Trinity Tft / Lx / Lx-WH
Firetube Giant FTG

Model #s: Tft60-399
Lx150-800
Lx200WH-800WH
FTG 600-2400
Version Date: 2026-02-05

APPENDIX A – CONTROLLER AND TOUCHSCREEN DISPLAY INSTRUCTIONS FOR Firetube Giant, TRINITY Tft & Lx SERIES

HAZARD SYMBOLS AND DEFINITIONS

⚠ DANGER Danger Sign: Indicates a hazardous situation which, if not avoided, will result in serious injury or death.

⚠ WARNING Warning Sign: Indicates a hazardous situation which, if not avoided, could result in serious injury or death.

⚠ CAUTION Caution Sign plus Safety Alert Symbol: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

CAUTION Caution Sign without Safety Alert Symbol: Indicates a hazardous situation which, if not avoided, could result in property damage.

NOTICE Notice Sign: Indicates a hazardous situation which, if not avoided, could result in property damage.

⚠ WARNING This appliance must be installed by a licensed and trained Heating Technician or the **Warranty is Void.** Failure to properly install this unit may result in property damage, serious injury to occupants, or possibly death.

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1 INTRODUCTION

IMPORTANT

Please note: within this document, references to "controller" apply to ALL of Trinity Tft/Lx/Lx-WH or Firetube Giant FTG except where explicitly identified otherwise.

The Controller and Touchscreen Display, together, form the control system of a Trinity Tft/Lx/Lx-WH or Firetube Giant FTG boiler. All control configuration parameters are stored in non-volatile memory in the controller. Access to controller status and configuration is achieved with the display. Interaction with the display is performed by physically touching icons presented on the screen. Communication between the controller and display is via EIA-485 interface using the Modbus RTU protocol.

Appliance and controller status information and configuration parameters are presented in a series of pages. On each page, the "Home" and "Back" icons are available to assist in quickly navigating through the menu structure. These icons appear at the top left and right corners of the pages. Touching the Home icon returns to the Home page immediately from any other page in the menu. Touching the Back icon displays the previous page.

IMPORTANT

Password - Many of the configuration parameters are password protected. The required password is "**sola**" (without the " "). It is case sensitive and must be entered in lower-case letters.

1.1 Boiler vs. Water Heater Settings – Quick Reference

Controller factory settings are **NOT** configured for a particular application. Since most settings are installation dependent, parameters must be field adjusted to suit not only the application (Boiler or Water Heater), but also the system requirements. See examples below of settings to be considered or adjusted:

Boiler Example: The factory setting for CH setpoint is 180°F [82°C] which is well suited for many "low mass-high temperature" systems; however, it should be adjusted down for "high mass-low temperature" heating systems (i.e. 100-130ºF for infloor heat or 130-160ºF for cast iron radiator systems).

***Water Heater Example* (*Trinity Lx200WH-800WH ONLY*)**: The factory setting for DHW setpoint is 180°F [82°C] which is well suited for high temperature applications such as commercial dishwashing; however, it should be adjusted down for applications not requiring such high temperature water (i.e. 140ºF for domestic fixtures only).

IMPORTANT

Please read the following document carefully as factory settings are not configured for a particular application and may require adjusting in order to satisfy system requirements.

It is the responsibility of the installer, a licensed qualified heating technician, to configure and commission the unit and adjust any parameters required to comply with the application and satisfy the system requirements. The Quick Reference Tables below list the minimum parameters that need to be considered and/or adjusted before putting the unit into operation. Note that each table is application-specific as setting adjustments differ depending on whether the appliance is installed as a Boiler or a Water Heater:

Boiler Settings

Table 1-1 Boiler Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
Central Heat	Ensure the sum of the **CH setpoint** and the **CH off hysteresis** does not exceed 200°F [93°C] or a "Lockout" condition may occur *(not applicable to models Tft60-399)*.	See Figure 4-4 and Table 4-4, pages 11 & 12
Outdoor Reset	These parameters affect the Central Heat setpoint. Settings are installation dependent and adjustments should be made accordingly.	See Figure 4-6 and Table 4-6, page on page 13
DHW	Ensure the sum of the **DHW setpoint** and the **DHW off hysteresis** does not exceed 200°F [93°C] or a "Lockout" condition may occur *(not applicable to models Tft60-399)*.	See Figure 4-8 and Table 4-8, page 14
High Limits	If higher water temperatures are required, 190-200°F [88-93°C], adjust limit response to avoid a "Lockout" condition. Boilers only *(Not applicable to models Lx500-800 & FTG 600-800)*.	See Figure 4-16 and Table 4-15, page 23

Water Heater Settings (*Trinity Lx200WH-800WH ONLY*)

Table 1-2 Water Heater Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
Central Heat	Not used for Water Heaters. No adjustments required.	Not applicable
Outdoor Reset	Not used for Water Heaters. "Disable" parameter to avoid nuisance faults.	Not applicable
DHW	Ensure the sum of the **DHW setpoint** and the **DHW off hysteresis** does not exceed 200°F [93°C] or a "Lockout" condition will occur.	See Figure 4-8 and Table 4-8, page 14
High Limits	The "Lockout" limit response is a mandatory safety feature intended to require a manual reset on water heater units in the event that the appliance high limit temperature is exceeded. For this reason, the limit response must remain set to "Lockout".	See Figure 4-16 and Table 4-15, page 23

1.2 Second Central Heat Input vs. Multiple Unit Application Settings

All boiler and water heater models can be used as stand-alone units or in a cascaded arrangement. It is important to note that factory settings are configured for a stand-alone unit with a single heating call input; therefore, some settings will need to be adjusted depending on the application chosen, whether it is e.g. a second central heat input (boilers only) or cascading multiple units. See the quick reference tables below to identify the minimal settings which must be adjusted for each application.

For Second Central Heat Input Applications with a stand-alone boiler configuration using CH1 as the high temperature call and CH2 (LL) as the low temperature call, refer to Table 1-3.

For multiple Boilers or Water Heaters applications refer to Table 1-4.

Second Central Heat Input Application Settings (Stand Alone Boilers ONLY)

Table 1-3 Second CH Input Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
Pump Configuration < CH pump >	Leave the checkbox "Use for Lead Lag Master demand" unchecked.	See Figure 4-12 and Table 4-11, page 20
Sensor Configuration (Lx500-800 Only)	Stand-alone boilers configured to use the second CH input [CH2 (LL)] cannot use the Outdoor Temperature Sensor. Change "Outdoor temperature source" from S5 (J8-11) to UNCONFIGURED.	See Figure 4-23 and Table 4-22, page 28
Lead Lag Master Configuration	**Master enable** - set to "Enable". This will allow the CH2 (LL) heat input to activate the boiler on a low temperature demand.	See Figure 4-25 on page on page 30 and Table 4-24 on page 30
	Setpoint – set to the boiler temperature required for the low temperature CH2 (LL) demand.	See Figure 4-27 and Table 4-26, page 31

Multiple-Boiler/Water Heater Application Settings

Table 1-4 Lead Lag Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
System Identification & Access	**MB2 Modbus Address** - set to a unique value between 1 and 8 inclusive for each boiler in the cascade. TIP: Set BOTH MB1 and MB2 the same to avoid confusion.	See Figure 4-2 and Table 4-2, page 10
Sensor Configuration (Lx500-800 Only)	**Outdoor Sensor** – This sensor cannot be connected to the boiler designated as a Lead-Lag Master. Change "Outdoor Temperature Source" from S5 (J8-11) to UNCONFIGURED. **System Sensor** – If using this sensor, connect it to the designated "Master" (enabled) boiler. "Outdoor Temperature Source" must be set to UNCONFIGURED.	See Figure 4-23 and Table 4-22, page 28
Pump Configuration < CH pump >	Set the checkbox "**Use for Lead Lag Master demand**" to checked only on the LL slave unit that will be controlling the system pump.	See Figure 4-12 and Table 4-11, page 20
Pump Configuration < DHW pump >	Set the checkbox "**Use for Lead Lag Master demand**" to checked only on the LL slave unit that will be controlling the DHW pump.	See Figure 4-14 and Table 4-13, page 21
Lead Lag Master Configuration	**Master enable** - set to "Enable" on one boiler; the boiler that will become the single point of contact for cascade control wiring, i.e. Thermostat demand [CH2 (LL)], DHW demand, Outdoor and System water temperature. All other boilers in the cascade must be set to "Disable".	See Figure 4-25 and Table 4-24, page 31
	CH Setpoint – set to the desired boiler temperature for a Lead Lag Central Heat, CH2 (LL) demand. Setting only valid on the boiler with "Master enable" set to "Enable".	See Figure 4-27 and Table 4-26, page 31
Lead Lag Master Configuration – Advanced Settings < Domestic Hot Water >	**Demand switch** – set to "DHW (S6) sensor shorted" if the DHW load is being serviced by the cascade; DHW demand will be received by the boiler configured as "Master", and will be serviced by all boilers in the cascade via the Lead Lag function. Set to "Disabled" to have the DHW demand serviced by individual boilers; DHW demand must be received by each responsible boiler; DHW settings must be configured at the individual boilers, under "DHW – Domestic Hot Water Configuration".	See Figure 4-27a and Table 4-26a, page 32
	DHW Setpoint – set to the desired boiler temperature for a Lead Lag DHW demand. Setting only valid on the boiler with "Master enable" set to "Enable", and with "Demand switch" set to "DHW (S6) sensor shorted".	See Figure 4-27a and Table 4-26a, page 32

1.3 Indoor Combustion Air Application Settings

For applications using the Indoor Combustion Air Kit (Lx500-800 only) instead of Direct Vent piping for the air inlet, refer to Table 1-5 for a list of parameters that need to be adjusted before putting the unit into operation.

Table 1-5 Indoor Combustion Air Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
Modulation Configuration	Adjust the Minimum Modulation rate according to model.	See Figure 4-11 on page 18 and Table 4-10 on page 19.
Burner Control Ignition	Adjust the Lightoff rate according to model.	See Figure 4-21 and Table 4-19 on page 26.

2 HOME PAGE

When the appliance is powered there is a brief interval while the display retrieves data from the boiler control. The display then shows the Home Page, similar to the one depicted below.

Figure 2-1 All Models

Home Page

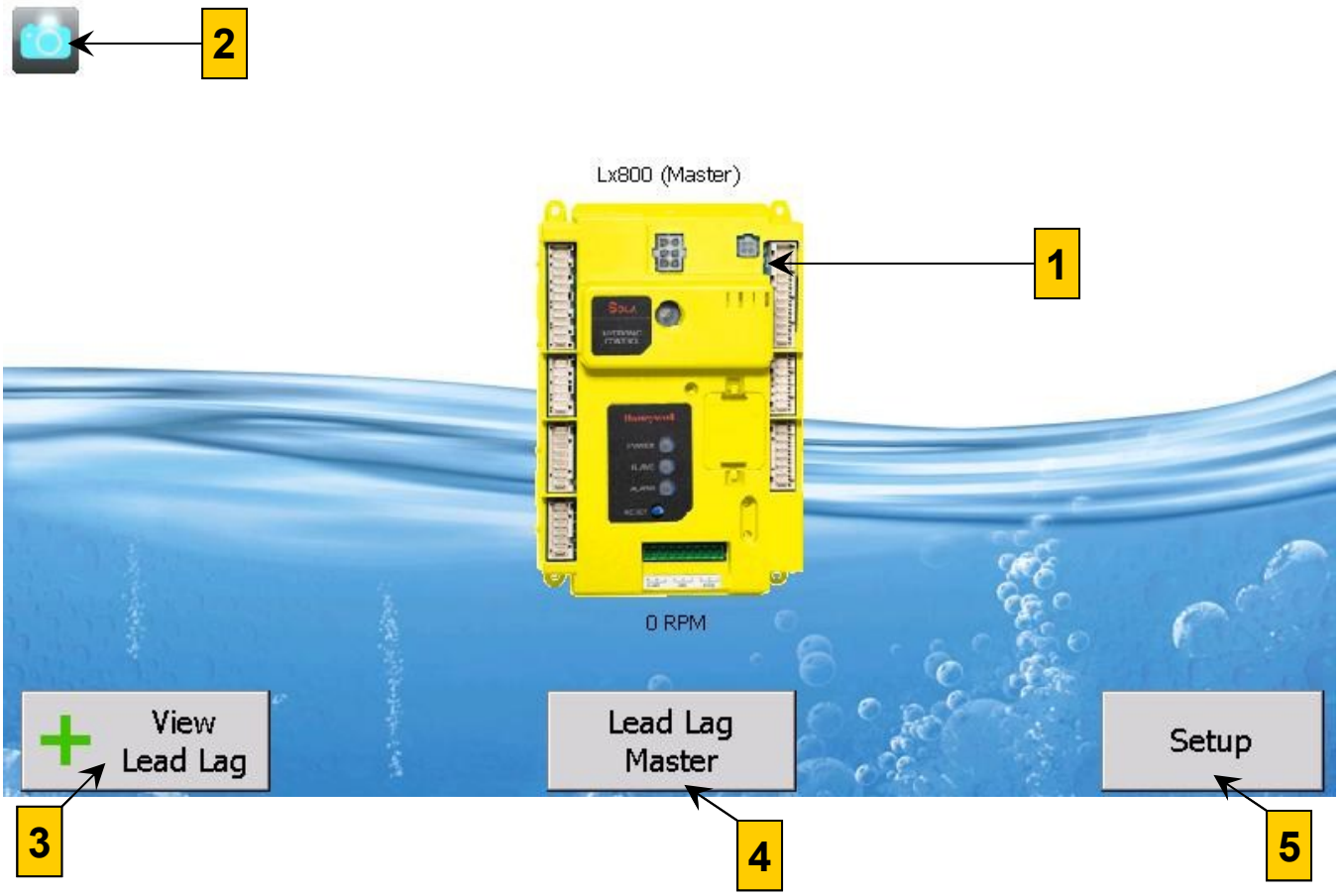


Table 2-1 Home Page Items

Item	Name	Description
1	Boiler icon(s) (individual boiler shown)	Icons shown depend on the selection of Item 3 (below). When "View Individual" is selected, the icon shows the local boiler name, status and current burner firing rate. The image changes color depending on the current status of the burner control: • **Blue**: Normal operation • **Red**: Lockout condition • **Yellow**: Holding mode • **Gray**: Communication error (disconnected or power off) When "View Lead Lag" is selected, each slave boiler is represented by a colored square indicating status and firing rate. Touching the individual boiler icon will cause the screen to display the Summary Page for that boiler, allowing access to more pages for configuration of the locally connected controller. When icons for Lead Lag slave boilers are present, touching a boiler's icon will cause limited status information to be displayed, but does not permit any configuration to be performed.

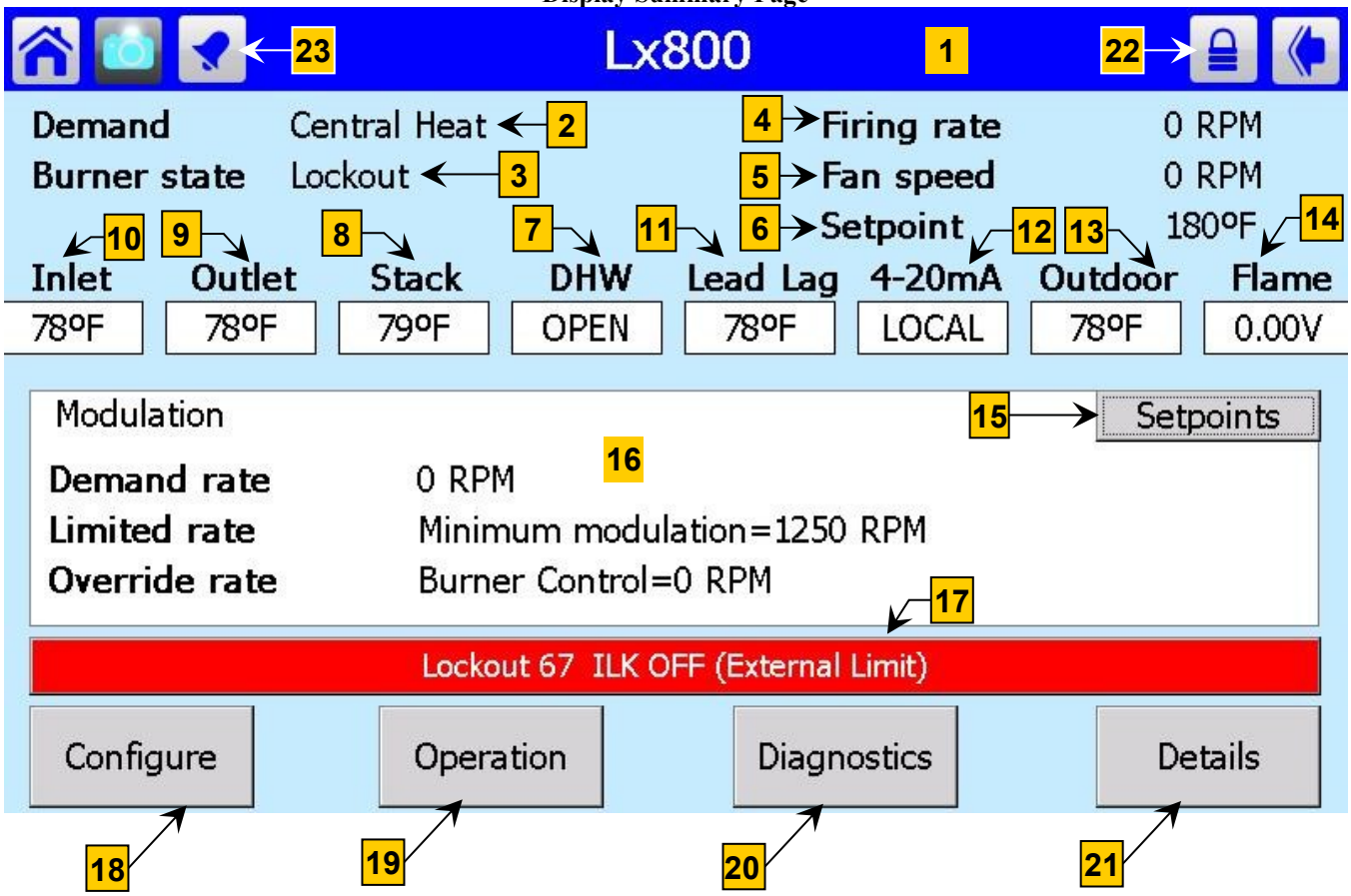
Item	Name	Description
2	Camera Icon	The camera icon button may be touched to take an image (called a "screenshot") of the current screen contents. The image is stored in JPEG format in the display's non-volatile memory. Each image is assigned a name based on the date, time, and the page title e.g.: "2012-05-22_1209_PM_HomePage" Up to 16 images may be stored at once. The images may be copied to a USB mass storage device. Refer to the Display Diagnostic section for instructions to copy screenshots to a USB device.
3	Individual/Lead Lag Selection Button	The Individual/Lead Lag selection button is used to toggle the Home Page display between the locally connected boiler control and the Lead Lag cascade group. The Lead Lag selection mode is only effective when the locally connected boiler is configured to be the Master controller of the cascade.
4	Lead Lag Master (may not be present)	Used to access pages for viewing the status of the Lead Lag cascade. May be used to access the Master configuration settings if the attached control is configured as a Lead Lag Master.
5	Setup	Used only to access pages for viewing and modifying the display's configuration and setup. To access setup of the boiler controller, refer to Item 1 above.

3 SUMMARY PAGE

The Summary page is accessed from the Home Page by touching the individual boiler's icon. For information purposes, Summary Page Configuration Parameters have been numbered in Figure 3-1 and their corresponding explanation itemized in Table 3-1 on the next page.

Figure 3-1 All Models

Display Summary Page



Commercial Criteria - The FTG and Lx500-800 have a Primary Safety Control designed to maintain a Lockout condition if power is interrupted. This means if a Lockout condition occurs, the Lockout condition cannot be cleared or reset by cycling power to the unit. A manual reset is required to clear the condition. Refer to "History Page", page 44, for more details regarding Lockouts.

Clearing a Lockout - The following are methods to clear a Lockout condition and perform a manual reset to restore the control to normal operation:

1. Switch *(not applicable to models Lx500-800 or FTG)*: Cycle power to the appliance OFF and ON. Tft models are equipped with a local On-Off switch; Lx150-400 must use the field-supplied service switch or circuit breaker.
2. Controller *(all models)*: Clear the lockout from the controller by pressing the RESET button situated on the controller near the indicator lights (see Figure 4-37 page 38)
3. Display *(all models)*: Clear the lockout from the touchscreen display menu. See Figure 6-4 on page 44 and Figure 6-5 on page 45.

