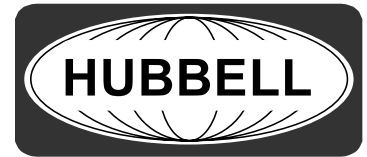


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Instruction Manual

LXi Version "D"

Fire Pump Controllers

- LXi-11/2100 Solid State Soft Start/Stop
- LXi-12/2200 Across-The-Line
- LXi-13/2300 Auto-Transformer
- LXi-14/2400 Primary Resistor
- LXi-16/2600 Manual Wound Rotor
- LXi-17/2700 Part Winding
- LXi-18/2800 Wye-Delta Closed Transition
- LXi-19/2900 Wye-Delta Open Transition

For use with electric motor driven fire pumps,
with and without Automatic Transfer Switches

Notes

Refer to job drawings for options and field connections.

Receiving, Handling, and Storage

1. Immediately upon receipt, carefully unpack and inspect the Controller for damage that may have occurred in shipment. If damage or rough handling is evident, file a damage claim with the transportation carrier.
2. If the Controller must be stored, cover it and then place it in a clean, dry location. Avoid unheated locations where condensation can result in damage to the insulation or corrosion of metal parts.

Installation

1. Consult the motor nameplate to determine voltage, current, and horsepower rating and compare with the Controller nameplate for matching data. Also, ensure that the Controller is correct for the motor, wye-delta, part winding, etc.
2. Release the door interlock by moving the ISOLATING SWITCH to the OFF position. The door interlock can also be released by using a screwdriver to turn the interlock defeat on the side of the operating handle.
3. Inspect the control transformer's primary connections for agreement with the line voltage of the incoming power.
4. Check panel wiring and component mountings for loose fasteners resulting from vibration during shipping.
5. Check all power wire and power component connections (bus bars and cables to circuit breakers) for loose fasteners resulting from vibration during shipping.
6. Exercise all switches and contactors, without power, to see that they operate freely.

<p>Caution: Before drilling and punching holes in the cabinet for wiring connections, cover the components inside the cabinet with a protective covering. Debris may cause shorts or prevent operation of components.</p>
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7. Punch holes in the bottom of the cabinet for conduit.
7. Connect the water pressure sensing line to the Pressure Transducer (1/4 NPT internal brass) fitting, bottom left, of the cabinet. For further details, consult the latest edition of NFPA 20.
8. Connect the power supply conductors to the line side of the ISOLATING SWITCH in the correct A-B-C phase sequence.
9. Connect the motor conductors to the load side of the motor contactor(s).

Controller Operation

WARNING: TO PREVENT STARTING ON POWER UP, REMOVE RELAY(S) CRR AND CRS (IF SUPPLIED). RE-INTSTALL AFTER SYSTEM IS ABOVE “STOP” PRESSURE SETTING ON CONTROLLER.

Closing the ISOLATING SWITCH and CIRCUIT BREAKER-DISCONNECTING MEANS energizes the system. Upon System Initialization, the LCD displays a hello message for three seconds. During the brief interval while the system hello message and software version information are displayed, depressing the STOP button will cause the unit to enter standby mode. While in standby mode, the controller will respond to system commands that allow system configuration and calibration while temporarily inhibiting pump starts. Once the system enters standby mode, some display indicates will blink on (red) and off indicating that the controller is not in normal operation. The controller will automatically exit standby mode after a period of ten (10) minutes or may be manually exited by depressing the alarm silence key.

At this point, the system is enabled and the Power Available LED (on the LED panel) should be green and the phase reversal LED should be dark. If a phase failure is present (i.e. a missing phase), the Power Available light will be red and the PFR relay contacts will indicate an alarm. If there is a phase reversal, this will be indicated by a red Phase Reversal LED and the PRR relay contacts will provide remote indication of phase reversal. The presence of either a phase failure or a phase reversal condition will also cause the common alarm relay to be in the alarm state.

The Controller contains a programming menu system which may be accessed by pressing the “ESC/DEL” key. Upon pressing this key, the display will prompt for the access code to keep unauthorized users from changing the system operation parameters. The access code is a four digit number (between 0000 and 9999). If the ESC key is pressed a second time (at the prompt), the system will return to normal operation and restore the default display. Similarly, if no entry is made within one minute, the system will also return to normal. After the correct password is entered, the system will display one of the menu options. The menus are navigated with the up and down scroll buttons. Once the desired menu option is displayed pressing the ENTER key will activate the selection. At any time pressing ESC will back the display up to the previous level (or exit the menu system).

