ensure calibration.

3.4.2 Spark Monitor Calibration (Benchmark Units Only)

The **Spark Monitoring** screen gives you the option of bounding the Spark Monitor's measurement range by specifying the minimum and maximum spark current.

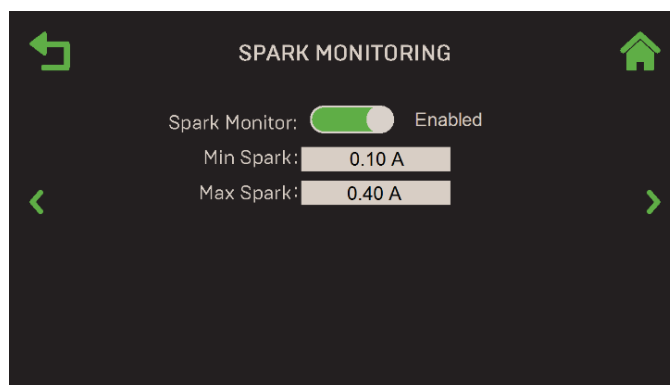


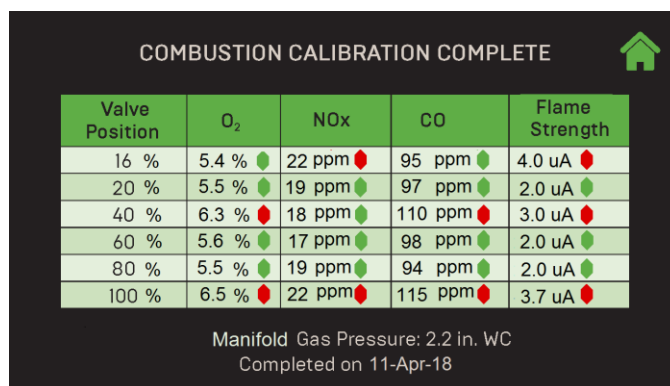
Figure 3-16: Subsystem: Spark Monitor Screen – Spark Monitor Enabled

1. Go to: **Main Menu → Calibration → Subsystem → Spark Monitoring**.
2. To set a spark range, specify values in the following fields:
 - **Min Spark:** Range: 0.00 to 0.29 A
 - **Max Spark:** Range: 0.30 to 2.50 A

3.5 Combustion Summary

Combustion Calibration Complete displays a summary of the results of the most recent combustion calibration. It remains in effect until the next combustion calibration. It also appears at the end of the Assisted Combustion Calibration (Section 3.1) and Manual Combustion Calibration (Section 3.2).

Each cell is color coded with green or red honeycomb to indicate if each level is acceptable



Valve Position	O ₂	NO _x	CO	Flame Strength
16 %	5.4 %	22 ppm	95 ppm	4.0 uA
20 %	5.5 %	19 ppm	97 ppm	2.0 uA
40 %	6.3 %	18 ppm	110 ppm	3.0 uA
60 %	5.6 %	17 ppm	98 ppm	2.0 uA
80 %	5.5 %	19 ppm	94 ppm	2.0 uA
100 %	6.5 %	22 ppm	115 ppm	3.7 uA

Manifold Gas Pressure: 2.2 in. WC
Completed on 11-Apr-18

Figure 3-17: Combustion Calibration Complete Screen

To view the summary, go to: **Main Menu → Calibration → Combustion Summary**.

3.6 Combustion Values

The Combustion Values screen displays all the operating Combustion Settings along with the Unit Serial #. It is a good idea to take a picture of this screen to keep for future reference.

To view the combustion values, go to: **Main Menu → Calibration → Combustion Values**.

SECTION 4: DIAGNOSTICS

The Diagnostics menu provides access to a number of tools you can use to diagnose a suspected or observed fault. It is accessed by pressing **Diagnostics** on the **Main Menu**

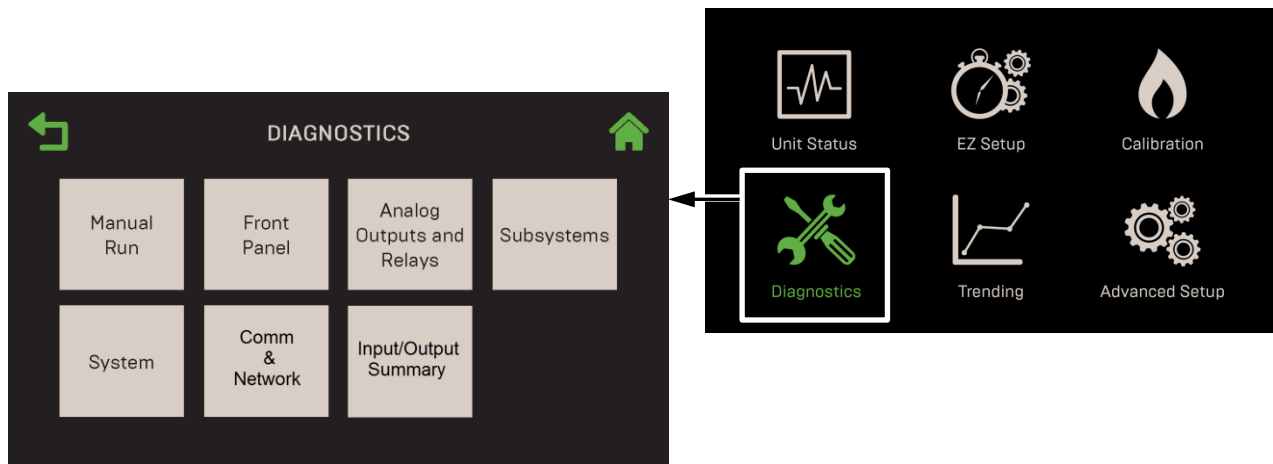


Figure 4-1: Diagnostics Menu

This Section includes the following topics:

[4.1: Manual Run](#)

[4.2: Front Panel](#)

[4.3: Analog Outputs and Relays](#)

[4.3.1: Relays](#)

[4.3.2: Analog Outputs](#)

[4.4: Subsystems](#)

[4.4.1: Air Fuel Valve Stepper Motor](#)

[4.4.2: Blower](#)

[4.4.3: Ignition](#)

[4.5: System](#)

[4.5.1: Pre-Start Up](#)

[4.5.2: Versions](#)

[4.6: Communication & Failsafe](#)

[4.6.1: IP Network](#)

[4.6.2: BAS](#)

[4.6.3: onAER](#)

[4.6.4: Smart Device](#)

[4.6.5: USB Storage](#)

[4.7: Input/Output Summary](#)

⚠ WARNING:

Before starting the instructions in this section for the first time, you must ensure that the unit has the latest Edge Controller firmware. Refer to [Section 6.2.7](#).

4.1 Manual Run

Most diagnostic tests require the unit to be in **Manual Mode**. To put the unit in **Manual Mode**:

- Initially reduces the unit's Fire Rate to zero.
- Allows the system to display certain diagnostic options that are otherwise unavailable.
- Suppresses event transmissions to external systems.
- Lights the red **Manual** LED on the Controller's front face.
- Flags all events in the internal log as related to Manual Mode.

To put the unit in Manual Mode:

1. Go to: **Main Menu → Diagnostics → Manual Run.**

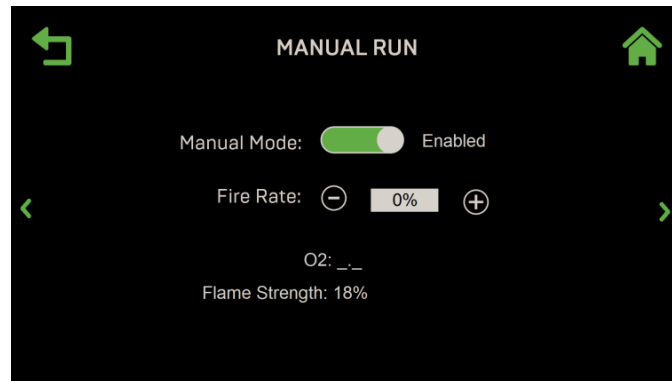


Figure 4-2: Diagnostics: Manual Run Screen – Manual Mode Enabled

2. Enable the **Manual Mode** toggle. The red Manual LED lights on the Controller's front face turns on, the unit shuts down (if not already) and stays in **Manual Mode** until it is disabled from this screen, or until the session times-out.
3. When Manual Mode is enabled, the Fire Rate control appears. You can use these controls to manually fire the unit in 1% increments using the + and – controls or press on the field and manually enter a specific fire rate.
4. When you are done operating in **Manual Mode**, use the **Manual Mode** toggle to disable it. All initiated/active diagnostic routines/processes will terminate, the **Manual LED** on the Controller's front face will go off, and the unit will resume normal operation.

4.2 Front Panel

The **Front Panel** screen provides access to tests of the touchscreen, LEDs, keypad and buttons.

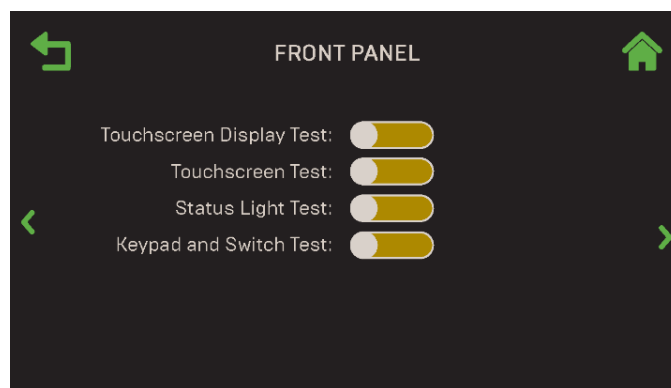


Figure 4-3: Diagnostics: Front Panel Screen

To run Front Panel diagnostics:

1. Go to: **Main Menu → Diagnostics → Front Panel.**
2. The **Front Panel** screen opens, with all diagnostic tests currently off.

3. To perform a test, press its toggles:

- **Touchscreen Display Test:** Sequentially displays five colors, full-screen, for 5 seconds each. Observe each screen to determine if any pixels fail to show any color. The test ends after the 5th color is displayed.



Figure 4-4: Diagnostics: Touchscreen Display Test

- **Touchscreen Test:** Allows you to verify touch calibration. When you enable this test, move your finger all around the screen and to all four corners. Verify that X and Y coordinates change as you move your finger around the screen.

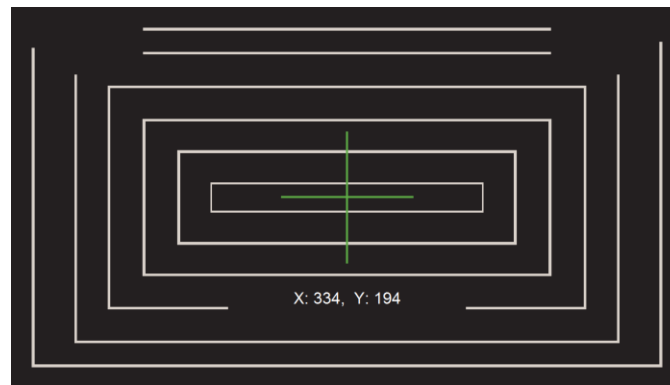


Figure 4-5: Diagnostics: Touchscreen Display Test

- **Status Light Test:** Walks through each of the LED lights Individually, 7-segment displays, 7-segment display parameter type indicators and multi-function bar before lighting them all at the same time for 5 seconds.
- **Keypad and Switch Test:** Allows you to verify the buttons on the Controller below the touchscreen; this test does not include the Low Water Level Test & Reset buttons.

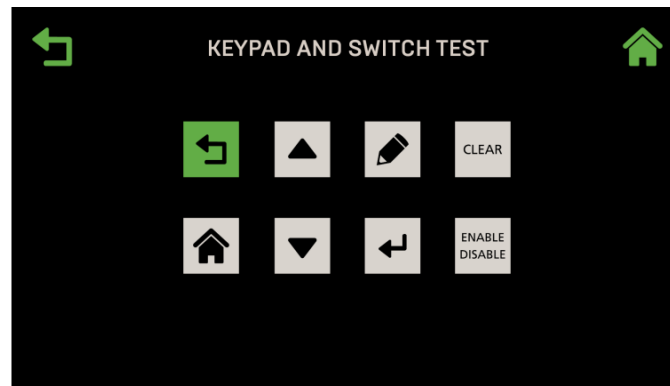


Figure 4-6: Diagnostics: Keypad and Switch Test Screen

4.3 Analog Outputs and Relays

The **Analog Outputs and Relays** screen allows you to test the unit's relays and analog outputs. This screen is accessible only in **Manual Mode**.

To run relays and analog output diagnostics:

1. Go to: **Main Menu → Diagnostics → Analog Outputs and Relays**.

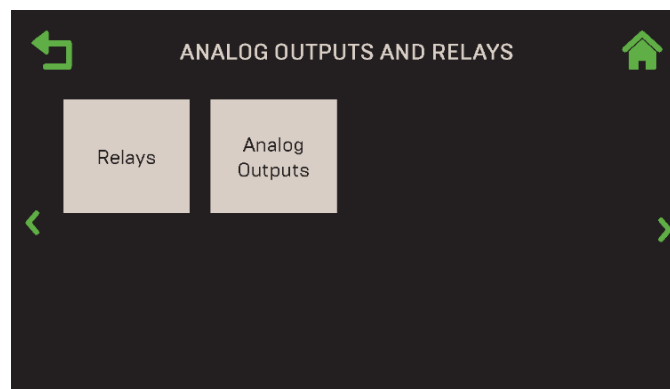


Figure 4-7: Diagnostics: Analog Outputs and Relays Screen

2. Press either Relays or Analog Outputs.

NOTE: You can navigate between the Analog Output and Relays screens in round-robin fashion using the Page Left and Page Right icons on both screens.

4.3.1 Relays

The Relays screen displays a list of all relays in the system and allows you to manually test each one individually to confirm they are functioning. Complete the instructions below to test the unit's relays.

1. Go to: **Main Menu → Diagnostics → Analog Outputs and Relays → Relays.**

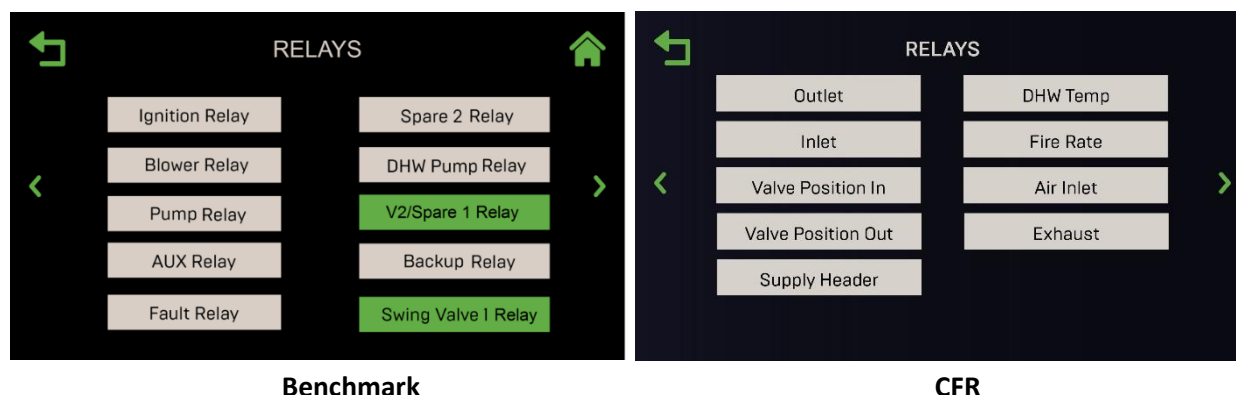


Figure 4-8: Analog Outputs and Relays: Relays Screens

NOTE: Swing Valve 1 Relay does not appear on CFR units

2. Press the relay you want to test; it turns green, enabling it for 1 minute, after which it is automatically disabled. You can select multiple relays to test at one time.
3. During the test, verify the function associated with the selected relay(s) occurred as expected.
4. The Relay test will disable automatically after 1 minute.

4.3.2 Analog Outputs

The Analog **Outputs** screen displays the current values of the various analog outputs and allows you to manually adjust their values.

1. Go to: **Main Menu → Diagnostics → Analog Outputs and Relays → Analog Outputs.**

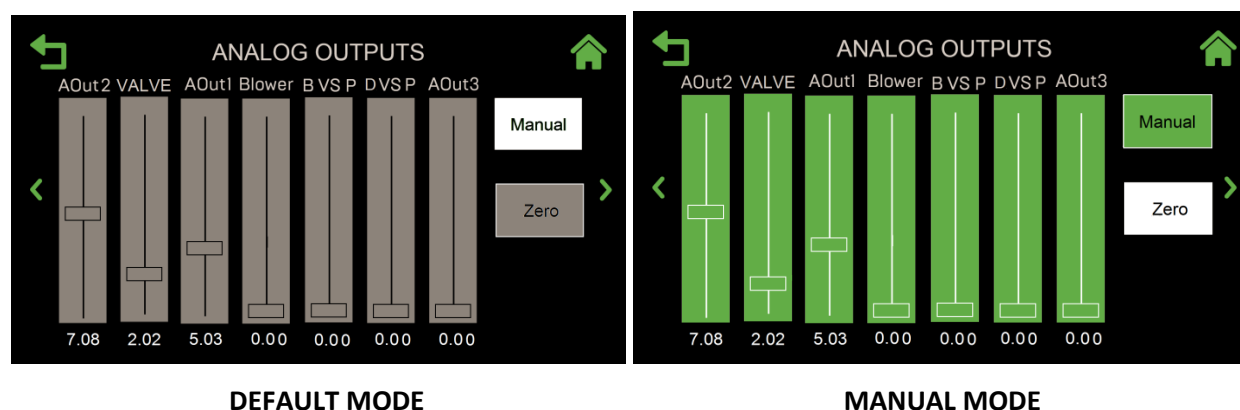


Figure 4-9: Analog Outputs and Relays: Analog Outputs Screen (Benchmark)

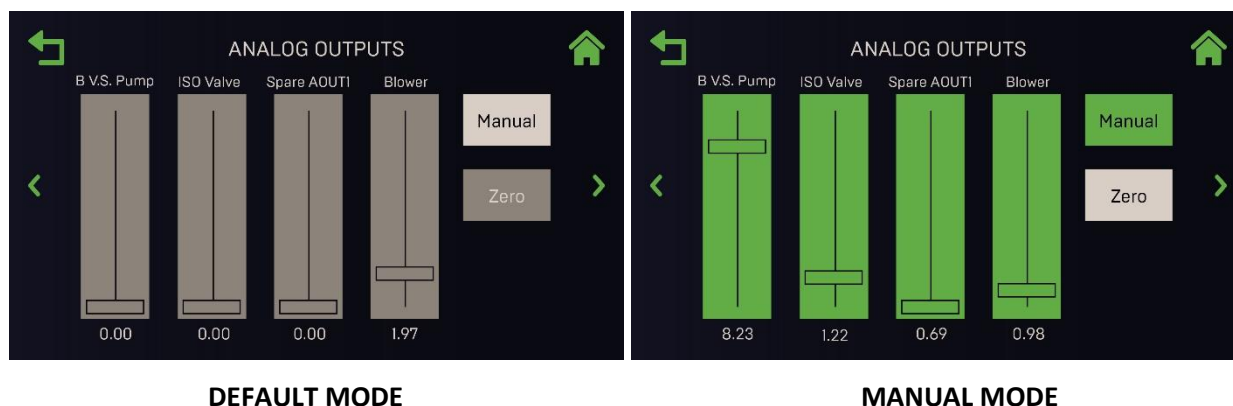


Figure 4-10: Analog Outputs and Relays: Analog Outputs Screen (CFR)

2. In Default mode, this screen is grey and displays the current value of all analog outputs.
3. If you press the **Manual** button, the unit's fire rate is reduced to zero and the sliders turn green. You can now manually adjust the position of one or more of the outputs and verify the behavior of the selected output(s). Press **Zero** to return all sliders to 0.00.
4. To put this screen back in Default mode, press the **Manual** button again.

4.4 Subsystems

The **Subsystems** screens allow you to test the units Air/Fuel Valve, Blower and Ignition.

NOTE: Use the Page Left and Page Right icons to navigate from one Subsystem screen to the next.

1. Go to: [Main Menu](#) → [Diagnostics](#) → [Subsystems](#).
2. Press on the component you want to test.

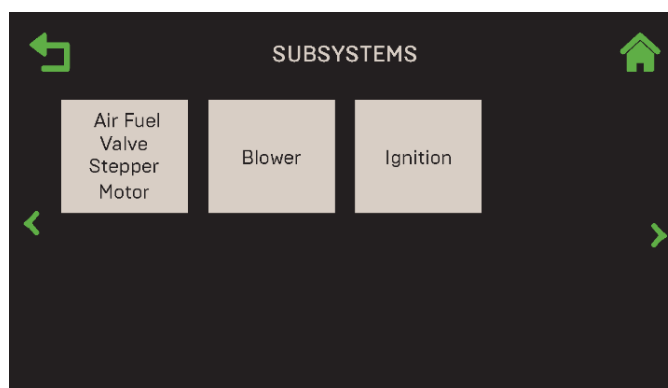


Figure 4-11: Diagnostics: Subsystems Screen

4.4.1 Testing the Air/Fuel Valve Stepper Motor

1. Go to: **Main Menu → Diagnostics → Subsystems → Air Fuel Valve Stepper Motor**.

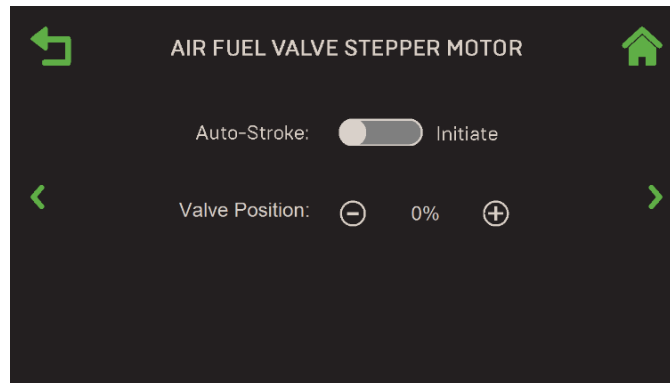


Figure 4-12: Subsystems: Air Fuel Valve Stepper Motor Test Screen

2. Press the **Auto-Stroke** control to initiate the test. This will start one full cycle of the Air Fuel Valve, from fully closed to fully open then back to closed. During the test, the valve position is displayed from 0% to 100%.
3. Alternatively, manually increment the Air Fuel Valve position in 1% increments using the **Plus** and **Minus** buttons and compare the stepper motor's physical position to the value on the screen.

4.4.2 Testing the Blower Motor

1. Go to: **Main Menu → Diagnostics → Subsystems → Blower**.
2. The **Blower** screen allows you manually drive the blower at a desired output using the **Plus** or **Minus** buttons on the **Blower** (voltage) control, or to run a pre-defined sequence.
3. To run the blower manually, use the **Plus** or **Minus** buttons or press the numeric field and input a blower voltage, then verify by observing the blower speed.
4. To run a pre-defined sequence, press **Profile** and select **Profile 1**, then enable the **Profile Run** control. This profile exercises the Blower in increments from 0 to 10 volts then back to 0.
5. Using either method, **Blower** (voltage) and **Blower** (rpm) are displayed continuously.

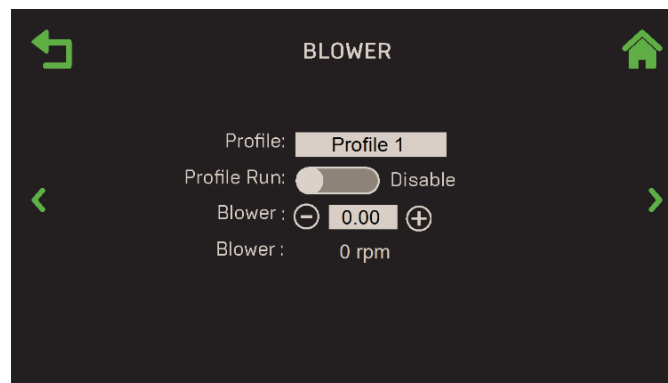


Figure 4-13: Subsystems: Blower Screen

4.4.3 Ignition

Complete the instructions below to test the ignition system. NOTE: the Safety Shutoff Valve does not open during this test.

1. Go to: **Main Menu → Diagnostics → Subsystems → Ignition.**

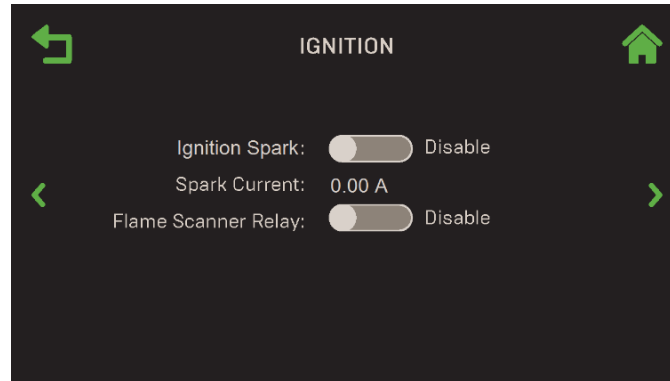


Figure 4-14: Subsystems: Ignition Screen

2. Start the **Ignition Spark** test or **Flame Scanner Relay** test (available only on Benchmark 5000 & 6000) by enabling its control.
3. The Igniter Solenoid opens the gas assist line solenoid and generates sparking of the igniter until the **Ignition Spark** control is disabled.
4. Enabling the **Flame Scanner Relay** enables the relay.
5. In both tests, the **Spark Current** is displayed continuously during the test.

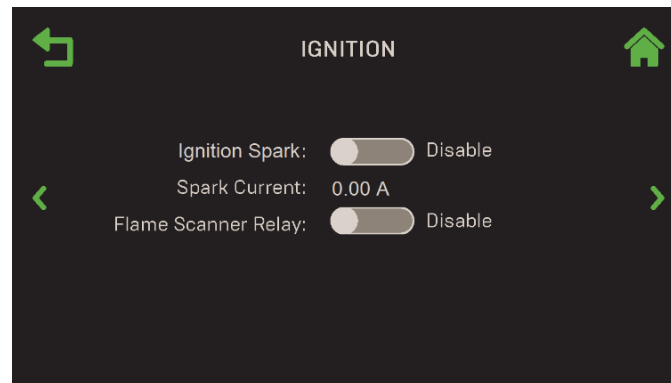


Figure 4-15: Subsystems: Ignition Screen

4.5 System

From the **System** screen you can run a programmable profile, manually ramp the fire rate up or down, perform a pre-startup diagnostic or view a software version summary.

1. Go to: **Main Menu → Diagnostics → System**.

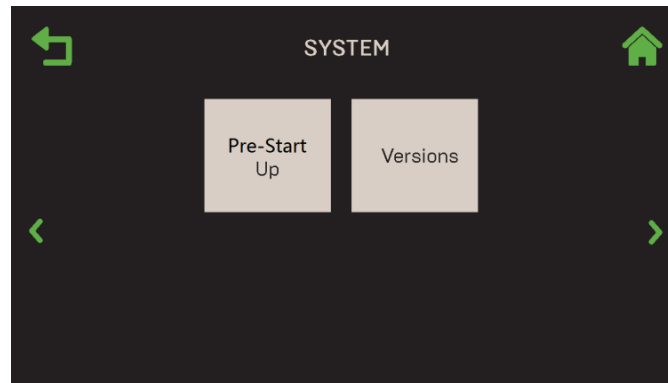


Figure 4-16: Diagnostics: System Screen

4.5.1 Pre-Start Up

The **Pre-Start Up** screen allows you verify various system components and assemblies without opening the SSOV. This is particularly useful when the building's gas supply has not been turned on and you want to make sure everything will function when the gas supply is turned on.

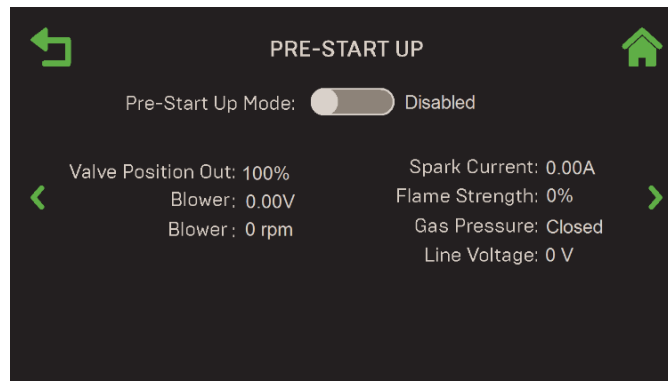


Figure 4-17: System: Pre-Start Up Screen – Shown Disabled

2. To run the Pre-Startup test, enable the **Pre-Start Up Mode** control. The following occurs:
 - The valve position moves to ignition position.
 - The Blower is turned on at ignition point voltage.
 - The gas assist solenoid opens.
 - The igniter is sparked.
3. Monitor the valve position out, blower voltage and speed, spark current, flame strength, gas pressure and line voltage.
4. When observations have completed, disable the **Pre-Start Up Mode** control.

4.5.2 Versions

Version Information displays the current version of the Controller's various firmware components.

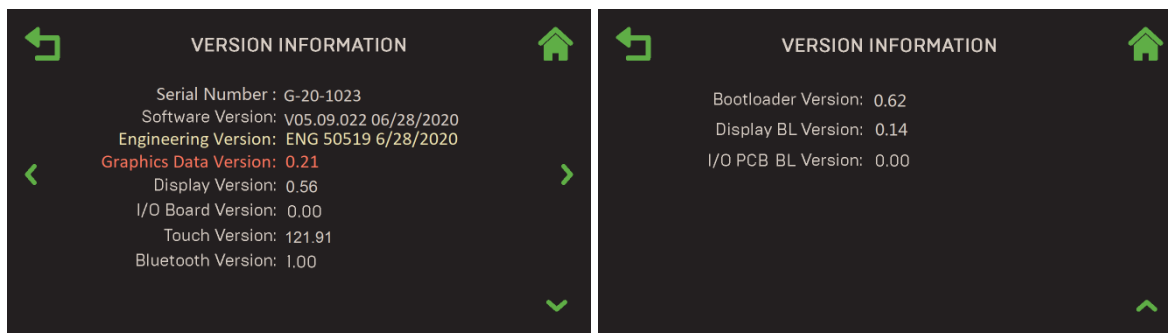


Figure 4-18: System: Versions Information Screen

4.6 Communication & Failsafe

The **Communication & Failsafe** screen provides access to screens that can be used to verify IP, onAER and BAS communication, and check the status of communication with smart devices and available space on a USB device plugged into the side of the Controller.

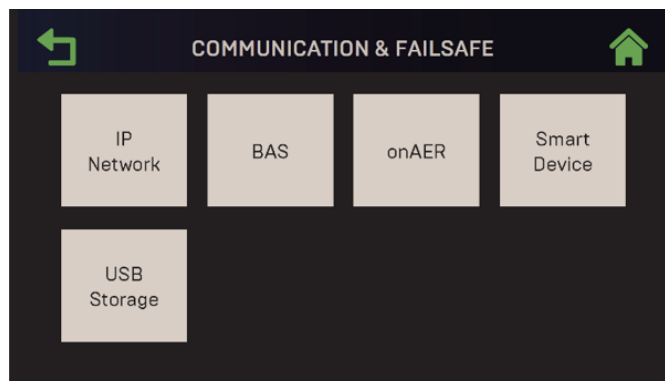


Figure 4-19: Diagnostics: Communications Screen (Benchmark)

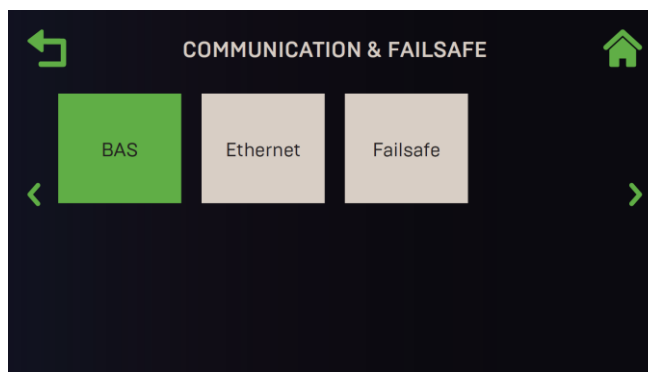


Figure 4-20: Diagnostics: Communications Screen (CFR)

4.6.1 IP Network

The **IP Network** option is used to check the IP interface used by onAER or BAS.

Go to **Main Menu → Diagnostics → Communication & Failsafe → IP Network** to view the available parameters.

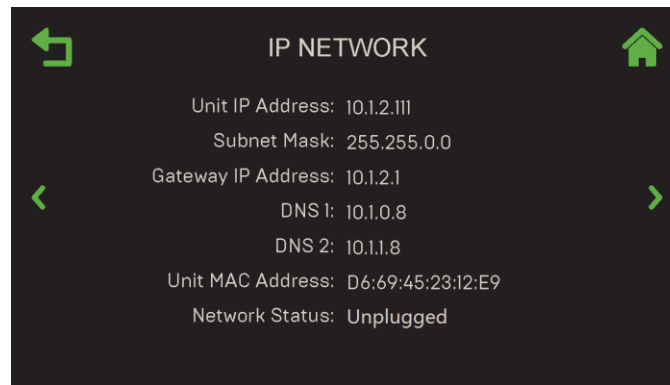
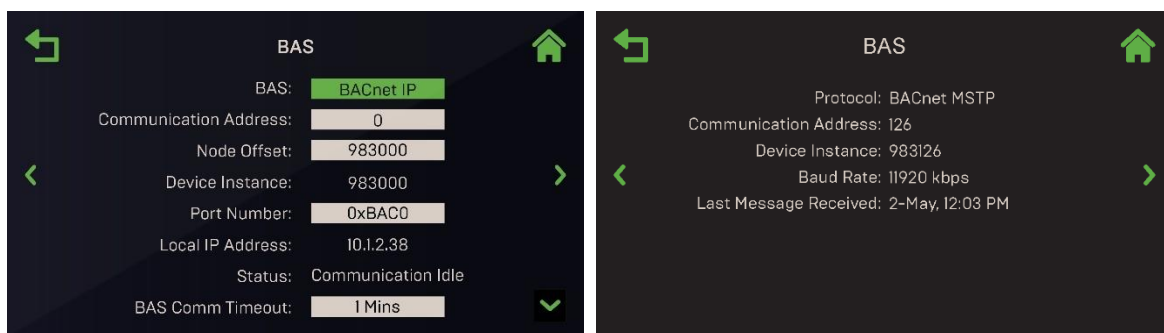


Figure 4-21: Communication & Failsafe: IP Network Screen

4.6.2 BAS

If the unit is part of a Building Automation System (BAS), the BAS screen provides a read-only display of various communication parameters. The screen that appears depends on the communication protocol specified in the **BAS** parameter in **Advanced Settings → Communication & Failsafe → BAS** (see [Section 6.4.1](#)).

Go to **Main Menu → Diagnostics → Communication & Failsafe → BAS** to view the available parameters.



BAS = BACnet IP

BAS = BACnet MSTP

Figure 4-22: Communication & Failsafe: BAS Screen

4.6.3 onAER (Benchmark Units Only)

The **onAER** screen displays several onAER communication parameters and provides the option to perform two functionality and communication tests.

1. Go to **Main Menu → Diagnostics → Communication & Failsafe → onAER**.

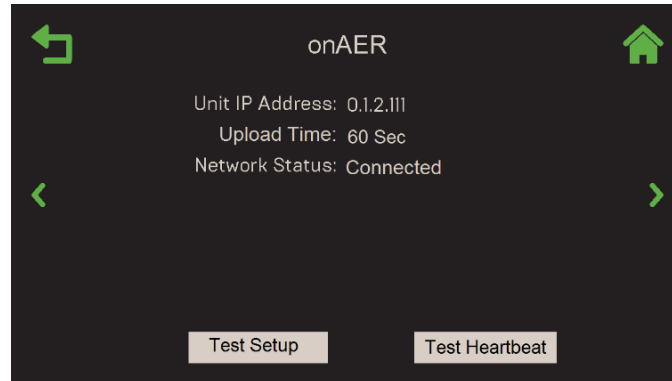


Figure 4-23: Communication & Failsafe: onAer Screen

2. This screen displays the following read-only parameters:
 - **Unit IP Address**
 - **Upload Time**
 - **Network Status**
3. There are two optional tests of onAER functionality and communication. Both send reports to the host server.
 - If you press the **Test Heartbeat** button, the green onAER LED on the Controller's front face blinks rapidly for one or two seconds while sending a summary status file to the host server.
 - If you press the **Test Setup** button, the green onAER LED on the Controller's front face blinks rapidly for several seconds while sending a full status file to the host server. Both buttons are greyed out until test completion.

4.6.4 Smart Device (Benchmark Only)

The **Smart Device** screen displays several Bluetooth communication parameters. Bluetooth communication is only available on Benchmark boilers. It is not available on CFR boilers.

Go to **Main Menu → Diagnostics → Communication & Failsafe → Smart Device** to view available parameters.



Figure 4-24: Communication & Failsafe: Smart Device Screen**4.6.5 USB Storage**

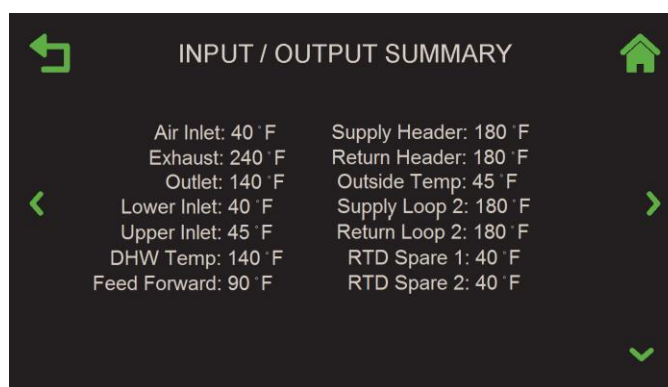
If a USB device is plugged into the port on the Controller's left side, the **USB Storage** screen displays parameters about that device (if no device is plugged in the screen displays the **Status** parameter).

1. Plug a USB device into the USB port on the Controller's left side.
2. Go to: **Main Menu → Diagnostics → Communication & Failsafe → USB Storage** to view available parameters.

**Figure 4-25: Communication & Failsafe: USB Storage Screen****4.7 Input/Output Summary**

A read-only, multi-page screen that displays the current status of all Inputs and Outputs, such as temperature sensors, pressure sensors, flow sensor, O₂ sensor, Analog Inputs and Analog Outputs. Items that are not part of the configuration (for example, Feed Forward), are displayed as --- (blank).

1. Go to: **Main Menu → Diagnostics → Input/Output Summary**.

**Figure 4-26: Input/Output: Input/Output Summary Screen (First of 3)**

2. The following is an example of the data in the **Input/Output Summary** screen.

Air Inlet:	40°F	Supply Header:	180°F
Exhaust:	240°F	Return Header:	180°F
Outlet:	140°F	Outside Temp:	40°F
Lower Inlet:	40°F	Supply Loop 2:	180°F
Upper Inlet:	40°F	Return Loop 2:	180°F
DHW Temp:	140°F	RTD Spare 1:	40°F
Feed Forward:	90°F	RTD Spare 2:	40°F
O ₂ :	3%	Spare Aout2:	19
Spare Aout1:	5.5	Spare Aout3:	5.50V
Cascade Valve:	5.5	Blower:	2.00 V
BLR V.S. Pump:	5.5	DHW V.S. Pump:	5.5V
Flow:	0.0 gpm	CO/Analog In:	5.5V
Air Pump:	1.05 V	Cas Vlv Fdbk:	5.5V
Remote Ain:	5.5	Spare Ain1:	5.5V
Spare Ain2:	5.5	Spare Ain3:	5.5V
Blower Relay:	Open	Swing Valve 1 Relay:	Closed
Ignition Relay:	Open	Backup Relay:	Closed
Pump Relay:	Open	DHW Relay:	Closed
Aux Relay:	Open	V2/Spare 1 Relay:	Closed
Fault Relay:	Open	Spare 2 Relay:	Closed
Blower	2.00 V	Blower	0 rpm
High Gas Pressure:	13.5 in. W.C.	Low Gas Pressure:	2.2 in. W.C.
Draft Pressure:	-0.81 in. W.C.	Spare Pressure:	28.1 in. W.C.

SECTION 5: TRENDING

The Controller provides two “Trending” graphs, which each display up to four selectable parameters. It is accessed by pressing **Trending** on the **Main Menu**.

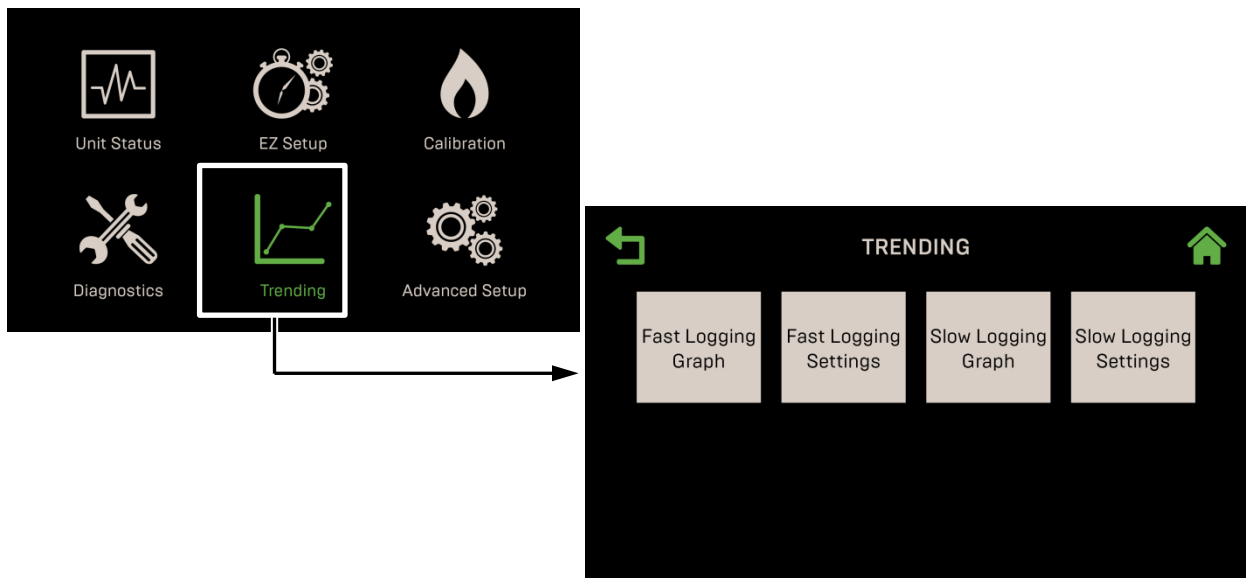


Figure 5-1: Trending Screen

This Section includes the following topics:

[5.1: Fast Logging Settings and Graph](#)

[5.2: Slow Logging Settings and Graph](#)

The Edge Controller provides two Trending graphs:

- **Fast Speed:** Data is saved 2x per second. Total historical data is 3 minutes (old data is dumped). It is saved for up to 30 seconds after a fault. Fault data is erased once the fault is cleared.
- **Slow Speed:** Data is saved on a user-selected time frame, ranging from every second to once every 2 minutes.

Both graphs have their own list of user-selectable parameters.

⚠ WARNING:

Before starting the instructions in this section for the first time, you must ensure that the unit has the latest Edge Controller firmware. Complete the instructions in [Section 6.2.7: Firmware Update](#) to obtain and install the latest firmware.

5.1 Fast Logging Settings and Graph

Complete the instructions below to select the settings and display the Fast Logging graph.

1. Go to: **Main Menu → Trending → Fast Logging Settings**.

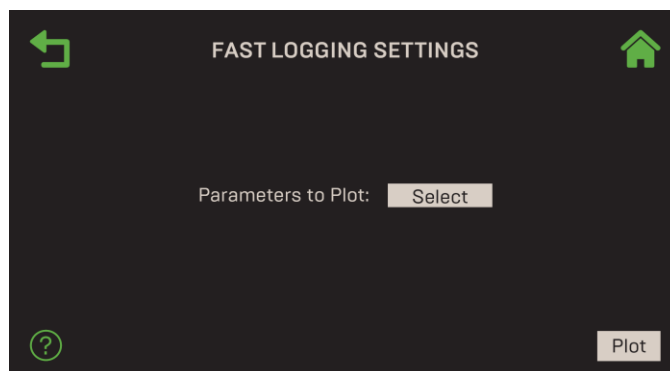


Figure 5-2: Trending: Fast Logging Settings Screen

2. Press **Parameters to Plot**. The **Select Plot Parameters** screen opens, displaying the parameters available in this graph. You can select up to 4 parameters. The selected item(s) turn green. Any new selection will create a new plot; the previous selection will be deleted.

