BriskHeat LYNX Temperature Control System Instruction Manual

BriskHeat® Corporation

LYNX™
Temperature Control System
Instruction Manual

Contents

LYNX Temperature Control System

⚠️ Read and understand this manual before operating or servicing this temperature controller. Failure to understand how to safely operate this controller could result in an accident causing serious injury or death. Only qualified personnel should operate or service this controller.

⚠️ **SAFETY ALERT SYMBOL**

The symbol above is used to call your attention to instructions concerning your personal safety. It points out important safety precautions. It means "ATTENTION! Become Alert! Your Personal Safety is involved!" Readthe message that follows and be alert to the possibility of personal injury odeath.

⚠️ **DANGER**

Immediate hazards which WILL result in severe personal injury or death.

⚠️ **WARNING**

Hazards or unsafe practices that COULD result in severe personal injury or death.

⚠️ **CAUTION**

Hazards or unsafe practices that COULD result in minor personal injury or property damage.

IMPORTANT SAFETY INSTRUCTIONS

⚠️ **DANGER**

A person who has not read and understood all operating instructions is not qualified to operate this product.

⚠️ **DANGER**

- Do not immerse or spray any component of the control system with liquid.
- Keep volatile or combustible material away from control andheating systems when in use.
- Keep sharp objects away from heater.

Failure to observe these warnings may result in electric shock, risk of ire, and personal injury.

CAUTION

- Inspect all components before use.
- Do not use control and heating systems if any component is damaged.
- Do not repair damaged or faulty control and heating systems.
- Do not crush or apply severe physical stress on any component of system, including cord assembly.
- Unplug control and heating system when not in use.

  Failure to observe these warnings may result in personal injury or damage to the heater.

⚠️ **WARNING**

End-User Must Comply to the Following:

- Only qualified personnel are allowed to connect electrical wiring.
- Disconnect all supply power at the source before making any power connections.
- All electrical wiring must follow local electrical codes.
- The person who performs the final installation / wiring must be qualified for this work.
- The end-user is responsible for providing a suitable disconnecting device.
- The end-user is responsible for providing suitable electrical protection device. It is highly recommended that a ground fault circuit breaker be used.

 Failure to observe these warnings may result in personal injury or damage to the heater.

INTRODUCTION

Your Lynx® Temperature Control System supplies a complete network of temperature control by providing each system an Operator Interface Panel and PID Control Module to each heater. A Lynx® Module is a compact PID temperature controller with RTD, J-Type, or K-Type Thermocouple feedback. The Lynx® Modules per string and 1024 heaters per OI. This unit displays user configurable graphical mapping, custom naming, and sending email alerts via hard wire CAT-5 connection or WIFI networking. These are just some of the features that the LYNX OI provides that help with complete system control and optimization for heating applications. This manual will provide information on these features and other advanced configurations for using the Lynx Temperature Control System. For successful operation of this system, please read these instructions prior to use.
Operator Interface Panel acts as a Global Programming Master for 1—8 heater strings with up to 128 Lynx

General Specifications

- Voltage: 100-277 VAC, 50-60 Hz
- Temperature Control Range: 32°F to 1112°F (0°C to 600°C)
- Sensor Input: Type-J or Type-K Thermocouples; PT100 RTD
- **Accuracy:**
- RTD +/- 0.25°C + 0.125% of measured temperature in °C (+/- 0.45°F + 0.125% of (measured temperature in °F – 32))
- J-Thermocouple +/- 1.09°C (+/-1.96°F)
- K-Thermocouple +/- 1.125°C (+/-2.03°F)
- Max Amp Load per Module: 7 amps at 77°F (25°C) ambient; 4 amps at 104°F (40°C)
- **Display:**
- Operator Interface: 10.1" (257 mm) full-color touchscreen
- Mounting Pattern: VESA mounting pattern on the back of the unit
- Module: 3 digit display
- **Alarms:**
- Operator Interface: 9 Dry contacts, one per string and one master for system
- Dry Contact Electrical Ratings: 30 VAC/VDC, 5 amps
- Module: High Visibility, Multi-color LED status indicator
- String Length: 30m
- **Environmental Rating:**
- Operator Interface: IP10
- Module: IP20
- **Environmental Exposure:**
- Operating Range: 32°F to 130°F (0°C to 54°C)
- Storage Range: -40°F to 140°F (-40°C to 60°C)
- Relative Humidity: 0 to 80% (non-condensing)

LYNX Load Amperage De-Rate Curve by Duty Cycle(Touchsafe)
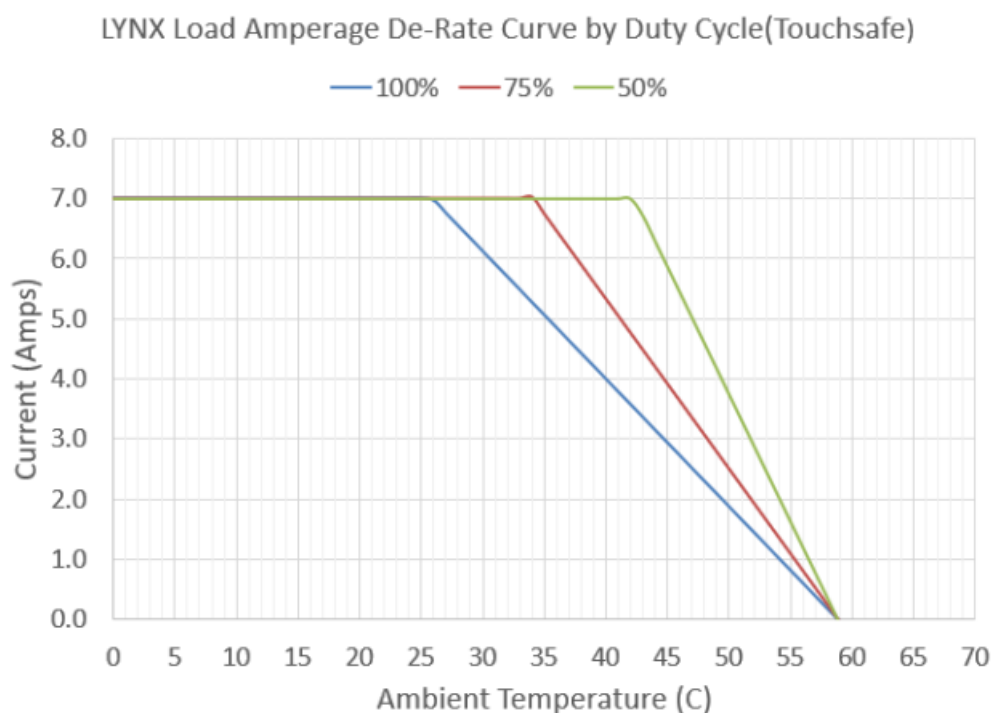
LYNX HARDWARE OVERVIEW

1. **Up Button**

   Used to move up through the Menu options and adjust parameters.

2. **Down Button**

   Used to move down through the Menu options and adjust parameters.

3. **Function Button**

   Multi-use button used to access menu options, select and enter new parameters, and save them. Refer to table 2 for module programming instructions.

4. **Display**

   Displays the current temperature, menu options, and parameters.
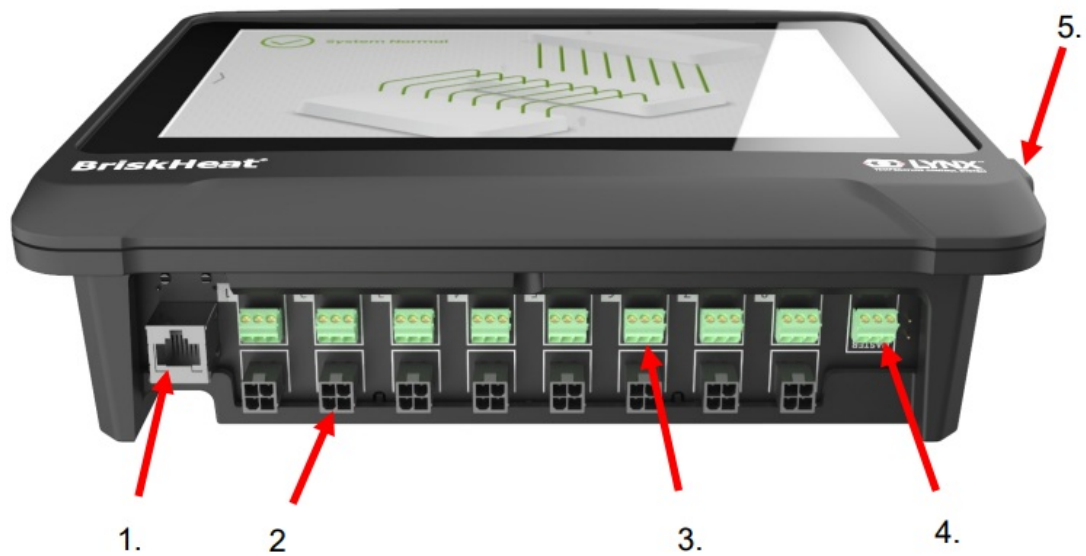
5. **Heater Output**

   Displays the current status of the heater output (on/off)

6. **LED Indicator Light**

   Lighted display that provides the status of the LYNX Module.

   Refer to table 1 for description of color codes.

1. Ethernet Port

   Used to connect the Operator Interface Panel to an Internet Connection or Local Area Network. (Required for Modbus TCP/IP communication)

2. LYNX Module Communication Connector

   Used to connect a LYNX Communication Harness to the Operator Interface Panel.

3. Dry-Contact Relay

   Used to connect customer provided equipment to monitor Alarms. Each Dry-Contact Relay corresponds with the communication port above it.

4. Master Dry-Contact Relay

   Used to connect customer provided equipment to monitor Alarms in conjunction with a heating system, this relay is connected to all 4-Pin connector ports.

5. USB Port

   Used to connect a USB Storage Device* to the Operator Interface Panel for uploading system drawings and exporting Data acquired during operation with the panel.

   * USB Devices must be formatted in FAT32 for proper communication with the Operator Interface Panel.

LYNX MODULE POWER INPUT CONNECTOR DIAGRAM
FOUND ON ALL LYNX JACKETS, STAND-ALONE DOCKING STATIONS (P/N: LYNX-DOC1-XX), AND EXTENSION CABLES.
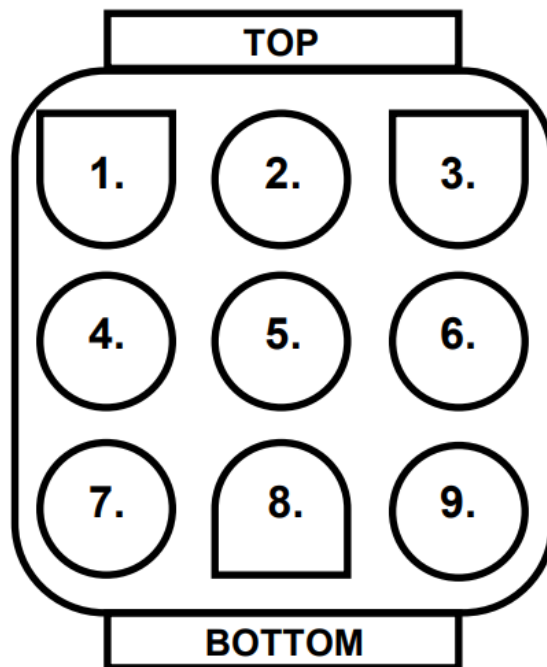
CONNECTOR P/N: TE MATE-N-LOK

P/N: 1-480706-9

1. PIN: L1 Contact: 350705-1	2. PIN: EARTH GROUND Contact: 350669-1	3. PIN: L2 Contact: 350705-1
4. NOT USED	5. PIN: DIGITAL GROUND Contact: 350706-1	6. NOT USED
7. PIN: RS-485A Contact: 350706-1	8. PIN: RS-485B Contact: 350706-1	9. PIN: ENUMERATION Contact: 350706-1

COMMUNICATION HARNESS CONNECTOR DIAGRAM
FOUND ON LYNX OI COMMUNICATION HARNESSES (P/N: LYNX-HN-XXX).

TOP

3.

4.

1.

