Operation Manual

Edge [i] Controller
For Benchmark Boilers and Innovation Water Heaters

Other documents for this product include:
OMM-0143, GF-216 Innovation-Edge [i] Installation-Operation Manual
OMM-0144, GF-217 Benchmark-Edge [i] Installation-Startup Manual

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SECTION 1: General Information

1.1 Introduction

The information in this Section provides a guide to the operation of Benchmark Boilers and Innovation Water Heaters using the Edge [i] Controller. In addition, it provides information on numerous types of external sensors and control devices that can interface to the unit using terminals provided in the Water Heater’s Input/Output (I/O) Box. Information regarding the set-up of all water heater Operating Modes, as well as Water Heater Management (WHM), an array of units, is also included.

NOTE:
Starting in Section 2, the instructions in this document are based on the assumption that you are already familiar with the Edge [i] Controller interface and can navigate through the menus and screens, enable/disable functions, make selections, edit parameters, and return to the Main Menu, etc., without detailed instructions. This section provides an introduction to navigating through the Edge Controller’s screens and how use the various components in them.

1.2 SAFETY PRECAUTIONS AND WARNINGS

It is imperative that the initial startup of Innovation Water Heaters be performed by factory trained personnel. Operation prior to initial startup by factory trained personnel will 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 INNOVATION WATER HEATERS MAY INCLUDE 120 OR 220 VOLTS AC. THEREFORE, THESE UNITS MUST BE SERVICED ONLY BY FACTORY CERTIFIED SERVICE TECHNICIANS.

WARNING:
DO NOT ATTEMPT TO DRY FIRE THE UNIT. STARTING THE UNIT WITHOUT A FULL WATER LEVEL CAN SERIOUSLY DAMAGE THE UNIT AND MAY RESULT IN PERSONNEL INJURY OR PROPERTY DAMAGE. THIS SITUATION WILL VOID ANY WARRANTY.
1.3 Power Up

Upon power-on, the splash screen appears, and the Edge Controller’s **Main Menu** then appears a few seconds later. However, if the **Screensaver Password** feature (see Section 1.5.1: **Screensaver Password**) has been enabled, the splash screen remains, with “LOCKED” appearing at the bottom of the screen. Pressing any control causes the **Enter Password** screen to appear (see Section 1.5 below). You must enter a password to get past the splash screen.

![Figure 1.3: Splash Screen](image)

1.4 Download Latest Firmware

AERCO is committed to making the Edge Controller a reliable and easy to use front-end to your AERCO Water Heaters. As part of that effort, AERCO will be continuously monitoring user’s experience and implementing improvements to the Edge Controller’s firmware.

As a result, it is possible that the Edge Controller firmware on your recently delivered Water Heater may already be out of date. **You must update the firmware to the latest version before you begin using the Edge Controller for the first time.** This will eliminate potential problems and allow AERCO Technical Support to better serve you if you need assistance.

The first step is to obtain the latest firmware from AERCO. AERCO certified technicians can download latest firmware from the AERCO website, or they can contact their local AERCO rep for information on latest firmware.

Once you have either connected the Water Heater to an Ethernet cable or downloaded the latest firmware to a USB device, you **must** update the firmware. Instructions for both options are in Section 4.2.7: **Firmware Update**.

1.5 Passwords

The Edge Controller has multiple levels of password protection.

<table>
<thead>
<tr>
<th>Level</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No password</td>
<td>The default. Some parameters are visible but “Read Only” but the user is excluded from most functionality.</td>
</tr>
<tr>
<td>1</td>
<td>159</td>
<td>Allows some basic setting changes. Appropriate for AERCO Trained technicians (ATT).</td>
</tr>
</tbody>
</table>

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

1. Go to the Main Menu, press Advanced Setup, then press Access. The Enter Password screen appears.

![Figure 1.5: Enter Password Screen](image)

2. Use the number keypad to enter the password (each number appears as a *), then press Save. You'll have access to the functionality associated with the level of the password.

### 1.5.1 Screensaver Password

By default, all users that have not been given a password have Level 0 access to the Edge Controller, which allows them to view many parameters but they are excluded from using most functionality. However, access can be restricted to users with an Edge Controller password, effectively eliminating Level 0 access, by enabling the Screensaver Password parameter.

Once enabled, all users are presented with the Enter Password screen when they attempt to perform any function, even accessing the Main Menu.

To enable the Screensaver Password parameter, complete the instructions below. You must already have a password to perform these instructions.

1. Go to the Main Menu and press Advanced Setup. The Advanced Setup screen opens (see Figure 4.0).
2. Press Access, then enter your password and press Save.
3. Press Unit, then press Front Panel Configuration. The Front Panel Configuration screen opens.

![Figure 1-5.1: Front Panel Configuration Screen](image)
4. Scroll down till you see the **Screensaver Password** parameter. It displays the current state of this parameter, either **Enabled** or **Disabled**.

5. If the current state is **Disabled**, press on **Disabled**; the state changes to **Enabled**.

6. Press the **Home** button. The change is saved and a password is now required for all users.

**NOTE:**

Once the Screensaver Password is **Enabled**, after the Edge Controller times out, *all* users will be prompted to enter a password as soon as they touch any control.

### 1.6 Main Menu

The Main Menu give you access to all Edge [i] Controller user functionality. There are four major divisions within the menu structure.

![Figure 1.6: The Edge [i] Touchscreen Main Menu](image)

### 1.7 Edge Controller Front Panel Functionality

The Edge Controller contains a capacitive touchscreen, which is a highly sensitive device. It continuously checks for user interaction at a very high frequency. Mechanical room environments are sometimes harsh, electromagnetically noisy and dirty, and can experience wide temperature ranges, all of which can be difficult for sensitive electronic components.

AERCO has taken precautions to ensure proper operation of your unit. We have built the Edge Controller with a high-quality glass screen for clarity and performance, with an optically bonded overlay covering the front of the enclosure to prevent dirt and liquids from affecting its operation. The Edge Controller’s front panel consists of a touchscreen display along with a variety of indicators and buttons, as shown in the image below.
All the completed settings and the Unit Event History are maintained throughout the power cycle.

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

**TABLE 1.7: Edge Controller Front Panel Controls**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔥</td>
<td>Previous</td>
<td>Takes you to the previous screen.</td>
</tr>
<tr>
<td>🏡</td>
<td>Home</td>
<td>Takes you to the touchscreen’s Main Menu (see Figure 1.2). If pressed during a procedure, it aborts the procedure.</td>
</tr>
<tr>
<td>⬆️⬇️</td>
<td>Up/Down</td>
<td>These buttons activate a selection box that can then be moved sequentially through the editable/selectable parameters starting from</td>
</tr>
</tbody>
</table>
The Edge 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:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄</td>
<td>Previous</td>
<td>Takes you to the previous screen.</td>
</tr>
<tr>
<td>🏡</td>
<td>Home</td>
<td>Takes you to the touchscreen’s Main Menu (see Figure 1.6). If pressed during a procedure, it aborts the procedure.</td>
</tr>
<tr>
<td>🍃🍃</td>
<td>Left/Right</td>
<td>The <strong>LEFT</strong> arrow moves to previous point in the array or list and <strong>RIGHT</strong> arrow moves to next point in the array or list.</td>
</tr>
<tr>
<td>⬆️⬇️</td>
<td>Up/Down</td>
<td>The <strong>UP</strong> arrow increases a value, <strong>DOWN</strong> decreases value.</td>
</tr>
<tr>
<td>🔄▶️</td>
<td>Page Left</td>
<td>The arrows on left and right edges of the touchscreen scroll <strong>Page Left</strong> or <strong>Page Right</strong> in a round-robin sequence.</td>
</tr>
<tr>
<td>🔄◀️</td>
<td>Page Right</td>
<td></td>
</tr>
<tr>
<td>⬆️⬇️</td>
<td>Page Up</td>
<td>On screens with multiple pages, the <strong>Page Up</strong> and <strong>Page Down</strong> buttons moves up and down the pages.</td>
</tr>
<tr>
<td>⬅️➡️</td>
<td>Page Down</td>
<td></td>
</tr>
<tr>
<td>🔴</td>
<td>Abort</td>
<td>The <strong>Abort</strong> button appears when a process may need to be exited prior to completion.</td>
</tr>
<tr>
<td>👉</td>
<td>Next</td>
<td>Pressing <strong>Next</strong> takes you to the next screen in a multi-step procedure. Some procedures have a <strong>Proceed</strong> button instead.</td>
</tr>
</tbody>
</table>
| 🔄   | Save       | 1. On a pop-up screen, pressing **SAVE** saves the entered data and returns you to the previous screen.  
2. On a non-pop-up screen, pressing **SAVE** 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 and opens the screen you chose. On other screens, the screen remains until you press **Next** or **Proceed**.

![Selected Item Indication – Color Change](image)

*Figure 1.9-1: Selected Item Indication – Color Change*

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.

![Toggle Controls](image)

*Figure 1.9-2: 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.

![List Controls](image)

*Figure 1.9-3: List Controls*
To make a selection in a user-selectable parameter, press on the field you want to change; a list of options appears. When you select an option, the original screen reappears with your selection displayed in the field.

![Figure 1.9-4: List Controls](image)

**1.10 Aborting an Action**

On some screens, an abort action is available when a process has begun but needs to be terminated. This is initiated by pressing the **Abort** button (if it appears on the screen).

1. If a process is aborted, a confirmation screen may appear. Select **Yes** to abort the process. If no action is taken within 15 seconds, or if you select **No**, the abort is cancelled.

![Figure 1.10: Abort Confirmation Screen](image)

2. When an abort is successful, the process terminates and you are returned to the original screen. When an abort is performed on a screen that has multiple items, items that were entered up to that point are saved.

3. If the process completes while the Abort 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; the Enter Password screen will appear if passwords are required.
SECTION 2: CALIBRATION

The Calibration screen provides several tools to calibrate the unit's components. It is accessed by pressing Calibration on the Main Menu.

![Calibration Screen](image)

*Figure 2.0: Calibration Screen*

This Section includes the following topics:

2.1: Manual Combustion  
2.2: Input/Output:  
   2.2.1: Temperature Sensors  
   2.2.2: O₂ Sensor – Benchmark Only  
   2.2.3: Analog Inputs  
   2.2.4: Analog Outputs  
2.3: Subsystems  
   2.3.1: Air Fuel Valve  
   2.3.2: Spark Monitor  
2.4 Combustion Summary  
2.5 Combustion Values – Innovation Only

**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 4.2.7: Firmware Update to obtain and install the latest firmware.
2.1 Combustion Calibration Overview

The Edge Controller has functionality to perform the full combustion calibration process on all Innovation Water Heaters and Benchmark Boilers.

**NOTE:**
The following is a *general overview* of the combustion calibration process and the screens that appear. 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.

1. Go to: Main Menu → Calibration → Combustion Calibration.
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.

![Combustion Calibration Screen](image1)

*Figure 2.1-1: Combustion Calibration Screen*

3. On the NOx Requirements screen, select the NOx (Nitrogen Oxide) target to use during combustion calibration.

![NOx Requirements Screen](image2)

*Figure 2.1-2: NOx Requirement Screen*
4. 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).

**PRE-SET CALIBRATION STEPS**

**FINE VALVE POSITION CONTROLS**

**TARGET CALIBRATION VALUES**

![Figure 2.1-3: Combustion Calibration Screens](image)

5. First change the valve position to 30%, press the **Go** button, 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**, **NOx**, **CO** and flame strength values from the combustion analyzer and multi-meter at the 100% fire rate in the **Reading** cells.

8. 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 2.4 for instructions on accessing this screen.
2.2 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:**
On Innovation units, 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 *Innovation Installation, Operation & Maintenance Manual* (OMM-0143, GF-216).

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.

![INNOVATION SCREEN](image1)
![BENCHMARK SCREEN](image2)

*Figure 2.2: 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.

2.2.1 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.

![TEMPERATURE SENSORS](image3)

*Figure 2.2.1: 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:
   - Feed Forward
   - Outside Temp
   - Lower Inlet
   - Exhaust
   - Air Inlet
   - Outlet

3. If necessary, you can 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.

### 2.2.2 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.

**NOTE:**
This section applies only to Benchmark units.

![Figure 2.2.2: O2 Sensor Screen](image)

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:

4. Auto Calibration Status shows the progress, including the offset implemented.

5. When completed, Auto Calibrate Now reverts to No.

6. You can define Calibration Frequency as Daily, Weekly, Monthly or Never.

7. 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.

8. If you choose Daily, the Time (time of day) field appears; choose an appropriate time to perform the calibration.
2.2.3 Analog Inputs

The Analog Inputs screen allows you to view the current reading and calibrate two analog inputs: Flow and Remote Analog In. 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 both analog inputs.

![Analog Inputs Screen](image)

*Figure 2.3.3: 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, either Flow or Remote Analog In. The selected input is displayed and its current reading appears in the Current Reading field.
3. If necessary, you can adjust the Current Reading to match a reliable reading or instrument by entering a value in the Offset parameter. (Range: -1.00 to 1.00)
4. If needed, repeat Steps 2 and 3 to configure the other Analog Input.

2.2.4 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.

![Analogue Outputs Screen](image)

*Figure 2.2.4: Input/Output: Analogue Outputs Screen*

2. The Analog Name field displays Analog Out, and the Function field displays the output’s function.

3. In the Level field, choose the value (such as 10 mA) that will drive the device connected to the Analog Out terminal and observe if the device behaves appropriately.
   (Range: 0.00 to 20.00 mA)

4. If necessary, you can adjust the Level to match a reliable reading or instrument by entering a value in the Offset parameter. (Range: -2.0 to +2.0 mA, default = 0.0)

### 2.3 Subsystem

The Subsystem screen provides access to two system components:

- The Air/Fuel Valve
- The Spark Monitor

![Subsystem Screen](image)

*Figure 2.3: Calibration: Subsystem Calibration Menu*
1. Go to: **Main Menu → Calibration → Subsystem**.

2. 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.

### 2.3.1 Air Fuel Valve Calibration

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

**Figure 2.3.1-1: Subsystem: Air/Fuel Valve Calibration Screen**

1. Go to: **Main Menu → Calibration → Subsystem → Air Fuel Valve**.

2. Before starting the 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 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 it reaches 0%.

**Figure 2.3.1-2: Subsystem: Air/Fuel Valve Calibration Screen – After Completion**

4. When the valve 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 or read 50%, you can press Done but then repeat the process to ensure calibration.

### 2.3.2 Spark Monitor Calibration

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 2.3.2: 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

### 2.4 Combustion Summary

The Combustion Calibration Complete screen provides the results of the previous combustion calibration, along with a color-coded honeycomb indicating whether the result at each calibration point was within acceptable limits (green) or outside acceptable limits (red).

**Figure 2.4: Calibration: Combustion Calibration Complete Screen**
1. Go to: **Main Menu → Calibration → Combustion Summary.**

2. This read-only screen remains accessible and unchanged until combustion calibration is performed again.

### 2.5 Combustion Values – Innovation Only

The **Combustion Calibration** screen, available only on Innovation water heaters, shows the expected Blower voltages for each valve position, along with some additional information, such as the unit’s Start and Stop valve positions. This screen is just a reference for the specified model and does not change.

![Combustion Calibration Screen](image)

*Figure 2.5: Calibration: Combustion Calibration Screen*

1. Go to: **Main Menu → Calibration → Combustion Values.**
SECTION 3: 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**.