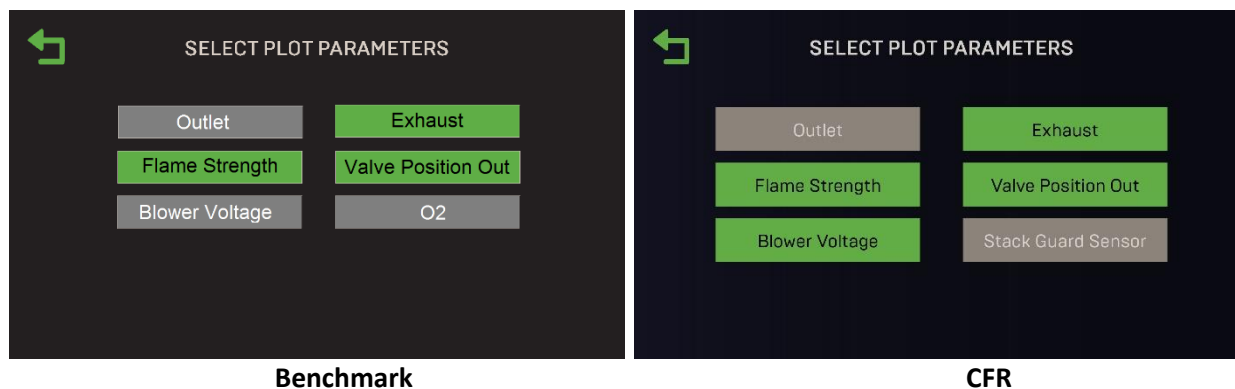


Figure 5-3: Trending: Select Plot Parameters Screen – Fast Logging

3. Press the **Back** button to return to the **Fast Logging Settings** screen.
4. Press the **Plot** button to create the new graph.

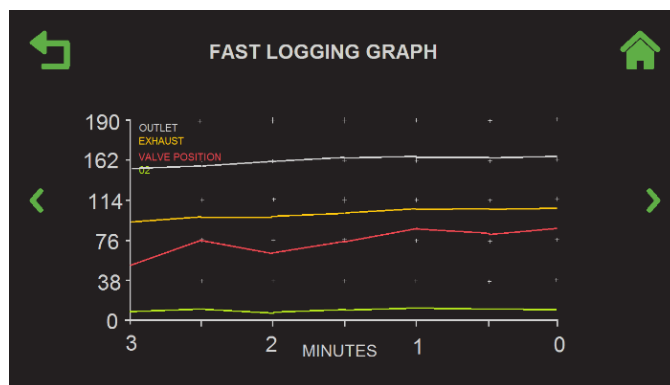


Figure 5-4: Trending: Graph Screen

5.2 Slow Logging Settings and Graph

Complete the instructions below to select the parameters for the **Slow Logging** graph.

- Go to: **Main Menu → Trending → Slow Logging Settings**.

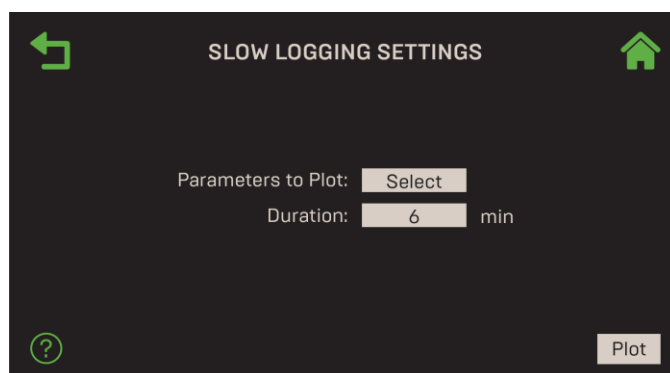
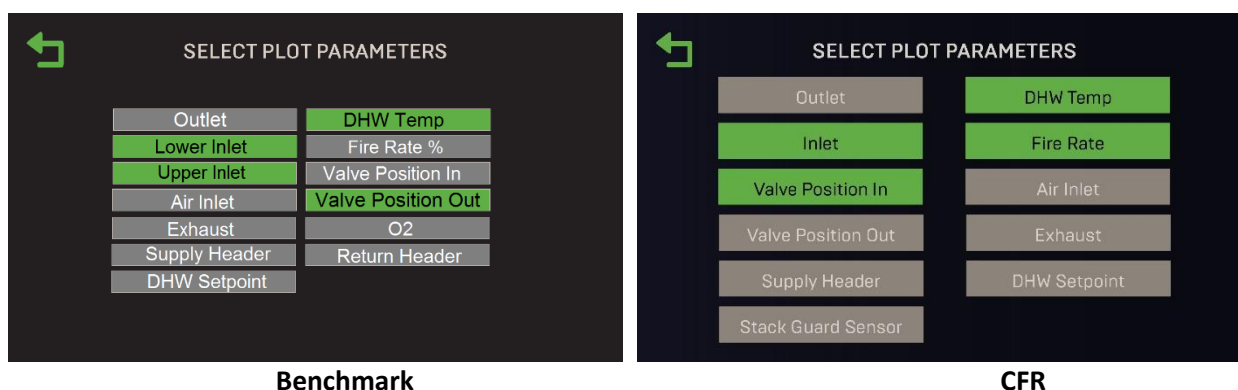


Figure 5-5: Trending: Slow Logging Settings Screen

- Press **Parameters to Plot**. The **Select Plot Parameters** screen opens, displaying the parameters available in this graph. You can select up to 4 parameters. The selected item(s) turn green.



Benchmark

CFR

Figure 5-6: Trending: Select Plot Parameters Screen – Slow Logging

- To set the logging duration (X-Axis), press the **Duration** field on the **Slow Logging Settings** screen (Figure 5.2-1, above) and then choose the duration.

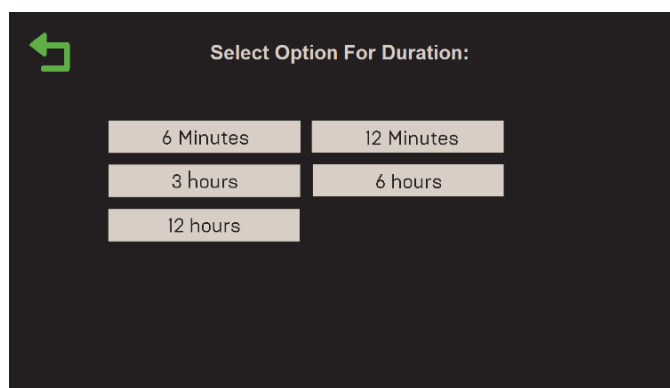


Figure 5-7: Trending: Select Logging Duration Screen – Slow Logging

SECTION 5: Trending

4. Press **Back** to return to the **Slow Logging Settings** screen. Any new selection will create a new plot; the previous selection will be deleted.
5. Press the **Back** button to return to the Slow Logging parameters screen.
6. Press the **Plot** button to create the new graph.



Figure 5-8: Trending: Select Logging Duration Screen – Slow Logging

7. Once the graph has been created, you can return to it any time by going to: **Main Menu → Trending → Slow Logging Graph.**

SECTION 6: ADVANCED SETUP

The **Advanced Setup** screen provides access to specific parameters. It is accessed by pressing **Advanced Setting** on the **Main Menu**.



Figure 6-1: Advanced Setting Screen

This Section includes the following topics:

6.1 Access

6.2: Unit

- [6.2.1: Unit Settings](#)
- [6.2.2: Front Panel Configuration](#)
- [6.2.3: Save and Transfer Settings](#)
- [6.2.4: Fault Management](#)
- [6.2.5: Freeze Protection](#)
- [6.2.6: Unit Application Configuration](#)
- [6.2.7: Firmware Update](#)
- [6.2.8: Maintenance](#)

6.3: BST Cascade

- [6.3.1: Cascade Configuration](#)
- [6.3.2: Cascade Communication](#)
- [6.3.3: BST Application Configuration](#)
- [6.3.4: Operating Controls](#)
 - [6.3.4.1: Sequencing Controls](#)
 - [6.3.4.2: Anti-Cycling Control](#)
 - [6.3.4.3: Temperature Control](#)
 - [6.3.4.4: Valve Configuration](#)
 - [6.3.4.5: Reserve Unit Control](#)
 - [6.3.4.6: Setpoint Range](#)
 - [6.3.4.7: Lead/Lag](#)
 - [6.3.4.8: Valve Balancing](#)
- [6.3.5: SmartPlate Communication](#)

6.4: Communication & Failsafe

- [6.4.1: BAS \(Building Automation System\)](#)
- [6.4.2: onAER](#)
- [6.4.3: Smart Devices](#)
- [6.4.4: Ethernet](#)
- [6.4.5: Communication Failsafe](#)

6.5: Ancillary Device

- [6.5.1: Interlocks](#)
- [6.5.2: Relays](#)
- [6.5.3: Analog Outputs](#)
- [6.5.4: Analog Inputs](#)

6.6: Performance

- [6.6.1: AERtrim](#)
 - [6.6.1.1: AERtrim Settings](#)
 - [6.6.1.2: AERtrim Parameters](#)
 - [6.6.1.3: AERtrim Status](#)
- [6.6.2: Temperature Controls](#)
 - [6.6.2.1: PID Setting](#)
 - [6.6.2.2: Temperature Conformance](#)
 - [6.6.2.3: Setpoint Range](#)
- [6.6.3: Fire Control](#)
 - [6.6.3.1: Purge Control](#)
 - [6.6.3.2: Ignition Control](#)
 - [6.6.3.3: Operation Control](#)
 - [6.6.3.4: Anti-Cycling Control](#)

6.7: Stack Guard Configuration (CFR Boilers only)

⚠ WARNING:

Before starting the instructions in this section for the first time, ensure that the unit has the latest Edge firmware. See [Section 6.2.7: Firmware Update](#).

6.1 Access

The **Enter Password** screen allows you to log in to the system. As mentioned in Section 1.6, there are multiple passwords, each granting a specific level of access.

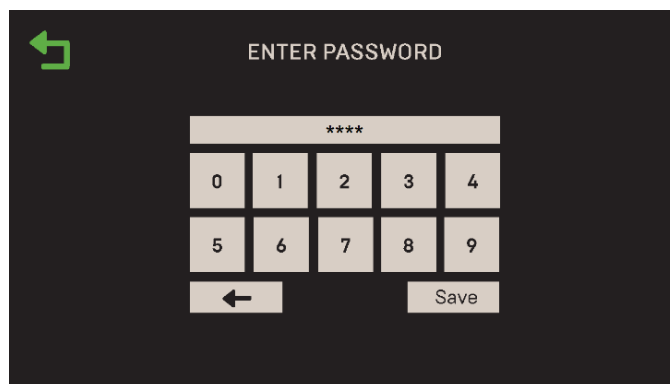


Figure 6-2: Advanced Setup: Enter Password Screen

1. Go to: **Main Menu → Advanced Setup → Access**. The Enter Password screen appears.
2. The password for AERCO Trained Technicians is **159**. Enter **159** or the password you have been given, then press **Save**.

6.2 Unit

The **Unit** screen provides access to parameters specific to the single unit. Note, some parameters were set at the factory prior to shipping and cannot be changed.

NOTE: You can navigate from one **Unit** screen to the next using the **Page Left** and **Page Right** icons.

1. Go to: **Main Menu → Advanced Setup → Unit**.

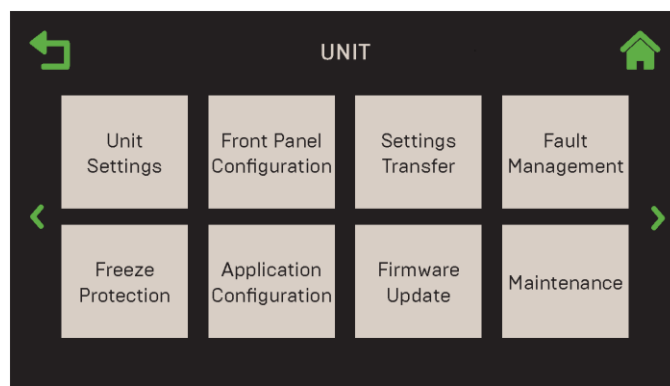


Figure 6-3: Advanced Setup: Unit Screen

NOTE: The Application Configuration button is enabled only if Unit Mode (in the **Advanced Setup → BST Cascade → Cascade Configuration**) = **Off**.

6.2.1 Unit Settings

The **Unit Settings** screens displays a list of parameters and controls on several pages. Many of the parameters were set at the factory before shipping and should not be changed.

1. Go to: **Main Menu → Advanced Setup → Unit → Unit Settings.**

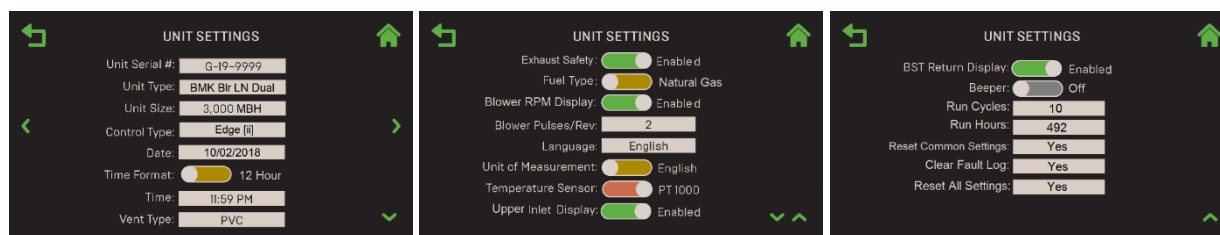


Figure 6-4: Unit: Unit Settings Screens (Benchmark)

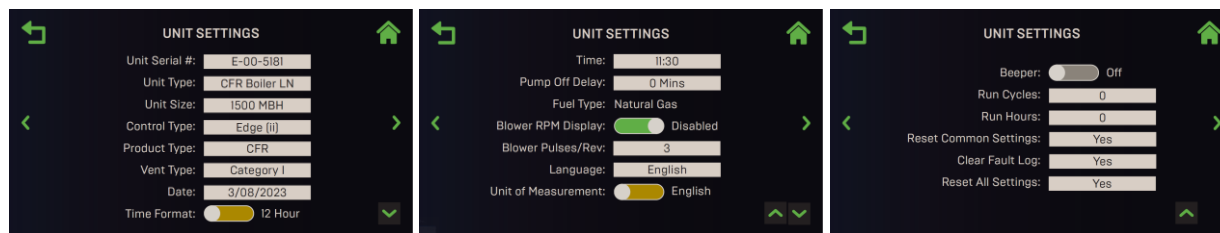


Figure 6-5: Unit: Unit Settings Screens (CFR)

2. The following fields are available:

- **Unit Serial #:** Displays the unit's factory-set serial number in a unique format of G-YY-ZZZZ or N-YY-ZZZZ. Do **NOT** change except if replacing the Edge Controller. The format is:
 - **G:** A letter specific to Benchmark 750-4000 boilers and Innovation Water Heaters. The letter **N** is specific to Benchmark 5000 & 6000 boilers.
 - **YY:** The two-digit year
 - **ZZZZ:** A sequential 4-digit serial number.
- **Unit Type:** Displays AERCO products/models. Do **NOT** change unless replacing Controller.
 - KC Boiler
 - BMK Boiler Std
 - BMK Boiler LN
 - KC Boiler LN
 - BMK Boiler Std Dual
 - BMK Boiler LN Dual
- **NOTE:** For CFR boiler, the only **Unit Type** available is CFR BOILER LN
- **Unit Size:** Displays available sizes for the given **Unit Type**. Do **NOT** change unless replacing the Edge Controller.
- **Control Type:** Specifies the controller: **Edge [ii]** or **Edge [i]**. Do **NOT** change unless replacing the Edge Controller with an Edge [i] Controller.
- **Date & Time:** Allows you to set the date and time. The **Time Format** control allows you to select 12- or 24-hour format.

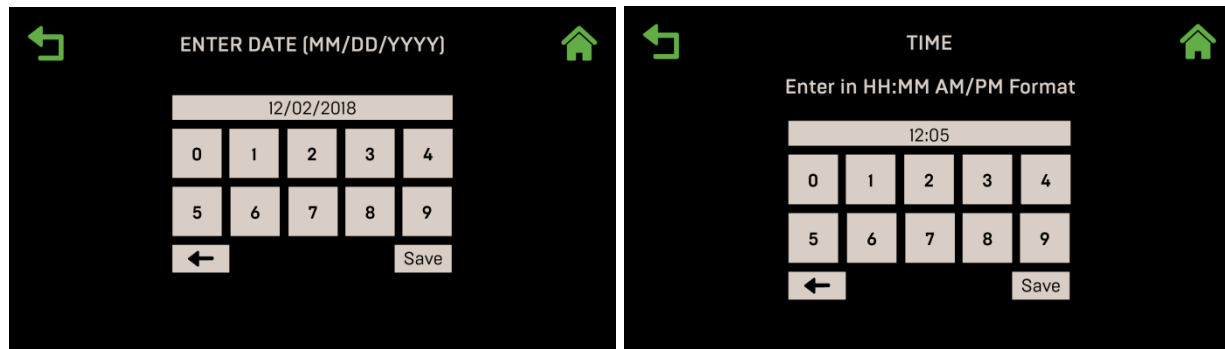


Figure 6-6: Unit: Enter Date & Time Screens

- **Time Format:** Choose the **12 Hour** or **24-Hour** format.
- **Vent Type:** Select from unit-type-specific venting options: **PVC**, **cPVC**, **Polypro** or **Stainless Steel**. For CFR boilers, the available venting type is Category I.
- **Pump Off Delay Exhaust Safety:** If enabled, this parameter protects the unit and exhaust vent from excessively high exhaust temperatures. When exhaust temperature exceeds any of three limits, an action is taken, as shown in the table below. The limits depend on the vent material specified in **Vent Type** (Stainless Steel has no limit).

TABLE 6.2.1: Exhaust Safety Temperature Limits				
Limit Type	Result Action	Vent Material		
		PVC	CPVC	Polypro
Caution Limit	Display Warning	158°F	210°F	215°F
High Temp Limit	Reduce Fire Rate	170°F	220°F	220°F
Fault Limit	Unit Shut Down	180°F	230°F	230°F

- Note: Exhaust Safety Temperature Limits are only applicable for Benchmark boilers. For CFR boilers, it is necessary to maintain a minimum flue temperature to prevent condensation in the Category I stack. See section 6.7 for details.
- **Fuel Type** or **Primary Fuel** (Dual Fuel models only): Choose either **Natural Gas** or **Propane**. This option is not available for all unit types.
- **Secondary Fuel** (Dual Fuel models only): Displays the alternative to **Primary Fuel**.
- **Blower RPM Display:** If set to **Enabled** the following parameter appears:
 - **Blower Pulses/Rev:** Specifies the number of blower pulses per revolution, based on the tachometer output of the blower. Setting above 0 is only practical in units with blowers that have a tachometer output. (Range: 0 to 100)
- **Language:** Choose from available language options: **English**, **Spanish**, **French**.
- **Unit of Measurement:** Choose the unit of measure the Controller will use, either **Metric** (°C, lps, Pa) or **English** (°F, gpm, in. W.C., psi). The corresponding LED indicator on the Controller's front face, °F or °C, lights (see Figure 6.2.2-1, below).
- **Temperature Sensor:** Specifies the sensor type: **PT1000** (the default on all current units) or **Balco**. DO NOT CHANGE unless replacing a C-More Controller on legacy units equipped with Balco sensors.
- **Upper Inlet Display:** Set to **Disabled** if you want to hide the Inlet 2 temperature for units with dual inlets where the upper inlet is not utilized. **Upper Inlet Display** is only applicable to Benchmark boilers; it is not applicable to CFR boilers.

SECTION 6: Advanced Setup

- **BST Return Display:** Enables/ disables display of the BST Return Header sensor. It should be enabled only when utilizing a BST return header sensor. **BST Return Display** is only applicable to Benchmark boilers; it is not applicable to CFR boilers.
- **Beeper:** Enables/disables the audible fault alarm.
- **Run Cycles/Run Hours:** Displays the number of run hours/run cycles since the last system reset. Both can be reset to 0 (or any other number).
- **Reset Common Settings:** To reset “common” settings and restored default values, press **Yes**, then press **Yes** again when asked to confirm. See [Section 6.2.3](#) .
- **Clear Fault Log:** To clear the Unit Event History (see [Section 7.7 Unit Event History](#)), press **Yes**, then press **Yes** again when asked to confirm.
- **Reset All Settings:** To reset all settings and restored default values, press **Yes**, then press **Yes** again when asked to confirm.

6.2.2 Front Panel Configuration

The **Front Panel Configuration** screen allows you to modify the Controller’s front panel and the touchscreen timeout setting.

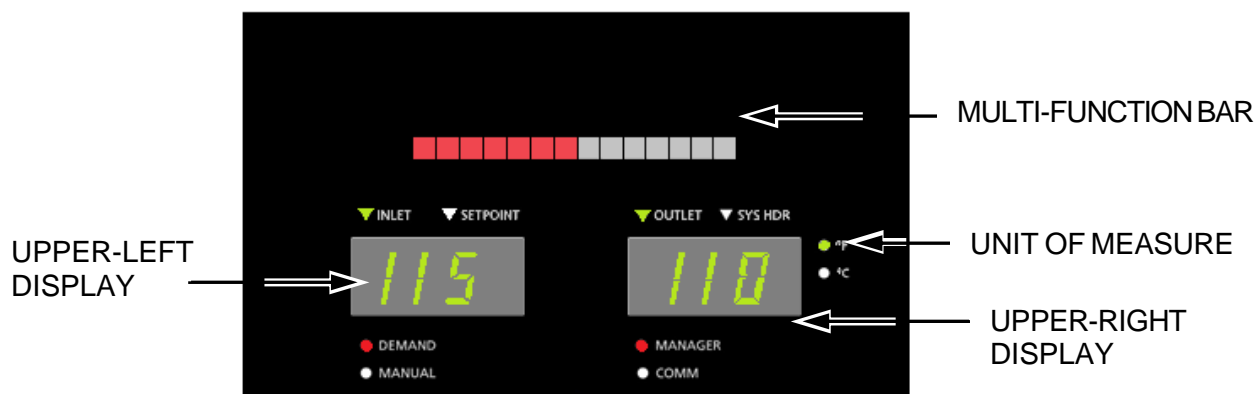


Figure 6-7: Unit: Controller Front Panel – Upper Portion

1. Go to: **Main Menu → Advanced Setup → Unit → Front Panel Configuration.**

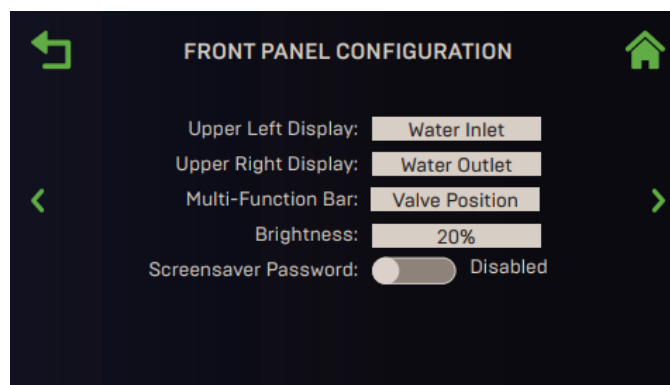


Figure 6-8: Unit: Front Panel Configuration Screen

2. The following fields are available:

Upper Left Display: Choose between: **Setpoint** and **Water Inlet**

Upper Right Display: Choose between: **Water Outlet** and **System Header**

Multi-Function Bar: Choose Multi-Function Bar display: **Fire Rate** or **Valve Position**.

Brightness: Touchscreen brightness (range: 10 to 100%)

Screensaver Password: Determines whether **all** users need a password to access functionality. See [Section 1.4](#).

Screen Timeout: Specifies touchscreen timeout in minutes. (Range: 3 to 90 min.)

Screen Timeout Now: Setting to **Yes** puts the screen into sleep mode. The **Enter Password** screen appears.

6.2.3 Save and Transfer Settings

The Edge Controller includes functionality for saving a unit's current setup, which creates a backup of the state of all user-configurable parameters. It can be saved to either:

- The Controller's internal memory
- To a USB device plugged into the USB port on the side of the Controller.

Once saved, the complete setup can be restored on the same unit or transferred to one or more other units. This second option is particularly useful when setting up a BST cascade; the first "client" unit is setup, configured and fully tested, then its setup is transferred to all the other "client" units **of the same unit type**. It can also be used to recover if a setup becomes corrupted, either through hardware malfunction or operator error.

⚠ WARNING:

When transferring to/from BST Client or BST Manager units, note the following:

- Client and Manager units use separate setup files; Client units require a Client setup file, and Manager units require a Manager setup file.
- If loading the setup from a USB device, the device can have only **Client** or **Manager** setup files on it but **cannot** have both files on the same device.
- When saving a setup file, each unit produces a file with a unique name based on unit serial number; that name never changes. A USB device can have multiple Client or Manager files (but not both) for multiple units, but only one for each unit. Creating a new setup file on the Controller's memory or a USB device will overwrite the existing copy.

1. Go to: **Main Menu → Advanced Setup → Unit → Settings Transfer**. If necessary, enter password 159 or your password.

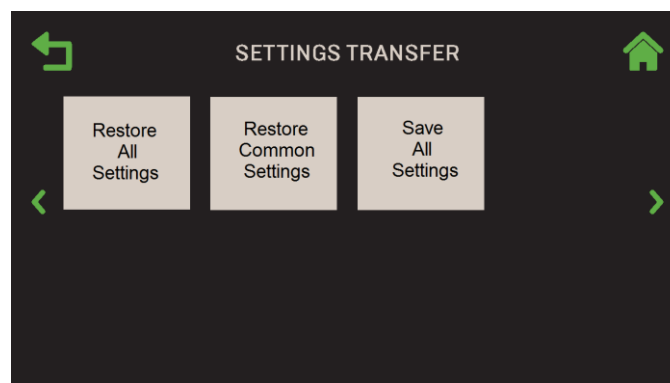


Figure 6-9: Unit: Settings Transfer Screen

2. Choose one of the following:

- To **save** the current settings, press **Save All Settings** and then complete the instructions in [Section 6.2.3.1: Save Settings](#). AERCO strongly recommends using this option periodically to guard against the need to perform a time-consuming recreation of the original setup
- To **restore** settings, choose one of the **Restore** options and then complete the instructions in [Section 6.2.3.2: Restore Settings](#).
 - **Restore All Settings:** This is appropriate when restoring settings that were saved on a unit and are only appropriate for that unit.
 - **Restore Common Settings:** Restores settings common to all units of the same type. This is appropriate when one unit has been setup and you want to copy its settings and parameters to additional units of the same type in a BST cascade.

6.2.3.1 Save Settings

If you chose **Save All Settings** in the previous section, complete the following steps to save the unit's current setup, which includes the current state of all settings/parameters.

1. The **Save Destination** screen appears. This option saves all unit settings and parameters.

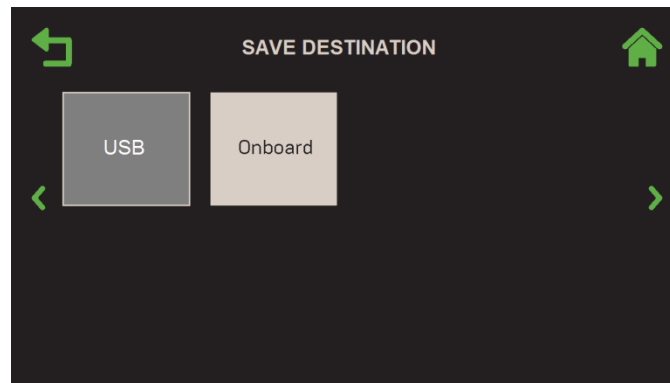


Figure 6-10: Unit: Save Source Selection

2. Chose where you want to save the current settings:

- **Onboard:** Saves the current setup file to the Controller's onboard memory.
- **USB:** This option is available only if an unencrypted USB device is plugged into the Controller's USB port; if no USB device is plugged in, it is greyed-out, as shown above. You can use the same USB device used in Section 6.2.7.1 to obtain the latest firmware.

NOTE: Each unit produces a setup file with a unique name based on the unit's serial number. If that setup file has already been saved to the Controller's memory or a USB device, **this step will overwrite it!**

3. If the setup was successfully saved, **Save Succeeded** appears; press **Continue** to proceed. If it failed, **Save Unsuccessful** appears. If successful, press **Continue** to proceed.

6.2.3.2 Restore Settings

If you chose **Restore All Settings** or **Restore Common Settings** in Section 6.2.3, one of the **following** screens appears:

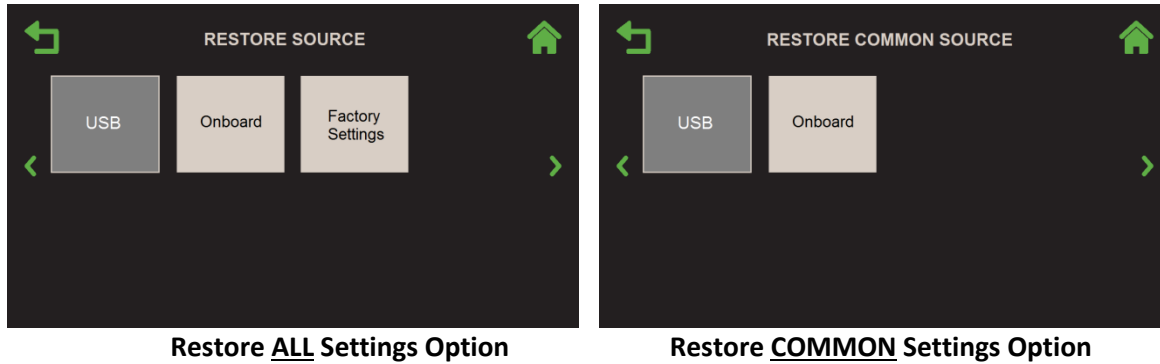


Figure 6-11: Unit: Restore Source/Common Screens

1. Choose where the setup was saved (see [Section 6.2.3.1: Save Settings](#)):
 - **USB:** If the setup was saved to a USB device plugged into the Controller's USB port.
 - **Onboard:** If the setup was saved to the Controller's onboard memory.
 - **Factory Settings:** Restores the original setup performed at the factory, overwriting parameters that were manually configured after the unit was installed.

⚠ WARNING:
THIS STEP WILL OVERWRITE THE PREVIOUS SETUP!

2. The **Overwrite Calibration** screen now appears. Press **Yes** to overwrite the existing combustion calibration. If you press **No**, the existing combustion calibration data is retained.

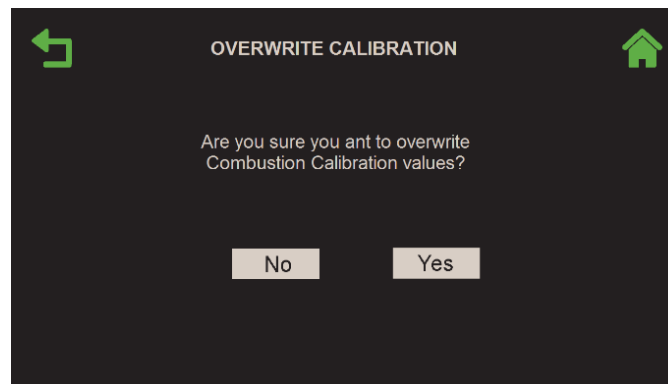


Figure 6-12: Unit: Load Settings Screen

3. The settings on the USB device are uploaded to the unit, overwriting the existing settings. The **Restore Succeeded** screen appears if the restore was successfully, and the unit then reboots in about 5 seconds. If there was a problem, the **Restore Failed** screen appears.

6.2.4 Fault Management

The **Fault Management** screen controls whether the fault condition reset mode is automatic or manual.

1. Go to: **Main Menu → Advanced Setup → Unit → Fault Management.**

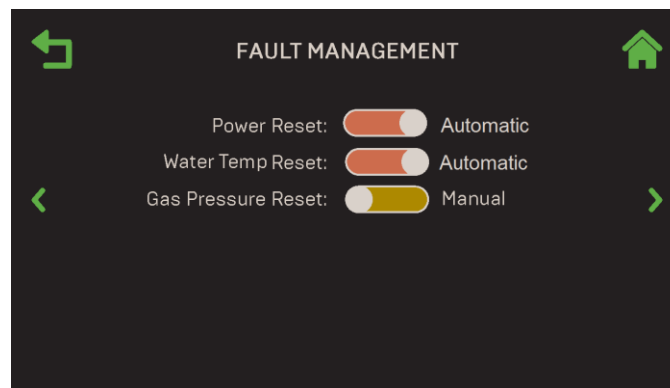


Figure 6-13: Unit: Fault Management Screen

2. Choose the desired reset mode, **Manual** or **Automatic**, for all three fault conditions.
 - **Power Reset:** Loss of electrical power.
 - **Water Temp Reset:** Supply water temperature exceeds specified tolerance. Applies only to the internal settings of the Controller, **not** to the Manual High Temp Safety Limit switch.
 - **Gas Pressure Reset:** Gas pressure outside specified tolerance (model specific).

6.2.5 Freeze Protection

This screen contains parameters that can prevent damage due to freeze conditions.

1. Go to: **Main Menu → Advanced Setup → Unit → Freeze Protection.**

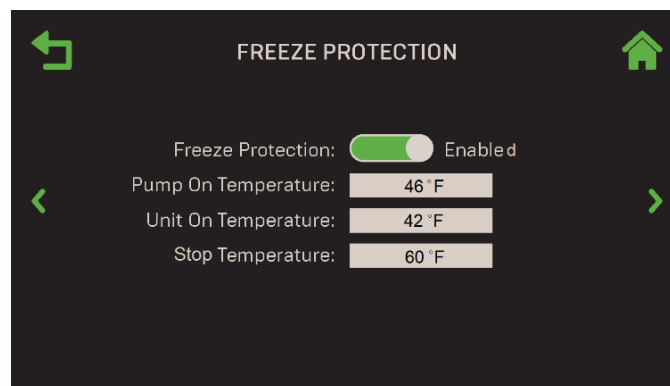


Figure 6-14: Unit: Freeze Protection Screen – Shown Enabled

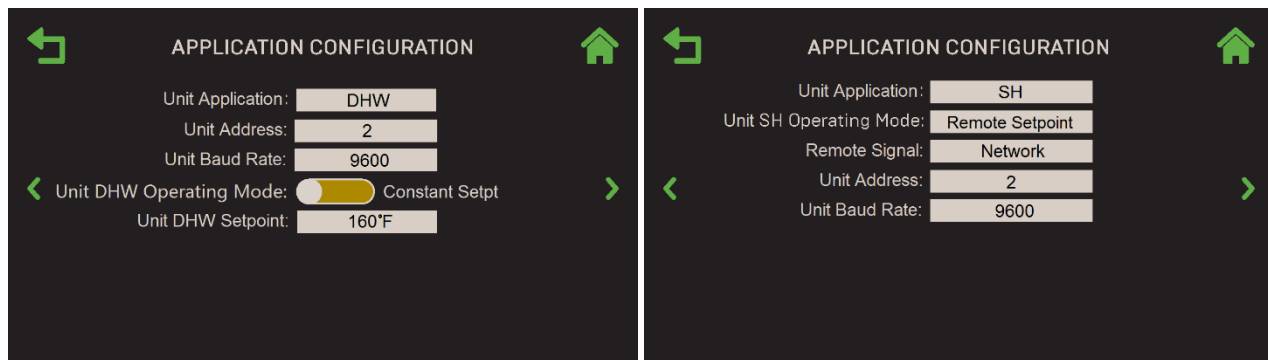
2. If desired, set **Freeze Protection** to **Enabled**. Once **Enabled**, the following parameters determine when the unit will shut off and restart:
 - **Pump On Temperature:** Ambient temperature below this value triggers system pump to start. (Range: 20 to 50°F)
 - **Unit On Temperature:** Ambient temperature below this value triggers the unit to fire. (Range: 20 to 45°F)
 - **Stop Temperature:** Ambient temperature above this value returns system to normal operation. (Range: 20 to 70°F)

6.2.6 Unit Application Configuration

This screen shows operating mode, temperature and setpoint parameters for Standalone units.

- This option is disabled (greyed out) if **Unit Mode = BST Client** or **BST Manager** in [Section 6.3.1: Cascade Configuration](#), below (it appears only if **Unit Mode = Off**).
- Some parameters below appear in EZ Setup (see Section 2). EZ Setup walks you through a full configuration while this screen allows you modify individual parameters.

1. Go to: **Main Menu → Advanced Setup → Unit → Application Configuration**.
2. Choose the **Unit Application** for this unit: **SH**, **DHW** or **Other** (**Other** is only applicable to Benchmark boilers; it is not available on CFR boilers).



Unit Application = DHW

Unit Application = SH

Figure 6-15: Unit Application Configuration

3. Depending on the Application chosen above, one of five **Operating Modes** appears. Choose the **Operating Mode** appropriate for the unit:

TABLE 6.1: Operating Modes			
Available Operating Modes	Application		
	SH	DHW	Other
1 Constant Setpoint	✓	✓	✓
2 Remote Setpoint	✓	✓	✓
3 Direct Drive	✓		
4 Combination	✓		
5 Outdoor Reset	✓		

4. Depending on the Application and Operating Mode chosen in Steps 2 and 3, a number of additional parameters appear. The table below shows which parameters appear for each combination of **Application** and numbered **Operating Mode**.

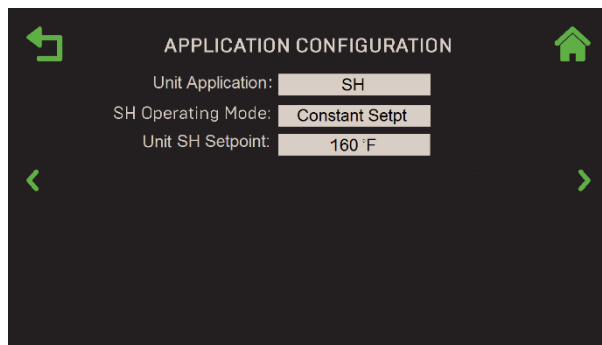
TABLE 6.2: Unit Application Configuration Parameters										
Available Parameters		Unit Applications & Operating Modes (see table above)								
		SH					DHW		Other	
		1	2	3	4	5	1	2	1	2
1	Unit SH Operating Mode	✓	✓	✓	✓	✓				
2	Unit DHW Operating Mode						✓	✓		
3	Unit Other Operating Mode								✓	✓
4	Unit SH Setpoint	✓								
5	Remote Signal		✓	✓	✓					
7	Unit Address	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Unit Baud Rate	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Unit DHW Setpoint				✓		✓			
10	Analog Input Source 1							✓		✓
	10 a Name ¹							✓		✓
11	Unit DHW Remote Signal							✓		
12	Unit Other Setpoint								✓	
13	Unit Other Remote Signal									✓
14	Outdoor Air Temp Sens					✓				
	14a BST Outdoor Temp 2					✓				
	14b Warm Weather Shtdwn ²					✓				
15	OAR Min Outside Temp					✓				
16	OAR Max Setpoint					✓				
17	OAR Max Outside Temp					✓				
18	OAR Min Setpoint					✓				
19	Outdoor Rst Setpt					✓				

¹ Unit DHW Operating Mode = Remote Setpt

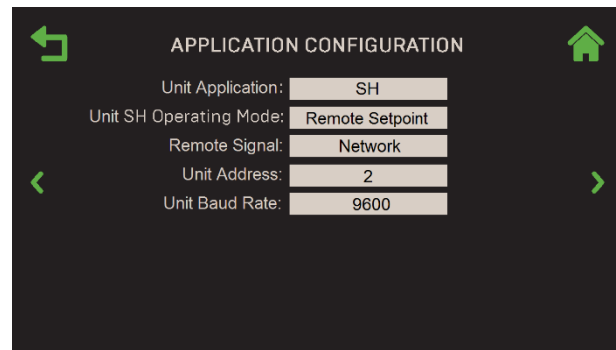
² Outdoor Air Temp Sens ≠ OFF

5. The following parameters apply only if the unit communicates with an ACS or BMS system; they appear for all Applications and Operating Mode selections:
- A. **Unit Address:** The number the unit will be known by the ACS or BMS system. (1-127)
 - B. **Unit Baud Rate:** Choose the communication rate: **9600, 19200, 38400** or **115200**.

6. If **Unit Application** = SH, chose one of the five **Unit SH Operating Modes**:



Unit SH Operating Mode = Constant Setpoint



Unit SH Operating Mode = Remote Setpoint

Figure 6-16: Unit Application Configuration, Application = SH

- A. If **Unit SH Operating Mode** = **Constant Setpt**, specify the space heating setpoint in the **Unit SH Setpoint** parameter. (Benchmark boilers — 60°F to 180°F; CFR boilers—140°F to 180°F)
- B. If **Unit SH Operating Mode** = Remote Setpoint, Combination or Direct Drive, the Remote Signal parameter appears. Choose the source of the signal:
 - 4-20mA
 - BST (PWM) Input (Benchmark only)
 - 1-5V
 - BAS
 - 0-20mA
 - Network
 - 0-5V
- C. If **Unit SH Operating Mode** = **Combination**, the **Unit DHW Setpoint** parameter appears; specify the setpoint for DHW operation. (Range: Benchmark boilers — 60°F to 180°F; CFR boilers—140°F to 180°F)

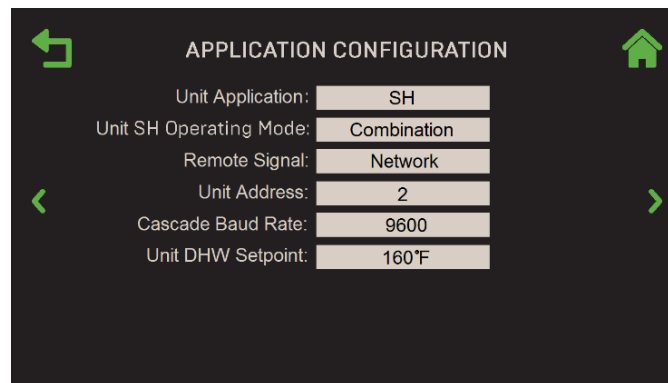


Figure 6-17: Unit Application Configuration, Application = SH

- D. If **Unit SH Operating Mode** = **Outdoor Reset**, the following OAR (outdoor air reset) parameters appear:

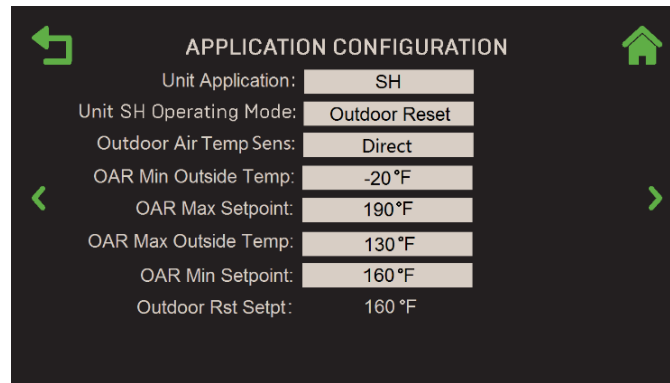
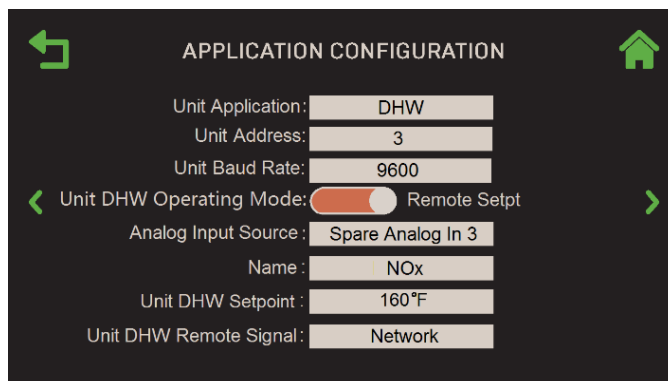


Figure 6-18: Unit Application Configuration, Application = SH

- **Outdoor Air Temp Sens:** Choose the Outdoor Sensor signal type: **Network**, **Direct**, **BAS** or **Off**. For all options except **Off**, the following additional parameters appear:
 - **BST Outdoor Temp:** A read-only display indicating how the unit communicates with the Outdoor Air Temp Sensor.
 - **Warm Weather Shutdown:** The threshold outside temperature above which the unit shuts down. (Range: 30°F to 120°F)
- **OAR Min Outside Temp:** Specifies the minimum outside air temperature the system will read; it interacts with the OAR Max Setpoint. For example, if **OAR Min Outside Temp** is set to -5°F and **OAR Max Setpoint** is 180°F, when the outside temperature is -5°F or below, the system will supply 180°F.
(Range: -40°F to 140°F, Default = -20°F)
- **OAR Max Setpoint:** The *maximum* allowable setpoint
(Range: Benchmark boilers — 20 or **OAR Min Setpoint** to 210°F, Default = 190°F; CFR boilers — 140 or **OAR Min Setpoint** to 210°F, Default = 190°F)
- **OAR Max Outside Temp:** Outdoor Air Reset Maximum Outside Temperature that the system will operate to. For example: if set to 60°F, the boiler will operate between 60°F outside temperature and OAR Min Outside Temp setting.
(Range: -40°F to 140°F, Default = 130°F)
- **OAR Min Setpoint:** The *minimum* allowable setpoint.
(Range: Benchmark boilers — 20°F to 210°F or **Max Setpoint**, Default = 160°F; CFR boilers — 140°F to 210°F or **Max Setpoint**, Default = 160°F)
- **Outdoor Rst Setpt:** A read-only display of the current outdoor reset setpoint, based on the four OAR parameters configured above.

