Operation Manual

Edge® X Controller
for Benchmark® E Electric Boilers

Other documents for this product include:

- OMM-0173, Edge X Communications Manual
- OMM-0169 BMK E - Installation, Startup, Operation and Maintenance Manual

Disclaimer

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IMPORTANT

Read this Manual BEFORE using this equipment. Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment.

Keep this Manual for future reference.

TABLE OF CONTENTS

SECTION 1: INTRODUCTION

This manual provides a guide to the **Edge X Controller** used on the **Benchmark E Electric Boiler** and the external sensors and devices that can interface to the unit using the boiler's Input/Output (I/O) Box.

1.1 Safety Precautions and Warnings

It is imperative that the initial startup of **Benchmark E** units 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 completed before starting the unit.

⚡⚡ ELECTRICAL HAZARD WARNING ⚡⚡-

Electrical voltages in Benchmark E boilers may include **480 or 600 volts AC**. Therefore, these units must be serviced only by factory certified service technicians.

Due to high electrical voltage the front door of the unit must always be closed during operation.

Opening the front door shuts down unit operation but does **not** completely remove high voltage from the unit. Be sure the main power switch is de-activated and locked out before servicing the unit.

⚠ WARNING!

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

1.2 Downloading the Latest Firmware

As AERCO is continuously implementing improvements to the Controller firmware, it is possible the firmware on your boiler may be out of date. You must update the firmware to the latest version before using the Edge Controller for the first time (see Section 8.2).

SECTION 2: BASIC NAVIGATION AND DISPLAY

2.1 Account Access

The Edge X Controller has multiple access levels of protection. See Section 7 for **Account** information.

2.2 Edge X Controller Front Panel

The Edge X Controller's front panel consists of six LEDs, a 7-segment digital display, a touchscreen display, three softkeys and an Enable/Disable button:

Figure 2-2: Edge X Controller Front Panel

2.2.1 LEDs

LED	Description
FAULT	Indicates a FAULT condition
DEMAND	Indicates a demand for heat
MANAGER	*This feature will be available in a future release*
CASCADE COMM	*This feature will be available in a future release*
BAS COMM	Indicates unit is communicating with Building Automation System (BAS)
PREDICTIVE MAINTENANCE	*This feature will be available in a future release*

2.2.2 7-Segment Display Messages

Message	Description
Out	Outlet temperature
# + °F or **°C**	Temperature value + units (based on user selection)

2.2.3 Button Functionality

Name	Description
CLEAR	Clears a fault, causing the red FAULT indicator to tun off
TEST	Initiates Low Water test
RESET	Resets unit after Low Water test
ENABLE/DISABLE	Enables or disables the unit functioning

SECTION 3: EDGE X MENU STRUCTURE

The menu icons on the left and right side of the controller screen are accessible from any screen. A downward pointing arrow icon (▼) indicates the screen is continued below. Touch the arrow to access.

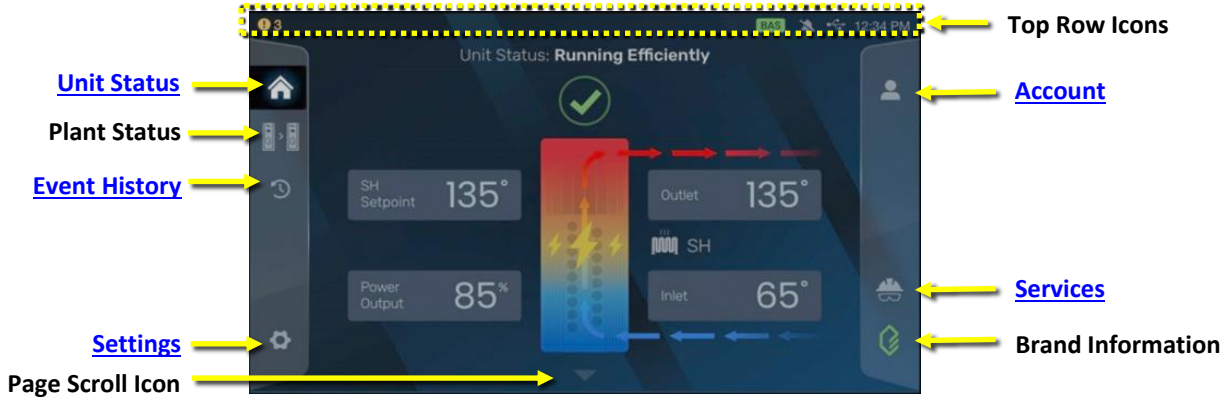


Figure 3-1: Menu Icons (Unit Status Screen Shown)

Icon/Menu Item	Description
Top Row Icons	Displays open events, BAS status, sound, USB status, and time.
Unit Status	Displays several parameters showing the status of the unit. See Section 4.
Plant Status	*Available in a future release*
Event History	Displays a summary of recent Faults and Warnings. See Section 5.
Settings	Allows configuration of the unit and connected devices. See Section 6.
Account	Allows access to different levels of functionality. See Section 7
Services	Includes options for servicing the individual unit. See Section 8

Top Row Icons

SECTION 4: UNIT STATUS

The default screen for Benchmark E boilers, **Unit Status** provides a variety of parameters showing the status of the unit. The following fields are displayed on the first screen: **SH Setpoint, Power Output**, **Outlet** temperature, and **Inlet** temperature.

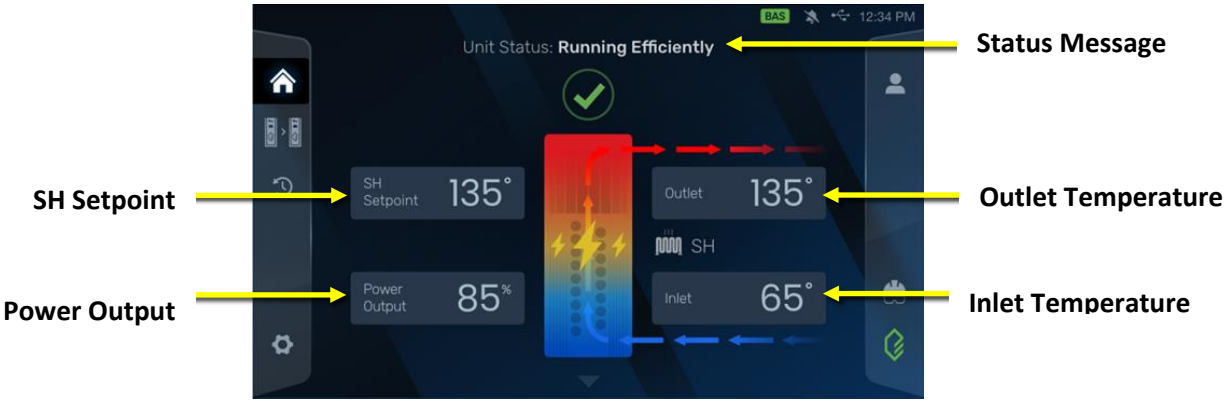


Figure 4-1: Unit Status: Screen 1

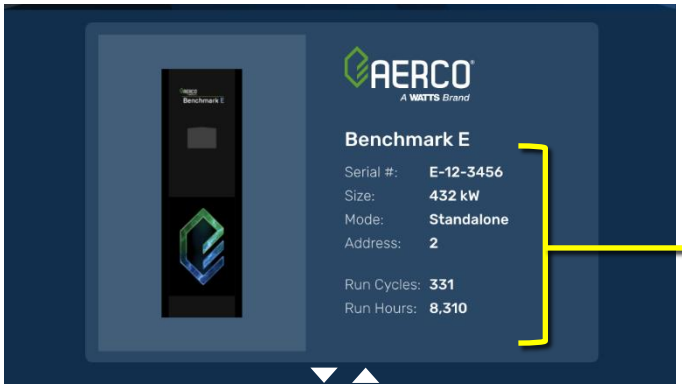
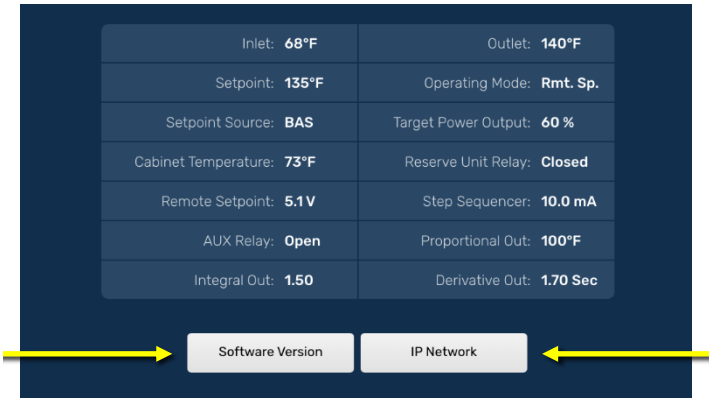


Figure 4-2: Unit Status: Screen 2



Displays current software version. Press to launch **Software Update** (*Section 8.2)*

Displays current BAS IP Address. Press to launch **BAS Network Status** (*Section 6.1.3)*

Figure 4-3: Unit Status: Screen 3

4.1 Unit Status Message

The unit's operating status is displayed at the top of the Unit Status screen. In the event of an operating error, the error is displayed along with either a **Warning** or **Fault** indicator.

Figure 4-4: Unit Status Screen – Running Efficiently

Figure 4-5: Unit Status Screen – Warning Indicator

Figure 4-6: Unit Status Screen – Fault Indicator

SECTION 5: EVENT HISTORY

This screen displays up to 200 of the most recent **Faults** and **Warnings**, providing a concise history of unit operation. Each event has a unique **Event ID**; the **State** of the event (open or closed); a brief **Event Description**; and the event's **Date** and **Time** of occurrence. See APPENDIX B for a list of fault codes.

Events are categorized into two types of alerts: **Warnings** and **Latching/Non-Latching Faults.**

Warnings

A Warning indicates that an abnormal event or condition occurred, but the unit continues to operate normally; no intervention is required.

Faults

Non-Latching 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.

Latching Fault: An abnormal event or condition occurred that caused the unit to shut down. 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.

Figure 5-1: Event History Screen

To clear an event, select it and press the CLEAR softkey. To clear all events, navigate to **Settings > Advanced Settings > Unit Settings > General > Clear Event History.**

SECTION 6: SETTINGS MENU

6.1 Advanced Setup

The Advanced Setup menu includes options for configuring **Unit Settings**, **Standalone Mode**, **Communication & Failsafe**, and **Ancillary Devices**.