![Diagnostics Menu](image)

**Figure 3.0: Diagnostics Menu**

This Section includes the following topics:

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**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 4.2.7: Firmware Update** to obtain and install the latest firmware.
3.1 Manual Run

Most diagnostic test procedures require the unit to be in **Manual Mode**. Putting the Edge Controller in **Manual Mode** does the following:

- 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 Edge 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 3.1: Diagnostics: Manual Run Screen – Manual Mode Enabled](image)

2. Enable the **Manual Mode** toggle. The red Manual LED lights on the Edge 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 Edge Controller’s front face will go off, and the unit will resume normal operation.
3.2 Front Panel

The Front Panel screen provides access to several tests of the Edge Controller’s touchscreen, LEDs, keypad and buttons.

To run Front Panel diagnostics:

1. Go to: Main Menu → Diagnostics → Front Panel.

   ![Figure 3.2-1: Diagnostics: Front Panel Screen](image)

   **Figure 3.2-1: Diagnostics: Front Panel Screen**

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 3.2-2: Diagnostics: Touchscreen Display Test](image)

   **Figure 3.2-2: 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 3.2-3: Diagnostics: Touchscreen Display Test](image)

4. Upon completion of a test, the toggle reverts to its initial (off) position and you can perform one of the other tests.

3.3 Analog Outputs and Relays

The **Analog Outputs and Relays** screen allows you to test the units 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.**
3.3.1 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 3.3: Diagnostics: Analog Outputs and Relays Screen](image)

   Figure 3.3: Diagnostics: Analog Outputs and Relays Screen

2. Press the relay you want to test; it turns green (as shown above), 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 period, verify that the function associated with the selected relay(s) occurred as expected.

4. The Relay test will disable automatically after 1 minute.
3.3.2 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**.

![Analog Outputs Screen](image)

**Figure 3.3.2: Analog Outputs and Relays: Analog Outputs Screen**

2. In Default mode, this screen is grey and displays the current value (read-only) 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). You can return all sliders to 0.00 by pressing the **Zero** button.

4. To put this screen back in Default mode, press the **Manual** button again.

3.4 Subsystems

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

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

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

![Subsystems Screen](image)

**Figure 3.4: Diagnostics: Subsystems Screen**

2. Press on the component you want to test.
3.4.1 Air Fuel Valve Stepper Motor

Complete the instructions below to test the Air/Fuel Valve’s stepper motor.

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

![Figure 3.4.1: Subsystems: Air Fuel Valve Stepper Motor Test Screen](image)

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, you can 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.

3.4.2 Blower

Complete the instructions below to test the Blower motor.

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

![Figure 3.4.2: Subsystems: Blower Screen](image)

2. The **Blower** screen allows you manually drive the blower to a desired RPM using the **Plus** or **Minus** buttons on the **Blower** (voltage) control, or you can 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 the Profile parameter 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.

### 3.4.3 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 3.4.3: Subsystems: Ignition Screen](image)

2. Start the Ignition Spark test 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. The Spark Current is displayed continuously during the test.
3.5 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 3.5: Diagnostics: System Screen](image)

**NOTE:** You can navigate from the Pre-Start Up screen to Versions in round-robin fashion using the Page Left and Page Right icons on each screen.

3.5.1 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.

Complete the instructions below to run Pre-Start Up diagnostic tests.

2. Go to: Main Menu → Diagnostics → System → Pre-Start Up.

![Figure 3.5.1: System: Pre-Start Up Screen – Shown Disabled](image)

3. 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.

4. Monitor the valve position out, blower voltage and spark current.

5. When observations have completed, disable the **Pre-Start Up Mode** control.

### 3.5.2 Versions

The **Version Information** screens displays the current version of the Edge Controller’s various firmware components.

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

![Figure 3.5.2: System: Versions Information Screen](image)

2. The version of each component is displayed.

### 3.6 Comm & Network

The **Comm & Network** screen provides access to screens that can be used to verify IP, onAER and BAS communication, and available space on a USB device plugged into the side of the Edge Controller.

1. Go to: **Main Menu → Diagnostics → Comm & Network**.

![Figure 3.6: Diagnostics: Communications Screen](image)
3.6.1 IP Network

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

1. Go to: **Main Menu → Diagnostics → Comm & Network → IP Network**.

   ![Figure 3.6.1: Comm & Network: IP Network Screen](image)

   *Figure 3.6.1: Comm & Network: IP Network Screen*

2. The status of the available parameters is displayed.

3.6.2 BAS – Innovation Only

**NOTE:**
This screen is available only on Innovation water heaters.

If the Innovation Water heater 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 (see **Section 4.4.1: Main Menu → Advanced Setup → Comm & Network → BAS**).

1. Go to: **Main Menu → Diagnostics → Comm & Network → BAS**.

   ![Figure 3.6.2: Comm & Network: BAS Screen](image)

   *Figure 3.6.2: Comm & Network: BAS Screen*

2. The status of the available parameters is displayed.
3.6.3 onAER

The onAER screen provides a read-only display of several onAER communication parameters and provides the option to perform two functionality and communication tests.

1. Go to: **Main Menu → Diagnostics → Comm & Network → onAER.**

![onAER Screen](image)

2. This screen displays a number of different parameters. The specific parameters that appear depends on the value of the **onAER Mode** parameter (see Section 4.4.2: **Main Menu → Advanced Setup → Comm & Network → onAER**).

   - **Unit IP Address** (**onAER Mode** = Ethernet, Wifi or Wiznet): Displays the unit’s IP Address
   - **Upload Time** (**onAER Mode** = Ethernet, Wifi or Wiznet): Displays the upload frequency selected in Section 4.4.2: **onAER**.
   - **Network Status** (**onAER Mode** = Ethernet): Displays the status of the network connection.

3. There are two optional onAER functionality and communication tests, both of which send reports to the host server.

   - **Test Heartbeat**: The green onAER LED on the Edge Controller’s front face blinks rapidly for one or two seconds while sending a summary status file to the host server.
   - **Test Setup**: The green onAER LED on the Edge 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.
### 3.6.4 USB Storage

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

1. Plug a USB device into the USB port on the Edge Controller’s left side.
2. Go to: **Main Menu → Diagnostics → Comm & Network → USB Storage**.

![USB Storage Screen](image.png)

*Figure 3.6.4: Comm & Network: USB Storage Screen*

3. The status of the available parameters is displayed.

### 3.7 Input/Output Summary

The **Input/Output Summary** screen is 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 are blank (---).

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

![Input/Output Summary Screen](image.png)

*Figure 3.7: Input/Output: Input/Output Summary Screen*
5. The following are examples of the data in the **Input/Output Summary** screen.

**TABLE 3.7-1: Innovation Summary Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Inlet</td>
<td>40°F</td>
</tr>
<tr>
<td>Exhaust</td>
<td>240°F</td>
</tr>
<tr>
<td>Outlet</td>
<td>140°F</td>
</tr>
<tr>
<td>Lower Inlet</td>
<td>40°F</td>
</tr>
<tr>
<td>Feed Forward</td>
<td>90°F</td>
</tr>
<tr>
<td>Blower</td>
<td>2.00 V</td>
</tr>
<tr>
<td>Remote Ain</td>
<td>5.5</td>
</tr>
<tr>
<td>Cascade Valve</td>
<td>5.5</td>
</tr>
<tr>
<td>Cas Vlv Fdbk</td>
<td>5.5V</td>
</tr>
<tr>
<td>Outside Temp</td>
<td>---</td>
</tr>
</tbody>
</table>
SECTION 4: ADVANCED SETUP

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

Figure 4.0: Advanced Setup Screen

This Section includes the following topics:

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<td>4.2.8: Maintenance</td>
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<td>4.3.2: Cascade Communication</td>
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<td>4.3.3: WHM &amp; BST Application Configuration</td>
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<td>4.3.4.1: Sequencing Controls</td>
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<td>4.3.4.2: Anti-Cycling Control</td>
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<td>4.3.4.3: Temperature Control – BMK Only</td>
</tr>
<tr>
<td>4.3.4.4: Valve Configuration</td>
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<tr>
<td>4.3.4.5: Setpoint Range – BMK Only</td>
</tr>
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<td>4.3.4.6: Lead/Lag</td>
</tr>
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<td>4.4: Comm &amp; Network</td>
</tr>
<tr>
<td>4.4.1: BAS (Building Automation System) – INN Only</td>
</tr>
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<td>4.4.2: onAER</td>
</tr>
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<td>4.4.3: Ethernet</td>
</tr>
<tr>
<td>4.4.4: Communication Failsafe</td>
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<td>4.5: Ancillary Device</td>
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<td>4.5.1: Interlocks</td>
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<td>4.6: Performance</td>
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<td>4.6.1: Temperature Controls</td>
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<td>4.6.1.1: PID Setting</td>
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<td>4.6.1.3: Setpoint Range</td>
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<td>4.6.2.2: Ignition Control</td>
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<tr>
<td>4.6.2.3: Operating Control</td>
</tr>
<tr>
<td>4.6.2.4: Anti-Cycling Control</td>
</tr>
</tbody>
</table>

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 4.2.7: Firmware Update to obtain and install the latest firmware.
4.1 Access

The **Enter Password** screen allows you to log in to the system. As mentioned in Section 1.5, there are multiple passwords, each granting a specific level of access.

![Figure 4.1: Advanced Setup: Enter Password Screen](image)

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.

4.2 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 in round-robin fashion using the **Page Left** and **Page Right** icons on each screen.

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

![Figure 4.2: Advanced Setup: Unit Screen](image)

**NOTE:**
The Application Configuration button is enabled only if **WHM Unit Mode** (Innovation) or **Unit Mode** (Benchmark) (see the **WHM Unit Mode** parameter in [Section 4.3.1.1: Cascade Configuration – Innovation](#), or the **Unit Mode** parameter in [Section 4.3.1.2: Cascade Configuration – Benchmark](#)) = Off.
4.2.1 Unit Settings

The **Unit Settings** screens display 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**.

![Unit Settings Screen](image)

2. The following parameters 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 unless replacing the Edge Controller. The format is:
     - **G**: A letter specific to Innovation Water Heaters and Benchmark Boiler models 750-4000, or letter **N** for BMK 5000 and 6000.
     - **YY**: The two-digit year
     - **ZZZZ**: A sequential 4-digit serial number.

![Figure 4.2.1-1: Unit: Unit Settings Screens](image)
- **Unit Type:** Displays AERCO products and models, such as Innovation WH, Benchmark Boilers and KC Water Heaters. Do **NOT** change unless replacing the Edge Controller.

- **Unit Size:** Displays available sizes for the given **Unit Type**. Do **NOT** change unless replacing the Edge Controller.

- **Date, Time, Time Format:** Allows you to set the date and time. The **Time Format** control allows you to select 12 or 24 hour format.

  ![Date and Time Screens](image)

  **Figure 4.2.1-2: Unit: Enter Date & Time Screens**

- **Vent Type:** Choose the unit’s exhaust vent material: **PVC**, **cPVC**, **Polypro** or **Stainless Steel**.

- **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).

  ![Exhaust Safety Table]

  **TABLE 4.2.1: Exhaust Safety Temperature Limits**

<table>
<thead>
<tr>
<th>Limit Type</th>
<th>Result Action</th>
<th>Vent Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PVC</td>
</tr>
<tr>
<td>Caution Limit</td>
<td>Display Warning</td>
<td>158°F 210°F 215°F</td>
</tr>
<tr>
<td>High Temp Limit</td>
<td>Reduce Fire Rate</td>
<td>170°F 220°F 220°F</td>
</tr>
<tr>
<td>Fault Limit</td>
<td>Unit Shut Down</td>
<td>180°F 230°F 230°F</td>
</tr>
</tbody>
</table>

- **Fuel Type** (not available for all unit types): Choose either **Natural Gas** or **Propane**.

- **Control Type:** Displays the Edge Controller type: **Edge [i]**. It can be changed on Benchmark units to **Edge [ii]**. Do **NOT** change unless replacing the Edge Controller.

- **Unit of Measurement:** Choose the unit of measure the Edge Controller will display, either **Metric** (°C, Lps, Pa) or **English** (°F, gpm, in. W.C., psi). The corresponding LED indicator on the Edge Controller’s front face, °F or °C, lights (see Figure 4.2.2-1, below).

- **Temperature Sensor:** Specifies the sensor type: **PT1000** or **BALCO**. Note, the default is BALCO on all units. Do **NOT** change unless replacing a on a legacy unit equipped with a different sensor.
• **Standby Pump On Time (Innovation Only):** The amount of time internal recirculation pump runs when unit is in standby. Pump has a continual operation. (Range: 0 to 20 min.)

• **Standby Pump Off Time (Innovation Only):** The amount of time internal recirculation pump is disabled during unit standby. Pump is continually cycled during standby. (Range: 0 to 30 min.)

• **Post-Fire Pump Time (Innovation Only):** The amount of time internal recirculation pump runs after unit has entered standby mode. (Range: 0 to 30 min.)

• **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 All Settings:** To reset all settings to their default values, press Yes, then press Yes again when asked to confirm.

• **Reset Common Settings (Benchmark only):** To reset common settings to their default values, press Yes, then press Yes again when asked to confirm.

• **Clear Fault Log:** To clear the Unit Event History (see Section 5.5 Unit Event History), press Yes, then press Yes again when asked to confirm.

### 4.2.2 Front Panel Configuration

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

![Front Panel Configuration](image)

**Figure 4.2.2-1: Unit: Edge Controller Front Panel – Upper Portion**

1. Go to: **Main Menu → Advanced Setup → Unit → Front Panel Configuration.**
The following fields are available:

- **Upper Left Display**: Choose between: Feedforward, Setpoint or Water Inlet. If you chose Setpoint or Water Inlet, a green ▼ icon appears on the Edge Controller’s front face next to your choice; If you chose Feedforward, the green ▼ icon disappears.

- **Upper Right Display**: Choose between: Water Outlet and System Header; a green ▼ icon appears on the Edge Controller’s front face above next to your choice.

- **Multi-Function Bar**: Choose what the Multi-Function Bar displays: Fire Rate or Valve Position.

- **Brightness**: Touchscreen brightness. Even when set to 10%, the touchscreen is never completely dark. (Range: 10 to 100%)

- **Screensaver Password**: Determines whether all users are required to enter a password to access the Edge Controller, even Password Level 0 items. See Section 1.5 Passwords. If set to Enabled, the following additional parameters appear:
  - **Screen Timeout**: Specifies touchscreen timeout. (Range: 3 to 90 min.)
  - **Screen Timeout Now**: Setting to Yes immediately puts the screen into sleep mode, causing the Enter Password screen to appear.

### 4.2.3 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 Edge Controller’s internal memory
- To a USB device plugged into the USB port on the side of the Edge 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 WHM 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 WHM or BST Client or 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 setup files (but not both) for multiple units, but only one for each unit. Creating a new setup file on the Edge Controller’s memory or a USB device will overwrite the existing copy.

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

![Figure 4.2.3: Unit: Settings Transfer Screen](image)

2. Choose one of the following:
   - To **save** the current settings, press **Save All Settings** and then complete the instructions in Section 4.2.3.1: **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 4.2.3.2: **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 the settings that are common to all units of the same type. This is appropriate when one unit has already been setup and you want to copy all its settings and parameters to additional units of the same type in a WHM or BST Cascade.

### 4.2.3.1 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 of the unit’s settings and configurable parameters.

   ![Save Destination Screen](image)

   *Figure 4.2.3.1: Unit: Save Destination Screen*

2. Chose where you want to save the current settings:
   - **Onboard**: Saves the current setup file to the Edge Controller’s onboard memory.
   - **USB**: This option is available only if an unencrypted USB device is plugged into the Edge 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 4.2.7.1 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 Edge Controller’s memory or a USB device, **this step will overwrite it**!

