

Trinity Lx

Model Numbers: Lx150-800
Version Date: 2011-02-17

BONUS
Night Time Setback
(Time of Day)
LX500-800 Only

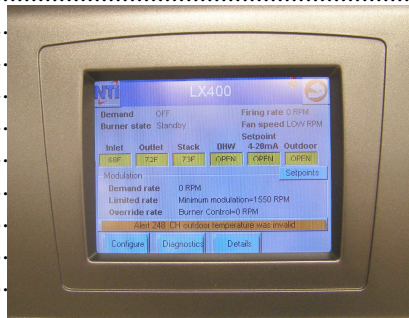
NEW FEATURES
Second Central Heat Input
Internal Lead-Lag Control
System Sensor
Modulation Sensor Alternatives
Warm Weather Shutdown



APPENDIX A – CONTROLLER AND TOUCHSCREEN DISPLAY INSTRUCTIONS FOR TRINITY LX SERIES

TABLE OF CONTENTS

1.0	INTRODUCTION	2
	Boiler vs Water Heater Application Settings	2
	Second Central Heat Input vs Multiple Unit Application Settings	3
	Indoor Combustion Air Application Settings	4
2.0	MENU STRUCTURE.....	5
3.0	SUMMARY PAGE.....	6
4.0	CONFIGURATION PAGE	9
	System Identification & Access	10
	CH - Central Heat Configuration	11
	Outdoor Reset Configuration	13
	DHW - Domestic Hot Water Configuration	15
	Warm Weather Shutdown Configuration.....	16
	Modulation Configuration.....	17
	Pump Configuration.....	18
	Statistics Configuration.....	19
	High Limits	20
	Stack Limit.....	21
	Delta T Limits	21
	Frost Protection Configuration.....	22
	Burner Control Timings & Rates	23
	Burner Control Ignition.....	23
	System Configuration	24
	Sensor Configuration (Lx500-800 Only)	25
	Lead Lag Slave Configuration	26
	Lead Lag Master Configuration	27
	Verify (Safety Parameter Verification)	32
	Display Setup	33
5.0	DIAGNOSTICS PAGE.....	37
6.0	DETAILS PAGE.....	39
7.0	HISTORY PAGE.....	40



HAZARD SYMBOLS AND DEFINITIONS



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



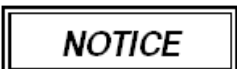
Warning Sign: Indicates a hazardous situation which, if not avoided, could result in serious injury or death.



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



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



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



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.

1.0 INTRODUCTION

Boiler vs Water Heater Application Settings

Although the Trinity Lx can be used as Boiler or a Water Heater, the installation, operation, and maintenance requirements of this appliance will differ depending on which application is chosen. 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. 100-130°F for infloor heat or 130-160°F for cast iron radiator systems).

Water Heater Example: 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 to applications not requiring such high temperatures water (i.e. 140°F for domestic fixtures only).



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 Application Settings

Table 1-1 Boiler Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
Central Heat	Ensure the <u>sum</u> of the CH setpoint and the CH off hysteresis do not exceed 200°F [93°C] or a "Lockout" condition may occur.	See Figure 4-4 and Table 4-4, page 11
Outdoor Reset	This parameter affects the Central Heat setpoint. Factory setting “enabled”. Settings are installation dependent and adjustments should be made accordingly.	See Figure 4-6 and Table 4-6, page 12
DHW	Ensure the <u>sum</u> of the DHW setpoint and the DHW off hysteresis do not exceed 200°F [93°C] or a "Lockout" condition may occur.	See Figure 4-9 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. Boiler Applications only.	See Figure 4-16 and Table 4-15, page 20

Water Heater Application Settings

Table 1-2 Water Heater Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
Central Heat	Not used for Water Heater Applications. No adjustments required.	See Figure 4-4 and Table 4-4, page 11
Outdoor Reset	Not used for Water Heater Applications. "Disable" parameter to avoid nuisance faults.	See Figure 4-6 and Table 4-6, page 12
DHW	Ensure the <u>sum</u> of the DHW setpoint and the DHW off hysteresis do not exceed 200°F [93°C] or a "Lockout" condition will occur.	See Figure 4-9 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 20

Second Central Heat Input vs Multiple Unit Application Settings

The Trinity Lx can be used as a stand alone unit or in a cascaded arrangement. It is important to note that factory settings are configured for a stand alone unit with a lone input to terminal CH1; therefore, some settings will need to be adjusted depending on the application chosen, whether it is a second central heat input or cascading multiple units. A quick reference table has been provided for each application to identify the minimum settings which must be adjusted.

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 Boiler Applications with a CH lead-lag configuration using CH2 (LL) as the central heat call for staging boilers, refer to Table 1-4. For Water Heater Applications with a DHW lead-lag configuration using CH2 (LL) as the DHW call for staging water heaters, refer to Table 1-5.

Second Central Heat Input Application Settings (Stand Alone Boilers)

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 17
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 25
LL Master Configuration	Set LL Master enable to "Enabled". This will allow the CH2 heat input to activate the boiler on a low temperature (LL) demand.	See Figure 4-25 and Table 4-24, page 27
LL Master Configuration < Central Heat >	Setpoint used for a low temperature (LL) demand when a call is applied to CH2. Factory settings are generic and not application specific and may need to be adjusted if used for a low temperature heating application.	See Figure 4-27 and Table 4-26, page 28

Multiple Boiler Application Settings

Table 1-4 Lead Lag Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
System Identification & Access	Set the Modbus Address of each controller, in a multiple unit Lead Lag cascaded installation, to a unique value between 1 and 8, inclusive.	See Figure 4-2 and Table 4-2, page 9
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 25
Pump Configuration < CH pump >	Set the checkbox "Use for Lead Lag Master demand" to checked <u>only</u> on the LL slave unit that will be controlling the system pump. Note: Any LL slave doing DHW cannot be used to control the system pump.	See Figure 4-12 and Table 4-11, page 17
Lead Lag Master Configuration	Set LL Master enable to "Enabled" on the designated Master only as the Master becomes the single point of contact for cascade control wiring such as Thermostat demand, Outdoor and System water temperature.	See Figure 4-25 and Table 4-24, page 27
LL Master Configuration < Central Heat >	Setpoint used for a CH Lead Lag demand when a call is applied to CH2 (LL) from the Master. Factory settings are generic and not application specific. Setpoint may need to be adjusted depending on the application.	See Figure 4-27 and Table 4-26, page 28

Multiple Water Heater Application Settings

Table 1-5 Lead Lag Settings Quick Reference Table

Configuration Group	Setting Considerations	Reference
System Identification & Access	Set the Modbus Address of each controller, in a multiple unit Lead Lag cascaded installation, to a unique value between 1 and 8, inclusive.	See Figure 4-2 and Table 4-2, page 9
Lead Lag Master Configuration	Set LL Master enable to "Enabled" on the designated Master only as the Master becomes the single point of contact for cascade control wiring such as DHW thermostat demand and water temperature.	See Figure 4-25 and Table 4-24, page 27
LL Master Configuration < Central Heat >	Setpoint used for a DHW Lead Lag demand when a call is applied to CH2 (LL) from the Master. Factory settings are generic and not application specific. Setpoint may need to be adjusted depending on the application. Outdoor reset set to "Disabled" to avoid nuisance faults. Not used for Water Heater Applications.	See Figure 4-27 and Table 4-26, page 28

Indoor Combustion Air Application Settings

For applications using the Indoor Combustion Air Kit (Lx500-800 only) in lieu of Direct Vent piping for the air inlet, refer to Table 1.6 for a list of parameters that need to be adjusted before putting the unit into operation.

Table 1-6 Indoor Combustion Air Settings Quick Reference Table

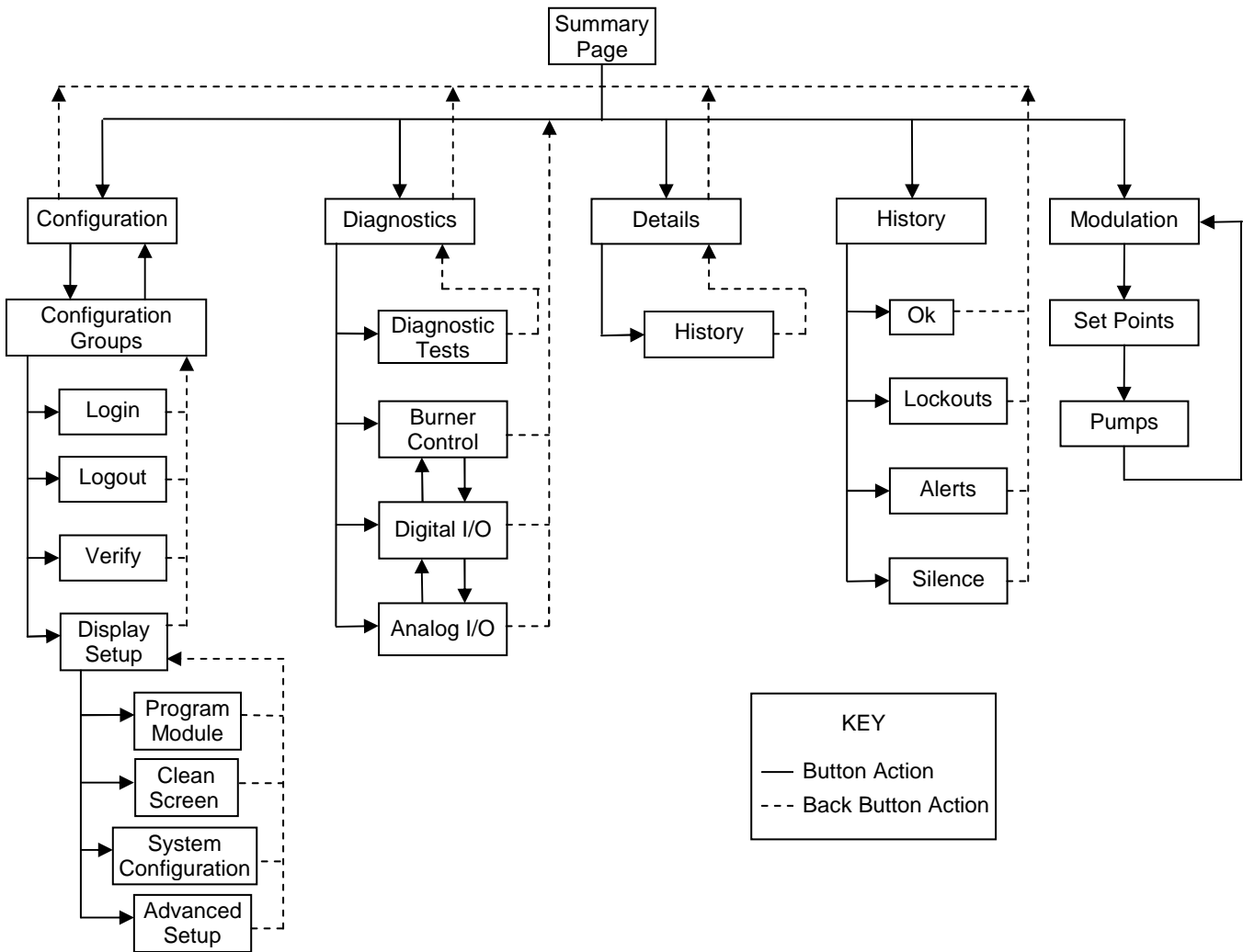
Configuration Group	Setting Considerations	Reference
Modulation Configuration	Adjust the Minimum Modulation rate according to model.	See Figure 4-11 and Table 4-10, page 17.
Burner Control Ignition	Adjust the Lightoff rate according to model.	See Figure 4-21 and Table 4-20, page 23.



2.0 MENU STRUCTURE

The Controller and Touchscreen Display, together, form the control system of the Trinity LX. All control configuration parameters are stored in non-volatile memory in the LX 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 LX controller and display is via EIA-485 interface using the Modbus protocol.

Appliance and controller status information and configuration parameters are presented in a series of pages. These pages are organized in an “upside-down tree” menu structure as shown in Figure 2-1.

**Figure 2-1 All Models
Menu Structure Tree**



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 Summary page immediately from any other page in the menu. Touching the Back icon displays the page at the next level up in the structure. A description of each page follows.