7. If **Unit Application** = DHW, choose the **Unit DHW Operating Mode** for the unit, either Constant Setpt or Remote Setpt.



The screenshot shows the 'APPLICATION CONFIGURATION' screen with the following settings:

- Unit Application: DHW
- Unit Address: 3
- Unit Baud Rate: 9600
- Unit DHW Operating Mode: Remote Setpt (selected via a toggle switch)
- Analog Input Source: Spare Analog In 3
- Name: NOx
- Unit DHW Setpoint: 160°F
- Unit DHW Remote Signal: Network

Figure 6-19: Unit Application Configuration, Unit DHW Remote Signal = Network

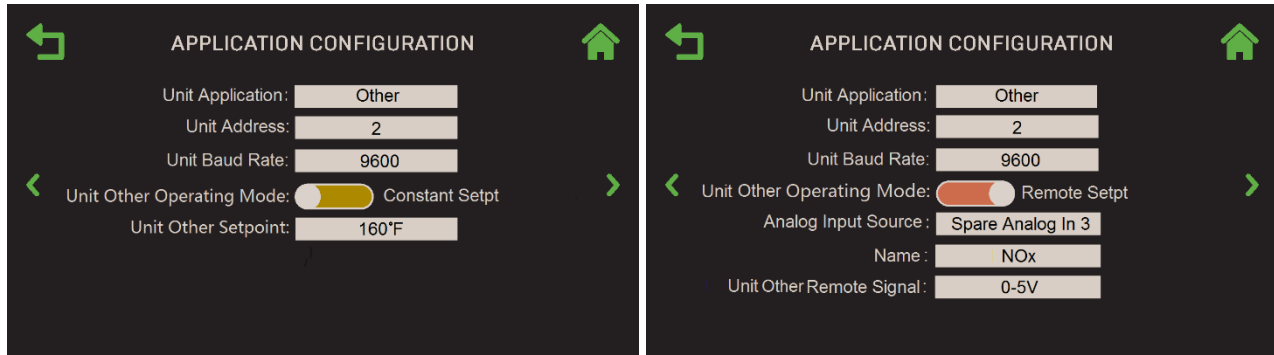
- A. If **Unit DHW Operating Mode** = **Constant Setpt**, specify the setpoint for DHW operation in the **Unit DHW Setpoint** parameter. (Range: Benchmark boilers — 80°F to 160°F; CFR boilers — 140°F to 180°F)
- B. If **Unit DHW Operating Mode** = **Remote Setpt**, the following additional parameters appear:
- **Analog Input Source:** Select the source for the remote setpoint: Benchmark boilers — **Spare Analog In 1**, **Spare Analog In 2**, **Spare Analog In 3**; CFR boilers — **Spare Analog In 1**.
 - **Name:** CFR boilers — Remote Setpoint; Benchmark boilers — choose the name to associate with the analog input:
 - Not Assigned
 - Swing V1 Fdbk
 - Blr VSP Fdbk
 - SmartPlate VP
 - Remote Setpt 2
 - Swing V2 Fdbk
 - DHW VSP Fdbk
 - NOx

NOTE: The **Analog Input Source** and **Name** parameters also appear in Step 8b, below, and in [Section 6.5.4: Analog Inputs](#). Changing them in any one changes them in the others.

- **Unit DHW Remote Signal:** Choose the signal type of the selected device:
 - 1-5V
 - Network
 - 0-5V
 - BAS

8. If **Unit Application** = Other, choose one of two **Unit Other Operating Mode**, either Constant Setpt or Remote Setpt.

NOTE: **Unit Application** = Other only applies to Benchmark boilers (not available on CFR boilers).



Unit Other Operating Mode = Constant Setpoint

Unit Other Operating Mode = Remote Setpoint

Figure 6-20: Unit Application Configuration, Unit Application = Other

- A. If **Unit Other Operating Mode** = **Constant Setpt**, specify the “other” setpoint in the **Unit Other Setpoint** parameter. (Range: 70°F to 180°F)
- B. If **Unit Other Operating Mode** = **Remote Setpt**, the following additional parameters appear:
 - **Analog Input Source:** Select the source for the Analog Input: **Spare Analog In 1, Spare Analog In 2, Spare Analog In 3.**
 - **Name:** Choose a name to associate with the analog input:
 - Not Assigned
 - Swing V1 Fdbk
 - Blr VSP Fdbk
 - SmartPlate VP
 - Remote Setpt 2
 - Swing V2 Fdbk
 - DHW VSP Fdbk
 - NOx

NOTE: The **Analog Input Source** and **Name** parameters also appear in Step 7b, above, and in [Section 6.5.4: Analog Inputs](#). Changing them in any one changes them in the others.

- **Unit Other Remote Signal:** Choose the source of the signal:
 - 4-20mA/1-5V
 - 0-20mA/0-5V
 - Network
 - BAS

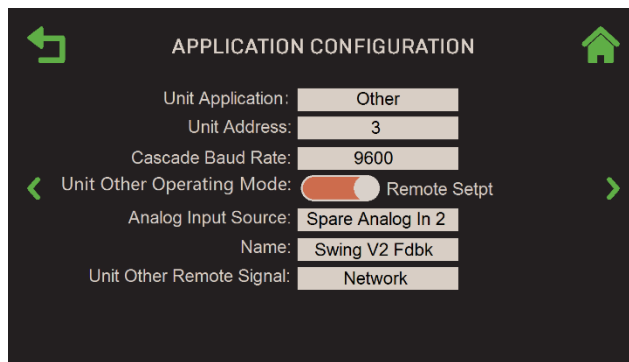


Figure 6-21: Unit: Application Configuration, Unit Other Remote Signal = Network

"Pump Off Delay" is the last setting in the Unit Application Configuration menu.

6.2.7 Firmware Update

When AERCO releases a new Controller firmware version, there are two options for obtaining it; both require the firmware to first be downloaded to a USB device:

Option 1: Download it to an external computer and then save it on a USB device – See [Section 6.2.7.2: Download to an External Computer](#).

Option 2: Download it via an Ethernet cable directly to a USB device plugged into the side of Controller – See [Section 6. 2.7.3: Download Directly to a USB Plugged Into the Controller](#)

Once the firmware is on the USB device, that device is then plugged into the side of the Controller and the Controller then performs the update.

However, the procedure for upgrading the Edge Controller also depends on the current version of the BootLoader, a component used during firmware updates. The Edge Controller on all new Benchmark Boilers and Innovation Water Heaters are equipped with the latest AERCO Intelligent BootLoader (V1.00 or later), however some older Benchmark units may still contain the original BootLoader.

There are 3 ways to tell what BootLoader Version you have.

1. Go to **Main Menu → Diagnostic → System → Versions**. The BootLoader version is shown on the 2nd page of this screen.
2. If the BootLoader screen blinks white, the version is **older** than V1.00
3. While the BootLoader is running, its version is displayed in the top-left numeric display.

If your Controller has an older BootLoader, you can obtain the BootLoader Upgrade Kit, P/N **69335-10** from AERCO, then install it per the instructions in the Technical Instruction Document (TID-0219) included with the kit.

NOTE: A BootLoader update is not mandatory. The older BootLoader will work but *cannot* use named files shown below; instead, it must always use the file named **edgelmage.hex**. Additionally, the unit may not support all USB device types. If the BootLoader update is not performed, ensure that your USB device works in the Edge Control by listening for the beep when it is inserted, or going to **Main Menu → Diagnostic → Comm and Network → USB Storage** and verify that the **Status** is **Present**.

The Intelligent BootLoader automatically distinguishes between Benchmark Boiler and Innovation Water Heater files loaded on the same USB device, and then loads the proper file for that unit. The Firmware file names are stored onto the USB device in the following format:

- BMK_V509014_Boiler Firmware
- INN_V509014_Water Heater Firmware

The Intelligent BootLoader looks for the appropriate file on the USB device **and** looks for the most recent version of that firmware. For Example, a USB device could contain the following files:

1. BMK_V509014_Boiler Firmware
2. BMK_V509015_Boiler Firmware
3. BMK_V509016_Boiler Firmware
4. INN_V419017_Water Heater Firmware

A Benchmark Boiler equipped with the Intelligent BootLoader will look for the Benchmark files and always pick Item #3, the Benchmark firmware file with the most recent version number. An Innovation Water Heater will look for and always pick item #4, the Innovation firmware file.

NOTE: The Intelligent BootLoader is backward compatible with earlier firmware versions; it will load firmware files named **edgelmage.hex** if it can't find the relevant BMK or INN file.

In addition, the **Unit Settings** screen now contains a **Product Type** parameter, which displays either **BMK** or **INN**, depending on which firmware type is currently loaded.

6.2.7.1 Preparing for Firmware Update

Complete the following steps to save the unit's current setup, which includes the current state of all settings/parameters. The setup will be restored *only if necessary*, as described in [Section 6.2.7.5](#).

1. Remove the unit's front panel, to expose the USB port on the Controller's left side.
2. On the Edge Controller, go to: Main Menu → Advanced Setup → Unit → Settings Transfer.

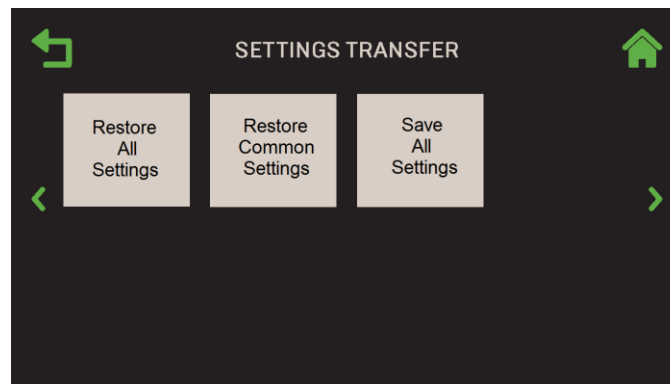


Figure 6-22: Unit: Settings Transfer Screen

3. Choose **Save All Settings**; the Save Destination screen appears.

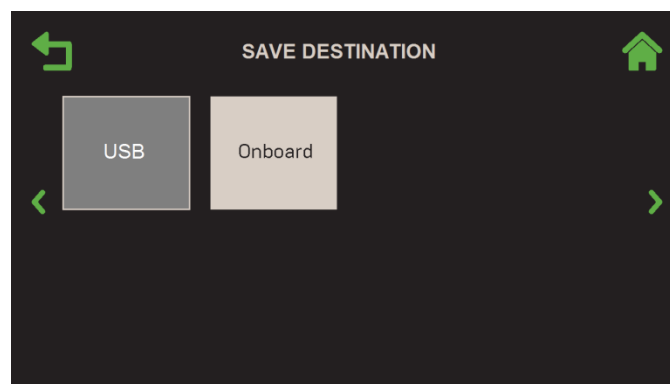


Figure 6-23: Unit: Save Source Selection

4. Chose where you want to save the current setup:

- **Onboard:** Saves the current setup file to the Controller's onboard memory.
- **USB:** This option is available only if an un-encrypted USB device is plugged into the Controller's USB port; if no USB device is plugged in, it is greyed-out, as shown above.

NOTE: Each unit produces a setup file with a name unique to that unit that never changes. If that setup file has already been saved to the Controller's memory or a USB device, **this step will overwrite that file**. However, a USB device can hold multiple setup files for multiple units.

5. If the setup was successfully saved, the **Save Succeeded** screen appears; press **Continue** to proceed. If it failed, a **Save Unsuccessful** screen appears.

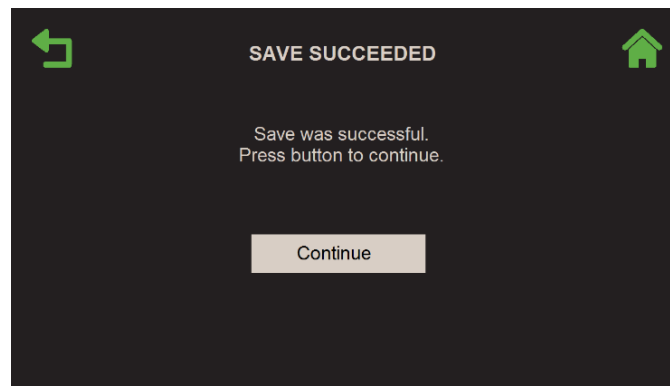


Figure 6-24: Save Succeeded Screen

6. Before initiating the firmware update, write down the following important settings on a piece of paper or take a screenshot. You will do a spot check of these values after the update.

- Serial Number and Unit Type in **Main Menu → Advanced Setup → Unit → Unit Settings**.
- Combustion Calibration Summary in **Main Menu → Calibration → Combustion Summary**.
- Application Setup** in **Main Menu → EZ Setup**. See summary in first screen, then abort.

The Controller is now ready for the firmware update. Complete the instructions in *one* of the next two sections below, depending on how the firmware will be downloaded:

- If the unit connects to the Internet via an Ethernet cable or Wi-Fi, complete [Section 6.2.7.3](#).
- If the unit does **not** have a direct connect to the Internet, complete [Section 6.2.7.2](#).

6.2.7.2 Download to an External Computer

If the unit does **not** have a direct Internet connection via Ethernet cable or Wi-Fi, an AERCO Trained Technicians (ATT) or AERCO Master Technicians (AMT) must download the firmware from the AERCO web site to an **un-encrypted** USB device on an external computer. If you are **not** an ATT or AMT, contact your local AERCO sales representative and request a copy of the latest Edge Controller firmware.

⚠ WARNING:

All instructions below *must* be carried out on a computer that can write to un-encrypted USB devices and *must* be performed using an **un-encrypted** USB device. Note, not all USB devices will work; they must be FAT32, and generally 32 GB or less (available from AERCO).

If you are an ATT or AMT, complete the following instructions to obtain the latest Edge firmware.

1. Plug the USB device into an external computer that can write to un-encrypted USB devices.
2. Go to the following URL: <http://learning.aerco.com>.
3. If you do not already have an account on this site, create one before continuing.
4. Scroll down the left navigation pane and open the **Edge Firmware** folder.
5. Copy the Edge Controller firmware file(s) to the root directory (not a sub-folder) of your USB device. If the folder contains updated **Graphics**, **I/O Board** and/or **Display** files, copy all these files to the root directory without changing their names (unless instructed to do so). If your unit has a BootLoader version prior to V1.00, you must download the file named **edgelimage.hex**.

NOTE: If your unit(s) all have the new Intelligent BootLoader (V1.00 or later), both Innovation and Benchmark files can be copied on to the same USB device. The download only needs to be performed once on a single USB device; that device can then be used to update all boilers and/or all water heaters.

6. You are now ready to update the Controller. Skip to [Section 6.2.7.4: Updating the Controller's Firmware](#). If needed, refer to the release notes for a running revision history.

6.2.7.3 Download Directly to the Controller

Complete the instructions below to download the latest firmware directly into the USB device plugged into the side of Controller. This option requires an **un-encrypted** USB device and an Ethernet cable capable of reaching the unit. Once the new firmware is copied to the USB device, it will be loaded into the Controller in [Section 6.2.7.4: Updating the Controller's Firmware](#). Note, this method saves the Innovation or Benchmark firmware update file(s) that are compatible with the Intelligent BootLoader V1.00 or later to the USB device. If you are updating a unit with an older BootLoader, it will save the file **edgelimage.hex** to the USB device.

1. Remove the unit's front panel, to expose the USB port on the Controller's left side.
2. Insert an **un-encrypted** USB device in the USB port.
3. Plug an active Ethernet cable in the Ethernet port.

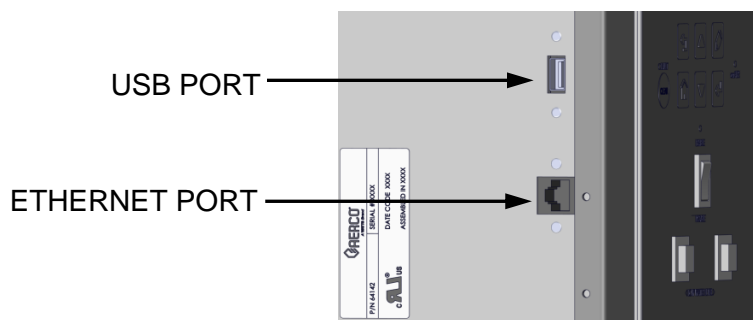


Figure 6-25: USB Port Location

4. Set the **Enable/Disable** switch on the Controller's front face to the **Disable** position.
5. Go to: Main Menu → Advanced Setup → Access and enter your password.
6. Go to: Main Menu → Advanced Setup → Unit → Firmware Update.
7. Press **Download Latest Version**. The firmware is copied from the Internet directly to the USB device installed in Step 2. This may take a minute or more. With the Intelligent BootLoader installed, this step also downloads updated graphics and/or I/O Board files, plus additional files, if any.

8. Progress is displayed as files are downloaded. Once completed, the screen displays **Downloads Complete**. If an error message is displayed, repeat the previous step, or complete the instructions in the previous section to download the file(s) to a USB device plugged into an external computer.

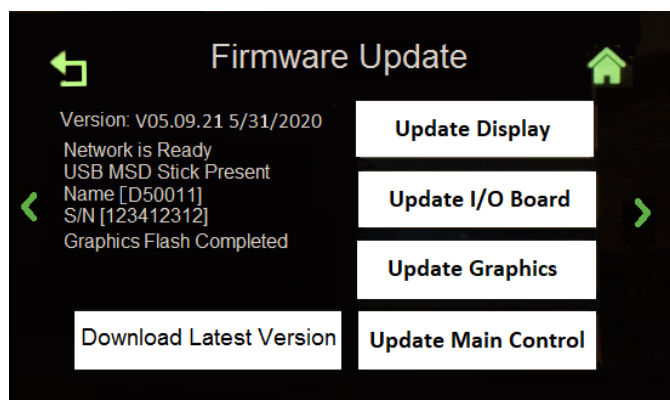


Figure 6-26: Firmware Update Screen

NOTE: The download only needs to be performed once on a single USB device. That device can then be used to update all boilers and/or all water heaters.

6.2.7.4 Updating the Controller's Firmware

1. Verify the USB device with the latest firmware is plugged into the Controller's USB port.
2. Verify that the **Enable/Disable** switch on the Controller's front face is set to **Disable**.
3. Go to: **Main Menu → Advanced Setup → Unit → Firmware Update** (enter your password if prompted; this screen requires a password). Note, the controls are disabled (greyed out) until the USB device is installed **and** the **Enable/Disable** switch is in the **Disable** position.
4. Press the **Update Main Control** button.
5. When done, the **Update Finished** screen appears displaying the new version number and the current date. **Do not remove the USB device until this screen appears.** Verify that the expected version and date is displayed. If so, press **OK** to continue.

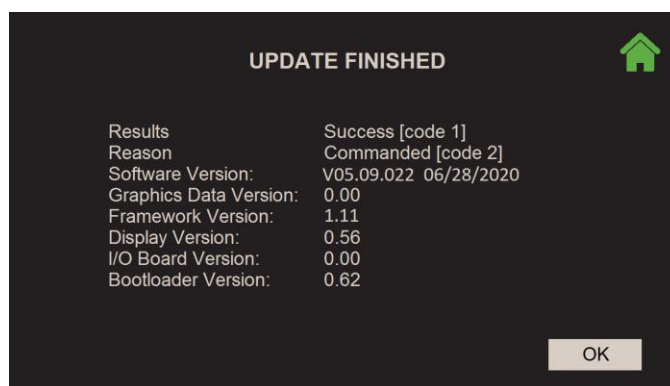


Figure 6-27: Update Finished Screen

6. If there are updated **Graphics**, **I/O Board** or **Display** files, the associated button(s) will be colored red (update required) or yellow (update recommended). Press all red and yellow buttons to initiate update; if you press more than one button, the Controller automatically starts the next update when the previous update completes. Do not remove the USB until **Update Finished** appears.

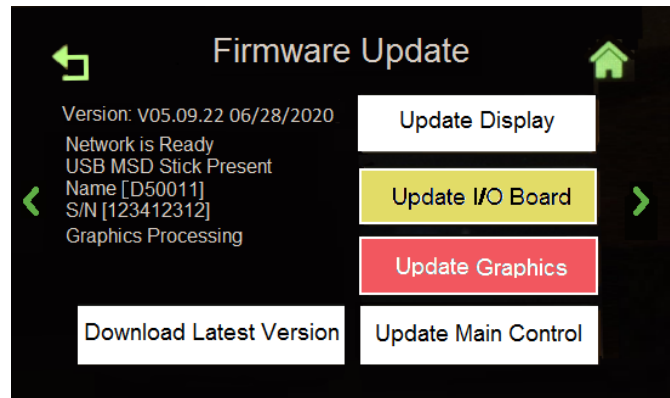


Figure 6-28: Graphics Processing Screen

7. To ensure the firmware update was successful, you must now turn the boiler's power **OFF** and then back **ON**. Continue with the next step after restarting the boiler.
8. Once the Controller restarts, set the **Enable/Disable** switch back to **Enable** and remove the USB device. If there was a problem with the update, see [Section 6.2.7.6: Troubleshooting](#).
9. Spot-check that the values recorded at the end of [Section 6.2.7.1](#) are still in effect. This step should be performed whether or not the firmware update was successful.
 - a. Serial Number and Unit Type in Main Menu → Advanced Setup → Unit → Unit Settings.
 - b. Combustion Calibration Summary in Main Menu → Calibration → Combustion Summary.
 - c. **Application Setup**, in **Main Menu → EZ Setup**. See summary in first screen, then abort.
10. If the spot-check is successful, the process is complete. But if any of the settings changed, or you suspect the setup was corrupted, complete the instructions in [Section 6.2.7.5](#).

6.2.7.5 Restore Settings After Firmware Update

If the spot check in the previous section failed, restore setup and parameters to their original state.

1. Go to: **Main Menu → Advanced Setup → Unit → Settings Transfer**.

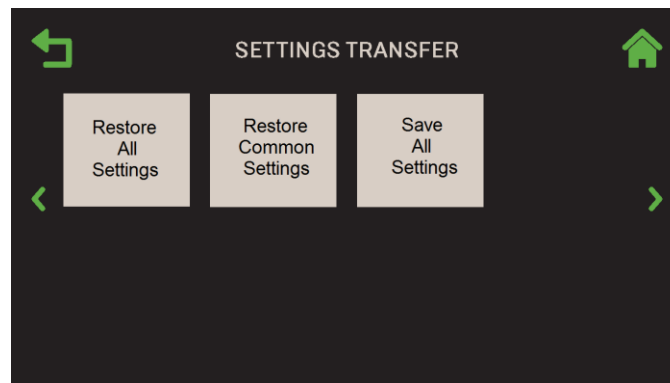


Figure 6-29: Settings Transfer Screen

2. Choose **Restore All Settings**; the Restore Source screen appears.

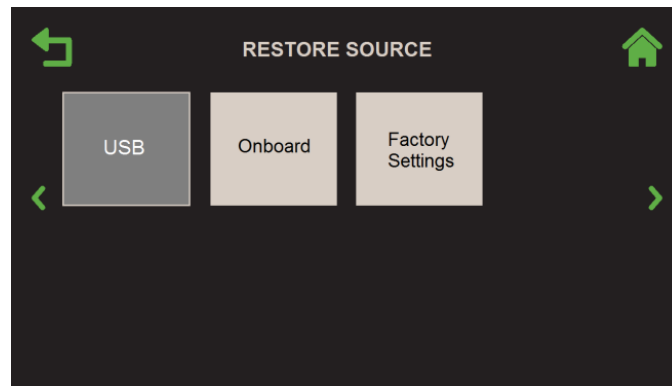


Figure 6-30: Restore Source Screens

3. Choose where you saved the setup (in [Section 6.2.7.3](#)), then press either:
 - **USB** if the same USB device is still plugged in.
 - **Onboard** If the setup was saved to the Controller's onboard memory.
4. The **Overwrite Calibration** screen now appears. Press **Yes** to overwrite the existing combustion calibration values or press **No** to retain the existing values.

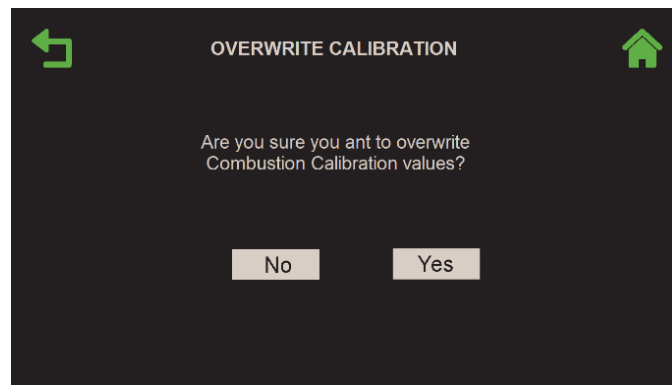


Figure 6-31: Load Settings Screen

5. The saved setup is restored to the unit. **Restore Succeeded** appears if the transfer was successful, and the unit reboots in about 5 seconds. If there was a problem, **Restore Failed** appears.

6.2.7.6 Troubleshooting

1. The Update buttons are grayed-out: The USB device is not recognized:
 - a. The USB device is not inserted correctly. Remove and reinsert it.
 - b. The USB device is not the correct type. Obtain the correct one.
 - c. Update the Bootloader.
2. The display shows Bootloader File Not Found:
 - a. For pre V1.00 BootLoaders, the unit looks for the **edgelimage.hex** file.
 - b. For Benchmark units, it is looking for a file starting with BMK_
 - c. For Innovation units, it is looking for a file starting with INN_
 - d. Verify the correct file is on the disk.
 - e. Verify that Advanced Setup → Unit → Unit Settings → Product Type is correct.

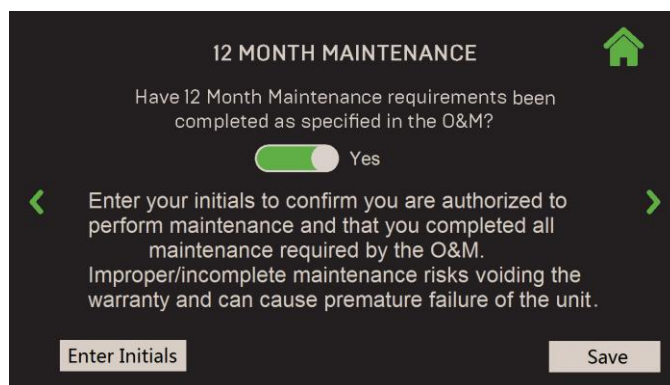
3. The Bootloader starts but does not complete:
 - a. Check the Status code in the upper right LED Display:
 - i. **Code 5** - USB Device Not Found.
 1. The USB device is not the correct type. Obtain a correct one.
 2. Update the Bootloader.
 3. Cycle the power to restore the old program, since it is not yet erased.
 - ii. **Code 21** – File Not Found
 1. For Pre V1.00 Bootloaders, the unit is looking for the file edgelImage.hex.
 2. For V1.00 Benchmark units, it's looking for a file starting with BMK_
 3. For V1.00 Innovation units, it's looking for a file starting with INN_
 4. Verify the correct file is on the disk.
 5. Cycle the power to restore the old program, since it is not yet erased.
 - iii. **Code 22** – The Hex File is corrupted.
 1. Recopy it to the USB device.
 2. Cycle the power to restore the old program, since it is not yet erased.
 - iv. **Code 23** - The Hex File is incomplete
 1. Recopy it to the USB device. Ensure it is fully copied. Try using the Eject feature on the Computer.
 2. If copied via the Edge Controller, verify that you received the complete file.
 3. Cycle the power to restore the old program, since it is not yet erased.
 - v. **Code 24** – 29 Programming Failure
 1. Programming Failed, Cycle the Power. The Bootloading will restart.
 - vi. **Code 30** - USB Device Removed.
 1. Do not touch or remove the USB device during programming.
 2. Cycle the Power. The Bootloading will restart.
 4. Disaster Recovery:
 - a. The unit will not run after bootloading. The screen could be off and the displays will be counting.
 - i. Turn off the power.
 - ii. Remove the top two screws from the Controller.
 - iii. Loosen the bottom two screws.
 - iv. Allow the front panel to tilt out slightly.
 - v. Ensure a USB device with the correct firmware is inserted in the USB port.
 - vi. On the left side of the Controller there is a small button even with the center of the display. Press and hold this button while turning on the power.
 - vii. The Bootloader will automatically restart.

6.2.8 Maintenance

Boilers and Water heaters require routine maintenance to ensure reliability and efficiency. There are two maintenance cycles: 12 month and 24 months. The Controller keeps track of both cycles and displays a warning when either cycle is ending.

The maintenance technician must confirm that maintenance has been fully or partially completed by using the **12-** and **24-Month Maintenance** screens.

1. Go to: **Main Menu → Advanced Setup → Unit → Maintenance.**



12 MONTH MAINTENANCE

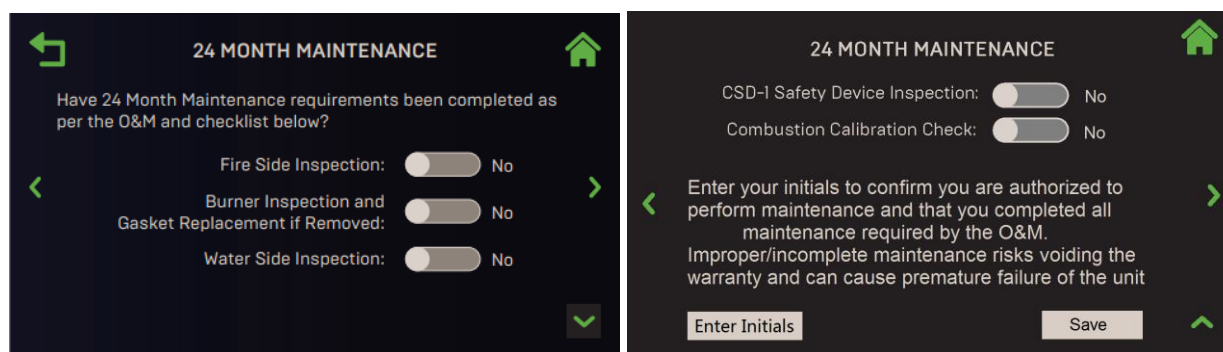
Have 12 Month Maintenance requirements been completed as specified in the O&M?

☒ Yes

< Enter your initials to confirm you are authorized to perform maintenance and that you completed all maintenance required by the O&M. Improper/incomplete maintenance risks voiding the warranty and can cause premature failure of the unit. >

Enter Initials Save

Figure 6-32: Unit: 12 Month Maintenance Screen



24 MONTH MAINTENANCE

Have 24 Month Maintenance requirements been completed as per the O&M and checklist below?

Fire Side Inspection: ☐ No

Burner Inspection and Gasket Replacement if Removed: ☐ No

Water Side Inspection: ☐ No

CSD-I Safety Device Inspection: ☐ No

Combustion Calibration Check: ☐ No

< Enter your initials to confirm you are authorized to perform maintenance and that you completed all maintenance required by the O&M. Improper/incomplete maintenance risks voiding the warranty and can cause premature failure of the unit. >

Enter Initials Save

Figure 6-33: Unit: 24 Month Maintenance Screen

2. Either the **12 Month Maintenance** or **24 Month Maintenance** screen appears, depending on which cycle is coming up next. On a new unit, the 12 Month screen appears first.
3. In the **12 Month Maintenance** screen, once all 12-month maintenance tasks have been completed set the toggle to **Yes**, enter your initials in the lower-left field, then press **Save**. The Controller will reset the 12 Month Maintenance cycle.
4. In the **24 Month Maintenance** screen, set each of the 24-month maintenance tasks that have been completed to **Yes**, then enter your initials in the lower-left field.
5. When all tasks have been completed, press **Complete** (the **Complete** button doesn't appear until all tasks have been completed). However, if any task is still set to **No**, you can press **Save** to close this screen; the 24 Month calendar is not reset.
6. Return to this screen once all tasks have been completed.
7. Once all 24-month maintenance tasks have been completed, set all toggles to **Yes**, then press **Complete**. The 24 Month Maintenance cycle is reset.

6.3 BST Cascade

The **BST Cascade** screen provides options to alter BST Cascade system settings.

1. Go to: **Main Menu → Advanced Setup → BST Cascade.**

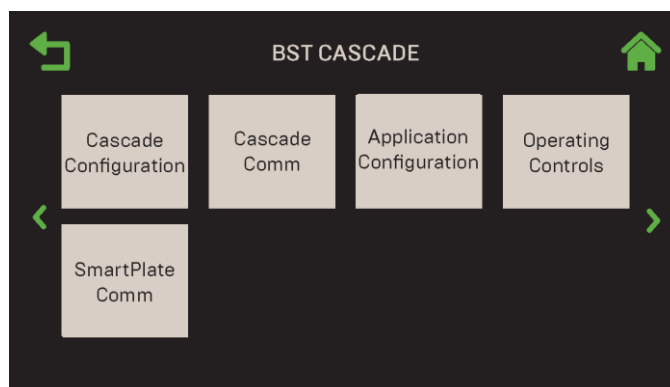


Figure 6-34: Advanced Setting: BST Cascade Screen

2. All the options on this screen are greyed out (disabled) except **Cascade Configuration** until BST Cascade functionality has been enabled (see Step 2 in the next Section).

NOTE: Once BST Cascade functionality is enabled, you can navigate from one screen to the next in round-robin fashion using the Page Left and Page Right icons.

6.3.1 Cascade Configuration

Boiler Sequencing Technology (BST) functionality is enabled from this screen by setting **Unit Mode** to either **BST Manager** or **BST Client** (default = **Off**).

Once either **BST Manager** or **BST Client** is enabled, the following occurs:

- If the unit is configured as a **BST Manager**, all parameters below (and all other BST Cascade sections) apply to all units in the BST cascade, and will take precedence over the same parameters on units configured as a **BST Client**.
- The unit **Application Configuration** screen for standalone units (in [Section 6.2.6](#)) is disabled.
- Additional BST parameters appear on the screen. The specific parameters depend on whether **BST Manager** or **BST Client** was selected, and on the current value of various parameter in [Section 6.3.3](#); the available parameters are shown in Step 3, below:

1. Go to: **Main Menu → Advanced Setup → BST Cascade → Cascade Configuration.**

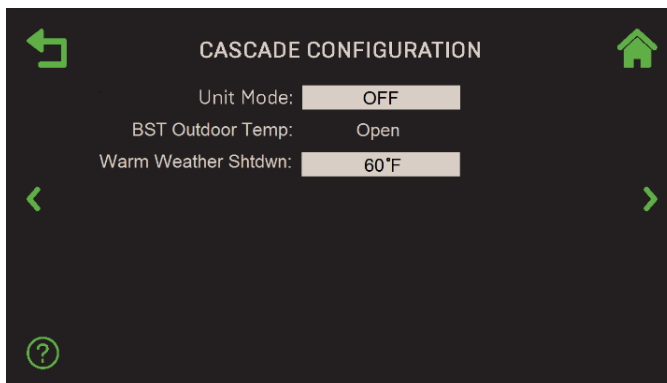


Figure 6-35: BST Cascade: Cascade Configuration Screen

- To designate the current unit as a BST Client or BST Manager, press **Unit Mode** and choose **BST Client** or **BST Manager**.

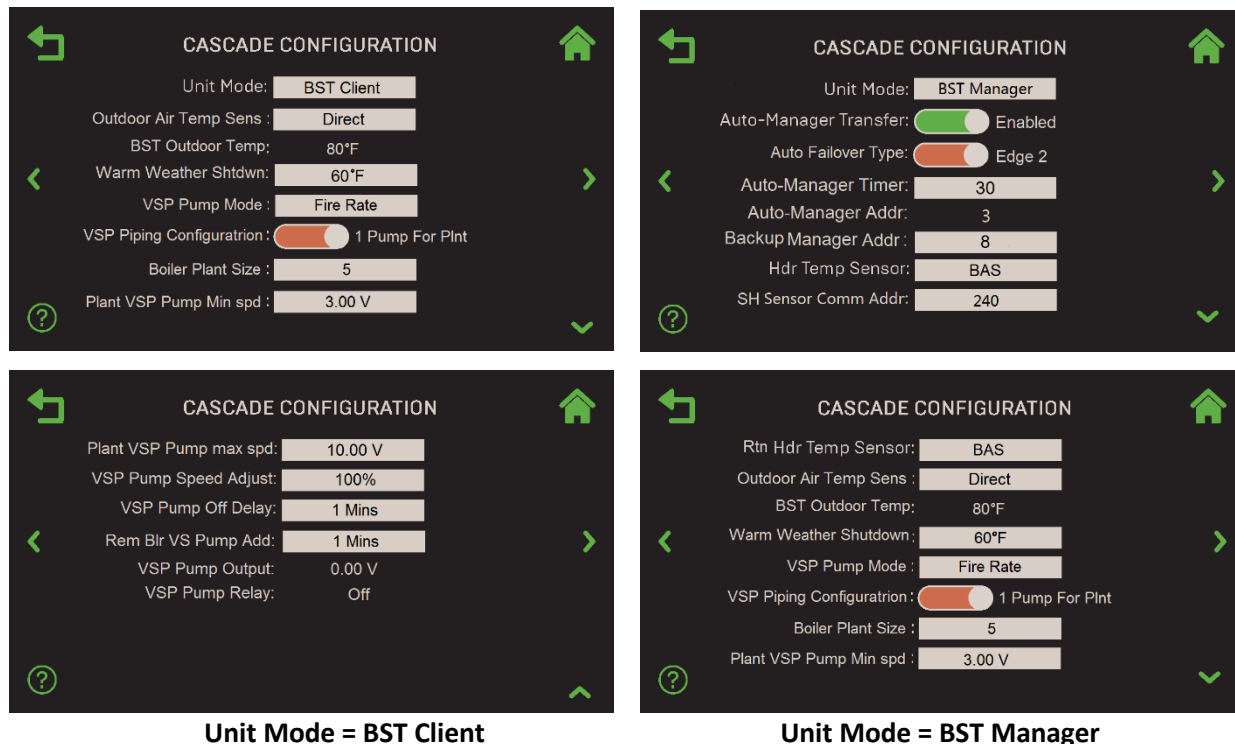


Figure 6-36: BST Cascade: Cascade Configuration Screen

- Additional parameters now appear, depending on which **Application** is chosen in [Section 6.3.3: BST Application Configuration](#). Note, the **Application** in that section can be set to **SH**, **DHW** or **Other**, or any of the combination Applications that includes **SH**, **DHW** or **Other**. For example, if **Application SH+DHW-1-Vlv** (which includes both **SH** and **DHW**) is chosen in the BST Application Configuration screen, the parameters in both the **SH** and **DHW** columns below will appear.
- Consult the table below to determine which parameters apply to your unit; descriptions of each item appear below the table.

TABLE 6.3: Cascade Configuration Parameters						
Parameters	Current BST Application Note: Application = Other is not available on CFR Boilers					
	SH	DH W	Othe r	SH	DH W	Othe r
	BST Client			BST Manager		
1 Auto-Manager Transfer				✓	✓	✓
1a Auto Failover Type (Item 1 = Enabled)				✓	✓	✓
1b Auto-Manager Timer (Item 1 = Enabled)				✓	✓	✓
1c Auto-Manager Addr (Item 1 = Enabled)				✓	✓	✓
1d Backup Manager Addr (Item 1 = Enabled)				✓	✓	✓
2 Hdr Temp Sensor				✓		✓
2a SH Hdr Temp Point (Item 2 = Network, BAS)				✓		✓
2b SH Sensor Comm Addr (Item 2 or 5 = Network or BAS)				✓		✓

SECTION 6: Advanced Setup

3 DHW Temp Sensor					✓	✓
3a DHW Hdr Sens Point (Item 3 = Network or BAS)					✓	✓
3b DHW Temp Unit Addr (Item 3 =Direct)					✓	✓
4 Rtn Hdr Temp Sensor				✓	✓	✓
4a Return Hdr Sens Point (Item 4 = Network)				✓	✓	✓
5 Outdoor Air Temp Sens	✓	✓	✓	✓	✓	✓
5a BST Outdoor Temp (Item 5 ≠ Off)	✓		✓	✓		✓
5b Outdoor Temp Addr (Item 5 = Network)				✓	✓	✓
5c Warm Weather Shtdwn (Item 5 ≠ Off)	✓		✓	✓		✓
5d OAT Temp Point (Item 5 = Network)				✓	✓	✓
6 VSP Pump Mode	✓	✓	✓	✓	✓	✓
6a VSP Pump Speed Adjust (Item 6 ≠ Off)	✓	✓	✓	✓	✓	✓
6b VSP Pump Off Delay (Item 6 ≠ Off)	✓	✓	✓	✓	✓	✓
6c VSP Pump Output (Item 6 ≠ Off)	✓	✓	✓	✓	✓	✓
6d VSP Pump Relay (Item 6 ≠ Off)	✓	✓	✓	✓	✓	✓
6e VSP Piping Configuration (Item 6 = Fire Rate)	✓	✓	✓	✓	✓	✓
6f Boiler Plant Size (Item 6 = Fire Rate)	✓	✓	✓	✓	✓	✓
6g Plant VSP Pump min spd (Item 6 = Fire Rate)	✓	✓	✓	✓	✓	✓
6h Plant VSP Pump max spd (Item 6 = Fire Rate)	✓	✓	✓	✓	✓	✓
6i Rem Blr VS Pump Add (Item 6 = Fire Rate)	✓	✓	✓	✓	✓	✓
6j VSP Pump Decrease (Item 6 = Return Temp)	✓	✓	✓	✓	✓	✓
6k VSP Pump Decr Time (Item 6 = Return Temp)	✓	✓	✓	✓	✓	✓
6l VSP Pump Incr Time (Item 6 = Return Temp)	✓	✓	✓	✓	✓	✓
6m VSP Pump Off Delay (Item 6 = Return Temp)	✓	✓	✓	✓	✓	✓

- **Item 1: Auto-Manager Transfer:** If enabled, BST Manager functionality can be transferred to a designated Backup Manager. The Backup Manager must be connected to all system level sensors, either via dual lead sensors or via Modbus wiring. When enabled, the following additional parameters appear:
 - **Item 1a: Auto-Manager Timer:** Specifies the time before switching over Manager functionality. (Range: 10 to 120 seconds, Default = 30)
 - **Item 1b: Auto-Manager Addr:** A read-only display of the address of the current BST Manager.
 - **Item 1c: Backup Manager Addr:** Enter the address of the unit designated as the Backup Manager. It can be any address above **0** except the value of **Auto- Manager Addr**. (Range: 0 to 16)
- **Item 2: Hdr Temp Sensor:** If plant operation is based on feedback from the Header Temp Sensor, choose how to communicate with the sensor:
 - **Network:** Choose this option if the Header Temp Sensor is wired to the Modbus transmitter. If chosen, the following additional parameter appears:
 - **Item 2a: SH Hdr Temp Point:** The Modbus point within the Modbus address of the Header Temp Sensor (Range: 0 to 255, default = 14).
 - **Item 2b: SH Sensor Comm Addr:** Specifies the Modbus transmitter address (common to all Modbus sensors). (Range: 0 to 255, default = 240)
 - **FFWD Temp:** Choose this option only if **Control Type = C-More** (in [Section 6.2.1: Unit Settings](#)); FFWD is the direct connect option in the C-More.
 - **Direct:** Choose this if the Modbus transmitter is connected directly to the unit.