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

### 4.2.3.2 Restore Settings

If you chose **Restore All Settings** or **Restore Common Settings** in Section 4.2.3, one of the following screens appears:

![Restore Source/Common Screens](image)

*Figure 4.2.3.2-1: Unit: Restore Source/Common Screens*

1. Choose where the setup was saved (see **Section 4.2.3.1: Save Settings**):
   - **USB**: If the setup was saved to a USB device plugged into the Edge Controller’s USB port.
• **Onboard**: If the setup was saved to the Edge 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!**
**THE NEXT STEP WILL OVERWRITE THE PREVIOUS SETUP!**

2. The **Overwrite Calibration** screen now appears. Pressing either **Yes** or **No** will restore the settings, overwriting the existing settings. If you press **Yes**, this will include the results of the most recent combustion calibration. However, if you press **No**, the most recent combustion calibration data is retained.

![Overwrite Calibration Screen](image)

*Figure 4.2.3.2-2: Unit: Overwrite Calibration Screen*

3. The **Restore Succeeded** screen appears if the restore was successful, and the unit then reboots in about 5 seconds. If there was a problem, the **Restore Failed** screen appears.

### 4.2.4 Fault Management

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

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

![Fault Management Screen](image)

*Figure 4.2.4: 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. This applies only to the internal settings of the Edge Controller, **not** to the Manual High Temp Safely Limit switch.
- **Gas Pressure Reset**: Gas pressure exceeds or drops below specified tolerance (model specific).

### 4.2.5 Freeze Protection

The **Freeze Protection** functionality will turn on the system pump and fire the unit if ambient temperature falls below specified values, thus reducing the risk of freeze damage.

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

2. To enable **Freeze Protection** functionality, set **Freeze Protection** to **Enabled**.

3. Once **Enabled**, the following additional parameters appear, which determine when the unit will shut off and restart:
   - **Pump On Temperature**: Specify the ambient temperature **below** which the system pump will be triggered to start. (Range: 20 to 245°F)
   - **Unit On Temperature**: Specify the ambient temperature **below** which the unit will be triggered to start firing. (Range: 20 to 245°F)
   - **Stop Temperature**: Specify the ambient temperature **above** which the unit will return to normal operation. (Range: 20 to 245°F)

### 4.2.6 Unit Application Configuration

The **Application Configuration** screen contains operating mode, temperature and setpoint parameters for “standalone” Innovation and Benchmark units.

#### 4.2.6.1 Unit Application Configuration - Innovation

**NOTE:**

This option is available only if **WHM Unit Mode** = **Off** in **Section 4.3.1.1: Cascade Configuration – Innovation**.
1. Go to: **Main Menu → Advanced Setup → Unit → Application Configuration.**

2. Choose the **Operating Mode** for the unit, either **Constant Setpoint** or **Remote Setpoint** (note, the **Unit Application** for all Innovation Water Heaters is **DHW**).

![Application Configuration](application_configuration.jpg)

**Figure 4.2.6.1: Unit: Application Configuration**

3. The following parameters appear regardless of the **Operating Mode** chosen:
   - **Setpoint Low Limit**: Specify the Setpoint’s *lower* limit. (Range: 40°F to 245°F)
   - **Setpoint High Limit**: Specify the Setpoint’s *upper* limit. (Range: 20°F to 220°F)

4. If **Operating Mode = Constant Setpoint**, the **Setpoint** parameter appears. Specify the setpoint for the unit. (Range: 60°F to 150°F)
   - **Operating Mode = Remote Setpoint**, the following additional parameters appear:
     - **Network Timeout**: The timeout value before a Modbus Fault is declared due to no response from the BAS. (Range: 5 to 999)
     - **Remote Signal**: Choose the source of the remote signal:
       - 4-20mA
       - PWM Input
       - 1-5V
       - BAS
       - 0-20mA
       - Network
       - 0-5V
     - If **Remote Signal = Network**, the following additional parameters appear:
       - **Unit Address**: Set to the unit number of the signal source. (Range 0 to 16)
       - **Cascade Baud Rate**: Choose 9600, 19200, 38400 or 57600.

**4.2.6.2 Unit Application Configuration – Benchmark**

**NOTE:**
This option is disabled (greyed out) if **Unit Mode = BST Client** or **BST Manager** in **Section 4.3.1.2: Cascade Configuration – Benchmark**; it appears only if **Unit Mode = Off**.
1. Go to: Main Menu → Advanced Setup → Unit → Application Configuration.

2. Choose the Unit Application for this unit: SH or Other.

![Application Configuration](image)

Unit Application = SH  \hspace{1cm} Unit Application = Other

**Figure 4.2.6.2-1: Unit: Application Configuration**

3. If you chose SH in Step 2, choose appropriate the Unit SH Operating Mode for the unit:
   - Constant Setpoint
   - Remote Setpoint
   - Direct Drive
   - Combination
   - Outdoor Reset

4. Depending on the Unit SH Operating Mode chosen in Step 3, a number of additional parameters appear, as shown in the table below.

<table>
<thead>
<tr>
<th>Available Parameters</th>
<th>Unit SH Operating Modes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant Setpt</td>
</tr>
<tr>
<td>Unit SH Setpoint</td>
<td>✓</td>
</tr>
<tr>
<td>Remote Signal</td>
<td></td>
</tr>
<tr>
<td>Unit Address (^1)</td>
<td>✓</td>
</tr>
<tr>
<td>Cascade Baud Rate (^1)</td>
<td>✓</td>
</tr>
<tr>
<td>Unit DHW Setpoint</td>
<td></td>
</tr>
<tr>
<td>Outdoor Air Temp Sens</td>
<td></td>
</tr>
<tr>
<td>BST Outdoor Temp (^2)</td>
<td></td>
</tr>
<tr>
<td>OAR Min Outside Temp</td>
<td></td>
</tr>
<tr>
<td>OAR Max Setpoint</td>
<td></td>
</tr>
<tr>
<td>OAR Max Outside Temp</td>
<td></td>
</tr>
<tr>
<td>OAR Min Setpoint</td>
<td></td>
</tr>
<tr>
<td>Outdoor Rst Setpt</td>
<td></td>
</tr>
<tr>
<td>Warm Weather Shdwn (^2)</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Remote Signal \(*\) Network  \hspace{1cm} \(^2\) Outdoor Air Temp Sens \(*\) OFF

A. If SH Operating Mode = Constant Setpt, the Unit SH Setpoint parameter appears; specify the space heating setpoint. (Range: 60°F to 180°F)
B. If SH Operating Mode = Remote Setpt, Combination or Direct Drive, the Remote Signal parameter appears. Choose the source of the signal:

- 4-20mA
- BST (PWM) Input
- 1-5V
- BAS
- 0-20mA
- Network
- 0-5V

- If Remote Signal = Network, the following additional parameters appear:
  - Unit Address: Set to the unit number of the signal source. (Range 1 to 127)
  - Cascade Baud Rate: Choose 9600, 19200, 38400 or 115200.

C. If SH Operating Mode = Combination, the Unit DHW Setpoint parameter appears; specify the setpoint for DHW operation. (Range: 60°F to 180°F)

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

- 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: 20 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: 20°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.

5. If **Unit Application = Other**, choose one of two **Unit Other Operating Mode** for the unit.

![Application Configuration](image)

**Unit Other Operating Mode = Constant Setpoint**

**Unit Other Operating Mode = Remote Setpoint**

### 4.2.6.2-4: **Unit** Application Configuration, **Unit Application = Other**

A. If **Unit Other Operating Mode = Constant Setpt**, the **Unit Other Setpoint** parameter appears. Specify the “other” setpoint in that 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 5b, above. Changing them in either one changes them in the other.

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

  - If **Unit Other Remote Signal** = Network, the following additional parameters appear:
    - **Unit Address**: Set to the unit number of the signal source. (Range 1 to 127)
    - **Cascade Baud Rate**: Choose 9600, 19200, 38400 or 115200.

![Application Configuration](image)

*Figure 4.2.6.2-5: Unit: Application Configuration, Unit Other Remote Signal = Network*

### 4.2.7 Firmware Update

All Edge Controllers now contain the AERCO Intelligent Bootloader, V1.00 or later. This component, used during firmware upgrades, has the capability to distinguish between Benchmark Boiler and Innovation Water Heater files loaded onto the same USB device, and then loads the proper file depending on the unit.

The Firmware file names are stored onto the flash drive in the following format:

1. BMK_V509014_Boiler Firmware
2. INN_V509014_Water Heater Firmware

The Intelligent Bootloader looks for the appropriate file on the flash drive and looks for the most up to date Version number of that firmware to load onto the unit.

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 pick Item #3, the BMK firmware file with the most recent version number.
An Innovation Water Heater will look for and pick item #4, which is the Innovation firmware 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.

**NOTE:**
The Intelligent Bootloader is backward compatible with earlier firmware versions; it will load firmware files labeled “edgeimage.hex” if it can’t find the relevant BMK or INN file.

### 4.2.7.1 Obtaining the Latest Firmware

When a new firmware version is released, there are two options for loading it into the Edge Controller:

- **Option 1**: Connect the Edge Controller to an Ethernet cable; the Edge Controller can then access the latest firmware directly from Internet. Note, this option requires the use of a USB device. See Section 4.2.7.4: Updating Firmware From the Internet.
- **Option 2**: Obtain the latest firmware from AERCO and save it on a USB device, as described below.

AERCO Trained Technicians (ATT) and AERCO Master Technicians (AMT) can download the firmware from the AERCO web site to a **non-encrypted** USB device. 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:**
The Edge Controller cannot read encrypted USB devices. All instructions below **must** be performed using **un-encrypted** USB devices.
The instructions below must be carried out on a computer that can write to un-encrypted USB devices.

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

1. Go to the following URL on a computer that allows access to un-encrypted USB devices: [http://learning.aerco.com](http://learning.aerco.com).
2. If you do not already have an account on this site, create one before continuing.
3. Scroll down the left navigation pane and open the **Edge Firmware** folder.
4. Copy the Edge Controller firmware file to the **root directory** of your USB device, not a sub-folder. If needed, refer to the release notes for a running revision history.
5. The **Edge Firmware** folder may contain an updated graphics file. Its name will be in the format of **EdgeGraphics_V0025.hex**. If so, repeat the previous step on that file. Do not change its name unless instructed to do so.
6. The **Edge Firmware** folder may also contain updated I/O Board and or Display files, although these are updated infrequently. If so, repeat Step 4 on that file(s).
4.2.7.2 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 current setup will be restored only if necessary, as described in Section 4.2.7.5.

1. On the Edge Controller, go to: Main Menu → Advanced Setup → Unit → Settings Transfer.

![Figure 4.2.7.2-1: Unit: Settings Transfer Screen](image)

2. Choose Save All Settings; the Save Destination screen appears.

![Figure 4.2.7.2-2: Unit: Save Source Selection](image)

3. Choose where you want to save the current setup: Choose either:
   - **Onboard**: Saves the current setup file to the Edge Controller’s onboard memory.
   - **USB**: This option is available only if an unencrypted USB device is plugged into the Edge 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 unique name that never changes. If that setup file has already been saved to the Edge 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.
4. If the setup was successfully saved, the **Save Succeeded** screen appears; press **Continue** to proceed. If it failed, a **Save Unsuccessful** screen appears.

![Figure 4.2.7.2-3: Unit: Save Succeeded Screen](image)

5. 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.

   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.

The Edge 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 loaded into the Edge Controller, either from a USB device or via Ethernet cable.

### 4.2.7.3 Updating Firmware From USB Device

Complete the instructions below to update the firmware from the USB device used in Section 4.2.7.1.

1. Remove the unit’s front panel, to expose the USB port on the Edge Controller’s left side.

2. Insert the USB device containing the latest firmware in the USB port.

![Figure 4.2.7.3-1: Unit: USB Port Location](image)
3. Set the **Enable/Disable** switch on the Edge Controller’s front face to the **Disable** position.

4. Go to: **Main Menu → Advanced Setup → Unit → Firmware Update**. If necessary, enter your password to continue. Note, the controls are disabled (greyed out) until the USB device is installed per Step 3 and the **Enable/Disable** switch is in the **Disable** position.

![Firmware Update Screen](image)

**Figure 4.2.7.3-2: Unit: Firmware Update Screen**

5. Press the **Update Main Control** button. The screen will flash on-off for a minute or more while the new firmware loads, updating the firmware.

6. 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.** Press **OK** to continue.

![Update Finished Screen](image)

**Figure 4.2.7.3-3: Unit: Update Finished Screen**

7. Spot-check that the values recorded at the end of Section 4.2.7.2 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.

8. If you obtained an updated **Graphics** file in Section 4.2.7.1, press the **Update Graphics** button. During the update, the **Update Graphics** button is greyed out and **Graphics**
Processing appears on the Edge Controller’s screen. Do not press any other controls or remove the USB device until Graphics Flash Completed appears.

9. If you obtained updated I/O board or Display files, press the Update I/O Board or Update Display button. Do not press any other controls or remove the USB device until you see confirmation that the update completed.

10. When done, set the Enable/Disable switch back to Enable.

11. If the spot-check of the settings in Step 7 was good, the process is complete. But if any of the settings changed, or you suspect the setup was corrupted, complete the instructions in Section 4.2.7.5: Restore Settings After Update.

4.2.7.4 Updating Firmware From the Internet

Complete the instructions below to update the firmware from an Ethernet cable connected to the Internet. This option requires a USB device with some free space to be plugged into the USB port. The new firmware is first copied to the USB device, then loaded into the Edge Controller from the USB device.

1. Remove the unit’s front panel, to expose the USB port on the Edge Controller’s left side.

2. Plug an active Ethernet cable in the Ethernet port and insert an unencrypted USB device in the USB port (see Figure 4.2.7.3-1).

3. Set the Enable/Disable switch on the Edge Controller’s front face to the Disable position.

4. Go to: Main Menu → Advanced Setup → Unit → Firmware Update.

5. Press the Download Latest Version button. The firmware is copied from the network to the USB device. This may take a minute or more.

6. Press the Update Main Control button. The screen will flash on-off for approximately 1 minute while the firmware is loaded from the USB device. When done, the Update Finished screen (see Figure 4.2.7.3-4, above) appears displaying the version number and date.

7. Press the Update Graphics button. Do not press any other controls or remove the USB device until you see confirmation that the update completed (see Figure 4.2.7.3-4). If the graphics did not update, press the Download Latest Version button a second time, wait for the download to complete, then press the Update Graphics button a second time.

8. Set the Enable/Disable switch back to Enable.
4.2.7.5 Restore Settings After Firmware Update

If the spot check in Section 4.2.7.2 failed, you can now restore the setup and its parameters to their state prior to the update.

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

![Unit: Settings Transfer Screen](image)

Figure 4.2.7.5-1: **Unit: Settings Transfer Screen**

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

![Unit: Restore Source Screens](image)

Figure 4.2.7.5-2: **Unit: Restore Source Screens**

3. Choose where you saved the setup (in Section 4.2.7.2), either:
   - **USB** if the same USB device is still plugged in.
   - **Onboard** If the setup was saved to the Edge Controller’s onboard memory.

4. The Overwrite Calibration screen now appears. Press Yes to overwrite the existing combustion calibration or press No to retain the existing combustion calibration.

![Unit: Load Settings Screen](image)

Figure 4.2.7.5-3: **Unit: Load Settings Screen**
5. The saved setup is restored to the unit. The **Restore Succeeded** screen appears if the transfer completed successfully, and the unit then reboots in about 5 seconds. If there was a problem, the **Restore Failed** screen appears.