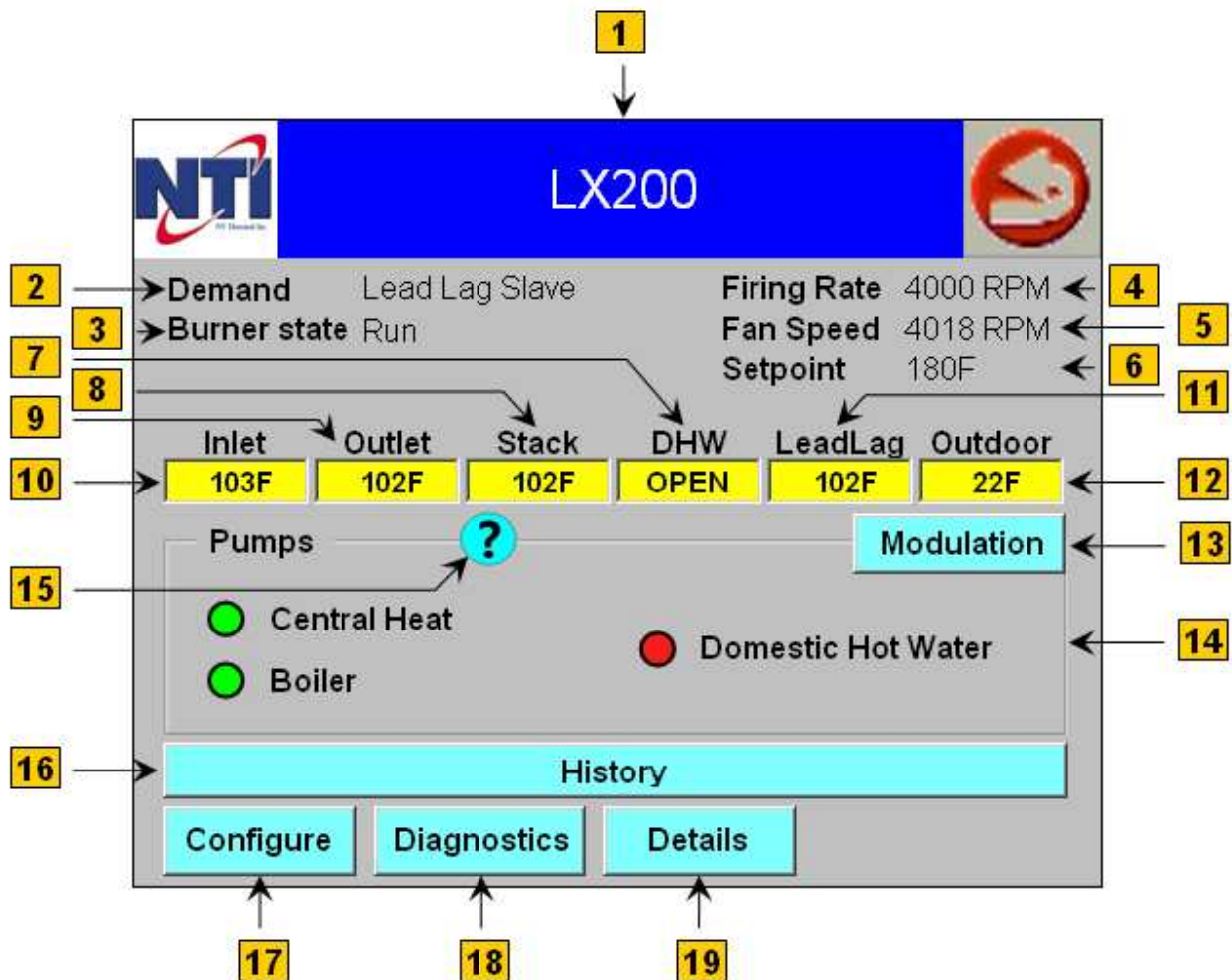


Password - Many of the configuration parameters are password protected. The required password, "sola" (less the " "), is case sensitive and must be entered in lower-case letters.

3.0 SUMMARY PAGE

The Summary page is the first page displayed when the display is powered on. Each time the controller is powered up, a brief interval is needed to synchronize the display with the LX controller. Once synchronization is complete, a page similar to Figure 3-1 is displayed. 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 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" in Section 7.0 of this manual for more details regarding Lockouts.

Clearing a Lockout - The following are two methods to clear a "lockout" condition and perform a manual reset of the auto gas shut-off control:

- 1- Switch - Cycle power to the appliance by toggling the power switch OFF and ON (Lx150-400 only).
- 2- Controller - Clear the lockout from the Controller by pressing the RESET button near the indicator lights.
- 3- Display - Clear the lockout from the touchscreen display menu. See Figures 7-1 and 7-2 on page 25.

Table 3-1 Summary Page Configuration Parameters

Item	Name	Description
1	Boiler model number	Boiler model number, must agree with model number shown on boiler (water heater) rating plate
2	Demand	Heat demand source: <ul style="list-style-type: none"> • OFF • Central Heat (24VAC applied to low voltage barrier “CH1” at terminal #5) • Lead Lag (24VAC applied to low voltage barrier “CH2” (LL) at terminal #6) • Domestic Hot Water (low voltage barrier DHW terminals, #7 & #10, shorted together) • CH frost protection • DHW frost protection • LL frost protection
3	Burner state	Current state of burner operation: <ul style="list-style-type: none"> • 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 demand source: <ul style="list-style-type: none"> • Central Heat (CH1) • Lead Lag (CH2) • Domestic Hot Water (DHW)
7	DHW	Status of indirect DHW aquastat: <ul style="list-style-type: none"> • SHORT – contacts closed creating heat demand • OPEN – contacts open, no demand
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	4-20mA or LeadLag	4-20mA - Signal from external controller (input at J8 terminals 6,7); LeadLag - Signal from system sensor (input at J10 terminal 7). Local CH configuration displays the 4-20mA sensor status, unless Lead Lag CH configuration used, then the LeadLag sensor status is displayed instead of the 4-20mA sensor status.
12	Outdoor	Temperature measured by outdoor air sensor (input at J8 terminals 11,12)
13	Pumps, Modulation, Setpoints select button	Touch button to select information group described in Item 14

Item	Name	Description
14	Pumps, Modulation, Setpoints	<ul style="list-style-type: none"> • 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.
15	Pumps detail	<p>Shows the assignment of each pump output (A, B, or C) to its respective circulator pump, and present status of each pump, whether ON or OFF. Pumps are factory assigned as:</p> <ul style="list-style-type: none"> • Domestic Hot Water = Pump A • Boiler = Pump B • Central Heat = Pump C
16	History	Details of most recent Lockouts and Alerts.
17	Configure	Access to controller settings.
18	Diagnostics	Access to controller tests, digital and analog Input/Output (I/O) status.
19	Details	Detailed one-page summaries of certain Configuration Groups and input/output devices.

4.0 CONFIGURATION PAGE

Touching the Configure button at the bottom left of the Summary page accesses the Configuration 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

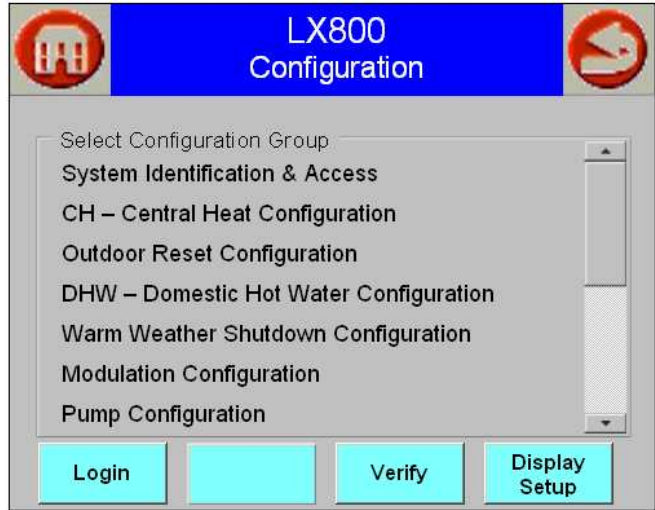
Login – Parameters that are password protected require an installer to login before parameters can be changed. See Section 2.0, page 4 for this password.

Verify – Some groups require safety parameter verification after configuration parameters are edited. This button provides access to the safety verification screens explained in more detail at the end of Section 4.0, commencing on page 29.

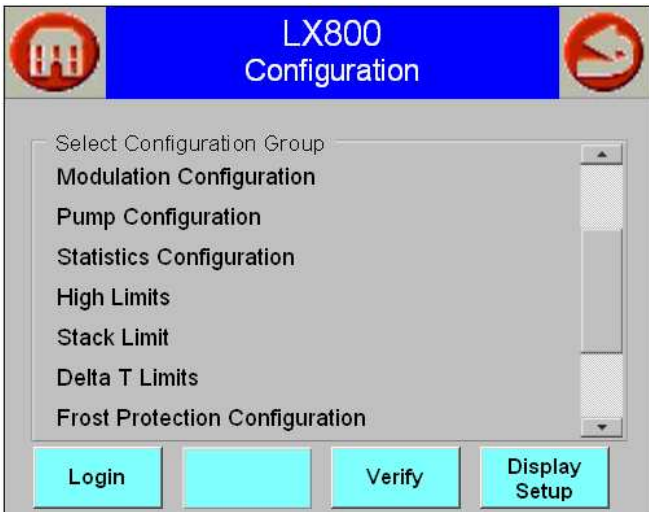
Display Setup – This button provides access to setup information, such as: program module, clean screen, system configuration, and advanced setup. These features are explained in more detail at the end of Section 4.0, commencing on page 30.

Sensor Configuration – Applicable to commercial models only, Lx500-800.

Scrollable List Screen (Top)



Scrollable List Screen (Middle)



Scrollable List Screen (Bottom)

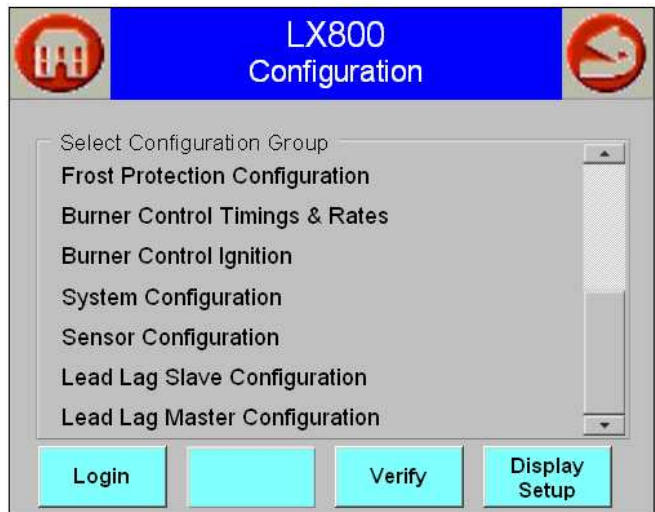


Table 4-1 Configuration Page Group Descriptions

Name	Description
System Identification & Access	View system identification
CH - Central Heat Configuration	Edit Central Heat settings
Outdoor Reset Configuration	Edit Outdoor Reset settings
DHW - Domestic Hot Water Configuration	Edit Domestic Hot Water settings
Warm Weather Shutdown Configuration	Edit Warm Weather Shutdown 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	Edit delay time for delta-t limit settings
Frost Protection Configuration	Edit settings for frost protection
Burner Control Timings & Rates	Edit settings for burn times and fan rates
Burner Control Ignition	Edit burner control settings
System Configuration	Edit temperature units, anti-short-cycle time, alarm silence time
Sensor Configuration ▲	Configure/Unconfigure Outdoor Sensor on Lx500-800 models only
Lead Lag Slave Configuration	Edit Lead-Lag Slave settings
Lead Lag Master Configuration	Edit Lead-Lag Master settings
Verify	Confirm safety parameter changes
Display Setup	View and change display settings

▲ The Sensor Configuration screen only appears on commercial controllers (i.e. Lx500-800 models).

System Identification & Access

Figure 4-2 System Identification & Access Screen

The System Identification & Access page contains information about the LX controller. Login with a valid password is required to modify factory settings. Up to twenty (20) characters may be entered in each field.

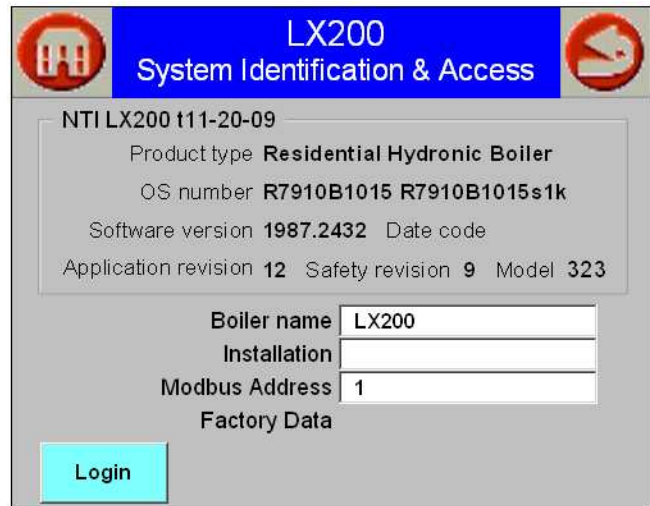


Table 4-2 Central Heat Configuration Parameters – Central Heat

Parameter	Description	Factory Settings	Comments
Boiler name *	Series (LX) and model no. of boiler or water heater unit.	LX model no.	E.g.: Lx200
Installation *	Date of installation to be entered here.	Blank	Date format mm/dd/yy
Modbus Address *	Unique controller I.D. needed when multiple units connected together in a Lead Lag cascade configuration. Range: 1 – 8.	1	Use each number once - no duplicates.