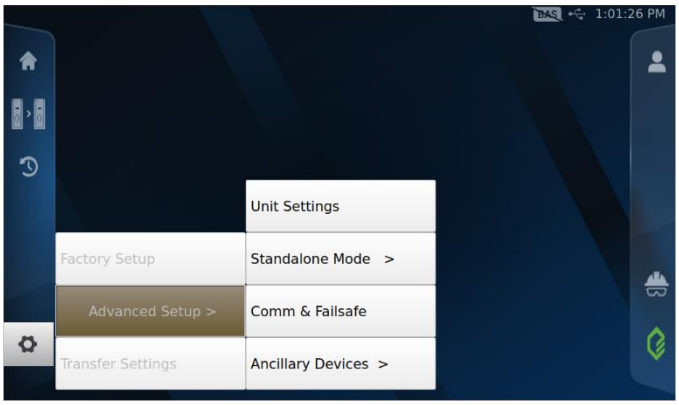


Figure 6-1: Advanced Setup Menu

6.1.1 Unit Settings

6.1.1.1 General

This displays basic unit information and allows the user to clear Event History or Reset All Settings.

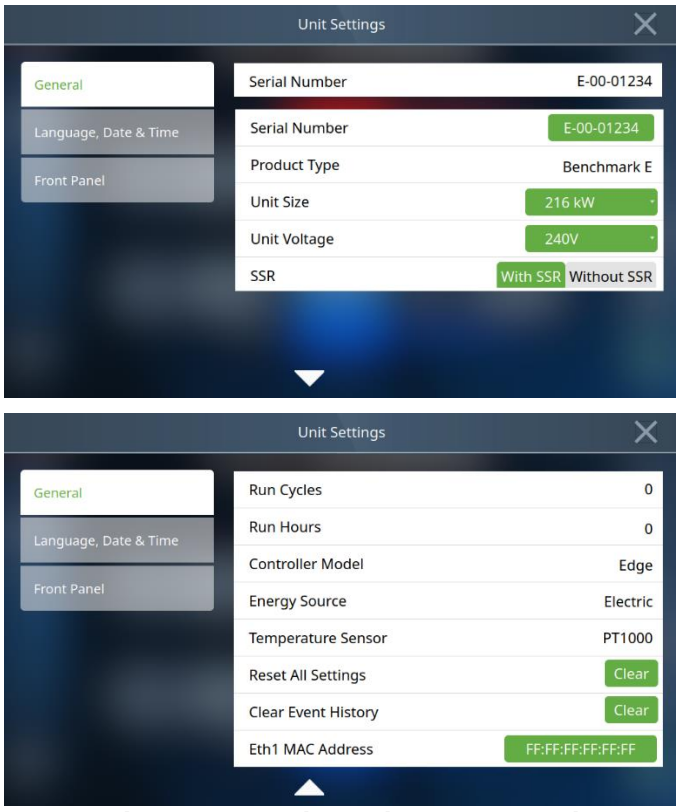


Figure 6-2: Unit Settings - General

NOTE: Settings should be saved to a USB after the unit is turned on for the first time, or after the boiler has been reconfigured. This backup can be used to easily restore factory settings or a previous configuration in the event a **Reset All Settings** is performed on the unit.

6.1.1.2 Language, Date & Time

This screen allows the user to set and adjust language, units of measurement, date, and time parameters on the unit.

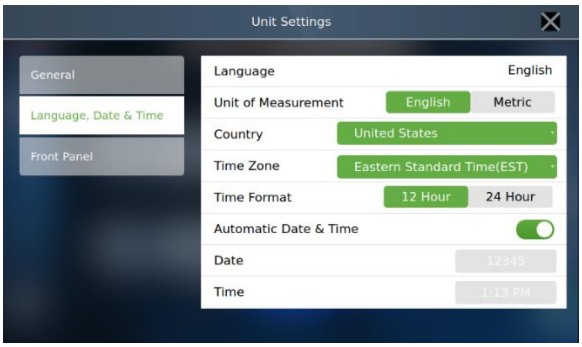


Figure 6-3: Unit Settings – Language, Date, & Time

NOTE: Make sure to configure **Country** and country specific **Time Zone** parameters before configuring **Date** and **Time**. Disable **Automatic Date & Time** to edit the date and time manually.

6.1.1.3 Front Panel

This screen allows the user to adjust and test the unit's display settings.

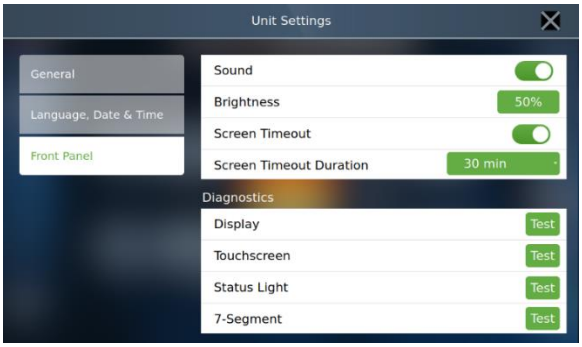


Figure 6-4: Unit Settings – Front Panel

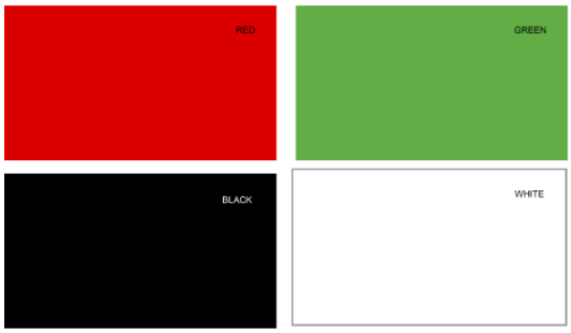


Figure 6-5: Front Panel > Display

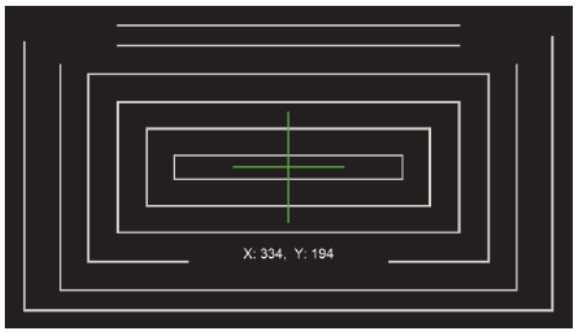


Figure 6-6: Front Panel > Touchscreen

6.1.2 Standalone Mode

These settings need to be configured to run the unit in **Standalone Mode**.

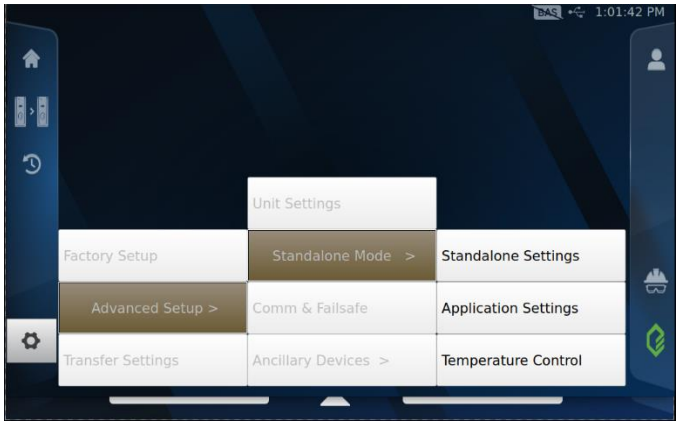


Figure 6-7: Unit Settings – Standalone Mode Screen

6.1.2.1 Standalone Settings

Unit Configuration displays the current **Application** and **Mode** information for the unit.

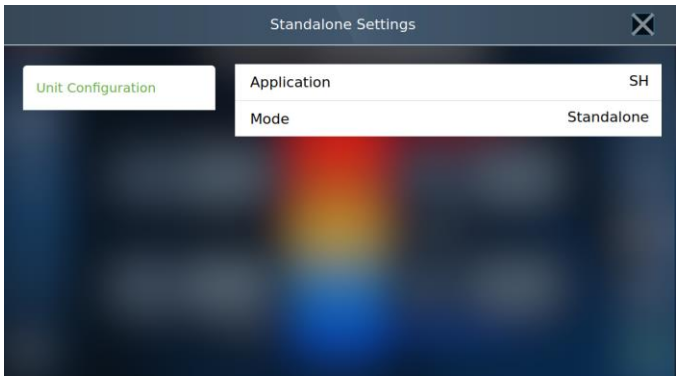


Figure 6-8: Standalone Settings – Unit Configuration

6.1.2.2 Application Settings

This allows the user to configure the **Constant Setpoint, Remote Setpoin**t, and **Outdoor Air Reset.**

- **Application Configuration**: Shows operating mode, temperature and setpoint parameters.

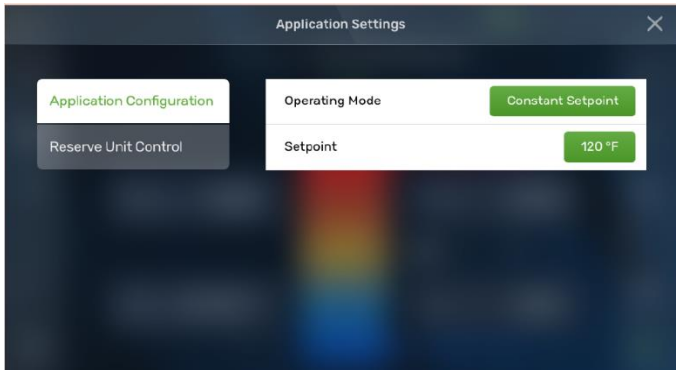


Figure 6-9: Application Configuration – Constant Setpoint Mode

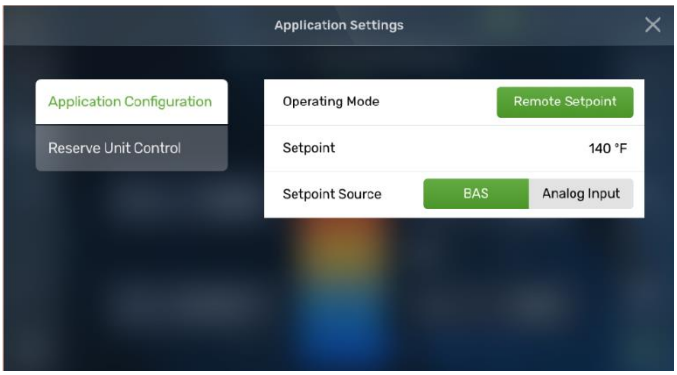


Figure 6-10: Application Configuration – Remote Setpoint Mode (BAS)

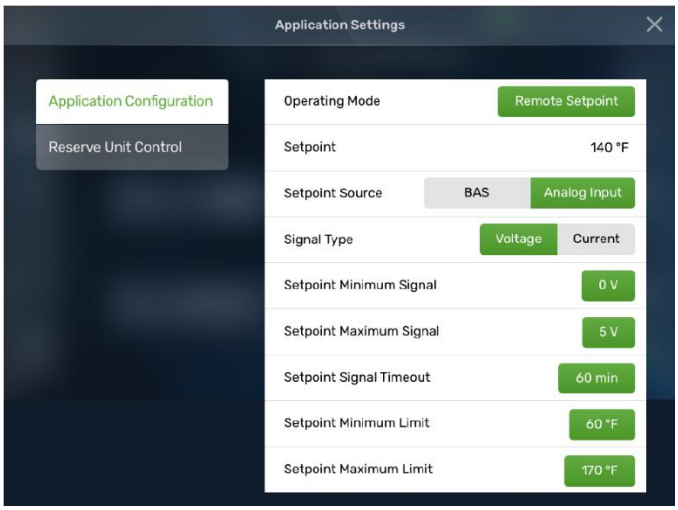


Figure 6-11: Application Configuration – Remote Setpoint Mode (Analog Input)

NOTE: Analog Input must be set to **Remote Setpoint** under Ancillary Devices to get setpoint for this configuration.