Table 3-1 Summary Page Items

Item	Name	Description
1	Boiler name	Boiler name, factory set to the model number shown on boiler (water heater) rating plate. May be set by the installer, see System Identification and Access on page 10.
2	Demand	Heat demand source: • OFF • Central Heat • Lead Lag • Domestic Hot Water • CH frost protection • DHW frost protection • LL frost protection
3	Burner state	Current state of burner operation: • Initiate • Standby Delay • Standby • Safe Startup • Prepurge - Drive to Purge Rate • Prepurge - Measured Purge Time • Prepurge - Drive to Lightoff Rate • Direct Burner Ignition • Run • Postpurge • Lockout
4	Firing rate	Target blower speed in RPM
5	Fan speed	Actual blower speed in RPM
6	Setpoint	Active setpoint, in °F [°C], that is the target water temperature the appliance maintains. Setpoint depends on the actual heat call: • Central Heat (CH1) • Lead Lag (CH2) • Domestic Hot Water (DHW)
7	DHW	Status of indirect DHW aquastat or DHW indirect tank sensor: • SHORT – contacts closed creating heat demand • OPEN – contacts open, no demand • Tank sensor temperature in °F [°C]
8	Stack	Exhaust gas temperature measured at appliance exhaust by dual thermistor sensor (input at J9 terminals 4,5,6) consisting of a temperature control and temperature limit.
9	Outlet	Water temperature measured at appliance outlet (hot supply to load) by dual thermistor sensor (input at J8 terminals 8,9,10) consisting of a temperature control and temperature limit. Complies with UL 353.
10	Inlet	Water temperature at appliance inlet (cold return from load) by single thermistor sensor (input at J8 terminals 4,5).
11	Lead Lag	Signal from system sensor. Displayed only when the controller is configured as Lead Lag Master.
12	4-20mA	4-20mA - Signal from external controller (input at J8 terminals 6,7).
13	Outdoor	Temperature measured by outdoor air sensor (input at J8 terminals 11,12)
14	Flame Signal	Flame signal strength measured in microamps
15	Modulation, Setpoints, Pumps select button	Touch button to select information group described in Item 16

Item	Name	Description
16	Pumps, Modulation, Setpoints	• Pumps: present status of Boiler, Central Heat, and Domestic Hot Water circulator pumps • Modulation: present Demand Rate given as blower RPM, any Limited Rate on the demand, and any Override Rate in effect • Setpoints: Central Heat, Domestic Hot Water, and Lead Lag setpoint temperatures with on and off hysteresis values.
17	History	Details of most recent Lockouts and Alerts.
18	Configure	Access to controller settings.
19	Operation	Access to controller operation summary page.
20	Diagnostics	Access to controller tests, digital and analog Input/Output (I/O) status.
21	Details	Detailed one-page summaries of certain Configuration Groups and input/output devices.
22	Login (Lock Icon)	Access to keyboard screen for entering the password to allow modification of certain parameters. The required password is "**sola**" (without the " ") and must be entered in lower-case characters. Note: after 10 minutes of inactivity i.e. no interaction with the display, the password will have to be re-entered.
23	Alarm	The Alarm "Bell" is shown when the burner is in the lockout state.

4 CONFIGURATION PAGE

Touching the Configure button at the bottom left of the Summary page accesses the Configuration Menu page. The page contains a scrollable list of configuration groups, any of which may be selected by touching the name of the desired group, for example CH – Central Heat Configuration. To scroll quickly down the list, press and hold the scroll bar on the display screen and slide it down/up. To advance by line item, touch the directional arrows on the scroll bar.

Figure 4-1 Configuration Groups

Configuration Buttons

Login – Parameters that are password protected require an installer to enter the password before they can be changed. A message indicating this may appear when a password protected parameter is selected. To enter the password, touch the Lock icon to access the keyboard screen.

Verify – Some configuration groups require safety parameter verification after configuration parameters are edited. This button provides access to the safety verification screens explained in more detail commencing on page 37.

Scrollable List Screen (Top)

Scrollable List Screen (Middle)

Scrollable List Screen (Bottom)

Table 4-1 Configuration Page Group Descriptions

Name	Description
System Identification & Access Screen	View system identification
CH - Central Heat Configuration	Edit Central Heat settings
Outdoor Reset Configuration	Edit Outdoor Reset settings
Domestic Hot Water Configuration	Edit Domestic Hot Water settings
Warm Weather Shutdown Configuration	Edit Warm Weather Shutdown settings
Demand Priority Configuration†	Edit Central Heat Demand Priority settings
Modulation Configuration	Edit burner modulation settings
Pump Configuration	Edit pump settings
Statistics Configuration	View equipment operating statistics
High Limits	Edit water temperature limit settings
Stack Limit	Edit flue temperature limit settings
Delta T Limits and T-rise Limit	Edit settings of delay time for delta-t limits and T-rise limit
Frost Protection Configuration	Edit settings for frost protection
Burner Control Timings & Rates	Edit settings for burn times and fan rates
Burner Control Ignition	Not used
System Configuration	Edit temperature units, anti-short-cycle time, alarm silence time
Sensor Configuration ⅄	Edit Sensor settings
Lead Lag Slave Configuration	Edit Lead-Lag Slave settings
Lead Lag (LL) Master Configuration	Edit Lead-Lag Master settings
Verify	Confirm safety parameter changes

⅄ Only Lx500-800 & FTG models †=Only FTG

4.1 System Identification & Access

Figure 4-2 System Identification & Access Screen

The System Identification & Access page contains information about the controller. Login with the installer password is required to modify factory settings. Up to twenty (20) characters each may be entered for the Boiler name and Installation. The installer may use these areas to record installation-specific data.

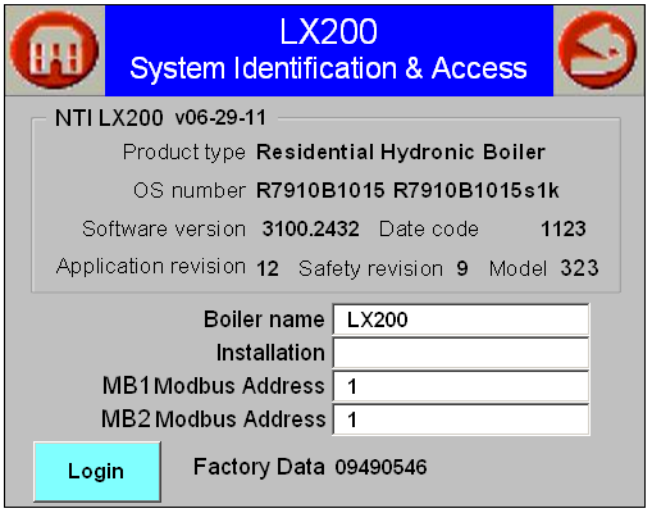


Table 4-2 System Identification & Access

Parameter	Description	Factory Settings
Boiler name *	Series and model no. of boiler or water heater unit, e.g. Tft60; limit 20 characters.	Model no.
Installation *	Installation specific data, e.g. installation date; limit 20 characters	Blank
MB1 Modbus Address *	Modbus communication address used by the display to identify the attached controller. Range: 1 – 8.	1
MB2 Modbus Address *	Unique controller I.D. needed when multiple units connected together in a Lead Lag cascade configuration; Lead-lag: each boiler needs unique address. Range: 1 – 8.	1

* = Password protected

4.2 CH - Central Heat Configuration

The Central Heat (CH) Configuration menu settings are only applicable to Boilers and are ***not applicable for Water Heaters***. The CH settings establish the demand input and water temperature operating parameters for a CH demand..

Figure 4-3 Central Heat Configuration - Central Heat

IMPORTANT

The sum of the CH setpoint and the CH off hysteresis should not exceed 200°F [93°C] or a "Lockout" condition may result *(not applicable to models Tft60-399)*. If higher water temperatures are required, e.g. 190-200°F [88-93°C], adjust high limit response to avoid a "Lockout" condition. See section on "High Limits", page 23.

Use the left and right arrow buttons at the top of the screen to switch between the three CH configuration sub-screens (e.g. Central Heat, Setpoint, and Modulation).

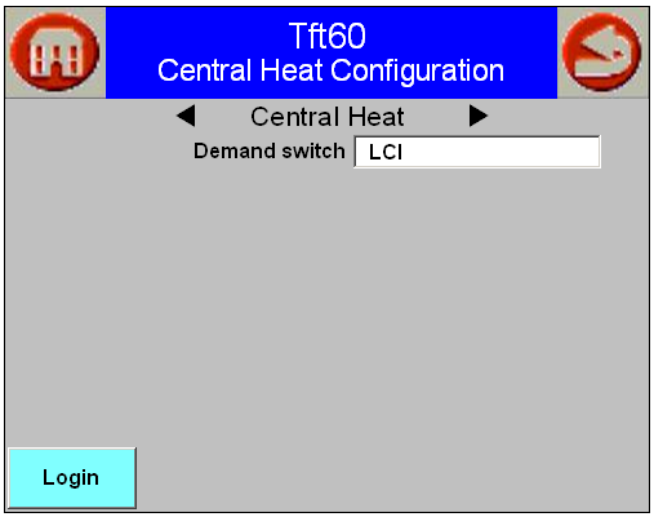


Table 4-3 Central Heat Configuration Parameters – Central Heat†

Parameter	Description	Factory Settings
Demand switch *	Source of CH demand: • Sensor only (modulation sensor) • LCI (CH1 terminal) Sensor only: Demand exists if water temp. < CH setpoint – On hysteresis.	LCI

* = Password protected †=Not applicable to Lx-WH

Figure 4-4 Central Heat Configuration - Setpoint

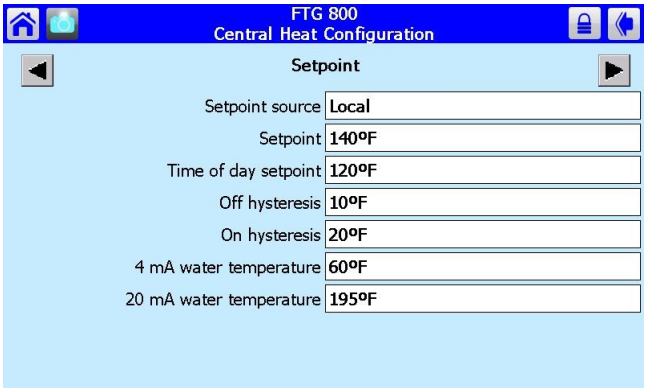
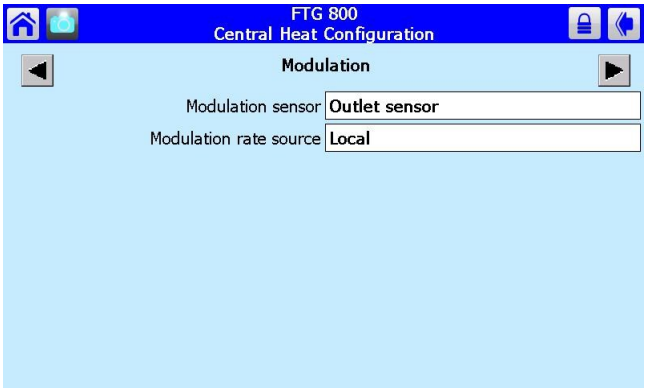


Figure 4-5 Central Heat Configuration – Modulation



Control of Central Heat operation: The controller has the ability to control CH operation itself, or to accept a 4-20mA signal from an external control. The 4-20mA signal may be used to supply a CH setpoint OR to directly modulate the burner for CH operation (***but not both***). Refer to the Installation and Operation manual for your specific appliance for information on connecting a 4-20mA input.

Setpoint - If "Local" is selected as the CH Setpoint source, the CH Setpoint value entered on the screen, depicted in Figure 4-4, is used for control. If 4-20mA is selected as the CH Setpoint source, the controller determines its setpoint from the 4-20mA signal. The setpoint is calculated from field-set values corresponding to 4mA and 20mA. If the 4-20mA input signal is invalid, out of range, or absent, the CH Setpoint is used until the signal is valid again. Regardless of the CH Setpoint source, "Local" or "4-20mA",

the controller's internal PID algorithm modulates the burner.

Modulation – The controller supports two methods of burner modulation for CH, selected by the "Modulation rate source" parameter, depicted on Figure 4-5 ; the factory set method is by internal PID algorithm. The installer has the option to use a 4-20mA signal from an external control to directly modulate the burner. Rates vary (see Modulation Configuration below) from minimum at 4mA to CH maximum at 20mA. ***The 4-20mA signal does not create burner demand; a call for heat must be present at the CH1 input*.**

Table 4-4 Central Heat Configuration Parameters - Setpoint†

Parameter	Description	Factory Settings
Setpoint source *	Select the Central Heat setpoint source: • Local (control references CH Setpoint setting) • S2 (J8-6) 4-20mA with sensor on/off Disable Outdoor reset to use 4-20mA Setpoint source.	Local
Setpoint	Setpoint value for CH modulation. If CH outdoor reset is disabled, this is the target boiler outlet water temperature. If CH outdoor reset is enabled, this is the CH maximum water temperature (see Outdoor Reset Configuration). Range: 60-195°F (60-190°F for Tft60-399). *Note: the sum of CH setpoint and Off hysteresis must not be greater than 200°F (not applicable to models Tft60-399).*	180°F [82°C] *except* FTG: 140°F[60°C]
Time of day setpoint ⅄	Time of day setpoint value for CH modulation when TOD input is made (night time setback). If CH outdoor reset is disabled, this is the target boiler outlet water temperature. If CH outdoor reset is enabled, this is the CH maximum water temperature. See Outdoor Reset Configuration *(model Lx500-800 only)*. *Note: the sum of Time of day setpoint and Off hysteresis must not be greater than 200°F.*	160°F [71°C] *except* FTG: 120°F[49°C]
Off hysteresis	Value added to CH setpoint to determine water temperature at which the burner will shut off e.g. if CH setpoint is 150°F[65°C], and CH off hysteresis is 10°F[6°C], the burner will be shut off at 160°F[71°C]. Range 2°F to 20°F [1°C to 11°C]. *Note: the sum of CH setpoint and Off hysteresis must not be greater than 200°F (not applicable to models Tft60-399).*	10°F [6°C]
On hysteresis	Value subtracted from CH setpoint to determine water temperature at which the burner will fire e.g. if CH setpoint is 150°F[65°C], and CH on hysteresis is 10°F[6°C], the burner will fire at 140°F[60°C]. Range 2 °F to 40°F [1°C to 22°C].	20°F [11°C]
4mA water temperature	Target water temperature at 4mA input. Range 60°F to 125°F [15°C to 52°C].	60°F [15°C]
20mA water temperature	Target water temperature at 20mA input. Range 126°F to 195°F [52°C to 90°C].	195°F [90°C]

* = Password protected ⅄ = Time of Day (TOD) feature is available on Lx500-800 & FTG only. †=Not applicable to Lx-WH

Table 4-5 Central Heat Configuration Parameters – Modulation†

Parameter	Description	Factory Settings
Modulation sensor *	Select which sensor Central Heat will modulate to: • Outlet sensor • Inlet sensor • S10 (J10-7) sensor [System Manifold Temperature] If Demand switch (Table 4-3 above) is "Sensor only" the choice of Modulation sensor also dictates which water temp. creates CH demand.	Outlet sensor
Modulation rate source *	Select which source controls the modulation rate: • Local [PID control] • S2 (J8-6) 4-20mA with sensor on/off [remote source - allows an external control to directly modulate the burner]	Local

* = Password protected †=Not applicable to Lx-WH

4.3 Outdoor Reset Configuration

The Outdoor Reset Configuration menu settings are only applicable to Boilers and are ***not applicable for Water Heaters.*** When the "Show Line" button is touched an Outdoor Reset graph similar to Figure 4-7 is displayed, illustrating the effect of varying outdoor temperature on the CH setpoint. Outdoor reset incorporates a "Boost" capability to increase the boiler setpoint if demand is not being met. The setpoint is "boosted" by the step value at intervals set by the boost time, until the maximum off point is reached.

Figure 4-6 Outdoor Reset Configuration – Central Heat

Outdoor Reset is effective only if the following two conditions are met: Outdoor Reset is "enabled", and an outdoor temperature sensor is connected to the controller. The Outdoor Reset CH parameters, together with the CH Setpoint parameters, define the relationship of water temperature setpoint to outdoor temperature. Refer to Table 4-6 for a list of Outdoor Reset parameters.

IMPORTANT **Water Heaters:** Outdoor Reset is not applicable.

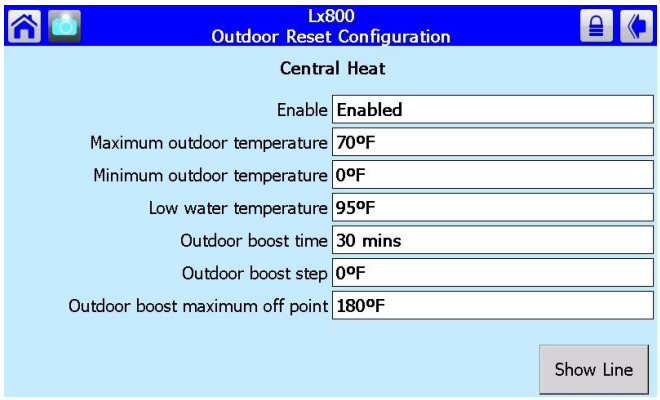


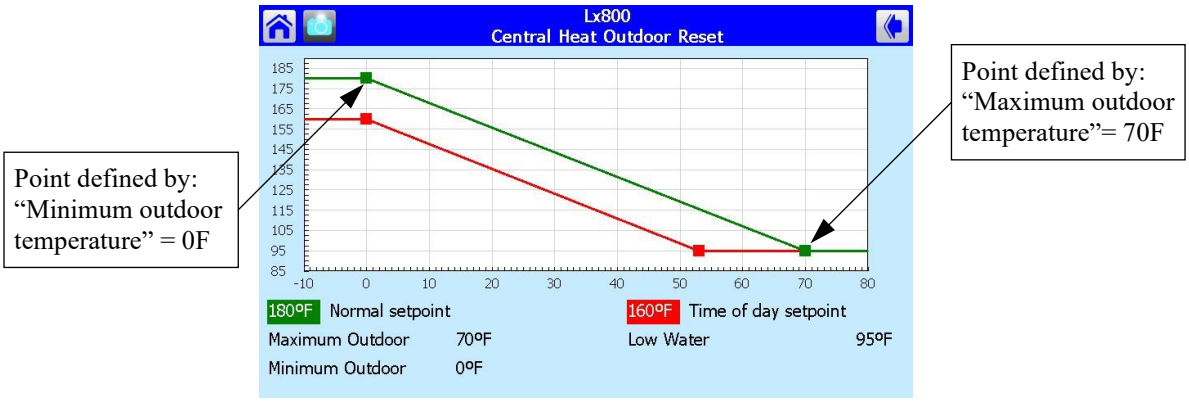
Table 4-6 Outdoor Reset Configuration Parameters – Central Heat†

Parameter	Description	Factory Settings
Enable	Enables or disables Outdoor reset	Enabled
Maximum outdoor temperature	Outdoor temperature that corresponds to the Low water temperature setting. *Example:* If the Low water temperature setting is 95°F[35°C], and the Maximum outdoor temperature setting is 70°F[21°C], the boiler water temperature setpoint will be 95°F[35°C] when the outdoor temperature is 70°F[21°C] or higher. Range 50°F to 95°F [10°C to 35°C].	70°F [21°C]
Minimum outdoor temperature	**Design Temperature** – Outdoor temperature that corresponds to the Maximum water temperature. *Example:* If the Maximum water temperature setting is 180°F[82°C] (defined by CH setpoint), and the Minimum outdoor temperature setting is 0°F[-18°C], the boiler water temperature setpoint will be 180°F[82°C] when the outdoor temperature is 0°F[-18°C] or lower. Range -40°F/°C to 40°F [4°C].	0°F [-18°C]
Low water temperature	Minimum water temperature setpoint; occurs when the outdoor temperature is equal to or greater than the Maximum outdoor temperature. Range 60°F to 140°F [15°C to 60°C].	95°F [35°C]
Outdoor boost time*‡	Time interval for boost step. Range 0 – 18 hours.	30 minutes
Outdoor boost step *‡	CH setpoint boost step value. Range 0-50°F [0-28°C]. A value of 0° disables boost.	0°F/C
Outdoor boost maximum off point *‡	Maximum temperature that the CH outlet temperature may be boosted to. Range 60-200°F [15-93°C]. Set Outdoor boost maximum off point = CH Setpoint + CH Off hysteresis	180°F[82°C]

* = Password protected †=Not applicable to Lx-WH

‡**Outdoor boost** – during a Central Heat demand, with active Outdoor boost, the nominal CH setpoint is suspended and the "Outdoor boost maximum off point" sets the OD reset curve. For a given burner demand the starting CH setpoint is calculated accordingly and is then increased by the "Outdoor boost step", at an interval equal to the "Outdoor boost time". This continues until the effective CH setpoint reaches the "Outdoor boost maximum off point" minus CH Off hysteresis. Accordingly, to ensure outlet temperature reaches the nominal CH setpoint, set Outdoor boost maximum off point = CH Setpoint + CH Off hysteresis.