* = Password protected

CH - Central Heat Configuration

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

Figure 4-3 Central Heat Configuration - Central Heat



BOILER APPLICATIONS:

The sum of the CH setpoint and the CH off hysteresis should not exceed 200°F [93°C] or a "Lockout" condition may result. 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 20.

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).

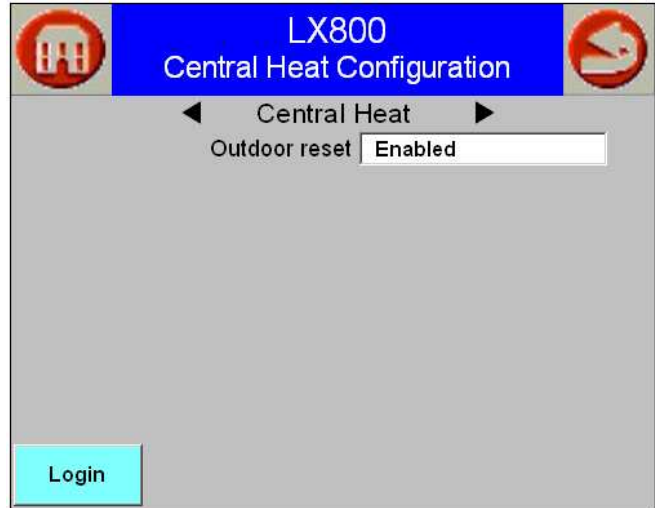


Table 4-3 Central Heat Configuration Parameters – Central Heat

Parameter	Description	Factory Settings	Comments
Outdoor reset enable	Enable or Disable Outdoor reset function	Enabled	Disable for Water Heater Applications.

Figure 4-4 Central Heat Configuration - Setpoint

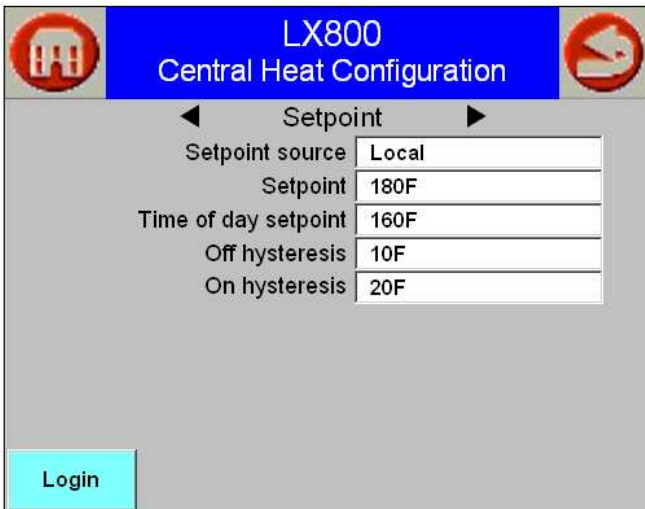
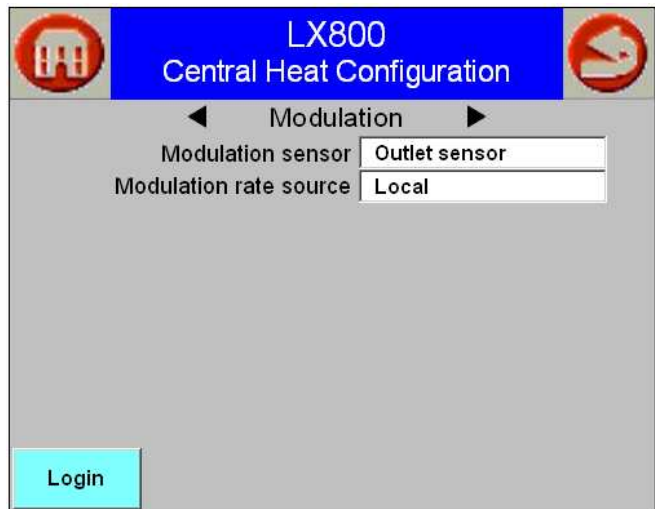


Figure 4-5 Central Heat Configuration - Modulation



Setpoint - Setpoint values for an external source having independent control of the 4-20mA interpolation curve are not field adjustable and are factory set to 60°F [15°C] for the low setpoint (4mA) and 200°F [93°C] high setpoint (20mA). Setpoint source reverts to "Local" if value invalid, out of range, or none and will revert back to 4-20mA when signal stable again. Setpoint source set to S2 (J8-6) 4-20mA.

Table 4-4 Central Heat Configuration Parameters - Setpoint

Parameter	Description	Factory Settings	Comments
Setpoint source *	Select which sensor is the Central Heat demand source: <ul style="list-style-type: none"> Local S2 (J8-6) 4-20mA with sensor on/off 	Local	Disable Outdoor reset to use 4-20mA Setpoint source
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.	180°F [82°C]	IMPORTANT CH setpoint + CH off hysteresis ≤ 200°F [93°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 (Lx500-800 only).	160°F [71°C]	IMPORTANT CH setpoint + CH off hysteresis ≤ 200°F [93°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, and CH off hysteresis is 10 °F, the burner will be shut off at 160°F. Range 2°F to 20°F [1°C to 11°C].	10°F [6°C]	IMPORTANT CH setpoint + CH off hysteresis ≤ 200°F [93°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, and CH on hysteresis is 10°F, the burner will be ignited at 140°F. Range 2 °F to 40°F [1°C to 22°C].	20°F [11°C]	

* = Password protected

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

Table 4-5 Central Heat Configuration Parameters – Modulation

Parameter	Description	Factory Settings	Comments
Modulation sensor *	Select which sensor Central Heat will modulate to: <ul style="list-style-type: none"> Outlet sensor Inlet sensor S10 (J10-7) sensor [System Manifold Temperature] 	Outlet sensor	
Modulation rate source *	Select which source controls the modulation rate: <ul style="list-style-type: none"> Local [PID control] S2 (J8-6) 4-20mA with sensor on/off [remote source] 	Local	S2 allows an external staging control to directly modulate the burner

* = Password protected

Outdoor Reset Configuration

The Outdoor Reset Configuration menu settings are only applicable to Boiler Applications and are not applicable for Water Heater Applications. When the “Show Line” button is touched on the Outdoor Reset secondary screens (Central Heat or Lead Lag) an Outdoor Reset graph is displayed, similar to Figure 4-8, illustrating the effect of varying outdoor temperature on the local or lead lag CH setpoint.

Figure 4-6 Outdoor Reset Configuration – Central Heat

The Outdoor Reset is effective only if the following two conditions are met: Outdoor Reset is "enabled" in the CH Configuration Group, and an outdoor temperature sensor is connected to the LX 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 CH parameters.



Water Heater Applications
Outdoor Reset is not applicable.

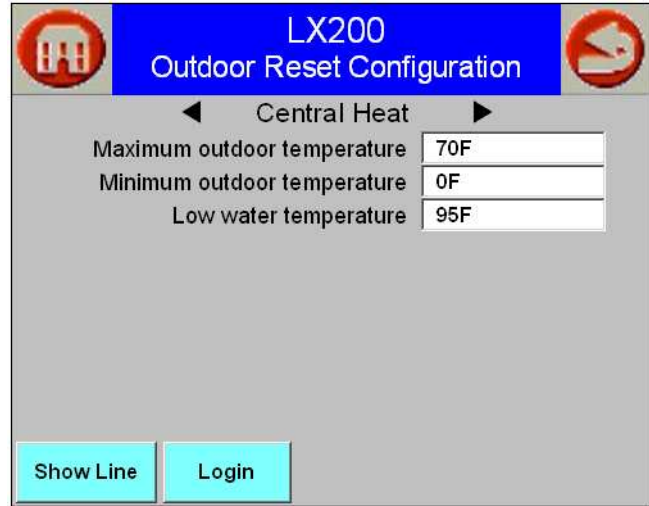


Table 4-6 Outdoor Reset Configuration Parameters – Central Heat

Parameter	Description	Factory Settings	Comments
Maximum outdoor temperature *	Outdoor temperature that corresponds to the CH "low water temperature". <i>Example:</i> If the CH low water temperature is 95°F, and the CH maximum outdoor temperature setting is 70°F, the boiler water temperature setpoint will be 95°F when the outdoor temperature reaches 70°F. Range 50°F to 95°F [10°C to 35°C].	70°F [21°C]	
Minimum outdoor temperature *	Outdoor temperature that corresponds to the CH maximum water temperature. <i>Example:</i> If the CH maximum water temperature is 180°F (defined by CH setpoint), and the CH minimum outdoor temperature setting is 0°F, the boiler water temperature setpoint will be 180°F when the outdoor temperature reaches 0°F. Range -40°F/C to 40°F [4°C].	0°F [-18°C]	Outdoor Design Temperature: - set higher for warmer climates - set lower for colder climates
Low water temperature *	CH water temperature setpoint at LL maximum outdoor temperature. Range 60°F to 150°F [15°C to 65°C].	95°F [35°C]	

* = Password protected

Figure 4-7 Outdoor Reset Configuration – Lead Lag

The Outdoor Reset is effective only if the following two conditions are met: Outdoor Reset is "enabled" in the LL Configuration Group, and an outdoor temperature sensor is connected to the LX controller. The Outdoor Reset LL parameters, together with the CH Setpoint parameters, define the relationship of water temperature setpoint to outdoor temperature. Refer to Table 4-7 for a list of Outdoor Reset LL parameters.

IMPORTANT Water Heater Applications
Outdoor Reset is not applicable.

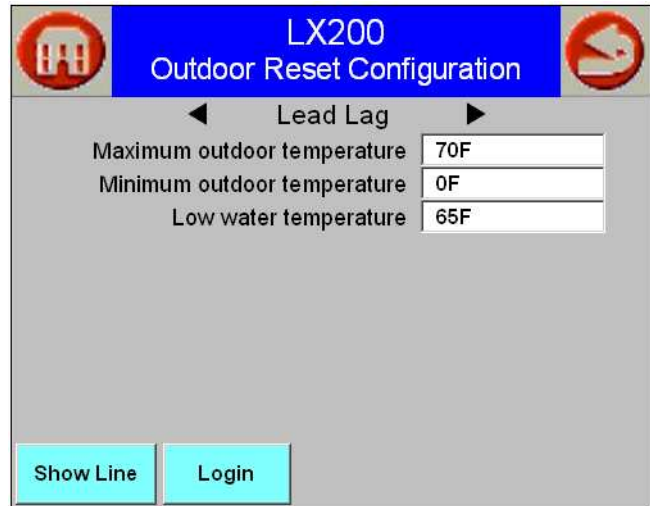


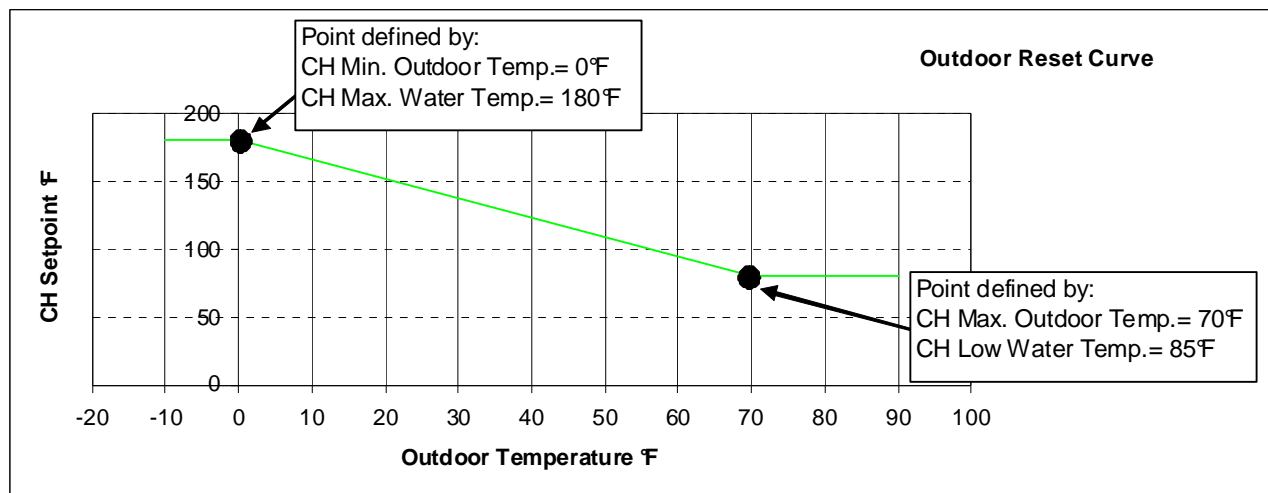
Table 4-7 Outdoor Reset Configuration Parameters - Lead Lag

Parameter	Description	Factory Settings	Comments
Maximum outdoor temperature *	Outdoor temperature that corresponds to the LL "low water temperature". <i>Example:</i> If the LL low water temperature is 85°F, and the LL maximum outdoor temperature setting is 70°F, the boiler water temperature setpoint will be 85°F when the outdoor temperature reaches 70°F. Range 50°F to 90°F [10°C to 32°C].	70°F [21°C]	
Minimum outdoor temperature *	Outdoor temperature that corresponds to the LL maximum water temperature. <i>Example:</i> If the LL maximum water temperature is 150°F (defined by LL setpoint), and the LL minimum outdoor temperature setting is 0°F, the boiler water temperature setpoint will be 150°F when the outdoor temperature reaches 0°F. Range -40°F to 40°F [-40°C to 4°C].	0°F [-18°C]	Outdoor Design Temperature: - set higher for warmer climates - set lower for colder climates
Low water temperature *	LL water temperature setpoint at LL maximum outdoor temperature. Range 60°F to 150°F [15°C to 65°C].	85°F [29°C]	

* = Password protected

Figure 4-8 Outdoor Reset Configuration

Outdoor Reset Graph



DHW - Domestic Hot Water Configuration

Figure 4-9 Domestic Hot Water Configuration Screen

CAUTION **BOILER APPLICATIONS:**
 The sum of the DHW setpoint and DHW off hysteresis should not be set to exceed 200°F [93°C] or a "Lockout" condition may result. 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 20. Failure to follow these instructions may result in damage to property or the unit.