NOTE: When Setpoint Source is set to **Analog Input**, the **Signal Type** must match the DIP switch setting on MCB.

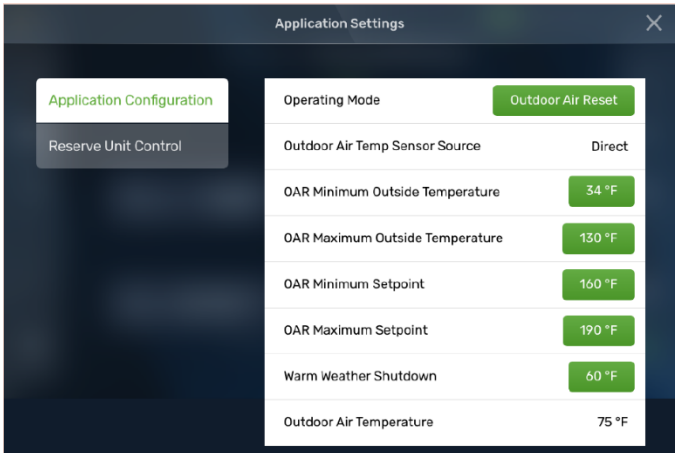


Figure 6-12: Application Configuration – Outdoor Air Reset Mode

NOTE: RTD must be configured for Outdoor Air Temperature function under Ancillary Devices for Outdoor Air Reset operating mode.

- **Reserve Unit Control:** This screen allows you to enable the Reserve Unit Control feature, which will activate a "Reserve Unit" in the event the unit cannot keep up with the load.

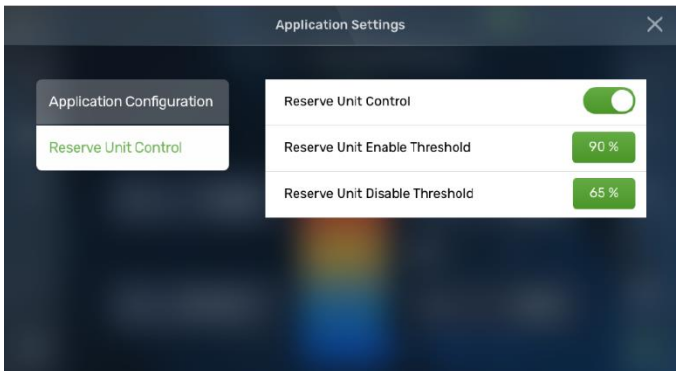


Figure 6-13: Application Settings – Reserve Unit Control

NOTE: One Digital Output is configured for Reserve Unit under **Ancillary Devices > Digital Outputs.**

6.1.2.3 Temperature Control

The **Temperature Control** menu items can be used to fine-tune the temperature responsiveness and limitations under which the unit operates.

- **Unit Temperature Control:** Includes options for Proportional Band, Integral Gain, Derivative Time, and Temperature High Limit parameters.

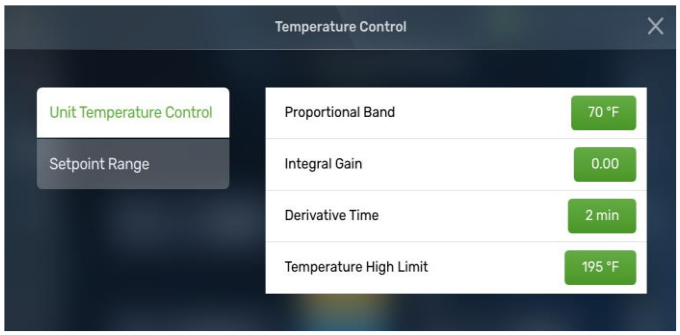


Figure 6-14: Temperature Control – Unit Temperature Control

- **Setpoint Range:** Limit and modify the setpoint range for periods of changing demand for heat.

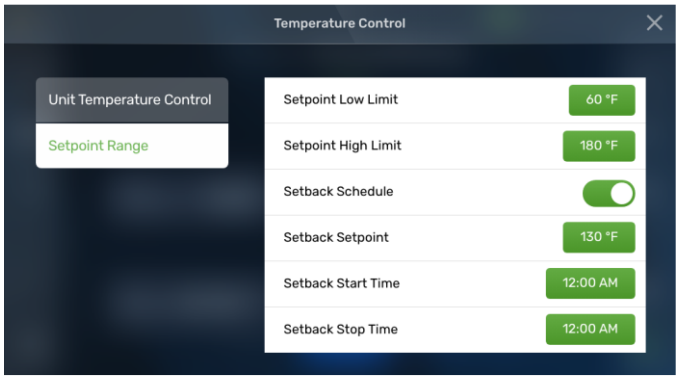


Figure 6-15: Temperature Control – Setpoint Range

6.1.3 Communication & Failsafe

6.1.3.1 BAS Settings

Configure **BACnet IP** parameters on the controller to communicate with BAS via BACnet IP.

Figure 6-16: BAS Settings Screen 1

Figure 6-17: BAS Settings Screen 2

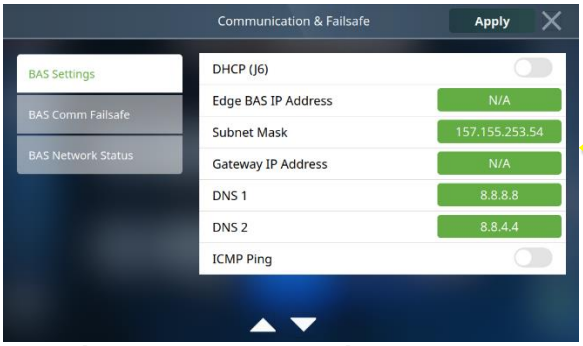


Figure 6-18: BAS Settings Screen 3 (DHCP Disabled)

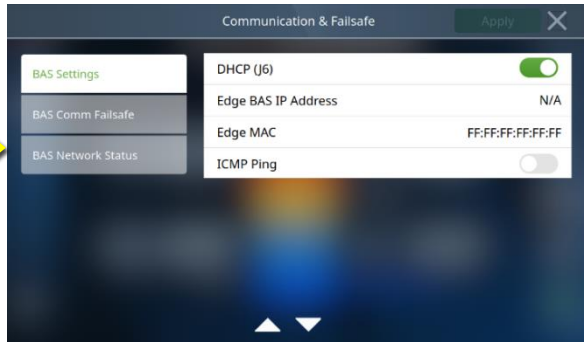


Figure 6-19: BAS Settings Screen 3 (DHCP Enabled)

Figure 6-20: BAS Settings Screen 4

NOTE: With DHCP enabled, after entering all DHCP information be sure to press **Apply** (at top of screen). The button will change from white to green once the parameters are saved.

6.1.3.2 BAS Comm Failsafe

The **BAS Comm Failsafe** option specifies how the unit will operate when a Remote Signal is lost and the unit has to operate independently. If **Constant Setpoint** is selected, the unit will fall back into a constant setpoint mode of operation with the setpoint defined in **Failsafe Setpoint** setting. If **Shutdown** is selected, the until will fall back into a standby disabled state until communication is reestablished.

Figure 6-22: Failsafe Mode - Constant Setpt.

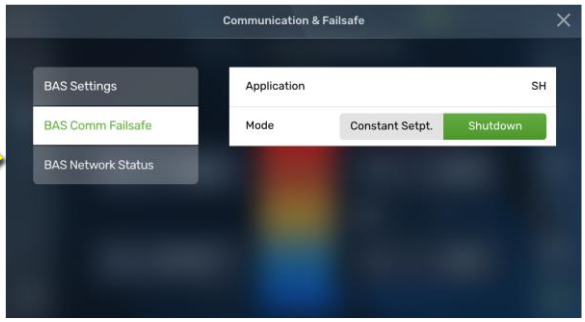


Figure 6-21: Failsafe Mode - Shutdown

6.1.3.3 BAS Network Status

The **BAS Network Status** screen will typically have **DHCP** enabled and not require additional configuration. If **DHCP** is *dis*abled, the parameters below are available for the unit to communicate with the network. Ethernet communication requires an Ethernet cable plugged into the Controller.

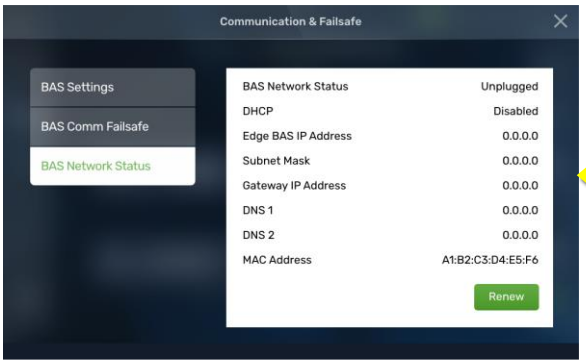


Figure 6-23: DHCP Disabled

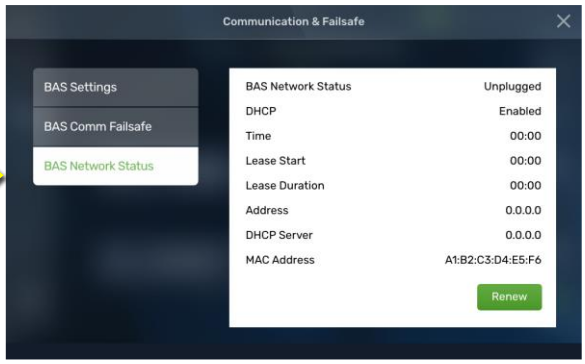


Figure 6-24: DHCP Enabled

6.1.4 Ancillary Devices

This screen allows input and output configurations of supplementary equipment connected to the unit, including Analog I/Os, Digital I/Os, and RTD sensors. See Appendix C for a list of I/Os.