2.
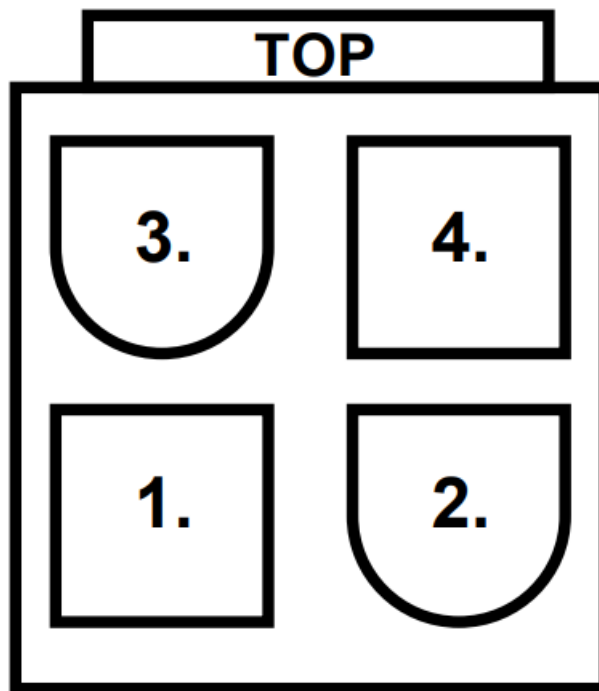
CONNECTOR P/N: MOLEX MINI-FIT JP
P/N: 39012040

3. PIN: RS-485A Contact: 39-00-0039	4. PIN: RS-485B Contact: 39-00-0039
1. PIN: DIGITAL GROUND Contact: 39-00-0039	2. NOT USED

LYNX SYSTEM SETUP GUIDE

STEP 1: INSTALL HEATERS

Install the heaters onto the parts to be heated. Ensure that the heaters make good contact across their entire area. If not included in the heater, attach a temperature sensor to the part as recommended by the heater manufacturer. If using stand-alone Lynx docking station assembly, ensure heater plug matches receptacle. Wire appropriate plug

on heater if required.

STEP 2: ATTACH LYNX MODULES AND CABLES

Connect Lynx Modules to docking stations, ensure clips are fully engaged on both sides.

Connect any additional Lynx docking stations to each other.
For stand-alone Lynx docking stations:
Connect RTD/Thermocouple sensors to the sensor port and connect heater power plug to heater receptacle.
Ensure that all docking stations are secured properly to the heaters or in such a way that the harness is not hanging freely. All modules features a removable clip on the bottom that can be secured to a variety of surfaces.
Connect a power harness to the first heater in each string and to electrical power. All modules will start in Disabled Mode and will therefore not heat until the control mode is changed by the operator.

STEP 3: MOUNT OPERATOR INTERFACE
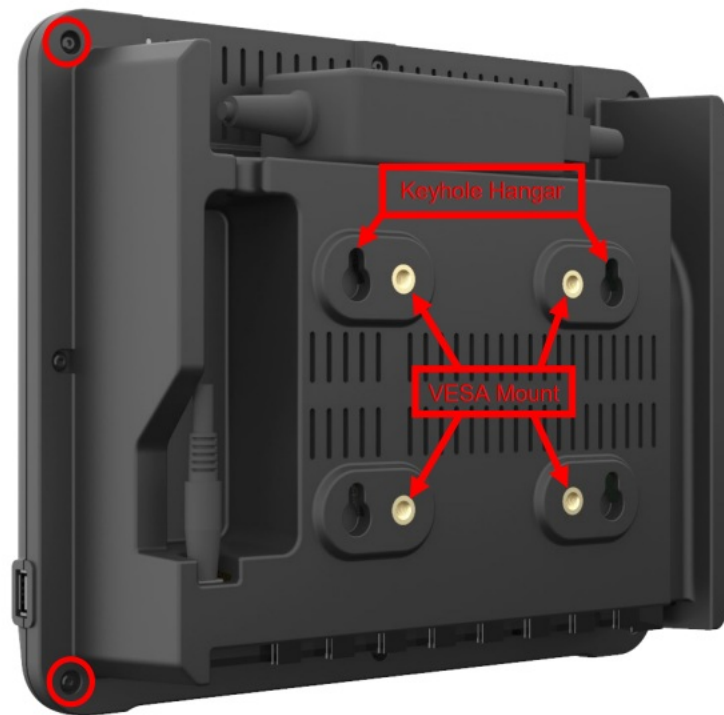
Mounting Options:
VESA / FDMI Mount
75 x 75mm on center spacing.
M6 x 10mm Inserts Provided.
Keyhole Hangar
Quantity of 4 Keyhole hangars are provided.
For use with screws or anchors.
Recessed / Panel Mounted
Cut opening to the dimensions shown below.
Remove the four screws in the corners of the Operator Interface.
Insert the Operator Interface into the cutout.
Use the four extra screws provided to replace the four removed.
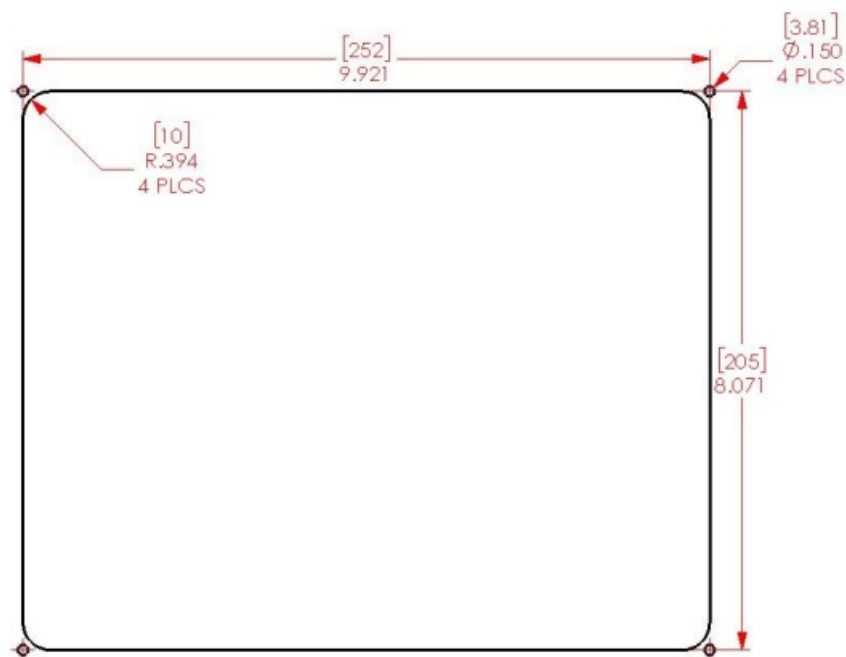
TEP 4: CONNECT OPERATOR INTERFACE

Connect the first Dock of each string to the Operator Interface Panel via the communication connector on the power harness. Any of the available input ports (1 – 8) may be used. Ensure all wiring connectors are fully and properly engaged.
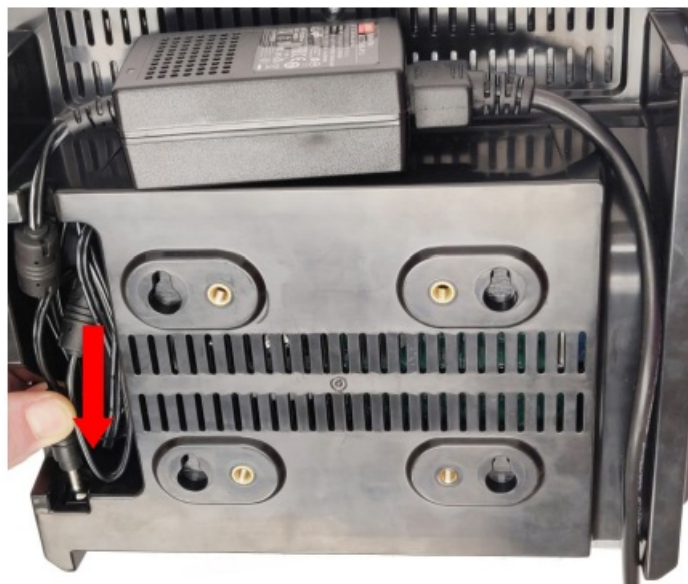
Plug in the power connector on the back of the Operator Interface.
Once the Operator Interface is plugged in, it will immediately turn on. Once it has fully booted up, configuration of the Operator Interface may begin.

OPERATOR INTERFACE CONFIGURATION

STEP 1: SYSTEM SETUP
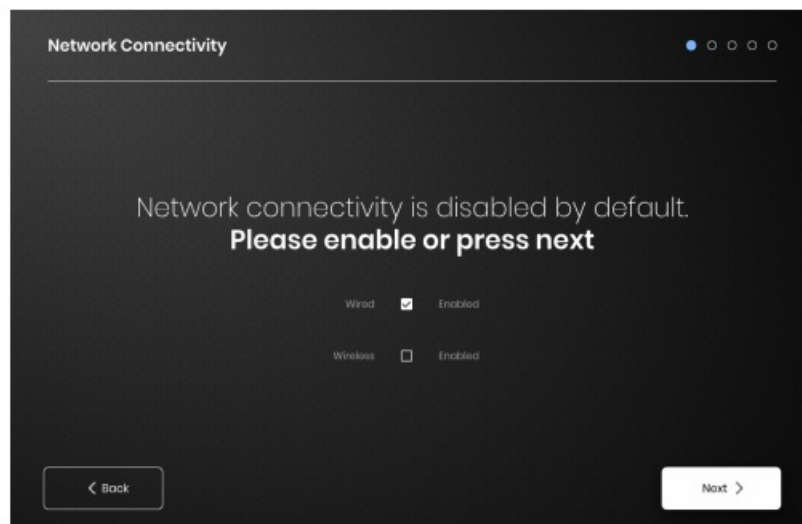
Configure network connectivity settings.
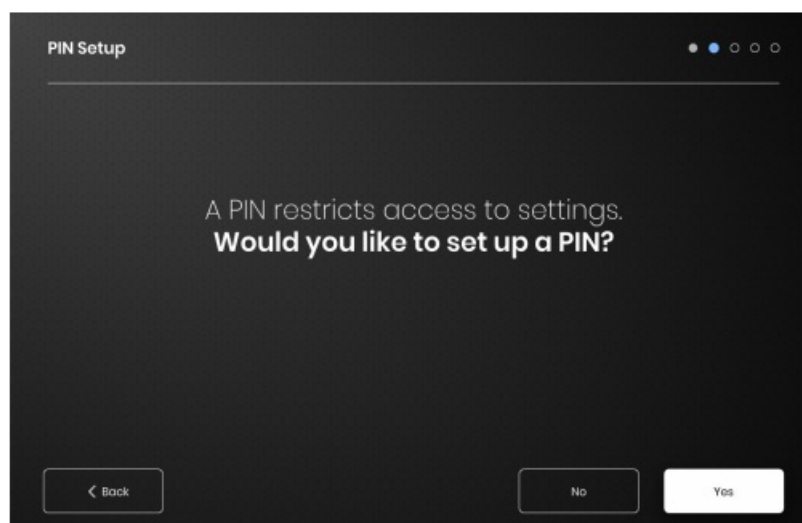
Set a PIN to restrict access to the unit, if desired.
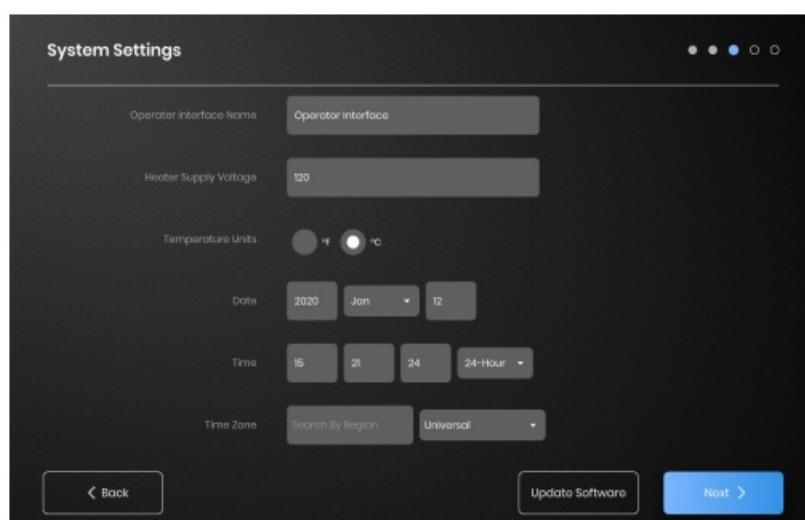
Assign the following values: Unit name, intended Supply Voltage, Temperature Units, Date and Time.