Display Indicators

LCD Panel

One of the primary functions of the LCD panel is to provide real time status information regarding the system voltage, motor currents, and pressure. This information is displayed on the default screen. Additional screens which display various other system operating parameters are accessed by using the up and down scroll buttons. The scroll buttons are indicated by the directional arrows on the numeric keypad (buttons 8,2 for up/down and 4,6 for left/right). Scrolling either up or down will cause the display to change to the next alternate screen. The system will return to the default screen after a one minute delay if no additional buttons are pressed.

In addition to the LCD, this panel also provides four LED indicators. The indicators and their functions are presented here:

Local Manual Start: This (yellow) LED indicates that the system has started the pump because the local manual start button was pressed.

Remote Start: This (yellow) LED indicates that the Controller has detected and started due to a closure of the Remote Start Contacts.

Emergency Manual Start: This (red) LED indicates that the system was started by the emergency manual start lever.

Local Manual Stop: This (yellow) LED will remain lit for two seconds following a local stop command (pressing the red Stop button). After the system has returned to idle, this light will go out.

LED Panel

The LED panel consists of 16 LEDs that show various system status indications. A list of the common indicators is presented here:

Power Available / Phase Failure: This LED is green when the Controller senses that all three phases are available and within specification. In the case of a phase failure condition, this LED turns red. The method of determining a phase failure depends on the state of the system. If the system is idle, a phase failure is detected by abnormal line voltage(s) whereas if the pump is running, due to the potential of back EMF from the motor, a phase failure is detected by an excessive current imbalance.

Pressure Switch Start: This LED is used to indicate that the system started due to the pressure falling outside of the allowable window as determined by the Start Pressure and Stop Pressure set points (see section on system programming). The LED turns yellow when a pressure start sequence has been initiated and is unlit otherwise. The light goes out, when the system returns to idle. Note in series pumping applications, the pressure start LED on a low zone controller may also indicate a start command from a high zone.

Acceleration Timer: When the system is performing a reduced voltage / current start, this LED blinks green while the Start Acceleration timer is active. Once the timer has expired, this light goes dark. Note: This item only applies to system with reduced voltage / current starting capability.

Run Timer: When the system starts by automatic (pressure start), this LED blinks green while the minimum run timer (set to ten minutes by default) is active. Once the timer has expired, the led will go out.

Lockout On: The lockout indicator turns yellow to indicate a lockout condition during which the system will not start. Since the lockout input is multiplexed with the input for a low suction condition, if the lockout input is asserted while the pump is running, the condition will be interpreted as a low suction condition, which will halt the pump. **Note: This feature is not allowed per NFPA 20 and is permitted only when acceptable to the authority having jurisdiction.**

Locked Rotor (Trip): If the controller senses that current draw in excess of 600% of the Full Load Amps (FLA), the system will activate the common alarm and turn this LED red.

ATS Connected to Normal Power: This indicator, which only applies to systems with a transfer switch, will turn green when the ATS is supplying power from the Normal source. If the ATS is not supplying power from the Normal source, or if no transfer switch is present, this LED will remain unlit.

ATS Connected to Emergency Power: This indicator, which only applies to systems with a transfer switch, will turn red when the ATS is supplying power from the Emergency Source. If the ATS is not supplying power from the Emergency source, or if no transfer switch is present, this LED will remain unlit.

Phase Reversal: This LED indicates that a phase reversal (non A-B-C sequence) has been detected. In order for a phase reversal to be detected properly, all three phases must be present for the signals to be sensed by the phase sequence detector. Consequently a phase failure (e.g. under voltage) could cause indeterminate phase readings. Therefore, a phase reversal condition will not be alarmed unless all three phases are present and within fifteen percent of normal spec.

Pump Start Delay Active: In systems that have been programmed for a pump start delay this LED will blink green when the delay timer is activated and then go out once the pump is running. The Start Timer only activates when the system has started automatically (pressure start). Consequently, a local manual start will not cause a start delay. Note: If the pressure is restored before the timer expires the start sequence will abort.