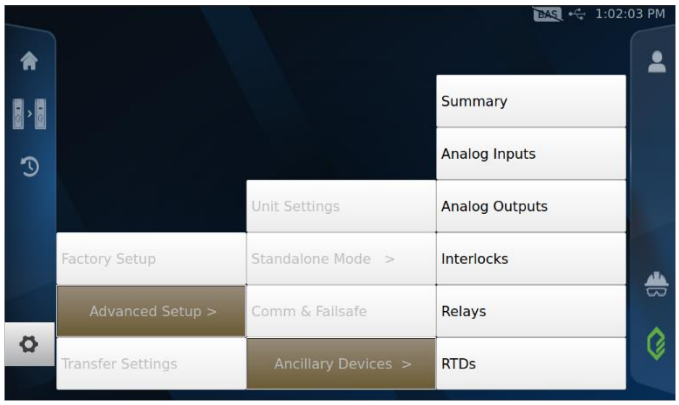


Figure 6-25: Ancillary Devices

6.1.4.1 Summary

This displays a list of all IOs and RTDs currently being used on the unit.

Figure 6-26: Ancillary Devices > Summary

6.1.4.2 Analog Inputs

If reliable feedback or external instrumentation indicates the reading is inaccurate, you can adjust its reading via the signal level parameter. This process can be repeated for all available analog inputs.

NOTE: The **Signal Type** (Voltage or Current) must match DIP switch setting on MCB.

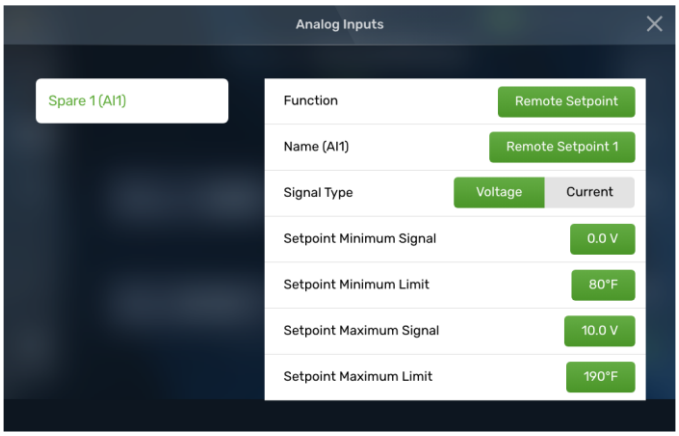


Figure 6-27: Ancillary Devices > Analog Inputs

6.1.4.3 Analog Outputs

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

NOTE: The **Signal Type** (Voltage or Current) must match DIP switch setting on MCB.

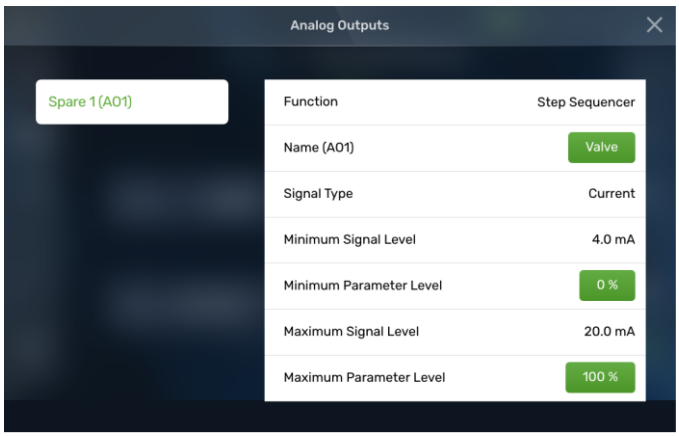


Figure 6-28: Ancillary Devices > Analog Outputs

6.1.4.4 Interlocks

The Controller offers 9 interlocks – Remote, Delayed, Primary Low Water Cut Off (LWCO), Secondary LWCO, High Temperature Limit Control (HTLC; Manual Reset), Operating Temperature Limit Control (OTLC; Auto Reset), Cabinet Door, Enable/Disable, and Demand Interlocks. All of these must be in the closed position for the unit to operate.

The three interlock circuits, Remote, Delayed, and Secondary LWCO, can interface with an Energy Management System (EMS) or a Building Automation System (BAS) and auxiliary equipment. The remaining 6 interlocks listed on the left of the menu are monitored by the controller. Touching any of the listed interlocks will display its status.

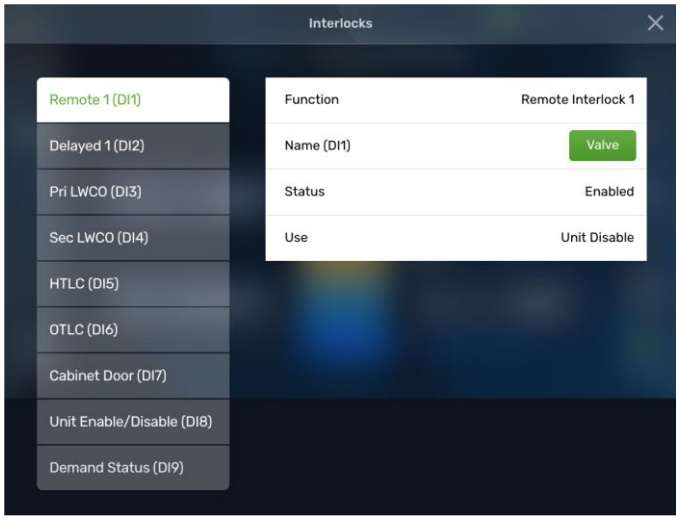


Figure 6-29: Ancillary Devices > Interlocks

6.1.4.5 Relays

The Controller provides 4 relays for the BMK E: Fault, Reserve Unit, Demand, and Aux.

Figure 6-30: Relays > Fault Relay (DO1)

Figure 6-31: Relays > Reserve Unit (DO2)

Figure 6-32: Relays > Demand Relay (DO3)

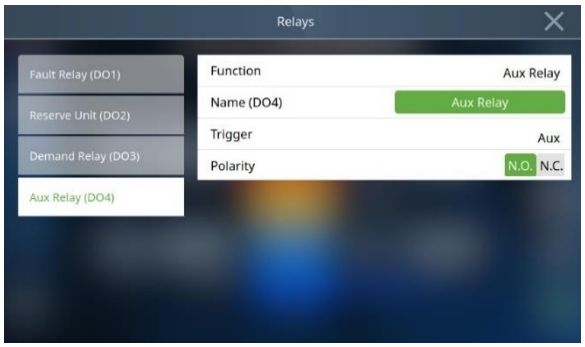


Figure 6-33: Relays > Aux Relay (DO4)

6.1.4.6 RTDs

The Controller offers a total of four Resistance Temperature Detectors (RTDs) that measure temperature by changing resistance as the temperature changes. Three of these RTDs (Inlet Water Temperature, Outlet Water Temperature, and Cabinet Temperature) are fixed. One spare RTD is available for configuring the Outdoor Air Temperature function.

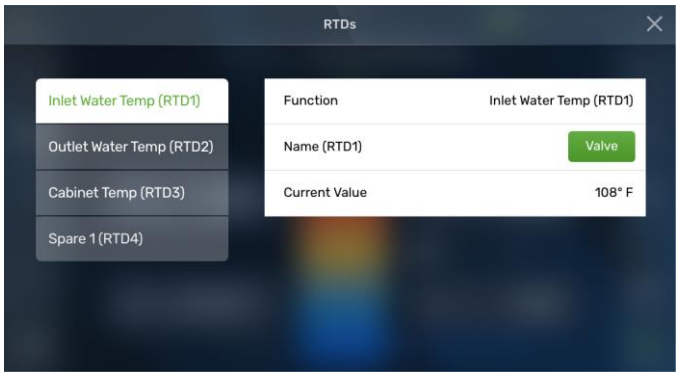


Figure 6-34: Ancillary Devices > RTDs

NOTE: An OAT sensor must be wired to the unit before configuring Outdoor Air Temperature function for Spare 1 RTD under Ancillary Devices.

6.2 Transfer Settings

The Edge X Controller includes functionality for saving and loading a backup of all user-configurable parameters via a USB device plugged into the side of the Controller.

6.2.1 Save Settings

AERCO recommends using this option periodically to avoid needing to reconfigure the original setup.

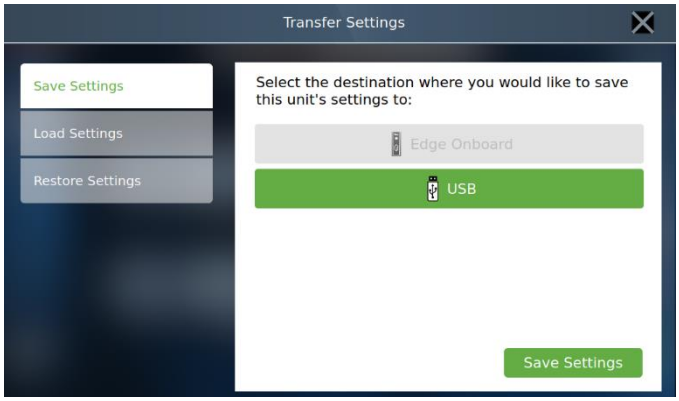


Figure 6-35: Transfer Settings > Save Settings Screen

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, this step will overwrite it!

6.2.2 Load Settings

Once saved, the complete setup can be easily recovered by loading settings from the USB if the settings on the unit are lost or corrupted, through hardware malfunction or operator error.

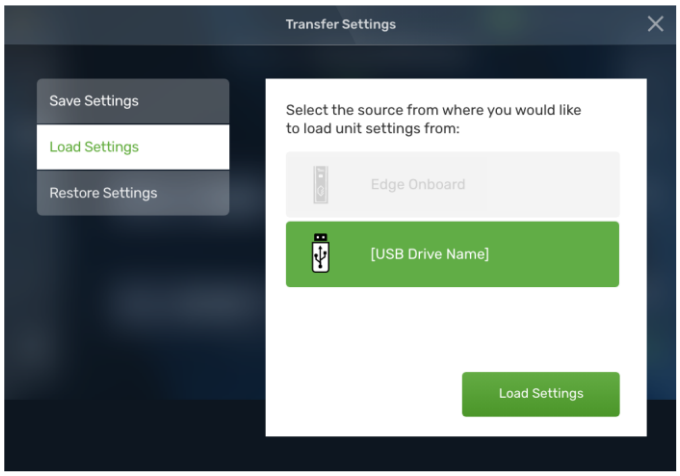


Figure 6-36: Transfer Settings > Load Settings Screen

6.2.3 Restore Settings

This feature will be available in a future release.