DANGER **WATER HEATER APPLICATIONS:**
 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.

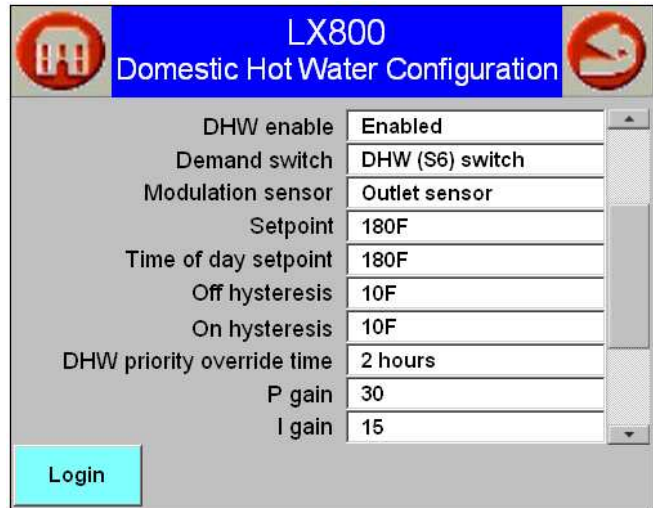


Table 4-8 DHW-Domestic Hot Water Configuration Parameters

Parameter	Description	Factory Settings	Comments
DHW enable *	Enable or Disable Domestic Hot Water	Enabled	
Demand switch *	Select which sensor is the DHW demand source: <ul style="list-style-type: none"> DHW (S6) switch Plate Heat Exchanger 	DHW (S6) switch	Plate Heat Exchanger only for Lx Combi (not available yet).
Modulation sensor *	Select which sensor is the DHW modulation source: <ul style="list-style-type: none"> Outlet Inlet 	Outlet sensor	Reduce setpoint by 20°F if modulating to the Inlet sensor.
Setpoint	Setpoint for DHW modulation. Range 60°F to 200°F [15°C to 93°C].	180°F [82°C]	CAUTION DHW setpoint + DHW off hysteresis ≤ 200°F [93°C]
Time of day setpoint ^	Setpoint for DHW modulation when TOD input is made (night time setback). Range 60°F to 200°F [15°C to 93°C].	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. Range 5 °F to 70°F [3°C to 39°C].	10°F [6°C]	CAUTION DHW setpoint + DHW off hysteresis ≤ 200°F [93°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. Range 2°F to 40°F [1°C to 22°C].	10°F [6°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 *	Gain applied to proportional term of the DHW PID control algorithm.	30	Higher value increases modulation rate
I gain *	Gain applied to integral term of DHW PID control algorithm.	15	Higher value increases modulation rate

* = Password protected

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

Warm Weather Shutdown Configuration

Figure 4-10 WWSD Configuration Screen

Enabling warm weather shutdown (WWSD) inhibits CH operation when the outdoor temperature goes above the WWSD set-point (50-90°F). Depending on the WWSD mode selected, CH operation will either end immediately or once an active CH demand ends.

CH operation is restored when the outdoor temperature drops below the WWSD set-point by a fixed value of 4°F.



Table 4-9 Warm Weather Shutdown Configuration Parameters

Parameter	Description	Factory Settings	Comments
Enable	Enable or Disable Warm Weather Shutdown and select shutdown options <ul style="list-style-type: none"> • 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-90°F [10°C-32°C].	60°F [15°C]	

Modulation Configuration

Figure 4-11 Modulation Configuration Screen

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

CH and DHW maximum modulation rate by model:

150 = 5850 RPM 500 = 6400 RPM
 150E = 4450 RPM 600 = 4350 RPM
 200 = 5950 RPM 700 = 4300 RPM
 300 = 5850 RPM 800 = 5300 RPM
 400 = 7250 RPM

Minimum modulation rate by model:

150 = 1150 RPM 500 = 1400 RPM (2500 RPM*)
 150E = 925 RPM 600 = 1075 RPM (2000 RPM*)
 200 = 925 RPM 700 = 1250 RPM (2500 RPM*)
 300 = 1250 RPM 800 = 1250 RPM (2500 RPM*)
 400 = 1550 RPM

CAUTION

Indoor Combustion Air Kit

The Asterick (*) indicates the increased minimum modulation rate required when using the Indoor Combustion Air Kit in lieu of Air-Intake Direct Vent piping (applicable to commercial models only, Lx500-800).

Increase Minimum Modulation Rate when using an Indoor Combustion Air Kit, as illustrated.

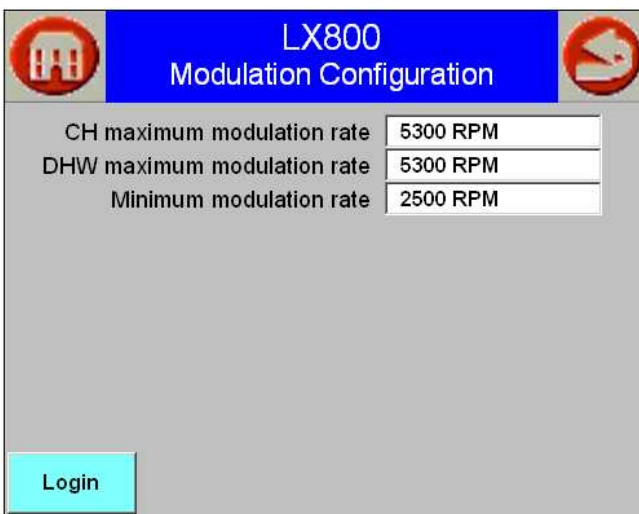
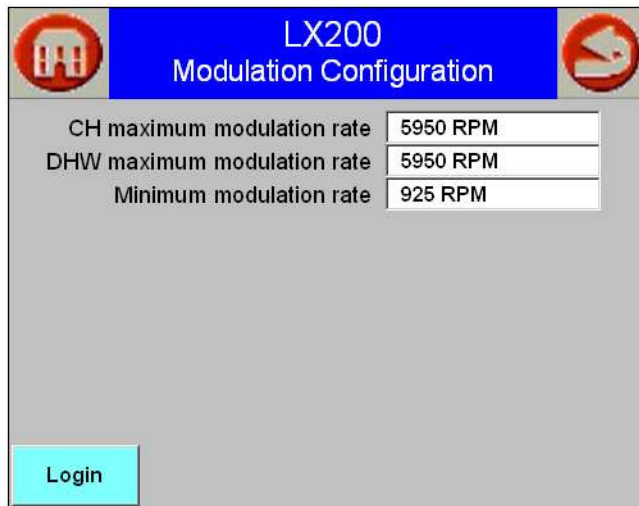


Table 4-10 Modulation Configuration Parameters

Parameter	Description	Factory Settings	Comments
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.	Model dependent	See CAUTION above when using Indoor Combustion Air Kit in lieu of Air-Intake Direct Vent piping (Lx500-800 only).

* = Password protected

Pump Configuration

Figure 4-12 Pump Configuration – Central Heat pump

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

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

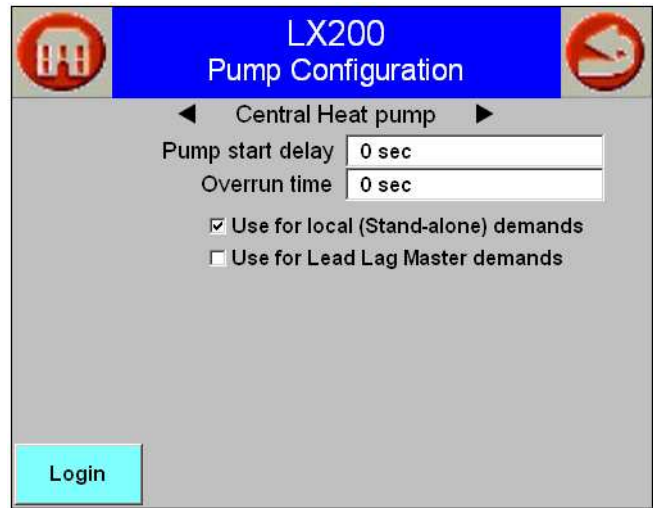


Table 4-11 Pump Configuration Parameters – Central Heat pump

Parameter	Description	Factory Settings	Comments
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 480 minutes.	0 sec	
Overrun time *	Amount of time the CH pump will continue to run after a CH demand ends. Range 0 to 10 seconds.	0 sec	
Use for local (Stand-alone) demands *	Check box used to allocate Pump C as the local pump needed for Stand-alone applications. Option only available on the Central Heat pump sub-screen.	Checked	
Use for Lead Lag Master demands *	Check box used to allocate Pump C as the system pump needed for Lead Lag applications. Option only available on the Central Heat pump sub-screen.	Unchecked	

* = Password protected

Figure 4-13 Pump Configuration – Boiler pump

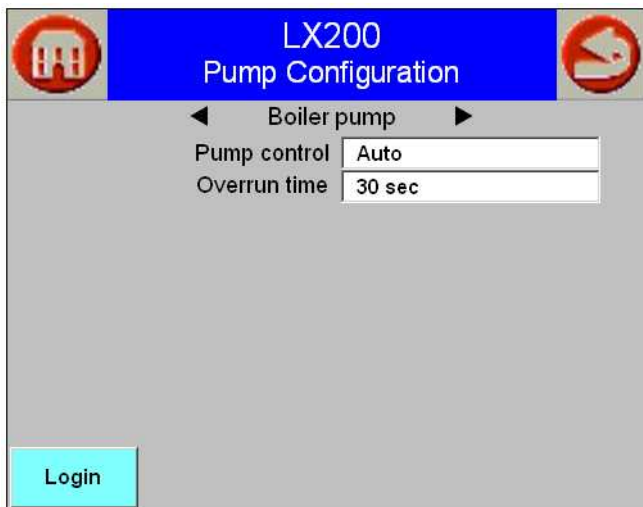


Figure 4-14 Pump Configuration – DHW pump

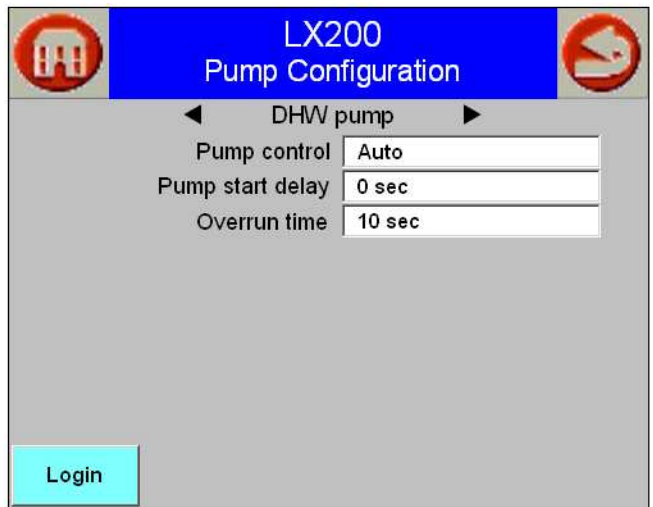


Table 4-12 Pump Configuration Parameters – Boiler pump

Parameter	Description	Factory Settings	Comments
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 burner shutdown. Range 0 to 480 minutes.	30 sec	

* = Password protected

Table 4-13 Pump Configuration Parameters – DHW pump

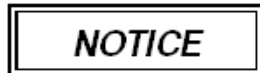
Parameter	Description	Factory Settings	Comments
Pump control *	Switches DHW pump control from Automatic to ON.	Auto	
Pump start delay *	Amount of time to delay start of DHW pump when DHW demand changed from off to on. No delay if burner already firing. Range 0 to 480 minutes.	0 sec	Pump start delay *
DHW pump overrun time *	Amount of time the DHW pump will continue to run after a DHW demand ends. Range 0 to 480 minutes.	10 sec	

* = Password protected

Statistics Configuration

Figure 4-15 Statistics Configuration Screen

The Trinity Lx 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.



Burner cycles and Burner run time counters cannot be reset in the field.