Pump Running: The Controller looks for the presence of sufficient motor current as the indication that the pump has successfully started. This LED will turn green when the Controller determines that the pump has successfully started and is running. If the pump should be running and the Controller is unable to detect sufficient line current this led will turn RED to indicate the failure

Low Suction Shutdown: If an external low suction shut down signal is asserted, the system starts the low suction timer. During the time period set by the timer, the low suction LED blinks to indicate that a shut down is imminent. This LED will turn red when the pump shut down occurs as the signal has remained continuously active during the timer period. See Lockout Section. **Note: This feature is not allowed per NFPA 20 and is permitted only when acceptable to the authority having jurisdiction.**

Fail To Start: If the Controller has attempted to start the pump, but has determined that the pump is not running by the lack of sufficient current load, the system and this LED will turn RED.

Overload: The Controller monitors the currents during both the start and run conditions. If during a run condition one or more phase currents exceeds 120% of the rated FLA this LED will turn YELLOW.

SCR Overtemp: On units equipped with a soft start module, this LED indicates an over temperature condition of one or more SCRs. The overtemp condition is determined by the state of the thermostats on the SCR heat sink assembly.

Shorted SCR: On units equipped with a soft start module, this LED indicates an a shorted SCR condition of one or more SCRs. The shorted SCR signal is generated by the soft start control module.

NOTE: This LED will come on if the emergency manual handle is used to start the motor. It can be reset by turning off the controller circuit breaker.

Keypad Buttons

The Keypad (on the LCD panel) contains a number of buttons including a numeric keypad with zero through nine (0 to 9), an ESC / DEL, a Decimal Point (.) and an Enter Key. Additionally There are a number of special function buttons. The details of how to input data and the functional description of these special buttons is provided here.

Function Buttons

The Function buttons are used to enter programming data, enter calibration data, and navigate through the system displays and menus. The scroll buttons are used to select the desired item from the pre-determined list. After providing the required input, pressing the Enter key will accept the data. The LCD display will provide prompts indicating whether to use the numeric keypad or the scroll buttons for the particular input. For information on the system menu layout and instructions on programming and calibration, refer to the appropriate sections in this manual.

Local Manual Start: This button is used to locally start the motor. If the Controller is a reduced voltage / current starting type, the starting sequence will be performed though no start delays will be executed. When the system is started by way of the local (or remote) start, the system can only be stopped by pressing the red Stop button.

Soft Stop: In systems that contain a Soft Start / Stop system, pressing this button will cause the controller to execute a soft stop sequence. In systems not equipped with a soft start module, this button will mimic the action of the stop button.

Lamp Test: This button causes the controller display to cycle all the LEDs through the four possible color combinations allowing verification that the lights are all operational.

Alarm Silence: Pressing this button will cause the controller to de-activate the common alarm contacts and to silence the external siren (if the option is present). If a new alarm occurs, however, the common alarm will re-activate. Additionally, the alarm will only remain silenced for a period of ten minutes before it will automatically re-activate. After alarm condition clears, alarm will sound again until silence button is pushed.

Stop: This button is used to locally stop the pump. The motor contactors will be disengaged. Note: pressing this button will cause a soft stop system to stop immediately without a ramp down period.

Enter: This button is used to complete numerical data entries or to select an item from a menu.

ESC: The ESC button serves multiple purposes depending on the system status. While the machine is displaying one of the standard display screens, pressing ESC will cause the system to prompt for the user access code (see section on password protection below). During menu selection, pressing the escape key will cause the system to either back up one menu level, or to exit the selection process entirely. While entering numerical data, if a mistake is made, pressing this key will activate the DEL(ete) function and the last digit entered will be erased. If all digits have been erased, pressing this key will exit out of the entry mode.

Password Protection

Many of the system functions are protected by a user password. The password consists of a four digit number between 0000 and 9999. If the ESC key is pressed, a prompt for the pass code will appear. At this point, enter the user pass code and press the Enter key. If the password is accepted, a brief message to this effect will be displayed and then the configuration menu will appear. If the password is invalid, an error message will be displayed and the machine will return to the default display. If a mistake is made while entering the password, pressing the ESC/DEL key will cause the last digit entered to be erased or will cause the Controller to exit out of password entry if there are no digits entered presently.