SECTION 7: ACCOUNT

Different access configuration levels provide an extra layer of protection to prevent unwanted changes to the unit. No access code is required for Basic User access. Access codes are required for Trained Technician (TT) and Master Trained Technician (MTT) access levels.

Level	Access Code	Description
Basic User	None	The default, read-only level that allows basic access. No password is required.
Trained Technicians (TTs)	Received upon TT training completion	Includes all Basic User permissions as well as unit configuration capabilities.
Master Trained Technicians (MTTs)	Received upon MTT training completion	Includes all TT permissions as well as advanced features.

To enter an access code, go to **Account > Access**. Type in the code then press **Enter**. If correct, the user is given the corresponding access level which is displayed under Access. Selecting **Logout** will remove the current access level and revert to the **Basic User** access.

When the unit enters sleep mode, the access permission reverts to **Basic User** access. See **Screen Timeout Duration** (Section 6.1.1) for further information.

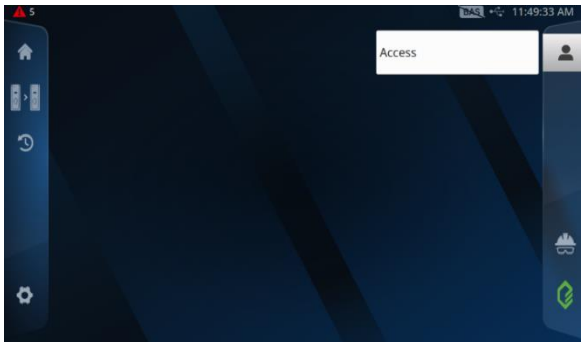


Figure 7-1: Account > Access Screen

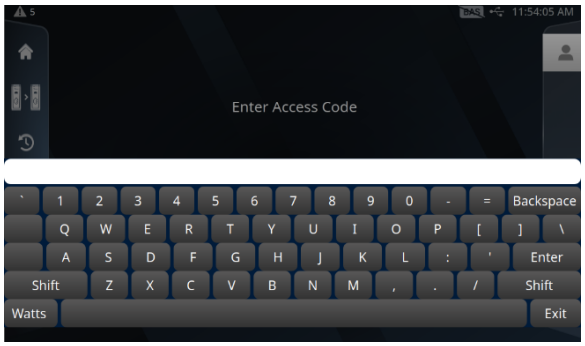


Figure 7-2: Account > Enter Access Code

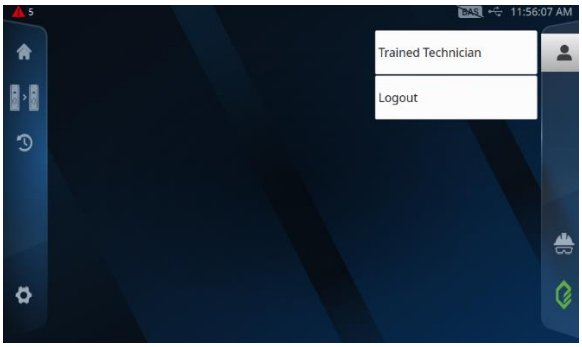


Figure 7-3: Account > Access Screen – Logged In

SECTION 8: SERVICES

The Services menu is used to service the individual unit, such as testing or checking unit operation, updating software on the unit and performing routine maintenance.

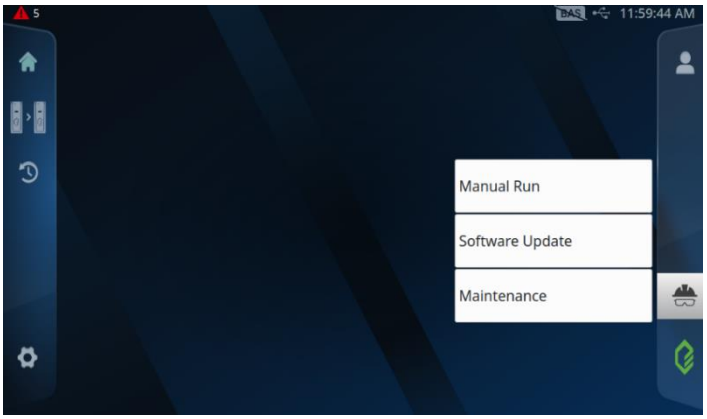


Figure 8-1: SERVICES Menu Screen

8.1 Manual Run

Manual Run allows the unit's power input to be controlled manually when testing or checking unit operation. When enabled, a yellow "Manual Run" banner will appear at the top of **Unit Status, Plant Status,** and **Event List** screens.

Raising or lowering the Analog Output value will raise or lower the Power Output of the unit.

CAUTION!

The unit will NOT follow normal operation while in Manual Run mode. Ensure adequate flow to prevent a potentially hazardous over temperature condition.

If the unit is left in manual run and the controller screen is not touched for an extended period (30 minutes), the controller will automatically exit manual operation and return to automatic (normal) operation.

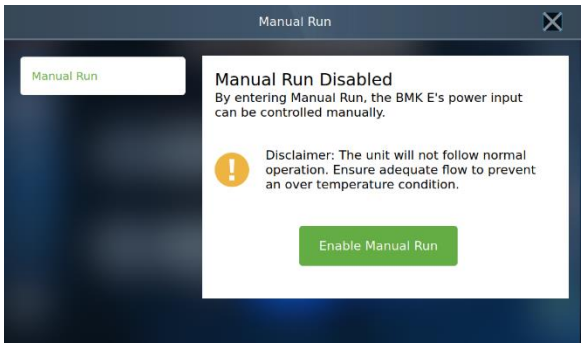


Figure 8-2: Manual Run Screen 1

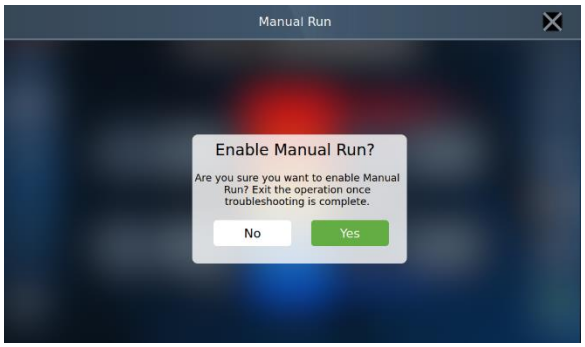


Figure 8-3: Manual Run Screen 2

Figure 8-4: Manual Run Screen 3

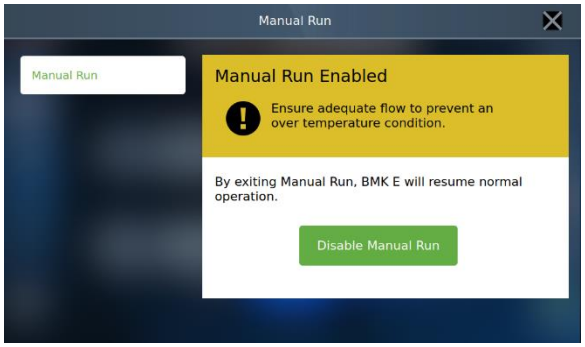


Figure 8-5: Manual Run Screen 4

8.2 Software Updates

To update the Application Firmware or Operating System (OS) Software, it must first be downloaded from the Watts LMS to an external computer and saved to a USB (Version 2.0 or higher) flash drive. This USB must be plugged into the Controller to save or load settings.

1. Disable the Unit; the blue Enable/Disable switch indicator turns off.
2. Insert USB with software into the side of the Controller.
3. Go to **Service > Software Updates > Application & OS Update;** follow the on-screen prompts.
4. The unit will auto-restart after an Application Firmware update. A manual restart (power cycle) is required to complete the OS software update.

NOTE: Do not power cycle the unit until after restart.
NOTE: The "Update" button will be greyed out until a USB drive with a valid Application Firmware or OS Software file is detected.

Figure 8-6: Software Update Screen

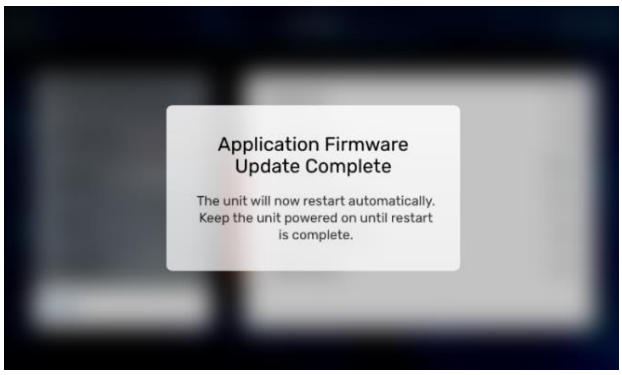


Figure 8-7: Firmware Update Complete

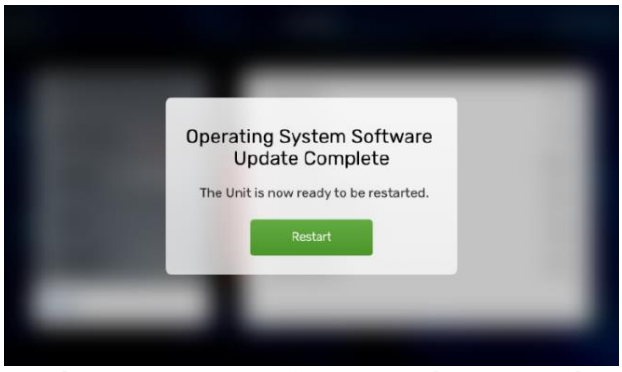


Figure 8-8: OS Software Update Complete

SECTION 9: EDGE REPLACEMENT

⚡⚡ ELECTRICAL HAZARD WARNING ⚡⚡

Electrical voltages in Benchmark E boilers may include **480 or 600 volts AC**. Therefore, these units must be serviced only by factory certified service technicians. Opening the front door shuts down unit operation but does **not** completely remove high voltage from the unit. Be sure the main power switch is de-activated and locked out before servicing the unit.