- **BAS:** Choose this option if header temperature is received from the site's Building Automation System.
- **OFF:** Disables header temperature sensor feedback functionality.
- **Item 3: DHW Temp Sensor:** Choose how to communicate with the sensor:
 - **Off:** Disables DHW temperature sensor functionality.
 - **Network:** Choose this option if DHW temp sensor is wired to the Modbus transmitter. If chosen, the following additional parameter appears:
 - **Item 3a: DHW Hdr Sens Point:** Specify the Modbus point within the Modbus address where the DHW temp sensor resides. (Range: 0 to 255, default = 17)
 - **Direct:** Choose this option if the DHW Temp Sensor is connected directly to a unit. If chosen, the following additional parameter appears:
 - **Item 3b: DHW Temp Unit Addr:** Specify the unit to which the DHW Header Temp Sensor is connected. (Range: 0 to 16)
 - **BAS:** Choose this option if the DHW temperature information is received from the site's Building Automation System.
- **Item 4: Rtn Hdr Temp Sensor:** This is applicable to Benchmark boilers only; it is not applicable to CFR boilers. If plant operation includes feedback from the Return Header Temp Sensor, choose how to communicate with the sensor:
 - **Network:** Choose this option if the Return Header Temp Sensor is wired to the Modbus transmitter. If chosen, the following additional parameter appears:
 - **Item 4a: Rtn Hdr Sens Point:** The Modbus point within the Modbus address of the Header Temp Sensor (Range: 0 to 255, default = 16).
 - **FFWD Temp:** Choose this option only if **Control Type = C-More** (in [Section 6.2.1: Unit Settings](#)); FFWD is the direct connect option in the C-More.
 - **Direct:** Choose this if the Modbus transmitter is connected directly to the unit.
 - **BAS:** Choose this option if header temperature is received from the site's Building Automation System.
 - **OFF:** Disables header temperature sensor feedback functionality.
- **Item 5 – Outdoor Air Temp Sens:** Choose how to communicate with this sensor:
 - **Off:** Disables Outdoor Air Temp Sensor functionality.
 - **Direct:** Choose this option if the analog Outdoor Air Temp Sensor is connected directly to the unit.
 - **BAS:** Choose this option if outside temperature is received from the site's Building Automation System.
 - **Network:** Choose this option if the Outdoor Air Temp Sensor is wired to the Modbus transmitter.
 - If **Outdoor Air Temp Sens ≠ Off**, the following additional parameters appear:
 - **5a – BST Outdoor Temp:** A read-only display indicating how the unit communicates with the Outdoor Air Temp Sensor.
 - **5b – Warm Weather Shutdown:** The threshold outside temperature above which the unit shuts down. (Range: 30°F to 120°F)
 - **5c – Outdoor Temp Addr:** Specifies the Modbus transmitter address (common to all Modbus sensors). (Range: 0 to 255, default = 240)

- **5d – OAT Temp Point:** The Modbus point within the Modbus address of the Outside Air Temp Sensor (Range: 0 to 255, default = 15).
- **Item 6 – VSP Pump Mode:** The variable speed pump (VSP) feature is applicable only in a primary-secondary piping arrangement. It controls the pump's speed in an effort to increase boiler efficiency by matching boiler water return temperature to the secondary system's return temperature.
 - **VSP Pump Mode** (default = **Off**): To enable this feature, choose what will control the speed of the variable speed pump, either **Fire Rate** or **Return Temp**. The following additional parameters appear if set to either one:
 - **VSP Pump Speed Adjust:** Use this parameter to adjust the voltage signal to achieve the desired pump speed. For example, setting to 110% will change the signal from 5.0V to 5.5V. (Range: 80 to 120%)
 - **VSP Pump Off Delay:** Specify the time delay after the unit stops firing before shutting the pump off. (Range: 1 to 600 secs.)
 - **VSP Pump Output:** The voltage signal sent to the pump (read-only).
 - **VSP Pump Relay:** Displays if pump is On or Off
 - The following parameters appear only if **VSP Pump Mode = Fire Rate**:
 - **VSP Piping Configuration:** Depending on the configuration of the plant, choose either **1 Pump Per Blr** or **1 Pump Per Plnt**.
 - **Boiler Plant Size:** Specify how many boilers are in the plant. (Range: 1 to 16)
 - **Plant VSP Pump min spd:** Specify the voltage that will drive the pump at its *minimum* speed. (Range 0 to 10.0 V)
 - **Plant VSP Pump max spd:** Specify the voltage that will drive the pump at its *maximum* speed. (Range 0 to 10.0 V)
 - **Rem Blr VS Pump Add:** Specify the address of the boiler to which the variable speed pump is connected. (Range: 1 to 16)
 - The following parameters appear only if **VSP Pump Mode = Return Temp**:
This mode is only available for Benchmark boilers, it is not applicable for CFR boilers.
 - **VSP Pump Decrease:** Specify the amount the voltage signal will increase/decrease for every **VSP Pump Decr Time** interval. (Range: 0 to 100%)
 - **VSP Pump Decr Time:** Specify the interval at which the **VSP Pump Decrease** signal is sent to the pump. (Range: 1 to 600 secs.)
 - **VSP Pump Incr Time:** Specify the amount of time for voltage signal to the pump will reach full speed when Setpoint Limiting or High Temperature occurs; this overrides VSP Pump Decrease and VSP Pump Decr Time. When Setpoint Limiting or High Temperature condition ends, the VSP Pump Decrease and VSP Pump Decr Time resumes. (Range: 1 to 600 secs.)

6.3.2 Cascade Communication

The **Cascade Communication** screen allows you to modify individual communication parameters.

NOTES:

- This screen is available only after BST functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1: Cascade Configuration](#)). If the unit is configured as a **BST Manager**, its parameters apply to this unit and all **BST Client** units.
- Some parameters on this screen also appear in **EZ Setup** (see Section 2). While EZ Setup is designed to walk you through the full configuring of a unit, this screen allows you modify individual parameters, as needed.

- Go to: **Main Menu** → **Advanced Setup** → **BST Cascade** → **Cascade Comm**. Two parameters appear only if **Unit Mode** = **BST Manager** in [Section 6.3.1: Cascade Configuration](#) (see Step 3).

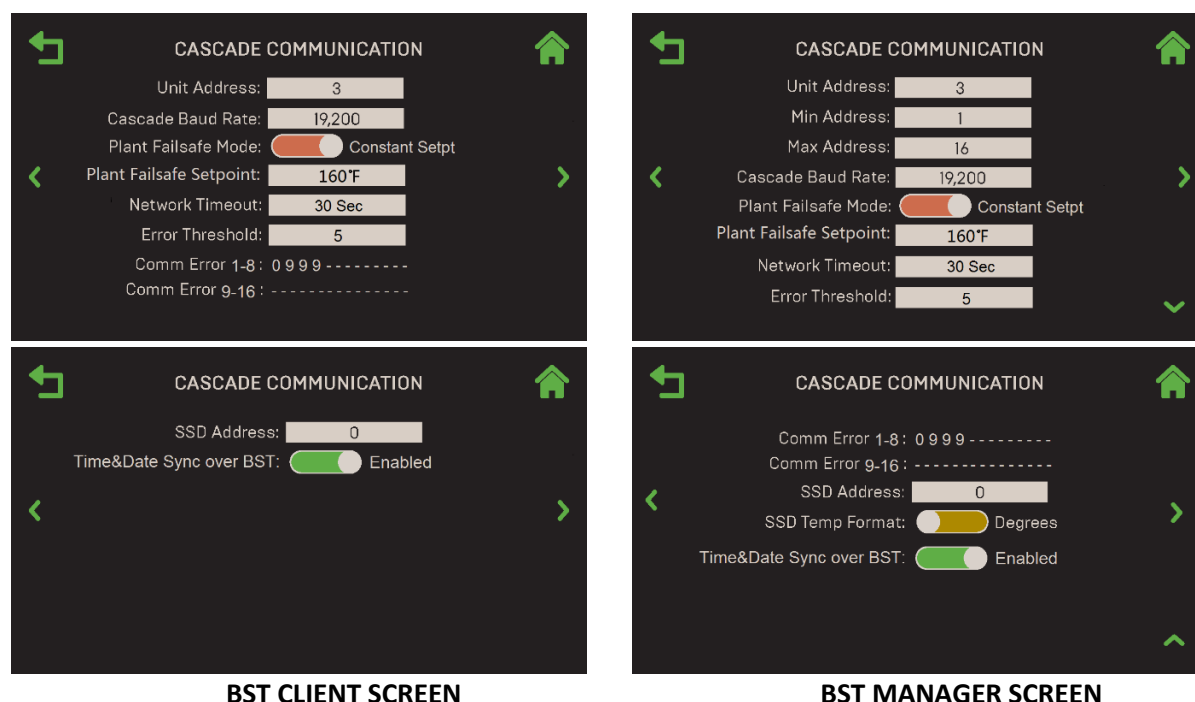


Figure 6-37: BST Cascade: Cascade Communication Screens

- Configure the following parameters on both **BST Client** and **BST Manager** screens:
 - Unit Address:** The unit's address in the BST Cascade network. (Range: 1 to 16)
 - Cascade Baud Rate:** Select the rate at which information is transferred in a communication channel: **9600**, **19200**, **38400**, **115200** bits per second.
 - Plant Failsafe Mode:** Specifies the plant's operating mode if there is a loss of communication with BAS or external sensor (i.e., an outdoor temperature sensor), either **Constant** or **Shutdown**. If the loss of communication is to the BST Manager unit, this setting applies to the current unit. Plant Failsafe Mode applies to what the entire plant does as a whole if it loses communication with the BAS or external sensor. If set to **Constant Setpt**, the following additional parameter appears:
 - Plant Failsafe Setpoint:** Specifies the plant's setpoint if there is a loss of communication with BAS or header sensor.

- **Network Timeout:** The timeout value before a Modbus Fault is declared due to no response from the BST Manager unit or (if a Manager) from the BAS. (Range: 5 – 999)
- **Error Threshold:** The number of Modbus Comm errors allowed before invoking a Modbus Comm Fault. (Range: 1 to 9)
- **Comm Error String:** Displays the number of Comm errors on each Comm port (client unit). If no valid address is entered for a client unit, it displays “-” for that address. The maximum number of error counts is 9.
- **SSD Address:** The Client/Client Device address (for backwards compatibility). This address must be set to 247 for the BST manager to communicate with a Protonode.
- **Time&Date Sync over BST:** If enabled, the BST Manager’s time and date are sent to all BST Clients units; all units in the cascade will then be synchronized.

3. If the unit is configured as a **BST Manager**, the following additional parameters appear:

- **Min & Max Addresses:** The address range of units in BST cascade. (Range: 1-16)
- **SSD Temp Format:** Choose either **Points** or **Degrees**. When communicating with a Protonode, this should be set to “Points”.

6.3.3 BST Application Configuration

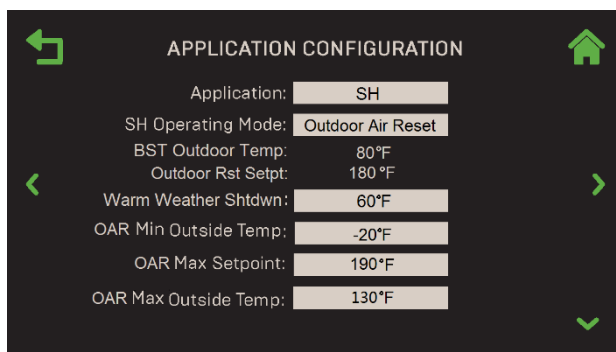
The BST Cascade’s Application **Configuration** screen allows you to configure individual operating parameters that will be transmitted to all BST Client units.

Some parameters below appear in **EZ Setup** (see Section 2). This screen allows you to modify individual parameters, as needed.

NOTES:

- This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1: Cascade Configuration](#)).
- If the unit is configured as a **BST Manager**, the parameters apply to this unit and will be transmitted to all BST Client units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** will take precedence.
- If BST Cascade functionality is enabled on a unit, the [Unit → Application Configuration screen in Section 6.2.6](#) (above) is disabled.

1. Go to: Main Menu → Advanced Setup → BST Cascade → Application Configuration.



APPLICATION CONFIGURATION

Application: SH

SH Operating Mode: Outdoor Air Reset

BST Outdoor Temp: 80°F

Outdoor Rst Setpt: 180°F

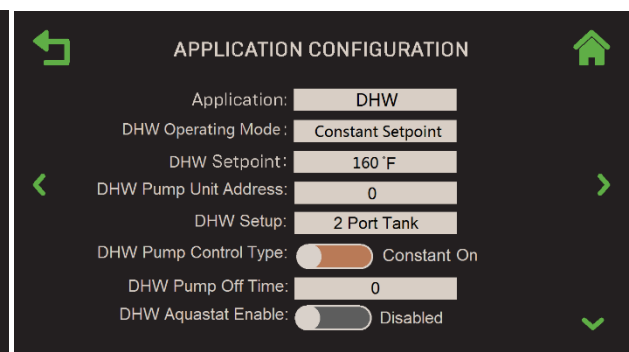
Warm Weather Shtdwn: 60°F

OAR Min Outside Temp: -20°F

OAR Max Setpoint: 190°F

OAR Max Outside Temp: 130°F

APPLICATION = SH (Space Heating)



APPLICATION CONFIGURATION

Application: DHW

DHW Operating Mode: Constant Setpoint

DHW Setpoint: 160°F

DHW Pump Unit Address: 0

DHW Setup: 2 Port Tank

DHW Pump Control Type: Constant On

DHW Pump Off Time: 0

DHW Aquastat Enable: Disabled

APPLICATION = DHW

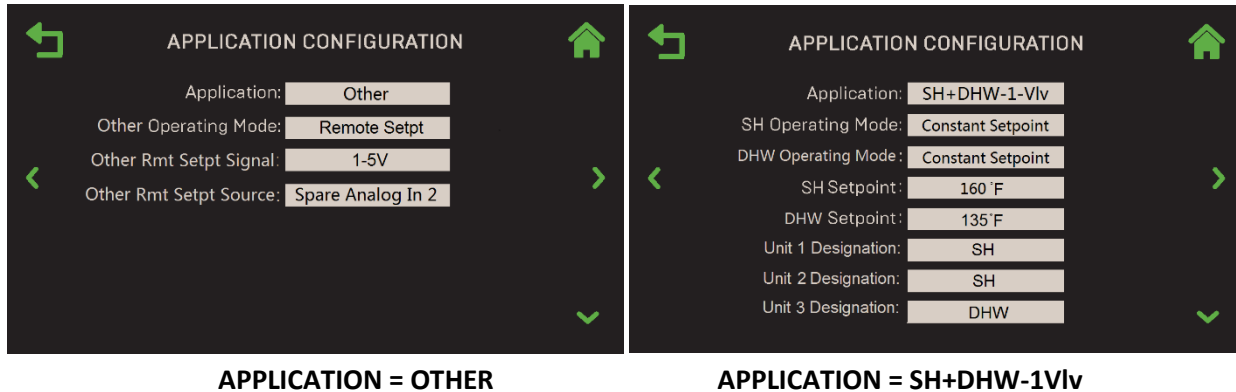


Figure 6-38: BST Cascade: Application Configuration – Example 1st Screens

2. Choose the **Application** for the unit:

TABLE 6.4a: Applications – Benchmark boilers	
1 SH (Space Heating)	5 SH+DHW-1-Vlv (1 Swing Valves)
2 DHW (Domestic Hot Water)	6 SH+DHW-Stpt Prty (SH Setpoint Priority)
3 Other	7 Other+SH-Stpt Prty (Other Setpoint Priority)
4 SH+DHW-2-Vlv (2 Swing Valves)	8 Other+DHW-StptPrty (Other Setpoint Priority)

TABLE 6.4b: Applications – CFR boilers
1 SH (Space Heating)
2 DHW (Domestic Hot Water)
6 SH+DHW-Stpt Prty (SH Setpoint Priority)

3. Next, choose the **Operating Mode** for the unit. The Operating Modes that appear depend on the Application chosen in the previous step:
- If **Application** = SH, or any Application that includes SH, the **SH Operating Mode** parameter appears. Choose: Constant Setpoint, Remote Setpoint or Outdoor Temp Reset.
 - If **Application** = DHW, or any Application that includes DHW, the **DHW Operating Mode** parameter appears. Choose either: **Constant Setpoint** or **Remote Setpoint**.
 - If **Application** = Other, or any Application that includes Other, the **Other Operating Mode** parameter appears. Choose either: **Constant Setpoint** or **Remote Setpoint**.
4. Additional parameters now appear, depending on the combination of **Application** and **Operating Mode** chosen in Steps 2 and 3, and in some cases depending on the value of another parameter, as shown below. Descriptions of all parameters appear below the tables.

TABLE 6.5: Application = SH			
SH Operating Mode =	Constant Setpoint	Remote Setpoint	Outdoor Air Reset *
SH Setpoint	✓		
SH Rmt Setpt Source		✓	
BST Outdoor Temp			✓
Outdoor Rst Setpt			✓

SECTION 6: Advanced Setup

Warm Weather Shutdown			✓
OAR Min Outside Temp			✓
OAR Max Setpoint			✓
OAR Max Outside Temp			✓
OAR Min Setpoint			✓

* **Outdoor Air Reset** requires a header temp sensor and an outdoor air temp sensor to be connected to the one of the units in the cascade, either directly, via the network or BAS.

TABLE 6.6: Application = DHW

DHW Operating Mode =	Constant Setpoint	Remote Setpoint
DHW Setpoint	✓	
DHW Rmt Setpt Signal		✓
DHW Rem Setpt Source (If DHW Rem Setpt Signal = 1-5V or 0-5V)		✓
DHW Pump Unit Address	✓	✓
DHW Setup	✓	✓
DHW Pump Control Type	✓	✓
DHW Pump Off Time	✓	✓
DHW Aquastat Enable (if DHW Setup = 2 or 4 Port Tank)	✓	✓
Aquastat Unit Addr (if DHW Aquastat Enable = Enabled)	✓	✓
DHW Setpoint Offset	✓	✓
Setpoint Ramp Rate	✓	✓

TABLE 6.7: Application = Other (applicable to Benchmark boilers only; not applicable to CFR boilers)

Other Operating Mode =	Constant Setpoint	Remote Setpoint
Other Rmt Setpt Signal		✓
Other Rmt Setpt Source (if Other Rem Setpt Signal = 1-5V or 0-5V)		✓
Other Setpoint	✓	

NOTE: The following tables show the parameters that are unique to these **Applications**. However, all the **Applications** below also include the parameters in the **SH**, **DHW** and/or **Other Application** tables above if the **Application** includes **SH**, **DHW** or **Other**.

TABLE 6.8: Application = SH+DHW-1-Vlv and SH+DHW-2-Vlv (applicable to Benchmark boilers only; not applicable to CFR boilers)

Application =	SH+DHW-1-Vlv	SH+DHW-2-Vlv
Unit 1 Designation, up to Unit 16 Designation	✓	✓
Default Swing Boiler Load	✓	✓
SH Swg Vlv Unit Add	✓	✓
DHW Swg Vlv Unit Add		✓
SH Valve Open Time	✓	✓
DHW Valve Open Time		✓

TABLE 6.9: Application = Other+SH-Stpt Prty (applicable to Benchmark boilers only; not applicable to CFR boilers)

Other SH PRI Setpt Mode
Other SH PRI Setpoint (if Other SH PRI Setpt Mode = Constant Setpoint)
Other SH PRI Remote Signl (if Other SH PRI Setpt Mode = Remote Setpoint)

TABLE 6.10: Application = Other+DHW-Stpt Prty (applicable to Benchmark boilers only; not applicable to CFR boilers)

Other DHW PRI Setpt Mode
Other DHW PRI Setpoint (if Other DHW PRI Setpt Mode = Constant Setpoint)
Other DHW PRI Remote Signl (if Other SDHW PRI Setpt Mode = Remote Setpoint)

In the table below, the prerequisite for a parameter to appear on the screen is shown in parentheses.

TABLE 6.11: Parameter Descriptions.

NOTE: Applications are numbered from 1 to 8, per Table 6.4a and 6.4b, in Step 2 above.

Item	Name	Description
1	Application	Choose SH (1) through Other+DHW-Stpt Prty (8)
2	SH Operating Mode	(Application = 1, 4 – 7) Choose: Constant Setpoint, Remote Setpoint or Outdoor Air Reset
3	Other Operating Mode	(Application = 3, 7 or 8) Choose either Constant Setpoint or Remote Setpoint
4	DHW Operating Mode	(Application = 2, 4 – 6, 8) Choose either Constant Setpoint or Remote Setpoint
5	SH Setpoint	(Application = 1, 4 – 8; SH Operating Mode = Constant Setpoint) Specify the Space Heating setpoint for the plant. (Range: Benchmark boilers — 60°F to 180°F; CFR boilers — 140°F to 180°F)
6	DHW Setpoint	(Application = 2, 4 – 6, 8; DHW Operating Mode = Constant Setpoint) Specify the setpoint for DHW application. (Range: Benchmark boilers — 60°F to 180°F; CFR boilers — 140°F to 180°F)
7	Other Rmt Setpt Signal	(Application = 2, 7, 8; Other Operating Mode = Remote Setpoint) Choose the remote signal type for the “other” Application: 1-5V , 0-5V or Network .
8	Other Rmt Setpt Source	(Application = 2, 7, 8; Other Rmt Setpt Signal = 1-5V or 0-5V) Choose the remote setpoint source: Spare Analog In 1, Spare Analog In 2 or Spare Analog In 3.
9	SH Rmt Setpt Source	(Application = 1, 4 – 7; SH Operating Mode = Remote Setpoint) Choose the remote signal type: 4-20mA, 20mA, 1-5V, 0-5V, Network or BAS.
10	DHW Rem Setpt Signal	(Application = 2, 4 – 6, 8; DHW Operating Mode = Remote Setpoint) Choose the remote signal type: 1-5V, 0-5V, Network or BAS.
11	BST Outdoor Temp	(Application = 1, 3 – 7, SH Operating Mode = Outdoor Air Reset, Outdoor Air Temp Sens ≠ OFF in Cascade Configuration screen) A read-only display indicating how the unit communicates with the Outdoor Air Temp Sensor
12	Outdoor Rst Setpt	(Application = 1, 4, 5, 7; SH Operating Mode = Outdoor Air Reset, Outdoor Air Temp Sens ≠ OFF in Cascade Configuration screen) A read-only display indicating the current outdoor reset setpoint based on the four OAR parameters (items 15-18).

TABLE 6.11: Parameter Descriptions.

NOTE: Applications are numbered from 1 to 8, per Table 6.4a and 6.4b, in Step 2 above.

Item	Name	Description
13	Warm Weather Shutdown	(Application = 1, 3 – 7, SH Operating Mode = Outdoor Air Reset, Outdoor Air Temp Sens ≠ OFF in Cascade Configuration screen) The threshold outside temperature above which the unit shuts down. For example, if set to 65°F, when the outside temperature is below 65°F the unit is in standby, but shuts down when the temperature goes above 65°F. (Range: 30°F to 120°F)
14	DHW Rem Setpt Source	(Application = 2, 4 – 6, 8; DHW Rem Setpt Signal = 1-5V or 0-5V) Choose the remote setpoint source: Spare Analog In 1, Spare Analog In 2 or Spare Analog In 3.
15	OAR Min Outside Temp	(Application = 1, 4 – 7, SH Operating Mode = Outdoor Air Reset) The minimum outside air temperature the system will read; it interacts with the OAR Max Setpoint. For example, if OAR Min Outside Temp is set to -5°F and OAR Max Setpoint is 180°F, when the outside temperature is -5°F or below, the system will supply 180°F. (Range: -40°F to 140°F)
16	OAR Max Setpoint	(Range: Benchmark boilers - OAR Min Setpoint up to 210°F; CFR boilers - OAR Min Setpoint to 190°F)
17	OAR Max Outside Temp	(Application = 1, , 4 – 7, SH Operating Mode = Outdoor Air Reset) Outdoor Air Reset Maximum Outside Temperature that the system will operate to. For example: if set to 60°F, the boiler will operate between 60°F outside temperature and OAR Min Outside Temp setting. (Range: -40°F to 140°F)
18	OAR Min Setpoint	(Application = 1, , 4 – 7, SH Operating Mode = Outdoor Air Reset) The <i>minimum</i> allowable setpoint. (Range: Benchmark boilers — 20°F to Max Outside Temp ; CFR boilers — 140°F to Max Outside Temp)
19	Unit x Designation (x=1 to 16)	(Application = 4, 5) Choose the designation for each unit in the BST cascade: SH , DHW or Swing .
20	Default Swing Boiler Load	(Application = 4, 5) Choose Swing Default SH or Swing Default DHW . Specifies whether the swing units serve the Space Heating side or DHW side when there is no DHW load, or the unit(s) dedicated to DHW can keep up with DHW load.
21	SH Swg Vlv Unit Add	(Application = 4, 5) The address of the unit to which valve V1 is connected. (Range: 0 to 16)
22	DHW Swg Vlv Unit Add	(Application = 4) The address of unit to which valve V2 is connected. (Range: 0 to 16)
23	DHW Pump Unit Address	(Application = 2, 4 – 8) The address of unit that controls the DHW pump. (Range: 0 to 16)
24	DHW Setup	(Application = 2, 4, 5) Choose one of the following: 2 Port Tank, 4 Port Tank or Indirect Tank.
25	DHW Pump Control Type	(Application = 2, 4 – 8) Choose between Constant On (even when unit or plant is in standby) or Controlled (based on DHW temp sensor feedback).
26	DHW Pump Off Time	(Application = 2, 4 – 6) The minimum time the DHW pump must stay off before restarting after being turned off. (Range: 0 to 600 sec.)
27	DHW Aquastat Enable	(Application = 2, 4 – 6, 8, DHW Setup = 2 or 4 Port Tank) Set to Enabled or Disabled.
28	Aquastat Unit Addr	(Application = 2, 4 – 6, 8, DHW Aquastat Enable = Enabled) The address of the unit to which a DHW Aquastat is connected; 0 = Disabled. If the Aquastat switch opens, units supporting the DHW side are disabled. (Range: 0 to 16 or max address)

TABLE 6.11: Parameter Descriptions.

NOTE: Applications are numbered from 1 to 8, per Table 6.4a and 6.4b, in Step 2 above.

Item	Name	Description
29	DHW Setpoint Offset	(Application = 6, 8) In “Setpoint Priority Mode”, when both Space Heating/Other and DHW loads are active, this is the DHW Setpoint Boost Value. (Range: 0°F to 10°F)
30	Setpoint Ramp Rate	(Application = 6 – 8) In “Setpoint Priority Mode”, when the active setpoint switches from one value to another, this is the active setpoint rate of change, to ensure a smooth transition from one setpoint to another. (Range: 5 to 30)
31	SH Valve Open Time	(Application = 4, 5) Time delay for the SH swing valve to remain open after priority has ended. (Range: 0 to 600)
32	DHW Valve Open Time	(Application = 4) Time delay for the DHW swing valve to remain open after priority has ended (Range: 0 to 600)
33	Other Setpoint	(Application = 3, 7, 8, Other Operating Mode = Constant Setpoint) Specify the setpoint for the “other” Application (Range: 160 to 160)
34	Other SH PRI Setpt Mode	(Application = 7) Choose the Setpoint mode: Constant Setpoint or Remote Setpoint.
35	Other SH PRI Setpoint	(Application = 7, Item 34 = Constant Setpoint) Specify the setpoint for the SH Priority Application. (Range: 60°F to 180°F)
36	Other SH PRI Remote Signl	(Application = 7, Item 34 = Remote Setpoint) Choose the remote signal type: 1-5V , 0-5V or Network .
37	Other DHW PRI Setpoint Mode	(Application = 8) Choose the Setpoint mode: Constant Setpoint or Remote Setpoint.
38	Other DHW PRI Setpoint	(Application = 8, Item 37 = Constant Setpoint) Specify the setpoint for the DHW Priority Application. (Range: 60°F to 180°F)
39	Other DHW PRI Remote Signl	(Application = 8, Item 37 = Remote Setpoint) Choose the remote signal type: 1-5V , 0-5V or Network

6.3.4 Operating Controls

The **Operating Controls** screen provides access to multiple operating parameters for the plant and units in a BST cascade.

NOTE: This screen, and all the screens accessible from this screen, is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1: Cascade Configuration](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all BST Client units.

- Go to: **Main Menu → Advanced Setup → BST Cascade → Operating Controls.**

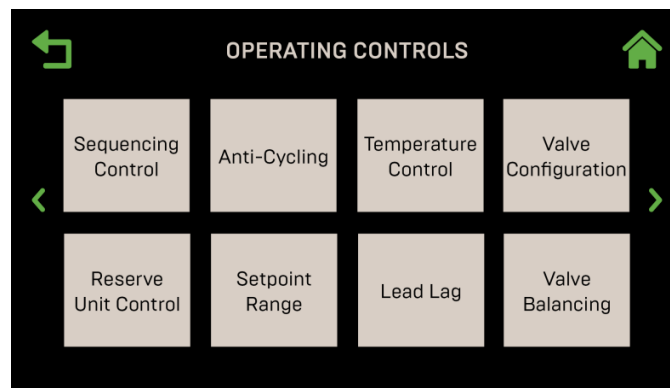


Figure 6-39: BST Cascade: Operating Controls Screen

6.3.4.1 Sequencing Controls

The **Sequencing Controls** screen offers options related to sequencing of units in the plant. **NOTES:**

- This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all BST Client units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** will take precedence.
- The parameters on this screen depend on the **Application** chosen in [Section 6.3.3](#).

- Go to: **Advanced Setup → BST Cascade → Operating Controls → Sequencing Controls.**

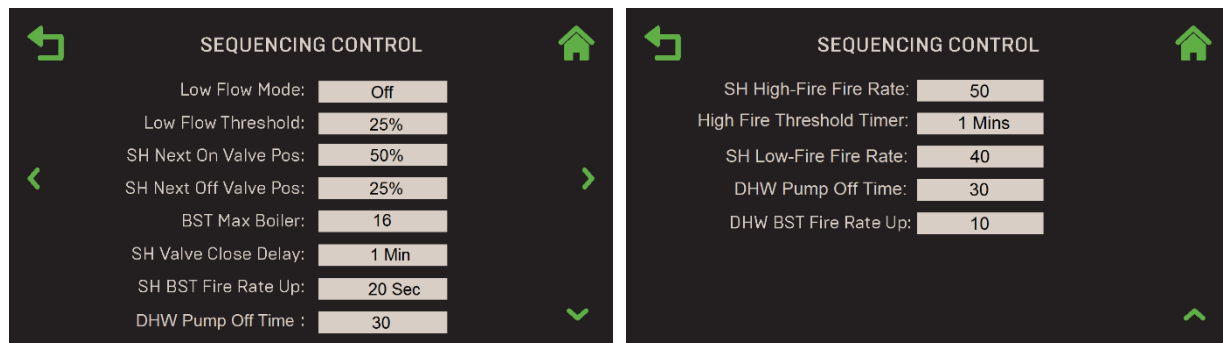


Figure 6-40: Operating Controls: Sequencing Controls Screen

- The parameters on this screen depend which **Application** is chosen in [Section 6.3.3](#) and whether the unit is configured as a BST Manager or BST Client in [Section 6.3.1](#). The following parameters appear only when the unit is configured as a BST Manager:
 - BST Max Boilers:** Maximum number of boilers that will fire. For example: if there are 5 boilers, but this setting is set to 3, the plant will only fire 3 boilers. (Range: 1 to 16)
 - SH Valve Close Delay:** The time an open Isolation Valve will remain open once a boiler has been cycled off. When an ignited boiler is cycled off, its Isolation Valve will remain open for the specified time to dissipate residual heat. (Range: 0 to 15)

3. The remaining parameters are available on both BST Manager and BST Client units. They are available depending on the Application chosen in [Section 6.3.3](#), as shown in the table below:

TABLE 6.12: Sequencing Control Parameters								
Available Parameters	Current BST Application							
	NOTE: All applications apply to Benchmark boilers; applications with asterisk (*) are the only ones that apply to CFR boilers.							
	*SH	*DHW	Other	SH+DHW- 2-Vlv	SH+DH W-1-Vlv	*SH+DHW -Stpt Prty	Other+SH- Stpt Prty	Other+DHW- Stpt Prty
Low Flow Mode	✓	✓	✓	✓	✓	✓	✓	✓
Low Flow Threshold	✓	✓	✓	✓	✓	✓	✓	✓
SH Next On Valve Pos	✓	✓	✓	✓	✓	✓	✓	✓
SH Next Off Valve Pos	✓	✓	✓	✓	✓	✓	✓	✓
SH BST Fire Rate Up	✓	✓	✓	✓	✓	✓	✓	✓
SH High-Fire Fire Rate		✓		✓	✓	✓		✓
SH Low-Fire Fire Rate		✓		✓	✓	✓		✓
DHW High-Fire Fire Rate	✓	✓	✓	✓	✓	✓	✓	✓
High Fire Threshold Timer		✓		✓	✓	✓		✓
DWH Pump Off Time				✓	✓	✓		
DHW BST Fire Rate Up				✓	✓	✓		

- **Low Flow Mode:** Choose **Off**, **On – Outlet Temp** or **On – Avg Temp**. If either “On” option is chosen, BST monitors the multi-boiler system to detect if a “low-flow” condition exists. If it does exist, BST slowly shuts down one boiler at a time in an attempt to raise the Fire Rate of the remaining boilers. If the low-flow condition persists, and only a single boiler remains ignited, BST will use the “Outlet Temperature Sensor” of the remaining ignited boiler to control the temperature. The Outlet Temperature Sensor is mounted in the individual boiler and drastically increases the response time to precisely control temperature.
- **Low Flow Threshold:** For low flow applications, this parameter allows the boiler to operate without excessive cycling. This parameter specifies the valve position below which the boiler plant will enter this mode (Range: 10% to 35%, default = 25%).
- **SH Next On Valve Pos:** Determines the valve position that triggers the next SH (Space Heating) unit to come on line. (Range: 16% to 100%)
- **SH Next Off Valve Pos:** Determines the valve position that triggers the next SH (Space Heating) unit to come off line. (Range: 16% to 100%)
- **SH BST Fire Rate Up:** Controls the frequency of updates made to the BST Fire Rate sent to all boilers focused on space heating. This feature can be used to slow down the rate of change of the Fire Rate of the BST System. (Range: 1 to 120 sec.)
- **SH High-Fire Fire Rate:** This parameter specifies the firing rate above which the swing boiler will be requested to support the SH loop application (Range: 75 to 100)
- **SH Low-Fire Fire Rate:** This parameter specifies the firing rate below which the swing boiler will be released to its default state. (Range: 30 to 60)
- **DHW High-Fire Fire Rate:** This parameter specifies the firing rate above which the swing boiler will be requested to support the DHW loop application (Range: 40 to 90)

SECTION 6: Advanced Setup

- **High Fire Threshold Timer:** This parameter specifies the amount of time between when the **SH High-Fire Fire Rate** or **DHW High-Fire Fire Rate** condition is met and the time the swing unit switches over to the secondary application. (Range: 1 to 30 mins.)
- **DHW Pump Off Time:** The minimum time the DHW pump must stay off before restarting after being turned off. (Range: 0 to 600 sec.)
- **DHW BST Fire Rate Up:** Controls the frequency of updates made to the BST Fire Rate sent to all boilers focused on domestic hot water generation in a combination plant. Like **SH BST Fire Rate Up**, this feature can be used to slow down the rate of change of the Fire Rate of the BST System. (Range: 1 to 120 sec.)
- **BST On Timeout** is the last menu item in SEQUENCING CONTROL.

6.3.4.2 Anti-Cycling Control

The parameters in the **Anti-Cycling Control** screen are used to prevent unwanted cycling.

NOTE: This screen is available only if BST Cascade functionality is enabled (see [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all **BST Client** units. If the unit is configured as a **BST Client**, the **BST Manager** parameters will take precedence.

1. Go to: **Advanced Setup → BST Cascade → Operating Controls → Anti-Cycling Controls.**



Figure 6-41: Operating Controls: Anti-Cycling Control Screen

2. The following parameters are available:

- **On Delay:** The minimum length of time the Manager must wait after firing one unit, before it calls for another unit to fire. (Range: 30 to 300 sec.)
- **Slow Shutdown:** Enable/Disable the Slow Shutdown feature. Once enabled on a unit, if the unit is run at a fire rate above **Off Delay Threshold** and then shut down, the fire rate will be reduced to the Stop Level for a period of time defined in **Off Delay**. This feature prevents units running at high fire rates from being quickly turned off and flushed with cold water, thereby possibly damaging the heat exchanger. Once enabled, the following additional parameters appear:
 - **Off Delay:** How long the full shut down is delayed. (Range: 0 to 9999 sec.)
 - **Off Delay Threshold:** The threshold fire rate above which the **Slow Shutdown** feature will take effect. (Range: 40 to 100%)
- **Shutoff Delay Temp:** The temperature above setpoint the unit may rise to (0 - 25°F)
- **Demand Offset:** Temperature below setpoint before a unit may come online. (0 - 25°F)

6.3.4.3 Temperature Control

The **Temperature Control** screen provides parameters that can be used to fine-tune the temperature responsiveness and limitations under which the plant operates.

- **NOTE:** This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all **BST Client** units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** will take precedence.

1. Go to: **Advanced Setup → BST Cascade → Operating Controls → Temperature Control**.

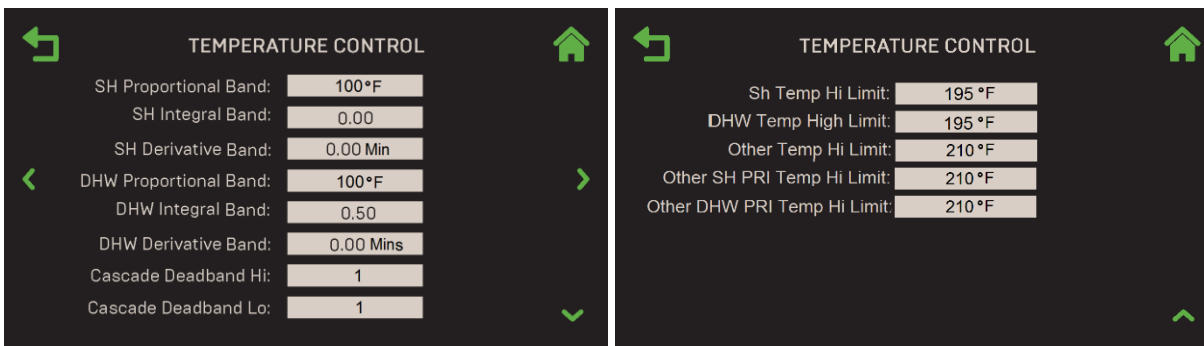


Figure 6-42: Operating Controls: Cascade Temperature Control Screens

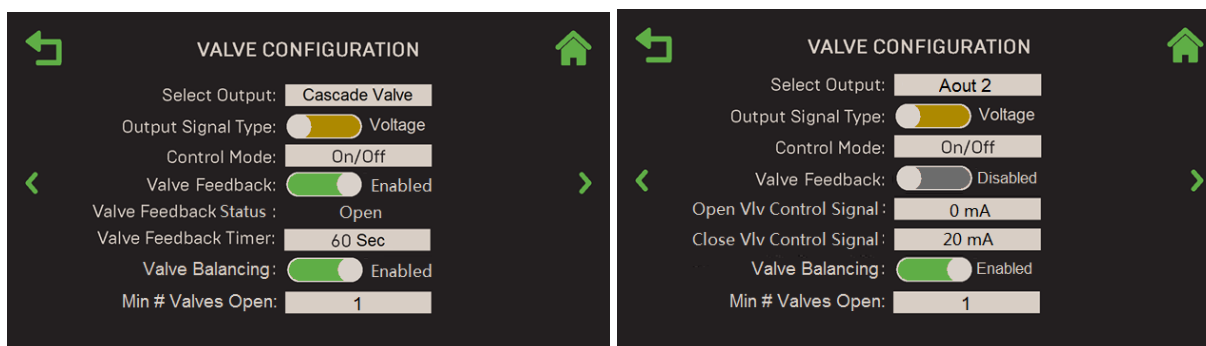
2. The following parameters appear (SH = Space Heating, DHW = Domestic Hot Water):
 - **SH & DHW Proportional Band:** Generates a fire rate based on the error between the setpoint temperature and the actual outlet temperature. If the difference is less than the value of these parameters, the fire rate will be less than 100%. If the error is equal to or greater than these parameters, the fire rate will be 100%. (Range: 1°F to 120°F)
 - **SH & DHW Integral Band:** the fraction of the output, due to setpoint error, to add or subtract from the output each minute to move towards the setpoint. (Range: 0.00 to 2.00)
 - **SH & DHW Derivative Band:** This responds to the rate of change of the setpoint error. This is the time that this action advances the output. (Range: 0.0 to 2.0 min.)
 - **Cascade Deadband Hi & Lo:** The temperature range within which the plant Outlet Temperature can drift above and below the Setpoint. (Range: 0 to 25°F)
 - **SH, DHW, Other, Other SH PRI & Other DHW PRI Hi Limit** (options depend on Application chosen in [Section 6.3.3](#)). The highest temperature for each Application the plant will meet. (Range: Benchmark boilers: 40 to 210°F; CFR boilers: 140 to 210°F)

6.3.4.4 Valve Configuration

The Valve Configuration screen contains parameters necessary for communicating with and controlling the external sequencing valves on the boilers in a BST cascade.

NOTE: This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all **BST Client** units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** will take precedence.

- Go to: **Advanced Setup → BST Cascade → Operating Controls → Valve Configuration.**



SELECT OUTPUT = CASCADE VALVE

SELECT OUTPUT = Aout 2

Figure 6-43: Operating Controls: Valve Configuration Screen

- In **Select Output**, choose either:
 - Cascade Valve:** For use with AERCO supplied valves.
 - Aout 2:** For controlling non-AERCO supplied valves. This is only available for Benchmark boilers, it is not applicable to CFR boilers.
- The following parameters appear for both values of **Select Output**:
 - Output Signal Type:** Select output signal type of selected output: **Current** or **Voltage**.
 - Control Mode:** Choose **On/Off**, **Linear Modulation** or **Delta T Modulation**.
 - Valve Feedback:** If Enabled, the following additional parameters appear:
 - Valve Feedback Status:** A read-only display of the current valve status.
 - Valve Feedback Timer:** Time to detect **Valve Feedback Status** (30 - 240 sec.)
 - Valve Balancing:** If you wish to implement the Valve Balancing feature on the cascade, set this parameter to **Enabled**, then go to [Section 6.3.4.8](#) and complete instructions there. **Valve Balancing** is only available for Benchmark boilers, it is not applicable to CFR boilers.
 - Min # Valves Open:** This parameter appears only if **Unit Mode = BST Manager** (see [Section 6.3.1](#)). Specify the minimum number of isolation valves that must stay open at all times, including during plant standby conditions. The number specified appears on the Isolation Valve Status screen (see [Section 7.5](#)). This ensures the boiler's maximum flow is not exceeded at low loads and helps reduce the flow rate during plant standby. To determine the value for Min # Valves Open, use the following formula, rounding up the result to the higher number:

$$\text{Min \# Valves Open} = (\text{Pump's minimum flow rate} / \text{Boiler maximum flow rate}).$$
- The following parameters appear only if **Select Output = Aout 2**:
 - Open Vlv Control Signal:** Select signal to "fully open" the valve: **0 mA**, **4 mA** or **20 mA**.
 - Close Vlv Control Signal:** Select signal to "fully close" the valve: **0 mA**, **4 mA** or **20 mA**.

6.3.4.5 Reserve Unit Control

The **Reserve Unit Control** screen allows you to enable the Reserve Unit Control feature, which will activate a “Reserve Unit” in the event the plant cannot keep up with the system load.

- **NOTE:** This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, its parameters apply to this unit and all **BST Client** units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** will take precedence.

1. Go to: **Advanced Setup → BST Cascade → Operating Controls → Reserve Unit Control**.

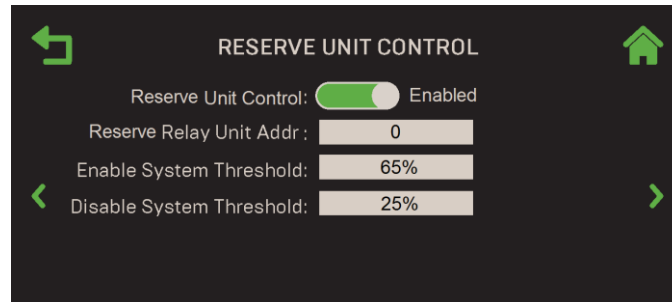


Figure 6-44: Operating Controls: Reserve Unit Control Screen

2. To enable a Reserve Unit, set **Reserve Unit Control** to **Enabled**.
3. If **Reserve Unit Control** = **Enabled**, the following additional parameters are available:
 - **Reserve Relay Unit Addr:** The address of the Edge unit that the reserve boiler is connected to via its reserve unit relay. (Range: 0 to 16 or max address in the plant)
 - **Enable System Threshold:** The plant fire rate that activates (closes) the Reserve Unit to fire. (Range: 20% to 100%)
 - **Disable System Threshold:** The plant fire rate that deactivates (opens) Reserve Unit; should be at least 20% below **Enable System Threshold**. (Range: 20% to 90%)

NOTE: In the event of a power outage, the BST Manager will not be able to tell the Reserve Unit to turn on. In the case where the Reserve Unit is also acting as a backup unit, a separate, normally open relay should be installed so that when a generator is operating the Reserve Unit will be active as well.

6.3.4.6 Setpoint Range

This screen includes all Setpoint Limiting and Setpoint Setback parameters for all units in the cascade.

- This screen is available only after BST Cascade functionality has been enabled (**Unit Mode** = **BST Client** or **BST Manager** in [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all **BST Client** units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** takes precedence.
- Some of the parameters below also appear in [Section 6.6.2.3](#), which is available only to standalone units. This section is available when that section is unavailable (see previous bullet).

SECTION 6: Advanced Setup

- Go to: **Advanced Setup** → **BST Cascade** → **Operating Controls** → **Setpoint Range**. The parameters on this screen depend which **Application** is chosen in [Section 6.3.3](#), as shown in the table below.