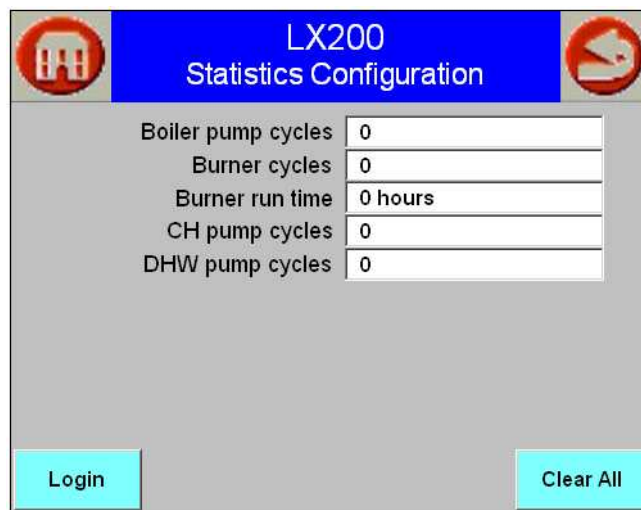


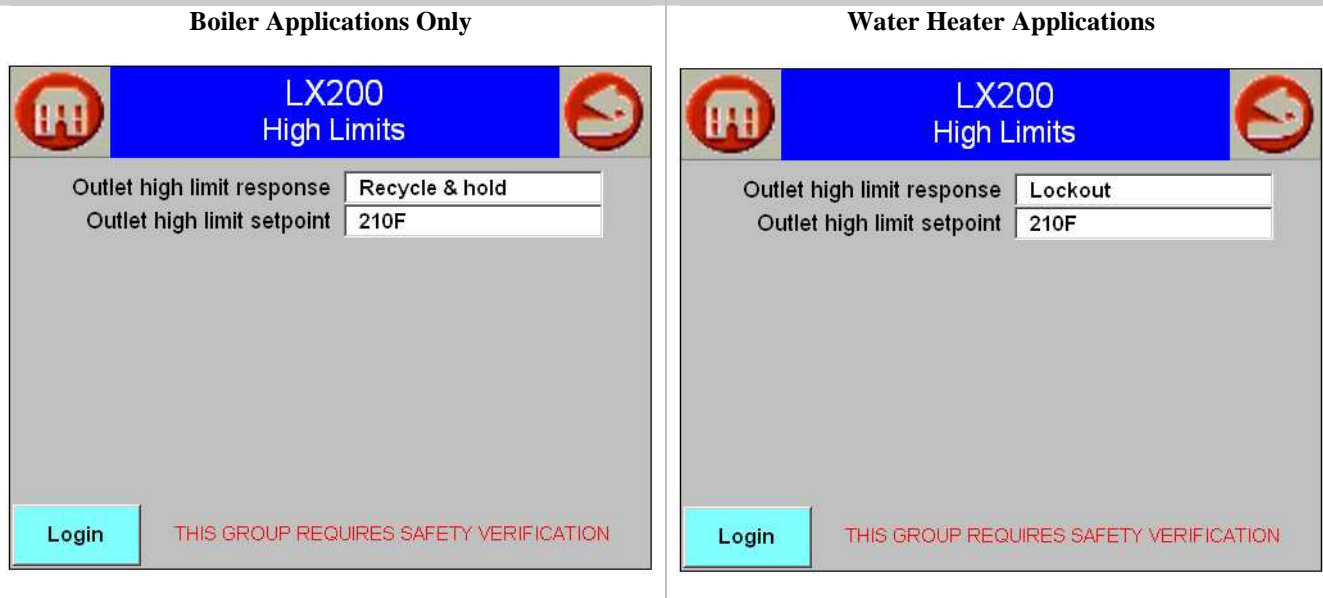
Table 4-14 Statistics Configuration Parameters

Parameter	Description	Factory Settings	Comments
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.	0	
Burner run time*	Total number of hours of burner operation. Range 0 to 999,999 hours.	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

High Limits

Figure 4-16 High Limits Screens



An Outlet High Limit "Lockout" will occur if the outlet temperature from the appliance exceeds the "Outlet High Limit Setpoint" (i.e. 210°F [99°C]). To avoid a lockout condition, ensure the sum of CH setpoint and CH off hysteresis is less than 200°F [93°C] and that the sum of the DHW setpoint and DHW off hysteresis is less than 200°F [93°C].

BOILER APPLICATIONS ONLY:

To completely avoid an Outlet High Limit Response "Lockout", set the limit response to "Recycle & Hold".

WATER HEATER APPLICATIONS:




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 two methods to clear a "lockout" condition and perform a manual reset of the auto gas shut-off control:

- 1- Switch - Cycle power to the appliance by toggling the power switch OFF and ON (Lx200-400 only).
- 2- Controller - Clear the lockout from the Controller by pressing the RESET button near the indicator lights.
- 3- Display - Clear the lockout from the touchscreen display menu. See Figures 7-1 and 7-2 on page 25.

Table 4-15 High Limit Parameters

Parameter	Description	Factory Settings	Comments
Outlet high limit response *	Select controller action in the event outlet temperature exceeds setpoint <ul style="list-style-type: none"> • Recycle & hold (Boiler Applications) • Lockout (Water Heater Applications) 	Lockout	 "Lockout" parameter is a required safety feature for Water Heater Applications.
Outlet high limit setpoint *	Outlet water temperature high limit. Range 100°F to 210°F [38°C to 99°C].	210°F [99°C]	

* = Password protected

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	Comments
Stack limit setpoint *	Stack exhaust gas high limit. Range 145°F to 220°F [63°C to 104°C].	220°F [104°C]	

* = Password protected

Delta T Limits

Figure 4-18 Delta T Limits Screen

Difference in water temperature between Inlet to Outlet flow. When the Outlet temperature minus the Inlet temperature results in a delta t greater than 60°F [35°C] there may be insufficient water flow through the heat exchanger. Once the delta t limit is exceeded, the Control will shut off the burner and delay for the time specified before firing the burner again. An initial cycle and two recycles are allowed before Lockout occurs.

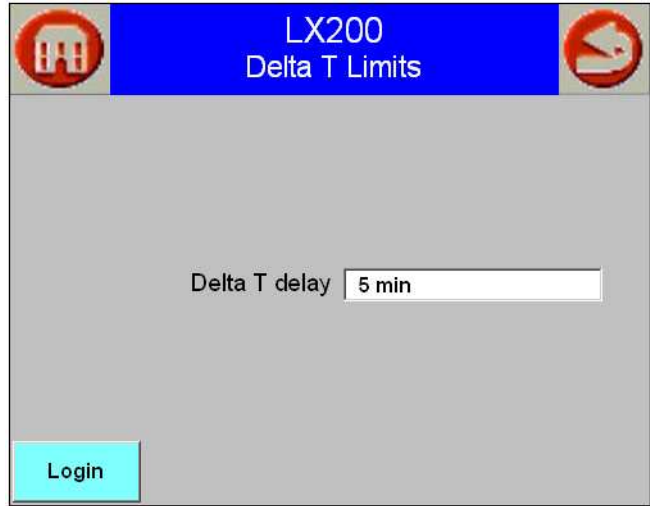


Table 4-17 Delta T Limit Parameters

Parameter	Description	Factory Settings	Comments
Delta T delay	Delay time between burner cycles when difference in water temperature between Inlet and Outlet flow exceeds delta t limit. Range 1 to 60 minutes.	5 min	

Frost Protection Configuration

Figure 4-19 Frost Protection Screen

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

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

LL Frost Protection - Operates System circulator (Pump Output C) if inlet 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].

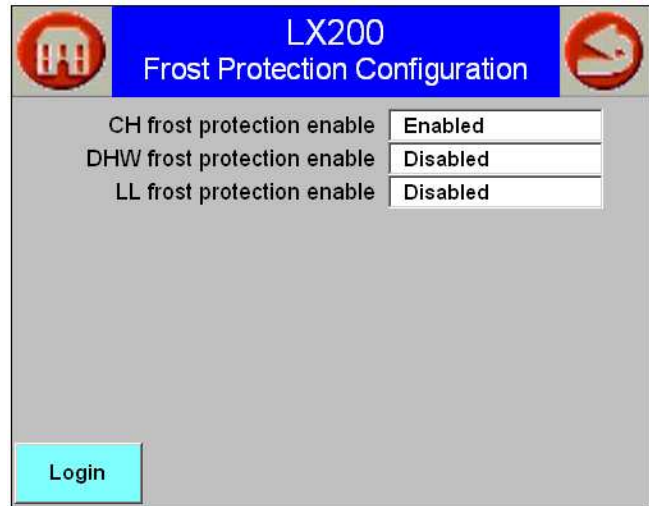


Table 4-18 Frost Protection Configuration Parameters

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

* Password protected

Burner Control Timings & Rates

Figure 4-20 Burner Control Timings & Rates Screen

NOTICE

"Best Practice" for combustion and power blower appliances typically include a post-purge as a way to reduce the risk of residual unburned gas remaining in the combustion chamber after burner shutdown.

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.

Pre-purge Time - Not field adjustable. Factory set to comply with ASME CSD-1 requirements. Applicable to models Lx500-800 only.



Table 4-19 Burner Control Timings & Rate Parameters

Parameter	Description	Factory Settings	Comments
Postpurge time *	Amount of time the Blower will continue to run after burner shutdown. Range 5 to 30 seconds.	5-15 sec	Varies by model

* = Password protected

Burner Control Ignition

Figure 4-21 Burner Control Ignition Screen

Lightoff rate can be adjusted to optimize ignition smoothness.

WARNING

When using the Indoor Combustion Air Kit in lieu of Air-Intake Direct vent piping (Lx500-800 only), the Lightoff rate must be adjusted as follows:

- Lx500 = 3500 RPM
- Lx600 = 5300 RPM
- Lx700 = 3000 RPM
- Lx800 = 3000 RPM



Table 4-20 Burner Control Ignition Parameters

Parameter	Description	Factory Settings	Comments
Lightoff rate *	Blower speed for burner ignition. Range 2000 RPM to 5300 RPM (depending on model).	Lx150-500 3000 RPM Lx600-800 2000 RPM	See WARNING above when using Indoor Combustion Air Kit in lieu of Air-Intake Direct Vent piping (Lx500-800 only).

* = Password protected

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.

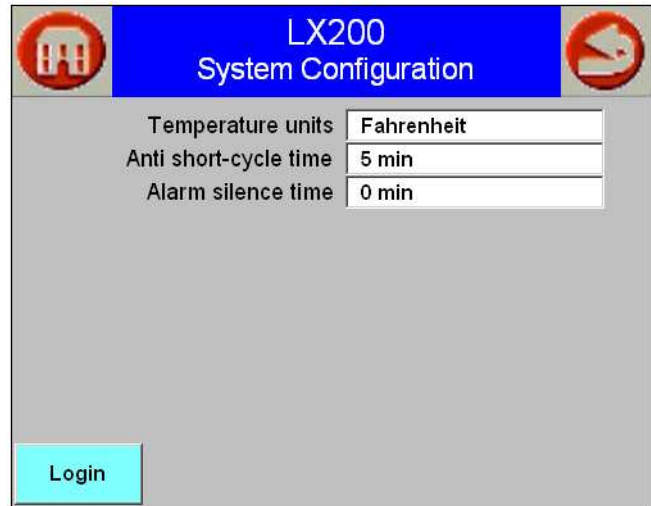


Table 4-21 System Configuration Parameters

Parameter	Description	Factory Settings	Comments
Temperature units cycles	Select which temperature unit to display: <ul style="list-style-type: none"> 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	
Alarm silence time	Alarm may be silenced for this amount of time. Range 0 to 600 minutes (10 hours).	0 minutes	

* Password protected

Sensor Configuration (Lx500-800 Only)

Outdoor Temperature Source

Stand Alone Boiler Applications – This application can either use a lone heat input and an Outdoor sensor or two heat inputs and no Outdoor sensor. If the former (CH1), use the "Outdoor Temperature Source" default setting S5 (J8-11). If the latter [CH2 (LL)], the boiler must be Master "Enabled" to use the Second Heat input and the "Outdoor Temperature Source" must be changed to UNCONFIGURED.

Multiple Boilers - When using the System Sensor for staging boilers, connect the System Sensor to the designated "Master" (enabled) boiler. Modify the Sensor Configuration on the designated "Master" by changing the "Outdoor Temperature Source" from S5 (J8-11) to UNCONFIGURED. The "Master" will not modulate to the System Sensor unless this change is made. An Outdoor sensor can still be used when modulating staging boilers with the System sensor. Simply connect the Outdoor sensor to any Slave boiler in the cascade that is Master "disabled (non-Master)". See applicable Sensor Configuration screen below.