The user password is set to 1234 by factory default, and it is recommended that this number be changed to a different value. Note: it is important that this number not be lost, as this will prohibit the ability to change the operational parameters, though the machine will continue to operate according to its present configuration. In the event that access to the machine can not be obtained due to a lost password, immediately contact your local Hubbell representative for assistance.

Navigating the System Menus

The menu system of the LXI Fire Pump Controller consists of two levels. The first level selects the function category and the second level selects the function within the category. Use the scroll buttons (8 and 2) and the Enter key to select a particular menu. Items marked with an “*” require factory password access and not intended for use by the end user. The menus are broken down into the following Arrangement:

Calibration Menu:

***Adjust Zero Offsets:** Sets the zero current point for current metering. Set with motor off.

***Calibrate Voltages:** Perform a fine tune calibration of the line voltages

***Calibrate Currents:** Perform a fine tune calibration of the phase currents, with motor running

***Calibrate Pressure:** Allows a fine tune adjustment to the system pressure

***Zero Pressure Trans:** Sets the zero pressure point for the pressure reading, must have zero pressure in the controller sensing line.

WARNING: Do not use this command with pressure on the system. The sense line **MUST** be at zero pressure while performing this operation.

Set Full Load Amps: Used to designate the motor FLA from the nameplate

Pressure Settings Menu:

Stop Pressure: Sets the automatic stop pressure value (if enabled). The default setting for this value is 75 psi.

Start Pressure: Sets the automatic Start Pressure. Note an entry of 0 psi is invalid and will cause an automatic starting of the pump. The default setting for this value is 50 psi.

Pressure Dev Limit: Used for data logging / printer purposes. This number sets the amount the pressure is allowed to fluctuate before an 'event' is triggered. The default setting is +/- 5 psi.

Time And Date Setup:

Set Time hh:mm:ss: Sets the system Real Time Clock for display and logging.

Set Date dd:mm:yy: Sets the system Date for event logging purposes

Set Day of Week: Sets the system day (Sunday – Saturday)

Set Test Timer Time: Sets the time at which the test timer will cause a start

Set Test Timer Day: Sets the day of the week at which the test timer will start

Test Timer Enable: Controls whether or not the weekly test timer is enabled

Note: The time is set and displayed in 24 hour format.

Timer Config Menu:

Note: All timers are set in Seconds

Minimum Run Time: Allows adjustment of the Minimum Run Period timer
In seconds. Factory default to ten (10) minutes of run time (600 seconds).

Min Run Timer Enable: This option enabled the minimum run timer and automatic stop when the pressure is satisfied after the timer has expired

Note: For Manual Stop – Set minimum run timer to “Disable”.

Step Accel Cont Time: Sets the amount of time in seconds that the system will remain in the reduced voltage / current start state (if applicable). maximum value is 60 seconds.

Delay Start Timer: Hold off time in Seconds before a pressure start will start the motor. If the pressure returns to a level above the start pressure before the timer expires, the system will not start –may be set for a maximum of 10 seconds.

Low Suction Timer: Time period during which the low suction input must be continuously maintained in order to cause a low suction shutdown.

Low Suc Auto Restart: If this option is enabled, the system will automatically restart on a low pressure condition (below start pressure). If this option is disabled, to clear a low suction shutdown, it is necessary to first press the **Stop** button before the system will restart.

System Config Menu:

Configuration String: Allows input of the system configuration code. This code should be displayed on a label on the inside of the door panel.

Change Access Code: Used to change the configuration system access code.

***Factory Default Init:** Automatically restores all configuration settings to a 480V, across the line system with no transfer switch.

***Datalog Init Restore:** Erases and reformats all datalogs for event recording

***Controller Type:** Used to set the machine model for starting and transfer switch

***System Voltage:** Used to set the nominal voltage range of the system

Serial Comms Config:

Serial Comms Enable: Sets whether or not serial communications are enabled. The default is for communications to be disabled.

Baud Rate Setting: Sets the serial communications baud rate (default 9600)

Parity Setting: Select No Parity, Odd Parity, or Even Parity (default is none)

Data Bits: Select either 7 or 8 data bits (default is 8)

Stop Bits: Select either 1 or 2 stop bits (default is 1)

Printer Enable: If this option is set, a printer, if installed, will automatically print on every event.