STEP 2: FACILITY SETUP
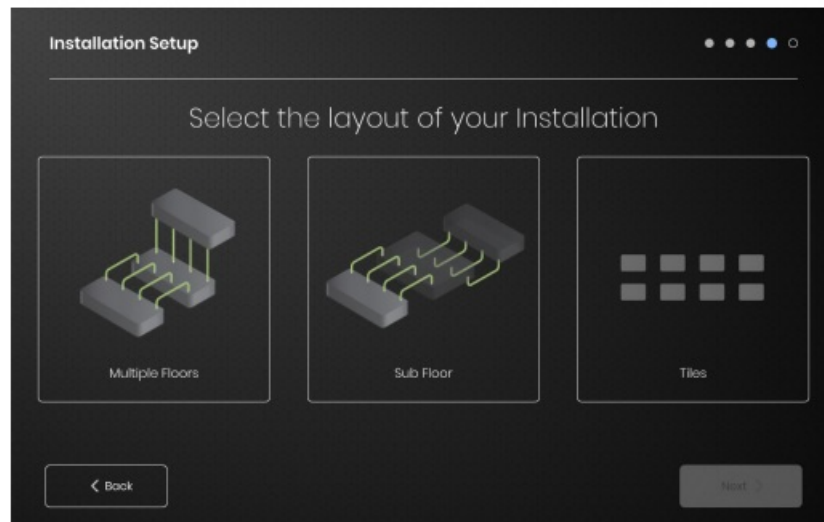
Select the facility map that best resembles the layout of your facility:
-Multiple Floors
-Sub Floor
-Tile indication if no map representation is needed or desired
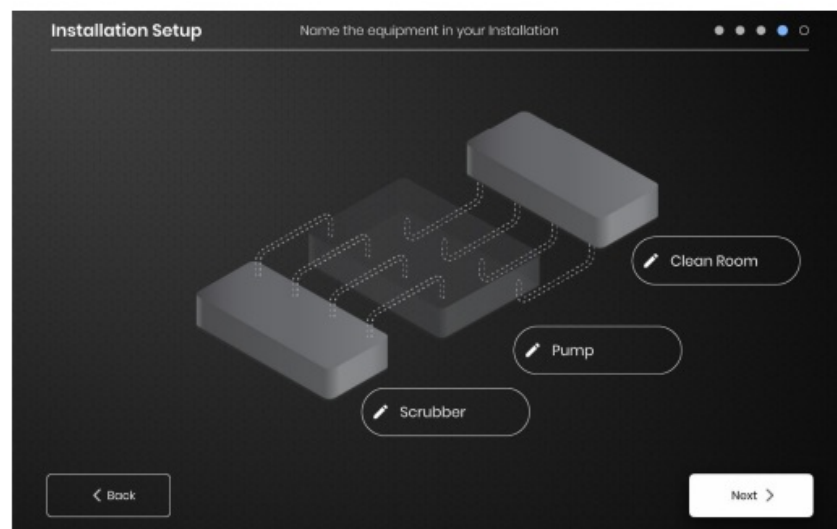
Assign names for each section of your facility by selecting the pen icon next to each text box. A text box will appear enabling text editing.
Default names will be applied if no custom names are assigned.
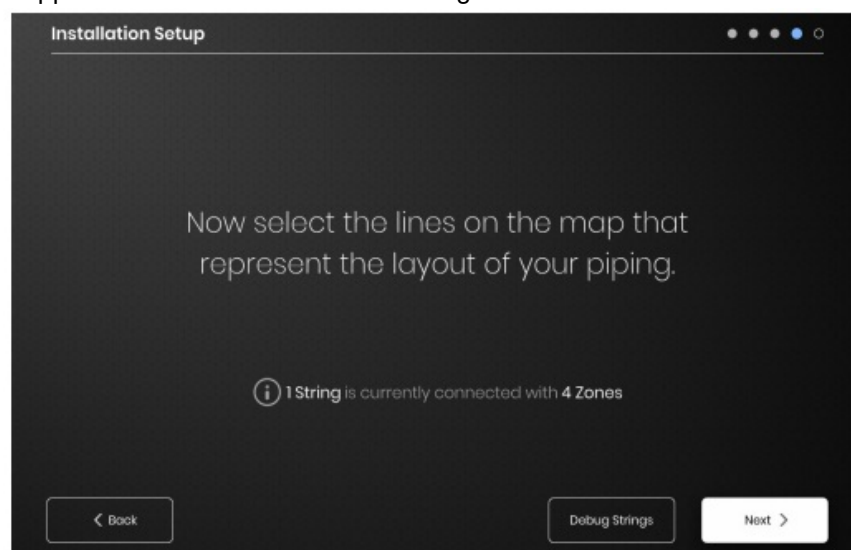
Ensure that the number of detected Strings and Zones matches what is plugged into the OI. If an error is present,

the "Debug Strings" button can help with identifying which Strings or Zones are having issues.

STEP 3: STRING AND ZONE SETUP

Select the number and position of lines that most closely represents your facility. A minimum number of lines equal to the number of physical communication Strings connected to the OI must be assigned.	Each String can be split into multiple lines if desired. The selectable green line dots represents a group of one or more heaters connected together. Each String can have multiple lines assigned to it.
Assign Zones: Select a line in the installation setup. Name the line if desired by clicking in the "Line Name" box to bring up a keyboard for name editing. Assign to each line the desired number of Zone addresses from each String.	The "Address Range" button lets you customize the number and order of Zones from a String are on each line.
Setup is complete after all Zones have been assigned.	
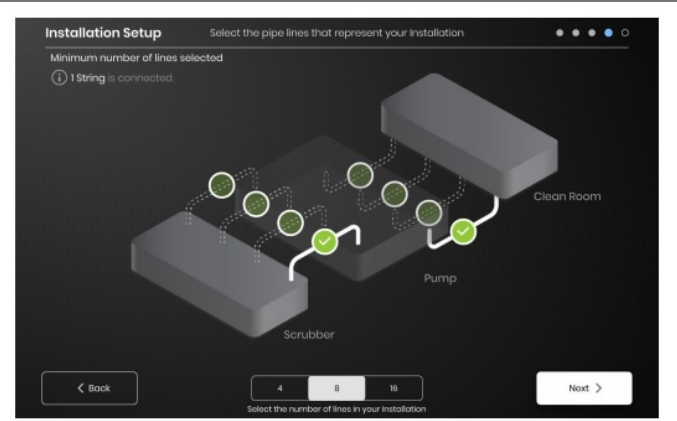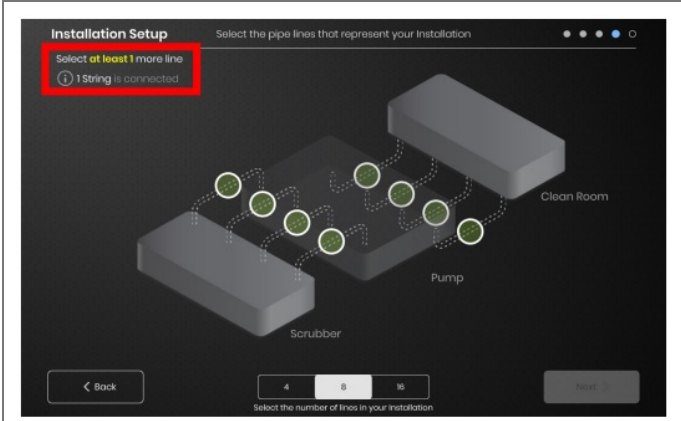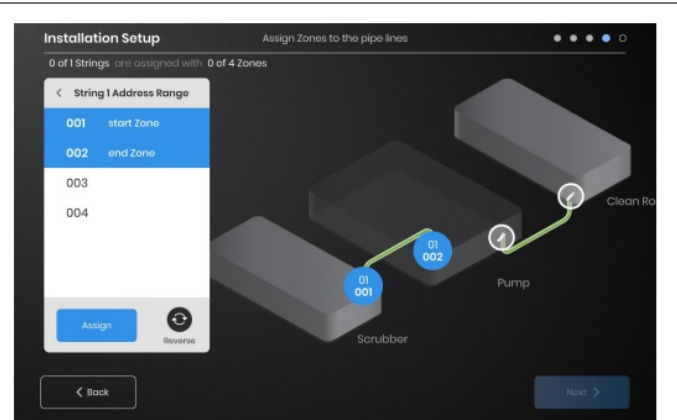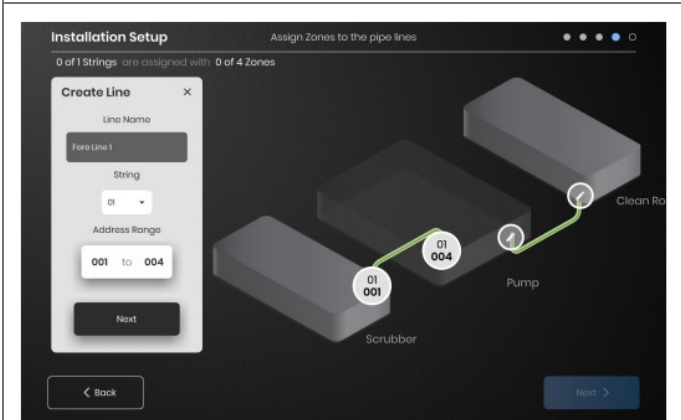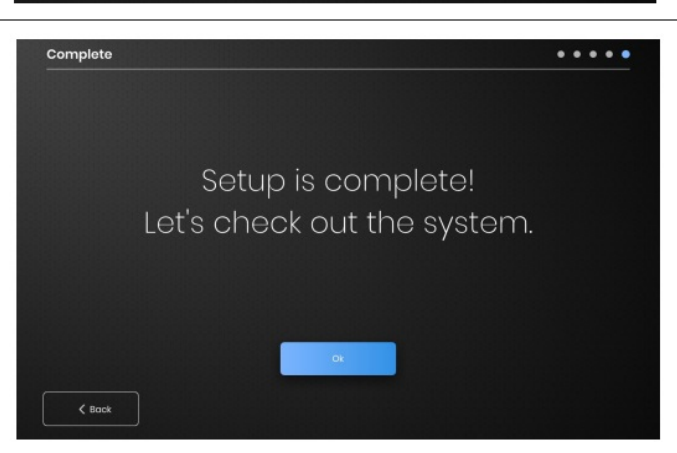
OPERATOR INTERFACE OVERVIEW

Operator Interface Panel Main Screen

1. System Status
2. Zone Detail—More information on current Zone statuses. Modules by default will start in "Disabled" Mode until the Control Mode is changed.
3. System Access Button—Press on this icon to access line and Zone views, edit parameters, view/export data, and access system menu options.
4. USB Indicator Button—Appears if a USB is inserted into the OI.
   Press to safely eject the USB.
5. Power Button—Press on this icon to access options to shut down or restart the Operator Interface Panel.
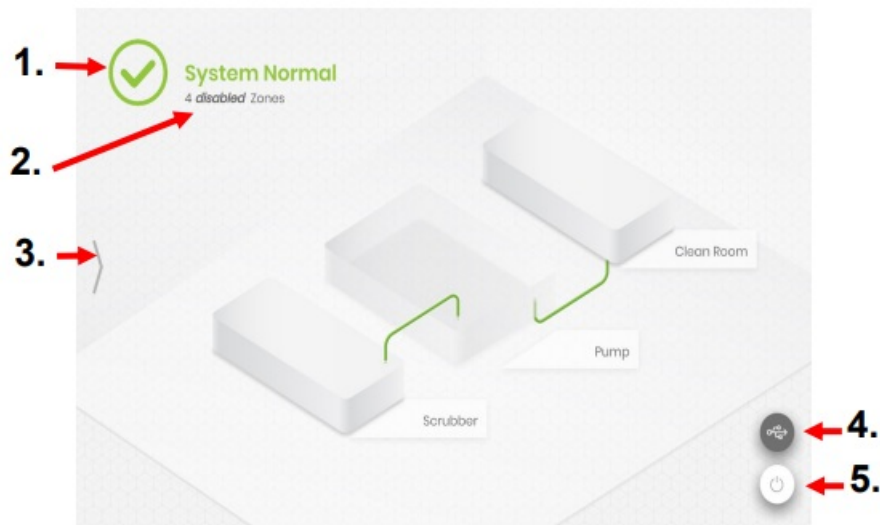
VIEW AFTER PRESSING SYSTEM ACCESS BUTTON

After Pressing the System Access Button, the following become available:

1. System Menu—Select this Option to bring up the Operator Interface Settings. See the "System Menu" section for more details.
2. Line Selection Panel—Select a line to view each Zone in that line.
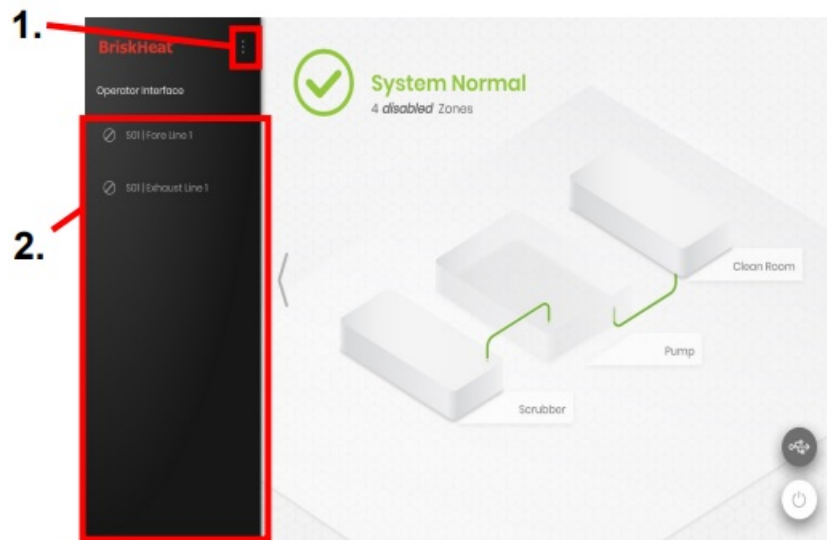
After selecting a line on the Line Selection Panel, the interface expands out again:

1. Zone Selection Panel—Displays Each Zone within a selected line.

   Displays the current status, Zone number, Set Point Temperature, Current Temperature, and % Duty Cycle. Select a zone to view additional details and to edit parameters. The check boxes next to each zone allow for the selection of multiple zones at a time.
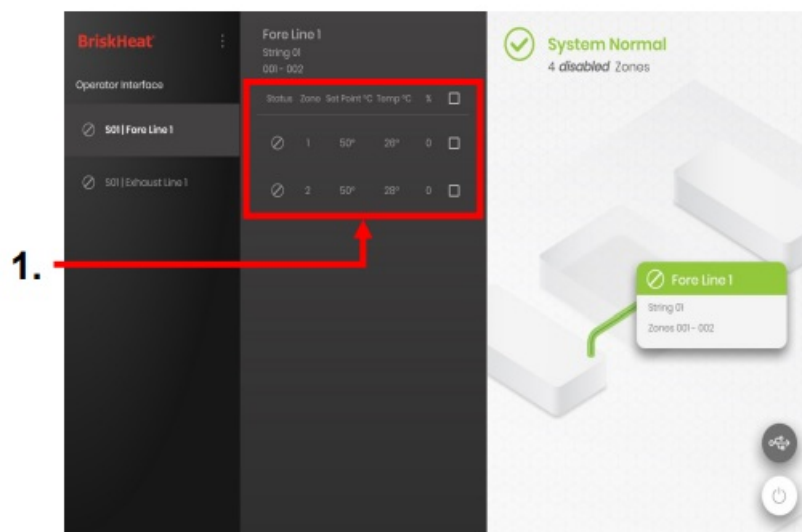
ZONE DETAIL SCREEN

After selecting one or more Zones, the interface expand again to reveathe following:

1. Data Export Button—Select this to export system data collected bthe Operator Interface (See Section on Exporting Historical Date).
2. Historical Data Viewer—Select this to view the Temperature DataDuty Cycle, and Current data acquired during system operation.
3. Selected Zone Information— Displays additional information for thselected zone including Low, Caution, and High Alarms, Sensor

   Type, Firmware version, Part and serial numbers. If multiple Zoneare selected then only the first selected Zone

will be shown.

4. Edit Parameters—Select this to edit parameters for the selected Zone(s).

5. Locate—Select this to Locate a Zone in a line. This will prompt thLYNX Module for that Zone to begin flashing white for easier idenfication. This will time-out after 2 hours.

6. System Drawing—Select this to view a System Drawing (See Section on Uploading System Drawings).
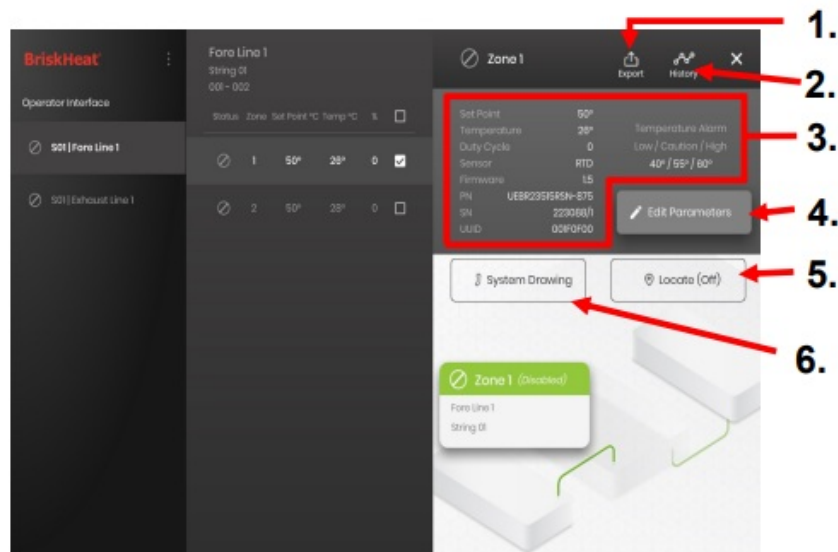
EDIT PARAMETERS SCREEN

1. Zone Line Display—Shows current Line, String, and Zones within a selected Line.

2. Zone Status Display—Select individual, multiple, or all Zones to configure parameters.

3. Zone Preset—Select named presets for easy loading of predefined parameters into each Zone. Presets must be created separately in the system menu before they can be used.

4. Normal Mode tab—Tab for editing operating parameters applied during normal use.

5. Idle Mode tab—Tab for editing operating parameters applied during Idle Mode (Idle Mode Setpoint and Idle High/Low Alarm).

6. Advanced tab—Tab for editing advanced operating parameters such as Ramp Rate.

7. Temperature Set Points— Used to set the target operating temperature.

8. Alarm Set Points—Adjust and set the Low, Caution, and High Alarms.
   Low Alarms are used to alert you to a heater that is too cold. Caution Alarms are used to alert you to a heater that is too warm. High Alarms are used to alert you to extreme overshoots in temperature in a heater.
   The High Alarm will turn off the heater if exceeded. These Alarms protect the heater and your equipment/materials from exceeding temperature limitations that may cause degradation in product quality.

9. Latch— Check these boxes to require the User to manually acknowledge and clear each Alarm should one trigger during operation.

10. Control Mode—Can toggle the Module control Mode between On/Off, PID, Auto-tune, and Disabled. Modules are set to Disabled by default.

11. Idle Mode Enable—check this box to enable Idle Mode and the parameters defined in the Idle Mode tab.

12. Send Update—Applies all parameters in all fields of all tabs of the Edit Parameters menu.

UPLOAD SYSTEM DRAWINGS

1. Insert a USB Flash drive into the side port of the Operator Interface Panel.The Panel will prompt the user with a confirmation that a USB Device has been connected, select "Eject" to disconnect the USB Flash drive or "Okay" to proceed with the connection.

2. Select the System Menu options then select the Facility Setup tab. Select the System Drawing tab, pick the drawing in the window to be uploaded, then select "Add Drawing". Multiple drawings can be added.
   *System drawings must be saved in .png or .jpeg format.
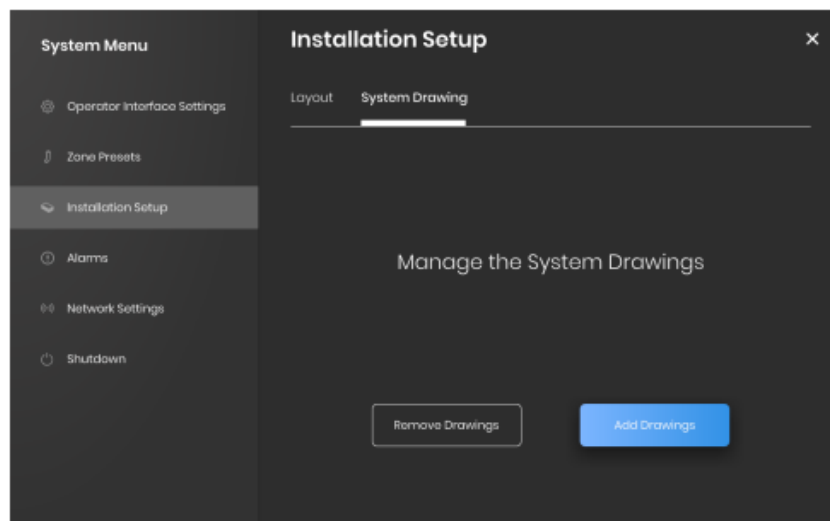
VIEW SYSTEM DRAWINGS

Select a Zone and select the "System Drawing" button to view the uploaded drawing.
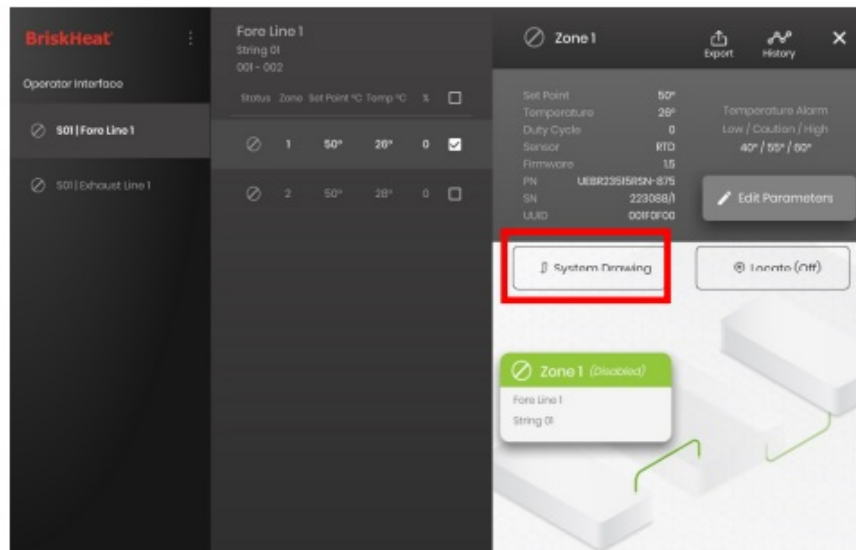
1. The drawing can be expanded or minimized by pinching to view in greater detail. Use the right and left arrows to scroll between multiple drawings. Press on the X button to close out of the drawing viewer Mode when finished.

2. A icon is present on the overview screen of the Operator Interface Panel to indicate that a USB device is connected to the Panel. Press on the icon to access the menu to safely eject the USB Flash Drive.
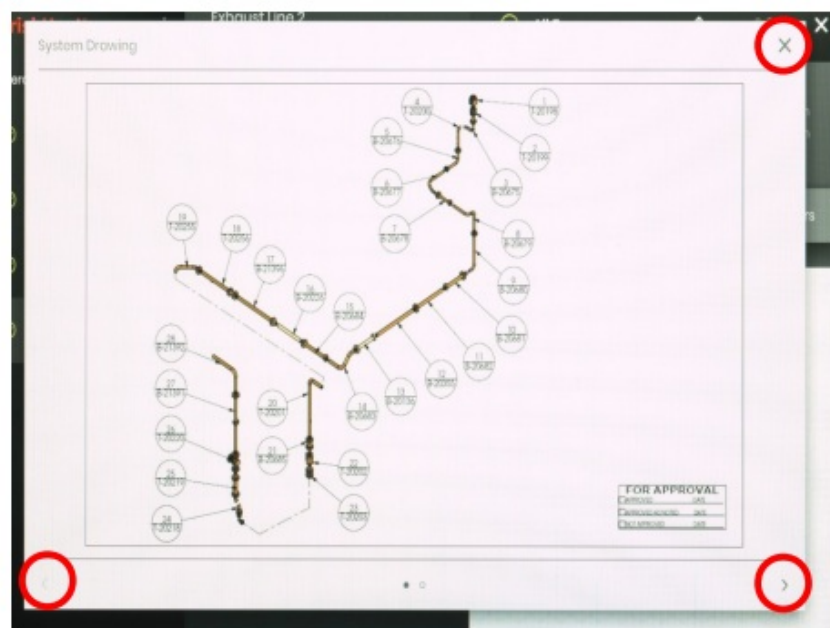
VIEW HISTORICAL DATA

Select a Zone from the overview screen. Select History to view the data acquired by that Zone's Module.
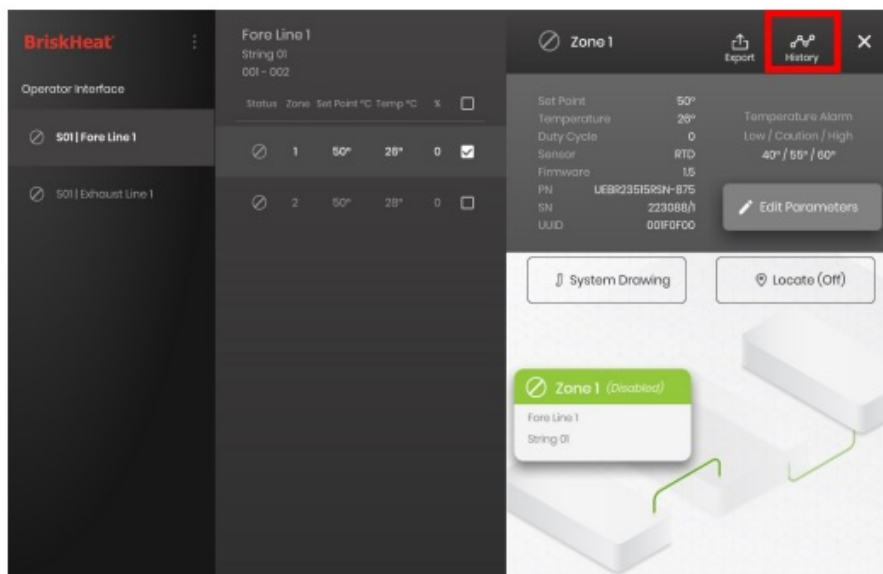
The Zone history can also be accessed via the Alarm and Alert settings
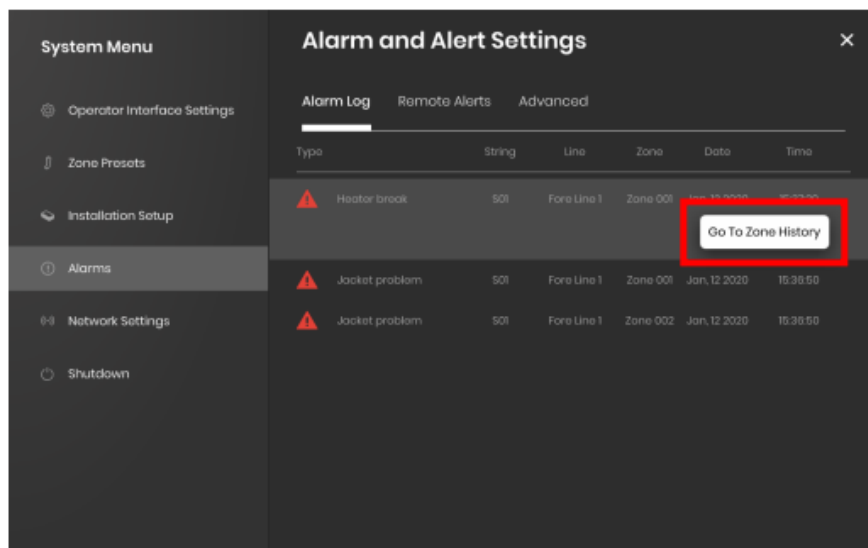
Data is viewed graphically and includes: Temperature (Setpoint and Actual), Duty Cycle, Current, and Alarm temperature (if viewing from Alarm and Alert settings). Please note that the Operator Interface Panel will not actively update the graphical data in real time. Clicking on the Lookup History button will refresh the data, or a date range of the data can be selected.