Figure 4-23 Sensor Configuration Screen

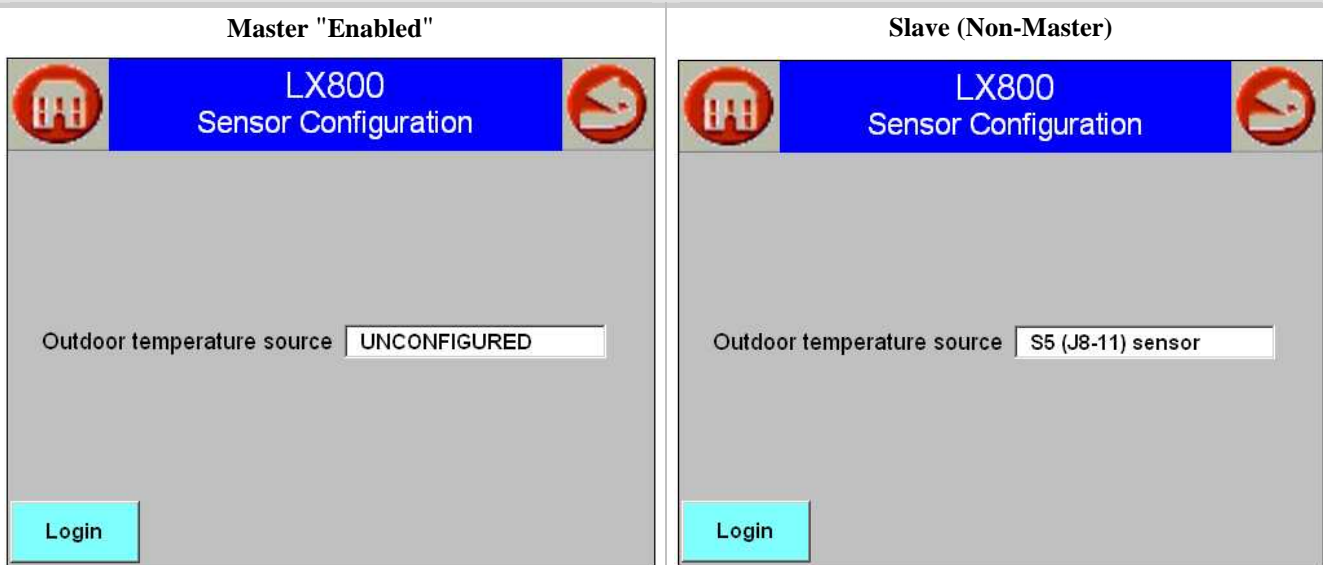


Table 4-22 Sensor Configuration Parameters

Parameter	Description	Factory Settings	Comments
Outdoor temperature source *^	Select which temperature unit to display (Lx500-800 Only): <ul style="list-style-type: none"> • S5(J8-11) sensor • UNCONFIGURED 	S5(J8-11) sensor	Change sensor to UNCONFIGURED on designated "Master" when modulating with a System Sensor.

* = Password protected

^ = The Sensor Configuration screen only appears on commercial controllers (i.e. Lx500-800 models).

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	Comments
Slave mode *	Select from slave mode from drop down list: <ul style="list-style-type: none"> • Use First • Equalize run time • Use Last 	Equalized run time	
Modbus address *	Address port on controller used for communicating between units. Set address from display System ID & Access screen.	1	See Figure 4-2 and Table 4-2, page 9.

* Password protected

Lead Lag Master Configuration

Figure 4-25 LL Master Configuration Main Screen

CH Setpoint – Setpoint temperature during a CH2 (LL) demand. If LL Outdoor Reset “Disabled”, this is the target water temperature; if LL Outdoor Reset “Enabled”, then this becomes the LL CH maximum water temperature.

CH setpoint value selected will depend on type of heating system and modulation source [i.e. System sensor on supply/return header or outlet sensor (backup)]. Lower setpoint recommended when using the system sensor, specifically if installed on return header. See Section 3.0 in Appendix B. **DO NOT** use a System Sensor to lead-lag multiple water heaters.

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	Comments
Master Enable *	Enable or Disable Lead-Lag Master	Disabled	Enable only one LL unit (Master).
CH Setpoint *	Setpoint value for LL CH modulation. Range 60°F to 200°F [15°C to 93°C].	150°F [65°C]	IMPORTANT LL CH setpoint + LL CH off hysteresis ≤ 200°F [93°C]
CH time of day setpoint ^	CH time of day setpoint value for LL CH modulation when TOD input is made (night time setback). Range 60°F to 200°F [15°C to 93°C].	130°F [54°C]	IMPORTANT LL CH setpoint + LL CH off hysteresis ≤ 200°F [93°C]

* = Password protected

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

Figure 4-26 LL Master Configuration Modulation

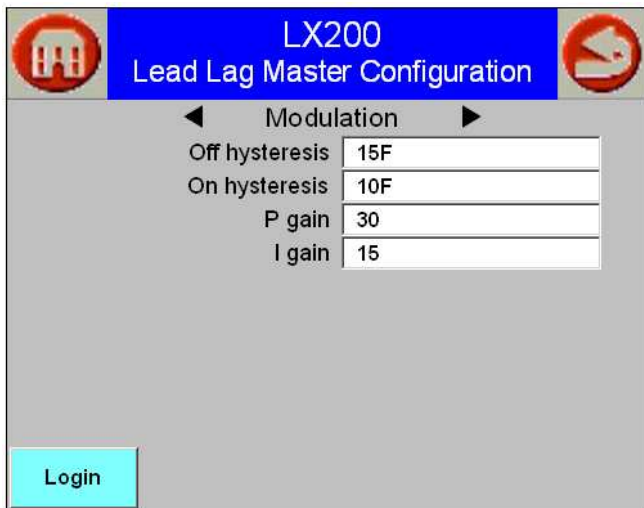


Figure 4-27 LL Master Configuration Central Heat

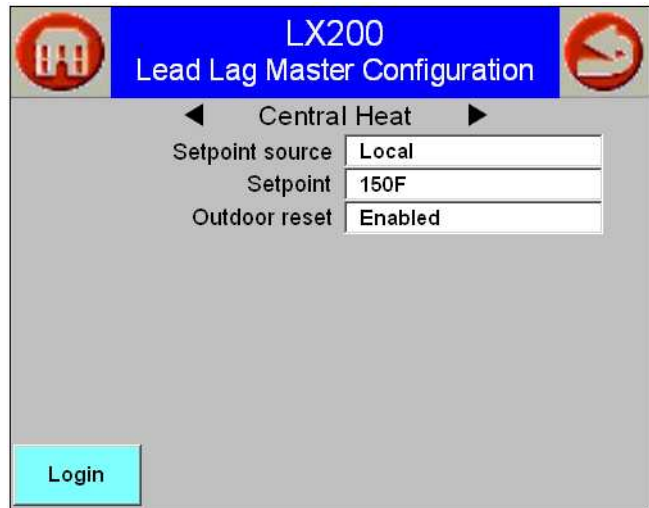


Table 4-25 Lead Lag Master Configuration Parameters – Modulation

Parameter	Description	Factory Settings	Comments
Off Hysteresis *	Value added to LL setpoint to determine water temperature at which the burner will shut off. <i>Example:</i> If LL setpoint is 150 °F, and LL off hysteresis is 15°F, the burner will be shut off at 165°F. Range 5 °F to 70°F [3°C to 39°C].	15°F [8°C]	IMPORTANT LL CH setpoint + LL CH off hysteresis ≤ 200°F [93°C]
On Hysteresis *	Value subtracted from LL setpoint to determine water temperature at which the burner will fire. <i>Example:</i> If LL setpoint is 150°F, and LL on hysteresis is 10°F, 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.	30	Decrease to slow rate of modulation.
I Gain *	Gain applied to the integral term of the LL PID control algorithm.	15	Decrease to slow rate of modulation.

* Password protected

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

Parameter	Description	Factory Settings	Comments
Setpoint Source *	Select which sensor is the LL Central Heat demand source: <ul style="list-style-type: none"> Local 4-20mA S2 (J8-6) 	Local	Allow LL CH setpoint to be set by external control. Outdoor reset must be disabled.
Setpoint *	Alternate location to edit LL CH setpoint. Equivalent to CH setpoint on LL Master main screen. Range 60°F to 200°F [15°C to 93°C].	150°F [65°C]+	IMPORTANT LL CH setpoint + LL CH off hysteresis ≤ 200°F [93°C]
Outdoor Reset *	Enable or Disable LL Outdoor reset function.	Enabled	Disable for Water Heater Applications.

* Password protected

Setpoint - Setpoint values for an external source having independent control of the 4-20mA interpolation curve are not field adjustable and are factory set to 60°F [15°C] for the low setpoint (4mA) and 200°F [93°C] high setpoint (20mA). Setpoint source reverts to "Local" if value invalid, out of range, or none and will revert back to 4-20mA when signal stable again. Setpoint source set to S2 (J8-6) 4-20mA.

Figure 4-28 LL Master Configuration Frost Protection

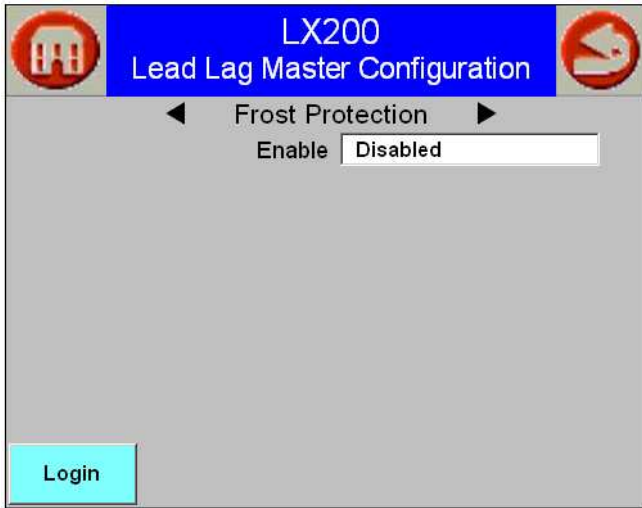


Figure 4-29 LL Master Configuration WWSD



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

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

* Password protected

Table 4-28 Lead Lag Master Configuration Parameters – Warm Weather Shutdown (WWSD)

Parameter	Description	Factory Settings	Comments
Enable	Enable or Disable LL Warm Weather Shutdown and select shutdown options: <ul style="list-style-type: none"> • Shutdown after demand ends • Shutdown immediately • Disable 	Disabled	Disable for Water Heater Applications.
Setpoint	Setpoint value for WWSD. Use of this value depends on warm weather shutdown (WWSD) being enabled. The outdoor temperature and a 4°F hysteresis 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 new occurrences of CH or LL and only respond to DHW demands until the outdoor temperature is below the WWSD set point.	60°F [15°C]	

Figure 4-30 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 forced rotation is non-zero, during a continuous heat call or demand, the controller will force a burner off cycle immediately once the specified time has elapsed.



Table 4-29 Lead Lag Master Configuration Parameters – Algorithms

Parameter	Description	Factory Settings	Comments
Lead selection method	Select preferred selection method for Lead: <ul style="list-style-type: none"> Measured run time (MRT) Sequence order (SO) 	Measured run time	MRT only valid if Slave Mode set to "Equalize run time".
Lag selection method	Select preferred selection method for Lag: <ul style="list-style-type: none"> Measured run time (MRT) Sequence order (SO) 	Measured run time	MRT only valid if Slave Mode set to "Equalize run time".
Lead rotation time	Minimum amount of run time accumulated before Lead rotation will occur. Range 1 minute - 960 hours.	1 hour	"Burner Hours" not 24-hour clock.
Forced lead rotation time	Maximum amount of continuous run time accumulated before Lead forced to rotate. Range 12 hours - 1030 hours.	24 hours	"Burner Hours" not 24-hour clock.

* Password protected

Figure 4-31 LL Master Configuration Rate Allocation

Base Load Common – The maximum firing rate (expressed in %) of all non-idle slaves while there are slaves remaining that are still idle. Normally set below 100% to promote higher operating efficiency.

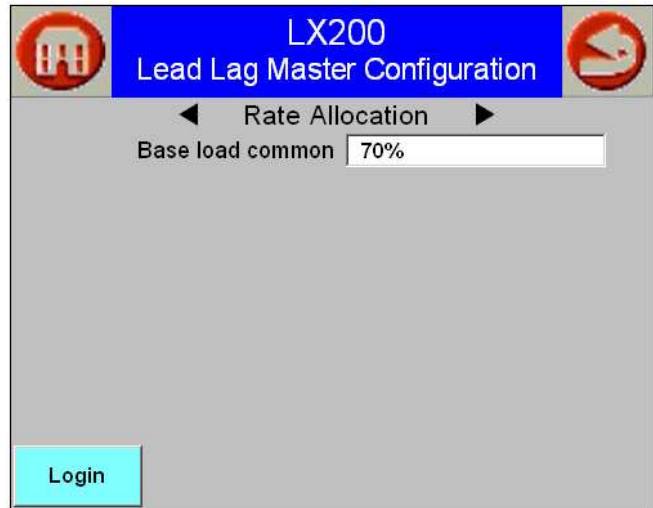


Table 4-30 Lead Lag Master Configuration Parameters – Rate Allocation

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

* Password protected

Figure 4-32 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 (dropped).