### 4.2.8 Maintenance

**NOTE:**
This screen applies to both Benchmark Boilers and Innovation Water Heaters.

Innovation Water Heaters and Benchmark Boilers require routine maintenance to ensure reliability and efficiency. There are two maintenance cycles: 12 month and 24 months. The Edge Controller keeps track of both cycles and displays a warning when either cycle is ending, prompting the maintenance technician to perform the required maintenance.

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.**

![Figure 4.2.8-1: Unit: 12 Month Maintenance Screen](image)

**Figure 4.2.8-1: Unit: 12 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 appear 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 Edge 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.

### 4.3 WHM & BST Cascade

The BST Cascade and WHM Cascade screens provide options to alter system settings that control the BST Cascade or WHM Cascade.

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

2. All the options on this screen are greyed out (disabled) except Cascade Configuration until WHM Cascade or BST Cascade functionality has been enabled, as described below.

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

Water Heater Management (WHM) and BST (Boiler Sequencing Technology) functionality are enabled from this screen. To enable WHM, see the next Section, 4.3.1.1. To enable BST, see Section 4.3.1.2.

4.3.1.1 Cascade Configuration – Innovation

Water Heater Management (WHM) functionality is enabled from this screen by setting WHM Unit Mode to either WHM Manager or WHM Client (default = Off). Once enabled, the following occurs:

- Additional WHM parameters appear on the screen. The specific parameters depend on whether WHM Manager or WHM Client was selected.
- If the unit is configured as a WHM Manager:
  - All parameters below (and in all other sections under WHM Cascade, below) apply to all units in the WHM cascade and will take precedence over the same parameters on units configured as WHM Clients.
  - The unit Application Configuration screen for standalone units (in Section 4.2.6.1: Unit Application Configuration) is disabled.

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

![Figure 4.3.1.1-1: WHM Cascade: Cascade Configuration Screen](image)

2. If the unit is designated as the WHM Manager, choose WHM Manager in the WHM Unit Mode parameter. Choose WHM Client on all other units in the Cascade.

![Figure 4.3.1.1-2: WHM Cascade: Cascade Configuration](image)
3. If you chose WHM Manager, the following additional parameters appear:

   - **Auto-Manager Transfer**: If enabled, WHM 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:
     - **Auto-Manager Timer**: Specifies the time before switching over Manager functionality. (Range: 10 to 120 seconds, Default = 15)
     - **Auto-Manager Addr**: Read-Only display of the WHM Manager’s address.
     - **Backup Manager Addr**: Enter the address of the unit you want to designate as the Backup Manager. It can be any address between 0 and 16 except the value of Auto-Manager Addr. (Range: 0 to 16)

### 4.3.1.2 Cascade Configuration – Benchmark

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

- Additional BST parameters appear on the screen. The specific parameters depend on whether **BST Manager** or **BST Client** was selected.
- If the unit is configured as a **BST Manager**:
  - All parameters below (and in all other sections under BST Cascade) apply to all units in the BST cascade, and will take precedence over the same parameters on units configured as **BST Clients**.
  - The unit **Application Configuration** screen for standalone units (in Section 4.2.6.2: **Unit Application Configuration**) is disabled.

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

![Figure 4.3.1.2-1: BST Cascade: Cascade Configuration Screen](image)

2. If the unit is designated as the BST Manager, choose **BST Manager** in the **Unit Mode** parameter. Choose **BST Client** on all other units in the Cascade.
3. The following parameters appear on both **BST Client** and **BST Manager** units:

- **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:
  - **Auto-Manager Timer:** Specifies the time before switching over Manager functionality. (Range: 10 to 120 seconds, Default = 30)
  - **Auto-Manager Addr:** A read-only display of the BST Manager’s address.
  - **Backup Manager Addr:** Enter the address of the unit you want to designate as the Backup Manager. It can be any address above 0 except the value of **Auto-Manager Addr**. (Range: 0 to 16)

- **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:
    - **SH Hdr Temp Point:** The Modbus point within the Modbus address of the Header Temp Sensor (Range: 0 to 255, default = 14).
    - **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 4.2.1: Unit Settings); FFWD is the direct connect option in the C-More.
  - **Direct:** Choose this option 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.

- **Rtn Hdr Temp Sensor:** 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:
    - **Rtn Hdr Sens Point:** The Modbus point within the Modbus address of the Header Temp Sensor (Range: 0 to 255, default = 16).
4.3.2 Cascade Communication

The Cascade Communication screen allows you to modify individual communication parameters. For Innovation units, see the next Section, 4.3.2.1. For Benchmark units, see Section 4.3.2.2.

4.3.2.1 Cascade Communication – Innovation

**NOTES:**
This screen is available only after WHM functionality has been enabled (see the WHM Unit Mode parameter in Section 4.3.1.1: Cascade Configuration – Innovation). If the unit is configured as a WHM Manager, its parameters apply to this and all WHM Client units.

1. Go to: Main Menu → Advanced Setup → WHM Cascade → Cascade Comm.
2. Configure the following parameters on both WHM Client and WHM Manager screens:

   - **Unit Address**: The unit’s address in the WHM 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.
   
   - **Network Timeout**: The timeout value before a Modbus Fault is declared due to no response from the WHM Manager unit or from the BAS. (Range: 5 to 999)
   
   - **Error Threshold**: The number of Modbus Comm errors allowed before invoking a Modbus Comm Fault. (Range: 1 to 9)
   
   - **Unit Failsafe Mode**: Specifies the unit’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 WHM Manager unit, this setting applies to the entire plant. If set to **Constant Setpt**, the following additional parameter appears:
     
     - **Unit Failsafe Setpoint**: Specifies the plant’s setpoint if there is a loss of communication with BAS or header sensor. (Range: 60°F to 150°F)

3. On unit designated as a **WHM Manager**, the following additional parameters appear:

   - **Min & Max Addresses**: The address range of the units in the WHM cascade. (Range: 1 to 16)
   
   - **Comm Error 1-8, 9-16**: Displays the number of Comm errors on Comm ports 1 through 8 (9 through 16). 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).
   
   - **SSD Temp Format**: Choose either **Points** or **Degrees**.
• **Time & Date Sync:** If Enabled, all Client units in the Cascade will synchronize time and date with the WHM Manager.

• **WHM Min Units:** The minimum number of units in the WHM cascade.
  (Range: 1 to 16)

• **WHM Max Units:** The maximum number of units in the WHM cascade.
  (Range: 1 to 16)

• **WHM On Timeout:** Specifies the time the WHM Manager must wait for a backup Client unit to turn on. (Range: 15 to 300)

### 4.3.2.2 Cascade Communication – Benchmark

**NOTES:**

This screen is available only after BST functionality has been enabled (see the Unit Mode parameter in Section 4.3.1.2: Cascade Configuration – Benchmark). If the unit is configured as a BST Manager, its parameters apply to this and all BST Client units.

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

![BST CLIENT SCREEN](image)

![BST MANAGER SCREENS](image)

*Figure 4.3.2.2: BMK Cascade: Cascade Communication Screens*

2. Configure the following parameters on both BST Client and BST Manager screens:

   • **Unit Address:** The unit’s address in the WHM 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.

   • **Network Timeout:** The timeout value before a Modbus Fault is declared due to no response from the WHM Manager unit or (if a Manager) from the BAS. (Range: 5 to 999)
- **Plant Failsafe Mode**: Specifies what happens if there is a loss of communication with BAS or between the BST Manager and BST Client units. On the WHM Manager unit, this setting applies to all units in the Cascade. Choose either **Constant** or **Shutdown**. 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.

- **Error Threshold**: The number of Modbus Comm errors allowed before invoking a Modbus Comm Fault. (Range: 1 to 9)

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

- **Min & Max Addresses**: The address range of the units in the BST cascade. (Range: 1 to 16)
- **Comm Error 1-8, 9-16**: Displays the number of Comm errors on Comm ports 1 through 8 (9 through 16). 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).
- **SSD Temp Format**: Choose either **Points** or **Degrees**.
- **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.

### 4.3.3 WHM and BST Application Configuration

**Application Configuration** screen allows you to configure individual operating parameters that will be transmitted to all WHM or BST Client units. For Innovation units, see the next **Section 4.3.3.1**. For Benchmark units, see **Section 4.3.3.2**.

#### 4.3.3.1 WHM Application Configuration – Innovation

**NOTES:**
- This screen is available only after WHM Cascade functionality has been enabled (see the **WHM Unit Mode** parameter in **Section 4.3.1.1: Cascade Configuration – Innovation**).
- If the unit is configured as a **WHM Manager**, the parameters in this screen apply to this unit and will be transmitted to all WHM Client units. If the unit is configured as a **WHM Client**, the parameters configured on the **WHM Manager** will take precedence.
- Once WHM Cascade functionality is enabled on a unit, the Unit → Application Configuration – Innovation screen in Section 4.2.6.1 (above) is disabled.

1. Go to: **Main Menu → Advanced Setup → WHM Cascade → Application Configuration**. Note, the only Application currently available is **DHW**.
2. In the WHM Setpoint parameter specify the setpoint for the unit or the Cascade (if the unit is a WHM Manager). (Range: 60°F to 170°F)

### 4.3.3.2 BST Application Configuration – Benchmark

**NOTES:**
- This screen is available only after BST Cascade functionality has been enabled (see the Unit Mode parameter in Section 4.3.1.2: Cascade Configuration – Benchmark).
- If the unit is configured as a BST Manager, the parameters in this screen 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.
- Once BST Cascade functionality is enabled on a unit, the Unit → Application Configuration – Benchmark screen (Section 4.2.6.2, above) is disabled.

1. Go to: Main Menu → Advanced Setup → BST Cascade → Application Configuration.
2. Choose the Application: SH (Space Heating) or Other.

**APPLICATION = OTHER**

**APPLICATION = SH**

*Figure 4.3.3.2-1: BST Cascade: Application Configuration – Example 1st Screens*

3. If you chose SH in step 2:
   - Choose the SH Operating Mode, either Constant Setpoint, Remote Setpoint or Outdoor Air Reset.
o If you chose **Constant Setpoint**, specify the setpoint in **SH Setpoint**.

o If you chose **Remote Setpoint**, choose the source of the setpoint in **Rmt Setpt Source**:
  - 4-20mA
  - 1-5V
  - Network
  - 0-20mA
  - 0-5V
  - BAS

o If you chose **Outdoor Air Reset**, configure the four **OAR Min** and **OAR Max** parameters. These four parameters are used to create the associated OATR curve. Once the curve has been setup, the Edge Controller will compute the setpoint based on outside temperature.

![APPLICATION CONFIGURATION](image)

**Figure 4.3.3.2-2: BST Cascade: Application Configuration, Application = SH**

4. If you chose **Other** in step 2:

- Choose the **Other Operating Mode**, either **Constant Setpoint** or **Remote Setpoint**.
  - If you chose **Constant Setpoint**, specify the setpoint in **Other Setpoint**.
  - If you chose **Remote Setpoint**:
    - Choose the source of the setpoint in **Other Rmt Setpt Signal**:
      - 1-5V
      - 0-5V
      - Network
    - Choose the source of the setpoint in **Rmt Setpt Source**:
      - Spare Analog In 1
      - Spare Analog In 2
      - Spare Analog In 3

![APPLICATION CONFIGURATION](image)

**Figure 4.3.3.2-4: BST Cascade: Application Configuration, Application = Other**
4.3.4 Operating Controls

The Operating Controls screen provides access to multiple operating parameters for the plant and units in a BST or WHM Cascade.

NOTE:
This screen (and all the screens accessible from this screen) is available only after WHM or BST Cascade functionality has been enabled (see the WHM Unit Mode parameter in Section 4.3.1.1: Cascade Configuration – Innovation, or the Unit Mode parameter in Section 4.3.1.2: Cascade Configuration – Benchmark). If the unit is configured as a BST or WHM Manager, the parameters apply to this unit and all BST or WHM Client units.

1. Go to: Main Menu → Advanced Setup → WHM Cascade → Operating Controls (Innovation), or Main Menu → Advanced Setup → BST Cascade → Operating Controls (Benchmark).

![Operating Controls Screens](image)

**Figure 4.3.4: WHM & BST Cascade: Operating Controls Screen**

4.3.4.1 Sequencing Controls

The Sequencing Controls screens offers options related to sequencing of units in the plant. For Innovation units, see the next Section, 4.3.4.1.1. For Benchmark units, see Section 4.3.4.1.2.

4.3.4.1.1 Sequencing Controls – Innovation

NOTES:
- This screen is available only after WHM Cascade functionality has been enabled (see the WHM Unit Mode parameter in Section 4.3.1.1: Cascade Configuration).
- If the unit is configured as a WHM Manager, the parameters apply to this unit and all WHM Client units. If the unit is configured as a WHM Client, the parameters configured on the WHM Manager will take precedence.

1. Go to: Main Menu → Advanced Setup → WHM Cascade → Operating Controls → Sequencing Control. The parameters that appear on this screen depend on whether the
unit is configured as a WHM Manager or WHM Client in Section 4.3.1: Cascade Configuration – Innovation.

Figure 4.3.4.1.1: Operating Controls: Sequencing Controls Screen

2. The following parameters are available on both WHM Manager and WHM Client units.
   - **Next On Valve Pos**: Determines the valve position that triggers the next unit to come on line. (Range: 16% to 100%)
   - **Next Off Valve Pos**: Determines the valve position that triggers the next unit to come off line. (Range: 16% to 100%)

3. The following parameters appear only when the unit is configured as a WHM Manager:
   - **WHM Max Units**: The maximum number of units that will fire. For example, if there are 5 units, but this setting is set to 3, the plant will not fire more than 3 units. (Range: 1 to 16)

### 4.3.4.1.2 Sequencing Controls – Benchmark

**NOTES:**
- This screen is available only after BST Cascade functionality has been enabled (see the Unit Mode parameter in Section 4.3.1.2: Cascade Configuration – Benchmark).
- 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.

4. Go to: **Main Menu → Advanced Setup → BST Cascade → Operating Controls → Sequencing Control.** The parameters that appear on this screen depend on whether the
unit is configured as a BST Manager or BST Client in Section 4.3.1.2: Cascade Configuration – Benchmark.

![BST Client screen and BST Manager screen](image)

**Figure 4.3.4.1.2: Operating Controls: Sequencing Controls Screen**

5. The following parameters are available on both BST Manager and BST Client units.

- **Low Flow Mode**: Choose Off, On - Outlet Temp or On - Avg Temp. If either “On” option is chosen, BST monitors the multi-unit system to detect if a “low-flow” condition exists. If it does exist, BST slowly shuts down one unit at a time in an attempt to raise the Fire Rate of the remaining units. If the low-flow condition persists, and only a single unit remains ignited, BST will use the “Outlet Temperature Sensor” of the remaining ignited unit to control the temperature. The Outlet Temperature Sensor is mounted in the individual unit and drastically increases the response time to precisely control temperature.

- **Low Flow Threshold**: For low flow applications, this parameter allows the unit to operate without excessive cycling. This parameter specifies the valve position below which the unit plant will enter this mode (Range: 10% to 35%, default = 25%).

- **SH Next On Valve Pos**: Determines the valve position that triggers the next unit to come on line. (Range: 16% to 100%)

- **SH Next Off Valve Pos**: Determines the valve position that triggers the next unit to come off line. (Range: 16% to 100%)

- **SH BST Fire Rate Up**: Controls the frequency of updates made to the Fire Rate sent to all units. 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.)