Print Event History: This command will cause a serial dump of the last 50 events to the serial port. Either to a printer or to a laptop that is connected to the serial port

*Options Config Menu:

NOTE: THESE OPTIONS REQUIRE THE ADDITION OF A CORRESPONDING RELAY. ACTIVATING THE MENU OPTION ALONE WILL NOT IMPLEMENT THESE FUNCTIONS

***Fail to Start Option:** If this option is enabled, set to '1', the open collector output for a fail to start condition will be activated on a fail to start.

***Load Shed Option:** If this option is enabled, set to '1', the output for load shed will activate when the pump starts and power is being supplied from the emergency source. The start condition is NOT limited to just automatic starts.

***Series Low Option:** If this option is enabled, set to '1', an automatic start will occur if the PX_BYPASS input goes active indicating a start command from a High Zone controller.

***Series High Option:** If this option is enabled, set to '1', on a pressure start condition, the controller will assert the pressure start open collector output to signal the low zone to start and hold off starting. Once the PX_BYPASS input goes active, the controller will initiate the delayed start timer and then commence running.

A Note on the System Timers

The allowable settings range on each timer vary. To set each of the timers, including the Min Run Period Timer, a value is entered through the numeric keypad that represents the timer period in SECONDS. Therefore if a value of minutes is desired, multiply the number of minutes by sixty (e.g. a 10 minute Min run timer would be set to $10 \times 60 = 600$).

As an example, to set the programmable motor ramp up time select the “Start Accel Cont Time” from the Timers Menu. The screen will prompt for a value (number of seconds), which should be entered using the number keys ‘0’ through ‘9’. The range of allowable values is zero seconds to 60 seconds.

Remote Inputs

Low Suction / Lockout: This input is used to signal the controller of either a Low Suction Pressure condition which will cause the motor to stop or to Lockout the Controller which will prevent it from automatically starting. The interpretation of this signal depends on the current state of the system.

(This feature is not allowed per NFPA 20 and is permitted only when acceptable to the authority having jurisdiction.) The lockout circuit requires the closure of remote contacts to stop the motor. If the lockout signal is applied while the motor is running, it will stop and then restart once the signal is removed.

Remote Start: This input is used to command the pump to start from a remote location. Once started in remotely, though, it can only be stopped locally.

Communications Parameters

The LXi series Fire Pump Controller is capable of communicating to a terminal device through the RS-232 port. Through the communications port, it is possible to download a snap shot of the system operating conditions including system voltages, currents, pressure, present alarms and operating history. The individual communications parameters are settable by using the scroll keys to choose one of the preset values. The parameters include baud rate, number of stop and data bits, and parity setting. Additionally, the RS-232 communications may be disabled entirely.

Weekly Test Timer

The LXI system incorporates a weekly test timer function. The test timer will initiate an automatic start sequence at the predetermined time and day of week. The weekly test timer will generate a **simulated** pressure start condition, to which the controller will respond. A couple of items should be noted regarding the operation of the weekly test timer. First, the timer does **not** actuate a drain solenoid and therefore does not test the pressure transducer. Second, if the minimum run timer is disabled, the controller will **not** stop automatically.

System Calibration

The Controller is calibrated at the factory and should not require adjustment at installation.

Pump Activation Sequence

LXi-All Models

The Controller is responsible for initiating all normal starting operations and performs an electrical assist operation in the advent of an emergency manual start. The starting sequence is controlled by one or two relays on the control panel labeled CRS, the start relay (if supplied), and CRR which is the run relay. When a start is performed, first the CRS relay is energized for the duration of the Acceleration Timer. After the timer has expired, the controller transitions to full run by activation of the run relay, CRR. If the unit is an across the line or non automatic model, only the CRR is present and no acceleration delay will be performed.