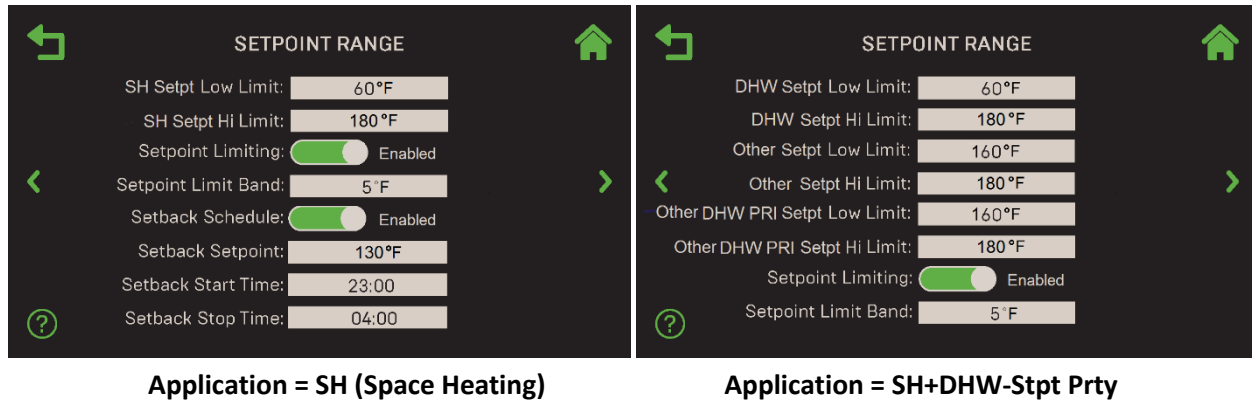


Figure 6-45: Operating Controls: Setpoint Range Screen

TABLE 6.13: Setpoint Range Parameters								
Available Parameters	Applications							
	NOTE: All applications apply to Benchmark, except those with an asterisk (*)							
	* SH	* DHW	Other	SH+DHW-2-Vlv	SH+DHW-1-Vlv	* SH+DHW-Stpt Prty	Other+SH-Stpt Prty	Other+DHW-Stpt Prty
SH Setpt Low Limit	✓			✓	✓	✓	✓	
SH Setpt Hi Limit	✓			✓	✓	✓	✓	
DHW Setpt Low Limit		✓		✓	✓	✓		✓
DHW Setpt Hi Limit		✓		✓	✓	✓		✓
Other Setpt Low Limit			✓				✓	✓
Other Setpt Hi Limit			✓				✓	✓
Other SH PRI Setpt Low Limit						✓	✓	
Other SH PRI Setpt Hi Limit						✓	✓	
Other DHW PRI Setpt Low Limit						✓		✓
Other DHW PRI Setpt Hi Limit						✓		✓
Setpoint Limiting	✓	✓	✓	✓	✓	✓	✓	✓
Setpoint Limit Band	✓	✓	✓	✓	✓	✓	✓	✓
Setback Schedule	✓	✓	✓	✓	✓	✓	✓	✓
Setback Setpoint	✓	✓	✓	✓	✓	✓	✓	✓
Setback Start Time	✓	✓	✓	✓	✓	✓	✓	✓
Setback Stop Time	✓	✓	✓	✓	✓	✓	✓	✓

- Configure the **Setpt Low Limit** and **Setpt High Limit** parameters. Together these two parameters determine the temperature range within which the setpoint for the chosen Application can vary. (Range: Benchmark boilers — 60°F to 245°F; CFR boilers — 140°F to 220°F)
- Set the **Setpoint Limiting** parameter to **Enabled** to **Disabled**. If **Enabled**, this feature acts as a temperature limiting governor. Should a unit's outlet temperature equal **Setpoint High Limit**, a PID function will intervene and maintain the outlet temperature at the **Setpoint High Limit** minus the **Setpoint Limit Band**. If Enabled, the following parameter appears:
 - Setpoint Limit Band:** Sets the number of degrees *below* **Setpoint High Limit** the unit's outlet temperature must fall before the unit restarts (Range = 0°F to 10°F)

SECTION 6: Advanced Setup

4. Set the **Setpoint Schedule** parameter to **Enabled** to **Disabled**. If **Enabled**, this feature will lower the Setpoint during periods of reduced demand for heat, such as at night. If **Enabled**, the following additional parameters appear (these same three parameter also appear in [Section 6.6.2.3](#) and can be changed in either screen):
 - **Setback Setpoint:** The Setpoint that will be in effect during the Setback period. (Range: Benchmark boilers — 60°F to 245°F; CFR boilers — 140°F to 190°F)
 - **Setback Start Time:** The **Setback** period's **start** time (example: 11:00 PM).
 - **Setback Stop Time:** The **Setback** period's **end** time (example: 5:00 AM).

6.3.4.7 Lead/Lag

The **Lead/Lag** screen allows you to create a Lead/Lag profile that the BST Cascade will follow.

NOTE: This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all **BST Client** units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** will take precedence.

1. Go to: **Advanced Setup → BST Cascade → Operating Controls → Lead/Lag**.

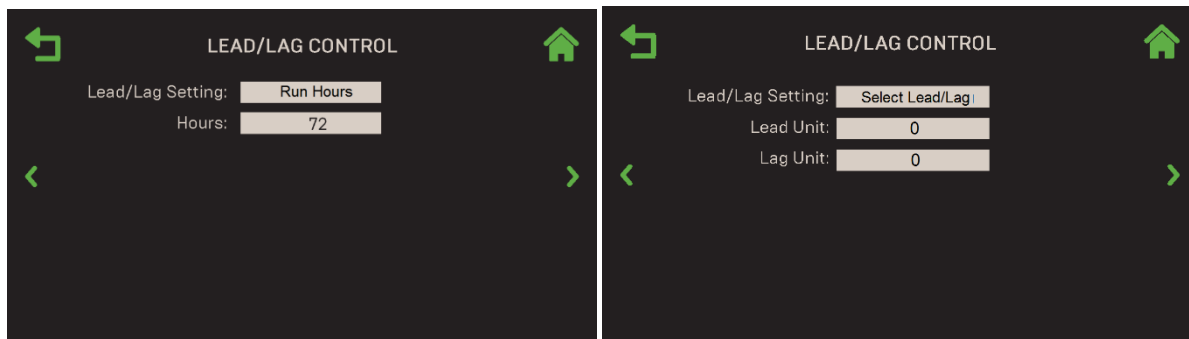


Figure 6-46: Operating Controls: Lead/Lag Control Screen

2. Set the **Lead/Lag Setting** to one of the following (default = **Run Hours**):
 - **Run Hours:** The **Hours** parameter appears; specify the number of hours after which the Lead unit is rotated. (Range: 25 - 225)
 - **Unit Size:** Perform Lead/Lag based on unit size, starting with the smallest unit capacity.
 - **Select Lead/Lag:** The **Lead Unit** and **Lag Unit** parameters appear. Specify the address of the Lead and Lag units. (Range: 0 to 127)

6.3.4.8 Valve Balancing (Benchmark Only).

NOTE: This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 6.3.1](#)) and the Valve Balancing feature has been enabled in [Section 6.3.4.4](#). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all **BST Client** units. If the unit is configured as a **BST Client**, the parameters configured on the **BST Manager** will take precedence.

The **Valve Balancing** screen is used to configure the **Balanced Flow Isolation Valve** feature. The goal of this feature is to raise or lower all unit's current ΔT (water outlet temp minus water inlet temp) to match the plant's target ΔT , thereby balancing the load across multiple boilers in a BST cascade.

SECTION 6: Advanced Setup

Prior to balancing, in normal operation all isolation valves are either fully closed or fully open (0% or 100% open). Valve balancing is accomplished by reducing the isolation valve's "fully open" position, thereby restricting the flow from the unit's hot water outlet, as needed, until the unit's ΔT matches the plant's target ΔT . This is repeated on the other units in the BST cascade until each unit's ΔT is approximately the same.

The isolation valve's "fully open" position is controlled by the number of volts sent to the valve; before balancing 0.00V = "fully open". Adjusting the "fully open" position is accomplished by raising the voltage to something above 0.00V. After balancing, the new voltage is used to open the valve when the boiler is firing. The "fully closed" voltage does not change.

The procedure described above is performed from the unit designated as the BST Manager; at completion the BST Manager transmits the new voltage to each unit in the cascade.

Once valve balancing has been completed, the final step is to physically go to each isolation valve and manually configure it to send the "valve open" signal to the Controller when it gets to the *new* "fully open" position. Once in operation, each time the isolation valve is activated, it will go to the new open position and send a "valve open" signal to the Controller, allowing ignition to proceed.

Before starting this procedure, determine the ΔT the plant was designed for.

1. Go to: **Advanced Setup → BST Cascade → Operating Controls → Valve Balancing**. (if disabled, go to **Valve Configuration**) and set the **Valve Balancing** parameter to Enabled.

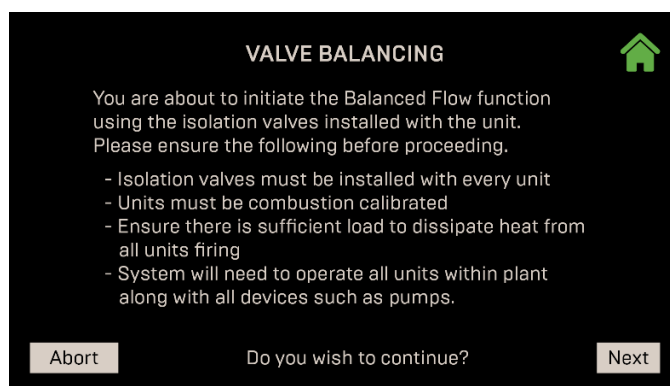


Figure 6-47: Operating Controls: Valve Balancing

2. Check that all the prerequisite requirements have been met. It is especially important that the third requirement ("Ensure there is sufficient load...") is met, as valve balancing is more accurate when all units are in normal operation. When ready, press **Next** to continue.
3. The **Manual Valve Balancing** screen appears. Each square represents one unit in the BST Cascade, and shows its current ΔT . The color coding is:
 - **Green:** The unit is firing normally, as shown in the Figure below.
 - **Yellow:** The unit is firing but experiencing an alert condition, which may prevent the unit from reaching the desired Air Fuel Valve Position.
 - **Red:** The unit is not firing due to a fault.

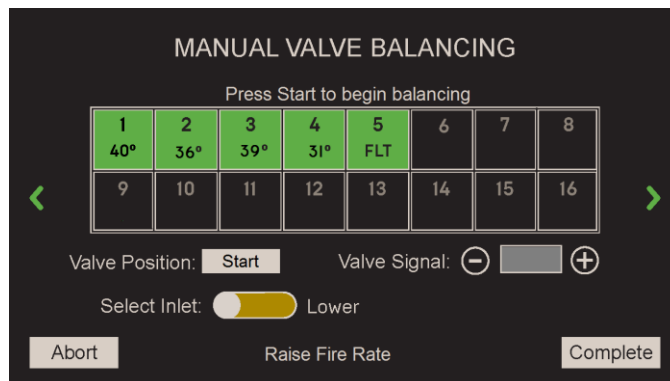


Figure 6-48: Operating Controls: Manual Valve Balancing Screen

4. To begin balancing, press the **Start** button. A screen opens prompting you to specify the A/F Valve position, which will be used on all units during balancing. AERCO suggests choosing an A/F Valve position that is typical in your normal, everyday operation, such as 40% to 60%. Press **Save** when done; all units will now ramp up/down to the specified A/F Valve position.
5. Wait for all units to complete ignition; each box should be green and display a temperature value.
6. The Manual Valve Balancing screen reappears. The lower portion of the screen contains shows:
 - **Valve Position:** A/F valve position; all units will run at this position during valve balancing.
 - **Valve Signal:** Controls the voltage sent to the isolation valve: 0.00 to 10.00V.
 - **Select Inlet:** Choose water inlet to be used to calculate ΔT : **Upper** or **Lower**.
 - **Status:** Displays the current status. Some plant events, such as alerts or faults, are displayed for a short time before reverting to displaying status.

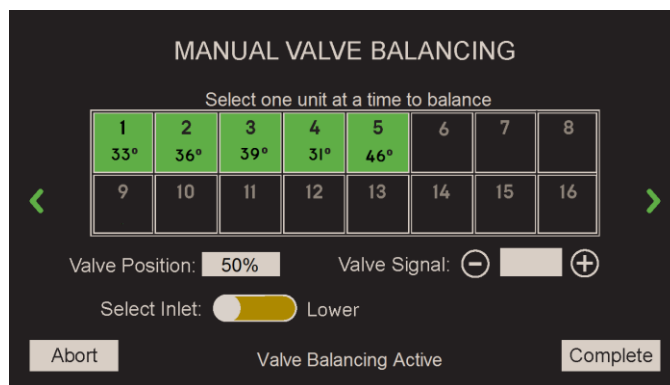


Figure 6-49: Operating Controls: Manual Valve Balancing Screen

7. Select the water Inlet to use to calculate ΔT , either **Upper** or **Lower**.
8. Allow ~ 20 seconds per boiler for the ΔT values of all units to stabilize before continuing.
9. Press the square of the first unit to balance. Do not start with any of the units with larger ΔT values.

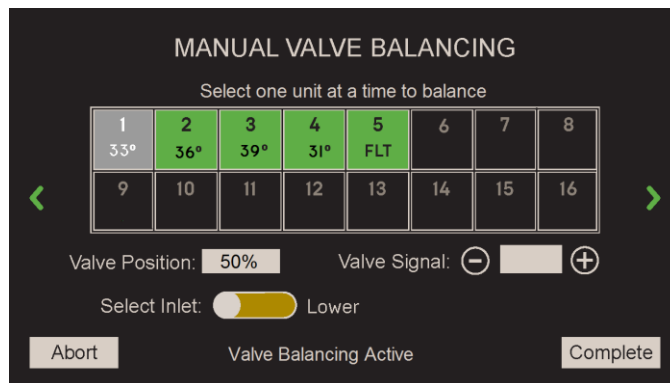


Figure 6-50: Operating Controls: Manual Valve Balancing Screen

10. Use the **Valve Signal** controls to adjust the voltage sent to the isolation valve. Note the following:

- Before Balancing, fully open = 0.00V, fully closed = 10.00V
- To view the current voltage, press the data entry field between the + and – controls.
- If the current ΔT is **below** the target, **raise** ΔT by **raising** the voltage sent to the isolation valve; this **reduces** the isolation valve's "fully open" position (**reducing** outlet water flow) thereby **increasing** outlet water temperature.

ΔT 	Voltage 	Valve Position 
---	--	---

- There are two ways to change the voltage sent to the isolation valve:
 - Use the + and – controls to change the voltage by 0.01V per push.
 - Press the data entry field, type any value from 0.00 to 10.00V in, then press **Save**.
 - The effect of voltage adjustments is not linear across the full 0 to 10V range. As the voltage approaches 0V, small voltage changes change flow rate by a greater percent and therefore have a greater effect on ΔT .
 - After a voltage change, allow a minute or more for ΔT to stabilize.
 - An adjustment to one unit can have a minor effect on some or all of the other units in the cascade. Allow enough time after each adjustment for it to take full effect before making the next adjustment.
 - The previous point is especially true for large cascades, as it will take time for the effect of each adjustment to ripple through the entire cascade.
11. Repeat the previous step on the next unit and wait for ΔT to stabilize.
12. Repeat Step 10 for **most** of the remaining units in the cascade. Note, it is common to exclude one unit from balancing, so that unit's isolation valve opens to 100%. This will make it easier for the remaining units to maintain the target ΔT (i.e., prevent choking). If you have trouble balancing all remaining units, try excluding 2 (or possibly more) units from balancing.
13. Once the last unit has been balanced, press **Complete**. All the new isolation valve voltage values are stored on the BST Manager and the new values are transmitted separately to each unit. This may take several minutes to complete.
14. Press **Abort** at any point before pressing **Complete**. Choose **Yes** to exit without saving any values; choose **Save Defaults** to save factory default signal settings; choose **No** to cancel the Abort.

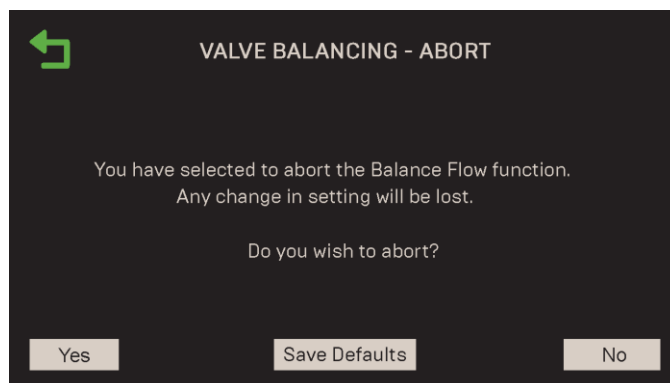


Figure 6-51: Operating Controls: Valve Balancing – Abort Screen

15. If the system experiences three or more over-temperature faults during valve balancing, the function will be interrupted, and the following screen displayed. Abort or retry this operation.

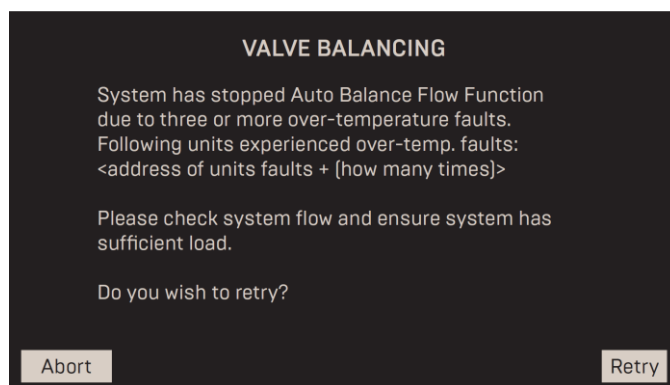


Figure 6-52: Operating Controls: Valve Balancing Stopped Screen

16. Go to the isolation valve and manually adjust when it sends the “valve open” signal to the Controller. With the valve in its new, balanced “fully open” position, use a screw driver to rotate the arrow on the Valve Position Signal Indicator so that it points well inside the “Valve On” arc, as shown in the figure below. When the indicator arrow (moving counter-clockwise when opening) passes the 1 at the top of the arc, the valve will send the “valve open” signal to the Controller. If this step is not done, the Controller could abort the ignition sequence and display a “**Delayed Interlock Open**” fault.

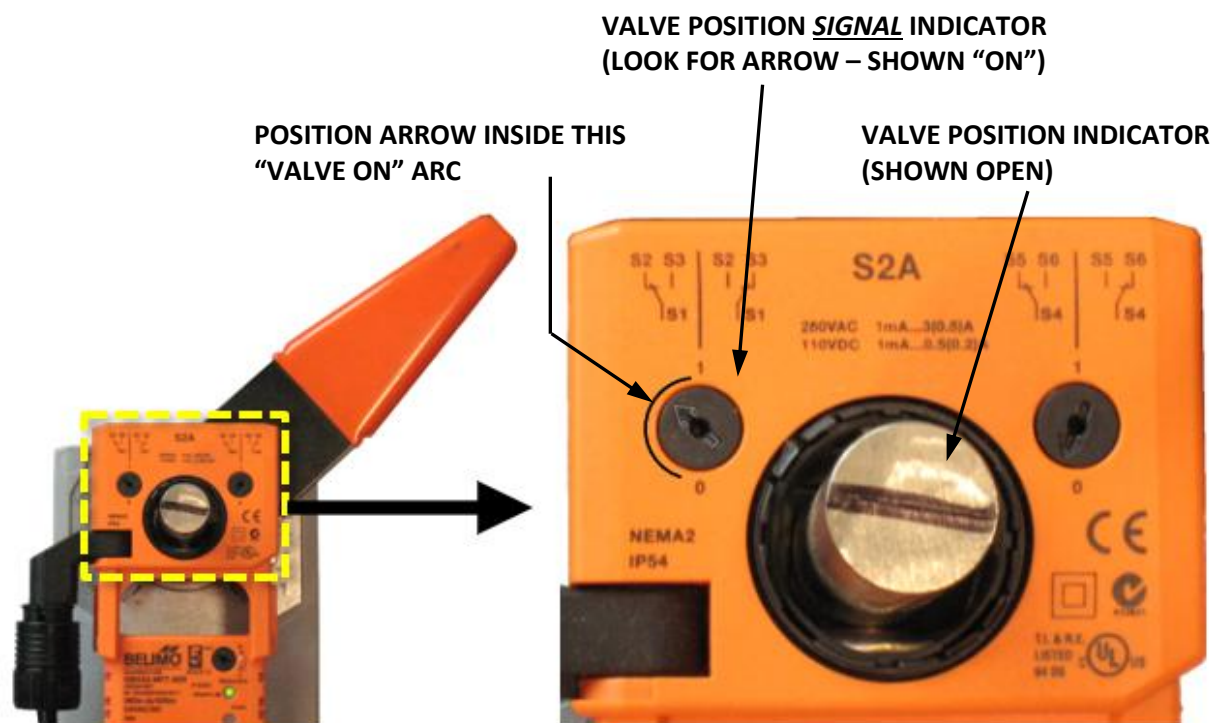


Figure 6-53: Operating Controls: Isolation Valve

17. Repeat the previous step on all other units that have been balanced.

6.3.5 SmartPlate Communication

The **SmartPlate Communication** screen provides parameters for configuring communication between SmartPlate units and a “Manager” boiler. **NOTE:** This screen is available only after BST Cascade functionality has been enabled (see **Unit Mode** in [Section 6.3.1](#)). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all BST Client units.

Go to: [Main Menu](#) → [Advanced Setup](#) → [BST Cascade](#) → [SmartPlate Comm.](#)

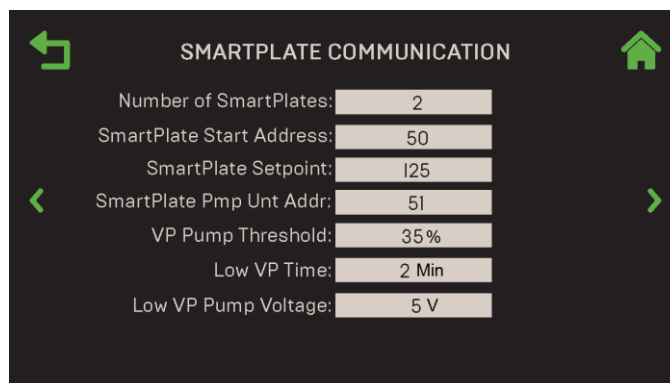


Figure 6-54: BST Cascade: SmartPlate Communication Screen

This screen contains the following parameters:

- **Number of SmartPlates:** Quantity of SmartPlate units in BST Cascade (range: 0 - 6).
- **SmartPlate Start Address:** Address of the first SmartPlate in the BST Cascade (range: 50 - 54).
- **SmartPlate Setpoint:** The setpoint of the SmartPlate units (range: 0 - 140°F).
- **SmartPlate Pmp Unit Addr:** Address of the SmartPlate whose feedback will be used to control the variable speed DHW pump (range: 0 - 255).
- **VP Pump Threshold:** Valve Position threshold lowers pump speed from 10V (range: 20% - 70%).
- **Low VP Time:** Amount of time SmartPlate is in VP (Valve Position) Pump Threshold before reducing DHW pump speed (range: 1 - 15 min.).
- **Low VP Pump Voltage:** The voltage to which the pump is reduced to after SmartPlate units meets **VP Pump Threshold** and **Low VP Time** has expired (range: 2 - 8 V).

6.4 Communication & Failsafe

The **Communication & Failsafe** screen allows you to configure all communication interfaces for a variety of purposes, such as BAS, onAER or Smart Devices. Each option is described below.

Go to: [Main Menu](#) → [Advanced Setup](#) → [Communication & Failsafe](#).



Figure 6-55: Advanced Setting: Communication & Failsafe

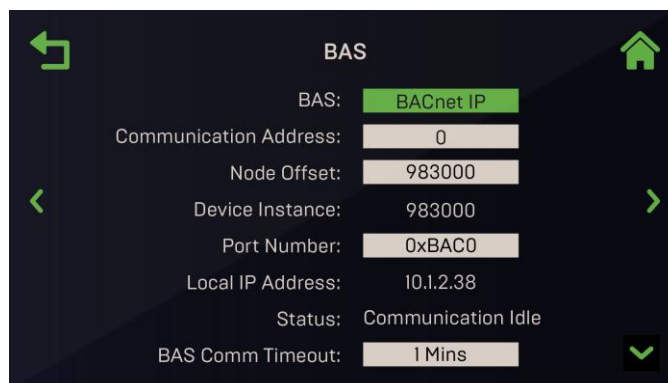
6.4.1 BAS (Building Automation System)

The **BAS** screen provides communication parameters for both BACnet and Modbus interfaces.



Figure 6-56: Communication & Failsafe: BAS Screens

1. The default is **Off**. To enable communication with a BAS, press **BAS** and choose the protocol:
 - BACnet IP
 - BACnet MSTP
 - Modbus TCP
 - Modbus RTU



BAS

BAS: BACnet IP

Communication Address: 0

Node Offset: 983000

Device Instance: 983000

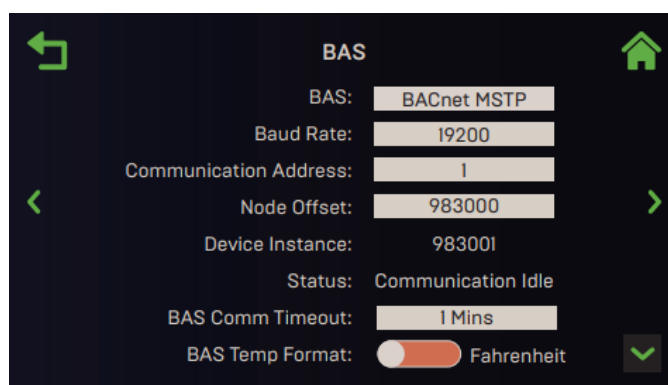
Port Number: 0xBAC0

Local IP Address: 10.1.2.38

Status: Communication Idle

BAS Comm Timeout: 1 Mins

Figure 6-57a: Communication & Failsafe: BAS Screen, BAS = BACnet IP



BAS

BAS: BACnet MSTP

Baud Rate: 19200

Communication Address: 1

Node Offset: 983000

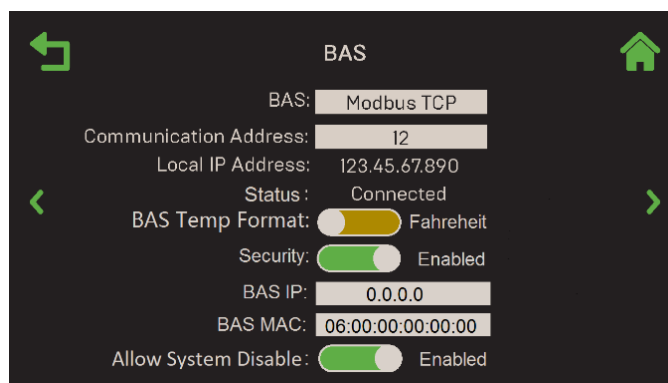
Device Instance: 983001

Status: Communication Idle

BAS Comm Timeout: 1 Mins

BAS Temp Format: ☒ Fahrenheit

Figure 6-58b: Communication & Failsafe: BAS Screen, BAS = BACnet MSTP



BAS

BAS: Modbus TCP

Communication Address: 12

Local IP Address: 123.45.67.890

Status: Connected

BAS Temp Format: ☒ Fahrenheit

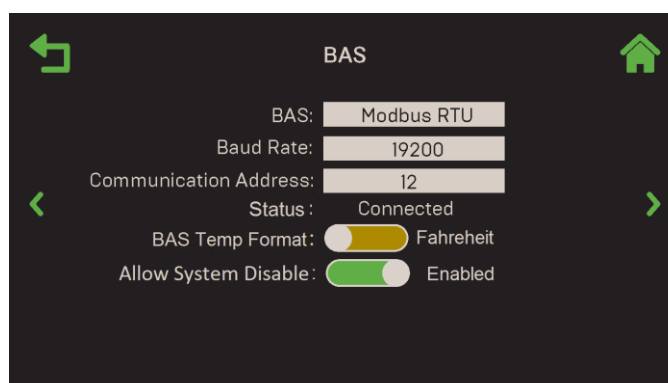
Security: ☒ Enabled

BAS IP: 0.0.0.0

BAS MAC: 06:00:00:00:00:00

Allow System Disable: ☒ Enabled

Figure 6-59c: Communication & Failsafe: BAS Screen, BAS = Modbus TCP



BAS

BAS: Modbus RTU

Baud Rate: 19200

Communication Address: 12

Status: Connected

BAS Temp Format: ☒ Fahrenheit

Allow System Disable: ☒ Enabled

Figure 6-60: Communication & Failsafe: BAS Screen, BAS = Modbus RTU

2. The table below lists the parameters available depending on the option chosen in Step 2:

TABLE 6.14: BAS Parameters				
Parameters Available	BACnet		Modbus	
	IP	MSTP	RTU	TCP
Baud Rate		✓	✓	
Communication Address	✓	✓	✓	✓
Node Offset	✓	✓		
Device Instance	✓	✓		
Port Number	✓			
Local IP Address	✓			✓
Status	✓	✓	✓	✓
BAS Temp Format	✓	✓	✓	✓
Security	✓			✓
• BAS IP (Security = Enabled)	✓			✓
• BAS MAC (Security = Enabled)	✓			✓
Allow System Disable	✓	✓	✓	

Baud Rate: Choose between: 9600, 19200, 38400 or 115200.

Communication Address: Network address of the Edge Controller on the BAS network. (0 - 127).

Node Offset: The starting address range for AERCO units.

Device Instance: Identifies the device on a BACnet network (read-only); generated from the **Node Offset** added to the **Communication Address** field. This value must be unique on a BACnet network.

Port Number: Specify the BAS port to which the unit will communicate (0xBAC0 – 0xBACF).

Local IP Address: Displays the local IP address of the Edge Controller.

Status: Displays the status of BAS communications.

BAS Temp Format: Choose Fahrenheit, Celsius or Points.

Security: Choose whether to **Enable** or **Disable** BAS Security. This option prohibits communication to any devices as specified by the IP address and MAC address, per parameters below. If enabled, the following additional parameters appear:

- **BAS IP:** Specifies the IP address of the BAS server.
- **BAS MAC:** Specifies the MAC address of the BAS server.

Allow System Disable: If **Yes** (default), a BAS front-end application can initiate a system or individual unit shutdown by writing **85** to an address below via BACnet or Modbus (not available for ProtoNode). BAS can reenale system by sending **0** to the same address.

BACnet: BST Manager BACnet address **229**; BST Client BACnet address **80**

Modbus: BST Manager Modbus address **40229**; BST Client Modbus address **40081**

6.4.2 onAER (Benchmark Only)

The **onAER** screen allows you to choose and configure how onAER will communicate with the network. **onAER** is only available for the Benchmark boilers, it is not available for the CFR boilers.

1. Go to: **Main Menu → Advanced Setup → → onAER.**

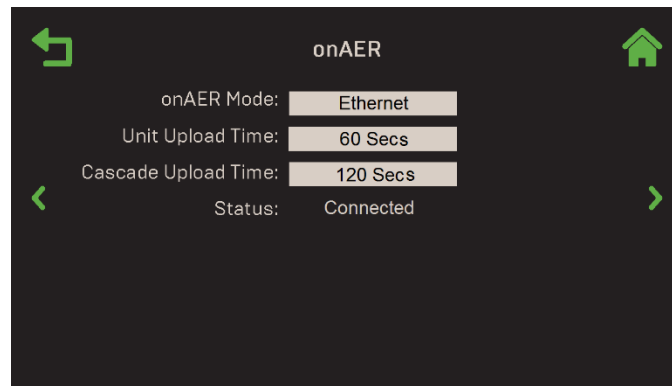


Figure 6-61: Communication & Failsafe: onAER Screen

2. The **onAER Mode** default is **Disabled**. To enable communication, choose one of the following:
 - **Ethernet:** Requires an Ethernet cable to plugged into the Controller's left side, as shown in Figure 6.2.7.1-1, in Section 6.2.7.1.
 - **Wi-Fi:** Requires the AERCO Wi-Fi module (P/N 24526-TAB) to be installed on the unit; see the *onAER Wi-Fi Module Installation Guide* (TID-0178) for instructions.
 - **Wiznet:** This option intended for units on which the Edge Controller was installed as a replacement for the C-More Controller.
3. Once enabled, the following additions parameters appear:
 - **Unit Upload Time:** How frequently unit data will upload to the server, in seconds. This will be split between unit data and cascade data (manager unit only). (Range: 30 to 9999)
 - **Cascade Upload Time:** How cascade data will upload to the server. (Range: 60 to 9999 sec.)
 - **Status:** Displays the communication interface status, which varies depending on the interface selected in Step 2.

6.4.3 Smart Devices (Benchmark Only)

The **Smart Devices** screen provides parameters for establishing and configuring Bluetooth communication with a smart device.

- Go to: **Main Menu → Advanced Setup → Communication & Failsafe → Smart Devices.**

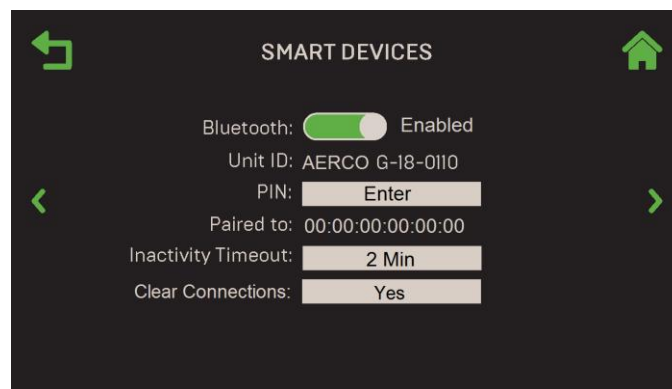


Figure 6-62: Communication & Failsafe: Smart Devices Screen – Shown Enabled

- The **Bluetooth** parameter's default is **Disabled**. If set to **Enabled**, the following additional parameters appear:
 - Unit ID:** Displays the Bluetooth device ID for the boiler as seen on a smart device. This is set to unit S/N at the factory and does not change.
 - PIN:** Press **Enter** and type the PIN required to authenticate pairing to the device.
 - Paired To:** Displays the name of the Smart Device that the unit is currently paired with and is actively connected (long names are truncated). If the name cannot be found, the MAC address is displayed.
 - Inactivity Timeout:** Specifies the inactive time in minutes, after which the connection is automatically severed. (Range: 2 to 15 min.)
 - Clear Connections:** Choose **Yes** or **No**. If **Yes**, the list of all paired devices is cleared.

6.4.4 Ethernet

The **Ethernet** screen will typically have the DHCP option **Enabled**, and therefore won't require additional configuration. If the DHCP is **Disabled**, the parameters shown below are available for editing with addresses the unit can use to communicate with the network.

NOTE: Ethernet communication requires an Ethernet cable plugged into the Ethernet port on the Controller's left side (see [Section 6.2.7.1: Preparing for Firmware Update](#)).

- Go to: **Main Menu → Advanced Setup → Communication & Failsafe → Ethernet**.

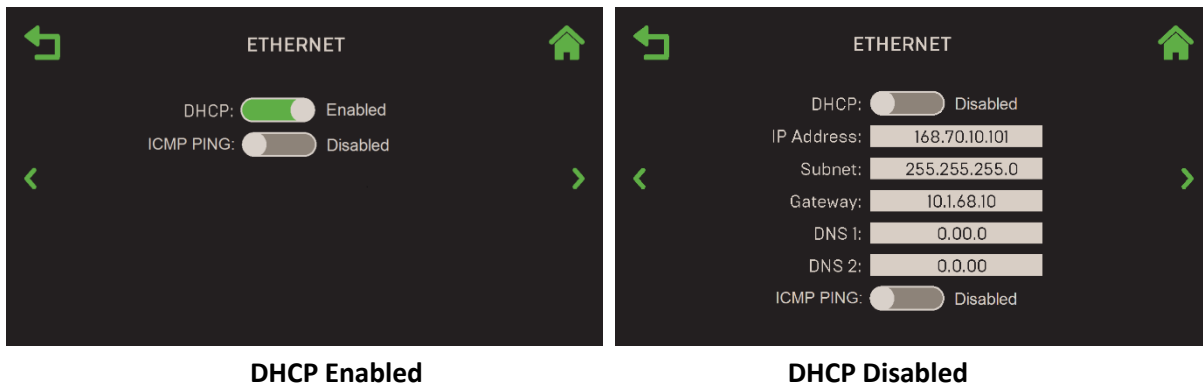


Figure 6-63: Communication & Failsafe: Ethernet Screen

- If **DHCP** is **Disabled**, manually enter the communication parameters, typically provided by a network administrator, in the following parameters:
 - IP Address**
 - Subnet**
 - Gateway**
 - DNS 1**
 - DNS 2**
- If **ICMP Ping** is **Enabled**, the unit will respond to a ping from a network administrator.

6.4.5 Communication Failsafe

The **Communication Failsafe** option specifies how the unit will operate when either the Manager communication or a Remote Signal is lost and the unit has to operate independently.

1. Go to: **Main Menu → Advanced Setup → Communication & Failsafe → Failsafe.**

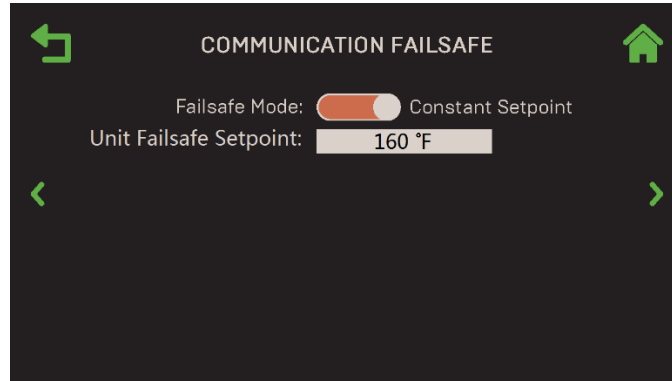


Figure 6-64: Communication & Failsafe: Communication Failsafe Screen

2. Set the **Failsafe Mode** parameter to either Constant Setpoint or Shutdown. If you chose **Constant Setpoint**, **Unit Failsafe Setpoint** appears: Set to default if communication fails.

6.5 Ancillary Devices

The **Ancillary Devices** screen allows configuration of all unit inputs and outputs.

1. Go to: **Main Menu → Advanced Setup → Ancillary Devices.**

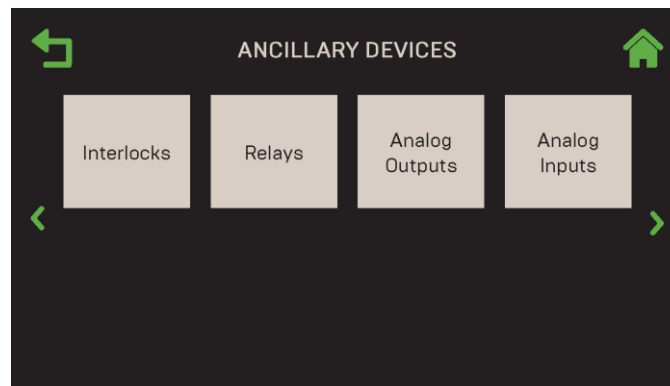


Figure 6-65: Advanced Setting: Ancillary Devices Screen

6.5.1 Interlocks

The Controller offers two interlock circuits, **Remote Interlock** and **Delayed Interlock**, both of which can interface with an Energy Management Systems (EMS) or a Building Automation System (BAS) and auxiliary equipment such as pumps or louvers. Both must be in the closed position to allow the unit to fire. They must be connected to the following pins on the unit's I/O board (see the *Benchmark Edge: INSTALLATION Manual* OMM-0136 for more info):

- **Remote Interlock** wired to connector strip J6, pins 1 and 2
- **Delayed Interlock** wired to connector strip J6, pins 3 and 4

1. Go to: **Main Menu → Advanced Setup → Ancillary Device → Interlocks.**

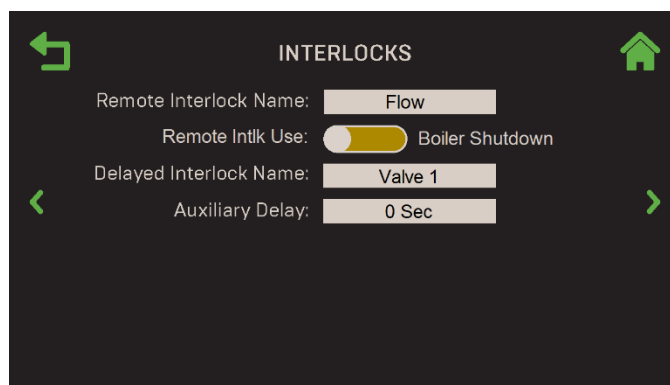


Figure 6-66: Ancillary Devices: Interlocks Screen

2. The following parameters Configure the **Remote Interlock**:
 - Remote Interlock Name:** Choose **Flow**, **Louver**, **Damper** or **Other**
 - Remote Intlk Use:** Specifies what will shut down if the selected interlock switch is open, either the individual boiler or the full system. Choose **Sys Shutdown**, **Boiler Shutdown** or **SH Shutdown**.
3. The following parameters configure the **Delayed Interlock**. This includes an adjustable delay timer, which delays the ignition sequence, allowing time for a proving switch to be made to prevent a fault.
 - **Delayed Interlock Name:** Choose **Valve 1**, **Valve 2**, **Louver** or **Louver 2**.
 - **Auxiliary Delay:** Select the interlock delay. **If the unit has a Sequencing Isolation Valve, this must be set to 120 seconds** (see *Benchmark Edge: Installation Manual* (OMM-0136, Section 2.14; for *CFR Boilers*, see *OMM-0163 Section 2.14*). (Range: 0 to 240 sec.)
 - **BST Remote Interlock:** Enable this feature on an Edge[ii] unit in order to use the "Spare RTD 1" input (J4 terminal 4&5) as a wired logical Remote Disable for the System or just the SH plant.

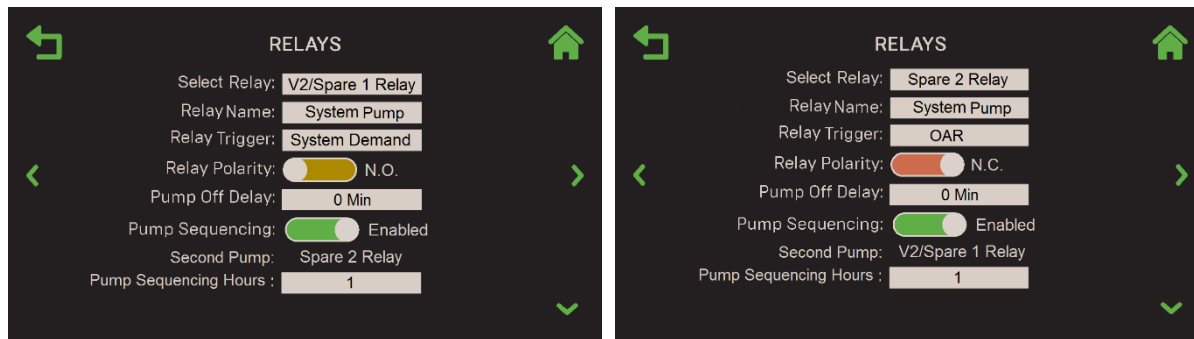
NOTE: Do not use the Remote Interlock connection for emergency shutdown, since the plant will not do so if the BST Manager is in fault

NOTE: For BST plant shutdown with the Edge controller (when "SH Shutdown" or "System Shutdown" is selected), "BST Remote Interlocks" must be "Enabled", and the remote interlock dry contact must be wired to pins 5 and 6 of connector J4 (labelled "RTD Spare 1") on the manager unit. For security, wire to the Remote Interlock of each boiler with a separate dry contact from a multi-pole switch.

6.5.2 Relays

This allows you to configure up to two auxiliary relays: **'AUX 2' Relay** and **'PUMP 2' Relay**.

- Go to: **Main Menu → Advanced Setup → Ancillary Device → Relays.**



SELECT RELAY = V2/Spare 1 Relay

SELECT RELAY = Spare 2 Relay

Figure 6-67: Ancillary Devices: Auxiliary Relays Screens

- Press **Select Relay** and choose either **V2/Spare 1 Relay** or **Spare 2 Relay**.
- In the **Relay Name** parameter, choose the name for the relay selected above:

Benchmark Boilers	V2/Spare 1 Relay Names		Spare 2 Relay Names	
	Swing Valve 2	System Pump	System Pump	Summer Pump
	Summer Pump	Pump 2	Pump 2	Louver
	Louver	Louver 2	Louver 2	Damper
	Damper	Sequenced Pump	Sequenced Pump	Other

CFR Boilers:

V2/Spare 1 Relay Names		Spare 2 Relay Names	
• Damper	• Pump 2	• Damper	• Other
• Louver	• System Pump	• Louver	• Pump 2
• Louver 2		• Louver 2	• System Pump

- This screen includes the following additional parameters:
 - Relay Trigger:** Choose the selected relay's activation trigger:
 - BAS
 - Always On
 - Unit Demand
 - OAR
 - DHW Demand
 - System Demand
 - Relay Polarity:** Choose how the relays will be defined when deactivated, either **N.O.** (Normally Open) or **N.C.** (Normally Closed).
 - Pump Off Delay:** Enter a delay time after the unit shuts down before the pump turns off. (Range: 0 to 30 minutes)
 - V2/Spare 1 Relay Address** or **Remote Pump2 Relay Address:** Enter the address of the boiler whose I/O Board relay is wired.
 - Pump Sequencing** (appears when **Relay Name = System Pump**) To turn on pump sequencing, set to **Enabled**. When enabled, the following additional parameters appear:
 - **Second Pump:** Displays 2nd pump, either: **V2/Spare 1 Relay** or **Spare 2 Relay**.