Figure 4-7 Outdoor Reset Line



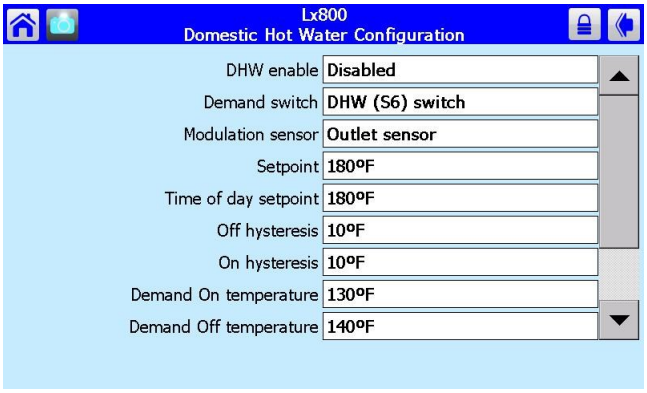
4.4 DHW - Domestic Hot Water Configuration

Figure 4-8 Domestic Hot Water Configuration Screen

CAUTION **BOILERS:** The sum of the DHW setpoint and DHW off hysteresis should not exceed 200°F [93°C] or a "Lockout" condition may result *(not applicable to models Tft60-399)*. If higher water temperatures are required, 190-200°F [88-93°C], adjust limit response to avoid a "Lockout" condition. See section on "High Limits", page 23. Failure to follow these instructions may result in damage to property or the unit.

⚠ DANGER **WATER HEATERS:** The "Lockout" limit response is a mandatory safety feature intended to require a manual reset on water heaters; therefore, the limit response must remain set to "Lockout". Failure to follow these instructions will result in serious injury or death.

NOTICE **Demand Switch -** If DHW is enabled ensure that the Lead Lag DHW is disabled; see Lead Lag Master Configuration DHW on page 32.



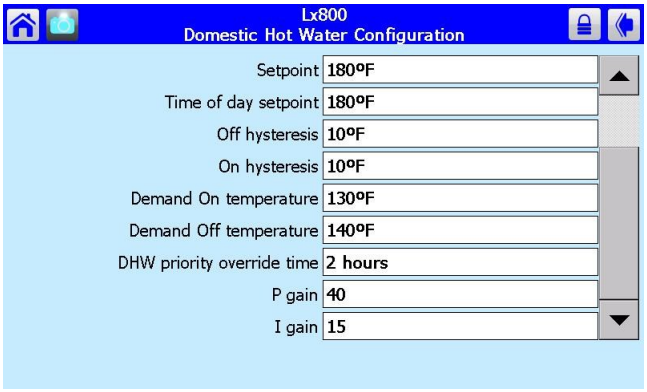


Table 4-8 DHW-Domestic Hot Water Configuration Parameters

Parameter	Description	Factory Settings
DHW Enable *	Enable or disable local DHW demand. (Set to "Disable" if the DHW demand is being serviced via the Lead Lag – i.e. when Lead Lag Master DHW Demand Switch is set to "DHW (S6) sensor shorted", page 32)	Enable
Demand switch *†	Select the DHW demand source (see Warning after table): • DHW (S6) switch • DHW sensor with On/Off temperatures	DHW (S6) switch

Parameter	Description	Factory Settings
Modulation sensor *	Select the DHW modulation sensor: • Outlet sensor • Inlet sensor (Reduce "Setpoint" by 20°F if "Inlet sensor" is selected)	Outlet sensor
Setpoint	Operating temperature for the boiler during a DHW demand, either at the Outlet or Inlet sensor. Range: Tft 60°F to 190°F; Lx 60°F to 200°F. *Note: the sum of Setpoint and Off hysteresis must not be greater than 200°F (not applicable to models Tft60-399).*	180°F [82°C]
Time of day setpoint ⅄	Setpoint for DHW modulation when TOD input is made (night time setback). Range: Lx 60°F to 200°F; FTG 60°F to 195°F. *Note: the sum of Time of day setpoint and Off hysteresis must not be greater than 200°F.*	180°F [82°C]
Off hysteresis *	Value added to DHW setpoint to determine water temperature at which the burner will shut off e.g. if DHW setpoint is 150 °F, and DHW off hysteresis is 10 °F, the burner will be shut off at 160°F. Applies when Demand switch is set to DHW (S6) switch. Range 5 °F to 70°F [3°C to 39°C]. *Note: the sum of Setpoint and Off hysteresis must not be greater than 200°F (not applicable to models Tft60-399).*	10°F [6°C]
On hysteresis *	Value subtracted from DHW setpoint to determine water temperature at which the burner will fire e.g. if DHW setpoint is 150°F, and DHW on hysteresis is 10°F, burner ignition occurs at 140°F. Applies when Demand switch is set to DHW (S6) switch. Range 2°F to 40°F [1°C to 22°C].	10°F [6°C]
Demand On temperature *	DHW demand is switched On when DHW tank temperature is ≤. Applies when Demand switch is set to "DHW sensor with On/Off temperatures". Range 60°F to 165°F [15°C to 74°C]	135°F [57°C]
Demand Off temperature *	DHW demand is switched Off when DHW tank temperature is ≥. Applies when Demand switch is set to "DHW sensor with On/Off temperatures". Range 65°F to 170°F [18°C to 77°C]	140°F [60°C]
DHW priority override time *	Time period during which a DHW demand has priority. If override time has elapsed, the boiler and CH pumps will service a CH demand regardless of DHW demand. Value=0 inhibits DHW priority. Range 0 to 18 hours.	2 hours
P gain *	Proportional gain factor for DHW PID algorithm. Range 30 to 50. (Only available on commercial models Lx500-800)	40
I gain *	Integral gain factor for DHW PID algorithm. Range 15 to 50. (Only available on commercial models Lx500-800)	15

* = Password protected
⅄ = Time of Day (TOD) feature is available on Lx500-800 & FTG models only.
† = If "Demand switch" is set to DHW sensor with On/Off temperatures, demand is determined by the On and Off temperature settings.

⚠ WARNING Tank sensor **MUST** be used in conjunction with a DHW temperature safety shutoff switch. NTI recommends using part number 84632. Failure to provide such a switch may result in property damage, serious injury to occupants, or possibly death.

4.5 Warm Weather Shutdown Configuration

Figure 4-9 WWSD Configuration Screen

Enabling warm weather shutdown (WWSD) inhibits Central heat operation when the outdoor temperature goes above the WWSD set-point. Depending on the WWSD mode selected, CH operation will either end immediately or when an active CH demand ends.

Central heat operation is restored when the outdoor temperature drops below the WWSD set-point by a fixed value of 4ºF[2ºC].

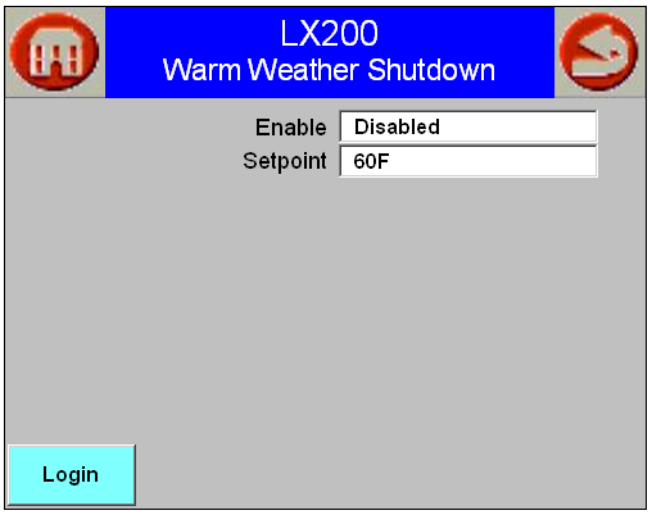


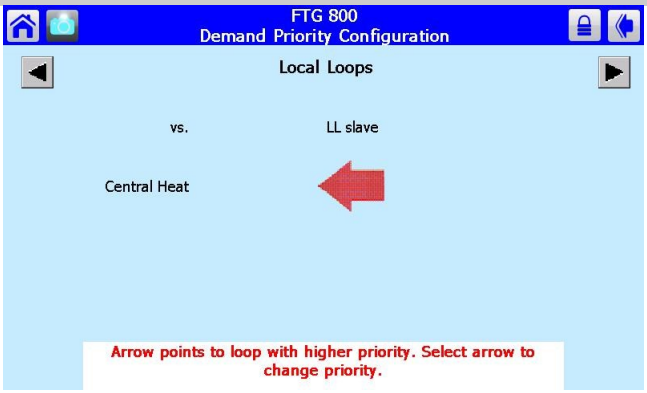
Table 4-9 Warm Weather Shutdown Configuration Parameters

Parameter	Description	Factory Settings
Enable	Enable or Disable Warm Weather Shutdown and select shutdown options • Shutdown after demand ends • Shutdown immediately • Disable	Disabled
Setpoint	Setpoint value for WWSD. When enabled it can prevent or permit response to CH demand calls. Range 50°F to120°F [10°C to 49°C]	60°F [15°C]

4.6 Demand Priority Configuration

Figure 4-9a Demand Priority Configuration Screen

Demand Priority Configuration is used to designate the Central Heat demand with highest priority. The arrow points to the demand with higher priority. To change the setting, touch the arrow. Login with password is required.



NOTICE

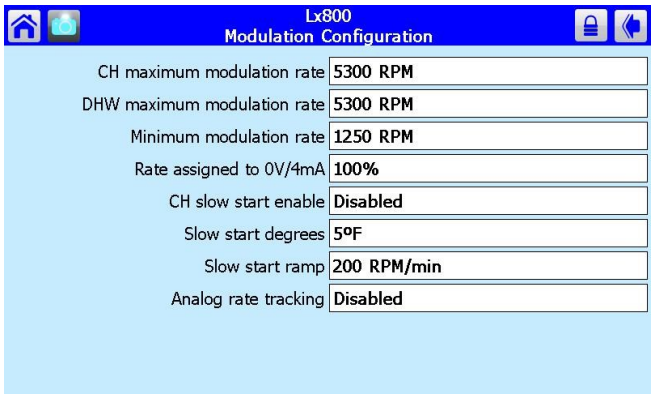
Demand Priority Configuration is currently available only on FTG models.

4.7 Modulation Configuration

Figure 4-10 Modulation Configuration Screen

The configuration screen sets the minimum and maximum blower speeds (RPM) for burner modulation during CH or DHW demand.

Modulation rates are listed by series and model number.



CH and DHW maximum modulation rate:

Tft	Lx/Lx-WH	FTG
60: 4650	150: 5850	600: 5600
85: 6300	150E: 4450	800: 7450
110: 7000	200: 5950	
154: 7980 (7500-LP)	300: 5850	
175: 4100	400: 7250	
200: 4650	500: 6400	
201: 8000	600: 4350	
250: 5900	700: 4300	
285: 7300	800: 5300	
340: 6650		
399 [2]: 6900(6600-LP)		
399 [3]: 7800(7500-LP)		

Minimum modulation rate:

Tft	Lx/Lx-WH	FTG
60: 1525	150: 1150	600: 1150
85: 1525	150E: 925	800: 1150
110:1625	200: 925	
154:1740	300: 1250	
175: 900	400: 1550	
200: 900	500: 1400(2500[4])	
201: 1450	600: 1075(2000[4])	
250: 900	700: 1250(2500[4])	
285: 7300	800: 1250(2500[4])	
340: 1100		
399 [2]: 1500		
399 [3]: 1050		

Notes:

[1] All modulation rate values are given in Revolutions per Minute (RPM).

[2] Tft399's with a serial number of 20899 and lower have a modulation range of 1500-6900 RPM when operating with Natural Gas and 1500-6600 RPM when operating with Propane.

[3] Tft399's with a serial number greater than 90974 have a modulation range of 1050-7800 RPM when operating with Natural Gas and 1050-7500 RPM when operating with Propane.

[4] When using the Indoor Combustion Air Kit (models Lx500-800 only), the minimum modulation must be adjusted up as indicated.

Figure 4-11 Modulation Configuration Screen (Indoor Combustion Air Kit)

CAUTION **Indoor Combustion Air Kit**

The Dagger (†) in the list just above indicates the minimum modulation rate required when using the Indoor Combustion Air Kit *(applicable only to commercial models Lx500-800)*.

Modify Minimum Modulation Rate setting when using an Indoor Combustion Air Kit

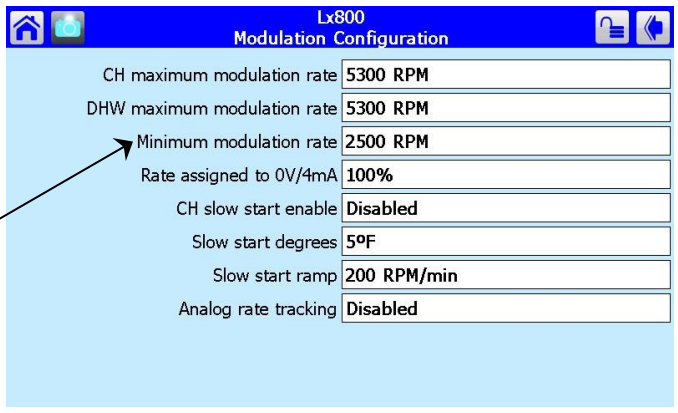


Table 4-10 Modulation Configuration Parameters

Parameter	Description	Factory Settings
CH max. modulation rate *	Maximum permissible blower speed during CH demand. Range is model dependent.	Model dependent
DHW max. modulation rate *	Maximum permissible blower speed during DHW demand. Range is model dependent.	Model dependent
Minimum modulation rate *	Minimum permissible blower speed. Range is model dependent. See **CAUTION** above when using Indoor Combustion Air Kit in lieu of Air-inlet Direct Vent piping (Lx500-800 only).	Model dependent
Rate assigned to 0V/4ma	Parameter not used	100%
CH slow start enable *	Select CH slow start rate limiting: • Enable • Disable If CH slow start is enabled and the outlet temperature is less than setpoint minus Slow start degrees, then the control applies slow start rate limiting i.e. the burner modulates to factory-set rate of 2000RPM, then ramps the firing rate up at the rate defined by Slow start ramp.	Disabled
Slow start degrees *	Differential temperature subtracted from setpoint to determine if CH slow start rate limiting is activated. Range 0°F to 40°F [0°C to 22.2°C]	5°F [2.8°C]
Slow start ramp *	Rate at which burner modulation (firing rate) increases in RPM/minute when CH slow start is enabled. Range 50RPM/minute to 2000RPM/minute	200RPM/minute
Analog rate tracking *	Select one of the functions listed below to cause analog output (4-20mA on J10-4 or 0-10Vdc on J10-5) to track either local or LL Master firing rate command: • Tracking PWM to 4-20mA • Tracking PWM to 0-10V • Tracking LL Master to 4-20mA • Tracking LL Master to 0-10V • Disabled Only available on commercial models Lx500-800 & FTG	Disabled

* = Password protected

4.8 Pump Configuration

Figure 4-12 Pump Configuration – Central Heat pump

The pump configuration screen allows adjustment of the pump overrun time after a demand ends, or burner shutdown.

NOTICE **Water Heaters:** use only the "Boiler pump" (PUMP B output); therefore, CH and DHW pump overrun time are not applicable.

IMPORTANT **Pump control may be used** to manually override automatic control of the pumps for testing purposes. If used in this manner, ensure that it is set back to "Auto"; otherwise the selected pump(s) will remain powered on indefinitely. TIP: Use the "Pump Test" feature under Diagnostics instead (see Figure 5-5).

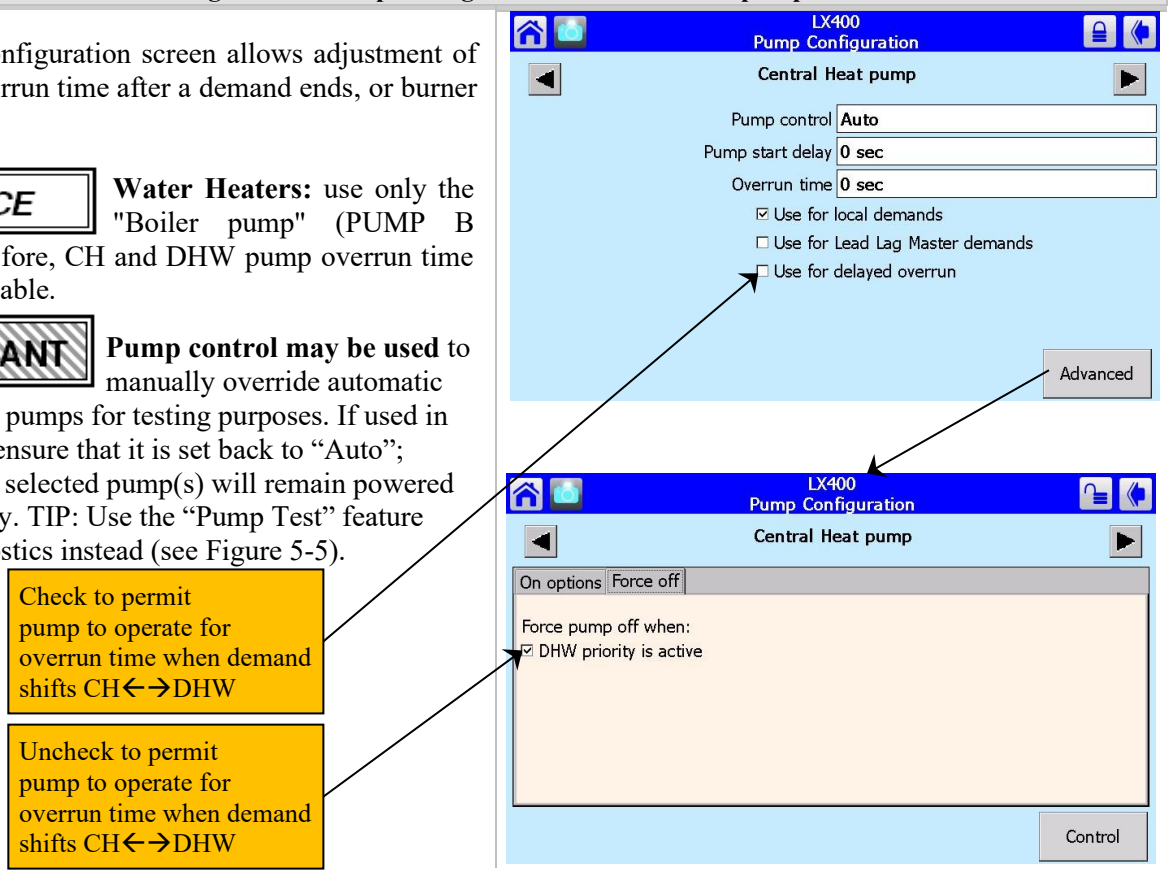


Table 4-11 Pump Configuration Parameters – Central Heat pump

Parameter	Description	Factory Settings
Pump control *	Switches CH pump control from Automatic to ON.	Auto
Pump start delay *	Amount of time to delay start of CH pump when CH demand changed from off to on. No delay if burner already firing due to other demand. Range 0 to 5 seconds.	0 sec
Overrun time *	Amount of time the CH pump will continue to run after a CH demand ends. Range 0 to 1080 minutes.	0 sec
Use for local (Stand-alone) demands *	Check box used to allocate Pump C as the local pump needed for Stand-alone boilers.	Checked
Use for Lead Lag Master demands *	Check box used to allocate Pump C as the CH system pump for Lead Lag boilers.	Unchecked
Use for delayed overrun *	Check box used to permit pump to continue running for the overrun time during a transition between CH and DHW demands. Typically used in conjunction with Advanced-Force off (see next item below) and similar DHW pump settings described on page 21.	Unchecked
Advanced: Force pump off when DHW priority is active*	Check box used to permit pump to continue running for the overrun time during a transition between CH and DHW demands. Typically used in conjunction with Use for delayed overrun (see item above).	Checked