1. Download the latest OS Software and Application Firmware to a USB Flash Drive (see Section 8.2).
2. Make sure all power to the BMK E unit is disabled and the Edge X controller is off.
3. Open the front door to the BMK E and insert the USB Flash Drive into the controller.
4. Close the front door and restore power to the unit. Power up the Edge X controller.
5. Go to **Account > Access.** Log in with a TT or MTT access code then press **Enter** (see Section 7).
6. Go to **Services > Maintenance** > **Edge Replacement** and enter the Edge key located on the Eth0 connector on the MCB.
7. To update software, go to **Services > Software Updates** and select **Update** under **Unit Operating System Software**. After updating, re-enter the TT or MTT access code in **Account > Access.**

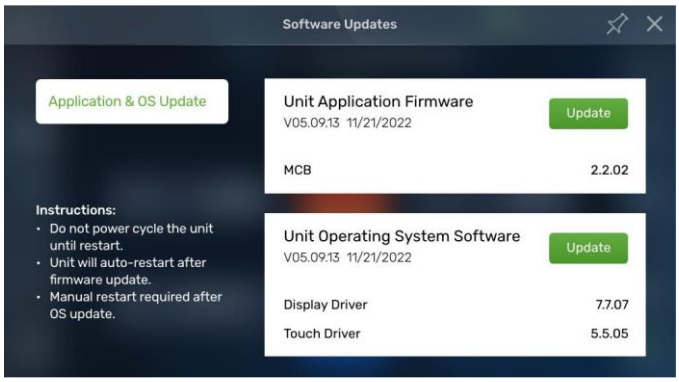


Figure 9-1: OS Software Update

8. If a firmware update is necessary, select **Update** under **Unit Application Firmware.** Once the update is complete, re-enter the TT or MTT access code in **Account > Access.**

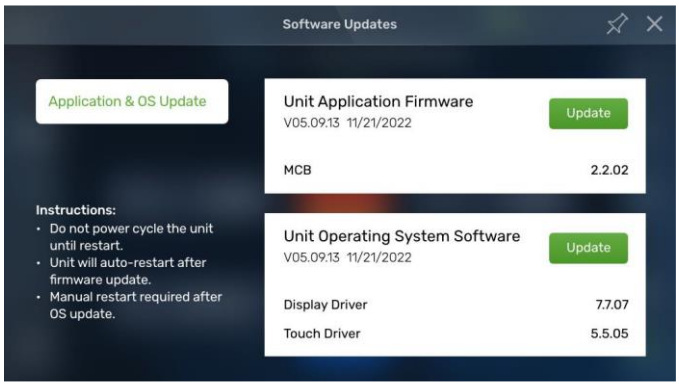


Figure 9-2: Firmware Update

9. Save current unit settings to the USB (see section 6.2.1). This step is required before loading all or common settings to the new or repurposed controller.

10. If the Edge controller is being repurposed from an existing unit, make sure to reset all settings by going to **Settings > Advanced Settings > Unit Settings > General.**
11. Go to **Settings > Transfer Settings > Load Settings > USB**, to load settings, if desired. For previously saved settings file or if a controller is being replaced, select **Load Settings.**
12. To update settings, go to **Settings > Advanced Settings > Unit Settings.** If the Edge controller is being repurposed from an existing unit, select **Clear Event History.** Review and update other Unit Settings, if applicable.
13. To update Standalone Mode settings go to **Advanced Settings > Standalone Mode.**

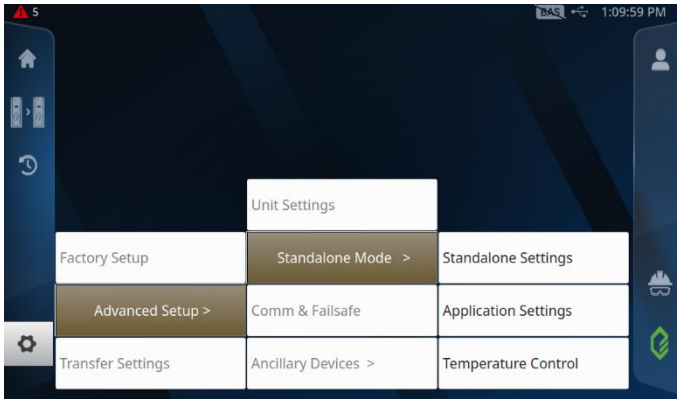


Figure 9-3: Standalone Mode Menu Options

14. To update Communication & Failsafe settings go to **Advanced Settings > Comm & Failsafe.**

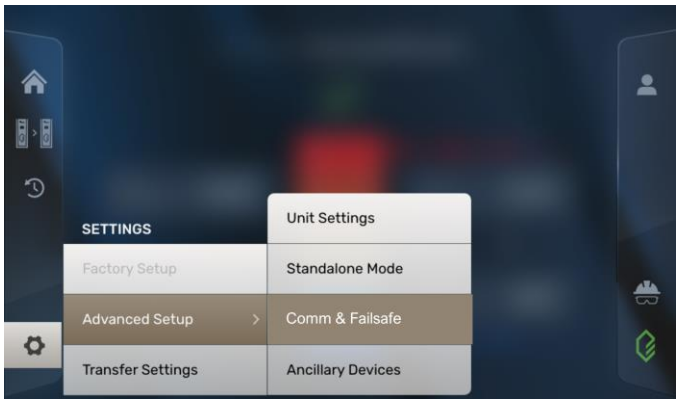


Figure 9-4: Comm & Failsafe Menu Options

15. To review and update Ancillary Device settings go to **Advanced Settings > Ancillary Devices.**

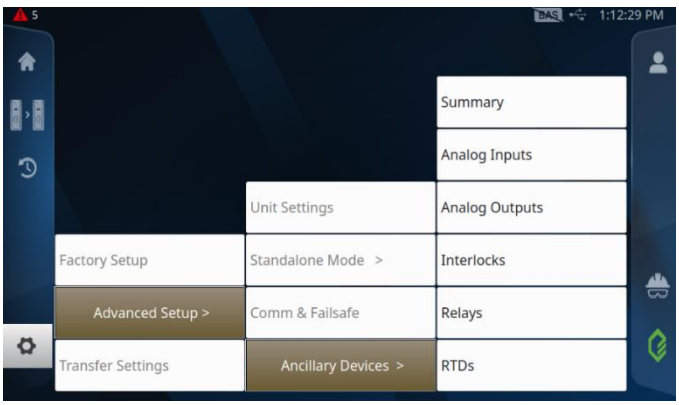


Figure 9-5: Ancillary Devices Menu Options

16. Test unit as required in **Test & Cal** until the test is passed. After successful test and calibration, clear faults by pressing the CLEAR Softkey on the controller front panel.

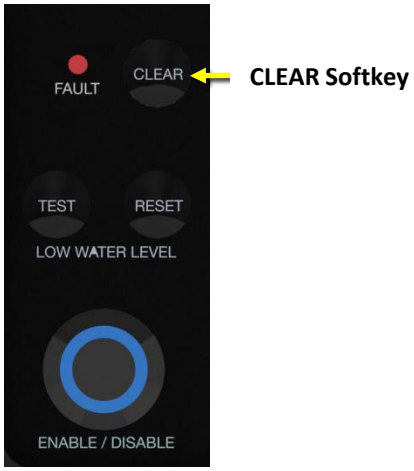


Figure 9-6: Clear Softkey

17. If the unit does not reboot, go to **Account > Logout** to log out of TT/MTT access.

APPENDIX A – ABBREVIATIONS & MENU ITEM DESCRIPTIONS

Common Abbreviations

Abbreviation	Term	Description
BAS	Building Automation System	A system that monitors and controls systems such as lighting, air conditioning, heating, ventilation, and air conditioning.
EMS	Energy Management System	A system that connects a building's systems (lighting, HVAC, etc.) to create a single, central platform to manage energy consumption.
LWCO	Low Water Cutoff	A device that prevents a burner from firing in low- or no-water.
OAR	Outdoor Air Reset	An operating mode in which the Setpoint value is defined by OAT
OAT	Outdoor Air Temperature	The temperature of the air surrounding (outside of) the building.
RTD	Resistance Temperature Detector	A sensor used to measure temperature whose resistance changes when its temperature changes.
SSR	Solid State Relay	Electronic switching device used to modulate a 36kW element group.

Menu Item Descriptions

Menu Item	Description
Automatic Date & Time	Disable to edit the date and time manually
AUX Relay	Displays the state of the AUX relay
Auxiliary Delay	Specifies the amount of time to wait between activating the Aux Relay (due to a demand) and checking the pre-purge string to start the unit
Cabinet Temperature	Displays the temperature value inside the cabinet
Clear Event History	Clears all events on Event History screen. Do NOT clear except when replacing the controller
Comm Address	For RS-485 communications (0-127). RS232 should have its own password
Constant Setpoint	Used when a fixed header temperature is desired, i.e. for water source heat pump loops and indirect heat exchangers for potable hot water systems or processes
Controller Model	Displays current controller model
Country	Select unit location; selected option dictates available time zones
Date and Time	Allows user to set the date and time manually
Derivative Time	This value responds to the rate of change of the setpoint error. This is the time that this action advances the PID temperature output. If the value is increased, the PID acts slower. If this value is decreased, the PID acts faster.
Energy Source	Specifies source of energy for unit. For BMK E, it is Electric by default
Mode (Failsafe Mode)	This setting is applicable when the operating mode is set to **Remote Setpoint** in the **Application Settings** menu. If there is a loss of communication the unit will revert to the selected failsafe mode until communication is reestablished.
Failsafe Setpoint	If the selected failsafe Mode is constant setpoint, this is the active setpoint if there is a loss of communication in the Remote Setpoint signal
Inlet	Displays the temperature of the water entering the unit
Integral Gain	This sets the fraction of the PID temperature output, due to setpoint error, to add or subtract from the output each minute to move towards the setpoint. If the value is increased, the integral portion of the PID acts faster. If the value is decreased, the integral acts more slowly.
Language	The language option currently available is English
Network Timeout	Specifies the timeout value before a Modbus Fault is declared
OAR Max Outside Temp	Maximum outside temperature that will change the setpoint of the outdoor reset function
OAR Max Setpoint	The maximum allowable setpoint when in OAR operating mode
OAR Min Outside Temp	Specifies minimum air temp unit will read; interacts with OAR Max Setpoint
OAR Min Setpoint	The minimum allowable setpoint when in OAR operating mode
Operating Mode	Displays current mode (Constant Setpoint, Remote Setpoint, or Outdoor Air Reset).
Outdoor Air Reset (OAR)	As the outside air temperature decreases, the supply header temperature will increase and vice versa. For this mode, it is necessary to install an outside air sensor.
Outdoor Air Temperature	Displays the current outdoor air temperature reading
Outlet	Displays the temperature of the water exiting the unit
Product Type	Displays AERCO products, BMK E