6. The following parameters appear only when the unit is configured as a BST Manager:

- **BST Max Boilers**: The maximum number of units that will fire. For example: if there are 5 units, but this setting is set to 3, the plant will not fire more than 3 units. (Range: 1 to 16)

- **SH Valve Close Delay**: The time an open Isolation Valve will remain open once a unit has cycled off. When an ignited unit is cycled off, its Isolation Valve will remain open for the specified time to dissipate residual heat. (Range: 0 to 15)
4.3.4.2 Anti-Cycling Control

The parameters in the Anti-Cycling Control screen are used to prevent unwanted cycling. This screen applies to both Benchmark Boilers and Innovation Water Heaters.

- For Innovation units, see the next Section, 4.3.4.1.1.
- For Benchmark units, see Section 4.3.4.1.2.

4.3.4.2.1 Anti-Cycling Control – Innovation

**NOTE:**
- This screen is available only after WHM Cascade functionality has been enabled (see the WHM Unit Mode parameter in Section 4.3.1: Cascade Configuration).
- If the unit is configured as a WHM Manager, the parameters apply to this unit and all WHM Client units.

1. Go to: Main Menu → Advanced Setup → WHM Cascade → Operating Controls → Anti-Cycling Controls.

![Figure 4.3.4.2: Operating Controls: Anti-Cycling Control Screen – Innovation](image)

2. The following parameters are available:
   - **On Delay:** Minimum length of time a unit must stay off after shutting down or going into standby. (Range: 30 to 300 sec.)
   - **WHM Off Delay:** Specifies the amount of time the full shut down will be delayed. (Range: 30 to 300 sec.)
   - **Shutoff Delay Temp:** Specifies the temperature above setpoint the unit may rise to during delay shutdown. (Range: 0°F to 25°F)

4.3.4.2.2 Anti-Cycling Control – Benchmark

**NOTE:**
- This screen is available only after BST Cascade functionality has been enabled (see the Unit Mode parameter in Section 4.3.1.2: Cascade Configuration – Benchmark). If the unit is configured as a BST, the parameters apply to this unit and all BST Client units.
- If the unit is configured as a BST Manager, the parameters apply to this unit and all BST Client units.
1. Go to: **Main Menu → Advanced Setup → BST Cascade → Operating Controls → Anti-Cycling Controls.**

![Anti-Cycling Control Screen](image)

**Figure 4.3.4.2: Operating Controls: Anti-Cycling Control Screen – Benchmark**

2. The following parameters are available:

   - **On Delay**: Minimum length of time a unit must stay off after shutting down or going into standby. (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**: Specifies the amount of time the full shut down will be delayed when Slow Shutdown is enabled. (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**: Specifies the temperature above setpoint the unit may rise to during delay shutdown. (Range: 0°F to 25°F)

   - **Demand Offset**: Offset temperature from setpoint before a unit may come online. (Range: 0°F to 25°F)

### 4.3.4.3 Temperature Control – Benchmark Only

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 applies only to Benchmark Boilers.
- This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in **Section 4.3.1.2: Cascade Configuration – Benchmark**). If the unit is configured as a **BST Manager**, the parameters apply to this unit and all BST Client units.
1. Go to: **Main Menu → Advanced Setup → BST Cascade → Operating Controls → Temperature Control.**

![Temperature Control](image)

**Figure 4.3.4.3 Operating Controls: Cascade Temperature Control Screen**

2. The following parameters appear.

- **SH Proportional Band:** Generates a fire rate based on the error that exists 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 the value of these parameters, the fire rate will be 100%. (Range: 1°F to 120°F)

- **SH 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)

- **SH Derivative Band:** This value 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:** These parameters define a temperature range within which the plant outlet temperature can drift above and below the Setpoint. (Range: 0 to 25°F)

- **SH/Other Temp Hi Limit:** The highest temperature the plant will meet for the chosen Application. (Range: 40 to 210°F)

### 4.3.4.4 Valve Configuration

The Valve Configuration screen contains parameters necessary for communicating with and controlling the external sequencing valves on the units in a BST or WHM Cascade. For Innovation units, see the next Section, 4.3.4.4.1. For Benchmark units, see Section 4.3.4.4.2.

### 4.3.4.4.1 Valve Configuration – Innovation

**NOTE:**

- This screen is available only after WHM Cascade functionality has been enabled (see the WHM Unit Mode parameter in Section 4.3.1.1: Cascade Configuration – Innovation).

- If the unit is configured as a WHM Manager, the parameters apply to this unit and all WHM Client units.

1. Go to: **Main Menu → Advanced Setup → WHM Cascade → Operating Controls → Valve Configuration.**
Figure 4.3.4.1: Operating Controls: Valve Configuration Screen – Innovation

2. Configure the following parameters:
   
   - **Output Signal Type**: Select the output signal type of the selected output: Current or Voltage.
   - **Control Mode**: A read-only display of the current Control Mode: On/Off.
   - **Valve Feedback**: Choose Enabled or Disabled. If Enabled, the following additional parameters appear:
     - **Valve Feedback Timer**: The amount of time for the valve to open before returning an error. (Range 30 to 240 sec.)
     - **Valve Feedback Status**: A read-only display of the current valve status.

4.3.4.2 Valve Configuration – Benchmark

**NOTE:**
- This screen is available only after BST Cascade functionality has been enabled (see Unit Mode parameter in Section 4.3.1.2: Cascade Configuration – Benchmark).
- If the unit is configured as a BST Manager, the parameters apply to this unit and all BST Client units.

1. Go to: Main Menu → Advanced Setup → BST Cascade → Operating Controls → Valve Configuration.

Figure 4.3.4.2: Operating Controls: Valve Configuration Screen – Benchmark

2. In the **Output Signal Type** field, choose either Current or Voltage.

3. Configure the following parameters:
   - **Control Mode**: Choose one: On/Off, Linear Modulation or Delta T Modulation.
- **Valve Feedback**: Choose **Enabled** or **Disabled**. If Enabled, the following additional parameters appear:
  - **Valve Feedback Status**: A read-only display of the current valve status.
  - **Valve Feedback Timer**: The time to detect the **Valve Feedback Status** (Range: 30 to 240 sec.).

- **Open Vlv Control Signal**: Select the signal that will “open” the valve: 0 mA, 4 mA or 20 mA.

- **Close Vlv Control Signal**: Select the signal that will “close” the valve: 0 mA, 4 mA or 20 mA.

- **Min # Valves Open**: Specify the minimum number of valves that must remain open at all times. (Range: 1 to 16)
### 4.3.4.5 Setpoint Range – Benchmark Only

The **Setpoint Range** screen includes all Setpoint Limiting and Setpoint Setback parameters.

**NOTES:**

- This screen applies only to Benchmark Boilers.
- This screen is available only after BST Cascade functionality has been enabled (see the **Unit Mode** parameter in [Section 4.3.1.2: Cascade Configuration – Benchmark](#)). If the unit is configured as a BST Manager, the parameters apply to this unit and all BST Client units.
- Some of the parameters below also appear in [Section 4.6.1.3: Setpoint Range](#), which is available on standalone units.

1. Go to: **Main Menu** → **Advanced Setup** → **BST Cascade** → **Operating Controls** → **Setpoint Range**.

![Figure 4.3.4.5: Operating Controls: Setpoint Range Screen](image)

2. Depending on the Application chosen in either the **Unit Application** screen ([Section 4.2.6.2: Unit Application Configuration – Benchmark](#)) or the **BST Application Configuration** screen ([Section 4.3.3.2: BST Application Configuration – Benchmark](#)), configure the following parameters, which together determine the temperature range within which the setpoint can vary:

   - **SH Setpt Low Limit** (Application = SH, Range: 40°F to 245°F)
   - **SH Setpt High Limit** (Application = SH, Range: 20°F to 220°F)
   - **Other Setpt Low Limit** (Application = Other, Range: 20°F to 245°F)
   - **Other Setpt High Limit** (Application = Other, Range: 20°F to 245°F)

3. 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** (see below):

   - **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)

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 parameters also appear in [Section 4.6.1.3: Setpoint Range](#) and can be changed in either screen):
- **Setback Setpoint**: The Setpoint that will be in effect during the Setback period. (Range = 60°F to 150°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).
4.3.4.6 Lead/Lag

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

**NOTE:**
- This screen applies to both Benchmark Boilers and Innovation Water Heaters.
- This screen is available only after WHM or BST Cascade functionality has been enabled (see the **WHM Unit Mode** parameter in Section 4.3.1.1: Cascade Configuration – *Innovation*, or the **Unit Mode** parameter in Section 4.3.1.2: Cascade Configuration – *Benchmark*). If the unit is configured as a *BST* or *WHM Client*, the parameters configured on the *BST* or *WHM Manager* will take precedence.

1. Go to: **Main Menu → Advanced Setup → WHM Cascade → Operating Controls → Lead/Lag**.

![Figure 4.3.4.7: Operating Controls: Lead/Lag Control Screen](image)

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 hours)
   - **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 16)
4.4 Comm & Network

The **Comm & Network** screen allows you to configure all communication interfaces for a variety of purpose, such as BAS, onAER or smart devices. Each option is described below.

1. Go to: **Main Menu → Advanced Setup → Comm & Network.**

![Figure 4.4: Advanced Setup: Comm & Network – Innovation Shown](image)

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

### 4.4.1 BAS (Building Automation System) – Innovation Only

The **BAS** screen provides communication parameters for the Modbus TCP interface.

**NOTE:**
This screen applies only to Innovation Water Heaters.

1. Go to: **Main Menu → Advanced Setup → Comm & Network → BAS.** The default is Off.

2. To enable communication with a BAS, press **BAS** and choose the **Modbus TCP** communication protocol.

![Figure 4.4.1: Comm & Network: BAS Screen](image)

3. The following additional parameter appear:
   - **Communication Address**: Specify the network address of the Edge Controller on the BAS network. (Range: 0 to 127)
• **Local IP Address**: Displays the local IP address of the Edge Controller.
• **Status**: Displays the status of BAS communications.
• **BAS Temp Format**: Choose Fahrenheit or Celsius.
• **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.

### 4.4.2 onAER

The onAER screen allows you to choose and configure how onAER will communicate with the network.

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

   ![onAER Screen](image)

   *Figure 4.4.2: Comm & Network: onAER Screen*

2. The **onAER Mode** parameter’s default is **Disabled**. To enable onAER communication, choose one of the following:
   - **Ethernet**: Requires an Ethernet cable to plugged into the Edge Controller’s left side, as shown in Figure 4.2.7.1-1, in Section 4.2.7.1.
   - **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**: This determines 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**: Determines how cascade data will upload to the server, in seconds. (Range: 60 to 9999)
   - **Status**: Displays the communication interface status, which varies depending on the interface selected in Step 2.
4.4.3 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 to be plugged into the Ethernet port on the Edge Controller’s left side (see Figure 4.2.7.1-1 in Section 4.2.7.2: Preparing for Firmware Update).

1. Go to: Main Menu → Advanced Setup → Comm & Network → Ethernet.

![DHCP Enabled](DHCP Enabled.png) ![DHCP Disabled](DHCP Disabled.png)

*Figure 4.4.3: Comm & Network: Ethernet Screen*

2. 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

4.4.4 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.

**NOTE:**

The parameters on this screen also appear in the Cascade Communication screen (see Section 4.3.2: Cascade Communication). Changing them in either one changes them in the other.
1. Go to: Main Menu → Advanced Setup → Comm & Network → Comm Failsafe.

![Image](image.png)

*Figure 4.4.4: Comm & Network: Communication Failsafe Screen*

2. Set the **Unit Failsafe Mode** parameter to either **Constant Setpoint** or **Shutdown**. This parameter specifies the unit's operating mode if there is a loss of communication with BAS or external sensor (i.e., an outdoor temperature sensor). If the loss of communication is to the WHM Manager unit, this setting applies to the entire plant. If set to **Constant Setpt**, the following additional parameter appears:

- **Unit Failsafe Setpoint**: Specifies the plant's setpoint if there is a loss of communication with BAS or header sensor. (Range: 60°F to 170°F)

### 4.5 Ancillary Devices

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

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

![Image](image.png)

*Figure 4.5: Advanced Setup: Ancillary Devices Screen*
### 4.5.1 Interlocks

The Edge 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 Innovation Installation, Operation & Maintenance Manual (OMM-0143, GF-216) for more info):

- Remote Interlock wired to REMOTE INTL'K IN on the I/O Board
- Delayed Interlock wired to DELAYED INTL'K IN on the I/O Board

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

![Figure 4.5.1: Ancillary Devices: Interlocks Screen – Innovation Shown](image)

2. The following parameters configure the **Remote Interlock**:

   - **Remote Interlock Name**: Choose one of the following:
     - Flow
     - Louver
     - Damper
     - Other
   - **Remote Intlk Use**: Displays what will shut down if the selected interlock switch is open. On Innovation units, it displays **Unit Shutdown** (see graphic above). On Benchmark units, you can choose **Boiler Shutdown** or **Sys Shutdown**.

3. This screen contains two parameters that can be used to configure a **Delayed Interlock**, an adjustable delay timer that delays the ignition sequence, allowing sufficient time for a proving switch to be made to prevent a fault:

   - **Delayed Interlock Name**: Choose one of the following:
     - Valve 1
     - Valve 2
     - Louver
     - Louver 2
   - **Auxiliary Delay**: On Benchmark units, select the interlock delay. If the Benchmark unit has a Sequencing Isolation Valve, this must be set to **120 seconds** (see Benchmark 750-6000 Operation & Maintenance Manual (OMM-0145, GF-218)). On Innovation units, it may be set to a value when using a pump instead of an isolation valve. (Range: 0 to 240 sec.)
4.6 Performance

The Performance screen provides access to control and performance parameters related to Temperature and Fire Control functionality. All Performance screens apply only to the individual unit (they are not part of WHM functionality).

Some unit level parameters are not applicable if BST or WHM is enabled. In those cases, the parameters are greyed out or hidden; those screens may include parameters that don’t appear on your unit.

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

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

4.6.1 Temperature Control

The Temperature Control screen provides access to various temperature control and Setpoint Range parameters that apply to this unit only.

1. Go to: Main Menu → Advanced Setup → Performance → Temperature Control.
**NOTE:** You can navigate from one *Temperature Control* screen to the next in round-robin fashion using the *Page Left* and *Page Right* icons on each screen.

### 4.6.1.1 PID Setting

The *PID Setting* screen provides access to PID parameters associated with the DHW application, plus the option to restore factory PID defaults.

**NOTE**

This screen applies to both Innovation Water Heaters and Benchmark Boilers.

1. Go to: **Main Menu → Advanced Setup → Performance → Temperature Control → PID Setting.**

![PID Settings Screen](image)

*Figure 4.6.1.1: Temperature Control: PID Setting*

2. 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.
4.6.1.2 Temperature Conformance

The Temperature Conformance screen provides access to parameters that define acceptable temperature ranges for the unit.

**NOTE**
This screen applies to both Innovation Water Heaters and Benchmark Boilers.

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

2. This screen includes the following parameters:
   - **Deadband High & Deadband Low**: These two settings create an “Outlet Temperature” zone in which no Valve Position corrections will be attempted. This zone operates with an Outlet Temperature between Active Setpoint + Deadband High and Active Setpoint – Deadband Low. (Range: 0 to 25°F for both)
   - **Temperature Hi Limit (Innovation Only)**: Sets the maximum allowable temperature at which the unit can run. (Range: 40°F to 210°F)
   - **Max Delta-T (Benchmark Only)**: 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. (Range: 20°F to 120°F)
4.6.1.3 Setpoint Range

The Setpoint Range screen includes all Setpoint and Setpoint Setback parameters that apply to this unit only. This screen includes ? (Help) functionality.