* = Password protected

Figure 4-13 Pump Configuration – Boiler pump

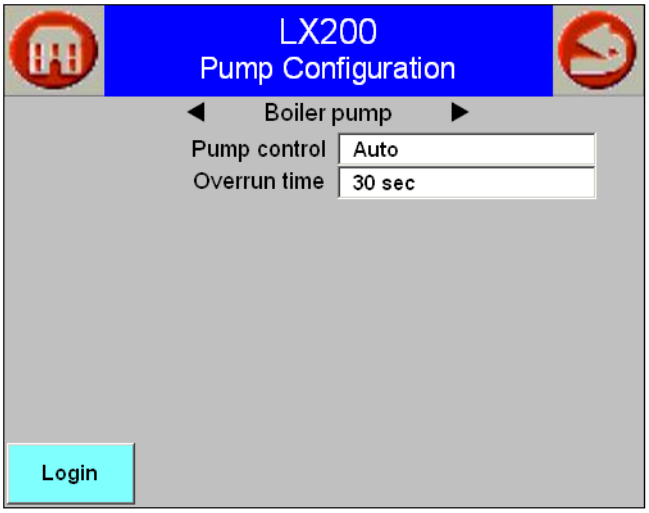


Figure 4-14 Pump Configuration – DHW pump

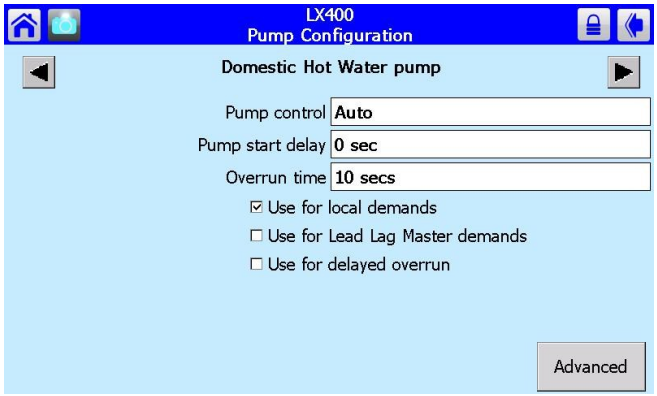


Table 4-12 Pump Configuration Parameters – Boiler pump

Parameter	Description	Factory Settings
Pump control *	Switches Boiler pump control from Automatic to ON.	Auto
Boiler pump overrun time *	Amount of time the Boiler pump will continue to run after the call for central heat or DHW ends. Range 0 to 1080 minutes.	30 sec

* = Password protected

Table 4-13 Pump Configuration Parameters – DHW pump

Parameter	Description	Factory Settings
Pump control *	Switches DHW pump control from Automatic to ON.	Auto
Pump start delay *	Amount of time to delay start of DHW pump when DHW demand changed from off to on. No delay if burner already firing. Range 0 to 480 minutes.	0 sec
DHW pump overrun time *	Amount of time the DHW pump will continue to run after a DHW demand ends. Range 0 to 1080 minutes.	10 sec
Use for local (Stand-alone) demands *	Check box used to allocate Pump A as the local pump needed for Stand-alone boilers.	Checked
Use for Lead Lag Master demands *	Check box used to allocate Pump A as the DHW system pump for Lead Lag boilers.	Unchecked
Use for delayed overrun *	Check box used to permit pump to continue running for the overrun time during a transition between CH and DHW demands. Typically used in conjunction with similar Central Heat pump configuration settings described in Table 4-11 on page 20.	Unchecked

* = Password protected

⚠ CAUTION Setting a "Pump start delay" may cause the boiler to operate without water flow; check plumbing configuration prior to adjusting "Pump start delay". Failure to follow these instructions may cause property damage, personal injury or death.

4.9 Statistics Configuration

Figure 4-15 Statistics Configuration Screen

The controller maintains counters for events related to various devices. The counters may be set to a specific value; for example if the CH pump is replaced its counter may be reset to zero.

NOTICE

Burner cycles and Burner run time counters cannot be reset.

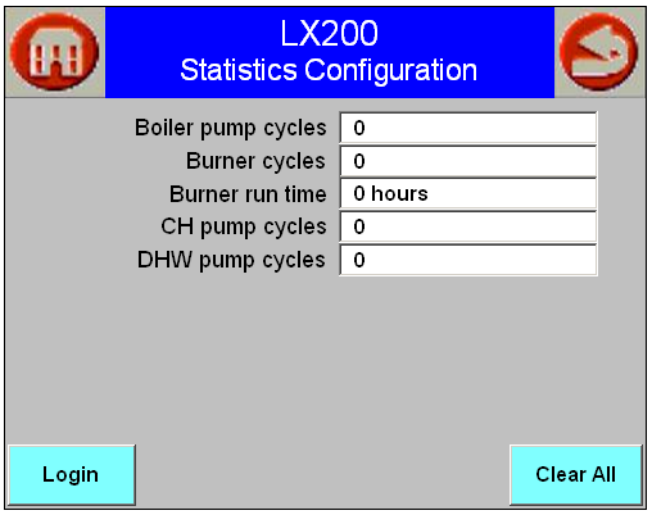


Table 4-14 Statistics Configuration Parameters

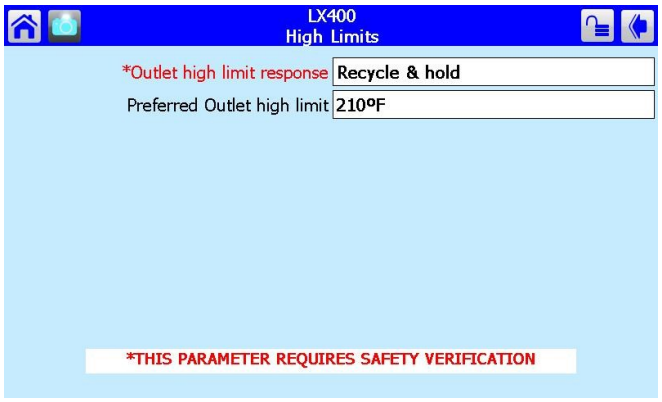
Parameter	Description	Factory Settings
Boiler pump cycles *	Number of boiler pump cycles since last reset. Range 0 to 999,999.	0
Burner cycles	Number of burner cycles since last reset. Includes the blower and ignition components. Range 0 to 999,999. *Not adjustable by installer*	0
Burner run time	Total number of hours of burner operation. Range 0 to 999,999 hours. *Not adjustable by installer*	0 hour
CH pump cycles *	Number of CH pump cycles since last reset. Range 0 to 999,999.	0
DHW pump cycles *	Number of DHW pump cycles since last reset. Range 0 to 999,999.	0

* = Password protected

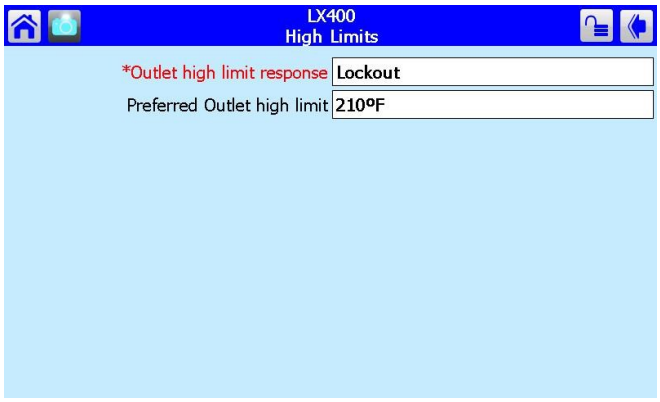
4.10 High Limits

Figure 4-16 High Limits Screens

Boilers Only



Water Heaters



An Outlet High Limit "Lockout" will occur if the outlet temperature from the appliance exceeds the "Outlet High Limit Setpoint" (e.g. 210°F [99°C]). To avoid a lockout condition, ensure the sum of the setpoint and off hysteresis (CH and DHW) is more than 10°F less than the High Limit setpoint.

BOILERS ONLY:
To completely avoid an Outlet High Limit Response "Lockout", set the limit response to "Recycle & Hold" (which is the factory setting for Tft models).

WATER HEATERS *(Trinity Lx200WH-800WH ONLY)*:

⚠ DANGER

The Outlet High Limit Response "Lockout" is a mandatory safety feature intended to require a manual reset on water heater units in the event that the appliance high limit temperature is exceeded. For this reason, the limit response must remain set to "Lockout". Failure to follow these instructions will result in serious injury or death.

Clearing a Lockout - The following are three methods to clear a "lockout" condition:

1. Switch *(not applicable to models Lx500-800 or FTG)* - Cycle power to the appliance by toggling the field-supplied service switch or circuit breaker OFF and ON. NOTE: Tft models are equipped with a local On-Off switch which also may be used.
2. Controller - Clear the lockout at the Controller by pressing the RESET button. See Figure 4-37, page 38.
3. Display - Clear the lockout from the touchscreen display menu. See Figure 6-4 on 44 and Figure 6-5 on page 45.

Table 4-15 High Limit Parameters

Parameter	Description	Factory Settings
Outlet high limit response *	Select controller action in the event outlet temperature exceeds High Limit setpoint *(not applicable to models Lx500-800 or FTG)* • Recycle & hold (Boilers) • Lockout (Water Heaters) **⚠ DANGER** "Lockout" parameter is a required safety feature for Water Heaters.	Lockout (Lx models) Recycle & Hold (Tft models)
Preferred Outlet high limit *	Outlet water temperature high limit. Range 100°F to 210°F	210°F [99°C] (Lx) 200°F [93°C] (Tft)

* = Password protected

4.11 Stack Limit

Figure 4-17 Stack Limit Screen

Set-point value for appliance Stack limit. Flue gas temperature measured at appliance exhaust port.

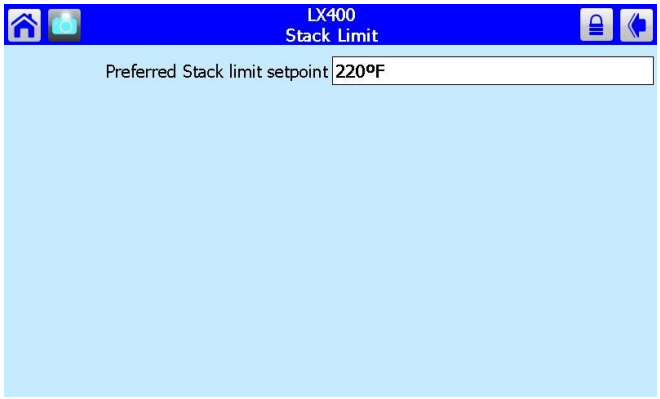


Table 4-16 Stack Limit Parameters

Parameter	Description	Factory Settings
Preferred Stack limit setpoint *	Stack exhaust gas high limit. Range: Tft/Lx 145°F to 220°F [63°C to 104°C]; FTG 145°F to 250°F†	220°F [104°C]

* = Password protected

†=FTG requires OEM password for access

4.12 Delta T Limits and T-rise Limit

Delta T is the difference in water temperature between the boiler Inlet and Outlet. If the Outlet temperature minus the Inlet temperature results in a Delta T greater than 60ºF [35ºC] the burner is shut off for the time specified before firing again. An initial cycle and two recycles are allowed before Lockout occurs. T-rise is the time rate of increase of the temperature difference between Inlet and Outlet. If the rate of change of Inlet to Outlet, in ºF/second, exceeds a fixed value (factory set, not field accessible) the burner will recycle with a delay equal to the T-rise delay setting. An initial cycle and two recycles are allowed before Lockout occurs.

Figure 4-18 Delta T Limits Screen

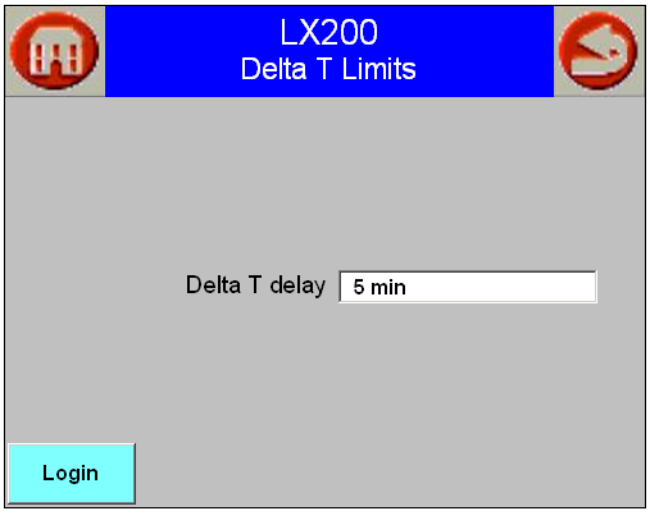


Figure 4-19 T-rise Limit Screen

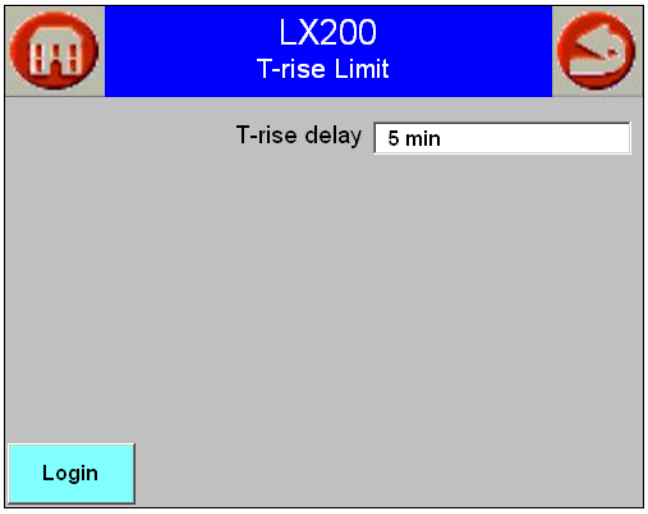


Table 4-17(a) Delta T Limits Parameters

Parameter	Description	Factory Settings
Delta T delay *	Delay time between burner cycles when Delta T limit is exceeded. Range 1 to 60 minutes.	5 min

*=Password Protected

Table 4-17(b) T-rise Limit Parameters

Parameter	Description	Factory Settings
T-rise delay *	Delay time between burner cycles when T-rise limit is exceeded. Range 1 to 60 minutes.	5 min

*=Password Protected

4.13 Frost Protection Configuration

Figure 4-20 Frost Protection Screen

CH Frost Protection - Operates CH and Boiler Circulators (Pump Outputs C and B) if outlet (or header) temperature drops below 45°F [7°C].

DHW Frost Protection - Operates DHW and Boiler Circulators (Pump Outputs A and B) if DHW temperature drops below 45°F [7°C].

LL Frost Protection - Operates System circulator (Pump Output C) if outlet (or header) temperature drops below 45°F [7°C].

Frost Protection operates the burner at the minimum modulation rate regardless of application (CH, DHW or LL) if outlet temperature drops below 38°F [3°C].

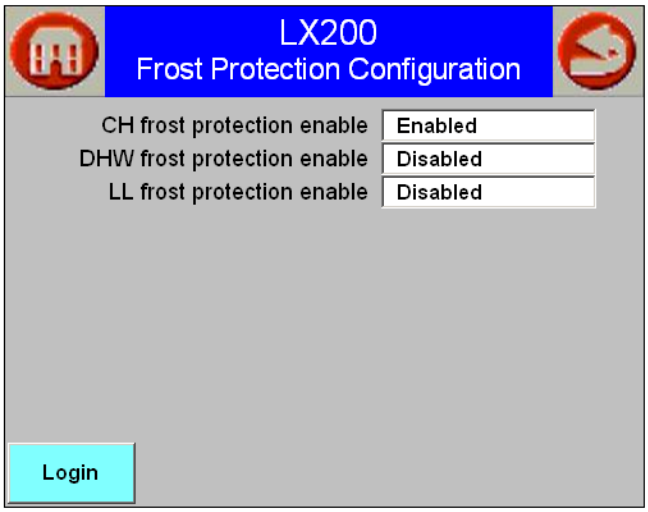


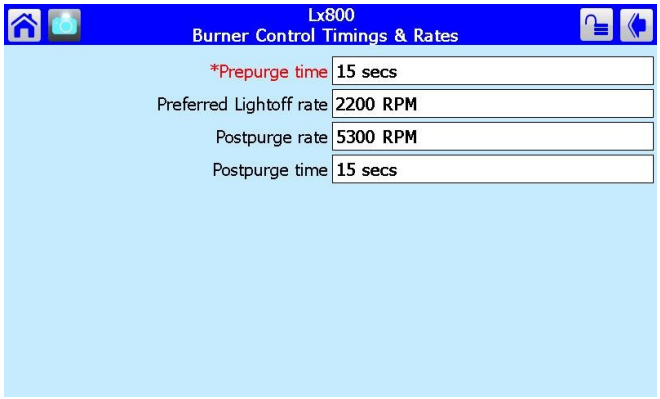
Table 4-18 Frost Protection Configuration Parameters

Parameter	Description	Factory Settings
CH frost protection enable *	Enable or Disable frost protection for central heat.	Enabled
DHW frost protection enable *	Enable or Disable frost protection for DHW. *Enable only when used with Indirect Fired Water Heater.*	Disabled
LL frost protection enable *	Enable or Disable frost protection for lead lag. Each slave detects Frost Protection individually and notifies the Master.	Disabled

* Password protected

4.14 Burner Control Timings & Rates

Figure 4-21 Burner Control Timings & Rates Screen



Preferred Lightoff rate - Can be adjusted to optimize ignition smoothness.

WARNING When using the Indoor Combustion Air Kit instead of Air Inlet direct vent piping (Lx500-800 only), the Lightoff rate must be adjusted as follows:

Lx500/Lx500WH = 3500 RPM
Lx600/Lx600WH = 3500 RPM
Lx700/Lx700WH = 3000 RPM
Lx800/Lx800WH = 3000 RPM

Post-purge Time - Applications with excessively long burner-on times or applications with long venting may require a longer post-purge to satisfactorily cool the flame sense circuit and remove moist flue gases remaining in the flue.

Table 4-19 Burner Control Timings & Rate Parameters

Parameter	Description	Factory Settings
Prepurge time *⅄	Amount of time the combustion blower will run prior to burner ignition. Range: Lx500-800 10 to 30 seconds; FTG 10 to 50 seconds.	Lx500-800: 15 sec FTG: 50 sec
Preferred Lightoff rate *	Blower speed for burner ignition. Range model dependent. See **WARNING** above when using Indoor Combustion Air Kit instead of Air-Inlet Direct Vent piping (Lx500-800 only).	Tft60-399/FTG 4000 RPM Lx150-500 3000 RPM Lx600-800 2000 RPM
Postpurge rate *	Blower speed for postpurge cycle after burner shutdown. Range: model dependent.	Model dependent
Postpurge time *	Amount of time the combustion blower will continue to run after burner shutdown. Range model dependent.	Model dependent

* = Password protected

⅄ = Prepurge time only on commercial models Lx500-800 & FTG.

4.15 Burner Control Ignition

Figure 4-21a Burner Control Ignition Screen

The Pilot test hold parameter is not used.

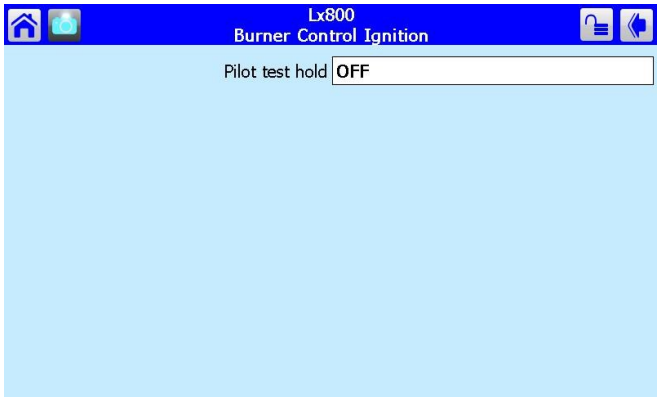


Table 4-20 Burner Control Ignition Parameters

Parameter	Description	Factory Settings
Pilot test hold	Not applicable	Off

4.16 System Configuration

Figure 4-22 System Configuration Screen

NOTICE

Anti short-cycle time - This feature does not apply to Domestic Hot Water demand or recycle events.