Emergency Manual Control

The emergency start handle should only be used if the Controller fails to start automatically or with the **Start** button. If control power is available and the emergency handle is closed, the controller will activate the motor contactors to start the motor across-the-line. The motor runs until the handle is returned to the **OFF** position or the circuit breaker is opened. To start the motor when control power is not available, **move the handle in one fast continuous motion to the full ON position and secure in the closed position with the spring-loaded latch.**

<p>Caution: Failure to move the handle in one fast and continuous motion can result in damage to the contactor and failure to start the motor.</p>

Model Specific Starting information

LXI-11/2100 Solid State Soft Start/Stop

General -

The soft start provides adjustable ramp time and motor voltage control. The soft start control board provides adjustments for Accel Time, Decel Time, Initial Torque/Idle Level and Idle Time. Additionally, eight status LED's provide indication for Ramp Up, Ramp Down, Idle, Ready, Run, SCR Shorted, Initiate, and Permissive. When the Controller energizes the CRS motor start relay, the S²MC (Soft Start Motor Control) begins to apply voltage through the SCRs to accelerate the motor. Voltage increases until full voltage is reached. The Voltage Ramp time is field adjustable from 0.5–10 seconds, factory set at 5 seconds..

After the S²MC accelerates the motor to full speed, at the end of the Start Acceleration Time, the Controller energizes CRR to close main contactor M1, bypassing the S²MC module.

Emergency Stop - The Stop button overrides the S²MC and cause the controller to immediately stop the motor unless the Emergency Manual Control is in the ON position. If the system water pressure is low, the motor will restart. To prevent the motor from restarting, open the Isolating Switch or CIRCUIT BREAKER-DISCONNECTING MEANS.

Soft Stop – Pressing the SOFT STOP button causes the Controller to signal the S²MC to begin decelerating the motor by reducing the voltage through the SCRs

SCR Temperature - If the S²MC thermostat senses high temperature, the thermostat contacts close, energizing the STR (SCR temperature relay). In the advent of an over temp condition, the Controller will activate the CRR relay, energizing M1 to bypass the S²MC, and run the motor. This condition will be accompanied by an SCR Over Temp LED. If this LED is on, immediately contact your local Hubbell representative.

SHORTED SCR - When a SCR fails, it usually fails by shorting, thereby passing full voltage. If the S²MC senses a shorted SCR, the SSCR contacts close to signal to the Controller that an SCR has shorted. This will result in a Shorted SCR LED and an alarm. Closing the Emergency Manual Control handle when there are no starting signals present also causes the SHORTED SCR LED to come on. Reset the Controller by opening and then closing the Controller circuit breaker. If the LED comes on again, immediately contact your local Hubbell representative.

The S²MC has adjustable parameters that must be set independently from the functions of the LXi controller. These functions are described below:

S²MC Adjustments

Function	Label	Range
A. Initial Torque/Idle Level (Standard NEMA B motor)	INIT TORQUE/ IDLE LEVEL	10–40% torque 25–50% voltage
B. Voltage Acceleration Ramp Time	ACCEL TIME	0.5–10 seconds
C. Voltage Deceleration Ramp Time	DECEL TIME	0.5–10 seconds
D. Idle Time	IDLE TIME	0–30 seconds
E. Start and Idle current based on optimization of A and B.		240–600% FLC

The factory settings for Accel and Decel time (dial setting of 50, approximately 4 s), Initial Torque/Idle level (dial setting of 20, 15 to 25% torque) and Idle time (100, approximately 10 s) are usually the best place to start for each application. Make field

adjustments to ensure that a critical specification is not exceeded. Most often, the starting current needs adjustment. Make these adjustments using a clamp on ammeter, a Digital Multimeter, a stopwatch, and a pocket screwdriver.

Maximum motor starting current is a function of acceleration time and initial torque/idle level. As acceleration time is reduced or initial torque/idle level is increased, the peak motor starting current increases. With ACCEL TIME set to maximum, 100, adjust the INIT TORQUE/IDLE level until the pump motor just begins to turn when the initiate input is activated, LED1 on. Next, permit a start and monitor the starting current level for a peak and then a decline. Note the time in seconds when the current value falls. This is the optimum starting acceleration timing. Readjust the ACCEL TIME potentiometer accordingly.

Set the IDLE TIME to accommodate restarts during the idle period, otherwise, it should be kept to a minimum. These adjustments are made to enable the Controller to respond to the system load requirements while minimizing the impact on the associated mechanical, electrical, hydraulic, or pneumatic components.