EXPORT HISTORICAL DATA

1. Insert a USB Flash drive into the side port of the Operator Interface Panel. The Panel will prompt the user with

a confirmation that a USB Device has been connected. Select "Eject" to disconnect the USB Flash drive or "Okay" to proceed with the connection.

2. Export data by selecting a Zone then clicking on the Export Button.

Once a specific series of dates to export data from has been selected, a file will be exported in a .CSV extension to the connected USB Flash Drive. Use the checkboxes to export data from multiple zones on a string at the same time. Each Zone will have its own .CSV file for data.
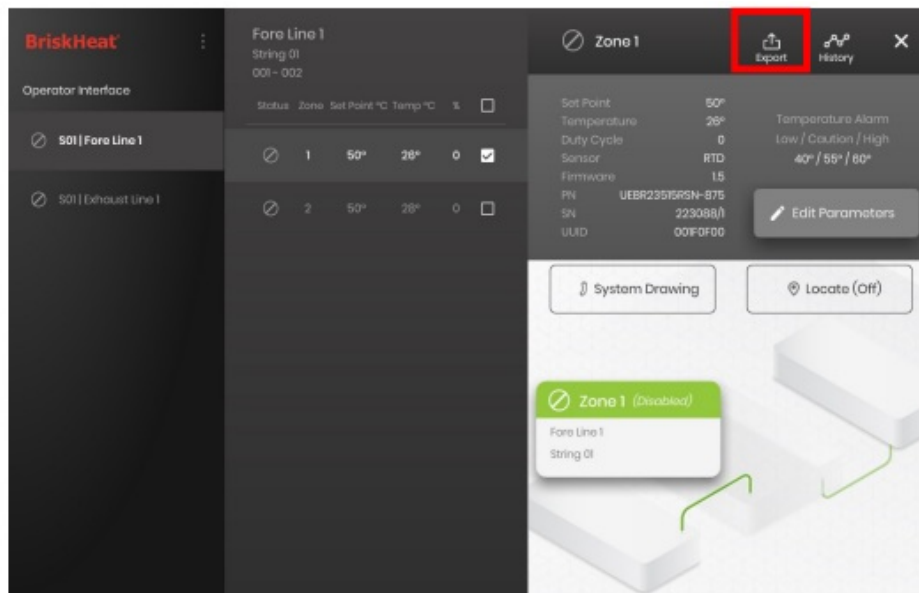
A icon is present on the main Idle screen of the Operator Interface Panel to indicate that a USB device is connected to the Panel. Press on the icon to access the menu to safely eject the USB Flash Drive.
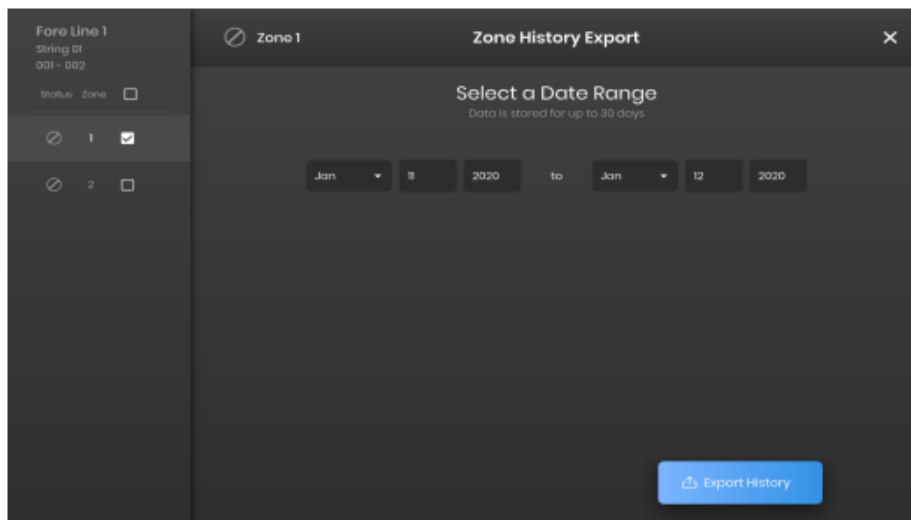
SYSTEM MENU

After Pressing the System Access button on the Operator Interface Overview screen, the System Menu is brought up and contains the following options:

1. Global Edit—See "Global Zone Edit" section
2. Operator Interface Settings—See "Operator Interface Settings" section
3. Zone Presets—See "Zone Presets" section
4. Facility Setup—Allows you to redo the Operator Interface Configuration setup as done in initial provision in the event the layout of your installation changes.

5. Alarms—See "Alarms" section.
6. Network Settings—Access and edit network settings
7. Shutdown—Shuts down the Operator Interface
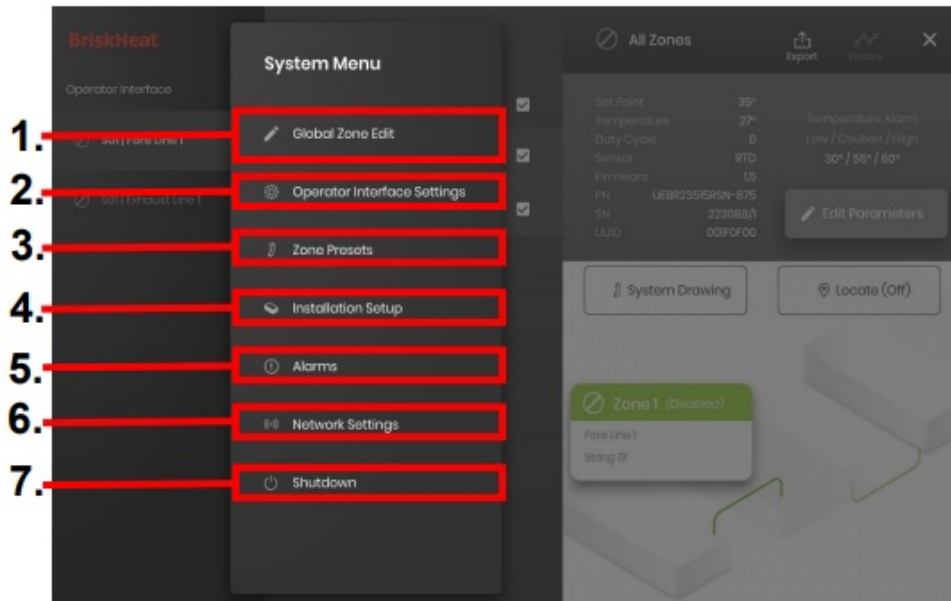
GLOBAL ZONE EDIT & MODULE FIRMWARE UPDATE

Behaves like the "Edit Parameters" screen for a Zone but will apply the parameters to the entire system. Used if your whole system is to be controlled to the same parameters.
Firmware Update Button—use this to update the module firmware if it is out of date.

To update module firmware:

1. Insert a USB Flash drive into the side port of the Operator Interface Panel. The Panel will prompt the user with a confirmation that a USB Device has been connected. Select "Eject" to disconnect the USB Flash drive or "Okay" to proceed with the connection.
2. Select "Firmware Update" and select the firmware file to use in the update. A progress bar on-screen will display the firmware update progress. Modules will not operate or provide recordable data while the firmware update is in progress.
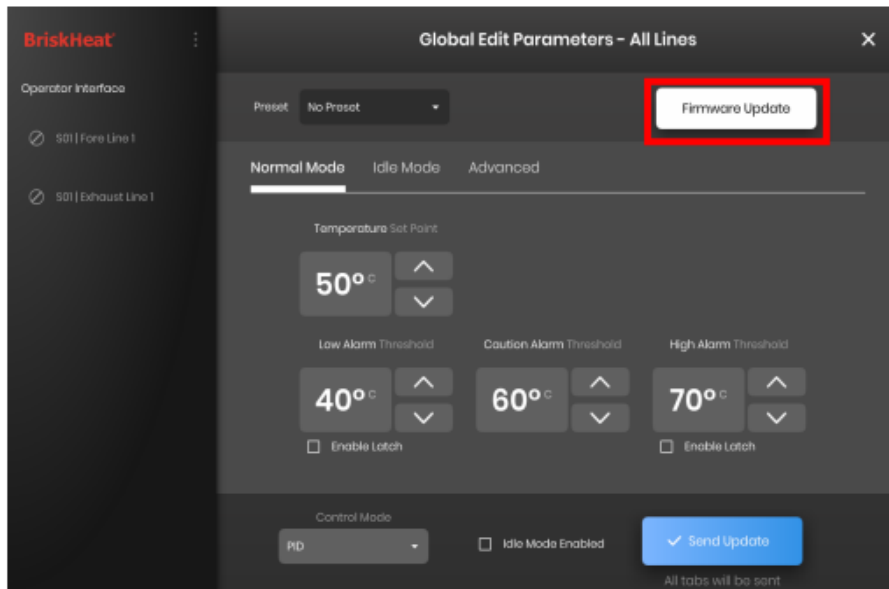
OPERATOR INTERFACE SETTINGS

Operator Interface Setting tabs:

- General—Access and edit System name, supply voltage information, temperature units, date and time.
- Manage PIN—Edit and enable/disable the security lockout PIN.
- Factory Reset—This tab will allow you to reset the OI to its factory defaults. This will delete all zone data and system settings.
- About—Version information for the Operator Interface and where the software can be updated.
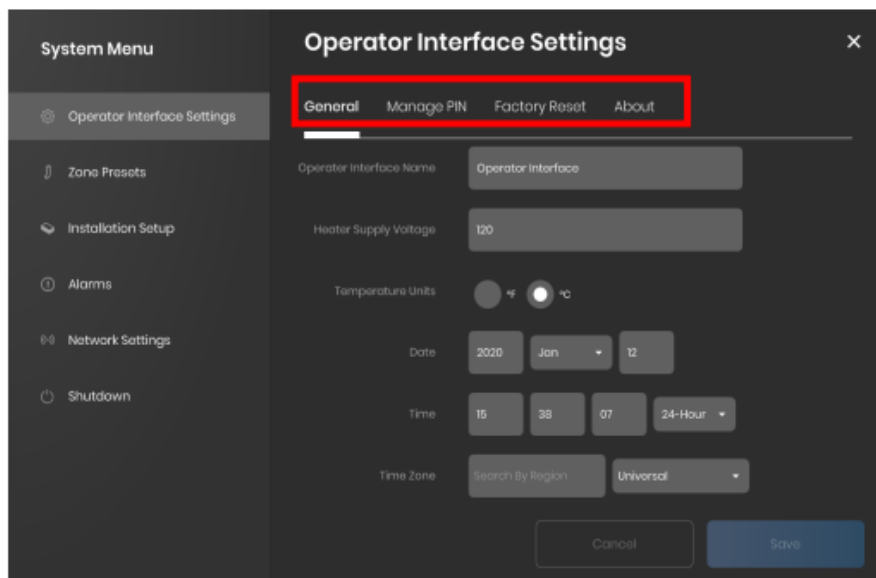
ZONE PRESETS