The Anti short-cycle feature is designed to prevent excessive burner on/off cycling due to e.g. short or rapid thermostat cycles, low heating load, etc.

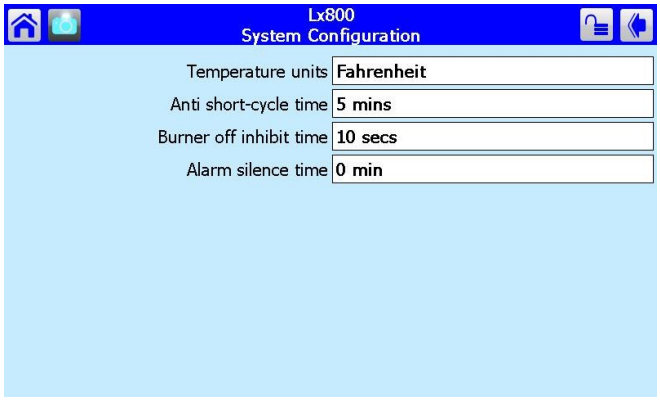


Table 4-21 System Configuration Parameters

Parameter	Description	Factory Settings
Temperature units	Select which temperature unit to display: • Fahrenheit • Celsius	Fahrenheit
Anti short-cycle time *	Whenever the burner is turned off due to no demand the anti-short-cycle timer is started and the burner remains in a Standby Delay condition waiting for this time to expire. Range 0 to 60 minutes (1 hour).	5 minutes
Burner off inhibit time *	If demand changes from a high-temperature setpoint to a lower setpoint (e.g. from CH to DHW), water temperature may exceed the burner off point for the new demand. This value determines how long the control will ignore the burner off hysteresis or threshold before shutting down the burner, in order to reduce burner cycling. Range 0 to 30 minutes.	10 seconds
Alarm silence time	Alarm may be silenced for this amount of time. Range 0 to 600 minutes (10 hours).	0 minutes

* Password protected

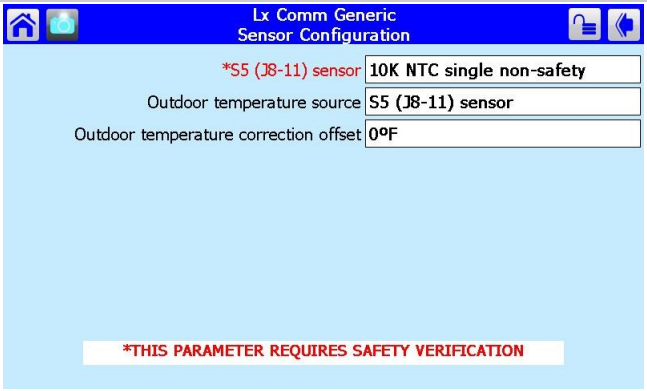
4.17 Sensor Configuration

Figure 4-23 Sensor Configuration Screens

Models Lx500-800

The temperature sensor input designated as Outdoor/System may function as an Outdoor temperature sensor input *OR* as a System temperature sensor input depending on the Lead-Lag "Master" setting. If Lead-Lag "Master" is "Disabled" the controller uses the input for Outdoor temperature. If Lead-Lag "Master" is "Enabled" it uses the Outdoor/System input as a System sensor. Depending on the installation requirements, sensor configuration will have to be set as described here.

Outdoor Temperature source: MUST be set to UNCONFIGURED on Master boiler of a multiple boiler application.



Models Lx500-800 & FTG

S5 (J8-11) sensor: MUST be set to UNCONFIGURED on Master boiler if NOT using a system sensor (NTI part number 84010).

NOTICE In a multiple boiler application, the Outdoor Sensor MUST be connected to a slave boiler.

Models Lx150-400/Tft60-399

S10 (J10-7) sensor: MUST be set to UNCONFIGURED on Master boiler if NOT using a system sensor (NTI part number 84010)

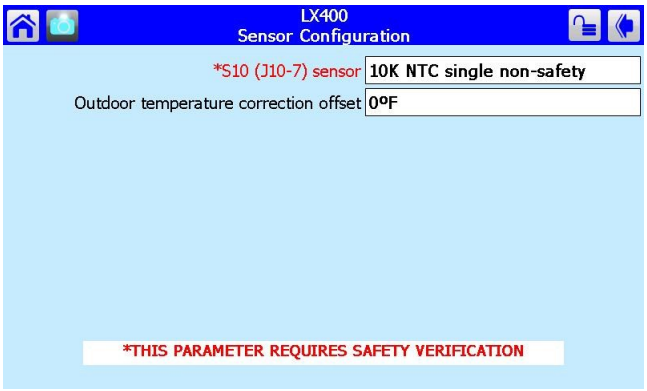


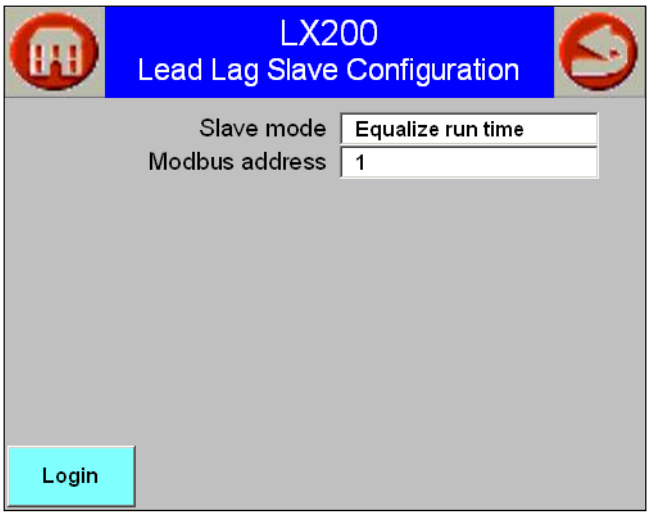
Table 4-22 Sensor Configuration Parameters

Parameter	Description	Factory Settings
S5 (J8-11) *	Select sensor type *(Lx500-800, FTG Only)*: • 10K NTC single non-safety • UNCONFIGURED	10K NTC single non-safety
S10 (J10-7) *	Select system sensor input *(Lx150-400, Tft60-399 Only):* • 10K NTC single non-safety • UNCONFIGURED	10K NTC single non-safety
Outdoor temperature source *	Select outdoor temperature input *(Lx500-800 Only)*: • S5(J8-11) sensor • UNCONFIGURED	S5(J8-11) sensor
Outdoor temperature correction offset *	Used to correct the outdoor temperature sensor readings in cases where the sensor must be installed in an unfavorable location. Range -72°F to 72°F or -40°C to 40°C (depends on temperature units selection).	0°F[0°C]

* = Password protected

4.18 Lead Lag Slave Configuration

Figure 4-24 LL Slave Configuration Screen



Use First – This mode has priority over all the others. A unit with its slave mode set to "Use First", will always fire first before any other slave in the cascade and it will be the last one dropped.

Equalize Run Time – This mode stages the units based on run time equalization where the unit with the least burner hours fires first and the most burner hours fires last. Only "Use First" has higher priority.

Use Last – This mode has the lowest priority. A unit with its slave mode set to "Use Last", will always fire last after every other slave in the cascade is running. It will be the last slave to fire and the first one dropped.

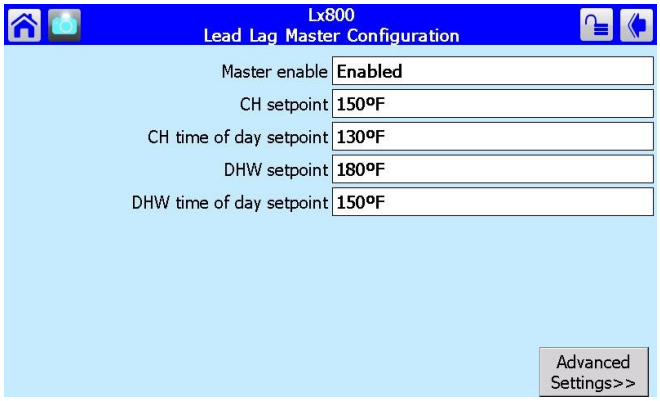
Table 4-23 Lead Lag Slave Configuration Parameters

Parameter	Description	Factory Settings
Slave mode *	Select from slave mode from drop down list: • Use First • Equalize run time • Use Last	Equalized run time
Modbus address *	DO NOT adjust Modbus address from this screen. Set MB2 address from “System Identification & Access” screen (page10). See Figure 4-2 and Table 4-2, page 10.	1

* Password protected

4.19 Lead Lag (LL) Master Configuration

Figure 4-25 Lead Lag Master Configuration Main Screen



CH Setpoint – Setpoint temperature during a CH2 (LL) demand. If LL Outdoor Reset is "Disabled", this is the target water temperature; if LL Outdoor Reset is "Enabled", then this becomes the setpoint when the outdoor temperature is at the "Minimum outdoor temperature" or lower.

The CH setpoint value selected will depend on the type of heating system and modulation source [i.e. System sensor on supply/return header or outlet sensor (backup)]. A lower setpoint is recommended when using the system sensor, especially if it is installed on the return header. See Plumbing section of Installation and Operation Manual.

Use the "Advanced Settings" button (main screen, bottom right corner) to access the other setup options described in Figures 4-26 through 4-32.

Table 4-24 Lead Lag Master Configuration Parameters – Main Screen

Parameter	Description	Factory Settings
Master Enable *	Enables or Disables Lead Lag Master. Enable only one unit as LL Master.	Disable
CH Setpoint	Setpoint temperature for a Lead Lag Central Heat, CH2 (LL) demand. Setting only valid on the boiler with "Master enable" set to "Enable". Range: 60-190°F (Tft60-399); 60-195°F (Lx500-800 & FTG); 60-200°F (Lx150-400).	150°F [65°C]
CH time of day setpoint *⅄	Setpoint temperature for Lead Lag Central Heat, CH2 (LL) demand when TOD input is made (night time setback). Range 60-195°F.	130°F [54°C]
DHW Setpoint	Setpoint temperature for Lead Lag DHW demand. Setting only valid on the boiler with "Master enable" set to "Enable", and with "Demand switch" set to "DHW (S6) sensor shorted". Range: 60-190°F (Tft60-399); 60-195°F (Lx500-800 & FTG); 60-200°F (Lx150-400).	180°F [82°C]
DHW Time of day setpoint *⅄	Setpoint for DHW modulation when TOD input is made (night time setback). Range 60-195°F.	180°F [82°C]

* = Password protected ⅄ = Time of Day (TOD) feature available only on Lx500-800 & FTG

Control of Lead Lag Central Heat operation - The controller has the ability to control LL CH operation with a locally configured setpoint temperature, or to accept a 4-20mA setpoint signal from an external control. Refer to the Installation and Operation manual for your specific appliance for information on connecting a 4-20mA input.

Setpoint - If "Local" is selected as the LL CH Setpoint source, the LL CH Setpoint value entered on the screen depicted in Figure 4-25 is used for control. If 4-20mA is selected as the LL CH Setpoint source, the boiler determines its setpoint from the 4-20mA signal. The setpoint is calculated from field-set values corresponding to 4mA and 20mA. In the event that the 4-20mA input signal is invalid, out of range, or absent, the LL CH Setpoint is used until the signal is valid again. Regardless of the LL CH Setpoint source, "Local" or 4-20mA, the controller's internal PID algorithm modulates the burner. **The 4-20mA signal does not create burner demand; a call for heat must be present at the CH2 (LL) input.**

If desired, a pump connected to the CH pump output of one boiler in a Lead Lag configuration may be configured as the system circulator pump. Refer to Figure 4-12, page 20.

Figure 4-26 LL Master Configuration Modulation

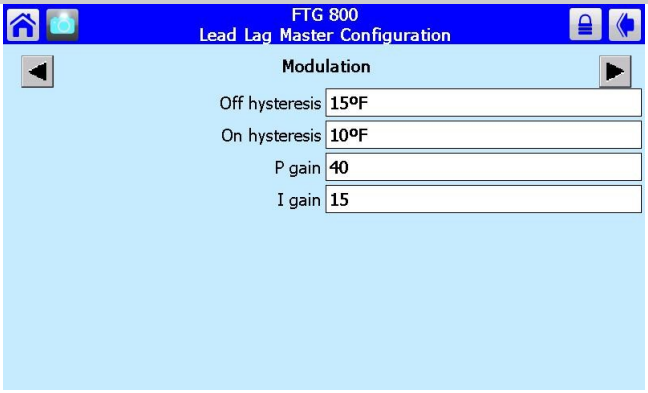
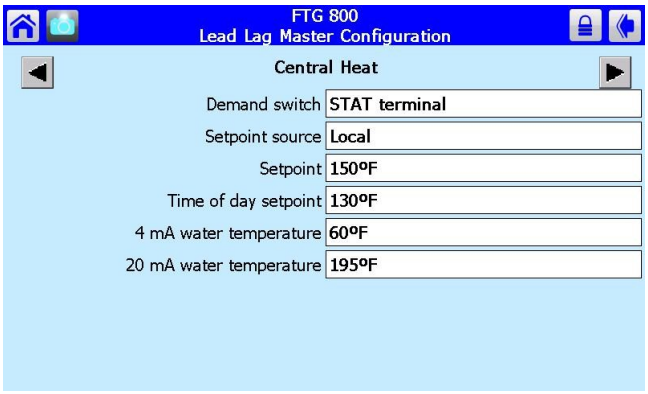


Figure 4-27 LL Master Configuration Central Heat



NOTICE

Demand Switch: If set to "Modulation sensor" demand occurs when Water termperature < Setpoint – On hysteresis, see Table 4-26 below.

Table 4-25 Lead Lag Master Configuration Parameters – Modulation

Parameter	Description	Factory Settings
Off Hysteresis *	Value added to LL CH Setpoint to determine water temperature at which the burner will shut off. *Example:* If LL CH Setpoint is 150°F, and Off hysteresis is 15°F, the burner will be shut off at 165°F. Range 5 °F to 70°F. *Note: the sum of Setpoint and Off hysteresis must not be greater than 200°F (not applicable for models Tft60-399).*	15°F [8°C]
On Hysteresis *	Value subtracted from LL CH setpoint to determine water temperature at which the burner will fire. *Example:* If LL CH Setpoint is 150°F[65°C], and On hysteresis is 10°F[6°C], burner ignition occurs at 140°F. Range 2°F to 40°F [1°C to 22°C].	10°F [6°C]
P Gain *	Gain applied to the proportional term of the LL PID control algorithm. Range 5 to 50 (no units). Decrease to slow rate of control response.	30
I Gain *	Gain applied to the integral term of the LL PID control algorithm. Range 5 to 50 (no units). Decrease to slow rate of control response.	15

* Password protected

Table 4-26 Lead Lag Master Configuration Parameters – Central Heat

Parameter	Description	Factory Settings
Demand Switch *	Select the LL Central Heat demand source: • STAT terminal • Modulation sensor • Disable	STAT terminal
Setpoint Source *	Select the LL Central Heat setpoint source: • Local (control references LL CH Setpoint setting) • 4-20mA S2 (J8-6) (control references 4-20mA signal from an external control) *Outdoor reset must be disabled when using 4-20mA signal.*	Local
Setpoint	Alternate location to edit LL CH setpoint. Equivalent to CH setpoint on LL Master main screen. See Table 4-24 above. *Note: the sum of Setpoint and Off hysteresis must not be greater than 200°F (not applicable for models Tft60-399).*	150°F [65°C]
Time of day setpoint ⅄	Alternate location to edit LL CH TOD setpoint. See Table 4-24 above. *Note: the sum of Time of day setpoint and Off hysteresis must not be greater than 200°F.*	130°F [54°C]

Parameter	Description	Factory Settings
4ma water temperature	Target water temperature at 4mA input. Range 60°F to 125°F [15°C to 52°C].	60°F [15°C]
20mA water temperature	Target water temperature at 20mA input. Range 126°F to 195°F [52°C to 90°C].	195°F [90°C]

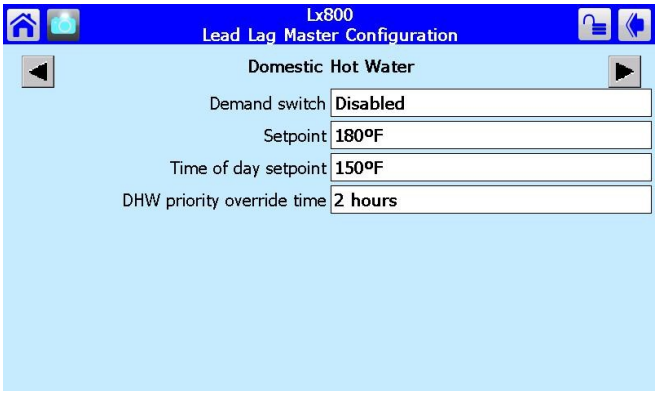
* = Password protected

⅄ = Time of Day (TOD) feature is available on Lx500-800 & FTG models only.

Figure 4-27a Lead Lag Master Configuration DHW

CAUTION **BOILERS:** The sum of the DHW setpoint and DHW off hysteresis should not exceed 200°F [93°C] or a "Lockout" condition may result *(not applicable to Tft60-399)*. If higher water temperatures are required, 190-200°F [88-93°C], adjust limit response to "Recycle and Hold" to avoid a "Lockout" condition. See section on "High Limits", page 23. Failure to follow these instructions may result in damage to property or the unit.

⚠ DANGER **WATER HEATERS:** The "Lockout" limit response is a mandatory safety feature intended to require a manual reset on water heaters; therefore, the limit response must remain set to "Lockout". Failure to follow these instructions will result in serious injury or death.



NOTICE **Demand Switch**: If Lead Lag DHW is enabled by selecting "DHW (S6) sensor shorted", ensure that the local DHW demand is disabled; see DHW - Domestic Hot Water Configuration on page 14.

Table 4-26a Lead Lag Master Configuration Parameters – DHW

Parameter	Description	Factory Settings
Demand switch *	Select the Lead Lag DHW demand source: • Disable • DHW (S6) sensor shorted. Note: ensure local DHW is disabled, see page 14	Disable
Setpoint	Setpoint for LL DHW modulation. Range 60°F – 190/200°F (Tft/Lx). *Note: the sum of Setpoint and Off hysteresis must not be greater than 200°F (not applicable for models Tft60-399).*	180°F [82°C]
Time of day setpoint ⅄	Alternate location to edit LL DHW TOD setpoint. See Table 4-24 above. *Note: the sum of Time of day setpoint and Off hysteresis must not be greater than 200°.*	180°F [82°C]
DHW priority override time *	Time period during which a DHW demand has priority. If override time has elapsed, the boiler and CH pumps will service a CH demand regardless of DHW demand. Value=0 inhibits DHW priority. Range 0 to 18 hours.	2 hours

* = Password protected

⅄ = Time of Day (TOD) feature available on Lx500-800 & FTG models only.