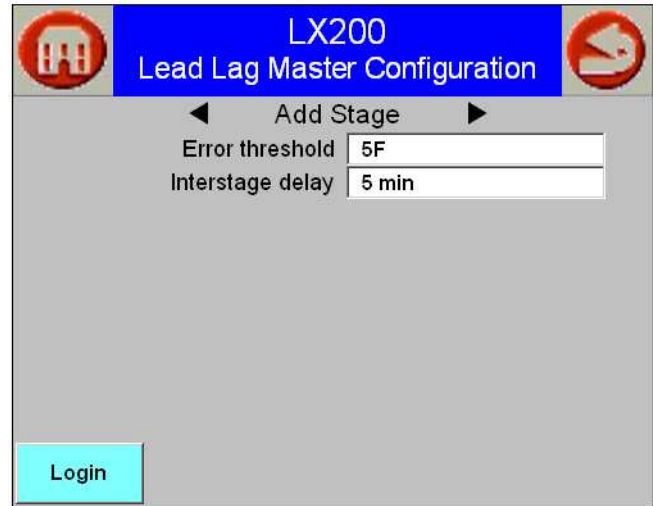


Table 4-31 Lead Lag Master Configuration Parameters – Add Stage

Parameter	Description	Factory Settings	Comments
Error threshold	Staging based on temperature error where another stage is added each time the temperature error exceeds the specified threshold value. Range 3°F to 10°F.	5°F [3°C]	Must be set less than on/off hysteresis value.
Interstage delay	Amount of time elapsed from adding one stage to the time the next stage is added. Range 1 min - 30 min.	5 min	Error threshold must also be exceeded.

* Password protected

Verify (Safety Parameter Verification)

Figure 4-33 Modifying Safety Parameters

When any safety parameter is modified the Trinity Lx controller requires the parameter(s) to 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 control is suspended, the Alarm LED on the Trinity Lx controller is illuminated, Alarm contacts (J6-7,8) close.



Figure 4-34 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 at the page with the lowest numbered Safety Parameter group ID.



Figure 4-35 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 Trinity Lx controller must be pressed within 30 seconds.



Figure 4-36 Controller Reset

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



Display Setup

Figure 4-37 Display Setup Screen

When the display SETUP button is touched, a page similar to the adjacent figure is displayed.

On the left side is a slider control to adjust the screen contrast. Immediately to the right of the contrast control is a volume adjustment slider that may be used to set the volume of the tone emitted by the display. The tone is audible feedback to indicate that an icon on the screen is touched.

Touching the drop-down list beneath the “Blank Display After” caption displays the screen-blanking interval options of: Never, 30 seconds, 1 minute, 2 minutes, 5 minutes, 10 minutes.

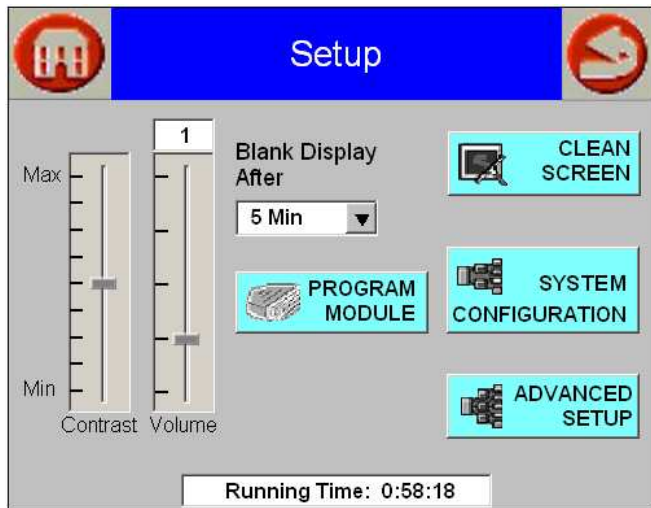


Figure 4-38 Clean Screen

Touching the CLEAN SCREEN button displays a page similar to the adjacent figure.

Touching Continue starts a 30-second timer during which the touch screen is disabled to permit cleaning of the screen.

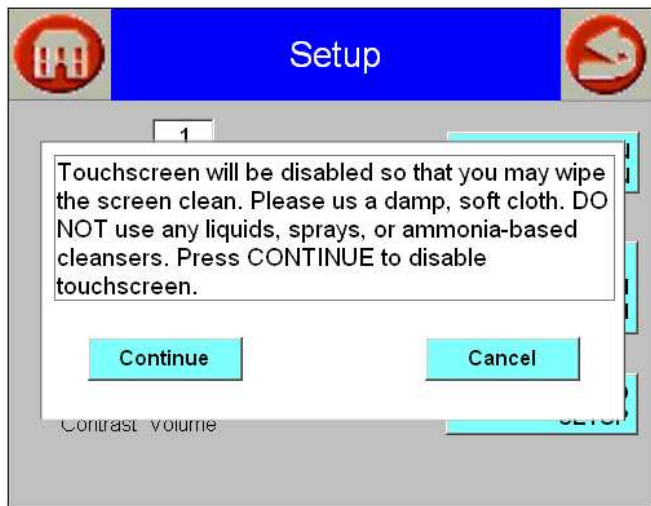


Figure 4-39 System Configuration

Touching SYSTEM CONFIGURATION displays a page similar to the adjacent figure.

The REFRESH button causes the display to scan for a connected controller at Modbus Address 1. If a controller is detected its name will be displayed in the list as shown. Touching the SYNCHRONIZE button will initiate transfer of configuration parameters from the controller to the display.

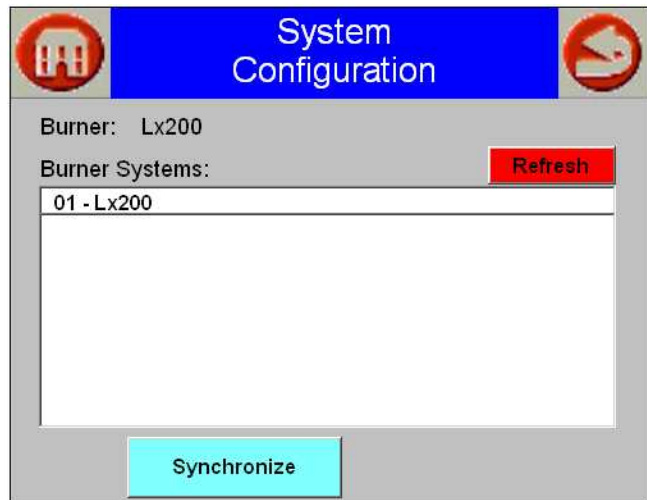


Figure 4-40 Advanced Set-up

Touching Advanced Setup displays a page similar to the adjacent figure with additional buttons for customized setup and user reference information.

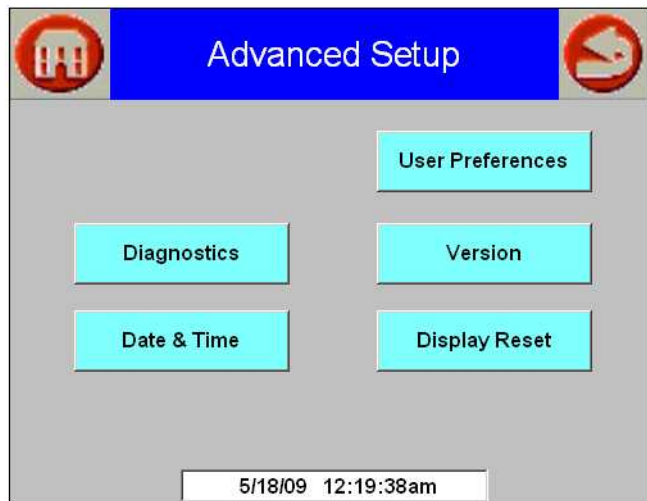


Figure 4-41 Diagnostics

The Diagnostics page is used to test display functions. Touching the TEST button adjacent to any of the items initiates a test of that function of the display. If any malfunction of the display is suspected it may be detected in this manner.

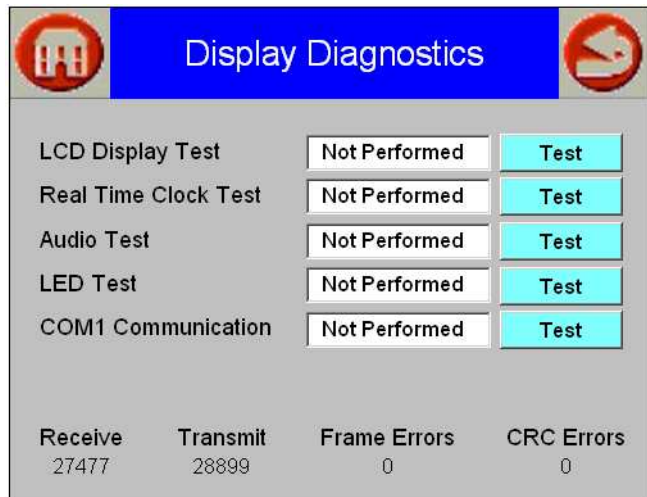


Figure 4-42 Time & Date

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 The date & time are reset to internally stored values whenever the display is reset or power to the display is cycled. To maintain a correct date & time they must be re-entered after either of these events.

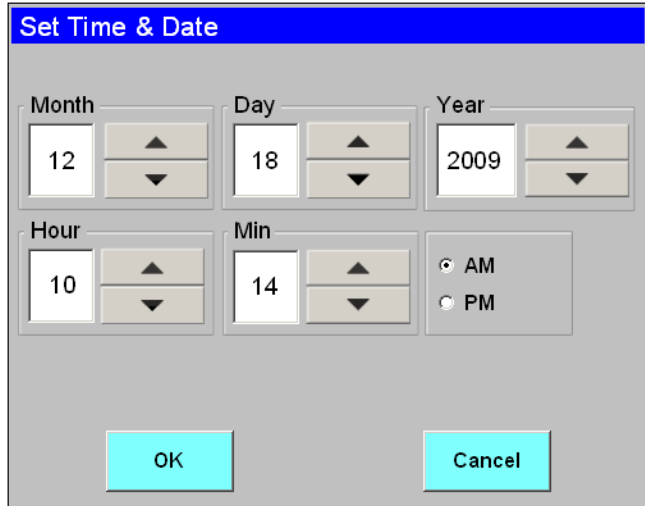


Figure 4-43 User Preferences

Touching User Preferences shows the following page. Checking either of the checkboxes enables the respective feature of the display; clearing disables the feature.

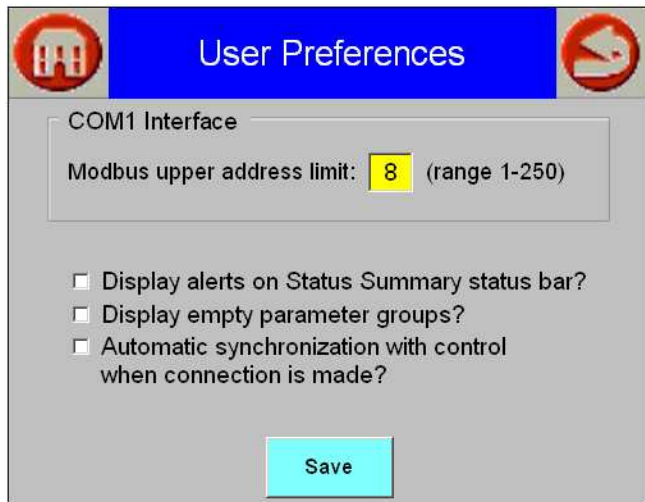


Table 4-32 User Preferences Parameters

Parameter	Description	Factory Settings	Comments
Modbus upper address limit	The display attempts to detect if one or more sola controllers are attached. This value sets the upper limit of the address range to scan. Range 1 - 250.	8	Recommend that the default settings of 8 be unchanged.
Display alerts on Status Summary status bar?	Installer can select if Alerts to be displayed on the Status Summary bar as well as in the Alert Log.	Unchecked	
Display empty parameter groups?	May be used to force the display of all possible configuration pages even if there are no configurable parameters associated with a given page. Its use is not recommended.	Unchecked	
Automatic synchronization with control when connection is made	Causes the display to automatically transfer all configuration and operating data when it detects connection to a controller. This occurs at any power-on or display reset regardless of this setting. Also note that the state of each input and output, and the burner operating state, is monitored and displayed continuously irrespective of the setting of this checkbox.	Unchecked	

* Password protected

Figure 4-44 Version Page

Touching the VERSION button displays a page similar to the adjacent figure which contains information pertaining to the version of the display.