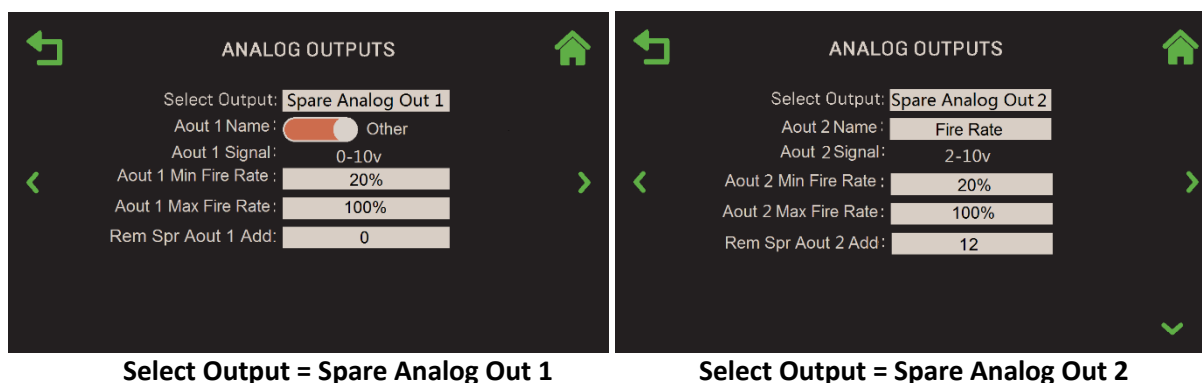
SECTION 6: Advanced Setup

- **Pump Sequencing Hours:** The number of hours each pump will run before switching to the other pump (Range: 1 to 250)
- **Flow Providing Interlock:** The Flow Providing Interlock proves a pump is operational before firing any units. This parameter specifies the number of the unit that has the Flow Providing Interlock. (Range: 0 to 16)

6.5.3 Analog Outputs

The **Analog Outputs** menu allows you to configure the three available analog outputs.

1. Go to: **Main Menu → Advanced Setup → Ancillary Device → Analog Outputs.**



Select Output = Spare Analog Out 1

Select Output = Spare Analog Out 2

Figure 6-68: Ancillary Devices: Analog Outputs Screen

2. In the **Select Output** parameter, choose the analog output you want to configure. These outputs attach to the unit's I/O box strip J5, on the pins shown below.

- Spare Analog Out 1 – pin 7 Spare Analog Out 1+ pin 8 Spare Analog Out 1-
- Spare Analog Out 2 – pin 9 DHW V.S. Pump + pin 10 DHW V.S. Pump -
- Spare Analog Out 3 – pin 11 Spare Analog Out 3+ pin 12 Spare Analog Out 3-

For CFR boilers, the only available analog output is Spare Analog Out 1 on terminal J5, pins 7 and 8.

3. The following parameters appear depending on the value of **Select Output**:

- **Aout # Name:** Aout 1 and Aout 3 can be set to Fire Rate or Other; Aout 2 can be set to Valve, Fire Rate or Other.
- **Aout # Signal:** Displays the signal for this output: Aout 1 = 1-10v, Aout 2 and Aout 3: Appears only if **Select Output** = Spare Analog Out 3: A read-only display of the signal associated with Spare Analog Out 3.
- **Aout # Min Fire Rate** and **Aout # Max Fire Rate:** Enter the minimum and maximum fire rates. The analog voltage signal is linearly mapped to the firing rate values. (Min Fire Rate Range: 0% to 50%, Max Fire Rate Range: 51% and 100%).
- **Rem Spr Aout # Add:** (Remote Spare Analog Output # Address, where # is the output chosen in Step 2, 1, 2 or 3): Specify the address of the unit to which the analog output signal is sent. (Range: 0 to 16)

6.5.4 Analog Inputs

Analog Input menu allows you to configure all available programmable analog inputs.

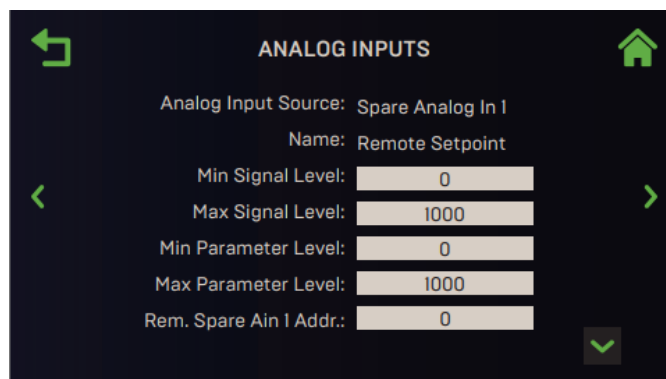


Figure 6-69: Ancillary Device: Analog Inputs Screen

4. Choose the analog input you want to configure. These inputs attach to the unit's I/O box strip J5, on the pins shown below.
 - Spare Analog In 1 – pin 3 Spare Analog In 1+ pin 4 Spare Analog In 1-
 - Spare Analog In 2 – pin 5 Spare Analog In 2+ pin 6 Spare Analog In 2-
 - Spare Analog In 3 – pin 1 Spare Analog In 3+ pin 2 Spare Analog In 3-
 For CFR boilers, the only available analog input is Spare Analog In 1 on terminal J5, pins 3 and 4.
5. For CFR boilers, the name of the input is Remote Setpoint. For Benchmark boilers, select the name for the input chosen in Step 2 in the **Name** field. (Note, the combination chosen in Steps 2 and 3 determines what appears in [Section 3.3.3: Analog Inputs.](#))
 - Not Assigned
 - Remote Setpt 2
 - Swing V1 Fdbk
 - Swing V2 Fdbk
 - Blr VSP Fdbk
 - DHW VSP Fdbk
 - SmartPlate VP
 - NOx
6. For all values of **Name** except **Not Assigned**, configure the remaining parameters for the input chosen in Step 2:
 - **Min & Max Signal Level:** Enter values in the **Min** and **Max Signal Level** parameters. These two values define the range of the input signal. (Range: 0 to 100).
 - **Min & Max Parameter Level:** Enter values in the **Min** and **Max Parameter Level** parameters. These two values define the range to which the analog input signal level defined in **Min & Max Signal Level** will be linearly mapped. (Range: 0 to 100).
7. Configure the **Rem Spr Ain # Addr** (Remote Spare Analog In X Address, where **X** corresponds to the input chosen in Step 2): Specify the address of the unit from which the analog input signal is received. (Range: 0 to 16)
8. If needed, repeat Steps 2 – 5 for the other two analog inputs.

6.6 Performance

The **Performance** screen provides access to control and performance parameters for AERtrim, Temperature and Fire Control functionality. All three **Performance** screens apply only to the individual unit (they are not part of BST functionality).

Some unit level parameters are not applicable if BST is enabled. In that case, those parameters are greyed out or hidden. As a result, the screens shown below may include parameters that don't appear on the unit you are working on.

The AERtrim option is enabled only on units equipped with a functional O₂ sensor. If O₂ sensor is not detected or has faulted, the AERtrim button is greyed out. AERtrim is only available on Benchmark boilers, it is not available on CFR boilers.

1. Go to: **Main Menu → Advanced Setup → Performance.**

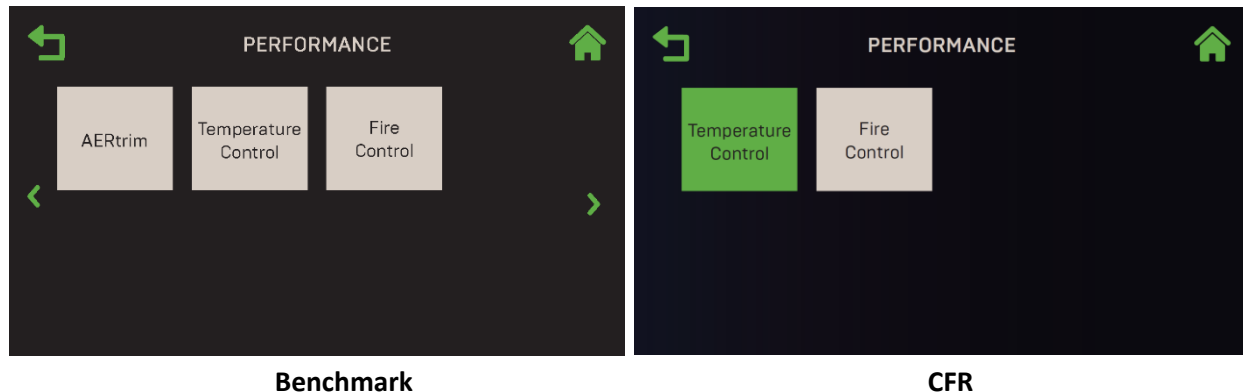


Figure 6-70: Advanced Setting: Performance

6.6.1 AERtrim (Benchmark Only)

The **AERtrim** screen provides access to AERtrim settings and parameters. Note, the parameters in those screens are not available until AERtrim has been successfully activated in the **AERtrim Settings** screen (see Section 6.6.2, below). AERtrim is only available on Benchmark boilers, it is not available on CFR boilers.

Go to: **Main Menu → Advanced Setup → Performance → AERtrim.**

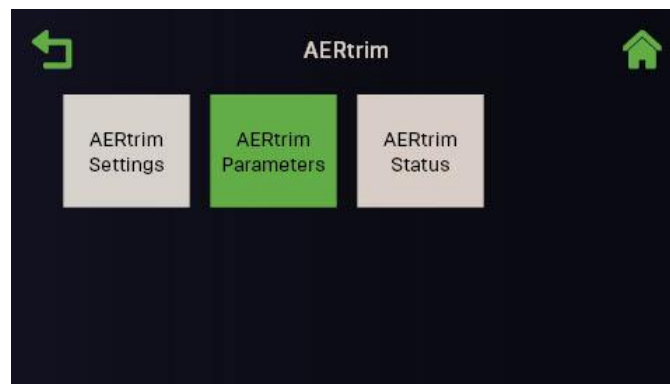


Figure 6-71: Performance: AERtrim Screen

6.6.1.1 AERtrim Settings

AERtrim functionality is enabled/disabled and configured on this unit from the **AERtrim Settings** screen.

NOTE: AERtrim must be **activated** before it can be **enabled**. When available, it is activated on Benchmark units before they are shipped. If a new controller is installed, it must be reactivated, which requires entry of the Activation Code, created by AERCO specifically for each unit. This process can be initiated from this screen, but you must have the Activation Code to complete the process. Each Activation Code is based on the serial number of the unit, and is therefore specific to that unit only. Once AERtrim has been successful activated, AERtrim can be disabled and re-enabled without having to re-activate it.

NOTE: AERtrim functionality is automatically disabled if the O₂ sensor is removed or faulted.

1. Go to: **Main Menu → Advanced Setup → Performance → AERtrim → AERtrim Settings.**

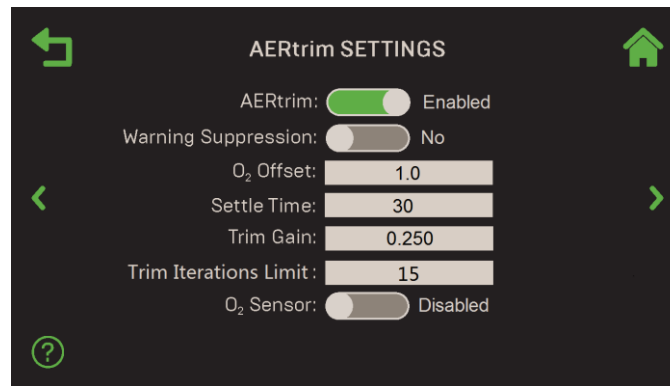


Figure 6-72: AERtrim: AERtrim Settings Screen

2. Use the **AERtrim** toggle to enable AERtrim functionality.

NOTE: If enabling AERtrim for the first time after replacing Controller, Activation procedure is initiated; Serial #, Trim ID, Fixed ID and Activation Code appear. You must contact AERCO to get an Activation Code.

3. Configure the remaining parameters as follows:
 - **Warning Suppression:** Set to **Yes** or **No**. No disables all AERtrim warnings.
 - **O2 Offset:** Sets O₂ offset to conform to an external analyzer. (Range: -3.0 to 3.0, Default = 1.0).
 - **Settle Time:** Specifies time for blower speed to settle after adjusting voltage (5 -120 seconds)
 - **Trim Gain:** A multiplier used to calculate offset to the blower voltage. 0.100 to 0.500)
 - **Trim Iteration Limit:** Specifies the maximum number of blower voltage adjustment iterations allowed in a single trim event (10-45, Default = 15)
 - **O2 Sensor:** Displays the current status of the O₂ Sensor, either **Enabled** or **Disabled**. If **Disabled** (for example, the sensor requires service), O₂ sensor warnings are suppressed.

6.6.1.2 AERtrim Parameters

Each Benchmark model has specific default valve positions. The **AERtrim Parameters** screen provides the ability to view, and if necessary, adjust the **O₂ Target**, **O₂ Upper Limit** and **O₂ Lower Limit** to suite specific conditions at each default valve position on this unit only.

1. Go to: **Main Menu → Advanced Setup → Performance → AERtrim → AERtrim Parameters.**

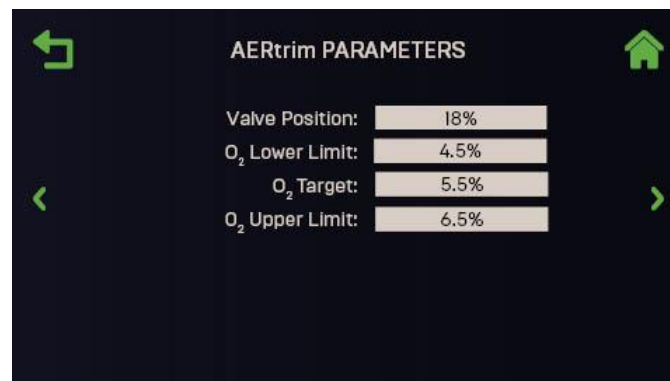


Figure 6-73: AERtrim: AERtrim Parameters

SECTION 6: Advanced Setup

2. Select a pre-defined **Valve Position** for the unit, from the minimum up to 100%.
3. Enter values for the position chosen in Step 2 as needed to suit site specific conditions:
 - **O₂ Lower Limit:** Must be at least 1% lower than O₂ Upper Limit (Range: 2.5% to 5.5%)
 - **O₂ Target:** Must be between O₂ Upper & O₂ Lower Limits. (Range: 3.0% to 8%)
 - **O₂ Upper Limit:** Must be at least 1% higher than O₂ Lower Limit (Range: 5.5% to 8.5%)
4. If necessary, repeat Step 2, choosing another valve position, then repeat Step 3 to enter appropriate values in the three parameters for the new valve position.

6.6.1.3 AERtrim Status

the **AERtrim Status** screen displays the current status of various AERtrim parameters and allows you to enable/disable **O₂ Monitoring** functionality on this unit only.

1. Go to: **Main Menu → Advanced Setup → Performance → AERtrim → AERtrim Status.**

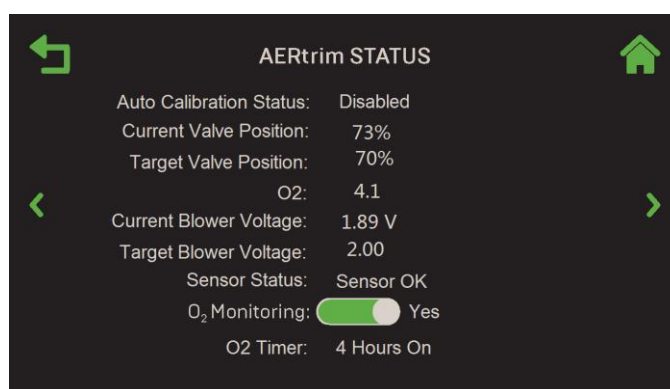


Figure 6-74: AERtrim: AERtrim Status

2. This screen displays the following “read only” parameters:
 - **Auto Calibration Status:** The current Auto Calibration status.
 - **Current Valve Position:** The A/F Valve’s actual current position.
 - **Target Valve Position:** The A/F Valve’s target position.
 - **O₂:** The current O₂ level.
 - **Current Blower Voltage:** The current blower voltage.
 - **Target Blower Voltage:** The target voltage
 - **Sensor Status:** The current status of the O₂ Sensor.
 - **O₂ Timer:** The current step in the AERtrim cycle.
3. Set the **O₂ Monitoring** parameter to **Yes** or **No**. Yes enables the AERtrim function. When set to **Yes**, the O₂ sensor is activated for 4 hours, followed by a 10 hours “off” period.

6.6.2 Temperature Control

The **Temperature Control** screen provides access to PID Settings, Temperature Conformance and Setpoint Range parameters for the unit. All three controls apply to this unit only.

Go to: [Main Menu](#) → [Advanced Setup](#) → [Performance](#) → [Temperature Control](#).

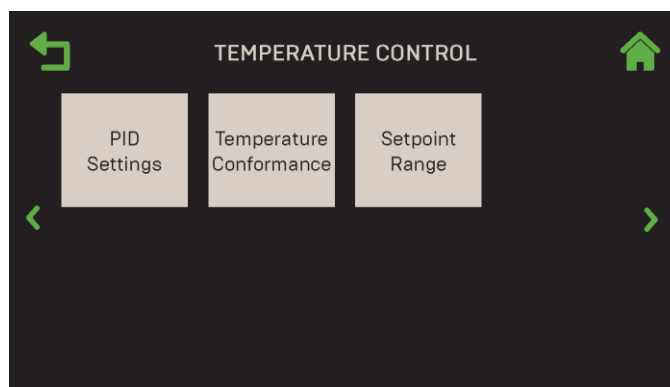


Figure 6-75: Performance: Temperature Control

6.6.2.1 PID Setting

The **PID Setting** screen provides access to PID parameters associated with **Space Heating**, Other and **DHW** applications, plus the option to restore factory PID defaults.

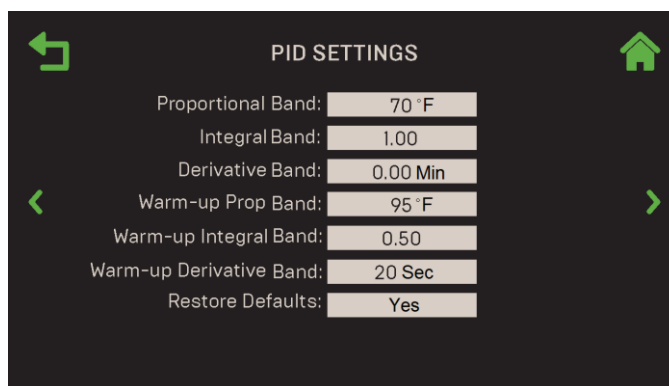


Figure 6-76: Temperature Control: PID Setting

This screen includes the following parameters:

- **Proportional Band:** Generates a fire rate based on the error that exists between the setpoint temperature and the actual outlet temperature. If the error is less than the proportional band setting, the fire rate will be less than 100%. If the error is equal to or greater than the proportional band setting, the fire rate will equal 100%. (Range: 1°F to 120°F)
- **Integral Band:** Specifies the fraction of the output, due to setpoint error, to add or subtract from the output each minute to move towards the setpoint. (Range: 0.00 to 2.00, default = 1.00)
- **Derivative Band:** This value responds to the rate of change of the setpoint error. It specifies the time that this action advances the output. (Range: 0.00 to 2.00 min.)
- **Warm-up Prop Band, Warm-up Integral Band, Warm-up Derivative Band:** These three parameters eliminate Temperature Overshoots during the “Warmup” period of a cold ignition cycle by temporarily modifying the PID Gain parameter during warmup.
- **Restore Defaults:** Set to **Yes** to reset all parameters to the factory default.

6.6.2.2 Temperature Conformance

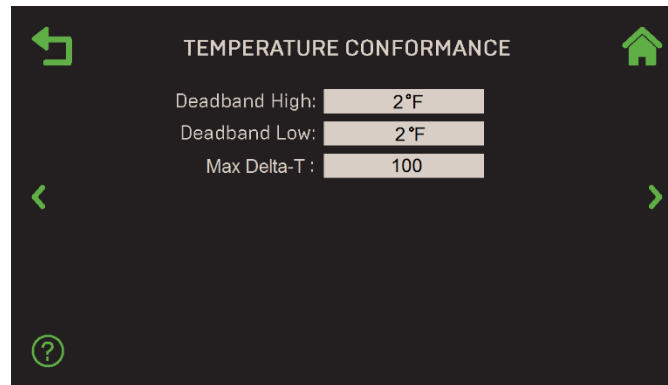


Figure 6-77: Temperature Control: Temperature Conformance

- **Deadband High & Deadband Low:** These create an “outlet temperature” zone in which no Valve Position corrections will be attempted. Operates with outlet temperature between **Active Setpoint + Deadband High** and **Active Setpoint – Deadband Low**. (0 - 25°F for both)
- **Max Delta-T:** Sets the maximum allowable difference between inlet and outlet water temperature (ΔT). If the unit reaches this limit, the fire rate will reduce to stay within the limit. The unit will shut down if it goes 20° above this limit. (20°F - 120°F)

6.6.2.3 Setpoint Range

This screen includes all **Setpoint** and **Setpoint Setback** parameters that apply to this unit only. **NOTE:** The parameters on this screen depend on the Application chosen in [Section 6.2.6](#). **NOTE:** Many of this screen’s parameters also appear in [Section 6.3.4.6: Setpoint Range](#), which is available only to **BST Client** or **Manager** units. That section is available when this section is unavailable.



Application = Space Heating

Application = Other

Figure 6-78: Temperature Control: Standalone Setpoint Range

1. Configure **Unit Setpoint Low Limit** and **Unit Setpoint High Limit (SH, DHW or Other)**, depending on application chosen in [Section 6.2.6](#). These determine temperature range for the chosen Application.

<ul style="list-style-type: none"> • Unit SH Setpt Low Limit • Unit DHW Setpt Low Limit • Unit Other Setpt Low Limit 	Sets <i>minimum</i> Setpoint Limiting temperature. (Range: Benchmark boilers — 20 to 245°F or Unit Setpt High Limit ; CFR boilers — 140 to 190°F or Unit Setpt High Limit)
<ul style="list-style-type: none"> • Unit SH Setpt High Limit • Unit DHW Setpt High Limit • Unit Other Setpt High Limit 	Sets <i>maximum</i> Setpoint Limiting temperature. (Range: Benchmark boilers — 20 or Unit Setpt Low Limit up to 245°F; CFR boilers — 140 or Unit Setpt Low Limit up to 220°F)

SECTION 6: Advanced Setup

2. The following **Setpoint** parameters are available for *all* values of the **Unit Application** parameter:
 - **Setpoint Limiting:** If Enabled, **Setpoint Limit Band** appears and **Setpoint Limit** acts as a temperature limit. Should a unit's outlet temperature equal **Setpoint High Limit**, a PID function will maintain outlet temperature at the **Setpoint High Limit** minus the **Setpoint Limit Band**.
 - **Setpoint Limit Band:** (If **Setpoint Limiting = Enabled**): How far *below* **Setpoint High Limit** the outlet temp must fall before restart (Default = 5°F (2.8°C), Range = 0°F to 10°F (0°C to 5.5°C))
3. **Setback Setpoint** can be used to lower the Setpoint when appropriate, such as at night. To enable, set **Setback Schedule** to **Enabled**, then configure **Setback Setpoint**, **Start Time** and **Stop Time**.

6.6.3 Fire Control

Fire Control provides access to functionality that affects the firing of this unit only.

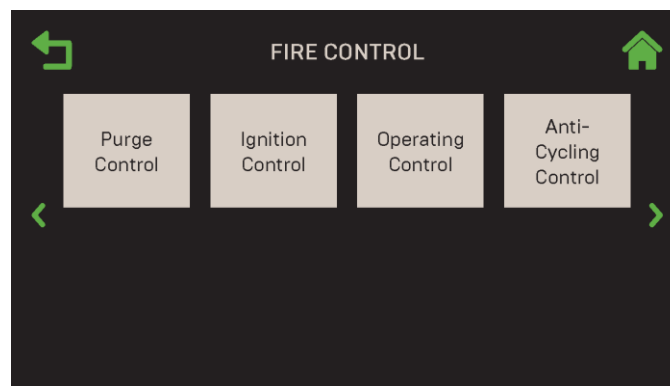


Figure 6-79: Performance: Fire Control

6.6.3.1 Purge Control

The **Purge Control** screen contains parameters associated with the purge process for this unit.

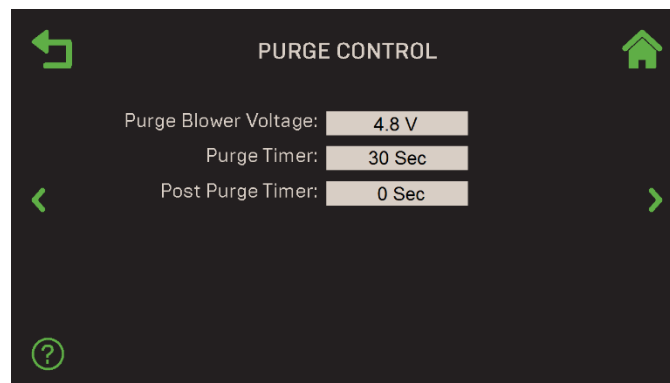


Figure 6-80: Fire Control: Purge Control

- **Purge Blower Voltage:** Adjusts blower speed (voltage) during the Purge cycle (2.0 to 10.0 V)
- **Purge Timer:** Allows adjustment of the pre-ignition purge time. (Range: 5 to 60 sec.)
- **Post Purge Timer:** Allows adjustment of the purge time when a unit shuts down. (0 to 60 sec.)

6.6.3.2 Ignition Control

The **Ignition Control** screen displays parameters related to ignition that apply to this unit only.

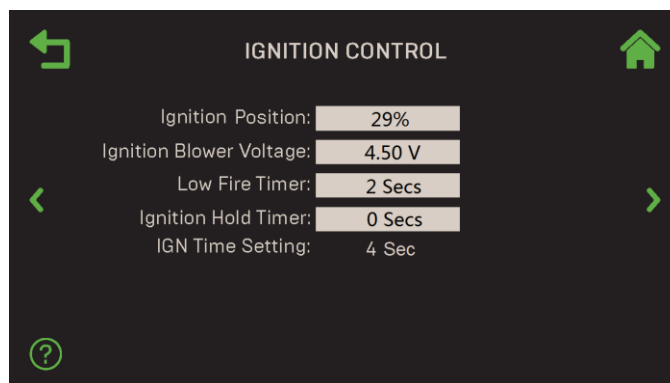


Figure 6-81: Fire Control: Ignition Control

The following ignition control parameters are available:

- **Ignition Position:** Sets the air fuel valve position at which the unit will ignite. This allows you to set the air fuel valve position during the ignition sequence (5% to 60%)
- **Ignition Blower Voltage:** Sets the blower voltage during ignition (0.25 to 10.0 V)
- **Low Fire Timer:** Specifies how long to remain in the low fire position after ignition, before going to the desired output. (Range: 2 to 600 sec.)
- **Ignition Hold Timer:** Sets the length of time the unit stays in ignition position (0 to 60 sec.)
- **IGN Time Setting:** Displays (read-only) the maximum allowable time between confirmation of gas valve opening (POC) and a stable flame detected; some legacy units allowed up to 7 seconds.

6.6.3.3 Operating Control

The **Operating Control** screens provides parameters to view or modify operating levels on this unit only.

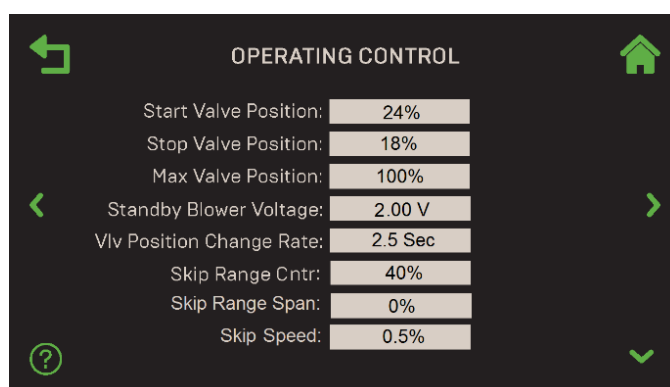


Figure 6-82: Fire Control: Operating Control Levels

The following operating control parameters are available:

- **Start Valve Position:** Specifies the valve position at Start Level. (Range: 0 or **Stop Valve Position** to 40%)
- **Stop Valve Position:** Allows the Stop Level to be set to a valve position. (Range 0% to **Start Valve Position**)
- **Max Valve Position:** Sets maximum allowable valve position for the unit. (Range: 40 to 100%)
- **Standby Blower Voltage:** Sets blower voltage when the unit is in Standby Mode, during which the blower motor remains “ON” at low speed, to limit power cycles. AERCO recommends keeping

SECTION 6: Advanced Setup

the default. However, individually vented units in positive pressure boiler rooms may set this between **2.00** and **0** volts to compensate. (Range: 0.0 to 10.0V)

- **Vlv Position Change Rate:** Defines the rate at which the **valve position** will progress from one step to the next. (Range: 0.5 to 60 sec.)
- **Skip Range Cntr, Skip Range Span, Skip Speed:** Together, these three parameters can be used to define a Fire Rate “skip zone” the Controller will avoid (**Skip Range Cntr** = the center of the range). These can be used in the rare instance when a unit emits an objectionable noise at a certain Fire Rate and no other remedy resolves the problem. The Controller will then skip-over the “skip” Fire Rate.

6.6.3.4 Anti-Cycling Control

Anti-Cycling Control provides parameters to reduce unnecessary cycling on this unit only.

1. Go to: [Main Menu](#) → [Advanced Setup](#) → [Performance](#) → [Fire Control](#) → [Anti-Cycling Controls](#).

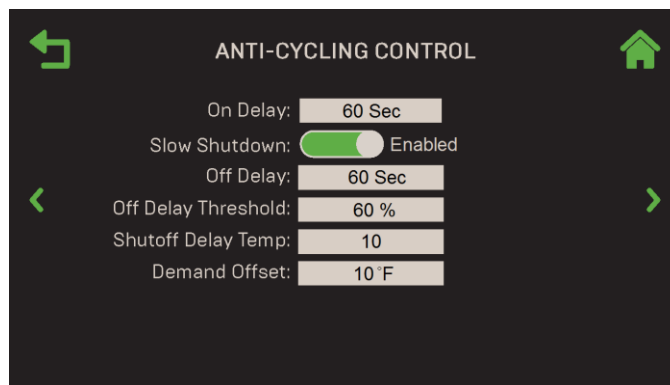


Figure 6-83: Fire Control: Standalone Anti-Cycling Controls

2. The following parameters are used to delay shutdown of a boiler to reduce excessive cycling:

- **On Delay:** How long a unit must stay **off** after shutting down/going into standby (0 to 600 sec.)
- **Slow Shutdown:** Enable/Disable the slowdown of unit shut down when **Off Delay Threshold** is achieved. If Enabled, the following additional parameters appear:
 - **Off Delay:** Defines a Shutoff delay, during which the unit remains at minimum fire rate after the unit has sequenced to shutoff. It is activated only when **Off Delay Threshold** is reached. (Range: 0 to 9999 secs, Default = 1 min.)
 - **Off Delay Threshold:** Fire rate that activates **Off Delay** function (default = 60%).
- **Shutoff Delay Temp:** Specifies the number of degree above setpoint which the outlet temperature can rise without triggering a unit shut down (Range: 0 to 25°F).
- **Demand Offset:** This parameter reduces excessive ON/OFF cycling in AUTO mode. When this entry \neq 0, the unit will not turn on again until **Valve Position In** reaches the **Start Level** value AND the outlet temperature goes below **Demand Offset**. In addition, the boiler will fire at the ignition Valve Position level or below for a period of one minute. When this entry is set to zero, the unit will turn on again as soon as the **Valve Position In** reaches the **Start Level** value. There will not be a one-minute delay when firing at the 29% valve position level.

6.7 Stack Guard Configuration (CFR Only)

Stack Guard Configuration is only applicable to CFR boilers. It is not applicable to Benchmark boilers.

The CFR boiler's Stack Guard sensor is field-installed in the factory-provided vent starter section. The Edge controller ensures the **Stack Guard** temperature stays above the **Stack Guard Low Limit** to prevent condensation in the flue. When the Stack Guard temperature is below the Stack Guard Low Limit plus a user-defined delta (**Stack Guard Low Limit Delta**), the boiler firing rate is increased incrementally. If the **Stack Guard** temperature remains below the **Stack Guard Low Limit** within a user-defined Exhaust Fault Time, the unit goes to "Low Stack Temp Shutdown" and will restart after the outlet temperature drops to 10°F below the application setpoint.

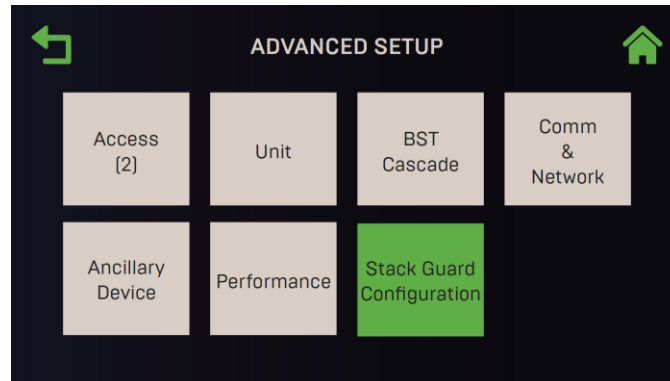


Figure 6-84: Advanced Setup

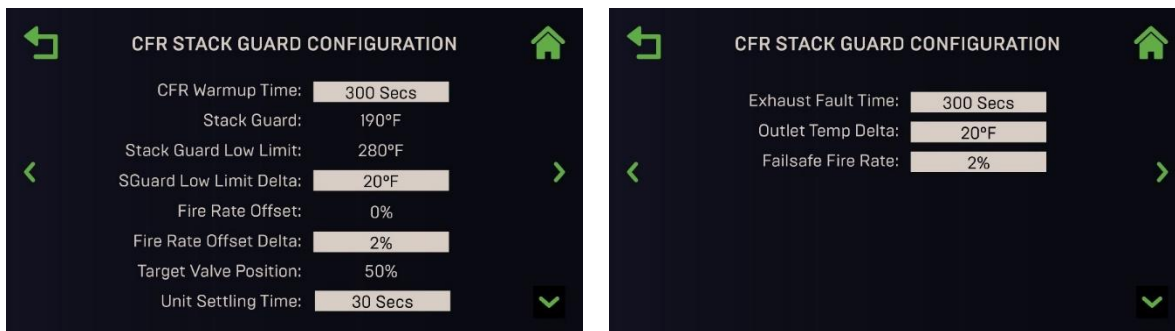


Figure 6-85: Advanced Setup: CFR Stack Guard Configuration Menu

Go to: [Main Menu](#) → [Advanced Setup](#) → [CFR Stack Guard Configuration](#).

The following parameters appear:

Parameter Name	Type	Description
CFR Warmup Time	Numerical Entry	On startup, the boiler is allowed this amount of time to reach the application setpoint before the Stack Guard temperature is checked. (Range: 30-600 seconds; Default = 300 seconds)
Stack Guard	Read Only	The current Stack Guard temperature.
Stack Guard Low Limit	Read Only	Minimum flue temperature to preventing condensation in the stack.
Stack Guard Low Limit Delta	Numerical Entry	This temperature delta plus the Stack Guard Low Limit is the target for the Stack Guard temperature to ensure it is sufficiently high. (Range: 0-100°F; Default = 20°F)
Fire Rate Offset	Read Only	When the current Stack Guard temperature is below the target, the boiler firing rate is increased by this Fire Rate Offset.
Fire Rate Offset Delta	Numerical Entry	The Fire Rate Offset is gradually increased by Fire Rate Offset Delta. (Range: 0-10%; Default = 2%)
Target Valve Position	Read Only	This is the target valve position after the boiler firing rate has been increased by the Fire Rate Offset.

SECTION 6: Advanced Setup

Parameter Name	Type	Description
Unit Settling Time	Numerical Entry	Amount of time allowed for boiler to settle before further increasing the firing rate with the Fire Rate Offset. <i>(Range: 0-600 seconds; Default = 30 seconds)</i>
Exhaust Fault Time	Numerical Entry	When the boiler firing rate is increased by the Fire Rate Offset, the Stack Guard temperature is allowed this amount of time to reach the Stack Guard Low Limit to stay in operation, otherwise, the unit goes to "Low Stack Temp Shutdown". Unit will restart after the outlet temperature drops to 10°F below the application setpoint. <i>(Range: 0-600 seconds; Default = 180 seconds)</i>
Outlet Temp Delta	Numerical Entry	Temperature delta between setpoint and outlet temperature that is used to determine how quickly the fire rate offset is reduced when the Stack Guard temperature is sufficiently high. <i>(Range 0-40°F; Default = 10°F)</i>
Failsafe Fire Rate	Numerical Entry	Sets the lowest firing rate that the boiler will operate in when the stack guard sensor is either open or short. <i>(Range: 50-100%; Default = 60%)</i>

SECTION 7: UNIT STATUS

The **Unit Status** screen provides access to a variety of parameters that show the status of the unit. In addition, in a BST Cascade, on the unit designated as a “Manager,” it provides access to screens that display parameters showing the status of the entire cascade.

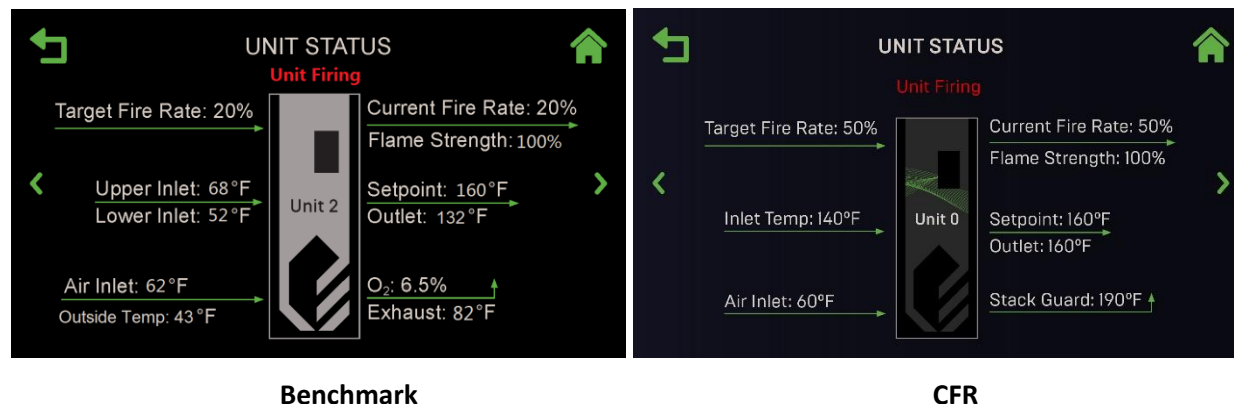


Figure 7-1: Unit Status Screen

This Section includes the following topics:

[7.1: Ignition Sequence](#)

[7.1.1: Demand](#)

[7.1.2: Auxiliary Delay Timers](#)

[7.1.3: Purging](#)

[7.1.4: Spark Cleaning](#)

[7.1.5: Ignition](#)

[7.2: Unit Status](#)

[7.3: Plant Status](#)

[7.4: BST Cascade Status](#)

[7.5 Isolation Valve Status](#)

[7.6: SmartPlate Status](#)

[7.7: Runtime Statistics](#)

[7.8: Unit Event History](#)

[7.9 Plant Event History](#)

[7.10: AERtrim](#)

[7.11: Ignition Sequence Summary](#)

⚠ WARNING:

Before starting this section, you must ensure the unit has the latest Edge Controller firmware. See [Section 6.2.7](#).

Unlike most areas of the system, navigation is performed exclusively with the **Page Left** and **Page Right** arrows to move from screen to screen in round-robin fashion. The order of navigation depends on whether the unit is part of a BST Cascade or a standalone unit. The order of navigation is as follows:

Screen Name	BST	Standalone
Unit Status	✓	✓
Plant Status	✓	
BST Cascade Status	✓	
Valve Status	✓	
SmartPlate Status (if connected)	✓	
Runtime Statistics	✓	✓
Unit Event History	✓	✓
Plant Event History	✓	
AERtrim (if activated)	✓	✓
Last Ignition Status	✓	✓

If there is a fault, the fault indicator will appear below the title bar at the top of the screen.

SECTION 7: Unit Status

7.1 Ignition Sequence

When the unit starts ignition, the **Ignition Sequence** screen automatically appears. This screen displays the status of each step in the sequence on five rectangles, with the first step, **Demand**, at the bottom. The rectangle for each step is grey before starting, then turns green when the step successfully concludes. Various notes appear on the side of the screen at each step. **Last Ignition Status** (Figure 7-2) serves as a summary screen. The ignition process consists of the following steps:

1. Demand
2. **Auxiliary Delay:** (Demand turns green)
3. **Purging:** (Demand and Aux Delay turns green)
4. **Spark Cleaning** (Demand, Aux Delay and Purging turns green)
5. **Ignition** (Demand, Aux Delay, Purging and Spark Cleaning turns green)
6. **Summary** (All stages turns green)

7.1.1 Demand

Upon a demand for heat, the **Demand** rectangle turns green, and, if the sequence has a delay timer, those timers display appropriate values. Upon expiration of the internal 4 second IGST Demand delay the unit progresses to the **Auxiliary Delay** sequence.

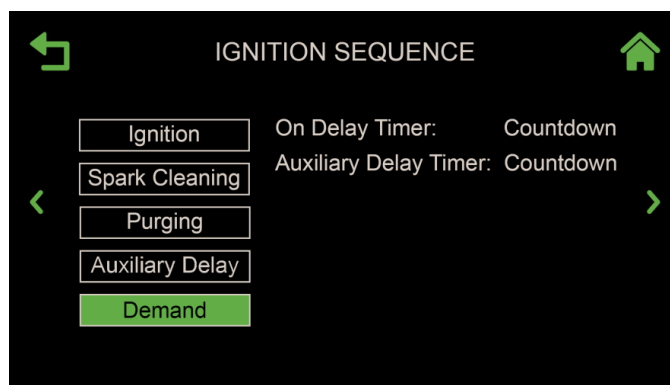


Figure 7-3: Ignition Sequence Step 1 – Demand

7.1.2 Auxiliary Delay Timers

1. Upon expiration of the internal 4 second IGST Demand delay, **On Delay Timer** starts, followed by **Auxiliary Delay Timer** (if any). In both cases, the displays the countdown.

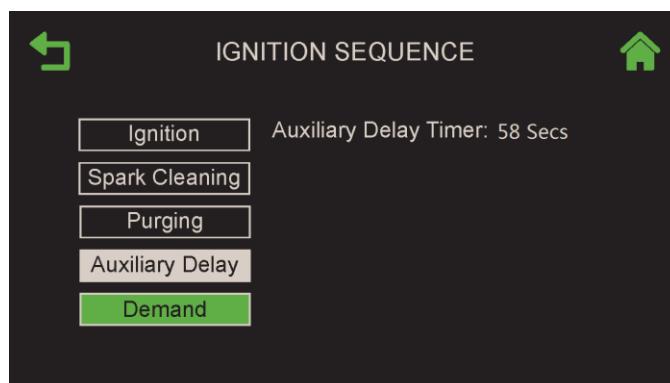


Figure 7-4: Ignition Sequence Step 2 – Auxiliary Delay

SECTION 7: Unit Status

2. When the **On Delay Timer** and all the interlock switches are closed, the **Auxiliary Delay** rectangle turns green and the unit progresses to the **Purging** sequence.
 - If the interlock switches are closed and On Delay time has expired, the **Auxiliary Delay** rectangle immediately changes to green, allowing for the purge cycle to begin.
 - If any of the interlock switches are not closed when the auxiliary timer expires, the **Auxiliary Delay** rectangle turns red and the correspond interlock fault is displayed.

7.1.3 Purging

All switches required to be met during the purge cycle have a checkbox, which change to green once the switch is met. If any switch fails, its checkbox will turn red and the unit will display a fault message. The safety circuit switches are **Blower Proof**, **Purge Position**, **Blocked Inlet**, and **Ignition Position**.