Figure 4-28 LL Master Configuration Frost Protection

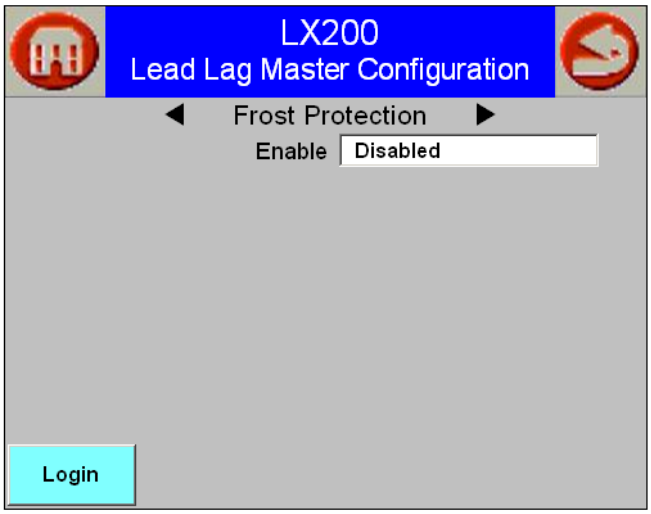


Figure 4-29 LL Master Configuration Outdoor Reset

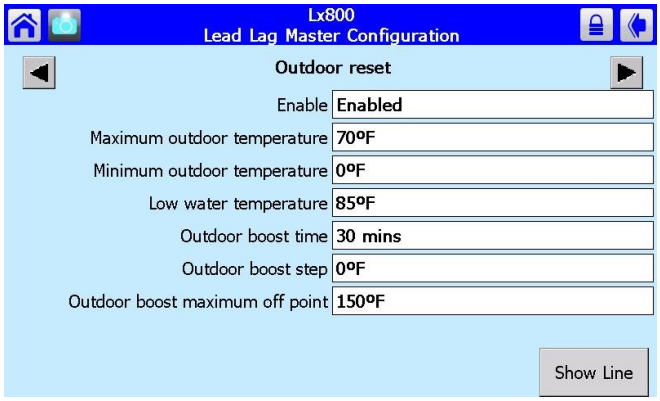


Table 4-27 Lead Lag Master Configuration Parameters – Frost Protection

Parameter	Description	Factory Settings
Enable *	Enable or Disable Frost Protection for Lead Lag Master.	Disabled

* Password protected

Table 4-28 Lead Lag Master Configuration Parameters – Outdoor Reset

Parameter	Description	Factory Settings
Enable	Enables or disables Outdoor reset	Enabled
Maximum outdoor temperature *	Outdoor temperature that corresponds to the Low water temperature setting. *Example:* If the Low water temperature setting is 95°F, and the Maximum outdoor temperature setting is 70°F, the boiler water temperature setpoint will be 95°F when the outdoor temperature is 70°F or higher. Range 50°F to 95°F [10°C to 35°C].	70°F [21°C]
Minimum outdoor temperature *	Outdoor temperature that corresponds to the Maximum water temperature. *Example:* If the Maximum water temperature setting is 150°F (defined by LL setpoint), and the Minimum outdoor temperature setting is 0°F, the boiler water temperature setpoint will be 150°F when the outdoor temperature is 0°F or lower. Range -40°F to 40°F [-40°C to 4°C].	0°F [-18°C]
Low water temperature *	Minimum water temperature setpoint; occurs when the outdoor temperature is equal to or greater than the Maximum outdoor temperature. Range 60°F to 140°F [15°C to 60°C].	85°F [29°C]
Outdoor boost time * †	Time interval for boost step, up/down. Range 0 – 18 hours.	30 minutes
Outdoor boost step * †	CH setpoint boost step, up/down. Range 0-50°F [0-28°C]. A value of 0° disables boost.	0°F/C
Outdoor boost maximum off point * †	Maximum temperature that the LL CH outlet temperature may be boosted to. Range 60 to 195°F [16 to 91°C].	0°F/C

* = Password protected

†**Outdoor boost** – See note for Table 4-6 for description.

Figure 4-30 LL Master Configuration WWSD

Enabling warm weather shutdown (WWSD) inhibits CH operation when the outdoor temperature goes above the WWSD set-point. Depending on the WWSD mode selected, CH operation will either end immediately or when an active CH demand ends.

CH operation is restored when the outdoor temperature drops below the WWSD set-point by a fixed value of 4ºF [2ºC].

NOTE: Warm Weather Shutdown configuration under Lead Lag Master Configuration is a duplicate of the Warm Weather Shutdown Configuration screen that is available in the main configuration menu. Changes made from either screen affect WWSD settings equally.

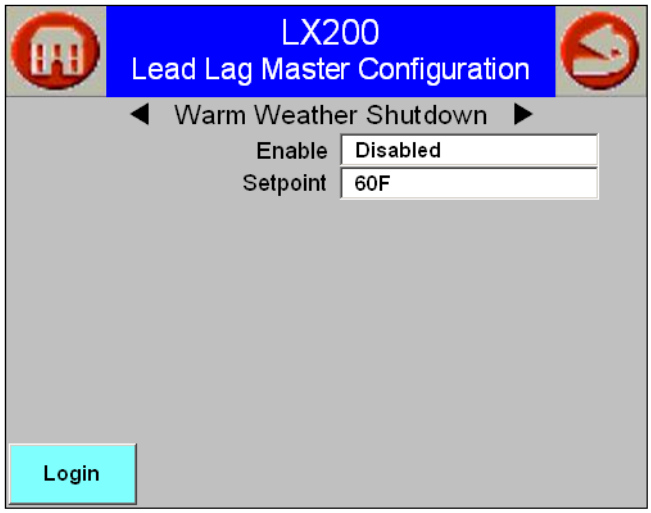
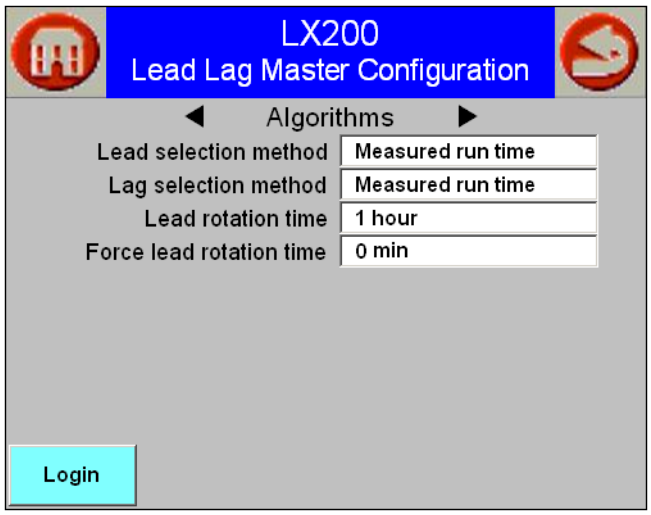


Table 4-29 Lead Lag Master Configuration Parameters – Warm Weather Shutdown (WWSD)

Parameter	Description	Factory Settings
Enable	Enable or Disable LL Warm Weather Shutdown and select shutdown options: • Shutdown after demand ends • Shutdown immediately • Disable *Disable for Water Heaters.*	Disabled
Setpoint	Setpoint value for WWSD. Use of this value depends on warm weather shutdown (WWSD) being enabled. The outdoor temperature and a 4ºF [2ºC] differential is compared to the WWSD setpoint to determine if it is in the active range. When enabled, the WWSD will not go active until all demand sources are off. Once active, it will inhibit CH or LL CH demand and only respond to DHW demands, until the outdoor temperature is below the WWSD set point.	60°F [15°C]

Figure 4-31 LL Master Configuration Algorithms



Measured Run Time – Determines selection based on burner run time. The unit with the lowest run time is first in the queue and selection proceeds in descending order to the final unit which has the highest run time.

Sequence Order – Determines the order in which units will be used in a round-robin arrangement based on the default or installer assigned Modbus address.

Rotation Time – Rotation is based on run time in "burner hours" rather than on a 24-hour clock. Once run time has elapsed, Lead rotation will occur at the next burner off cycle. If Force lead rotation time is non-zero, during a continuous heat call or demand, the Master will force a rotation of the lead boiler immediately once the specified time has elapsed.

Table 4-30 Lead Lag Master Configuration Parameters – Algorithms

Parameter	Description	Factory Settings
Lead selection method*	Select preferred selection method for Lead: • Measured run time (only valid if Slave Mode set to "Equalize run time") • Sequence order	Measured run time
Lag selection method*	Select preferred selection method for Lag: • Measured run time (nly valid if Slave Mode set to "Equalize run time") • Sequence order (SO)	Measured run time
Lead rotation time*	Minimum amount of burner run time accumulated before Lead rotation will occur. Range 1 minute - 960 hours.	1 hour
Force lead rotation time*	Maximum amount of burner run time accumulated before Lead forced to rotate. Range 0 hours - 1030 hours (a setting of 0 disables Force lead rotation feature).	0 hours

* Password protected

Figure 4-32 LL Master Configuration Rate Allocation

Base Load Common – In a Lead Lag configuration all the boilers fire at the same rate which is determined by the Master. When there is a call for heat resulting in a burner demand, the lead boiler fires first and is allowed to modulate up to the Base load common rate. If the call for heat is not satisfied within a specified time (see Add Stage just below) successive lag boilers are fired at the Base load common rate until the water temperature is within the error threshold of the setpoint, or all the boilers are firing. When the water temperature is within the threshold of setpoint, or all boilers are firing, the system is free to modulate to meet the heating load. This parameter value is normally set below 100% to promote higher operating efficiency.

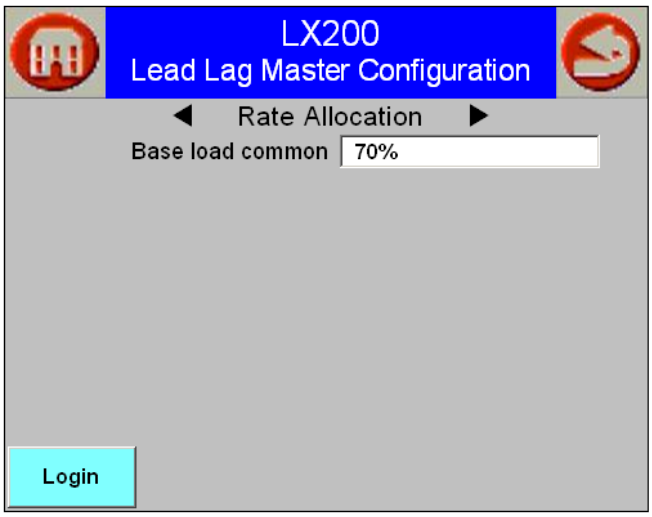


Table 4-31 Lead Lag Master Configuration Parameters – Rate Allocation

Parameter	Description	Factory Settings
Base load common *	Maximum modulation rate of all firing units when other units are still available and idle. Range 25 - 100%.	70%

* Password protected

Figure 4-33 LL Master Configuration Add Stage

Add Stage - The LL master uses error threshold and interstage delay to determine when a new stage will be added.

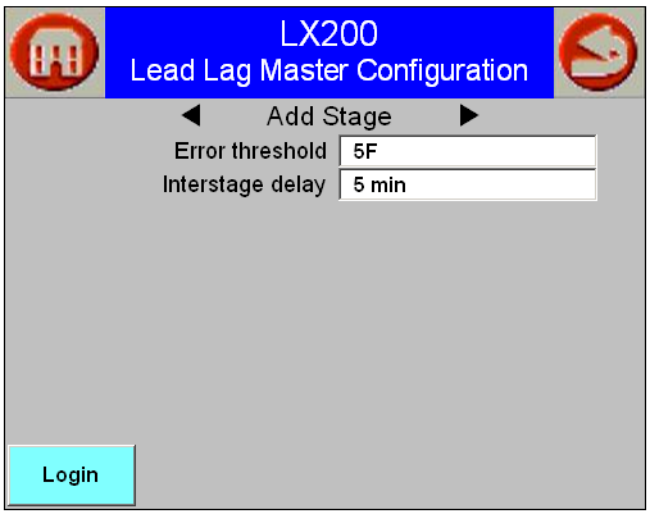


Table 4-32 Lead Lag Master Configuration Parameters – Add Stage

Parameter	Description	Factory Settings
Error threshold	Staging based on temperature error: a stage is added when the temperature error (setpoint-measured value) exceeds the specified threshold for more than 30 seconds. Range 3°F to 10°F. Note: must be set less than on/off hysteresis value.	5°F [3°C]
Interstage delay	Specifies the minimum time that the Master waits after adding one stage before adding another stage. Range 1 min - 30 min. Note: error threshold must also be exceeded before next stage is added.	5 min

* Password protected

4.20 Verify (Safety Parameter Verification following Lockout 2)

Figure 4-34 Verifying Safety Parameters

When any safety parameter is modified the controller requires that the parameter(s) be verified before burner control operation is allowed to resume. Login with password is required to access the safety parameters. After any safety parameter is changed, the controller enters a Lockout 2 "waiting for safety data verification" state: burner operation is suspended, the Alarm LED on the controller is illuminated, Alarm contacts (J6-7,8) close.

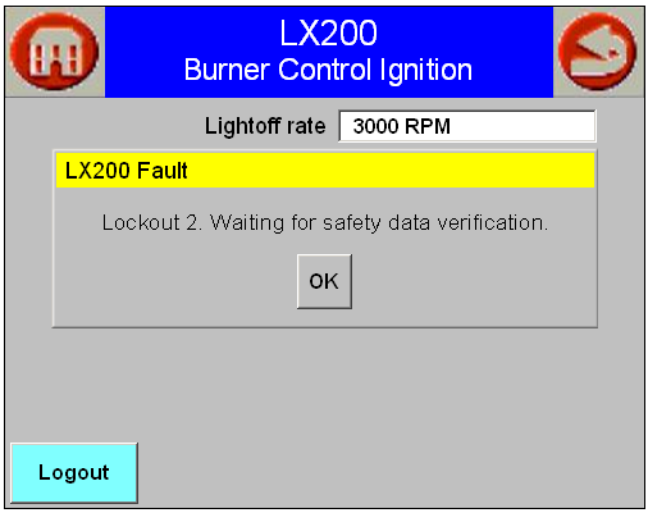


Figure 4-35 Verification ID

To verify the changed parameter(s), it is necessary to navigate to the Configuration page and touch the Verify button at the page bottom. If more than 10 minutes elapse following parameter change(s), a new login is required. Once login is accomplished, a page similar to the adjacent figure is displayed.

Touching the BEGIN button starts the verification.

Figure 4-36 Group Confirmation

Confirmation of the displayed parameter values is required within 30 seconds, otherwise the verification times out and the BEGIN button must be touched again. After the first group is confirmed, subsequent groups (if any) are displayed and must be confirmed. When all groups have been confirmed, the Reset button on the controller must be pressed within 30 seconds. You must have physical access to the controller to perform a reset. For **ALL** Lx models remove either the front access cover of the unit (Lx150-400) or the back section of the top jacket panel (Lx500-800), and then remove the cover of the control enclosure. For Tft models, remove the front cover. For FTG remove front cover, then the control cover. TIP: Do this before starting confirmation!

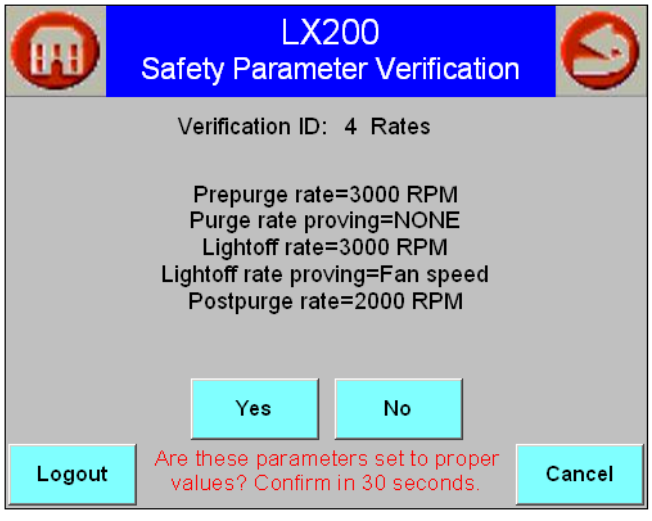
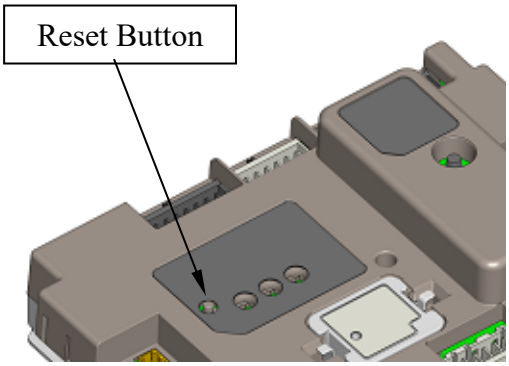


Figure 4-37 Controller Reset

When the controller RESET button is pressed the controller clears the Alarm LED, opens the Alarm contacts, and resumes normal operation.



5 DIAGNOSTICS PAGE

Figure 5-1 Input/Output Screen

The Diagnostics page initially presents a display of Input/Output (I/O) status. The screen image immediately to the right is a typical display of Digital I/O status.

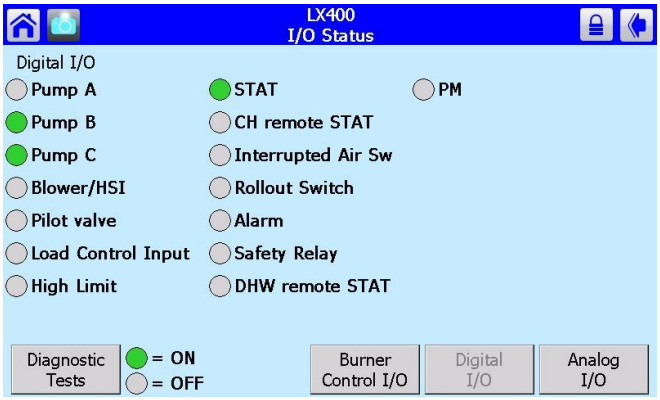


Figure 5-2 Digital & Analog I/O Status

The Burner Control I/O, Digital I/O and Analog I/O buttons at the page bottom are used to toggle between I/O status pages. Each digital input or output status is depicted by a simulated LED with green representing ON, or active, and non-colored representing OFF or inactive. Touching the Burner Control I/O button will display a subset of digital I/O related specifically to burner operation as depicted immediately to the right.

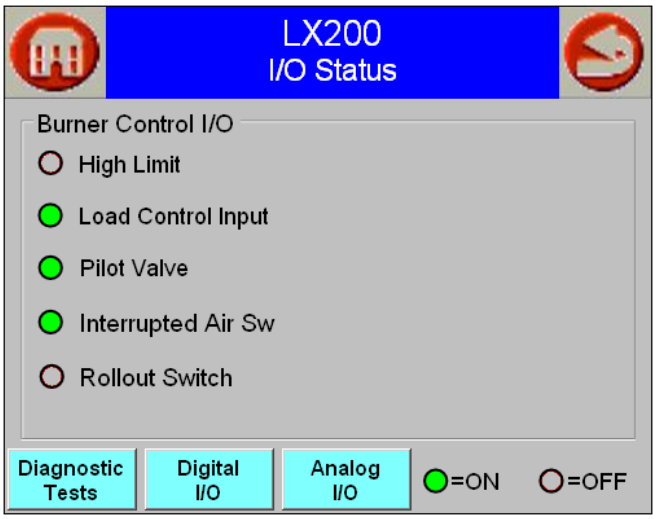


Figure 5-3 Analog I/O Graphs

Touching the Analog I/O button displays a scrollable group of bar graphs depicting the current value of each analog input and output.

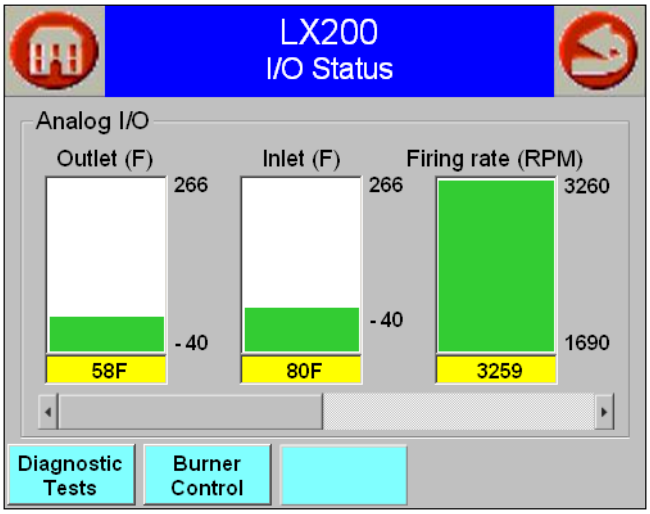
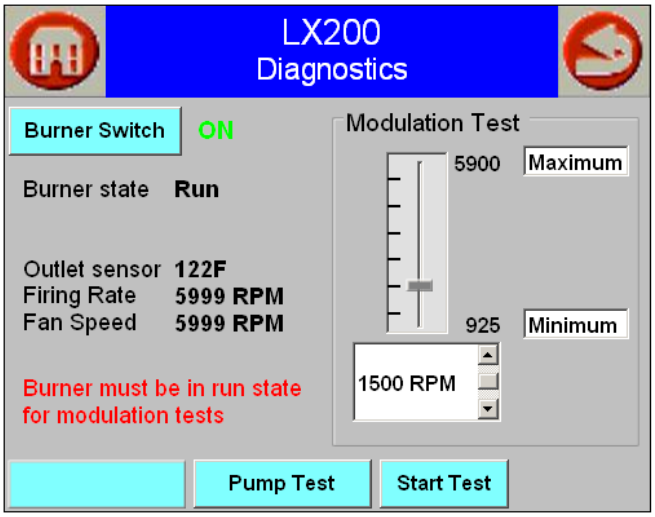


Figure 5-4 Modulation Test



Selecting the DIAGNOSTIC TESTS button brings up one of two pages for performing tests with the burner and pumps. The initial page displayed is the Modulation Test page.