NOTE
- This screen applies to both Innovation Water Heaters and Benchmark Boilers.
- Many of this screen’s parameters also appear in Section 4.3.4.5: Setpoint Range, which is available only after WHM or BST Cascade functionality has been enabled (for Innovation units, see Section 4.3.2.1, for Benchmark units, see Section 4.3.2.2).

1. Go to: Main Menu → Advanced Setup → Performance → Temperature Control → Setpoint Range.

![Setpoint Range Screen](image)

INNOVATION UNITS

BENCHMARK UNITS

Figure 4.6.1.3: Operating Controls: Setpoint Range Screen

2. This screen includes the following parameters:

- **Setpt Low Limit** and **Setpt High Limit**: Together these two parameters determine the temperature range within which the setpoint can vary. Note that on Benchmark units, these two parameter names are preceded by either SH or Other, depending on the Application chosen in either the Unit Application screen (Section 4.2.6.2: Unit Application Configuration – Benchmark) or the BST Application Configuration screen (Section 4.3.3.2: BST Application Configuration – Benchmark). (Range: 20°F to 245°F)

- **Setpoint Limiting**: When 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** (see below):
  - **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)

- **Setpoint Schedule**: When Enabled, this feature will lower the Setpoint during periods of reduced demand for heat, such as at night. Note, on Benchmark units, these same three parameters also appear in Section 4.3.4.5: Setpoint Range and can be changed in either screen. If Enabled, the following additional parameters appear:
  - **Setback Setpoint**: The Setpoint that will be in effect during the Setback period. (Range = 60°F to 150°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).
4.6.1.4 FFWD Settings – Innovation Only

**NOTE:**
This screen applies only to Innovation Water Heaters.

The **FFWD Settings** screen’s parameters setup and configure Feed Forward functionality. These parameters apply to this unit only.

1. Go to: **Main Menu** → **Advanced Setup** → **Performance** → **Temperature Control** → **FFWD Settings**.

![FFWD Settings Screen](image)

**Figure 4.6.1.4: Temperature Control: FFWD Settings Screen**

2. The following parameters appear:
   - **FFWD Temp**: The current FFWD temperature.
   - **PID Output**: Displays the calculated PID output.
   - **FFWD Output**: Displays the current FFWD output.
   - **Min Load Adj**: Adjusts the output by adding an offset to the breakpoint chart at minimum flow.
   - **Max Load Adj**: Adjusts the output by changing the scaling of the breakpoint chart at maximum flow.
   - **Outlet Feedback**: Enables Outlet Feedback functionality.
   - **Feedback Gain**: The percentage of feedback from the water outlet sensor the algorithm factors to determine fire rate.
   - **Fdbck Start Pos**: The Feedback start position.
   - **Fdbck End Pos**: The Feedback end position.
   - **Max Feedback**: Specifies the maximum Feedback position.
   - **Fdbck Value**: Displays the current feedback value.
   - **Breakpt at 100 – Breakpt at 0**: Allows breakpoint temperature settings to be entered for 100% to 0% in 10% increments.
   - **Temp Gov**: Enables temperature governor limiting functionality.
   - **GOV Limit-5 – GOV Limit-15**: When the Outlet Temperature exceeds the **Temperature Hi Limit** by 5 to 15°F, the effective Fire Rate will be reduced by the value entered in GOV Limit-5 through GOV Limit-15.
4.6.2 Fire Control

The **Fire Control** screen provides access to functionality that affect the firing of this unit. All four controls apply to this unit only.

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

![Fire Control Screen](image)

*Figure 4.6.2: Performance: Fire Control*

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

### 4.6.2.1 Purge Control

The **Purge Control** screen contains parameters associated with the purge process for this unit.

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

![Purge Control Screen](image)

*Figure 4.6.2.1: Fire Control: Purge Control*

2. This screen includes the following parameters:

   - **Purge Blower Voltage**: Allows adjustment of the blower speed (blower output voltage) during the Purge cycle. (Range: 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. (Range: 0 to 60 sec.)
4.6.2.2 Ignition Control

The **Ignition Control** screen displays parameters related to ignition that apply to this unit only.

3. Go to: **Main Menu → Advanced Setup → Performance → Fire Control → Ignition Control**.

![Ignition Control Screen]

Figure 4.6.2.2: *Fire Control: Ignition Control*

4. The following ignition control parameters are available:

- **Ignition Position**: Specify the air fuel valve position at which the unit ignites. This position may be between two combustion calibration points. (Range: 5% to 60%)

- **Ignition Blower Voltage**: A read-only display of the current blower voltage at the selected Ignition Position.

  **Ignition Voltage Offset**: Allows you to fine-tune the Blower Voltage at the selected Ignition Position to ensure a smooth ignition. (Range: -5.00V to 5.00V)

- **Low Fire Timer**: Specifies how long the unit remains in the low fire position after ignition. (Range: 2 to 600 sec.)

- **Ignition Hold Timer**: Specifies the length of time the unit stays in ignition position before modulating. (Range: 0 to 60 sec.)

- **IGN Time Setting**: A read-only display of the maximum allowable time between confirmation of gas valve opening (POC) and a stable flame detected; some legacy units allowed up to 7 seconds.
4.6.2.3 Operating Control

The Operating Control screens provides parameters to view or modify operating levels that apply to this unit only.

1. Go to: Main Menu → Advanced Setup → Performance → Fire Control → Operating Control.

![Operating Control Screen](image)

Figure 4.6.2.3: Fire Control: Operating Control Screen

2. The following operating control parameters are available:

- **Start Valve Position**: Allows the Start Level to be set to a valve position.
  (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 the maximum allowable valve position for the unit. (Range: 40 to 100%)

- **Standby Blower Voltage**: Sets the 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 the default. However, individually vented units in positive pressure mechanical 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 Edge 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 Edge Controller will then skip-over the “skip” Fire Rate.
### 4.6.2.4 Anti-Cycling Controls

The **Anti-Cycling Controls** screen provides parameters that can be used to reduce unnecessary cycling on this unit only.

1. Go to: **Main Menu → Advanced Setup → Performance → Fire Control → Anti-Cycling Controls.**

   ![Anti-Cycling Controls Screenshots]

   **Figure 4.6.2.4: Fire Control: Standalone Anti-Cycling Controls**

2. The following anti-cycling parameters are available on both Innovation and Benchmark units. They can be used to delay the shutdown of a unit in order to reduce excessive cycling:

   - **On Delay**: Specifies the minimum length of time a unit must stay off after shutting down or going into standby. (Range: 0 to 600 sec.)
   - **Shutoff Delay Temp**: Specifies the number of degrees above setpoint which the Outlet Temperature can rise without triggering a unit shut down (Range: 0 to 25°F).

3. The following anti-cycling parameters are available only on Benchmark units:

   - **Slow Shutdown**: If Enabled, unit shut down is slowed down until Off Delay threshold is achieved. When 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 (Range: 40 to 100 %, default = 60%).
   - **Demand Offset**: This parameter reduces excessive ON/OFF cycling in AUTO mode. When this entry ≠ 0, the unit will not turn on again until Valve Position In reaches the Start Level value AND the Outlet Temperature goes below Active Setpoint – Demand Offset. In addition, the unit 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. There will not be a one minute delay when firing at the 29% Valve Position level.
SECTION 5: 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 or WHM Cascade, on the unit designated as a “Manager,” it provides access to screens that display parameters showing the status of the entire cascade.

It is accessed by pressing Unit Status on the Main Menu.

This Section includes the following topics:

5.1: Ignition Sequence
   5.1.1: Demand
   5.1.2: Auxiliary Delay Timers
   5.1.3: Purging
   5.1.4: Spark Cleaning
   5.1.5: Ignition

5.2: Unit Status

5.3: Plant Status

5.4: WHM Cascade Status

5.6: Runtime Statistics

5.7: Unit Event History

5.8 Plant Event History

5.10: Ignition Sequence 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. Complete the instructions in Section 4.1.7: Firmware Update to obtain and install the latest firmware.

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 WHM Cascade or a standalone unit. The order of navigation is as follows:

<table>
<thead>
<tr>
<th>Screen Name</th>
<th>BMK</th>
<th>INN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Status</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Plant Status *</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>BST/WHM Cascade Status</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Runtime Statistics</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Unit Event History</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Plant Event History</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Last Ignition Status</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Not available when ACS is used.

If there is a fault condition, the fault indicator will appear below the screen’s title bar at the top of the screen.

5.1 Ignition Sequence

When the unit starts the ignition sequence, the Ignition Sequence screen automatically appears (see Figure 5.1.1, below). This screen displays the status of each step in the ignition 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 text notes appear on the right side of the screen at each step. The last screen, Last Ignition Status (Figure 5.1.6), serves as a summary screen. This summary remains in effect until the next successful ignition.

The ignition process, which starts with a call for heat, 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)
5.1.1 Demand

1. Upon a demand for heat, the Demand rectangle turns green, and, if the sequence has a delay timer, those timers display appropriate values.

![Figure 5.1.1: Ignition Sequence Step 1 – Demand](image)

2. Upon expiration of the internal 4 second IGST Demand delay and the unit progresses to the Auxiliary Delay sequence.

5.1.2 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 count down.

![Figure 5.1.2: Ignition Sequence Step 2 – Auxiliary Delay](image)

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 the 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.
5.1.3 Purging

1. All switches required to be met during the purge cycle (as shown above) have a checkbox, which changes to green once the switch is met. If any switch fails to be proven, its checkbox will turn red with a white X and the unit will display a fault message explaining the failure. The safety circuit switches are:
   - Blower Proof
   - Purge Position
   - Blocked Inlet
   - Ignition Position

![Figure 5.1.3: Ignition Sequence - Screen 3, Purge]

2. 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

3. 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.
5.1.4 Spark Cleaning

1. The Spark Cleaning Timer begins, typically for 10 seconds.

![Figure 5.1.4: Ignition Sequence - Screen 4, Spark Cleaning]

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.

5.1.5 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.

![Figure 5.1.5: Ignition Sequence - Screen 5, Ignition]
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 with 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.

![Ignition Sequence - Screen 6, Summary with Fault Message](image)

*Figure 5.1.5: Ignition Sequence - Screen 6, Summary with Fault Message*

2. Once flame is proven:
   - The **Ignition** box turns green.
   - **Flame Proven** appears with green checkmark box and the 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.
5.2 Unit Status

The Unit Status screen is the default Operating screen. It also appears when the unit powers on (post splash screen), comes out of sleep mode or has a successful flame. The system automatically transitions to the Ignition screen during the Ignition sequence.

![UNIT STATUS Screen](image)

**Figure 5.2: Example Unit Status Screen – Innovation Shown**

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.

The following notes apply to this screen:

- The Flame Strength is displayed in %, up to 100%.
- The Setpoint is not displayed if the unit is a “Client” in a WHM Cascade.

5.3 Plant Status (Benchmark Only)

The Plant Status screen is displayed only on BST Manager units, in a round-robin with Unit Status screen.

![PLANT STATUS Screen](image)

**Figure 5.3: Plant Status Screen – Benchmark Only**
The **Outside Temp** (Outdoor Air Temp Sensor) and **Inlet Temp** are displayed when the associated sensors are enabled as part of a WHM Cascade. If a given sensor is enabled but no sensor is detected, the screen displays “Open” for the missing data.

## 5.4 BST and WHM Cascade Status

### 5.4.1 WHM Cascade Status – Innovation Only

The **WHM Cascade Status** screen is displayed only on Innovation units, in a round-robin with Unit Status screen. It provides a view of the WHM Cascade as a whole, and the status of all 16 possible Water Heaters, including pertinent WHM system settings and readings.

![WHM Cascade Status Screen](image)

**Figure 5.4.1-1: WHM Cascade Status Screen**

The following notes apply to this screen:

- Each of the 16 possible units in the WHM Cascade is represented by a square in the grid and identified by its COM Address. Unused boxes are numbered but otherwise blank.
- The color of Lead unit box blinks on/off.
- The colors of the box and the text in the boxes display the designation and status of each unit within the WHM Cascade:

<table>
<thead>
<tr>
<th>Unit Status Display Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
</tr>
<tr>
<td>Off Line</td>
</tr>
<tr>
<td>DIS</td>
</tr>
<tr>
<td>FLT</td>
</tr>
<tr>
<td>STBY</td>
</tr>
<tr>
<td>ON</td>
</tr>
<tr>
<td>S LIM</td>
</tr>
<tr>
<td>IGN</td>
</tr>
</tbody>
</table>

- The color in the Lead unit’s box blinks.
The Lag unit displays **LAG** in place of the COM Address.

The **Fire Rate** area displays the current fire rate for the WHM Manager. The WHM Manager unit will drive all ignited units at the fire rate specified.

**Supply** displays the current Header Temperature of the WHM Cascade.

**Units Online** displays the total number of units actively connected to the WHM Manager unit via the Modbus Network. This includes units that have Faulted and 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 Cascade.

The bottom line displays the current state of the WHM Manager.

On the **WHM Cascade Status** screen (Figure 5.3.2-1, above), if you press on any unit, the **WHM 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.

![WHM Unit Status Screen](image)

**Figure 5.4.1-2: WHM Unit Status Screen**

### 5.4.2 BST Cascade Status – Benchmark BST Manager Only

The **BST Cascade Status** screen appears only on the BST Manager unit in round-robin fashion. It 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 5.4.2-1: BST Cascade Status Screen

The following notes apply to this screen:

- The data displayed on this screen depends on the Application(s) chosen in Section 4.3.3.2: 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:

<table>
<thead>
<tr>
<th>Unit Designations</th>
<th>Unit Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>DS</td>
<td>Dedicated Space Heating</td>
</tr>
<tr>
<td>DD</td>
<td>Dedicated DHW</td>
</tr>
<tr>
<td>SS</td>
<td>Swing Boiler - SH</td>
</tr>
<tr>
<td>SD</td>
<td>Swing Boiler - DHW</td>
</tr>
<tr>
<td>Sd</td>
<td>Swing Boiler, serving DHW, default SH</td>
</tr>
<tr>
<td>Ss</td>
<td>Swing Boiler, serving SH, default DHW</td>
</tr>
<tr>
<td>IGN</td>
<td>Igniting</td>
</tr>
</tbody>
</table>

- The Lag unit displays LAG in place of the COM Address.
- The Fire Rate area displays the current fire rate for each Application in the 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 the current Header Temperature of the BST cascade for each Application in the cascade.
• **Units Online** displays the total number of units actively connected to the BST “Manager” unit via the BST Modbus Network. This includes units that have Faulted and 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:

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failsafe Mode Active</td>
<td>Raise Fire Rate</td>
</tr>
<tr>
<td>One Boiler Mode</td>
<td>All Boilers are On-Raise FR</td>
</tr>
<tr>
<td>BST In Deadband</td>
<td>Lower Fire Rate</td>
</tr>
<tr>
<td>BST In Control</td>
<td>BST is On Temperature</td>
</tr>
<tr>
<td>All Boilers are Off</td>
<td>All Boilers are On at MAX FR</td>
</tr>
<tr>
<td>Igniting First Boiler</td>
<td>BST Overtemp</td>
</tr>
<tr>
<td>Boiler Ignited</td>
<td>BST Remote Signal Fault</td>
</tr>
<tr>
<td>Igniting Next Boiler</td>
<td>BST in Failsafe Mode</td>
</tr>
</tbody>
</table>

On the **BST Cascade Status** screen (Figure 5.4.2-1, above), 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.