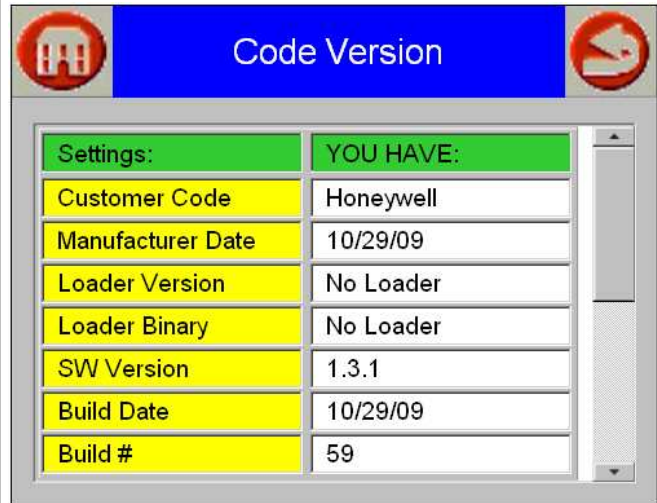
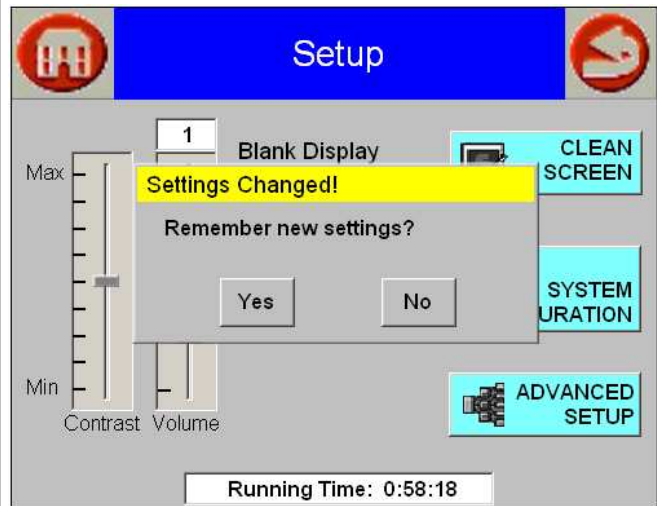


Figure 4-45 Save Setup

Touching the Display RESET button will perform a re-boot of the display and re-synchronization of the display with the controller.

When the Back or Home icon is touched to exit Display Setup, you are prompted to save or discard changes to the contrast or volume settings.



5.0 DIAGNOSTICS PAGE

Figure 5-1 Input/Output Screen

The Diagnostics page initially presents a display of digital Input/Output (I/O) status. Touching the BURNER CONTROL button displays a subset of digital I/O related specifically to burner operation.

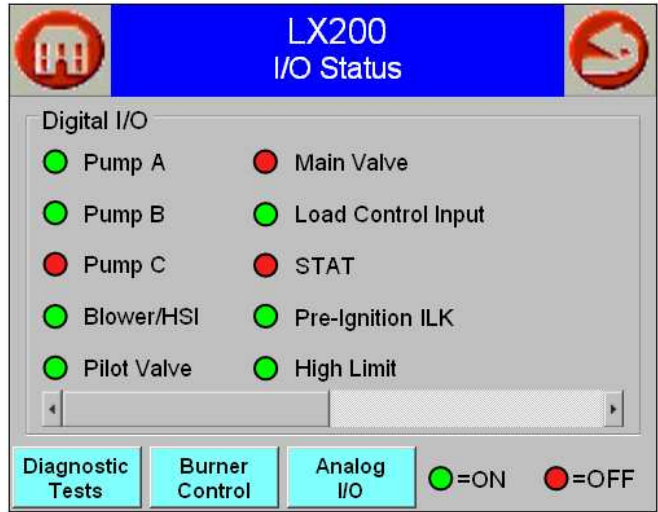


Figure 5-2 Analog I/O Status

The two right-most buttons at the page bottom are used to toggle between I/O status pages. Each input or output status is depicted by a simulated LED with green representing ON, or active, and red representing OFF or inactive.

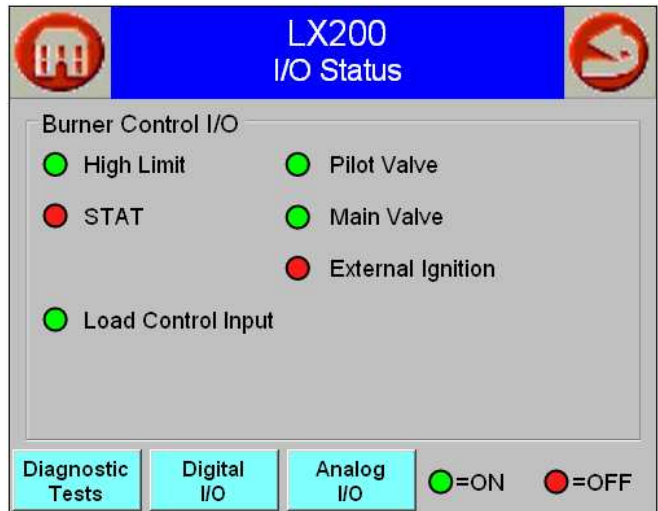


Figure 5-3 Analog I/O Graphs

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

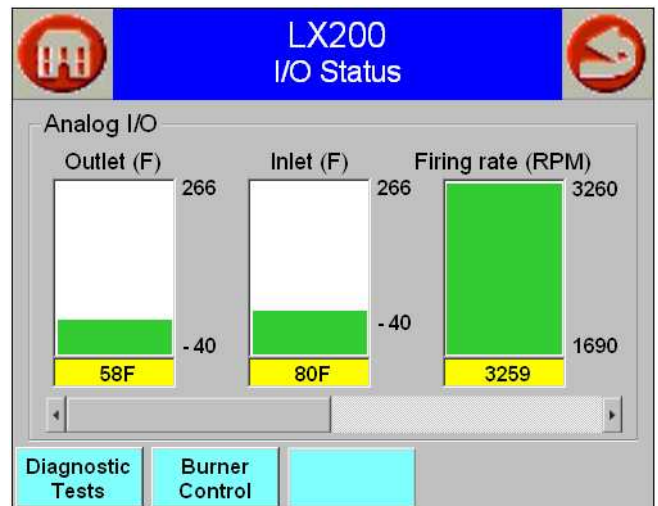


Figure 5-4 Modulation Test

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 diagnostics page allows the installer to test burner operation and combustion at a given firing rate (i.e. 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 during that interval.

NOTICE A high level password is required to initiate the modulation test, contact NTI technical support for more details. 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.

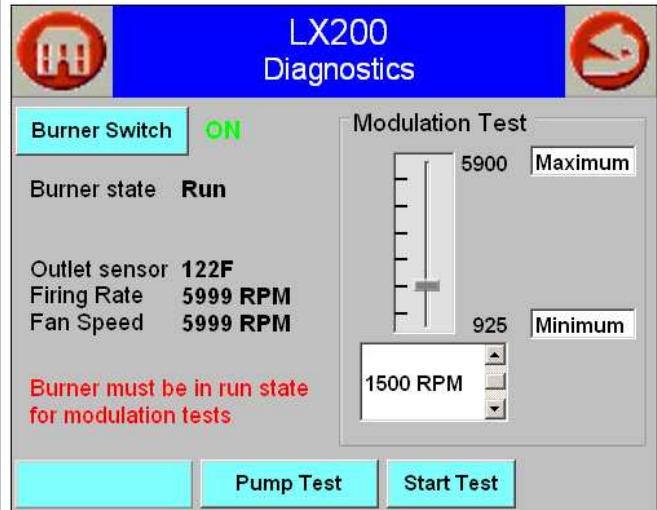
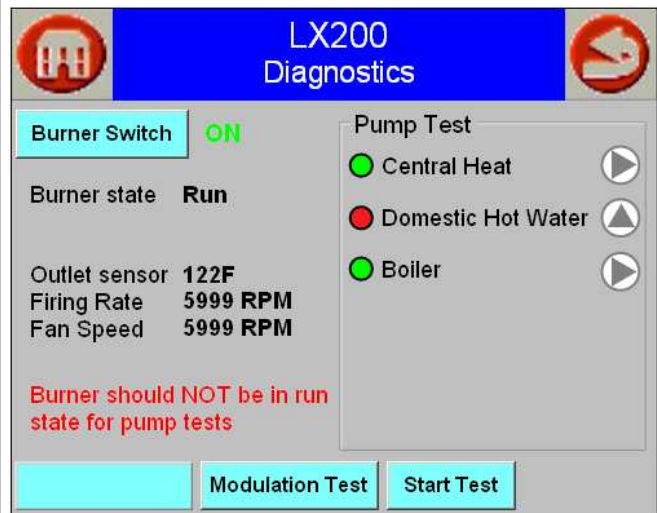


Figure 5-5 Pump Test

Touching the PUMP TEST button displays the Pump Test page. Touch the pump icons on the right side of the page to manually start / stop each respective pump.

On each of the two test pages there is a Burner switch button that may be used to manually shut off the burner. The control only responds to a demand. The burner will not fire simply by turning the burner switch on, there must also be a call to fire due to a CH, LL or DHW demand, and the water temperature is below on hysteresis.

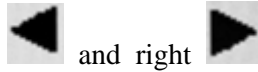
IMPORTANT When a pump is turned on via the Diagnostics Pump Test screen, it will not turn off until it is turned off via the Diagnostics Pump Test screen.



6.0 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 Domestic Hot Water (DHW) 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.

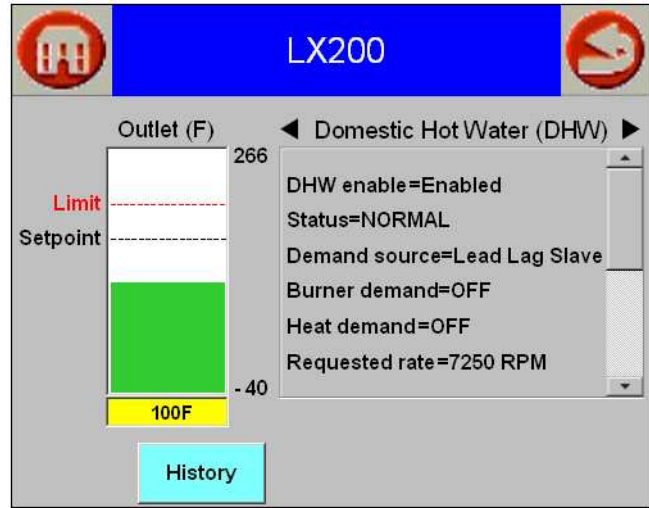


Table 6-1 Details Page Parameters

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 sepoint 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

7.0 HISTORY PAGE

The LX 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 in the **Installation and Operation Instructions For Trinity LX Series**.

Figure 7-1 History Page

The Trinity Lx 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 7-2 Lockout History Screen

Touching Lockouts displays the Lockout History page which contains a scrollable list of events. See Figure 7-4 for description of Alert button icon. The Clear Lockout button may be used to clear a Lockout, similar to pressing the Reset button on the Trinity Lx controller.



Figure 7-3 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.

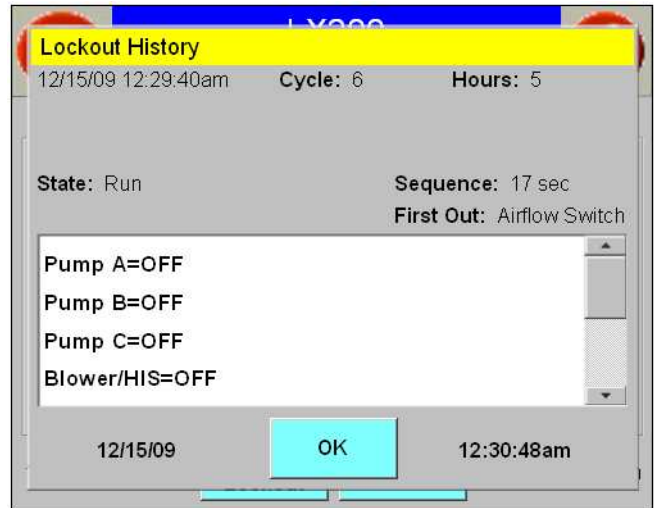


Table 7-1 Control States Displayed

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 7-4 Alert Log and Events

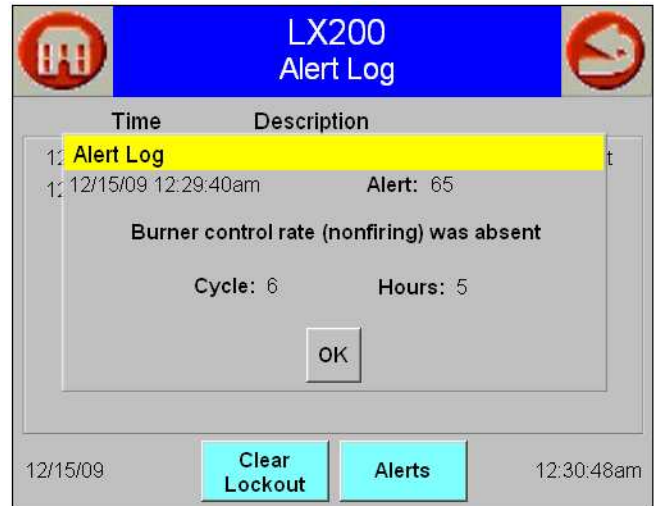
Similarly the Alert Log page contains a list of Alert events. Touching an individual item displays detailed information about the event. See also Figure 7-5.



Figure 7-5 Timestamp Display



The Trinity Lx 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 current time is entered into the display via the Display Setup page (see Figure 4-24), after power is restored.





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