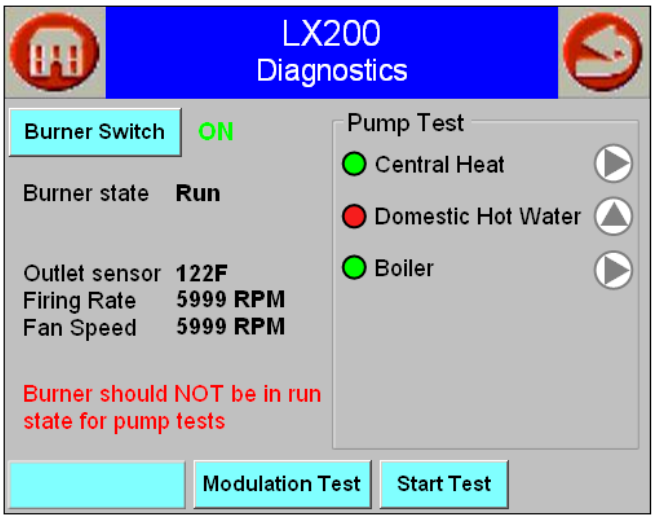
The Modulation Test page allows the installer to test burner operation and combustion at a given firing rate (E.g. minimum and maximum).

Touching the START TEST button initiates the Modulation Test. The test will run for a maximum of 5 minutes. It may be stopped and restarted as required.

NOTICE The installer password is required to initiate the modulation test. When the modulation test is complete touch the STOP TEST button to terminate – do not turn power off while performing the modulation test.

IMPORTANT The burner MUST be firing for the Modulation Test to function.

Figure 5-5 Pump Test



Touching the PUMP TEST button displays the Pump Test page. Here the installer may manually start and stop the pumps to verify their operation.

IMPORTANT When a pump is turned on by touching one of the pump icons, it will remain on until it is turned off by touching its icon again. **Use the Start Test button to test the pumps**. This will perform a timed test lasting 10 seconds for each pump. After its test interval, each pump is stopped and restored to automatic operation. The test may be stopped at any time by touching the button again. During the test the button's color changes to red and the button text changes to "Stop Test".

CAUTION On each of the Modulation Test and Pump Test pages there is a "Burner Switch" button that may be used to manually shut off the burner. The installer password must be entered to permit use of the Burner Switch. **Be aware that using the Burner Switch to turn the burner OFF inhibits automatic operation of the burner. It will remain OFF, even if power to the appliance is cycled off and on, until it is manually placed in the ON condition. The Burner Switch MUST be ON for automatic burner operation**. Furthermore the Burner Switch cannot be used to manually fire the burner. The control only responds to an actual demand. The burner will not fire simply by turning the Burner Switch on; there must also be a heat call due to a CH1, CH2 (LL) or DHW demand, and the water temperature must be less than Setpoint - On hysteresis.

6 DETAILS PAGE

Figure 6-1 Details Page Navigation

Touching the DETAILS button enters a series of pages, each presenting a detailed summary of configuration and operational data that roughly corresponds to one of the configuration groups.

Use the left ◀ and right ▶ horizontal scroll buttons to navigation between Details pages. See sample of Central Heat Pump page as shown in Figure 6-1.

If all the data pertaining to the selected item cannot fit on a single screen, the vertical scroll bar may be used to scroll through the complete list.

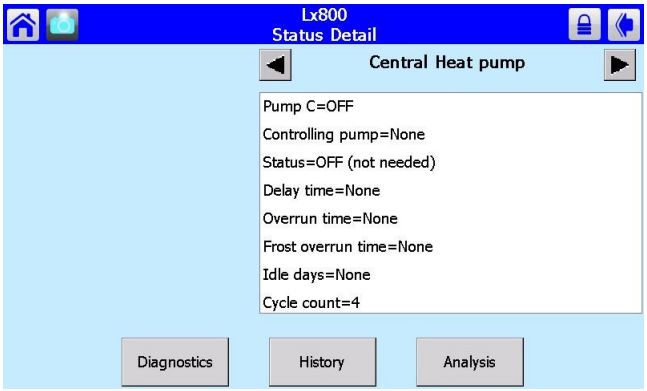


Table 6-1 Details Page Parameters

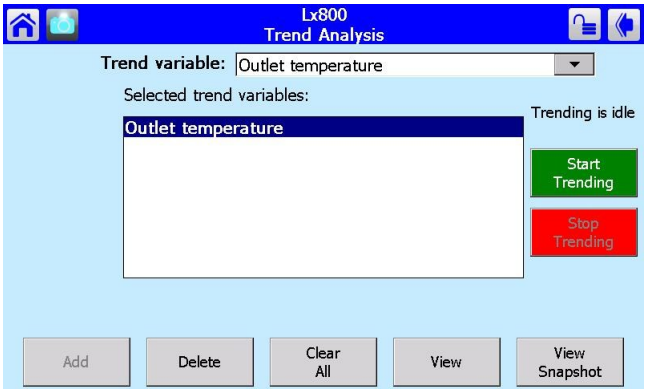
Parameter	Options Displayed by Page (Scrollable List)			
Domestic Hot Water (DHW)	DHW enable Status Demand source Burner demand Heat demand	Requested rate Setpoint source OFF setpoint Setpoint ON setpoint	Operating Temperature DHW pump DHW pump overrun time DHW Pump frost overrun time DHW priority override time	Outlet sensor state Outlet temperature
Burner Control	Status Burner state Firing rate control Firing rate	Flame signal Sequence time Delay time	Lockout Hold code Alarm reason	Annunciator first out Annunciator hold Remote STAT
Demand & Modulation	Demand source Firing rate Demand rate	Rate limiter Limited rate Rate override	Override rate System ON setpoint System setpoint	System OFF Operating Temperature
Inlet	Inlet sensor state	Inlet temperature		
Fan	Fan Speed			
Central Heat Pump	Pump C Controlling pump	Status Delay time	Overrun time Frost overrun time	Idle days Cycle count
DHW Pump	Pump A Controlling pump	Status Delay time	Overrun time Frost overrun time	Idle days Cycle count
Boiler Pump	Pump B Controlling pump	Status Delay time	Overrun time Frost overrun time	Idle days Cycle count
Flame Detection	Flame detected	Flame signal		
Statistics	Burner cycles Burner run time	CH ump cycles DHW pump cycles	Boiler pump cycles Controller cycles	Controller run time
Stack Limit	Stack limit setpoint	Stack sensor state	Stack temperature	
Outdoor Reset	CH outdoor reset enable	CH setpoint source	Outdoor sensor state	Outdoor temperature
CH Frost Protection	Frost protection enable Frost protection Frost burner demand	Frost heat demand CH pump	CH pump frost overrun time Firing rate	Outdoor temperature Outlet temperature

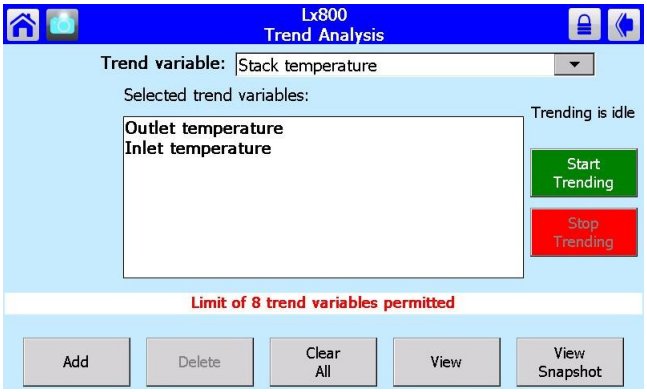
6.1 Analysis Page

Figure 6-2 Analysis Page

The Analysis button enters a page where time-based trends of boiler activity may be captured, viewed and saved. The variables that may be trended are:

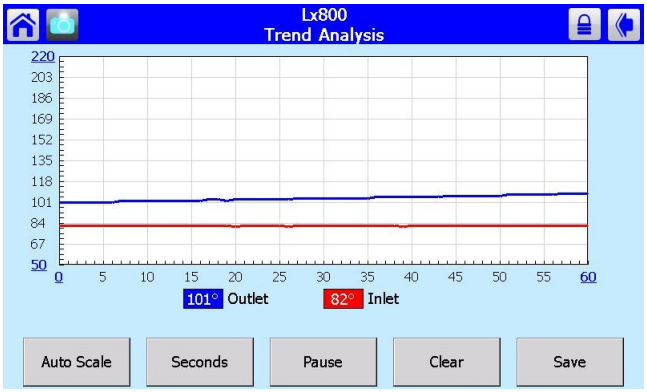
- Demand source
- Firing rate
- Fan speed
- Flame signal
- Outlet temperature
- Inlet temperature
- DHW temperature
- Outdoor temperature
- Stack temperature
- Lead Lag temperature
- Remote control
- CH setpoint
- Lead Lag CH setpoint
- Operating temperature
- Central Heat operation Analysis
- Lead Lag Operation Analysis
- Vessel Analysis





For collection of data, select up to 8 variables from the Trend variable drop-down list. Touch the green Start Trending button to begin data capture. To stop data capture, touch the red Stop Trending button.

Touch the View button to show the trend graph(s) of the selected variables. Each line is color coded to match its name displayed beneath the graph. The horizontal axis represents time, the vertical axis represents the value of the variable. The left and right margins indicate the scale of the values. The second button from the left can be touched to change the time scale to seconds, minutes, hours or days. The Save button will save the data to a file that can be copied to a USB storage device. A descriptive name can be assigned to the file. When copied to a USB device, the file(s) is(are) saved in a folder called "Trends", for example "E:\Trends\2012-06-06_0155_PM_.csv. The file is in Comma Separated Variable format to allow easy importation to a spreadsheet program such as Microsoft Excel.



Vertical and horizontal scales can be modified for more convenient viewing of the trend graphs. The underlined numbers at the corners of the graph chart can be touched to show a numerical keypad where new values are entered.

6.2 History Page

The controller identifies and records two kinds of events and categorizes them as either Lockouts or Alerts. The bulleted lists below indicate the significance of each type of fault:

Lockouts:

- Cause the burner to shutdown and require manual intervention to reset the controller from Lockout
- Always cause the Alarm contacts to close
- Are logged in the Lockout History

Alerts:

- Events reported by the controller
- For informational purposes only

For more details on specific Lockout and Alert conditions, refer to the "Troubleshooting" section of the **Installation and Operation Instructions** for your particular appliance**.**

Figure 6-3 History Page

The controller maintains in its non-volatile memory a record of the most recent Lockout and Alert events. There is capacity in memory for fifteen (15) of each. Access to the history is achieved either by touching the History button icon on the Summary page, or by touching the History button at the bottom of any of the Details pages.

Touching the History button on the Summary page presents a dialog. If no button is touched within 30 seconds the dialog is automatically cancelled. Touching OK simply returns to the Summary page.

The text on the history button automatically updates if a Lockout or Alert occurs (e.g. Alert 32).

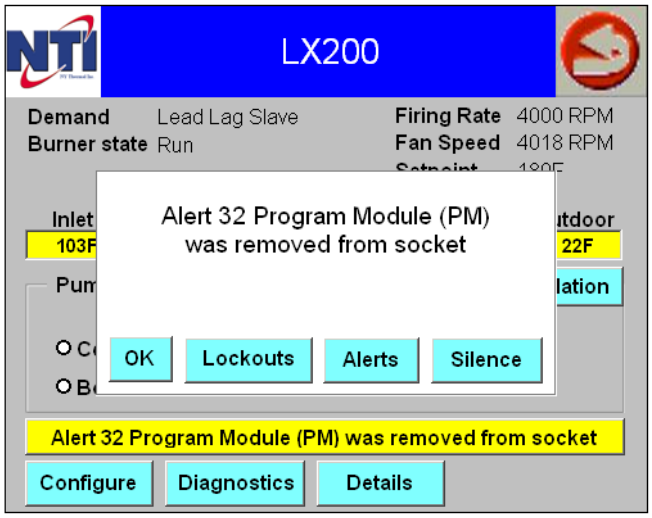


Figure 6-4 Lockout History Screen

Touching “Lockouts” displays the Lockout History page which contains a scrollable list of events. See Figure 6-6 for description of Alert button icon. The Clear Lockout button may be used to clear a Lockout. Pressing the Reset button on the controller may also be used to clear a Lockout.

Figure 6-5 Control State at Lockout

Lockout events can be viewed by scrolling down the Lockout History page. Touching an individual item from the list displays a detailed description of the control state at the time of the Lockout.

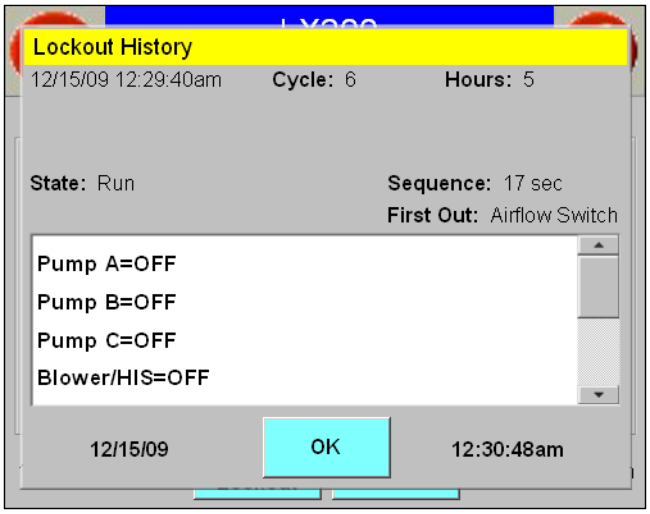


Table 6-2 Control States Displayed

Parameter	Description	Factory Settings	Comments
Lockout time	Set by display		
Fault code	Unique code defining which lockout occurred		
Annunciator first out	First interlock that resulted in shutdown		
Description	Fault description		
Burner Lockout/Hold	Source or reason for lockout/hold		
Burner Control State	Burner operating state at the time of lockout		
Sequence time	Burner control state timer at time of fault		
Cycle	Burner control cycle		
Run Hours	Burner control hours		
I/O	All digital I/O status at time of fault		
Annunciator 1-8 states	All Annunciator I/O status at time of fault		
Fault data	Fault dependent data		

* Password protected

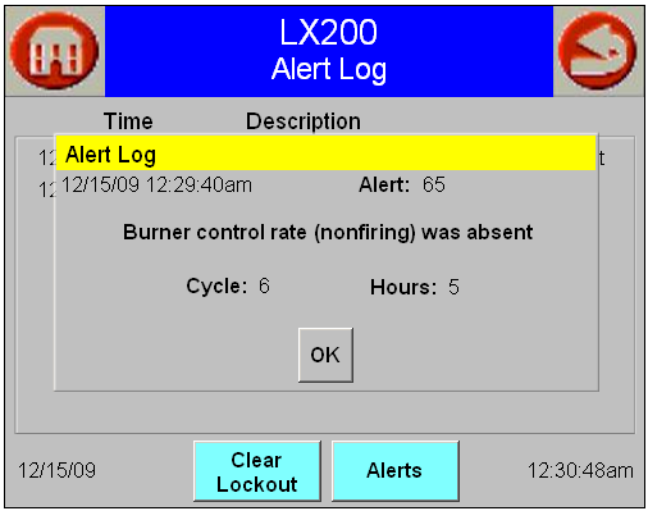
Figure 6-6 Alert Log and Events

The Alert Log page contains a list of Alert events. Touching an individual item displays detailed information about the event. See also Figure 6-7.

Figure 6-7 Timestamp Display

IMPORTANT

The controller contains no internal system time. The timestamp for each Lockout and Alert is assigned by the display when it learns of the event from the controller; therefore, the event history transferred from the controller to the display following a power interruption does not have valid timestamps. New events will be given correct timestamps only if the time has been set in the display via the Display Setup page (see Figure 8.4-1).



7 LEAD LAG MASTER

Figure 7-1 Lead Lag Master Screen

When the LEAD LAG MASTER button on the Home Page is touched, a page similar to the adjacent figure is displayed.

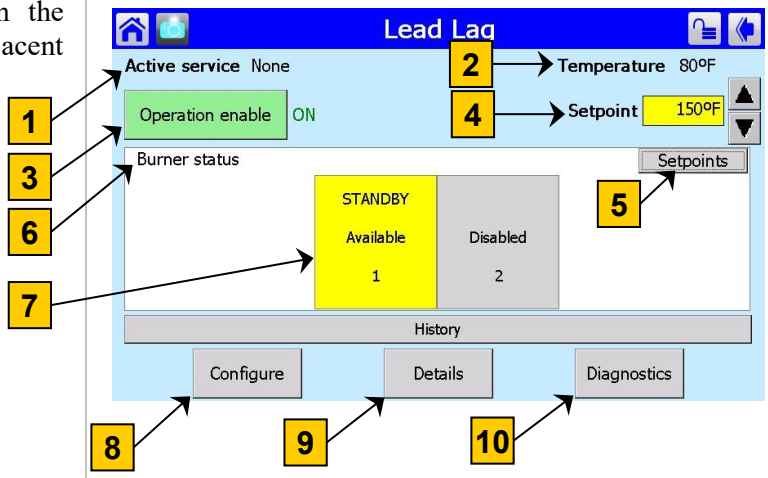


Table 7-1 Lead Lag Items

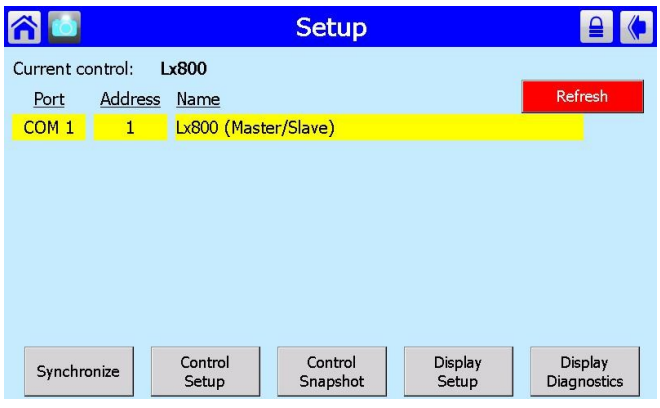
Item	Name	Description
1	Active service	Indicates if there is a Lead Lag demand being serviced
2	Temperature	The temperature as measured by a 10k thermistor sensor connected to the System Sensor field wiring barrier terminal.
3	Operation enable	Indicates that Lead Lag operation is enabled. This is a read-only indication.
4	Setpoint	Lead Lag Central Heating setpoint temperature. May be adjusted from this screen, or from the Lead Lag Master configuration page, see page 31
5	Selection	Toggles through the status information groups: Slaves (not shown), Burner Status, and Setpoints (not shown). Touch the button to display the next group.
6	Status group	Indicates which group of status information is displayed

7	Status information	Information relevant to the group selected:
		• Slaves
		  ○ Firing rate %
		  ○ Availability to fire
		  ○ Address
		• Burner status
		  ○ Current Burner state
		  ○ Availability
		  ○ Address
		• Setpoints
		  ○ Lead Lag Central Heat Setpoint
		  ○ On hysteresis
		  ○ Off hysteresis

8	Configure	Shortcut to Lead Lag Master configuration page, see page 31.
9	Details	Detailed status information for each boiler, similar to details available in the individual boiler's Details pages, see page 42.
10	Diagnostics	Manual firing rate test for Lead Lag cascade group, similar to Modulation test page for individual boiler, see page 40.