Proportional Band	Adjustment of the PID temperature output control based on error between setpoint temperature and actual outlet temperature. If value is increased, the proportional portion of the PID acts more slowly; if decreased, the proportional acts faster.
Remote Setpoint	The unit's setpoint can be remotely controlled by an Energy Management System (EMS) utilizing either a current or voltage signal level
Reserve Unit Enable/ Disable Threshold	The Power Output level at which the Reserve Unit deactivates/ engages.
Reserve Unit Relay	Displays the current state of the Reserve Unit relay (see Section 6.1.2)
Reset All Settings	Resets all settings and restores default values. Do NOT use except when replacing Controller.
Run Cycles	Displays number of run cycles since last system reset. Can be reset to 0 (or any other number)
Run Hours	Displays number of run hours since last system reset. Can be reset to 0 (or any other number)
Serial Number	Displays unit's factory-set serial number in a unique format of Z-YY-XXXX. Do NOT change except when replacing Controller. Z = a letter specific to Benchmark E boilers; YY = two-digit year; XXXX = 4-digit serial number.
Setback Schedule	This feature can be used to reduce the setpoint during periods of low use. This can help lower energy consumption when a building has a regular period of low demand. For example, an office building may have no occupancy from the hours of 0000 to 0500. For best comfort, it is recommended that the Setback Setpoint is no more than 5 to 10°F below normal setpoint, and to end the Setback period at least one hour before the demand returns to normal levels.
Setback Setpoint	The setpoint temperature the unit maintain within the setback schedule
Setback Start Time	The time that the Setback Schedule begins
Setback Stop Time	The time that the Setback Schedule ends
Setpoint Hi Limit	Used to set the maximum allowable setpoint (Setpoint Lo Limit to 240°F)
Setpoint High Limit	If the operating mode is constant setpoint, this option allows the user to limit how high the unit's setpoint can be set in the Application Settings menu
Setpoint Lo Limit	Used to set the minimum allowable setpoint (40°F to Setpoint Hi Limit)
Setpoint Low Limit	If the operating mode is constant setpoint, this option allows the user to limit how low the unit's setpoint can be set in the Application Settings menu
Setpoint Source	Used to set type of external signal used when operating in the Remote Setpoint
SH Setpoint	Limits setpoint range (factory default= 60°F). To adjust setpoint see Application Settings.
SSR	Allows configuration with or without SSR. Change ONLY if updated by factory
Temperature High Limit	The temperature limit feature that will shut down the unit and generate an event if the actual outlet temperature exceeds this setting
Temperature Sensor	Specifies the sensor type (PT1000 = default) on the current units
Time Format	Select 12- or 24-hour format
Time Zone	Based on the Country selected, specific time zones will be available
Unit of Measurement	Choose English (°F, gpm, in. W.C., psi) or Metric (°C, lps, Pa). The LED indicator displays either °F or °C accordingly
Unit Size	Displays available sizes for given Product Type. Do NOT change except when replacing the Controller. Options are 216kW, 360kW, 432kW, 576kW, and 684kW.
Unit Voltage	480V or 600V
Warm Weather Shutdown	The threshold outside temperature above which the unit shuts down

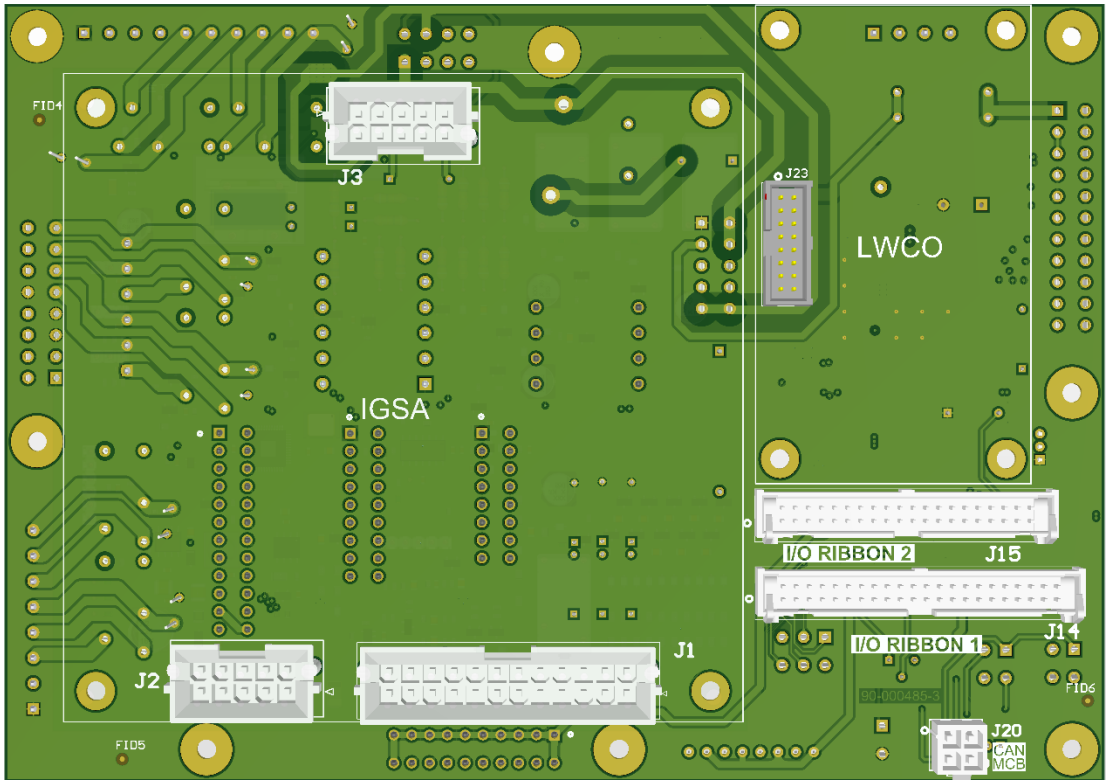
APPENDIX B – BMK E ALERT MESSAGE LIST

Alert #	Event Message	Alert Type	Description
1	Unit Disabled	Info	**Enable/Disabled** switch set to **Disabled**. Shows time/date disabled.
2	Standby	Info	Displayed when Enable/Disable switch is in Enable position, but there is no demand for heat. Time and date are also displayed.
3	Manual Mode	Info	See *Manual Run Enabled*
4	Automatic Mode	Info	Control over the boiler is automatically determined by the system outlet temperature or plant header temperature and current setpoint value.
5	Unit Fault	Fault, Non-Latching	See Section 5: Event History
8	Manual Reset	Fault, Latching	Max water temp exceeded; manual reset required.
9	Low Water Level	Fault, Latching	Primary Low Water Cutoff board indicating low water level
12	Remote Interlock Open	Fault, Non-Latching	Remote Interlock is open
13	Delayed Interlock Open	Fault, Latching	Delayed Interlock is open
40	Remote Setpt Signal Fault	Fault, Non-Latching	Remote Setpoint signal not present or out of range
56	Inlet Temp Sensor Short	Fault, Non-Latching	Inlet Water Temp Sensor has malfunctioned/ shorted out
57	Inlet Temp Sensor Open	Fault, Non-Latching	Inlet Water Temp Sensor is not connected or malfunctioned
58	Inlet Temp High	Fault, Non-Latching	Inlet water temperature above normal
59	Inlet Temp LOW	Fault, Non-Latching	Inlet water temperature below normal.
107	Warm Weather Shutdown	Warning	Standalone warm weather shutdown warning
300	OAT Sensor open circuit	Warning	*Connection to OAT sensor is incomplete*
301	OAT Sensor short circuit	Warning	Usually indicates a wiring fault, improper connection, or short circuit to OAT sensor.
302	OAT Sensor Not Set	Warning	Occurs when setpoint mode and source are set to Outdoor Air reset via direct and Spare 1 sensor is not configured as an OAT sensor.
303	High Cabinet Temperature	Fault, Non-Latching	Temperature measured by Cabinet Sensor out of range.
304	Cabinet Temp Sensor OPEN circuit	Fault, Non-Latching	Connection to Cabinet sensor is incomplete
305	Cabinet Temp Sensor SHORT circuit	Fault, Non-Latching	Temperature measured by the Cabinet Temp Sensor is out of range.
306	Outlet Temp Sensor Short	Fault, Non-Latching	Outlet Temp Sensor has shorted
307	Outlet Temp Sensor Open	Fault, Non-Latching	Cabinet sensor has malfunctioned/ shorted out
308	Demand Relay Open Fault	Fault - Latching	Signal sent, but demand relay not closed
309	Enable/Disable Switch Open	Warning	Enable/Disabled switch set to Disabled.
310	Auto Over-temp Limit Control Open	Fault, Non-Latching	When Auto Over-temp detects temperature greater than Trip Temperature, OTLC safety module trips to signify fault. Module resets when temperature returns to a safe level
311	24VAC Safety String Invalid	Warning	Indicates a mis-wired or "jumped" safety string
312	Manual Run Enabled	Warning	Manual Run mode enabled by user. Power is controlled manually to test unit operation.
313	Manual Run Disabled By User	Warning	Manual Run mode disabled by user.
314	Manual Run Auto Disabled	Warning	Manual Run mode was auto disabled by Edge due to > 30 mins of inactivity
315	Setback Schedule Enabled	Warning	Setback Schedule is configured and activated
900	Secondary Low Water Level	Fault, Latching	Secondary Low Water Cutoff board indicates low water level.
901	Cabinet Door Open	Fault, Latching	Cabinet Door switch disabled the unit when the Cabinet Door is opened to prevent accidental exposure to unsafe voltages.
998	High Water Temp Fault	Fault, Non-Latching	Temp measured by Outlet Sensor exceeded Temp Hi Limit