Zone Presets allow you to create custom parameter profiles that can be quickly assigned to a Zone during Edit Parameters. Each Preset profile will auto-fill the fields in Edit Parameters with the selected profile's parameters. All Preset tabs (Normal Mode, Idle Mode, Advanced) will be assigned when applying the preset profile to a Zone.
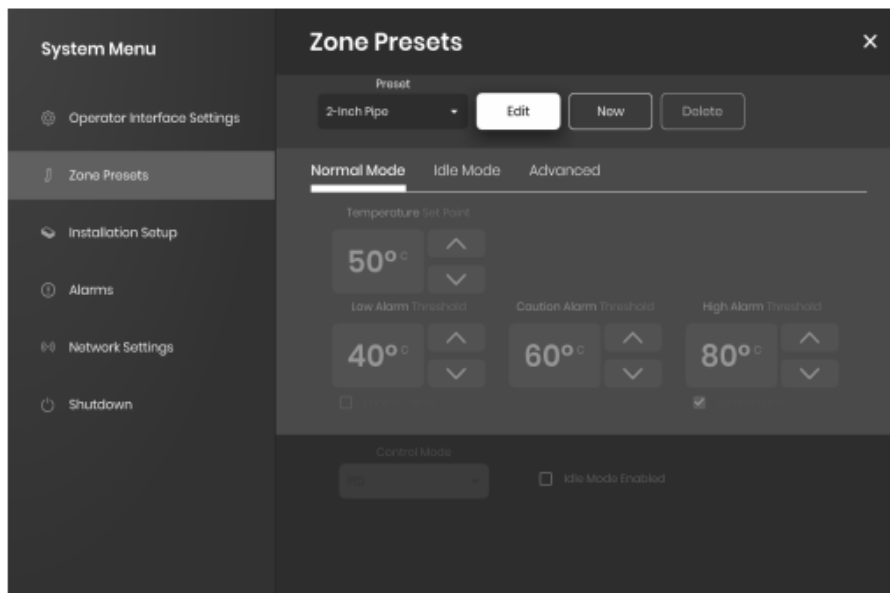
ALARM LOG

The Alarm Log Tab tracks and logs all Alarms experienced by the system. For further detail on an alarm event, pressing the "Go To Zone History" button will bring up the Zone History Graph, centered on the event in question.
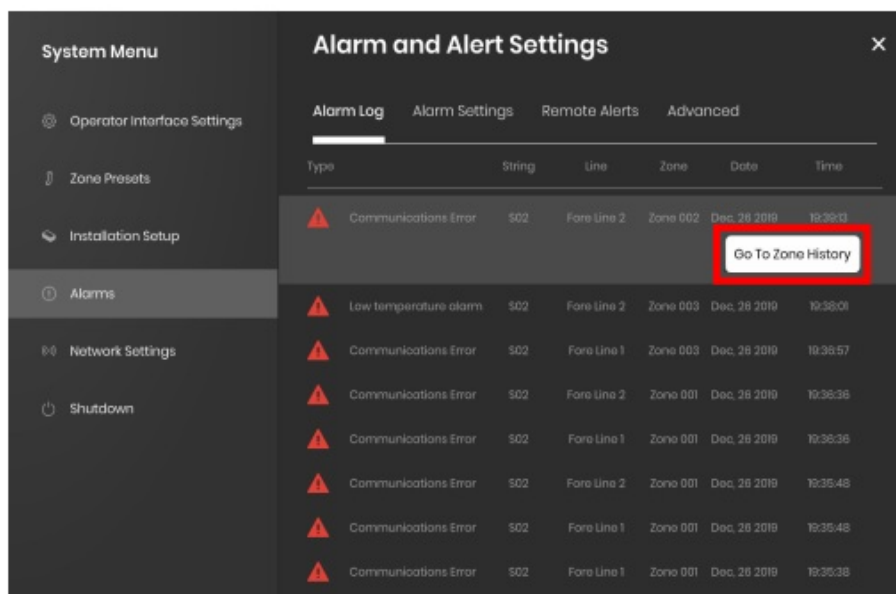
ALARM SETTINGS

The Alarm Settings Tab allows you to set which groups activate the dry contact relays. The Alarm Delay will cause the system to wait a set period of time before activating the dry contact alarm. If the condition is resolved before the delay time is reached, then the alarm will not be activated at all. The Number of Zones Before Alarming setting can be used to only trigger the dry contact alarm if multiple alarm conditions exist. Alarm Types can also be set from this tab— high temperature, low temperature, over current, jacket problem, etc.

Only conditions that are selected will be considered. On this tab, you can also set the Master Contact Behavior— to either ignore group alarm settings and activate the master contact when any alarm is present, or only activate the master contact when a group alarm is present.
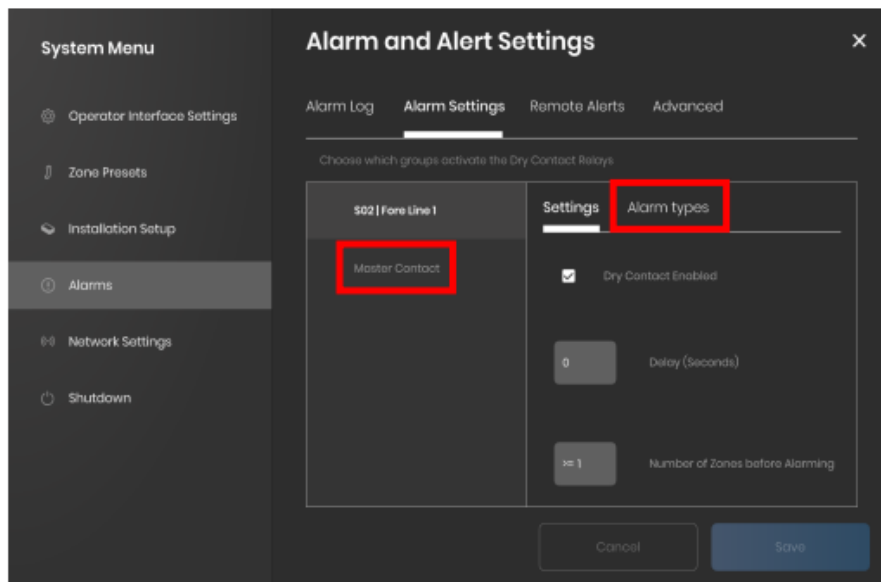
REMOTE ALERTS & ADVANCED

The Remote Alerts tab allows for the configuration of email alert notifications. A valid email and SMTP server for the Operator Interface to use to sends alerts with must be provided by the user in order for the OI to be able to send remote alerts. The Advanced tab details additional SMTP authorization and connection type settings for use with the Remote Alerts.
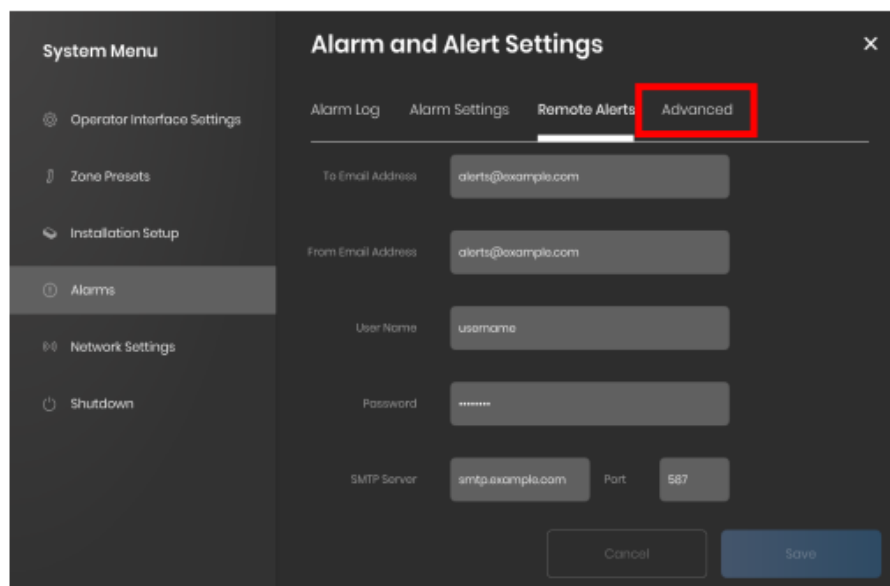
TABLE 1: LYNX MODULE LED COLOR INDICATIONS

Color / Action	Meaning	Explanation
White (blinking)	Locate – find me	Activated by selecting the Locate button on the Operator Interface.
Red (solid)	Module overheat	This is triggered whenever the Module internal temperature is above a threshold temperature of 80°C.The heater output is disabled when this Alarm is active
Pink (blinking)	Sensor fault	This is triggered whenever a Module's Sensor Input field does not match the sensor connected to it, such as con- figuring the Module to read RTD sensor input but connected to a harness that is using a Type-J Thermocouple. This can also be triggered when a sensor fails or is not connected.
Red (blinking)	High Alarm	This is triggered whenever the measured temperature is above the High Alarm threshold. The heater output is disabled when this Alarm is active.
Purple (blinking)	Jacket amperage	This is triggered when the Module measures a current that does not match the specified heater amperage that it is connected to, if the heater is not connected, or if the heater has failed.
Yellow (blinking)	Caution Alarm	This is triggered whenever the heater temperature exceeds the Caution Alarm set point. The heater output is not disabled when the Caution Alarm is active.
Lt Blue (blinking)	Low Alarm	This is triggered when the measured temperature is below the Low Alarm threshold and the Low Alarm Delay has expired.
Purple (solid)	Disabled	Heater output is Disabled. Default state of a Module when it is shipped. This can also occur if swapping a LYNX Module from one Dock to another to prevent the Module from automatically using its previously configured parameters on a new system.
Green (solid)	Normal operation	Module is operating normally.

Note: If multiple conditions are active simultaneously, those higher in the table will take display precedence over those lower in the table.

TABLE 2: LYNX MODULE MENU PROGRAMMING

1. Open the programming menu by pressing the Menu button.
2. Find the desired parameter using the up/down buttons and select with the menu button.
3. Change the value with the up/down buttons and save with the menu button.
4. The menu will time-out after 5 seconds of inactivity and return to the temperature display.

Display	Meaning	Explanation	Factory Default Setting
Setpoint	Setpoint	Temperature in degrees, this is the setpoint that the Operator Interface and Module control the Heating product to during operation.	50°C
Lo Alarm	Low Alarm	Temperature in degrees. The Low Alarm is trigger whenever the heater ex-ceeds the Low Alarm threshold temperature.	40°C
Caution	Caution	Temperature in degrees. The Caution Alarm is triggered whenever the heater exceeds the Caution Alarm threshold temperature.	55°C
Hi Alarm	High Alarm	Temperature in degrees. The High Alarm is triggered whenever the heater exceeds the High Alarm threshold temperature.	60°C
Delay	Low Alarm Delay	Time in minutes. The Low Alarm timer is reset whenever the setpoint, control mode, Low Alarm Delay, are changed, or a Factory Reset.	30 (minutes)
Address	Modbus Address	The Modbus address assigned to the Module.	1
Control	Control Mode	Values: 0– Disabled 1– On/Off 2– PID 3– PID Tuning 4– Manual Duty Cycle	0 (Disabled)

Baud	Baud Rate for serial communication	Values: 0—9600 1— 19200 2— 38400 3—57600 4— 115200	4 (115200 bits/s)
Factory	Factory default	1—Restores all applicable registers to factory default	0
Reset	Fahrenheit Celsius Selection for Display	Change which units are displayed by the menu Values: 0— Celsius 1— Fahrenheit	0 (Celsius)
Unlatch	Unlatch all Alarms	1—Unlatch all current Alarms, Alarms will not unlatch if they are still active.	0

ADVANCED MODULE MODBUS PROGRAMMING

MODULE COMMUNICATIONS

Remote communication to the Module is possible using Modbus-RTU communications over RS-485 serial. Default parameters for communication are 115,200 bits per second, 8 bits per byte, no parity, 2 stop bit. The baud Rate is adjustable using the Module Menu system.

The controller responds to three types of Modbus commands.

1. Read Holding Registers, Function Code 3
2. Preset Single Register, Function Code 6
3. Preset Multiple Registers, Function Code 16

TABLE 3: LYNX MODULE MODBUS REGISTERS

Name	Address	Default	Factory Default	R/W	Description
Unused	0				Unused register

Modbus watchdog	2	10	Y	R W	Number of seconds for the Modbus watchdog timer (if enabled). When this time expires without a valid Modbus command, the device restarts.
Device ID	3	3		R	Identifies what the device is (value 3 is LYNX Module)
Firmware version	4	5		R	Current version of the firmware
Settings	5	0	Y	R W	Bitfield that specifies other settings. See settings table for more infor-mation.
Current temperature	6			R	Temperature in units of 0.01 degrees Celsius. Divide by 100 to get actual temperature
Status	7			R	Bitfield that expresses the current condition of the Module, see table for bit definitions
Status2	8			R	Bitfield that expresses the current condition of the Module, see table for bit definitions
Current	9			R	Measured RMS current of the jacket. Units of milliamps.
Duty cycle calc	10			R	The actual Duty cycle of the Module. On off Mode simply reports 0 or 100% Duty cycles.
Temperature Setpoint	11	5000	Y	R W	Temperature setpoint in units of 0.01 degrees Celsius. Divide by 100 to get actual temperature setpoint
Hysteresis	12	10	Y	R W	Hysteresis in units of 0.01 degrees C, used in on/off control Mode only, applied as a +- above and below the setpoint. Divide by 100 for the actu-al temperature value
Manual Duty cycle	13	0		R W	Manually specified Duty cycle in percent, ranges from 0 – 100.