8 SETUP

Figure 8-1 Setup Screen



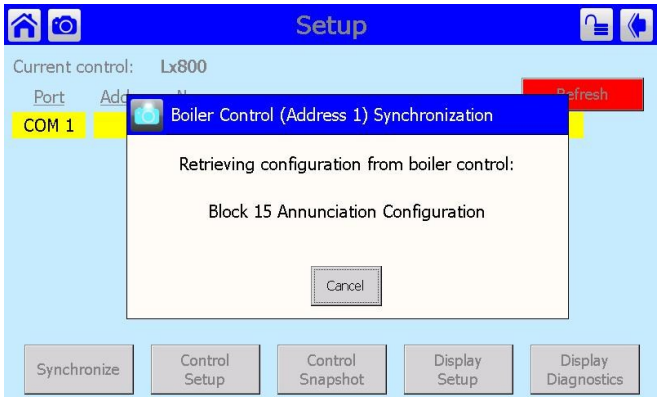
IMPORTANT Access to actual boiler control settings is obtained via the Home Page by touching the individual boiler icon, see page 4.

When the Setup button on the Home Page is touched, a page similar to the adjacent figure is displayed. Touch the Refresh button to have the display scan for a connected controller. Communication between the display and controller uses the Modbus RTU protocol. The display acts as a Modbus Master and the controller as a Modbus Slave. When the Refresh button is touched the display will scan Modbus addresses in the range 1 through 8. When the controller is detected, its Modbus address and name will appear on this page. If the display cannot detect a controller, "SYSTEM DISCONNECTED!" is shown.

8.1 Synchronize

Figure 8.1-1 Synchronize

Touching the Synchronize button forces the display to refresh its data from the controller, as indicated in the adjacent figure.



8.2 Control Setup

Figure 8.2-1 Control Setup

Touching Control Setup will display a page like the one immediately to the right.

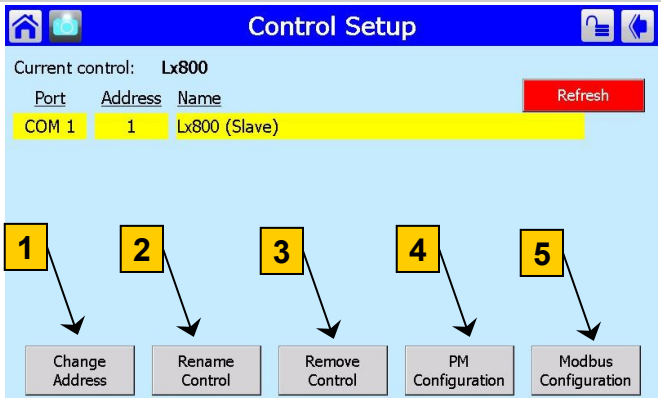


Figure 8.2-1

Table 8.2-1

Item	Name	Description
1	Change Address	Shortcut to System Identification and Access configuration menu, see page 10
2	Rename Control	Same as item 1
3	Remove Control	Use not recommended; removes connected controller from the list, requires Refresh and Synchronization
4	PM Configuration	May be used to backup and restore controller settings with a PIM (NTI part number 83998)
5	Modbus Configuration	Use only when instructed to do so by NTI technical support; permits reading and writing directly to individual Modbus registers in the controller

IMPORTANT

Access to actual boiler control settings is obtained via the Home Page by touching the individual boiler icon, see page 4.

8.3 Control Snapshot

Figure 8.3-1 Control Snapshot

The Control Snapshot page is used to copy controller status and configuration data to the non-volatile memory of the display where it may be viewed and copied to a USB mass storage device. This feature can be used for troubleshooting, the controller data can be e-mailed to NTI Technical Support for analysis.

The buttons beneath the controller name are used to capture controller status, configuration, or both. The example page in the figure below and to the right depicts the data.

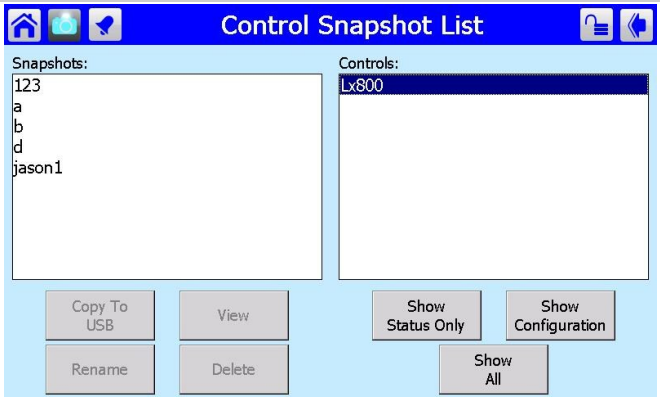


Figure 8.3-1

Figure 8.3-2 Control Snapshot

Touch the Save button to store the data to a file that can be viewed and further copied to a USB mass storage device. A keyboard screen will be shown where a descriptive name for the control snapshot may be entered, e.g. Lx800-2012-05-25-Lockout174.

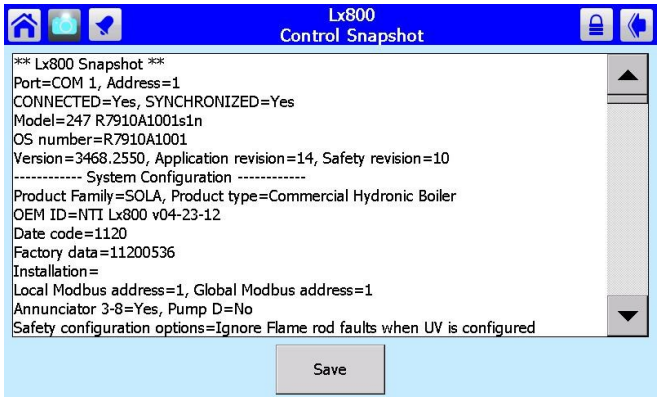


Figure 8.3-2

Figure 8.3-3 Control Snapshot

To copy a control snapshot to a USB device, insert the device into the connector located at the bottom of the display. Touch the desired snapshot name to select it, then touch Copy To USB to transfer the snapshot file to the USB device. When the USB device is inserted into a personal computer USB port, the file will appear on the device in a folder called “Controlshots”, for instance E:\Controlshots\Lx800-2012-05-25-Lockout174.txt.

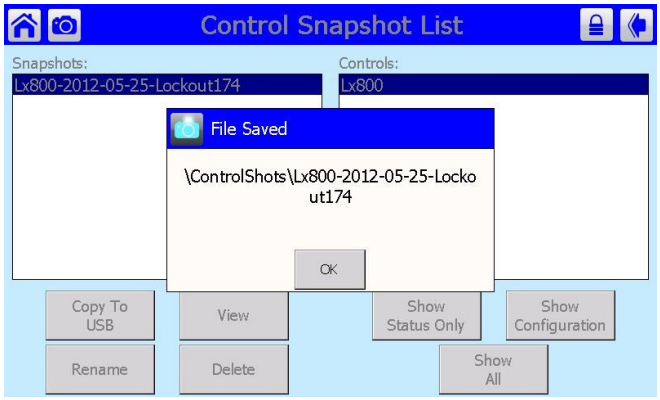


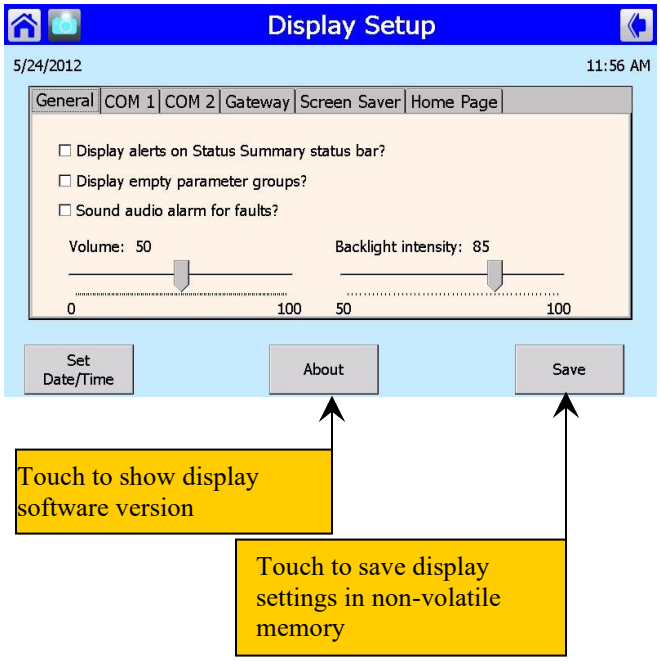
Figure 8.3-3

8.4 Display Setup

Figure 8.4-1 Display Setup

The Display Setup page is used to view and modify settings of the display itself. The settings are divided into groups represented by a series of tabs. The General tab contains the following settings:

- Checkbox: Display alerts on Status Summary status bar? When checked, enables Alerts to be displayed on the History bar of the Summary Page. Most alerts are for information only and do not indicate a boiler problem. NTI recommends that this setting remain un-checked.
- Checkbox: Display empty parameter groups? Use not recommended, leave un-checked.
- Checkbox: Sound audio alarm for faults? Enables the built-in speaker to sound if a boiler alarm condition such as a burner lockout occurs.
- Slider: Volume. Adjusts the volume of the built-in speaker.
- Slider: Backlight intensity. Adjusts the intensity level of the display screen backlight.

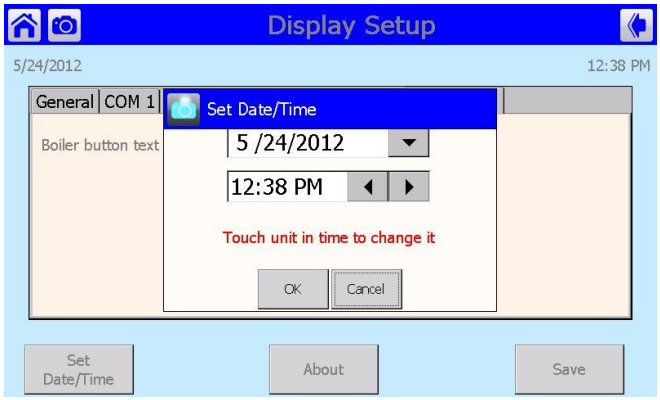


Set Date/Time

Figure 8.4-2 Set Date/Time

The Date & Time page is used to set the date and time so that any lockout or alert events may be properly time-stamped.

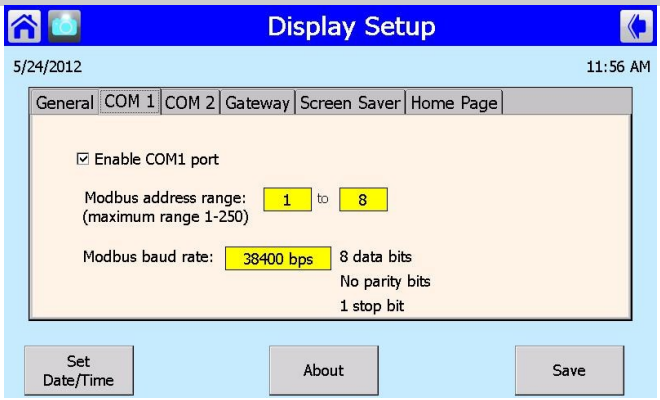
IMPORTANT Date & time are maintained in the display by an internal clock with battery back-up. After the time is set, it will persist even if power is removed from the display.



COM1 Serial Port

Figure 8.4-3 COM1 Settings

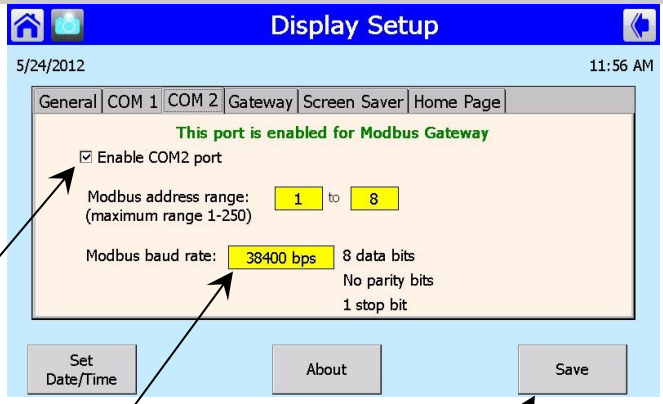
The display is equipped with two serial EIA-485 communication ports, COM1 and COM2. COM1 is dedicated for communication with the boiler control. **Do not change the factory settings**.



COM2 Serial Port

Figure 8.4-4 COM2 Settings

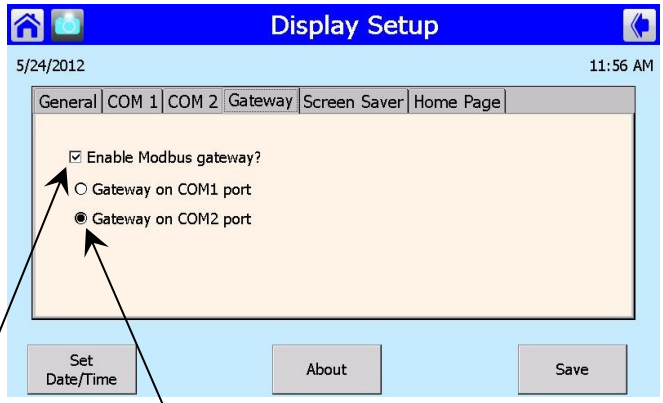
The COM2 serial port may be utilized to provide an interface to an external system, such as a Building Automation System. The factory setting is not enabled. To enable COM2, check the "Enable COM2 port" checkbox. COM2 settings must be used in conjunction with Gateway settings to fully enable communications with an external system. Refer to the appliance Installation and Operating manual for wiring details.



Modbus Gateway

Figure 8.4-5 Gateway Settings

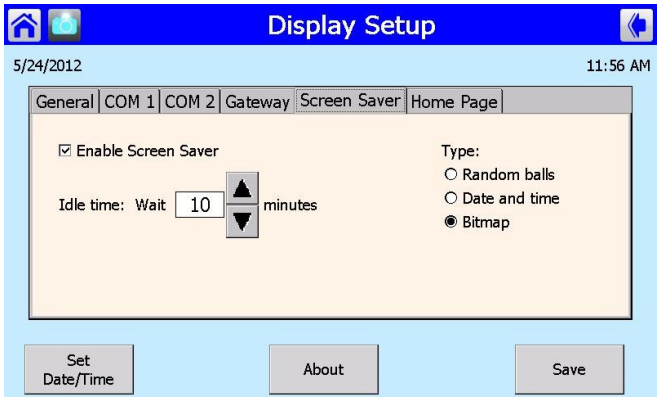
To use the COM2 port for communication with an external system, the display's internal Modbus gateway must be enabled. When enabled the gateway provides access, by an external system, to the Modbus registers of the boiler control as if the external system is connected directly to one of the two Modbus communication ports on the control itself. After enabling the gateway, touch the Save button to save the settings, and either 1) cycle power to the boiler to reset the display; or 2) use the Display Reset function in Display Diagnostics.



Screen Saver

Figure 8.4-6 Screen Saver Settings

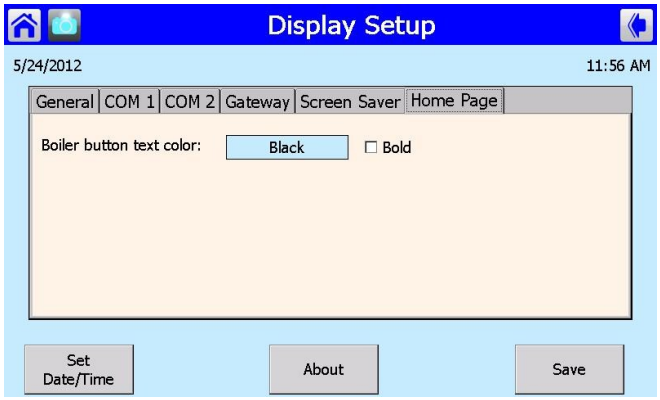
Touch the "Enable Screen Saver" checkbox to toggle enable and disable of the screen saver. Set the wait time in minutes using the up and down arrows next to the time value. Select the screen saver type, e.g. "Date and Time". The "Bitmap" option is inactive until a bitmap image is transferred to the display using the USB port. By this means a customized image may be used for the screen saver, such as a company logo, service provider contact information, etc. Contact NTI Technical Support at (800) 688-2575 for assistance to load a customized bitmap screen saver image into the display.



Home Page

Figure 8.4-7 Home Page Settings

Select a desired text color for the boiler name that appears above the individual boiler icon on the Home Page, see page 4.

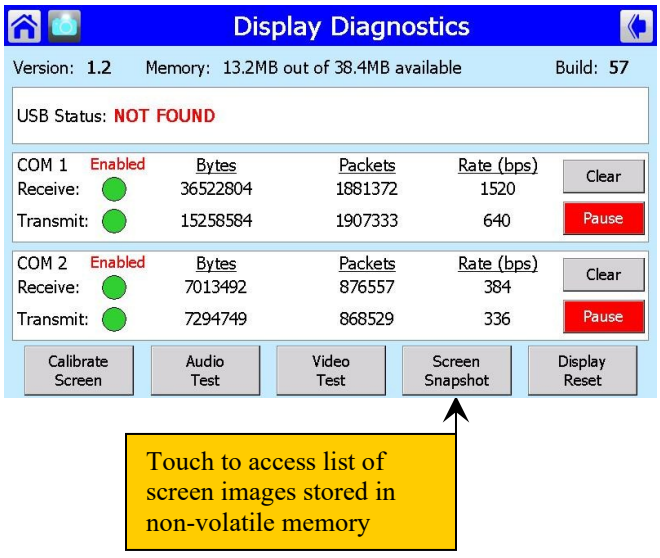


8.5 Display Diagnostics

Figure 8.5-1 Display Diagnostics

The Display Diagnostics page is used to adjust and test display functionality. Typically these operations are not required, contact NTI Technical Support for assistance if needed.

Touch the Display Reset button to re-boot the display. This may be necessary if, for example, the Modbus gateway function is enabled.



Screen Snapshot

Figure 8.5-1 Screen Snapshot List

The Screen Snapshot button is used to access the list of screen images stored in the display memory. These images can be a useful aid for troubleshooting. They can be copied to a USB mass storage device, and subsequently e-mailed to NTI Technical Support. The images are stored in JPEG format. To copy an image to a USB device, insert the device into the USB port of the display.

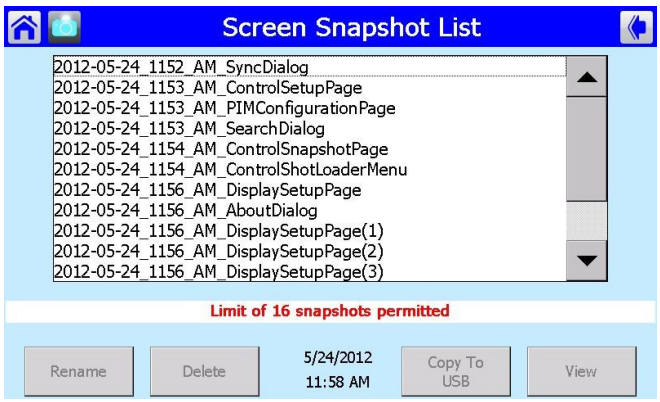
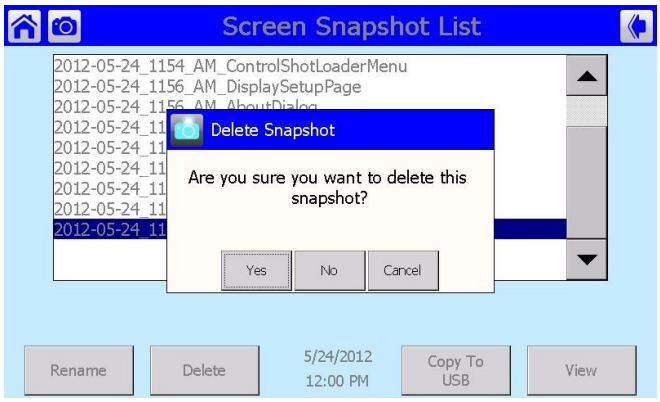


Figure 8.5-2 Screen Snapshot Copy

Select the image to be copied by touching its name in the list. When an image is selected the "Copy to USB" button is enabled. Touch the button to copy the image to a file on the USB device. Files are stored on the USB device in a folder called "Screenshots", for example:
E:\Screenshots\2012-05-29_0954_AM_StatSummary.jpg
is a typical path if the USB device is inserted in a personal computer.

Figure 8.5-3 Screen Snapshot Delete

A maximum of 16 images may be stored in the display memory. Use the Delete button to remove images as needed. To delete an image, select the image name by touching it, then touch the Delete button. A confirmation dialog allows the Delete operation to be confirmed or canceled.



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