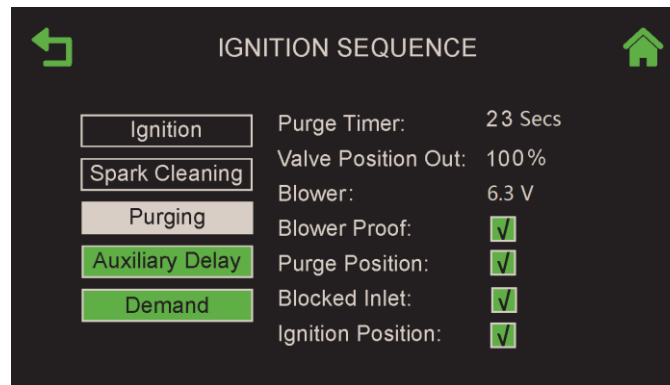


Figure 7-5: Ignition Sequence - Screen 3, Purge

3. The following additional parameters are displayed:
 - **Purge Timer:** The purge cycle's elapsed time in seconds
 - **Valve Position Out:** The Air Fuel Valve's position
 - **Blower Voltage:** The blower voltage as the unit purges
4. Upon expiration of purge timer, if all the switches are met, the **Purging** rectangle turns green and the system progresses to **Spark Cleaning**. If the purge timer expires before all the switches have been met, the **Purging** rectangle turns red.

7.1.4 Spark Cleaning

1. The **Spark Cleaning Timer** begins, typically for 10 seconds.

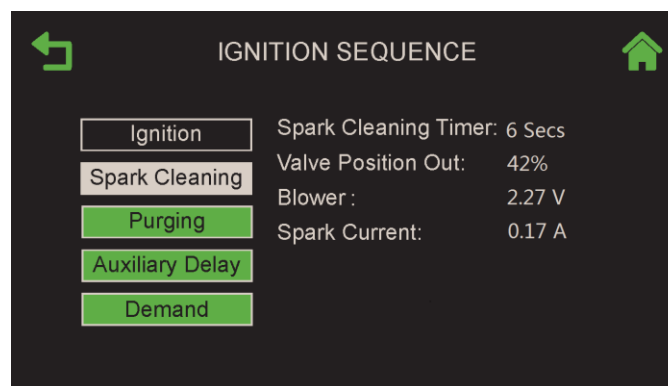


Figure 7-6: Ignition Sequence - Screen 4, Spark Cleaning

SECTION 7: Unit Status

2. The Valve Position Out and Blower Voltage continue from the Purging sequence.
3. The **Spark Current** (amps draw from spark across igniter) is displayed. If this value goes outside the set threshold range (typically 0.1 to 0.4 A), the **Spark Cleaning** rectangle turns red and **Spark Current Fault** is displayed.
4. Upon expiration of the **Spark Current Timer**, if the spark current remains within range, the **Spark Cleaning** rectangle turns green and the system progresses to the **Ignition** trial.

7.1.5 Ignition

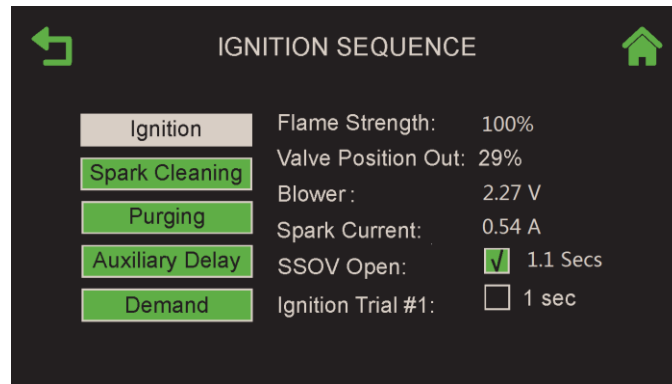


Figure 7-7: Ignition Sequence - Screen 5, Ignition

1. The screen now displays the following additional parameters:
 - a) **Flame Strength** – Remains 0 until the flame sensor(s) senses flame, then displays the flame strength between 0-100%. A flame strength less than 70% will lead to flame loss.
 - b) **SSOV Open** – The check box turns green if the SSOV opened in the required 4 second time period. The time it took appears next to the check box. If the SSOV does not open within 4 seconds, the box turns red and the unit displays a fault message.
 - c) **Ignition Trial #** – Displays current trial attempt (from 1 to 3) and begins a timer, starting at 0 once the SSOV is proven open. The check box turns green if flame is proven within 4 seconds or turns red if flame is **not** proven. If the trial is not successful, the trial number is incremented, and the timer is reset. If the flame is not proven after 3 unsuccessful attempts, a fault message appears, as shown below.

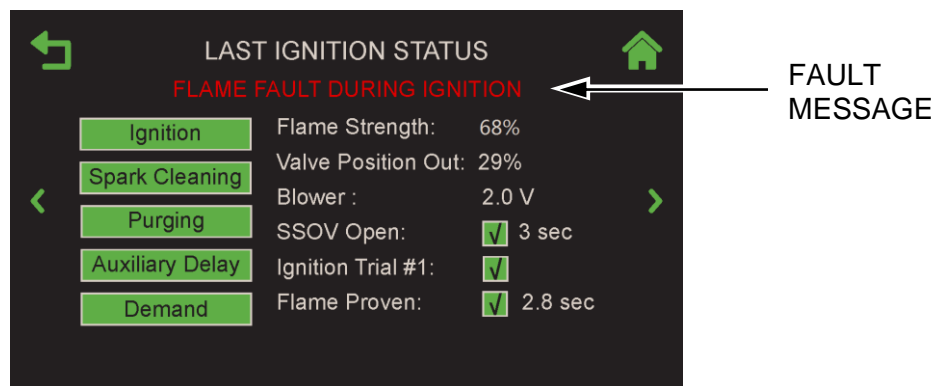


Figure 7-8: Ignition Sequence - Screen 6, Summary with Fault Message

SECTION 7: Unit Status

2. Once flame is proven:
 - The **Ignition** box turns green.
 - **Flame Proven** appears with green checkmark box and time it took for flame to be proven.
 - The **Summary** and all parameters are automatically saved, including the ignition flame strength, SSOV time to open and ignition time
3. The **Summary** screen disappears within 5 seconds (unless you press **Home** or **Back**). However, it remains available in the round-robin operating screen pages until the next successful ignition.

7.2 Unit Status

The **Unit Status** screen is the default Operating screen. It also appears when the unit powers on (post the splash screen), comes out of sleep mode or has a successful flame. The system automatically transitions to the Ignition screen during the Ignition sequence.

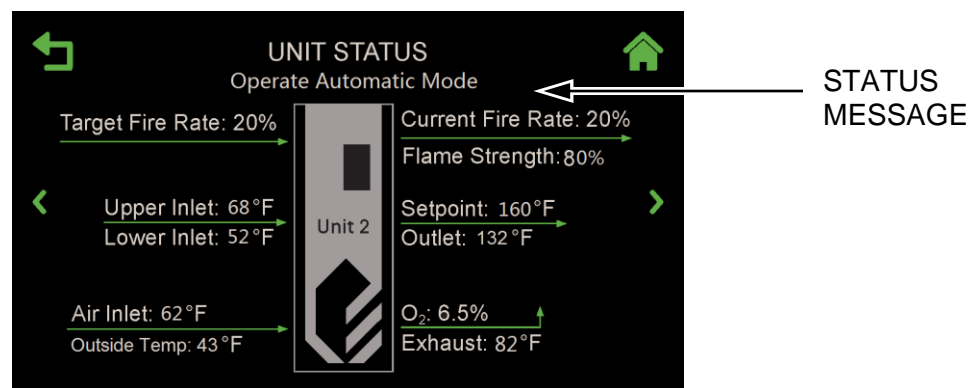


Figure 7-9: Example Unit Status Screen

In normal operation, the area just below the screen heading displays operating status. However, if there's an operating error, it displays the error condition in red, as shown above.

- For boilers with a single inlet port, the screen will not display upper Inlet data and associated tag.
- The **Flame Strength** is displayed in %, up to 100%.
- The **Setpoint** is not displayed if the unit is part of a "Client" in a BST cascade.
- The **Max. Fire Rate** parameter is displayed when the max fire rate is set to a value other than 100% and the unit Target Fire Rate is -1% or more from the Max Fire Rate.

7.3 Plant Status (BST Manager units only)

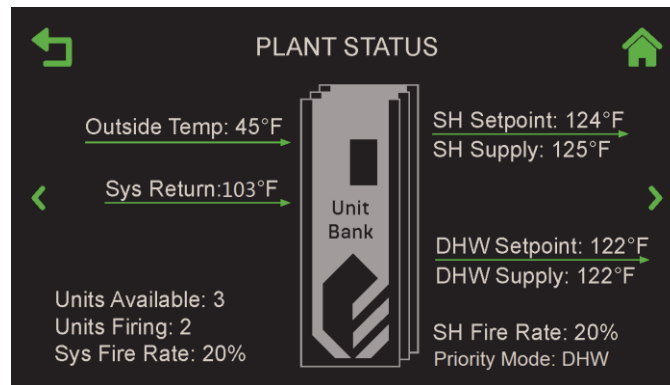


Figure 7-10: Plant Status Screen

- The **Outside Temp** (Outdoor Air Temp Sensor), **Sys Return** (Rtn Hdr Temp Sensor), **SH Supply** (Hdr Temp Sensor), **DHW Supply** (DHW Temp Sensor) and **Other Supply** (Loop 2 Supply, not shown) are displayed when the associated sensors are enabled as part of a BST Cascade. If a sensor is enabled but not detected, the screen displays “Open” for the missing data.
- Note: **Sys Return** applies to Benchmark boilers only. It is not available on CFR boilers.
- A maximum of two Setpoint and Supply data can be displayed, based on the Application chosen in [Section 6.3.3](#) (only **Space Heating** and **DHW**, **Space Heating** and **Other** or **DHW** and **Other** can be active simultaneously). If only one application is active, one Setpoint and Supply data are displayed.

NOTE: Application = **Other** applies to Benchmark boilers only. It is not available on CFR boilers.

- The screen displays **Sys Fire Rate** unless the Plant is configured for **DHW Swing Boiler**.
- If the plant is configured for **DHW Swing Boiler**, the screen displays **DHW Fire Rate**.
- NOTE:** **DHW Swing Boiler** configuration applies to Benchmark boilers only..

7.4 BST Cascade Status

The **BST Cascade Status** screen provides a view of the BST cascade as a whole. It displays the status of all of the 16 possible boilers, as well as pertinent BST system settings and readings.

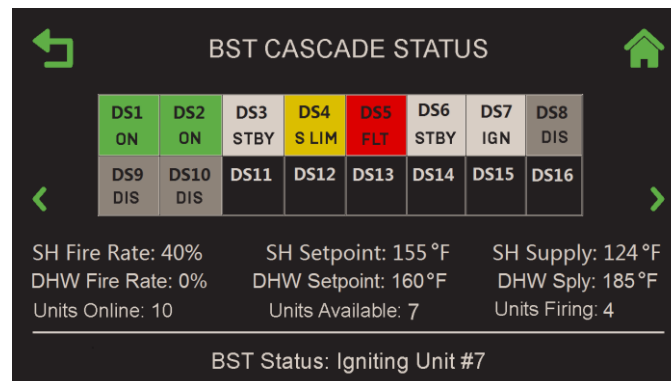


Figure 7-11: BST Cascade Status Screen

SECTION 7: Unit Status

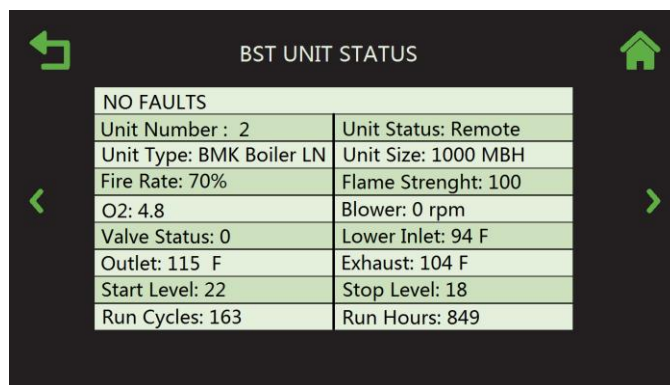
- The data displayed on this screen depends on the Application(s) chosen in [Section 6.3.3: Application Configuration](#). It can display data for only two applications at a time, **Space Heating** and **DHW**, or **Other**.
- Each of the 16 possible boilers in the BST cascade is represented by a box in the grid and identified by their COM Address. Unused boxes are shown blank.
- The color of Lead boiler box blinks on/off.
- The colors of the box and the text in the boxes display the designation and status of each boiler within the BST cascade:

Unit Designations	
Label	Description
DS	Dedicated Space Heating
DD	Dedicated DHW
SS	Swing Boiler - SH
SD	Swing Boiler - DHW
Sd	Swing Boiler, serving DHW, default SH
Ss	Swing Boiler, serving SH, default DHW

Unit Status		
Label	Status	Color
	Off Line	BLACK
DIS	Disabled	GREY
FLT	Fault	RED
STBY	Standby	WHITE
ON	Operating	GREEN
S LIM	Setpt Lim	AMBER
IGN	Igniting	WHITE

- The Lag unit displays **LAG** in place of the COM Address.
- Fire Rate** displays current fire rate for each Application in cascade: **SH**, **DHW** and/or **Other**. The BST Manager unit will drive all ignited boilers at the fire rate specified for each Application.
- SH Setpoint**, **DHW Setpoint** and/or **Other Setpoint** displays the current Active Setpoint for each Application in the cascade.
- Supply** displays current Header Temperature of BST cascade for each Application in the cascade.
- Units Online** displays total number of units actively connected to BST "Manager" via BST Modbus Network, including units that have stopped communicating with the Manager.
- Units Available** displays the total number of connected units either ON, being Ignited or in Standby Mode waiting to be Ignited.
- Units Firing** displays the total number of units currently Ignited in the BST System.
- The **BST Status** line displays the current state of the BST system as follows:
 - Failsafe Mode Active
 - One Boiler Mode
 - BST In Deadband
 - BST In Control
 - All Boilers are Off
 - Igniting First Boiler
 - Boiler Ignited
 - Igniting Next Boiler
 - Raise Fire Rate
 - All Boilers are On-Raise FR
 - Lower Fire Rate
 - BST is On Temperature
 - All Boilers are On at MAX FR
 - BST Overtemp
 - BST Remote Signal Fault
 - BST in Failsafe Mode

On the **BST Cascade Status** screen, if you press on any unit, the **BST Unit Status** screen appears, showing the details of that particular unit. From here, you can navigate to the status screens of all the other units in the cascade using the **Left** and **Right** arrows.



The screenshot shows the 'BST UNIT STATUS' screen with a dark background and green navigation icons. A table displays the following data:

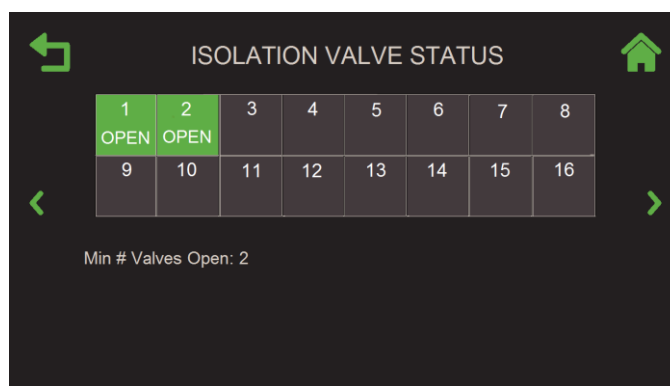
NO FAULTS	
Unit Number : 2	Unit Status: Remote
Unit Type: BMK Boiler LN	Unit Size: 1000 MBH
Fire Rate: 70%	Flame Strenght: 100
O2: 4.8	Blower: 0 rpm
Valve Status: 0	Lower Inlet: 94 F
Outlet: 115 F	Exhaust: 104 F
Start Level: 22	Stop Level: 18
Run Cycles: 163	Run Hours: 849

Figure 7-12: BST Unit Status Screen

7.5 Isolation Valve Status

The **Isolation Valve Status** screen displays which isolation valves have been designated as always open (see [Section 6.3.4.4: Valve Configuration](#)), even during plant standby conditions. It also displays the value of the **Min # Valves Open** parameter, set in [Section 6.3.4.4: Valve Configuration](#).

Note, this screen shows the command that the BST Manager is sending the isolation valve. Any failure on the valve will not be reflected on this screen.



The screenshot shows the 'ISOLATION VALVE STATUS' screen with a dark background and green navigation icons. It features a grid of 16 valves and a 'Min # Valves Open' indicator.

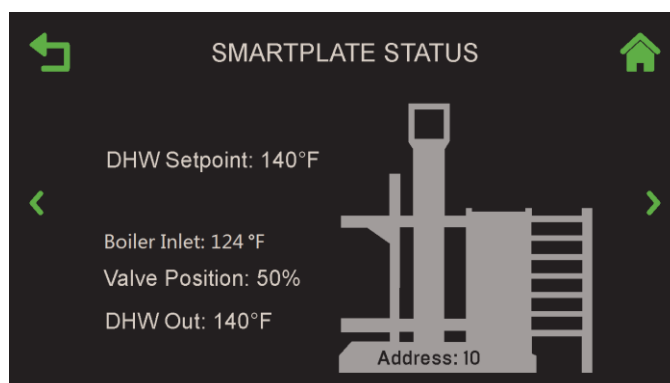
1 OPEN	2 OPEN	3	4	5	6	7	8
9	10	11	12	13	14	15	16

Min # Valves Open: 2

Figure 7-13: Isolation Valve Status Screen

7.6 SmartPlate Status

If the cascade includes one or more SmartPlate units, the **SmartPlate Status** screen appears in the Unit Status round-robin on the BST Manager unit only. SmartPlate communication must be enabled for this screen to be displayed (see [Main Menu](#) → [Advanced Setup](#) → [BST Cascade](#) → [SmartPlate Comm](#)).



The screenshot shows the 'SMARTPLATE STATUS' screen with a dark background and green navigation icons. It displays temperature setpoints and positions, along with a schematic diagram of a SmartPlate unit.

DHW Setpoint: 140°F
Boiler Inlet: 124 °F
Valve Position: 50%
DHW Out: 140°F

Address: 10

Figure 7-14: SmartPlate Status Screen (if connected)

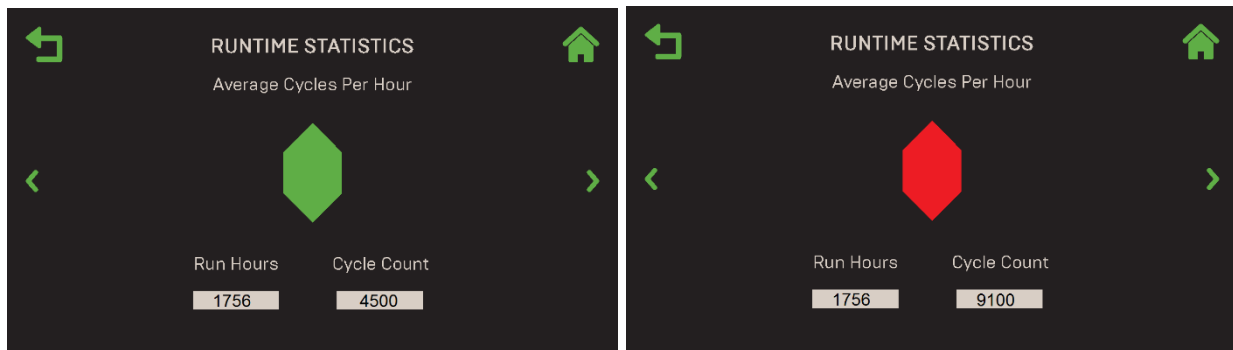
SECTION 7: Unit Status

The SmartPlate Status screen displays:

- **DHW Out:** The SmartPlate's domestic hot water outlet temperature.
- **Valve Position:** Valve position, percentage, setpoint and communication address.
- **Status** or error messages, shown below the screen title.

7.7 Runtime Statistics

This screen displays the unit's total run hours, cycle count and average cycles per hour.



STATUS = GREEN

STATUS = RED

Figure 7-15: Runtime Statistics Screen

- The average cycles per run hour is calculated based on cycle count during rolling 1-enabled-hour.
- The Average Cycles Per Hour honeycomb is color coded are follows:
 - **Green** = Less than 3 cycles per hour
 - **Yellow** = Between 3 and 5 cycles per hour
 - **Red** = More than 5 cycles per hour
- If the cycle count exceeds 5 per hour, an event is logged for a given unit (does not lock out unit).

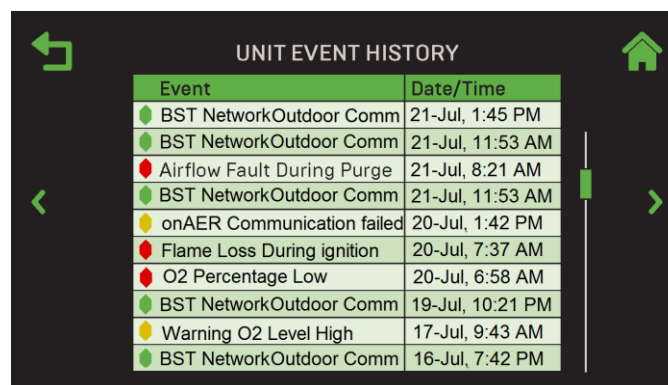
7.8 Unit Event History

This is a scrollable display of unit events arranged chronologically, with most recent on the top. Each event includes event name, date and time, and a color-coded honeycomb in front of the event name:

Red = Faults

Yellow = Warnings

Green = Events



Event	Date/Time
BST NetworkOutdoor Comm	21-Jul, 1:45 PM
BST NetworkOutdoor Comm	21-Jul, 11:53 AM
Airflow Fault During Purge	21-Jul, 8:21 AM
BST NetworkOutdoor Comm	21-Jul, 11:53 AM
onAER Communication failed	20-Jul, 1:42 PM
Flame Loss During ignition	20-Jul, 7:37 AM
O2 Percentage Low	20-Jul, 6:58 AM
BST NetworkOutdoor Comm	19-Jul, 10:21 PM
Warning O2 Level High	17-Jul, 9:43 AM
BST NetworkOutdoor Comm	16-Jul, 7:42 PM

Figure 7-16: Unit Event History Screen

- The maximum event history (unit or plant) is 200 events.
- You can drag the scroll bar up and down to view additional events.
- You can press on any row to see the details of that event. The **"Event" Details** screen appears; the title of the screen depends on the "Event".



Figure 7-17: Event Details Screen – O₂ Level High Event Shown

In this screen, you can navigate to the details of other events using the Left and Right arrows without having to go back to the **Unit Event History** screen. Note, this is not a round robin.

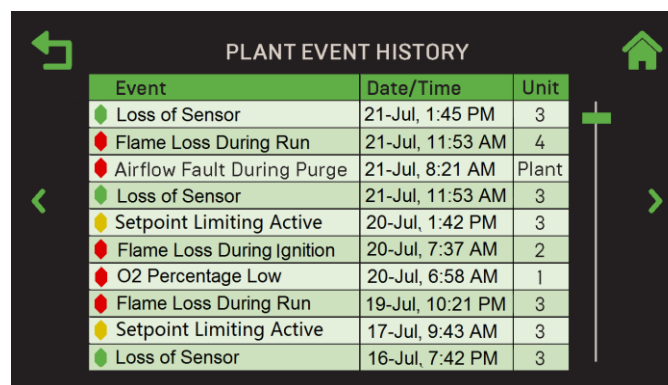
The **Event Details** screen contains the following parameters:

- Date
- Time
- Event Code
- Valve position
- Outlet temperature
- Inlet temperature
- Air temperature
- Exhaust temperature
- Flame strength
- O₂ level
- AERtrim state

7.9 Plant Event History

The **Plant Event History** screen is displayed in the round-robin queue on BST Manager units only. It is similar to the unit **Event History** screen, in that it displays a list of events, however in this screen, the events can come from any unit in the cascade, with the **Unit ID** column indicating which unit the event occurred on, or **Plant** for plant level events such as communication fault with BAS.

The **Plant Event History** screen displays the same layout, number of event and color coding as the **Unit Event History** screen. However, plant-level events do not have additional details.



Event	Date/Time	Unit
Loss of Sensor	21-Jul, 1:45 PM	3
Flame Loss During Run	21-Jul, 11:53 AM	4
Airflow Fault During Purge	21-Jul, 8:21 AM	Plant
Loss of Sensor	21-Jul, 11:53 AM	3
Setpoint Limiting Active	20-Jul, 1:42 PM	3
Flame Loss During Ignition	20-Jul, 7:37 AM	2
O ₂ Percentage Low	20-Jul, 6:58 AM	1
Flame Loss During Run	19-Jul, 10:21 PM	3
Setpoint Limiting Active	17-Jul, 9:43 AM	3
Loss of Sensor	16-Jul, 7:42 PM	3

Figure 7-18: Plant Event History

7.10 AERtrim (Benchmark Only)

The **AERtrim** screen displays the AERtrim state and a graph showing the current valve position, O₂ level and blower voltage. It can be displayed on any unit on which **AERtrim** is both activated and enabled (see

SECTION 7: Unit Status

Section 6.6.1). The AERtrim status (under the screen title) will be **Disabled** if the function is disabled after being successfully activated.

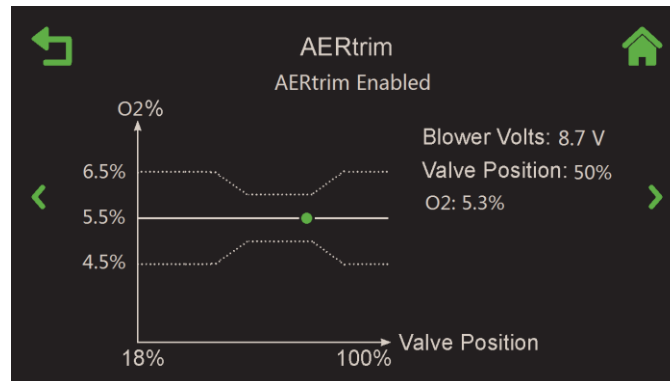


Figure 7-19: AERtrim Status

- This screen displays the O₂ reading, current valve position and blower voltage in numerical form.
- The screen also displays a graph showing the O₂ level associated with current valve position; the green dot on the graph represents the current O₂ level of the unit.
 - If the unit is not firing (or AERtrim is disabled), the green dot will not appear.
 - The solid line represents the O₂ target for a given valve position. Note that this is model and/or site specific.
 - The two dotted lines represents the O₂ target band for a given valve position.

7.11 Ignition Sequence (Summary)

The **Last Ignition Status** screen displays a summary of the last ignition sequence, whether it is a successful or not. If unsuccessful, it shows the step that failed in red, and one or more check boxes and the status box has red X.

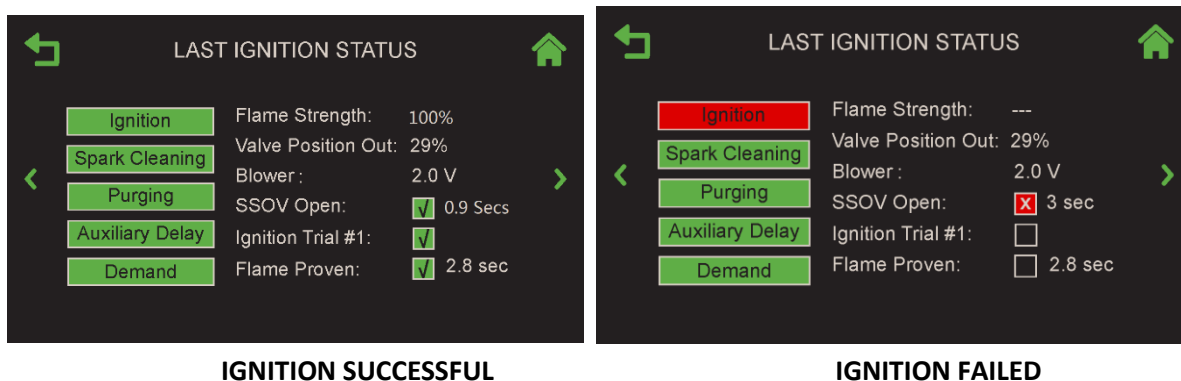


Figure 7-20: Ignition Screen

SECTION 8: I/O Nomenclature

SECTION 8: I/O NOMENCLATURE

The table below list names that appear in the Controller's menu structure.

TABLE 8-1 Benchmark Boiler I/O Nomenclature		
Name	Function	Comments
Relays On I/O Board (Controlled by MCB Board)		
Swing Valve 1 Relay	Swing V1	
Backup Relay	Backup unit contact	
V2/Spare 1 Relay	Programmable -Swing V2 -System Pump -Summer Pump -Multi Temp Pump -Other	Dropdown Name list: -Swing Valve 2 -System Pump -Summer Pump -Pump 2 -Louver -Louver 2 -Damper -Sequenced Pump -Other
DHW Pump Relay	DHW pump contact	
Spare 2 Relay	Programmable -System Pump 2 -Summer Pump -Multi Temp Pump -Other	Dropdown Name list: -Swing Valve 2 -System Pump -Summer Pump -Pump 2 -Louver -Louver 2 -Damper -Sequenced Pump -Other
Analog Output On I/O Board		
Spare Analog 1	Programmable -Fire Rate	Dropdown Name list: -Fire Rate -Other
BLR V.S. Pump	Variable Speed Pump	
DHW V.S. Pump	DHW Variable Speed pump	
Spare Analog Out 3	-Fire Rate	Dropdown Name list: -Fire Rate-Other
Analog Output On Harness		
Blower	Blower control signal	
Cascade Valve	BST Cascade Valve	
Spare Analog Out 2	Programmable -Fire Rate -Cascade Valve	Dropdown Name list: - -Valve -Fire Rate -Other
Analog Input On I/O Board		
CO Input	CO sensor input	
Remote Analog In	Remote Setpoint or Fire Rate	
Spare Analog In 3	Programmable -SmartPlate Valve input	Dropdown Name list: -Remote Stpt 2

SECTION 8: I/O Nomenclature

TABLE 8-1 Benchmark Boiler I/O Nomenclature		
Name	Function	Comments
	- Swing V1 feedback -Swing V2 Feedback -VS Pump Feedback -Remote Setpoint 2 -NOx -DHW VSP Fdbk	-Swing V1 Fdbk -Swing V2 Fdbk -Blr VSP Fdbk -DHW VSP Fdbk -SmartPlate VP -NOx
Spare Analog In 1	Programmable -SmartPlate Valve input - Swing V1 feedback -Swing V2 Feedback -VS Pump Feedback -Remote Setpoint 2 -NOx -DHW VSP Fdbk	Dropdown Name list: -Remote Stpt 2 -Swing V1 Fdbk -Swing V2 Fdbk -Blr VSP Fdbk -DHW VSP Fdbk -SmartPlate VP -NOx
Spare Analog In 2	Programmable -SmartPlate Valve input - Swing V1 feedback -Swing V2 Feedback -VS Pump Feedback -Remote Setpoint 2 -NOx -DHW VSP Fdbk	Dropdown Name list: -Remote Stpt 2 -Swing V1 Fdbk -Swing V2 Fdbk -Blr VSP Fdbk -DHW VSP Fdbk -SmartPlate VP -NOx
Analog Input On Harness		
Flow	Flow input	
Air Pump	Air pump feedback	Used only on BMK5000 & 6000
Cas Vlv Fdbk	Cascade Valve Feedback	

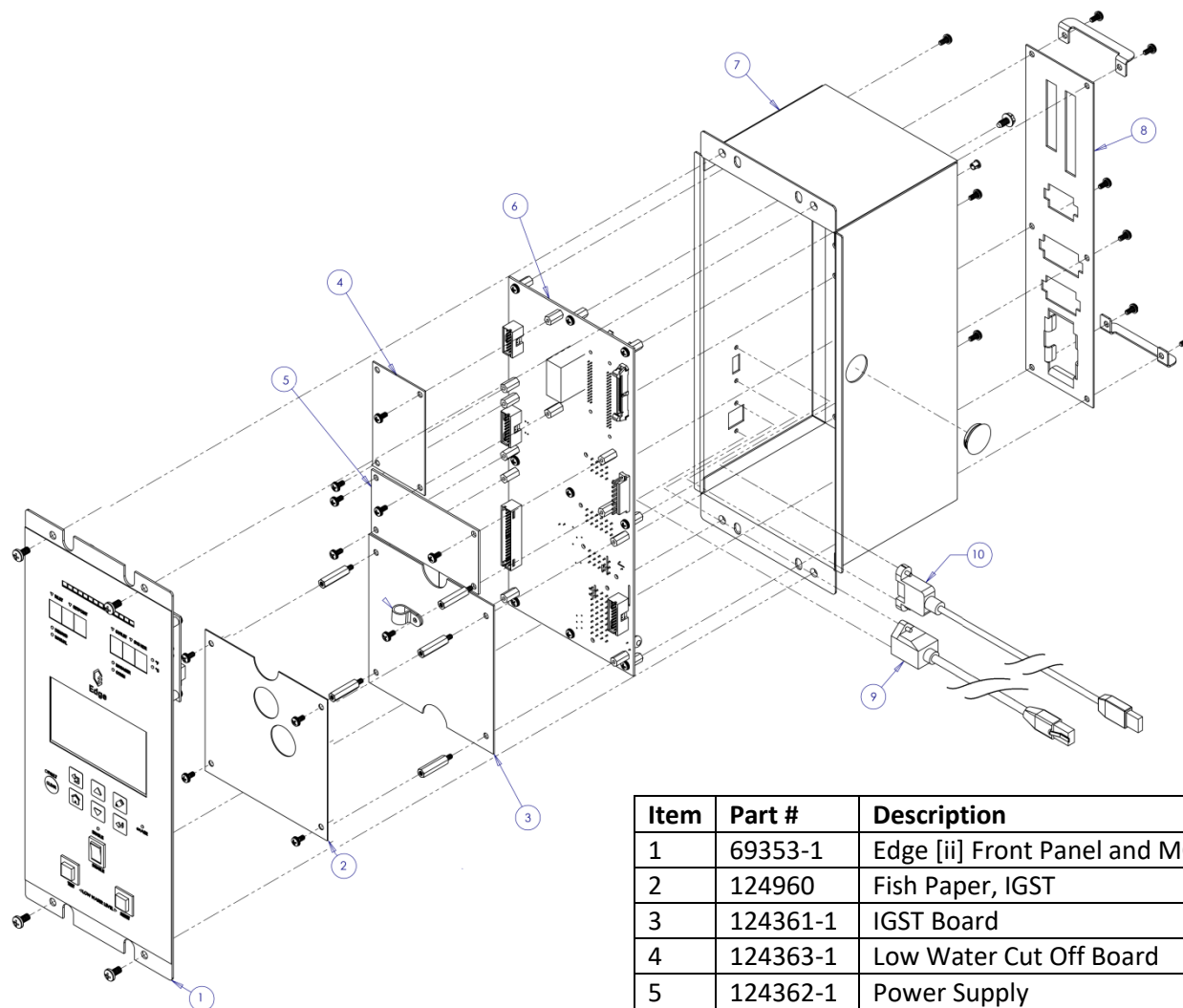
TABLE 8-2 CFR Boiler I/O Nomenclature		
Name	Function	Comments
Relays On I/O Board (Controlled by MCB Board)		
Backup Relay	Backup unit contact	
V2/Spare 1 Relay	Programmable -System Pump -Summer Pump -Multi Temp Pump	Dropdown Name list: - Damper -Louver -Louver 2 -Pump 2 -System Pump
DHW Pump Relay	DHW pump contact	
Spare 2 Relay	Programmable -System Pump 2 -Summer Pump -Multi Temp Pump -Other	Dropdown Name list: -Damper -Louver -Louver 2 -Other -Pump 2 -System Pump

SECTION 8: I/O Nomenclature

TABLE 8-2 CFR Boiler I/O Nomenclature		
Name	Function	Comments
Analog Output On I/O Board		
Spare Analog 1	Programmable -Fire Rate	Dropdown Name list: -Fire Rate -Other
BLR V.S. Pump	Variable Speed Pump	
Analog Output On Harness		
Blower	Blower control signal	
Cascade Valve	BST Cascade Valve	

Analog Input On I/O Board		
Remote Analog In	Remote Setpoint or Fire Rate	
Spare Analog In 1	Programmable -DHW Remote Setpoint	Name: -Remote Setpoint
Analog Input On Harness		
Flow	Flow input	
Cas Vlv Fdbk	Cascade Valve Feedback	

SECTION 9: EDGE CONTROLLER VIEWS



Item	Part #	Description
1	69353-1	Edge [ii] Front Panel and MCB Kit
2	124960	Fish Paper, IGST
3	124361-1	IGST Board
4	124363-1	Low Water Cut Off Board
5	124362-1	Power Supply
6	64139-1	Connector Board Assembly
7	37142	Control Box Enclosure
8	38045	Connector Plate Cover
9	62085	Panel Mount Ethernet Extension
10	62084	Panel Mount USB Cable
11	64113-1	*Display Board Kit
12	64131-1	*Interface Board Kit

Figure 9-1: Edge [ii] Controller (P/N 69344-1) - Exploded View

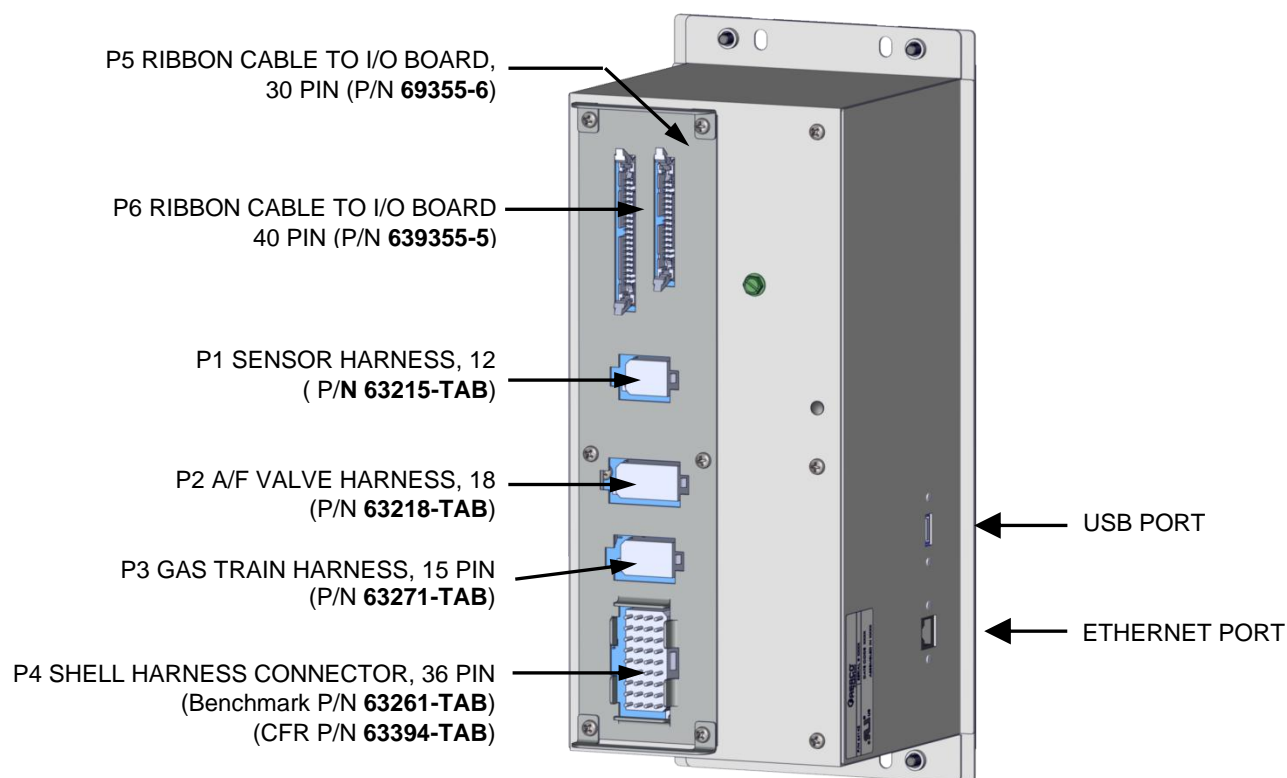


Figure 9-2: Edge Controller Rear View

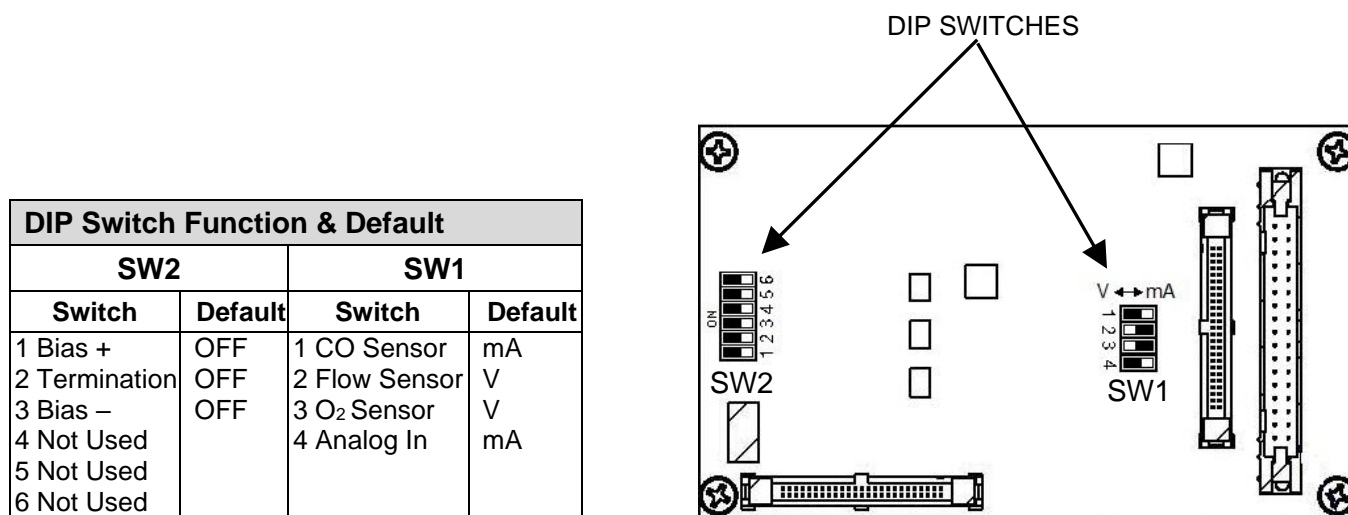


Figure 9-3: Edge [i] Controller Interface Board (the back side of the front face)

SECTION 10: STARTUP, STATUS, FAULT MESSAGES

The Edge Controller displays status messages at various times showing the current state of the Controller. All status messages are displayed near the top of the touchscreen in **WHITE** text, just under the current screen's title.

10.1 FAULT MESSAGES

The Edge Controller displays the following status messages when appropriate. The # column lists the corresponding code returned to Building Automation Systems.

Four types of messages can appear on the Edge Controller's display screen:

- **Message:** Information about a current event or condition: no intervention required.
- **⚠ WARNING:** An abnormal event or condition occurred, but the unit continues to operate normally: no intervention required.
- **Fault:** An abnormal event or condition occurred that caused the unit to shut down. The unit will restart automatically once the cause of the fault is resolved.
- **Fault, Manual Reset:** An abnormal event or condition occurred that caused the unit to shut down. A corrective action may be required. Once the cause of the fault is resolved, the Controller's **CLEAR** button must be pressed manually to restart the unit.