![Figure 5.4.2-2: BST Unit Status Screen](image)

### 5.5 Isolation Valve Status – Benchmark BST Manager Only

The **Isolation Valve Status** screen appears only on the BST Manager unit in round-robin fashion. It displays which isolation valves have been designated as always open (see **Section 4.3.4.4.2: Valve Configuration**), even during plant standby conditions. It also displays the value of the **Min # Valves Open** parameter, set in **Section 4.3.4.4.2: 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.
5.6 Runtime Statistics

The Runtime Statistics screen displays the unit’s total run hours, total cycle count and a color-coded honeycomb signifying the Average Cycles Per Hour.

The following notes apply to this 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 as 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 cycles per hour, an event is logged for a given unit (a high cycle count does not lock out a unit).
5.7 Unit Event History

The Unit Event History screen is a scrollable display of unit events, faults and warnings, arranged chronologically, most recent on top. Each event includes the event name, date and time, and a color-coded honeycomb in front of the event name:

- **Red** = Faults
- **Yellow** = Warnings
- **Green** = Events

![Unit Event History Screen](image)

**Figure 5.7-1: Unit Event History Screen**

The following notes apply to this 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”.

![Event Details Screen](image)

**Figure 5.7-2: 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
- Flame strength
- Air temperature
- O2 level
- Exhaust temperature
- O2 Trim state

### 5.8 Plant Event History

The Plant Event History screen is displayed in the round-robin queue on WHM and BST Manager units only. Like the Unit Event History screen, it displays the same layout, number of events and color coding as the Unit Event History screen, however the events come from any unit in the cascade. The Unit ID column indicates which unit the event occurred on, or Plant for plant level events such as communication fault with BAS.

![Plant Event History](image)

*Figure 5.8: Plant Event History*

### 5.9 Ignition Sequence Status

The Last Ignition Status screen displays a summary of the last ignition sequence, whether it is 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.

![Ignition Status](image)

*Figure 5.9: Ignition Screen*
# SECTION 6: I/O NOMENCLATURE

On Innovation Water Heaters, the tables below list the names that appear in the Edge Controller’s menu structure.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup Relay</td>
<td>Backup unit contact</td>
</tr>
</tbody>
</table>

**Analog Output On Harness**

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower</td>
<td>Blower control signal</td>
</tr>
<tr>
<td>Cascade Valve</td>
<td>WHM Cascade Valve</td>
</tr>
</tbody>
</table>

**Analog Input On I/O Board**

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Analog In</td>
<td>Remote Setpoint or Fire Rate</td>
</tr>
</tbody>
</table>

**Analog Input On Harness**

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cas Vlv Fdbk</td>
<td>Cascade Valve Feedback</td>
</tr>
</tbody>
</table>

On Benchmark Boilers, the table below lists names that appear in the Edge Controller’s menu structure.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swing Valve 1 Relay</td>
<td>Swing V1</td>
<td></td>
</tr>
<tr>
<td>Backup Relay</td>
<td>Backup unit contact</td>
<td></td>
</tr>
<tr>
<td>V2/Spare 1 Relay</td>
<td>Programmable Swing V2, Swing V2, System Pump, Summer Pump, Multi Temp Pump, Other</td>
<td>Dropdown Name list: Swing Valve 2, System Pump, Summer Pump, Pump 2, Louver, Louver 2, Damper, Sequenced Pump, Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHW Pump Relay</td>
<td>DHW pump contact</td>
<td></td>
</tr>
<tr>
<td>Spare 2 Relay</td>
<td>Programmable System Pump, Summer Pump, Multi Temp Pump, Other</td>
<td>Dropdown Name list: Swing Valve 2, System Pump, Summer Pump, Pump 2, Louver, Louver 2, Damper, Sequenced Pump, Other</td>
</tr>
</tbody>
</table>

**Analog Output On I/O Board**

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spare Analog 1</td>
<td>Programmable Fire Rate</td>
<td>Dropdown Name list: Fire Rate</td>
</tr>
</tbody>
</table>
### Analog Output On Harness

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLR V.S. Pump</td>
<td>Variable Speed Pump</td>
<td>-Other</td>
</tr>
<tr>
<td>DHW V.S. Pump</td>
<td>DHW Variable Speed pump</td>
<td></td>
</tr>
<tr>
<td>Spare Analog Out 3</td>
<td>-Fire Rate</td>
<td><strong>Dropdown Name list:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Fire Rate-Other</td>
</tr>
</tbody>
</table>

**Analog Output On Harness**

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower</td>
<td>Blower control signal</td>
<td></td>
</tr>
<tr>
<td>Cascade Valve</td>
<td>WHM Cascade Valve</td>
<td></td>
</tr>
<tr>
<td>Spare Analog Out 2</td>
<td>Programmable</td>
<td><strong>Dropdown Name list:</strong></td>
</tr>
<tr>
<td></td>
<td>-Fire Rate</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-Cascade Valve</td>
<td>-Valve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Fire Rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Other</td>
</tr>
</tbody>
</table>

### Analog Input On I/O Board

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO Input</td>
<td>CO sensor input</td>
<td></td>
</tr>
<tr>
<td>Remote Analog In</td>
<td>Remote Setpoint or Fire Rate</td>
<td></td>
</tr>
<tr>
<td>Spare Analog In 3</td>
<td>Programmable</td>
<td><strong>Dropdown Name list:</strong></td>
</tr>
<tr>
<td></td>
<td>-SmartPlate Valve input</td>
<td>-Remote Stpt 2</td>
</tr>
<tr>
<td></td>
<td>-Swing V1 feedback</td>
<td>-Swing V1 Fdbk</td>
</tr>
<tr>
<td></td>
<td>-Swing V2 Feedback</td>
<td>-Swing V2 Fdbk</td>
</tr>
<tr>
<td></td>
<td>-VS Pump Feedback</td>
<td>-Blr VSP Fdbk</td>
</tr>
<tr>
<td></td>
<td>-Remote Setpoint 2</td>
<td>-DHW VSP Fdbk</td>
</tr>
<tr>
<td></td>
<td>-NOx</td>
<td>-SmartPlate VP</td>
</tr>
<tr>
<td></td>
<td>-DHW VSP Fdbk</td>
<td>-NOx</td>
</tr>
<tr>
<td>Spare Analog In 1</td>
<td>Programmable</td>
<td><strong>Dropdown Name list:</strong></td>
</tr>
<tr>
<td></td>
<td>-SmartPlate Valve input</td>
<td>-Remote Stpt 2</td>
</tr>
<tr>
<td></td>
<td>-Swing V1 feedback</td>
<td>-Swing V1 Fdbk</td>
</tr>
<tr>
<td></td>
<td>-Swing V2 Feedback</td>
<td>-Swing V2 Fdbk</td>
</tr>
<tr>
<td></td>
<td>-VS Pump Feedback</td>
<td>-Blr VSP Fdbk</td>
</tr>
<tr>
<td></td>
<td>-Remote Setpoint 2</td>
<td>-DHW VSP Fdbk</td>
</tr>
<tr>
<td></td>
<td>-NOx</td>
<td>-SmartPlate VP</td>
</tr>
<tr>
<td></td>
<td>-DHW VSP Fdbk</td>
<td>-NOx</td>
</tr>
<tr>
<td>Spare Analog In 2</td>
<td>Programmable</td>
<td><strong>Dropdown Name list:</strong></td>
</tr>
<tr>
<td></td>
<td>-SmartPlate Valve input</td>
<td>-Remote Stpt 2</td>
</tr>
<tr>
<td></td>
<td>-Swing V1 feedback</td>
<td>-Swing V1 Fdbk</td>
</tr>
<tr>
<td></td>
<td>-Swing V2 Feedback</td>
<td>-Swing V2 Fdbk</td>
</tr>
<tr>
<td></td>
<td>-VS Pump Feedback</td>
<td>-Blr VSP Fdbk</td>
</tr>
<tr>
<td></td>
<td>-Remote Setpoint 2</td>
<td>-DHW VSP Fdbk</td>
</tr>
<tr>
<td></td>
<td>-NOx</td>
<td>-SmartPlate VP</td>
</tr>
<tr>
<td></td>
<td>-DHW VSP Fdbk</td>
<td>-NOx</td>
</tr>
</tbody>
</table>

### Analog Input On Harness

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>Flow input</td>
<td></td>
</tr>
<tr>
<td>Air Pump</td>
<td>Air pump feedback</td>
<td>Used only on BMK 5000 &amp; 6000</td>
</tr>
<tr>
<td>Cas Viv Fdbk</td>
<td>Cascade Valve Feedback</td>
<td></td>
</tr>
</tbody>
</table>
**Figure 7-1 – Edge [i] Controller (P/N 64134) - Exploded View**
**SECTION 7 – EDGE [i] CONTROLLER VIEWS**

**Figure 7-2: Edge [i] Controller Rear View**

**Figure 7-3: Edge [i] Controller Interface Board (the back side of the front face)**

---

**DIP Switch Function & Default**

<table>
<thead>
<tr>
<th>SW2</th>
<th>SW1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch</td>
<td>Default</td>
</tr>
<tr>
<td>1 Bias +</td>
<td>OFF</td>
</tr>
<tr>
<td>2 Termination</td>
<td>OFF</td>
</tr>
<tr>
<td>3 Bias –</td>
<td>OFF</td>
</tr>
<tr>
<td>4 Not Used</td>
<td></td>
</tr>
<tr>
<td>5 Not Used</td>
<td></td>
</tr>
<tr>
<td>6 Not Used</td>
<td></td>
</tr>
</tbody>
</table>
The Edge Controller displays status messages at various times showing the current state of the Edge Controller. All status messages are displayed near the top of the touchscreen in **WHITE** text, just under the current screen’s title.

### 8.1 FAULT MESSAGES

The Edge [i] Controller displays the following 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>
<thead>
<tr>
<th>#</th>
<th>FAULT MESSAGE</th>
<th>DESCRIPTION</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NO FAULTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Disabled</td>
<td>Indicates the <strong>Enable/Disable</strong> switch is set to <strong>Disabled</strong>. The display also shows the time (AM or PM) and date that the unit was disabled.</td>
<td>Message</td>
</tr>
<tr>
<td>2</td>
<td>Standby</td>
<td>Displayed when ON/OFF switch is in the <strong>ON</strong> position, but there is no demand for heat. The time and date are also displayed.</td>
<td>Message</td>
</tr>
<tr>
<td>3</td>
<td>Demand Delay</td>
<td>Demand Delay is active.</td>
<td>Message</td>
</tr>
<tr>
<td>4</td>
<td>Purging</td>
<td>The duration of the purge cycle during startup, in seconds.</td>
<td>Message</td>
</tr>
<tr>
<td>5</td>
<td>Ignition Trial</td>
<td>Displayed during ignition trial startup sequence. The duration of cycle counts up in seconds.</td>
<td>Message</td>
</tr>
<tr>
<td>6</td>
<td>Flame Proven</td>
<td>Displayed after flame has been detected for a period of 2 seconds. Initially, the flame strength is shown in %. After 5 seconds has elapsed, the time and date are shown in place of flame strength.</td>
<td>Message</td>
</tr>
<tr>
<td>7</td>
<td>Warmup</td>
<td>Displayed for 2 minutes during the initial warm-up only.</td>
<td>Message</td>
</tr>
<tr>
<td>8</td>
<td>High Water Temp Switch Open</td>
<td>The High-Water Temperature Limit switch is open.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>9</td>
<td>Low Water Level</td>
<td>The Low Water Cutoff board is indicating low water level.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>10</td>
<td>Low Gas Pressure Fault</td>
<td>The Low Gas Pressure Limit switch is open.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>11</td>
<td>Gas Pressure Fault</td>
<td>The Gas Pressure Limit switch is not connected or malfunctioned</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td></td>
<td>FAULT MESSAGE</td>
<td>DESCRIPTION</td>
<td>TYPE</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>12</td>
<td>Interlock Open</td>
<td>The Remote Interlock is open.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>13</td>
<td>Delayed Interlock Open</td>
<td>The Delayed Interlock is open.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>14</td>
<td>Airflow Fault During Purge</td>
<td>The Blower Proof switch opened during purge, or air inlet is blocked.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>15</td>
<td>SSOV Fault During Purge</td>
<td>The SSOV switch opened during purge.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>16</td>
<td>Prg Switch Open During Purge</td>
<td>The Purge Position Limit switch on the Air/Fuel Valve was open during purge.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>17</td>
<td>Ign Switch Open During Ignition</td>
<td>The Ignition Position Limit switch on the Air/Fuel Valve opened during ignition.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>18</td>
<td>Airflow Fault During Ign</td>
<td>The Blower Proof switch opened during ignition.</td>
<td>Fault</td>
</tr>
<tr>
<td>19</td>
<td>Airflow Fault During Run</td>
<td>The Blower Proof switch opened during run.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>20</td>
<td>SSOV Fault During Ignition</td>
<td>The SSOV switch closed for more than 15 seconds during run.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>21</td>
<td>SSOV Fault During Run</td>
<td>The SSOV switch closed or failed to open during ignition.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>22</td>
<td>Flame Loss During Ignition</td>
<td>The Flame signal was not seen during ignition or lost within 5 seconds after ignition.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>23</td>
<td>Flame Loss During Run</td>
<td>The Flame signal was lost during run.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>24</td>
<td>High Exhaust Temp Switch</td>
<td>The High Exhaust Temp switch is open.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>25</td>
<td>Loss of Power</td>
<td>The unit shut down due to loss of power.</td>
<td>Fault</td>
</tr>
<tr>
<td>26</td>
<td>Loss of Sensor</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>27</td>
<td>Loss of Signal</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>28</td>
<td>High O2 Level</td>
<td>The O₂ Sensor reading is above acceptable level.</td>
<td>Fault</td>
</tr>
<tr>
<td>29</td>
<td>Low O2 Level</td>
<td>The O₂ Sensor reading is below acceptable level.</td>
<td>Fault</td>
</tr>
<tr>
<td>30</td>
<td>High CO Level</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>31</td>
<td>SSOV Relay Failure</td>
<td>A failure has been detected in one of the relays that control the SSOV.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>32</td>
<td>Residual Flame</td>
<td>The Flame signal was seen for more than 60 seconds during standby.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>33</td>
<td>Heat Demand Failure</td>
<td>The unit failed to fulfill the demand for heat.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>34</td>
<td>Ign Switch Closed During Purge</td>
<td>The Ignition Position Limit switch on the Air/Fuel Valve closed during purge.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>35</td>
<td>Prg Switch Closed During Ign</td>
<td>The Purge Position Limit switch on the Air/Fuel Valve was stuck closed during ignition.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>36</td>
<td>SSOV Switch Open</td>
<td>The SSOV switch opened during standby.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>37</td>
<td>Ign Board Comm Fault</td>
<td>A communication fault has occurred between the PMC board and Ignition board.</td>
<td>Fault</td>
</tr>
<tr>
<td>38</td>
<td>Wait</td>
<td>The unit is waiting for a process to run to completion.</td>
<td>Message</td>
</tr>
<tr>
<td>39</td>
<td>Direct Drive Signal Fault</td>
<td>The direct drive signal is not present or is out of range.</td>
<td>Fault</td>
</tr>
</tbody>
</table>
### TABLE 8-1: Edge Controller Fault Messages