Low Alarm	14	4000	Y	R W	Low Alarm temperature in units of 0.01 degrees C. Divide by 100 for actual temperature.
High Alarm	15	6000	Y	R W	High Alarm temperature in units of 0.01 degrees C. Divide by 100 for actual temperature.
Control Type	16	0	Y	R W	Defines the operation Mode of the controller, see table for value defini-tions
Low Alarm timer	17	1800	Y	R W	Length of the Low Alarm Delay in seconds. The timer is reset whenever the control type register is written and when the temperature setpoint is updated.
Sensor type	18	4	Y	R W	Value determines the type of sensor attached to the Module.
Calibrate 1	19	12016	Y	R W	Use for calibrating RTD sensors
Calibrate 2	20	11786	Y	R	Holds the actual measurement for a calibrated RTD sensor
Modbus Address	21	1	Y	W	The default Modbus address the Module uses.
Modbus Address	21			R	The current address the Module is responding to.
Reset	22			W	Write anything to this register to reset the Module.
Period	34	610	Y	R W	Determines the frequency of PID and manual Duty cycle operation. Val- ue is T(seconds) * 40,000,000/65 535
Alarm latching	35	*	Y	R W	Determines which Alarm conditions are latching. See status register table.

Alarm Latching2	36	*	Y	R W	Determines which Alarm conditions are latching. See status2 register table.
Alarm Clearing	37			W	Any bits cleared when writing this register will attempt to unlatch the corresponding Alarm. See status register table.
Alarm Clearing2	38			W	Any bits cleared when writing this register will attempt to unlatch the corresponding Alarm. See status2 register table.
Modbus baud Rate	39	11520	Y	R W	Defines the baud Rate in units of 10 bits per second. Multiply by 10 to get the actual baud Rate in bits per second.
PID P Value	40	55	Y	R W	The proportional value for PID control.
PID I Value	41	1	Y	R W	The integral value for PID control.
PID D Value	42	1500	Y	R W	The derivative value for PID control.
Module temperature	43			R	Measure internal temperature of the Module in units of 0.01 degrees C. Divide by 100 to get actual temperature in degrees C.
Factory default	44			W	Write the value 0x4674 to factory default the Module.

ALARM CLEAR REGISTER
The Alarm clear register (register 37 and 38) is a bitfield that clears latched Alarms when written. See status register for definition of bits.
ALARM LATCHING REGISTER
The Alarm latching register (register 35 and 36) is a bitfield that determines which Alarms latch. See status register for definition of bits.

TABLE 4: LYNX MODULE MODBUS REGISTERS

Name	Address	Default	Factory Default	R/W	Description
Temperature offset	45	0	Y	RW	Used to calibrate measured temperature by adding or subtracting a value to the measured temperature. Units are in 0.001 degrees C. Divide by 1000 to get actual offset value in degrees C. This is a signed value.
Temperature scaling	46	1000	Y	RW	Used to calibrate measured temperature by multiplying measured temperature by a scaling factor. Divide this by 1000 to get the actual scaling value. 1000 corresponds to no change in temperature. This is applied after the offset is applied.
Runtime	47+48			R	Number of seconds the Module has been running. Least significant byte first.
Alarm Count	49+50			R	Number of times the Module has gone into Alarm state for any rea-son. Least significant byte first.
Startup Count	51+52			R	Number of times the Module has started up or restarted. Least signifi-cant byte first.
Modbus Delay	53	10240	Y	RW	Defines how long the Module Delays before responding to a Modbus command.
Low Alarm Idle	54		Y	RW	Low Alarm temperature when Idle Mode is active, in units of 0.01 degrees C. Divide by 100 for actual temperature.

High Alarm Idle	55		Y	RW	High Alarm temperature when Idle Mode is active, in units of 0.01 degrees C. Divide by 100 for actual temperature.
Setpoint Idle	56		Y	RW	Temperature setpoint when Idle Mode is active, in units of 0.01 de-grees C. Divide by 100 for actual temperature.
Temperature Ramp Rate	57		Y	RW	Ramp Rate specified in degrees Celsius per minute. 0 degrees per minute is Ramp Rate disabled. The Module will heat as fast as it canat 0 degrees per minute.
Caution Temperature	58	5500	Y	RW	Temperature for the Caution condition in units of 0.01 degrees C. Divide by 100 for actual temperature.
Minimum Duty Cycle Alarm	59		Y	RW	Minimum Duty Cycle for the Duty Cycle Alarm. Controlled by the Low Alarm Delay.
Maximum Duty Cycle Alarm	60		Y	RW	Maximum Duty Cycle for the Duty Cycle Alarm. Controlled by the Low Alarm Delay.
Number of Jackets	61			R	Number of jackets attached to Module.
Amperage Offset	62			RW	Offset parameter for amperage measurement. Used to calibrate am- perage measurements. Offset is specified in milliamps and is a signed value.

Amperage Scale	63			RW	Scale parameter for amperage measurement. Used to calibrate am-perage measurements. Value is multiplied by 1000.
LED Red Value				RW	Defines the strength of the red channel for each of the LED display Modes. See display Mode table for more information.
LED Green Value				RW	Defines the strength of the green channel for each of the LED display Modes. See display Mode table for more information. The least signifi-cant bit of this register makes the led flash.
LED Blue Value				RW	Defines the strength of the blue channel for each of the LED display Modes. See display Mode table for more information.

TABLE 5: DISPLAY MODE

Mode	Precedence	Address -Red	Address -Green	Address -Blue	Color Name	Default (R) (G) (B)
Good	1	64	65	66	**Green**	**(0) (65534) (0)**
Low Alarm	3	67	68	69	**Blinking Cyan**	**(0) (65535) (0)**
Caution	4	70	71	72	**Blinking Yellow**	**(65535) (65535) (0)**
High Alarm	6	73	74	75	**Blinking Red**	**(65535) (1) (0)**
Sensor Fault	7	76	77	78	**Blinking Magenta**	**(65535) (1) (65535)**
Module Overheat	8	79	80	81	**Red**	**(65535) (0) (0)**
Find Me	9	82	83	84	**Blinking White**	**(36864) (65535) (65535)**
Disabled	2	85	86	87	**Purple**	**(12288) (0) (65535)**
Jacket Amperage	5	88	89	90	**Blinking Purple**	**(12288) (1) (65535)**
Debug	10	91	92	93	**White**	**(36864) (65535) (65535)**
Reserved1	0	94	95	96		
Reserved2	0	97	98	99		
Reserved3	0	100	101	102		
Reserved4	0	103	104	105		

TABLE 6: STATUS REGISTER (LYNX MODULE REGISTER 7)

Value	Latchable[1]	Default Latch[2]	Meaning	Explanation

0x0001	No	No	Alarm Condition	Active when any Alarm is active.
0x0002	Yes	Yes	High Temperature Alarm	Active when High Temperature Condition is present. Remains set until cleared if latched.
0x0004	Yes	No	Low Temperature Alarm	Active when Low Temperature Condition is present. Remains set until cleared if latched.
0x0008	Yes	No	Caution Condition	Active when temperature is above the Caution Temperature.
0x0010	Yes	No	Faulty Sensor	Active when a Sensor Fault is detected.
0x0020	Yes	No	Corrupt flash memory	Active when the crc32 checksum of the flash data fails.
0x0040	Yes	No	Overcurrent	Too much current flowing through jacket.
0x0080	Yes	No	Duty Cycle Too Low	Duty cycle is too low.
0x0100	Yes	No	Duty Cycle Too High	Duty cycle is too high.
0x0200	Yes	No	Jacket Problem	Jacket is drawing more than or less than the expected current.
0x0400	Yes	No	Module Overheat	Active when the internal Module temperature is above a critical limit.
0x0800	Yes	No	Module Overheat 2	Active when the internal Dock temperature is above a critical limit.
0x1000	Yes	Yes	Local Changes	Some settings were changed on the Module using the buttons on the Module. Not an Alarm condition.
0x2000	Yes	Yes	Module power on	The Module has been powered on or restarted.
0x4000	Yes	No	Unknown Sensor	Active when the sensor type is unknown.
0x8000	Yes	No	Sensor Autodetect	The sensor is currently being detected.

1 Latchable means the status bit can be set to be latchable
2 Default latch means the status bit is set to be latchable by default

TABLE 7: STATUS2 REGISTER (LYNX MODULE REGISTER 8)

Value	Latchable[1]	Default Latch[2]	Meaning	Explanation
0x0001	Yes	No	Next Module	The presence of a next Module is detected.
0x0002	Yes	Yes	Address Changed	The Modbus address changed from one valid value to a different valid value.
0x0004	Yes	No	Temperature stability	The measured temperature on the Module is detected as stable.
0x0008	Yes	No	Duty Cycle Stability	The Duty cycle of the Module is detected as stable.
0x0010	Yes	No	Heater Break	The heater is detected as broken.
0x0020	Yes	No	High Temperature Alarm Idle	System drawings must be saved in .png or .jpeg for proper viewing on the Operator Interface Panel.
0x0040	Yes	No	Low Temperature Alarm Idle	System drawings must be saved in .png or .jpeg for proper viewing on the Operator Interface Panel.
Others	Yes	No	Reserved	Reserved for future use

- Any combination of these values can occur simultaneously

TABLE 8: CONTROL TYPES (LYNX MODULE REGISTER 16)

Value	Meaning	Explanation
0	Disabled	Duty cycle is always 0%. Low Alarm and Low Duty cycle Alarm is disabled, other Alarms function normally.
1	On/Off	Temperature control is an on/off algorithm. Duty cycle Alarms disabled, other Alarms function normally.
2	PID	Control algorithm is PID.
3	PID tuning	Controller performs autotuning for PID, control automati- cally switches to PID when complete. Duty Cycle Alarm disabled, other Alarms function normally.
4	Manual Duty cycle	The Duty Cycle is controlled by writing to the Duty Cycle register, Alarms still function normally. Duty cycle Alarm disabled, others function normally.

TABLE 9: SENSOR TYPES (LYNX MODULE REGISTER 18)

Value	Sensor Type
0	100 ohm Platinum RTD
1	K type thermocouple
2	J Type thermocouple
3	100 Ohm Resistor for RTD Calibration
4	Use value specified by jacket[3]
5	Auto detect algorithm
6	Unknown sensor type[4]
7	No sensor present

TABLE 10: SETTINGS (LYNX MODULE REGISTER 5)

Value	Definition	Explanation
0x0001	Locate	When set, the LED will light up in the Locate condition.
0x0002	Idle Mode	When set, the controller switches to using the Idle Mode setpoint, Idle Mode Low Alarm temperature, and Idle Mode High Alarm temperature.
0x0004	Comms Watchdog	Enables a watchdog timer that is reset by the receipt of any good Modbus command
0x0008	Local Change Disable	No settings can be changed using the buttons on the Module when this is enabled
0x0010	Display Fahrenheit	When enabled, the Module Display will show temperature in Fahrenheit instead of Celsius. All other registers remain in Celsius.
0x0020	Debug	Enable debug output on Module.

3 If multiple jacket id chips specific differing sensor types, the result is an unknown sensor error.
4 Unknown sensor type causes an Alarm condition

ADVANCED OPERATOR INTERFACE PANEL MODBUS PROGRAMMING
OPERATOR INTERFACE PANEL COMMUNICATIONS
Remote communication to the Operator Interface Panel is possible using Modbus TCP/IP communications via IEEE 802.3. The default access port is port 502 specifically for Modbus/Register commands. Please refer to the network IP address generated in the network settings of the Operator Interface Panel. The IP Address is generated when the Panel connects to a wired network, WIFI, or is assigned manually.
The network IP Address and port number will be used as a gateway to access the registry for editing the Modbus of the Operator Interface Panel.