TABLE 10-1: Edge Controller Fault Messages			
#	FAULT MESSAGE	DESCRIPTION	TYPE
0	NO FAULTS		
1	Disabled	Enable/Disable switch set to Disabled . Shows time/date disabled.	Message
2	Standby	Displayed when ON/OFF switch is in ON position, but there is no demand for heat. Time and date are also displayed.	Message
3	Demand Delay	Demand Delay is active.	Message
4	Purging	The duration of the purge cycle during startup, in seconds.	Message
5	Ignition Trial	Displayed during ignition trial startup sequence. The duration of cycle counts up in seconds.	Message
6	Flame Proven	Displayed after flame has been detected for 2 seconds. Initially, the flame strength is shown in %. After 5 seconds, time and date are shown in place of flame strength.	Message
7	Warmup	Displayed for 2 minutes during the initial warm-up only.	Message
8	High Water Temp Switch Open	High-Water Temperature Limit switch is open.	Fault, Man. Reset
9	Low Water Level	Low Water Cutoff board is indicating low water level.	Fault, Man. Reset
10	Low Gas Pressure Fault	Low Gas Pressure Limit switch is open	Fault, Man. Reset
11	Gas Pressure Fault	Gas Pressure Limit switch is not connected or malfunctioned	Fault, Man. Reset
12	Interlock Open	Remote Interlock is open.	Fault, Man. Reset
13	Delayed Interlock Open	Delayed Interlock is open.	Fault, Man. Reset
14	Airflow Fault During Purge	Blower Proof switch opened during purge, or air inlet is blocked.	Fault, Man. Reset

TABLE 10-1: Edge Controller Fault Messages

#	FAULT MESSAGE	DESCRIPTION	TYPE
15	SSOV Fault During Purge	The SSOV switch opened during purge.	Fault, Man. Reset
16	Prg Switch Open During Purge	Purge Position Limit switch on A/F Valve was open during purge.	Fault, Man. Reset
17	Ign Switch Open During Ignition	Ignition Position Limit switch on A/F Valve opened during ignition.	Fault, Man. Reset
18	Airflow Fault During Ign	The Blower Proof switch opened during ignition.	Fault
19	Airflow Fault During Run	The Blower Proof switch opened during run.	Fault, Man. Reset
20	SSOV Fault During Ignition	The SSOV switch closed or failed to open during ignition.	Fault, Man. Reset
21	SSOV Fault During Run	The SSOV switch closed for more than 15 seconds during run.	Fault, Man. Reset
22	Flame Loss During Ignition	Flame signal not seen during ignition, or lost after ignition.	Fault, Man. Reset
23	Flame Loss During Run	The Flame signal was lost during run.	Fault, Man. Reset
24	High Exhaust Temp Switch	The High Exhaust Temp switch is open.	Fault, Man. Reset
25	Loss of Power	The unit shut down due to loss of power	Fault
26	Loss of Sensor	Not used	Not used
27	Loss of Signal	Not used	Not used
28	High O ₂ Level	The O ₂ Sensor reading is <u>above</u> acceptable level.	Fault
29	Low O ₂ Level	The O ₂ Sensor reading is <u>below</u> acceptable level.	Fault
30	High CO Level	Not used	Not used
31	SSOV Relay Failure	Failure detected in one of the relays that control the SSOV.	Fault, Man. Reset
32	Residual Flame	Flame signal was seen for more than 60 seconds during standby.	Fault, Man. Reset
33	Heat Demand Failure	The unit failed to fulfill the demand for heat.	Fault, Man. Reset
34	Ign Switch Closed During Purge	Ignition Position Limit switch on A/F Valve closed during purge.	Fault, Man. Reset
35	Prg Switch Closed During Ign	Purge Position Limit switch on A/F Valve closed during ignition.	Fault, Man. Reset
36	SSOV Switch Open	The SSOV switch opened during standby.	Fault, Man. Reset
37	Ign Board Comm Fault	A communication fault between the PMC board and Ignition board.	Fault
38	Wait	The unit is waiting for a process to run to completion.	Message
39	Direct Drive Signal Fault	The direct drive signal is not present or is out of range.	Fault
40	Remote Setpt Signal Fault	The Remote Setpoint signal is not present or is out of range.	Fault
41	Outdoor Temp Sensor Fault	Temperature measured by the Outdoor Air Sensor is out of range.	Fault
42	Outlet Temp Sensor Fault	Temperature measured by the Outlet Sensor is out of range: OUTLET TEMPERATURE display – Sht: sensor is shorted OUTLET TEMPERATURE display - Opn: sensor is open-circuited	Fault
43	FFWD Temp Sensor Fault	Temp measured by Feed Forward Sensor out of range.	Fault
44	High Water Temp	Temp measured by Outlet Sensor exceeded Temp Hi Limit.	Fault

TABLE 10-1: Edge Controller Fault Messages

#	FAULT MESSAGE	DESCRIPTION	TYPE
45	Line Voltage Out of Phase	The Line (Hot) and Neutral wires are reversed.	Fault, Man. Reset
46	Stepper Motor Failure	Stepper Motor failed to move Air/Fuel Valve to desired position.	Fault, Man. Reset
47	Setpoint Limiting Active	Outlet temperature crossed the high setpoint limit. Setpoint limiting feature is active.	Fault
48	Modbus Comm Fault	A network communication fault	Fault
49	Wait Ignition Retry	The unit is waiting before retrying to ignite.	Message
50	WaitFault Purge	Fault while purging.	Message
51	Wait Retry Pause	Pause before retrial for ignition.	Message
52	Exhaust Temp Sensor Short	The Exhaust Temp Sensor has malfunctioned.	Warning
53	Exhaust Temp Sensor Open	Exhaust Temp Sensor is not connected or malfunctioned.	Warning
54	Warning Exhaust Temp High	The Exhaust temperature is above normal.	Warning
55	Exhaust Temp High	The Exhaust Temperature has exceeded 200°F (93.3°C).	Fault, Man. Reset
56	Inlet Water Temp Sensor Short	Inlet Water Temp Sensor has malfunctioned/shorted out.	Warning
57	Inlet Water Temp Sensor Open	Inlet Water Temp Sensor is not connected or malfunctioned.	Warning
58	Warning In Wtr Temp High	⚠ WARNING: Inlet water temperature is above normal.	Warning
59	Warning In Wtr Temp Low	⚠ WARNING: Inlet water temperature is below normal.	Warning
60	Inlet Gas Press Sensor Open	Inlet Gas Pressure Sensor is not connected or malfunctioned.	Fault
61	Gas Plate Dp Sensor Open	Gas Plate Dp Sensor is not connected or malfunctioned.	Fault
62	O2 Percentage Low	The O2 % has gone below 2% for more than 30 seconds	Fault
63	O2 Sensor Malfunction	O2 Levels below -4% or above 24% for more than 10 seconds.	Fault
64	Warning O2 Level High	The O2 is above normal operating limits.	Warning
65	Recirc Pump Failure	The recirculation pump has failed.	Fault, Man. Reset
66	Ignition Monitor	The ignition spark monitor indicated no or out of range spark.	Message
67	No Flow Safety Lockout	Not used	Not Used
68	Ignition Spark Fault	The O2 is above normal operating limits.	Fault, Man. Reset
69	Pre Ignition	The recirculation pump has failed.	Message
70	Cleaning Igniter	Displayed during ignition sequence during Spark Cleaning cycle.	Message
71	Too Many Cycles In 24 Hours	Number of cycles exceeded the allowable limit.	Fault
72	Too Many Ovrtrmps In 24 Hours	Number of over-temperature events exceeded allowable limit.	Fault
73	Air Sensor Fault	The Air Temp sensor has malfunctioned.	Fault
74	Auto Diagnostic Mode ACTIVE	The unit is in Auto Diagnostic Mode	Message
75	Auto Diagnostic Mode COMPLETED	Auto Diagnostic Mode has completed	Message
76	Auto Diagnostic Mode ABORTED	Auto Diagnostic Mode has aborted	Message
77	DHW Heating Active	The unit is actively heating domestic hot water.	Message
78	Boiler Cooling Off	The unit has ceased firing and is now cooling down.	Message
79	BST Network Temp Sensor Fault	BST network temp sensor fault.	Fault
80	BST Network Temp Com Fault	BST network temp communication fault.	Fault
81	BST Local Header Sensor Fault	BST local header sensor fault.	Fault
82	BST Net Outdoor Sensor Fault	BST net outdoor sensor fault.	Fault
83	BST Net Outdoor Com Fault	BST net outdoor communication fault.	Fault
84	BST Local Outdr Sensor Fault	BST local outdoor sensor fault.	Fault
85	BST Client Com Fault	Communication with a BST Client unit failed.	Message
86	O2 Cal Purge	O2 calibration is in purge cycle.	Message

TABLE 10-1: Edge Controller Fault Messages

#	FAULT MESSAGE	DESCRIPTION	TYPE
87	Auto Calibration In Progress	O ₂ calibration is underway.	Message
88	Autocal Finished	O ₂ calibration is complete.	Warning
89	O ₂ Sensor Out Of Range	O ₂ sensor failed during O ₂ calibration.	Warning
90	O ₂ Warning Service Required	AERtrim has reached its limit and O ₂ level is still out of range.	Message
91	Wait Sensor Warm-up	The unit is waiting for the O ₂ sensor to turn on.	Warning
92	Air Pump Failed AERtrim Disabled	Air Aductor pump failed, disabling AERtrim functionality (BMK5000-6000 only)	Fault
93	onAER Communication failed	onAER communication failed. No internet connection.	Warning
94	Isolation Valve Stuck Open	The isolation valve failed to <u>close</u> as expected.	Warning
95	Isolation Valve Stuck Closed	The isolation valve failed to <u>open</u> as expected.	Fault
96	Maintenance Overdue	Scheduled 12- or 24-month maintenance is overdue.	Warning
97	Maintenance Due Soon	Scheduled 12- or 24-month maintenance is due in near future.	Warning
98	BAS System Disable	Unit is shut down remotely via BAS	Warning
99	Delta-T Activated	Delta-T temperature is out of user defined delta limit.	Warning
100	Delta-T Shutdown	The unit shut down due to exceeding allowable Delta-T value.	Warning
101	Back Up Manager is not Compatible	The unit designated as the Backup Manager is not compatible with Manager functionality.	Warning
102	IO Board Communication Failed	I/O board communication has failed.	Warning
103	SH Swing Valve Fault	Space Heating side swing valve failed	Warning
104	DHW Swing Valve Fault	Domestic hot water side swing valve failed	Warning
105	No BAS Communication	No communication from the Building Automation system	Warning
106	BST Warm Weather Shutdown	BST warm weather shutdown warning	Warning
107	Warm Weather Shutdown	Standalone warm weather shutdown warning	Warning
108	DHW Header Temp BAS Comm Fault	BAS failed to update the DHW temperature periodically	Warning
109	BST Header Temp BAS Comm Fault	BAS failed to update the BST header temperature periodically	Warning
110	Supply Return Temp BAS Comm Fault	BAS failed to update the supply return temperature periodically	Warning
111	Outdoor Temp BAS Comm Fault	BAS failed to update the outdoor temperature periodically	Warning
112	BST Return Sensor Short Warning	BST return sensor is shorted. Check the wirings.	Warning
113	BST Return Sensor Open Warning	BST return sensor is disconnected	Warning
114	DHW Header Network Sensor Fault	DHW header network sensor temperature is out of range.	Warning
115	DHW Header Network Comm Fault	No communication response from the DHW header network sensor	Warning
116	Supply Return Network Sensor Fault	Supply Return Network Sensor temperature is out of range.	Warning
117	Supply Return Network Comm Fault	No communication response from the supply return network sensor	Warning

10.2 AERtrim MESSAGES

The Edge Controller displays the following **AERtrim** Status and Warning messages when appropriate.

TABLE 10-2: Edge Controller AERtrim Messages		
FAULT MESSAGE	Type	MESSAGE DESCRIPTION
O ₂ Cal Purge	Status	O ₂ auto-calibration purge has started
O ₂ Auto Calibration In Progress	Status	O ₂ auto-calibration is underway
Autocal Finished	Status	O ₂ auto-calibration has completed
Wait Sensor Warm-up	Status	???
O ₂ Auto Cal Done	Status	???
O ₂ Level Out Of Range	Warning	Sensor auto calibration offset required is more than $\pm 3\%$
O ₂ Warning Service Required	Warning	O ₂ level is outside of its limits for more than 5 minutes.
OnAER Communication failed	Warning	
O ₂ Percentage Low	Warning	O ₂ % below 2% for more than 30 seconds
O ₂ Sensor Malfunction	Warning	Occurs if O ₂ Levels are less than -4% or more than 24% for more than 10 seconds.
Warning O ₂ Level High	Warning	O ₂ Levels > 9% and < 24% for more than 30 seconds {auto-reset when value comes back in range}

10.3 BST CASCADE MESSAGES

The Edge Controller displays the following messages related to Boiler Sequencing Technology (BST):

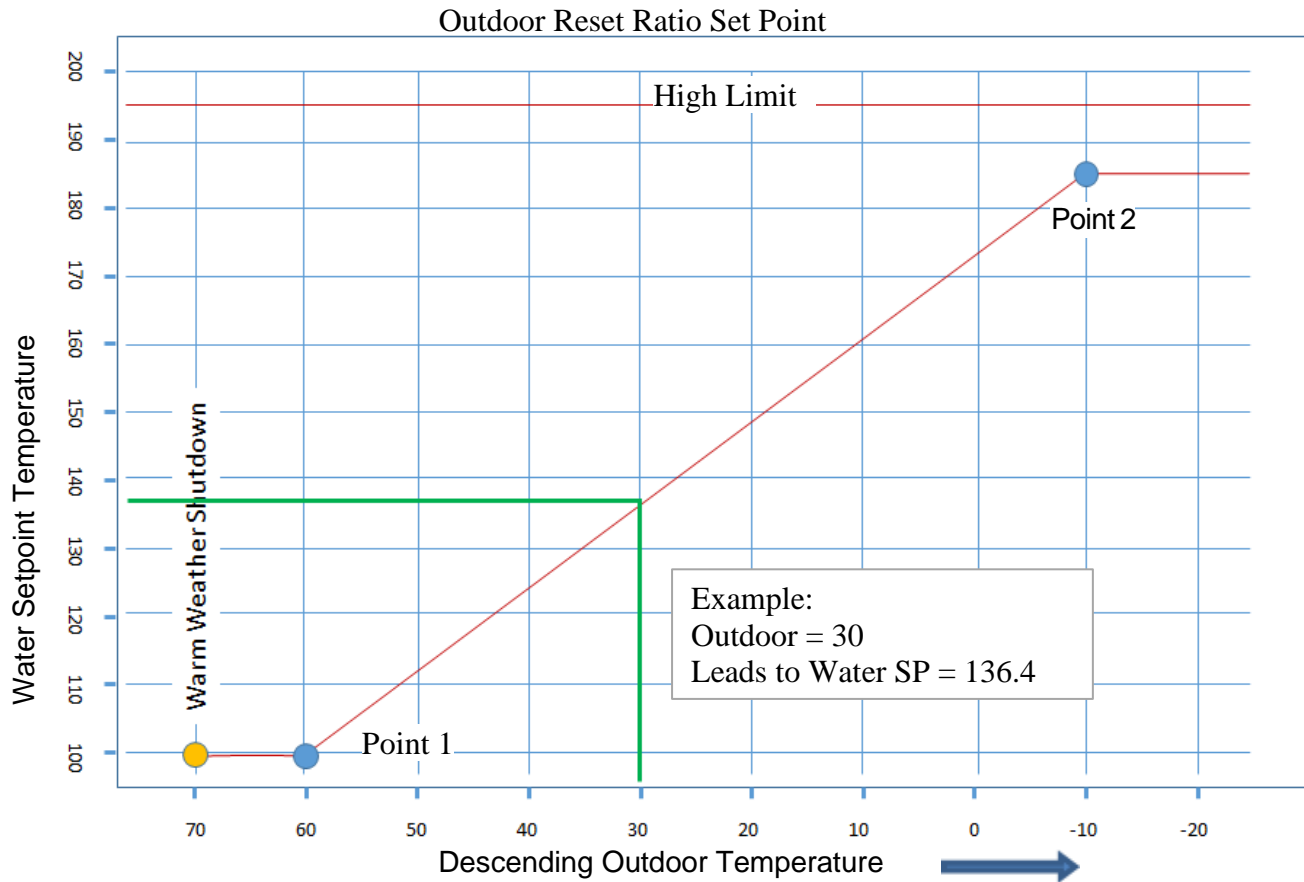
TABLE 10-3: Edge Controller BST Cascade Messages			
MESSAGE	Type	MESSAGE	Type
All Boilers Off	Status	BST Overtemp	Fault
All On > 90% Fire Rate	Warning	Failsafe Active	Status
All On-Raise Fire Rate	Status	Igniting First	Status
Auto Cycling On	Status	Igniting Next Boiler	Status
Boiler Ignited	Status	Lower Fire Rate	Status
BST Client Com Fault	Warning	On Temperature	Status
BST FAILSAFE	Warning	One Boiler Mode	Status
BST in Control	Status	Raise Fire Rate	Status
BST in Deadband	Status	Remote Sig Fault	Fault

10.4 STACK GUARD MESSAGES

The Edge Controller displays the following messages related to the CFR boiler's Stack Guard operation. These do not apply to Benchmark boilers.

MESSAGE	Description	Corrective Action
Low Stack Temp Shutdown	The Stack Guard temperature is below the Stack Guard Low Limit	Check system return water temperature is at least 120°F.
Stack Guard Sensor Short	Stack guard sensor is shorted	Check for short in wiring connection between sensor and CFR boiler.
Stack Guard Sensor Open	Stack guard sensor is not installed	Ensure stack guard sensor is installed in the starter section and is connected to the boiler wiring harness.

Appendix A: Indoor/Outdoor Reset Ratio



Point 1:

OD Air Temp = 60°

Min Water Temp = 100°

Point 2:

OD Air Temp = -10°

Max Water Temp = 185°

High Limit:

HL (Water Temp) = 195°

Warm Weather Shutdown:

WWS = 70°

Appendix A: Indoor/Outdoor Reset Ratio

Reset Ratio Formula

Calculate Set point based on Outdoor temperature:

Water Temp Current =

$$\frac{(\text{Outdoor Current} - \text{Outdoor P1}) \times (\text{Water SP Temp P1} - \text{Water SP Temp P2}) + \text{Water Temp P1}}{(\text{Outdoor P1} - \text{Outdoor P2})}$$

EXAMPLE:

What is the Current Water SP Temp when Outdoor Current is 30 °F?

$$\text{Water Temp Current} = \frac{(30 - 60) \times (100 - 185)}{60 - (-10)} + 100 = \frac{-30}{70} \times -85 + 100 = 136.4 \text{ °F}$$

Reset Ratio Application Suggested Startup Settings					
Application	P1 Outdoor	P1 Water SP	P2 Outdoor	P2 Water SP	Warm Weather Shutdown
Radiators / baseboard	70	100	-20	190	65
Radiant (High mass (Concrete))	70	90	-20	140	65
Radiant (Low mass (Joists))	70	90	-20	120	65
Air handler	70	90	-20	140	65
Fan Coil	70	90	-20	140	65

Appendix B: I/O Board Connections – Benchmark Boilers

Each unit is fully wired from the factory with an internal operating control system. No field control wiring is required for normal operation. However, the Edge Controller used with your Benchmark unit does allow for some additional control and monitoring features. Wiring connections for these features are made on the Input/Output (I/O) board located behind the unit's removable front panel, as shown in Figure B-1.

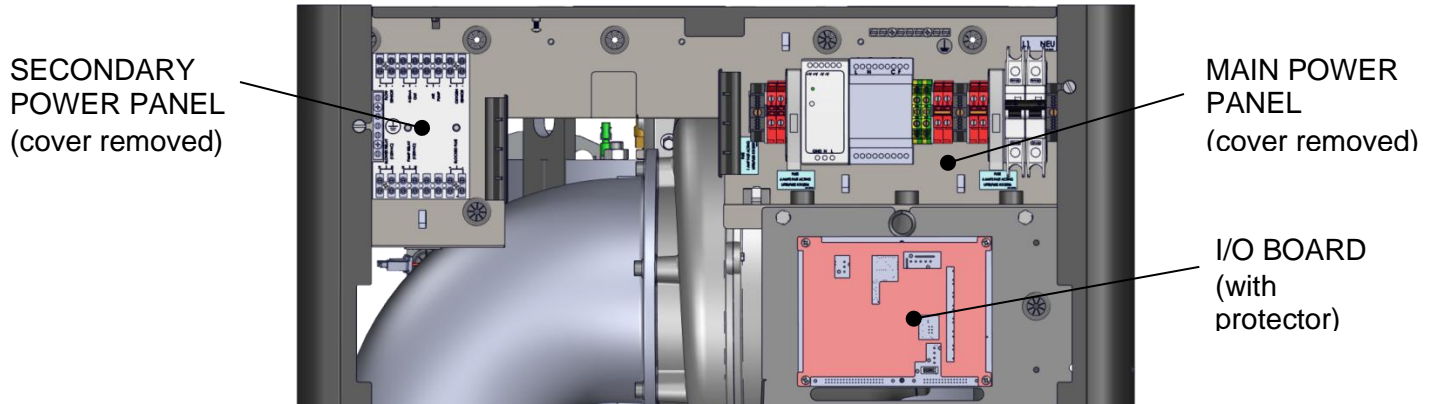


Figure B-1: Power Panel and Input/Output (I/O) Board Location

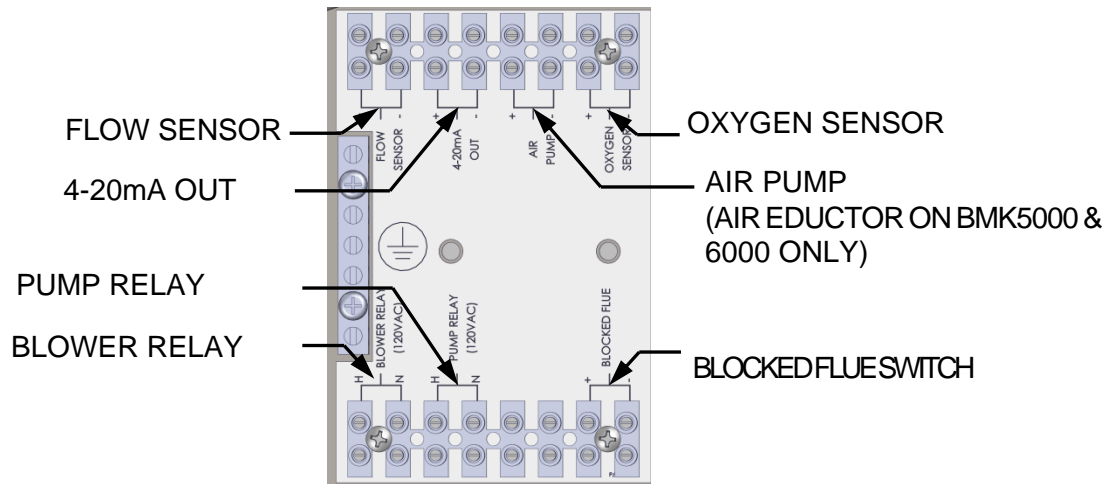


Figure B-2: Secondary Power Panel Terminals

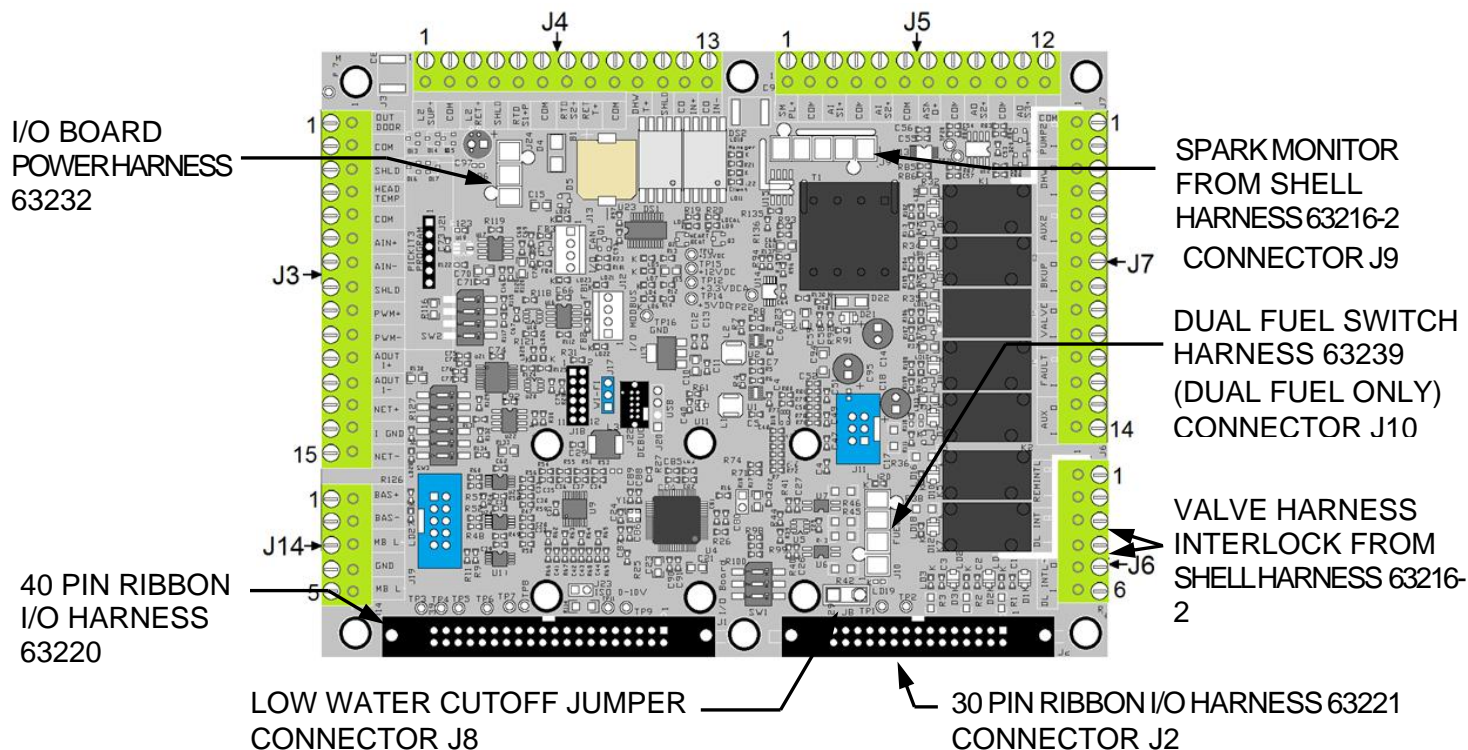
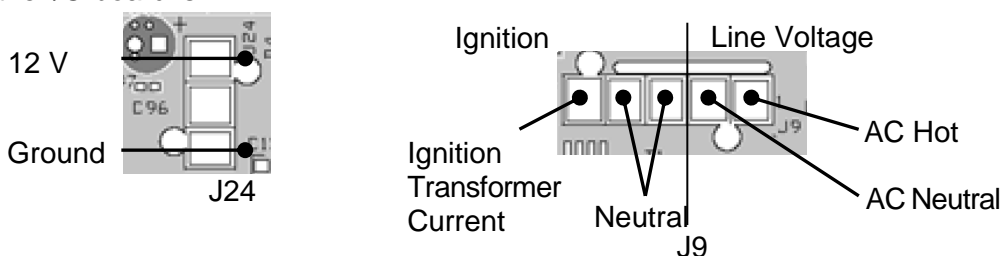


Figure B-3: I/O Board Cable Connections

The I/O board contains the terminal listed below, arranged on removable, named connector strips J3 through J7 and J14, plus Molex connectors for unit harnesses. The maximum gauge of wires connecting to the I/O board is 14.



NOTE: To facilitate connections, the strips can be lifted off the I/O board. The entire strip is then remounted on the I/O board after all connections have been made. If a connector strip is removed, it must be re-mounted in its original orientation (connecting wires arranged around the **outside** perimeter of the I/O board).

Connector Strip J3 Terminals		
Pin #	Name	Description
1	Outside Temp +	Connections to Outside Air Temperature (OAT) sensor (P/N 61048). Used on Manager and Backup Manager units. Required for the OUTDOOR RESET mode of operation. To enable this mode, go to the Controller's Main Menu → Advanced Setup → Unit → Application Configuration and set SH Operating Mode to Outdoor Reset , then configure the related parameters.
2	Outside Temp -	
3	Shield	Connection to the shield from any cable.

Connector Strip J3 Terminals		
Pin #	Name	Description
4	Supply Header +	Connection to the Supply Header temperature sensor (2 wire sensor P/N 24410 , or 4 wire sensor P/N 61058) for: <ul style="list-style-type: none"> • Main Loop (in a Variable-Primary application) • Secondary Loop (in a Primary-Secondary application) • Loop 1 (in a Multi-application) Typically, used on Manager and Backup Manager units. For more information, refer to the <i>Benchmark Boiler Application Guide</i> (TAG-0019)
5	Supply Header –	
6	Remote Analog In +	Connection to the Analog Remote Signal, if Operating Mode = Remote Setpoint. Used on Manager and Backup Manager units.
7	Remote Analog In –	
8	Shield	Connection to the shield from any cable.
9	PWM Input +	Reserved for future use.
10	PWM Input –	
11	BLR V.S. Pump +	Boiler Variable Speed Pump. Connection for the VFD signal to the pump,
12	BLR V.S. Pump –	
13	BST/WHM RS485 +	Dedicated to internal communication between units in a BST or WHM system. ACS (legacy) panel should also be connected to this terminal.
14	RS485 Iso Gnd	
15	BST/WHM RS485 -	

Connector Strip J4 Terminals		
Pin #	Name	Description
1	Supply Loop 2	In a multiple application configuration, connection to the 2 nd loop <u>supply</u> header temperature sensor.
2	Sensor Ground	Ground connection for Supply Loop 2
3	Return Loop 2	In a multiple application environment, connection to the 2 nd loop <u>return</u> header temperature sensor.
4	Shield	Connection to the shield from any cable.
5	RTD Spare 1	Reserved. Spare temp sensor
6	Sensor Ground	Ground connection for RTD Spare 1
7	RTD Spare 2	Reserved. Spare temp sensor
8	Return Header	Connection to the Supply Header temperature sensor (2 wire sensor P/N 24410 , or 4 wire sensor P/N 61058) for: <ul style="list-style-type: none"> • Main Loop (in a Variable-Primary application) • Secondary Loop (in a Primary-Secondary application) • Loop 1 (in a Multi-application) Typically, used on Manager and Backup Manager units. For more information, see <i>Benchmark Boiler Application Guide</i> (TAG-0019)
9	Sensor Ground	Ground connection for Return Header Temp sensor
10	DHW Temp	Connect DHW tank temperature or DHW Loop Supply Temperature sensor
11	Shield	Connection to the shield from any cable.
12	CO/Analog In +	Reserved for future use
13	CO/Analog In -	

Connector Strip J5 Terminals		
Pin #	Name	Description
1	Spare Analog In 3 +	Connection to one of the following signals:

Connector Strip J5 Terminals		
Pin #	Name	Description
2	Spare Analog In 3 -	<ul style="list-style-type: none"> • SmartPlate Valve input • Swing V1 feedback • Swing V2 Feedback • VS Pump Feedback (Variable Speed Pump Feedback) • Remote Setpoint 2 • DHW VSP Fdbk
3	Spare Analog In 1 +	
4	Spare Analog In 1 -	
5	Spare Analog In 2 +	
6	Spare Analog In 2 -	To assign/program its function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Analog Inputs , then set the Input parameter to Spare Analog In 1, Spare Analog In 2, or Spare Analog In 3.
7	Spare Analog Out 1 +	Connection to one of the following signals: <ul style="list-style-type: none"> • Fire Rate • Cascade Valve To assign/program its function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Analog Outputs , then set the Output parameter to Spare Analog Out 1.
8	Spare Analog Out 1 -	
9	DHW V.S. Pump +	Connection to VFD signal to a DHW Variable Speed Pump, between: <ul style="list-style-type: none"> • The 4-port buffer tank and SmartPlate • The boiler and SmartPlate in a 2-port buffer tank configuration.
10	DHW V.S. Pump -	
11	Spare Analog Out 3 +	Connection to the Fire Rate signal. To assign/program its function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Analog Outputs , then set the Output parameter to Spare Analog Out 3.
12	Spare Analog Out 3 -	

Connector Strip J6 Terminals		
Pin #	Name	Description
1	Remote Interlock Out	Connection to an auxiliary device interlock, such as louver open feedback or flow sensor.
2	Remote Interlock Return	
3	Delayed Interlock 1 Out	Connection to an auxiliary device interlock that requires a delay before the plant starts firing.
4	Delayed Interlock 1 Return	
5	Delayed Interlock 2 Out	Connection to an auxiliary device interlock that requires a delay before the plant starts firing.
6	Delayed Interlock 2 Return	

Connector Strip J7 Terminals		
Pin #	Name	Description
1	Spare 2 Relay N.O.	Connection to an auxiliary device enable/disable signal, such as:

Connector Strip J7 Terminals		
Pin #	Name	Description
2	Spare 2 Relay Com	<ul style="list-style-type: none"> • System Pump • Summer Pump • Pump 2 • Louver • Louver 2 • Damper • Other <p>To assign/program its function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Relays, then set the Relay to Spare 2 Relay and the Name to one of the above devices.</p>
3	DHW Pump Relay N.O.	Connection to a DHW Pump enable/disable signal.
4	DHW Pump Relay Com	
5	V2/Spare 1 Relay N.O.	
6	V2/Spare 1 Relay Com	<p>Connection to an auxiliary device enable/disable signal, such as:</p> <ul style="list-style-type: none"> • Swing Valve 2 • System Pump • Summer Pump • Pump 2 • Louver • Louver 2 • Damper • Other <p>To assign/program its function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Relays, then set the Relay to V2/Spare 1 Relay and the Name to one of the above devices.</p>
7	Reserve Relay N.O.	Connection to a reserve/backup boiler enable/disable signal.
8	Reserve Relay Com	
9	Swing Valve 1 Relay N.O.	Connection to a Swing Valve 1 enable/disable signal.
10	Swing Valve Relay Com	
11	Fault Relay N.O.	Connection to a Fault/Remote Alarm enable/disable signal.
12	Fault Relay Com	
13	Aux Relay N.O.	Connection to an auxiliary device enable/disable signal.
14	Aux Relay Com	

Connector Strip J14 Terminals		
Pin #	Name	Description
1	BAS RS485 +	Connection to the building automation system (BAS) network (Modbus RTU, BACnet MSTP). For IP network, use the Ethernet port.
2	BAS RS485 -	
3	RS485 Local +	Reserved for internal use only
4	RS485 Ground	
5	RS485 Local -	

Appendix C: I/O Board Connections – CFR Boilers

Field Control Wiring – I/O Board

Each unit is fully wired from the factory with an internal operating control system. No field control wiring is required for normal operation. However, the Edge Controller allows for some additional control and monitoring features. Wiring connections for these features are made on the I/O board located behind the removable front panel. All field wiring is installed from the rear of the panel by routing the wires through one of the four bushings provided on the sides of the I/O board.

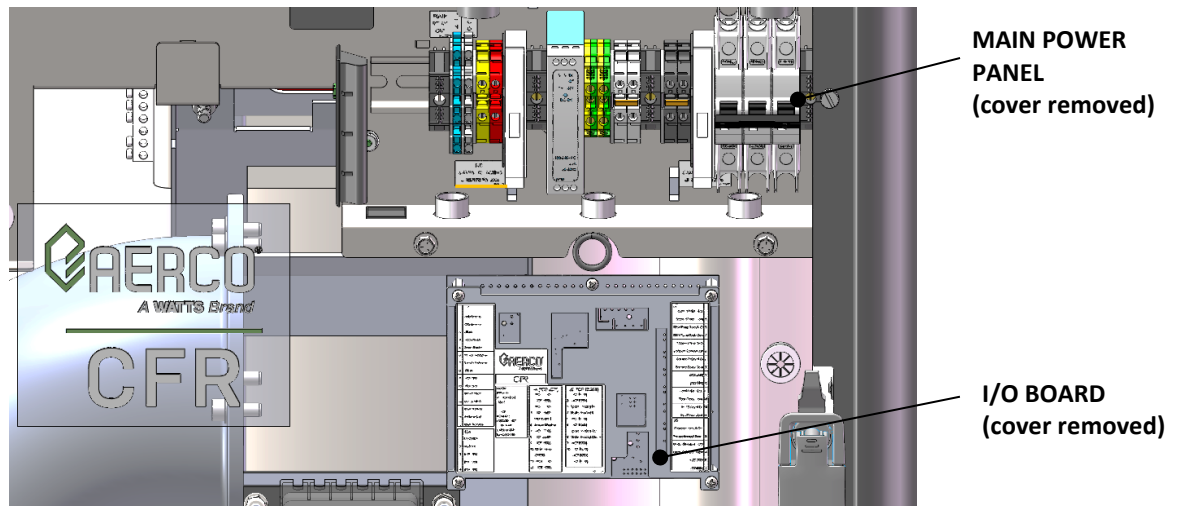


Figure C-1: Input/Output (I/O) Location

⚠ WARNING!

To avoid damaging unit, DO NOT make connections to terminals labeled “NOT USED”.

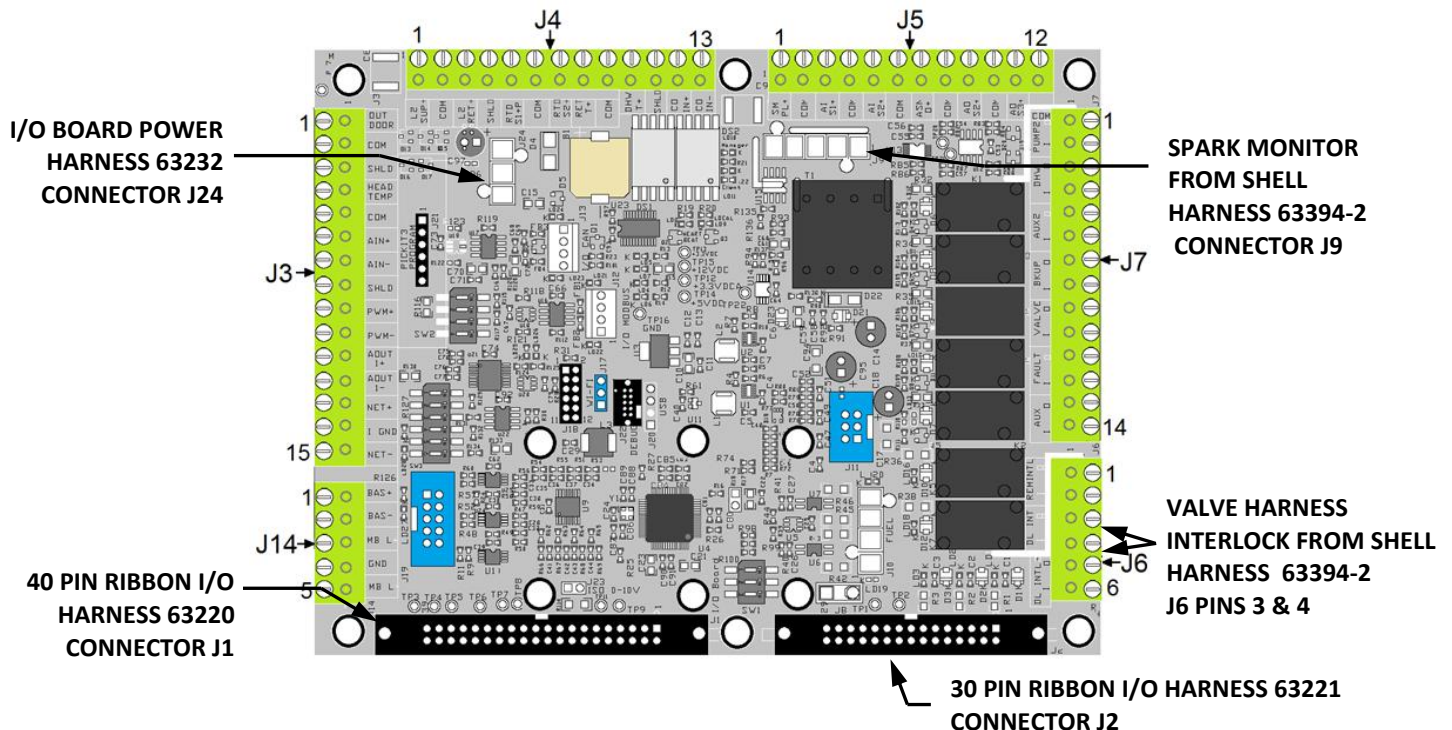


Figure C-2: Terminal Block Terminal Strips

I/O Board Connections

The I/O board contains the terminal listed below, arranged on removable, named connector strips J3 through J7 and J14, plus Molex connectors for unit harnesses. The maximum gauge of wires connecting to the I/O board is 14.

NOTE: To facilitate connections, these strips can be lifted off the I/O board. The entire strip is then remounted on the I/O board after all connections have been made. If a connector strip is removed, it must be re-mounted in its original orientation (connecting wires arranged around the **outside** perimeter of the I/O board).

Connector Strip J3 Terminals		
Pin #	Name	Description
1	Outside Temp +	Connections to Outside Air Temperature (OAT) sensor (P/N 61048). Used on Manager and Backup Manager units. Required for the OUTDOOR RESET mode of operation. To enable this mode, go to the Controller's Main Menu → Advanced Setup → Unit → Application Configuration and set SH Operating Mode to Outdoor Reset , then configure the related parameters.
2	Outside Temp -	
3	Shield	
4	Supply Header +	Connection to the Supply Header temperature sensor (2 wire sensor P/N 24410 , or 4 wire sensor P/N 61058) for: <ul style="list-style-type: none"> Main Loop (in a Variable-Primary application) Secondary Loop (in a Primary-Secondary application) Loop 1 (in a Multi-application) Typically, used on Manager and Backup Manager units. For more information, refer to the <i>CFR Boiler Application Guide</i> (TAG-0107)
5	Supply Header -	
6	Remote Analog In +	Connection to the Analog Remote Signal, if Operating Mode = Remote Setpoint. Used on Manager and Backup Manager units.
7	Remote Analog In -	
8	Shield	Connection to the shield from any cable.
9	(NOT USED)	
10	(NOT USED)	
11	BLR V.S. Pump +	Reserved for future use. Boiler Variable Speed Pump. Connection for the VFD signal to the pump,
12	BLR V.S. Pump -	
13	BST/WHM RS485 +	Dedicated to internal communication between units in a BST system. ACS (legacy) panel should also be connected to this terminal.
14	RS485 Iso Gnd	
15	BST/WHM RS485 -	

Connector Strip J4 Terminals		
Pin #	Name	Description
1	(NOT USED)	
2	(NOT USED)	
3	(NOT USED)	
4	(NOT USED)	
5	RTD Spare 1	Reserved. Spare temp sensor
6	Sensor Ground	Ground connection for RTD Spare 1
7	(NOT USED)	
8	(NOT USED)	
9	(NOT USED)	
10	DHW Temp	Connect the DHW tank temperature or DHW Loop Supply Temperature sensor
11	Shield	Connection to the shield from any cable.
12	(NOT USED)	
13	(NOT USED)	

Connector Strip J5 Terminals		
Pin #	Name	Description
1	(NOT USED)	
2	(NOT USED)	
3	Spare Analog In 1 +	Connection to one of the following signals: <ul style="list-style-type: none"> • SmartPlate Valve input • VS Pump Feedback (Variable Speed Pump Feedback) • Remote Setpoint 2 To assign function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Analog Inputs , then set the Input parameter to Spare Analog In 1 .
4	Spare Analog In 1 -	
5	(NOT USED)	
6	(NOT USED)	
7	Spare Analog Out 1 +	Connection to one of the following signals: • Fire Rate • Cascade Valve To assign/program function, go to the Controller's Advanced Setup → Ancillary Devices → Analog Outputs , then set the Output parameter to Spare Analog Out 1 .
8	Spare Analog Out 1 -	
9	(NOT USED)	
10	(NOT USED)	
11	(NOT USED)	
12	(NOT USED)	

Connector Strip J6 Terminals		
Pin #	Name	Description
1	Remote Interlock Out	Connection to an auxiliary device interlock - requires delay before firing.
2	Remote Interlock Return	
3	Delayed Interlock 1 Out	Connection to an auxiliary device interlock - requires delay before firing.
4	Delayed Interlock 1 Return	
5	(NOT USED)	
6	(NOT USED)	

Connector Strip J7 Terminals		
Pin #	Name	Description
1	Spare 2 Relay N.O.	Connection to an auxiliary device enable/disable signal, such as: <ul style="list-style-type: none"> • System Pump • Pump 2 • Louver • Louver 2 • Damper • Other To assign/program its function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Relays , then set the Relay to Spare 2 Relay and the Name to one of the above devices.
2	Spare 2 Relay Com	
3	DHW Pump Relay N.O.	Connection to a DHW Pump enable/disable signal.
4	DHW Pump Relay Com	
5	V2/Spare 1 Relay N.O.	Connection to an auxiliary device enable/disable signal, such as: <ul style="list-style-type: none"> • System Pump • Pump 2 • Louver • Louver 2 • Damper • Other To assign/program its function, go to the Controller's Main Menu → Advanced Setup → Ancillary Devices → Relays , then set the Relay to V2/Spare 1 Relay and the Name to one of the above devices.
6	V2/Spare 1 Relay Com	
7	Reserve Relay N.O.	Connection to a reserve/backup boiler enable/disable signal.
8	Reserve Relay Com	
9	(NOT USED)	
10	(NOT USED)	
11	Fault Relay N.O.	Connection to a Fault/Remote Alarm enable/disable signal.
12	Fault Relay Com	
13	Aux Relay N.O.	Connection to an auxiliary device enable/disable signal.

Connector Strip J7 Terminals		
Pin #	Name	Description
14	Aux Relay Com	

Connector Strip J14 Terminals		
Pin #	Name	Description
1	BAS RS485 +	Connection to the building automation system (BAS) network (Modbus RTU, BACnet MSTP). For IP network, use the Ethernet port.
2	BAS RS485 -	
3	(NOT USED)	
4	(NOT USED)	
5	(NOT USED)	