<table>
<thead>
<tr>
<th>#</th>
<th>FAULT MESSAGE</th>
<th>DESCRIPTION</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Remote Setpt Signal Fault</td>
<td>The Remote Setpoint signal is not present or is out of range.</td>
<td>Fault</td>
</tr>
<tr>
<td>41</td>
<td>Outdoor Temp Sensor Fault</td>
<td></td>
<td>Fault</td>
</tr>
<tr>
<td>42</td>
<td>Outlet Temp Sensor Fault</td>
<td>The temperature measured by the Outlet Sensor is out of range:</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• OUTLET TEMPERATURE display = Sht  Indicates sensor is shorted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• OUTLET TEMPERATURE display = Opn  indicates sensor is open-circuited</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>FFWD Temp Sensor Fault</td>
<td>The temperature measured by the Feed Forward (FFWD) Sensor is out of range.</td>
<td>Fault</td>
</tr>
<tr>
<td>44</td>
<td>High Water Temp</td>
<td>The temperature measured by the Outlet Sensor exceeded the Temp Hi Limit setting.</td>
<td>Fault</td>
</tr>
<tr>
<td>45</td>
<td>Line Voltage Out of Phase</td>
<td>The Line (Hot) and Neutral wires are reversed.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>46</td>
<td>Stepper Motor Failure</td>
<td>The Stepper Motor failed to move the Air/Fuel Valve to the desired position.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>47</td>
<td>Setpoint Limiting Active</td>
<td>Outlet temperature crossed the high setpoint limit. Setpoint limiting feature is active.</td>
<td>Fault</td>
</tr>
<tr>
<td>48</td>
<td>Modbus Comm Fault</td>
<td>A network communication fault</td>
<td>Fault</td>
</tr>
<tr>
<td>49</td>
<td>Wait Ignition Retry</td>
<td>The unit is waiting before retrying to ignite.</td>
<td>Message</td>
</tr>
<tr>
<td>50</td>
<td>Wait Fault Purge</td>
<td></td>
<td>Message</td>
</tr>
<tr>
<td>51</td>
<td>Wait Retry Pause</td>
<td></td>
<td>Message</td>
</tr>
<tr>
<td>52</td>
<td>Exhaust Temp Sensor Short</td>
<td>The Exhaust Temp Sensor has malfunctioned.</td>
<td>Warning</td>
</tr>
<tr>
<td>53</td>
<td>Exhaust Temp Sensor Open</td>
<td>Exhaust Temp Sensor is not connected or malfunctioned.</td>
<td>Warning</td>
</tr>
<tr>
<td>54</td>
<td>Warning Exhaust Temp High</td>
<td>The Exhaust temperature is above normal.</td>
<td>Warning</td>
</tr>
<tr>
<td>55</td>
<td>Exhaust Temp High</td>
<td>The Exhaust Temperature has exceeded 200°F (93.3°C).</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>56</td>
<td>Inlet Water Temp Sensor Short</td>
<td>Inlet Water Temp Sensor has malfunctioned/shorted out.</td>
<td>Warning</td>
</tr>
<tr>
<td>57</td>
<td>Inlet Water Temp Sensor Open</td>
<td>Inlet Water Temp Sensor is not connected or malfunctioned.</td>
<td>Warning</td>
</tr>
<tr>
<td>58</td>
<td>Warning In Wtr Temp High</td>
<td>Warning: Inlet water temperature is above normal.</td>
<td>Warning</td>
</tr>
<tr>
<td>59</td>
<td>Warning In Wtr Temp Low</td>
<td>Warning: Inlet water temperature is below normal.</td>
<td>Warning</td>
</tr>
<tr>
<td>60</td>
<td>Inlet Gas Press Sensor Open</td>
<td>Inlet Gas Pressure Sensor is not connected or malfunctioned.</td>
<td>Fault</td>
</tr>
<tr>
<td>61</td>
<td>Gas Plate Dp Sensor Open</td>
<td>Gas Plate Dp Sensor is not connected or malfunctioned.</td>
<td>Fault</td>
</tr>
<tr>
<td>62</td>
<td>O2 Percentage Low</td>
<td>The O2 % has gone below 2% for more than 30 seconds</td>
<td>Fault</td>
</tr>
<tr>
<td>63</td>
<td>O2 Sensor Malfunction</td>
<td>Indicates O2 Levels are less than -4% or more than 24% for more than 10 seconds.</td>
<td>Fault</td>
</tr>
<tr>
<td>64</td>
<td>Warning O2 Level High</td>
<td>The O2 is above normal operating limits.</td>
<td>Warning</td>
</tr>
<tr>
<td>65</td>
<td>Recirc Pump Failure</td>
<td>The recirculation pump has failed.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>66</td>
<td>Ignition Monitor</td>
<td>The ignition spark monitor indicated no or out of range spark.</td>
<td>Message</td>
</tr>
<tr>
<td>#</td>
<td>FAULT MESSAGE</td>
<td>DESCRIPTION</td>
<td>TYPE</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------</td>
<td>-------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>67</td>
<td>No Flow Safety Lockout</td>
<td>Not used</td>
<td>Not Used</td>
</tr>
<tr>
<td>68</td>
<td>Ignition Spark Fault</td>
<td>The O₂ is above normal operating limits.</td>
<td>Fault, Manual Reset</td>
</tr>
<tr>
<td>69</td>
<td>Pre Ignition</td>
<td>The recirculation pump has failed.</td>
<td>Message</td>
</tr>
<tr>
<td>70</td>
<td>Cleaning Igniter</td>
<td>Displayed during ignition sequence during the Spark Cleaning cycle.</td>
<td>Message</td>
</tr>
<tr>
<td>71</td>
<td>Too Many Cycles In 24 Hours</td>
<td>The number of cycles experienced by the unit exceeded the allowable limit.</td>
<td>Fault</td>
</tr>
<tr>
<td>72</td>
<td>Too Many Ovrtmps In 24 Hours</td>
<td>The number of over-temperature events exceeded the allowable limit.</td>
<td>Fault</td>
</tr>
<tr>
<td>73</td>
<td>Air Sensor Fault</td>
<td>The Air Temp sensor has malfunctioned.</td>
<td>Fault</td>
</tr>
<tr>
<td>74</td>
<td>Auto Diagnostic Mode ACTIVE</td>
<td>The unit is in Auto Diagnostic Mode</td>
<td>Message</td>
</tr>
<tr>
<td>75</td>
<td>Auto Diagnostic Mode COMPLETED</td>
<td>Auto Diagnostic Mode has completed</td>
<td>Message</td>
</tr>
<tr>
<td>76</td>
<td>Auto Diagnostic Mode ABORTED</td>
<td>Auto Diagnostic Mode has aborted</td>
<td>Message</td>
</tr>
<tr>
<td>77</td>
<td>DHW Heating Active</td>
<td>The unit is actively heating domestic hot water.</td>
<td>Message</td>
</tr>
<tr>
<td>78</td>
<td>Boiler Cooling Off</td>
<td>The unit has ceased firing and is now cooling down.</td>
<td>Message</td>
</tr>
<tr>
<td>79</td>
<td>BST Network Temp Sensor Fault</td>
<td>BST network temp sensor fault.</td>
<td>Fault</td>
</tr>
<tr>
<td>80</td>
<td>BST Network Temp Com Fault</td>
<td>BST network temp communication fault.</td>
<td>Fault</td>
</tr>
<tr>
<td>81</td>
<td>BST Local Header Sensor Fault</td>
<td>BST local header sensor fault.</td>
<td>Fault</td>
</tr>
<tr>
<td>82</td>
<td>BST Net Outdoor Sensor Fault</td>
<td>BST net outdoor sensor fault.</td>
<td>Fault</td>
</tr>
<tr>
<td>83</td>
<td>BST Net Outdoor Com Fault</td>
<td>BST net outdoor communication fault.</td>
<td>Fault</td>
</tr>
<tr>
<td>84</td>
<td>BST Local Outdr Sensor Fault</td>
<td>BST local outdoor sensor fault.</td>
<td>Fault</td>
</tr>
<tr>
<td>85</td>
<td>BST Client Com Fault</td>
<td>Communication with a BST Client unit failed.</td>
<td>Message</td>
</tr>
<tr>
<td>86</td>
<td>O2 Cal Purge</td>
<td>O₂ calibration is in purge cycle.</td>
<td>Message</td>
</tr>
<tr>
<td>87</td>
<td>Auto Calibration In Progress</td>
<td>O₂ calibration is underway.</td>
<td>Message</td>
</tr>
<tr>
<td>88</td>
<td>Autocal Finished</td>
<td>O₂ calibration is complete.</td>
<td>Warning</td>
</tr>
<tr>
<td>89</td>
<td>O2 Sensor Out Of Range</td>
<td>O₂ sensor failed during O₂ calibration.</td>
<td>Warning</td>
</tr>
<tr>
<td>90</td>
<td>O2 Warning Service Required</td>
<td>AERtrim has reached its limit and O₂ level is still out of range.</td>
<td>Message</td>
</tr>
<tr>
<td>91</td>
<td>Wait Sensor Warm-up</td>
<td>The unit is waiting for the O₂ sensor to turn on.</td>
<td>Warning</td>
</tr>
<tr>
<td>92</td>
<td>Air Pump Failed O2 Trim Disabled</td>
<td>Air Aductor pump failed, disabling O₂ trim functionality (BMK5000-6000 only)</td>
<td>Fault</td>
</tr>
<tr>
<td>93</td>
<td>onAER Communication failed</td>
<td>onAER communication failed. No internet connection.</td>
<td>Warning</td>
</tr>
<tr>
<td>94</td>
<td>Isolation Valve Stuck Open</td>
<td>The isolation valve failed to close as expected.</td>
<td>Warning</td>
</tr>
<tr>
<td>95</td>
<td>Isolation Valve Stuck Closed</td>
<td>The isolation valve failed to open as expected.</td>
<td>Fault</td>
</tr>
<tr>
<td>96</td>
<td>Maintenance Overdue</td>
<td>Scheduled 12- or 24-month maintenance is overdue.</td>
<td>Warning</td>
</tr>
<tr>
<td>97</td>
<td>Maintenance Due Soon</td>
<td>Scheduled 12- or 24-month maintenance is due in near future.</td>
<td>Warning</td>
</tr>
<tr>
<td>98</td>
<td>BAS System Disable</td>
<td>Unit is shut down remotely via BAS</td>
<td>Warning</td>
</tr>
<tr>
<td>99</td>
<td>Delta-T Activated</td>
<td>Delta-T temperature is out of user defined delta limit.</td>
<td>Warning</td>
</tr>
</tbody>
</table>
### TABLE 8-1: Edge Controller Fault Messages

<table>
<thead>
<tr>
<th>#</th>
<th>FAULT MESSAGE</th>
<th>DESCRIPTION</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Delta-T Shutdown</td>
<td>The unit shut down due to exceeding allowable Delta-T value.</td>
<td>Warning</td>
</tr>
<tr>
<td>101</td>
<td>BackUp Manager is not Compatible</td>
<td>The unit designated as the Backup Manager is not compatible with Manager functionality.</td>
<td>Warning</td>
</tr>
<tr>
<td>102</td>
<td>IO Board Communication Failed</td>
<td>I/O board communication has failed.</td>
<td>Warning</td>
</tr>
<tr>
<td>103</td>
<td>SH Swing Valve Fault</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>104</td>
<td>DHW Swing Valve Fault</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>105</td>
<td>No BAS Communication</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>106</td>
<td>BST Warm Weather Shutdown</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>107</td>
<td>Warm Weather Shutdown</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>108</td>
<td>DHW Header Temp BAS Comm Fault</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>109</td>
<td>BST Header Temp BAS Comm Fault</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>110</td>
<td>Supply Return Temp BAS Comm Fault</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>111</td>
<td>Outdoor Temp BAS Comm Fault</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>112</td>
<td>BST Return Sensor Short Warning</td>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>113</td>
<td>BST Return Sensor Open Warning</td>
<td></td>
<td>Warning</td>
</tr>
</tbody>
</table>

### 8.2 WHM and BST CASCADE MESSAGES

On Innovation Water Heaters, the Edge [i] Controller displays the following messages related to Water Heater Management (WHM):

#### TABLE 8-3: Edge Controller WHM Cascade Messages

<table>
<thead>
<tr>
<th>MESSAGE</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Heaters Off</td>
<td>Status</td>
</tr>
<tr>
<td>All Heaters On</td>
<td>Status</td>
</tr>
<tr>
<td>Enabling First</td>
<td>Status</td>
</tr>
<tr>
<td>Enabling Next</td>
<td>Status</td>
</tr>
<tr>
<td>Water Heater Inactive</td>
<td>Status</td>
</tr>
<tr>
<td>Water Heater Active</td>
<td>Status</td>
</tr>
<tr>
<td>Remote Signal Fault</td>
<td>Fault</td>
</tr>
<tr>
<td>WHMS Failsafe</td>
<td>Status</td>
</tr>
</tbody>
</table>

On Benchmark Boilers, the Edge [i] Controller displays the following messages related to Boiler Sequencing Technology (BST):

#### TABLE 8-4: Edge Controller BST Cascade Messages

<table>
<thead>
<tr>
<th>MESSAGE</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Boilers Off</td>
<td>Status</td>
</tr>
<tr>
<td>All On &gt; 90% Fire Rate</td>
<td>Warning</td>
</tr>
<tr>
<td>All On-Raise Fire Rate</td>
<td>Status</td>
</tr>
</tbody>
</table>
## TABLE 8-4: Edge Controller BST Cascade Messages

<table>
<thead>
<tr>
<th>MESSAGE</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto Cycling On</td>
<td>Status</td>
</tr>
<tr>
<td>Boiler Ignited</td>
<td>Status</td>
</tr>
<tr>
<td>WHM Client Com Fault</td>
<td>Warning</td>
</tr>
<tr>
<td>BST FAILSAFE</td>
<td>Warning</td>
</tr>
<tr>
<td>BST in Control</td>
<td>Status</td>
</tr>
<tr>
<td>BST in Deadband</td>
<td>Status</td>
</tr>
<tr>
<td>BST Overtemp</td>
<td>Fault</td>
</tr>
<tr>
<td>Failsafe Active</td>
<td>Status</td>
</tr>
<tr>
<td>Igniting First</td>
<td>Status</td>
</tr>
<tr>
<td>Igniting Next Boiler</td>
<td>Status</td>
</tr>
<tr>
<td>Lower Fire Rate</td>
<td>Status</td>
</tr>
<tr>
<td>On Temperature</td>
<td>Status</td>
</tr>
<tr>
<td>One Boiler Mode</td>
<td>Status</td>
</tr>
<tr>
<td>Raise Fire Rate</td>
<td>Status</td>
</tr>
<tr>
<td>Remote Sig Fault</td>
<td>Fault</td>
</tr>
</tbody>
</table>
## Change Log:

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Changed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/13/2019</td>
<td><strong>Rev B:</strong> Updated to include Benchmark Boilers with Edge [i] Controller.</td>
<td>Chris Blair Linley Thobourne</td>
</tr>
<tr>
<td>3/4/2020</td>
<td><strong>Rev C:</strong> Amended footer: the GF number for this document is GF-213-B.</td>
<td>Chris Blair</td>
</tr>
<tr>
<td></td>
<td><strong>DIR 20-14:</strong> Added description and instructions regarding the Intelligent Bootloader to Section 4.2.7, changed firmware upgrade file name (reference PIR 1434-25). Added Type column to Fault message list, added new fault messages, clarified effect of each message type, Section 8.1, removed Section 8.2: Status Messages (duplicates of messages in Section 8.1).</td>
<td>Chris Blair</td>
</tr>
</tbody>
</table>