TABLE 11: OPERATOR INTERFACE OI LEVEL MODBUS TABLE

	Name	R/W	Modbus Table Type	Address	Notes/Units
	OI Name	R	Input	0-63	64 unicode charcters
	# of active lines	R	Input	64	

	LINE 1 NAME LINE 2 NAME LINE 3 NAME LINE 4 NAME LINE 5 NAME LINE 6 NAME LINE 7 NAME LINE 8 NAME LINE 9 NAME LINE 10 NAME LINE 11 NAME LINE 12 NAME LINE 13 NAME LINE 14 NAME LINE 15 NAME LINE 16 NAME	R	Input	65-96 97-128 129-160 161-192 193-224 225-256 257-288 289-320 321-352 353-384 385-416 417-448 449-480 481-512 513-544 545-576	32 chars * 16 lines. Line name corre- sponds to each of the lines setup in the facility layout. A line can contain any number of strings and Zones that were identified in the initial line setup.
OI Level	NUMBER OF ZONES ON LINE 1 NUMBER OF ZONES ON LINE 2 NUMBER OF ZONES ON LINE 3 NUMBER OF ZONES ON LINE 4 NUMBER OF ZONES ON LINE 5 NUMBER OF ZONES ON LINE 6 NUMBER OF ZONES ON LINE 7 NUMBER OF ZONES ON LINE 8 NUMBER OF ZONES ON LINE 9 NUMBER OF ZONES ON LINE 10 NUMBER OF ZONES ON LINE 11 NUMBER OF ZONES ON LINE 12 NUMBER OF ZONES ON LINE 13 NUMBER OF ZONES ON LINE 14 NUMBER OF ZONES ON LINE 15 NUMBER OF ZONES ON LINE 16	R	Input	577 578 579 580 581 582 583 584 585 586 587 589 590 591 592	

Line Alarm States	R	Input	593	Alarms based on Lines 1 – 16(bits) Used to determine if a line is an Alarmed state per line (bit)
String Alarm States	R	Input	594	Alarms based on Strings 1—16(bits) Used to determine if a string is an Alarmed state per line (bit)
Master Alarm State	R	Discrete Input	0	
Global Enable Idle Mode	R/W	Coil	0	Always 0, write 1 to enable all zone's Idle Mode
Global Disable Idle Mode	R/W	Coil	1	Always 0, write 1 to disable all zone's Idle Mode

ZONE LEVEL MODBUS TABLE
Zone Level Information can be communicated for each Module connected to the Operator Interface Panel. The formula below must be used to calculate the Register Base Address for each Zone.

ZONE BASE ADDRESS CALCULATION
Zone base addresses = ((line#-1) * 3072) + ((zone#-1) * 24)+1024

Zone Offset Examples				
OI Registers	Count/Zone	Line	Zone	Base Address
1024	24	1	1	1024
		1	2	1048
		1	127	4048
		1	128	4072
		2	1	4096
		2	2	4120
		2	127	7120
		2	128	7144
		16	1	47104
		16	2	47128
		16	127	50128
		16	128	50152

TABLE 12: ZONE LEVEL MODBUS TABLE

	Name	R/W	Modbus Table Type	Address	Notes/Units
	Temperature	R	Input	base address	degC * 100
	Duty Cycle	R	Input	1 + base address	%
	Current	R	Input	2 + base address	A * 1000
	Sensor Type	R	Input	3 + base address	
	Set Point	R/W	Holding	base address	degC * 100
	Temp Low Alarm Threshold	R/W	Holding	1 + base address	degC * 100

	Temp Caution Alarm Threshold	R/W	Holding	2 + base address	degC * 100
	Temp High Alarm Threshold	R/W	Holding	3 + base address	degC * 100
	Idle Set Point	R/W	Holding	4 + base address	degC * 100
	Idle Temp Low Alarm Threshold	R/W	Holding	5 + base address	degC * 100
	Idle Temp High Alarm Threshold	R/W	Holding	6 + base address	degC * 100
	Ramp Rate	R/W	Holding	7 + base address	degC * 100 / Minute
	Control Type	R/W	Holding	8 + base address	See Control Mode Explanation (Table 2)
	Temp Controller Present	R	Discrete Input	base address	All others invalid if this is false
	Alarming	R	Discrete Input	1 + base address	
	Locate Module	R/W	Coil	base address	
	Idle Mode Enabled	R/W	Coil	1 + base address	
	High Temp Alarm	R/W	Coil	2 + base address	Write 0 to attempt unlatch
	Low Temp Alarm	R/W	Coil	3 + base address	Write 0 to attempt unlatch
Zone Level	Caution Condition	R/W	Coil	4 + base address	Write 0 to attempt unlatch
	Faulty Sensor	R/W	Coil	5 + base address	Write 0 to attempt unlatch
	Corrupt Flash Memory	R/W	Coil	6 + base address	Write 0 to attempt unlatch
	Overcurrent	R/W	Coil	7 + base address	Write 0 to attempt unlatch

Duty Cycle Low	R/W	Coil	8 + base address	Write 0 to attempt unlatch
Duty Cycle High	R/W	Coil	9 + base address	Write 0 to attempt unlatch
Jacket Problem	R/W	Coil	10 + base address	Write 0 to attempt unlatch
Module Overheat	R/W	Coil	11 + base address	Write 0 to attempt unlatch
Base Overheat	R/W	Coil	12 + base address	Write 0 to attempt unlatch
Unknown Sensor	R/W	Coil	13 + base address	Write 0 to attempt unlatch
Heater Break	R/W	Coil	14 + base address	Write 0 to attempt unlatch
High Temp Alarm Idle	R/W	Coil	15 + base address	Write 0 to attempt unlatch
Low Temp Alarm Idle	R/W	Coil	16 + base address	Write 0 to attempt unlatch

GLOSSARY

Autotune
The controller will operate in On-Off mode for a period of time (typically 10-20 minutes) during which it will learn the behavior of the attached heater to optimize its PID control algorithm. After Autotune is completed the module will automatically switch into PID control mode.

Baud Rate
The baud rate (measured in bits per second (bps)) refers to the speed the control modules will use to communicate on the RS-485 serial bus.
When using an Operator Interface the Baud Rate must be set to 115,200 bps.

Caution Alarm
This alarm is used to indicate an elevated temperature condition. The control module will change color and a message will display on the Operator Interface to indicate this condition. The dry-contact / alarm relays on the Operator Interface will not change state and the heater will continue to function in this condition. This alarm will not function during idle mode. The Caution alarm is typically set above the operating setpoint and below the high alarm setpoint.

Control Mode
This setting allows different control modes to be selected. The options are PID, On-Off, Autotune, Manual Duty Cycle, and Disabled.

Disabled Mode
Disabled Mode is the default setting for LYNX controllers. In this mode the controllers will not energize the heater. When modules are moved from one heater to another they will automatically return to Disabled Mode to prevent accidental heating.

Dry Contact / Alarm Relay
The Operator Interface features 9 dry contact relays. These relays are energized on system start and will de-energize if an alarm occurs or if the Operator Interface is turned off. One dry contact is available for each of the 8 strings and there is a master connected to all strings (e.g. If an alarm occurs on string 3, then the string 3 dry contact and the master dry contact will de-energize). This relay is energized on system start and will deenergize if an alarm occurs or if the Operator Interface is turned off.

Enumeration
The complete, ordered listing of all items in a collection.
The process by which the LYNX system discovers each module in a String for a system and establishes an order for them by setting their Modbus addresses.

High Alarm
This alarm is used to indicate a critical temperature condition.
The control module will change color and a message will display on the operator interface to indicate this condition.
The dry-contact / alarm relays on the operator interface will change state and the heater will turn off in this condition.
This alarm will function regardless of whether Idle Mode is enabled or not.

Idle Mode
This mode allows an alternate setpoint to be used to reduce power consumption during down-time or maintenance.
This mode has its own unique Setpoint, High Alarm, and LowAlarm settings.

Idle High /Low
Alarm Idle High and Low alarms only function when Idle Mode is enabled.
They function the same as the standard High and Low alarms, butwith Idle Mode Setpoints.

Latching
Latching can be enabled or disabled for alarm conditions.
Setting an alarm o be Latching will force an operator to manually clear the alarm.
NonLatching alarms will automatically clear when the condition is nolonger active.

MAINTENANCE INSTRUCTIONS

Anyone who reads and understands these instructions is qualified to maintain this heater.

Maintenance:

- All maintenance should be performed after the heater has cooled to room temperature and with the electricity disconnected.
- This product should be inspected prior to being installed and at least every 3 months during use.
- Do not attempt to repair a damaged heater.

Inspection:

- The enclosure should be free of any cuts, cracks, or punctures.
- The power leads should not have any visible breaks in their insulation.

Storage:

- This product should be stored at room temperature range 32°F -140°F (0°C – 60°C) in an environment with less than 80% relative humidity.

Disposal:

- This product should not be mixed with general household waste. For proper treatment, recovery and recycling, please take this product to designated collection points where it will be accepted free of charge.

EMERGENCY PROCEDURES

Read and understand these procedures prior to using this heater.
Disconnect power to the heater in the event of an emergency.

Electric Shock:

- Do not touch the injured person while they are still in contact with the electrical current.
- Call your local emergency service if the injured person experiences: severe burns, confusion, difficulty breathing, heart rhythm problems, cardiac arrest, muscle pain and contractions, seizures or a loss of consciousness.

Minor Burns:

- Hold the burned area under cool running water for 10-15 minutes.
- Remove rings or other tight items from burned area.

Major Burns:

- Call your local emergency service.
- Protect the person from further harm.
- Remove rings or other tight items from burned area.
- Monitor breathing and perform CPR if necessary.

Fire:

- Call your local emergency service.
- If it is safe to do so, use a fire extinguisher to fight the fire, otherwise evacuate to a safe distance and wait for help to arrive.
- This heater is built from material that will not support a flame but could ignite nearby combustible material.

TROUBLESHOOTING GUIDE

Please read this guide prior to contacting BriskHeat with any issues with your system. This guide is designed to answer the most commonly asked troubleshooting questions. If the below corrective actions do not work, you are unable to identify the problem, or otherwise need additional assistance, please contact BriskHeat at: 1-800-848-7673 (U.S. / Canada), 1-614-294-3376 (worldwide), or **bhtsales1@briskheat.com**.

Issue	Suggested Corrective Action

Module does not turn on	Verify Module is properly attached to the Dock and that both Module clips have been fully seated. Verify that power is connected to the Dock, and that all Docks in a String are properly connected. Verify that the supply power is turned on and that the supply power fuses and breakers are intact.
Module LED is purple and Module does not heat	Change Module control mode from "Disabled" to another mode.
Module displays "FFF" or "Sensor fault"	Verify Module is properly attached to the Dock and that both Module clips have been fully seated. Verify that the correct sensor type is properly connected if using a Stand-alone Dock.
Module displays "ddd"	Verify Module is properly attached to the Dock and that both Module clips have been fully seated.
Module displays high temp with red LED on initial startup	Verify Module is properly attached to the Dock and that both Module clips have been fully seated.
Module LED is blinking white	Disable Locate Mode from the OI.
Module LED is blinking red but displays temperature below the High Alarm setpoint	The Module exceeded the High Alarm setpoint during operation. Manually unlatch the High Alarm to clear the blinking.
Module LED is solid red	Ensure that the ambient temperature has not exceeded the listed temperature ratings. Verify Module is properly attached to the Dock and that both Module clips have been fully seated.
Cannot remove Module from Dock	Firmly depress top edge of both Module clips simultaneously, pull Module straight away from Dock. Pry bottom of Module clips to assist with disengagement if required.
OI does not turn on	Verify that the OI power supply is properly inserted in the back of the unit. Verify that supply power is turned on and that the supply power fuses and breakers are intact.
OI screen is black	Shutdown the OI. Unplug OI from power supply, wait 10 seconds, then plug in power supply back in.

OI screen is flickering	Shutdown the OI. Unplug OI from power supply, wait 10 seconds, then plug in power supply back in.
OI does not detect some or any modules	Verify all Modules and Strings are plugged in and have power. Utilize the "Debug Strings" option from the Installation Setup flow to verify Module communications. To do this, select the String that is hav- ing issues from the Debug String menu and press the "Scan" button. The OI will scan all valid Modbus addresses for the selected string for communicating Modules. Once the scan has finished, the "Start Debug" button can be pressed to have each Module light up white and display the Modbus address it has taken. Use this feature to identify where there is a break in communication or enumeration. If any errors are found, locate the erroneous Module(s) and verify Module is properly attached to the Dock and that both Module clips have been fully seated. Additionally, verify that all Docks are properly connected and that supply power is turned on. If the issue remains unresolved contact BriskHeat for advanced troubleshooting.
Not receiving email alerts from OI	Ensure OI is properly connected to a valid network and has the proper email credentials entered.
Forgot OI access PIN	Contact BriskHeat with OI serial number for a master unlock PIN.
Module displays "d01"	Sensor type is being auto detected. Should change momentarily.
Module displays "d02"	Sensor type register value is Invalid (See Table 8)
Module displays "d03"	Module is waiting for ADC + 0 Stabilize. Should change momentarily.
Module displays "d04"	ABC is not responding. Check all connections. Variety module is properly attached to the….

WARRANTY INFORMATION

BriskHeat®
Corporation

Briskheat Corporate Headquarters:
4800 Hilton Corporate Dr,

Columbus, OH 43232
Europe: Taiwan: China:
P.O. Box 420124
44275 Dortmund, Germany
Toll Free: 800-848-7673
Phone: 614-294-3376
Fax: 614-294-3807
Email: **bhtsales1@briskheat.com**
PN: 41295-10 Rev A

Documents / Resources

	BriskHeat LYNX Temperature Control System [pdf] Instruction Manual LYNX Temperature Control System, LYNX, Temperature Control System, Control System, LYNX Temperature Control System

Manuals+,