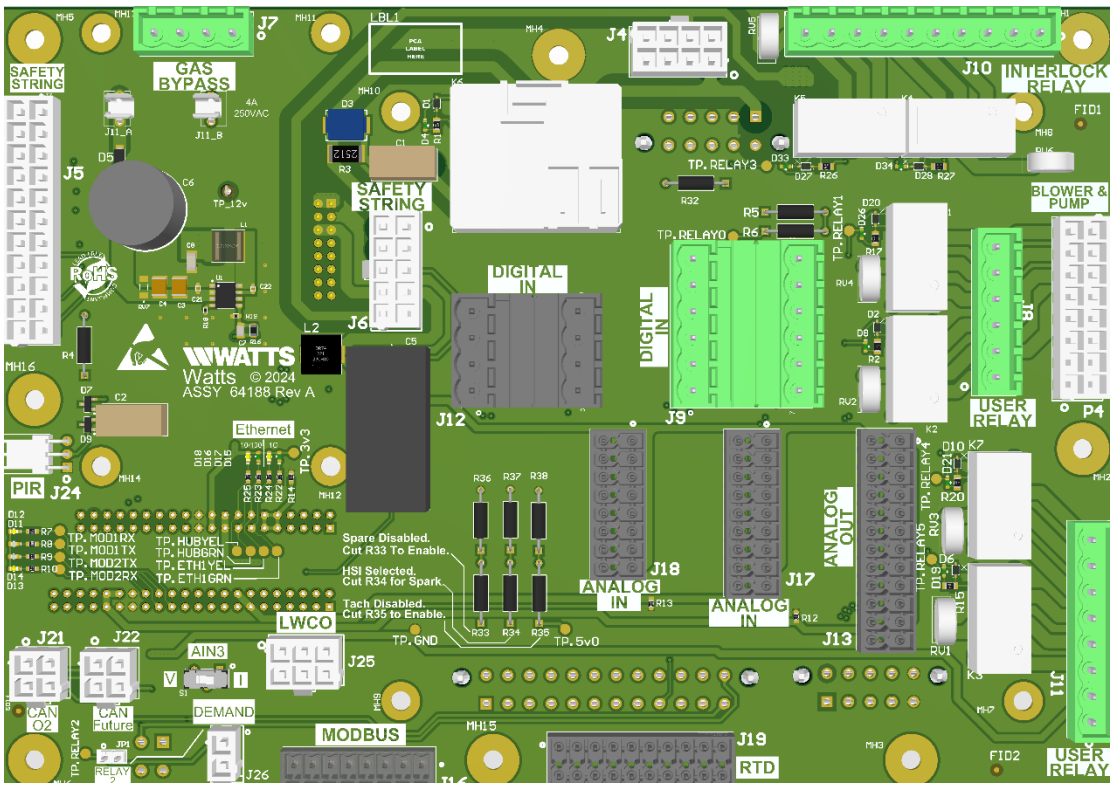
APPENDIX C – I/O LIST

Edge: Ancillary Devices (I/Os) Features, Required Quantities, and Signal Type					
IO Type & Count	**Functions**	**Signal Type**	**Units**	**Board Name**	**Connector-Pin#**
AI0	Remote Setpoint	0-20mA/0-10V	mA/V	I/O Board	J18 PIN 9 : AIN 1 J18 PIN 1 : Ain_GND
AO0	Step Sequencer	0-20mA/0-10V	mA/V	I/O Board	J13 PIN 15 : AOUT 1 J13 PIN 14: Aout_GND
DI0	Remote Interlock 1	24VAC/VDC	Volts	I/O Board	J9 PIN 1 - DIGITAL_IN_1
DI1	Delayed Interlock	24VAC/VDC	Volts	I/O Board	J9 PIN 3 - DIGITAL_IN_2
DI2	Primary Low Water Cut-off (LWCO) (Edge or OTS Board)	24VAC/VDC	Volts	I/O Board	J9 PIN 5 - DIGITAL_IN_3
DI3	Secondary Low Water Cut-off (LWCO)	24VAC/VDC	Volts	I/O Board	J9 PIN 7 - DIGITAL_IN_4
DI4	High-Temperature Limit Control (HTLC; Manual)	24VAC/VDC	Volts	I/O Board	J9 PIN 9 - DIGITAL_IN_5
DI5	Operating Temperature Limit Control (OTLC; Auto)	24VAC/VDC	Volts	I/O Board	J9 PIN 11 - DIGITAL_IN_6
DI6	Cabinet Door Switch	24VAC/VDC	Volts	I/O Board	J12 PIN 1 - DIGITAL_IN_7
DI7	Demand Relay Status	24VAC/VDC	Volts	I/O Board	J12 PIN 3 - DIGITAL_IN_8
DI8	Unit Enable/Disabled Switch (on Edge Front Panel and connects at MCB)	24VAC/VDC	Volts	MCB	J11 PIN 1 - DIGITAL_IN_9
DO0	Fault Relay	120V AC, 10 Amp	VAC	I/O Board	J10 PIN 7 - IGSA_FAULT_RELAY_COM
DO1	Reserve Unit	120V AC, 10 Amp	VAC	I/O Board	J10 PIN 6 - IGSA_FAULT_RELAY_NO
DO2	Demand Relay [BMK E: Sequencer Power On/Off]	120V AC, 10 Amp	VAC	I/O Board	J10 PIN 5 - IGSA_FAULT_RELAY_NC
DO3	Aux Relay	120V AC, 10 Amp	VAC	I/O Board	J8 PIN 6 - USER_RELAY1_COM
RTD8	Inlet Water Temperature	Voltage	counts	I/O Board	J19 PIN 12 - RTD_IN8
RTD9	Outlet Water Temperature	Voltage	counts	I/O Board	J19 PIN 13 - RTD_IN9
RTD10	Cabinet Temperature	Voltage	counts	I/O Board	J19 PIN 14 - RTD_IN10
RTD11	For User - Outside Air Temperature (OAT)	Voltage	counts	I/O Board	

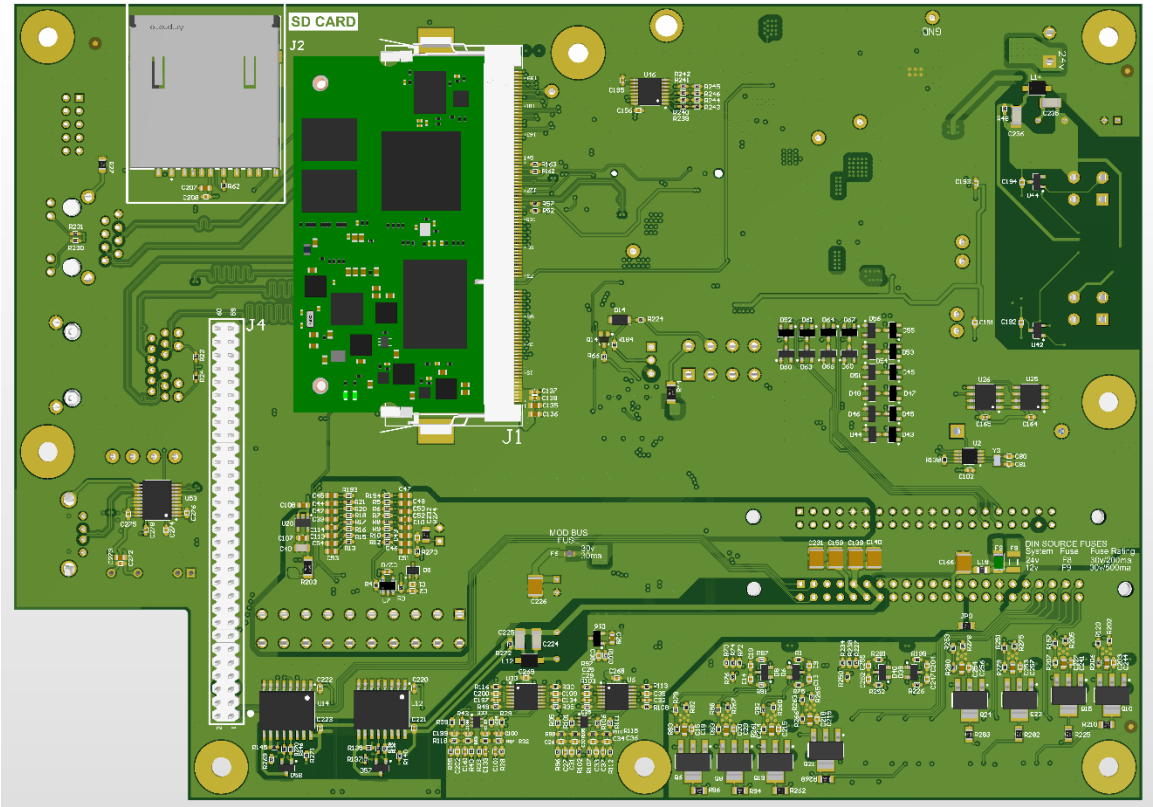
APPENDIX D - I/O BOARD and MCB RENDERINGS



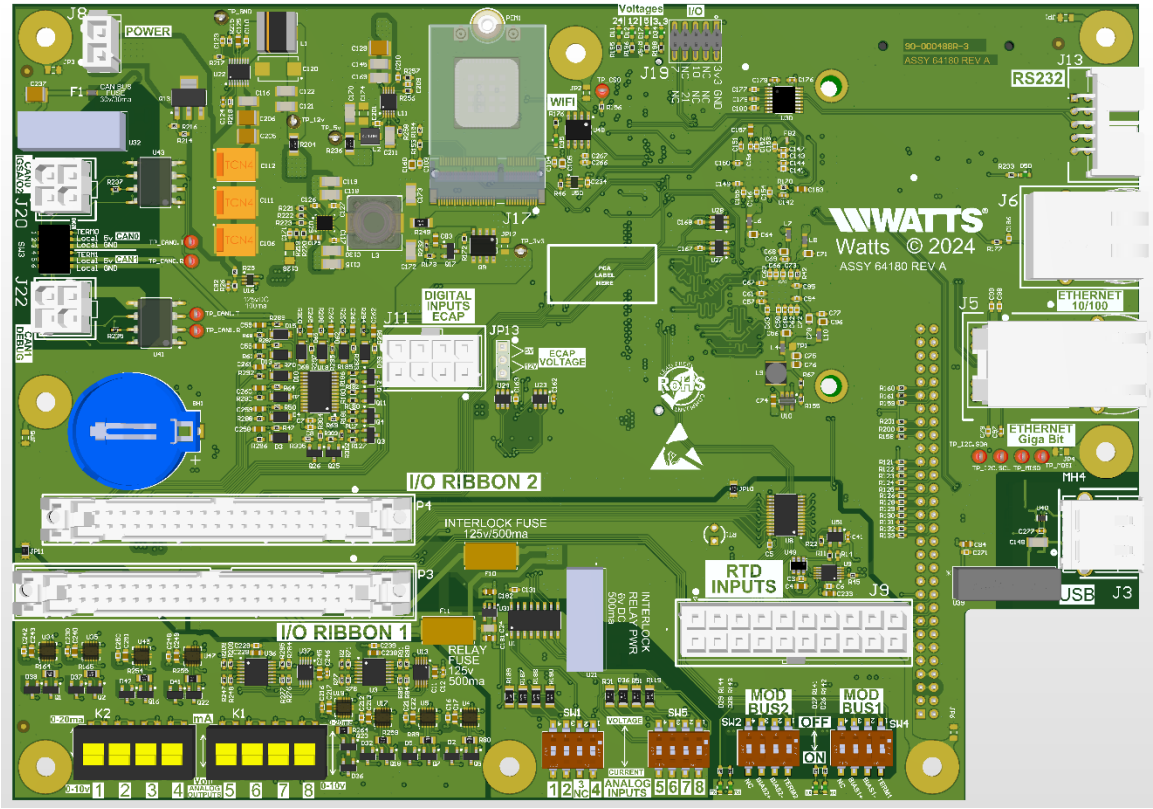
I/O Board - Front



I/O Board - Back



MCB - Front



MCB - Back

APPENDIX E – TROUBLESHOOTING

1. **Issue:** Enable/Disable button LED light stays active when unit is disabled.

   Recommendation: Configure the I/O board to remove the jumper (SJ1) from the connector JP1 to disable the Enable/Disable button LED light on the front panel for Benchmark E only.