<p>NOTE: The acceleration timer in the LXi menu system must be set longer than the acceleration dial setting on the soft start module. The factory default acceleration timer value for controllers equipped with a soft start module is eight (8) seconds.</p>
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LXi-1200 Across-the-Line

The Across-the-Line system uses the CRR, relay to energize the M1 contactor. The across the line starter behaves exactly as described in the above sections with the exception that it does not utilize the Start Acceleration Timer and will ignore a non zero setting.

LXi-13/2300 Auto-Transformer

The start procedure of the Auto-Transformer start begins with closure of the CRS contacts to energize the M1 contactor coil and start the motor. The normally closed contacts of CRS are used while the motor is starting, energizing the neutral contactor, S. The motor now starts at reduced voltage through the auto transformer.

Contactors S and M2 are interlocked both mechanically and electrically. While S is energized, M2 is locked out by contact Sb1. After the start period, which is defined by the Start Acceleration Timer, S contactor is de-energized and the CRR contacts and the Sb1 contacts close to energize the M2 contactor. Contact M2b1 keeps the S contactor locked out. The motor now runs at full voltage.

The auto transformer taps can be field changed if required. The factory setting is the 65% voltage tap, 50% and 80% are also supplied. This should be changed only by a qualified service person.

LXi-14/2400 Primary Resistor

The Primary Resistor system starts by closing contacts CRR which causes the motor contactor M1 to energize and start the motor at reduced current through the starting resistors. After the start period defined by the Start Acceleration Timer, The controller

activates the motor run relay CRR. The CRR contacts close to energize the M2 contactor, applying full voltage to the motor.

LXi-16/2600 Manual Wound Rotor Controller

The non automatic controllers do not have a pressure sensing system and can only be started by either the remote or local start inputs. The non automatic system starts by energizing the CRR, run relay, which in turn energizes motor contactor M1. The M1 contactor supplies power to the manual drum switch which is then used to manually start and accelerate the motor.

LX-17/2700 Part Winding

When starting the Part Winding system, the Controller first activates the CRS relay to energize the M1 contactor coil to start the motor at reduced current through one motor winding. After the start period, defined by the Start Acceleration Timer, the Controller activates CRR. Contacts CRR close, energizing contactor M2 to apply voltage to the second winding in the motor to run at full speed.

LXi-1800 Wye-Delta Closed Transition

The Wye-Delta Closed Transition starts by activating the CRS contacts close to energize the M1 and S1 contactors and start the motor at reduced current connected in the Wye configuration.

The Neutral contactor, S1, connects the motor windings to complete the wye connection. Contactors S1 and M2 are interlocked both mechanically and electrically. While S1 is energized, M2 is locked out by the S1b1 contact. After the start period, defined by the Start Acceleration Timer, the Controller activates CRR. The CRR contacts close to energize the transitional contactor, S2. Current briefly flows through the transitional resistors and contactor S2 to maintain motor torque. Then contacts S2b1 open to de-energize the S1 contactor. The sequence is complete when the S1b1 contact energizes the M2 contactor to connect the motor in the delta configuration.

LXi-19/2900 Wye-Delta Open Transition

The Wye-Delta Open Transition starts by activating the CRS relay. The CRS contacts close to energize the M1 and S1 contactors to start the motor connected in the wye configuration at a reduced current. The Neutral contactor, S1, connects the motor windings to complete the wye connection. Contactors S1 and M2 are interlocked both mechanically and electrically. While S1 is energized, M2 is locked out by the S1b1 contact. After the start period, defined by the Start Acceleration Timer, the Controller de-activates CRS, which de-energizes the S1 and M1 contactors and the S1b2 contacts close. Motor torque is momentarily lost until the CRR relay is activated. The CRR contacts close to re-energize the M1 contactor and energize the M2 contactor. The motor then connects in the delta configuration and runs at full speed.

Startup Procedure

1. Verify that the motor nameplate horsepower and voltage match the Controller nameplate and that the Controller is correct for the type of motor, e.g. wye-delta, part winding, etc.
2. Verify that the ISOLATING SWITCH and CIRCUIT BREAKER-DISCONNECTING MEANS are open. Check with the electrician to see if the Controller is connected directly to the main transformer. If so, apply the Service Disconnect label above the ISOLATING SWITCH handle operator.
3. Check the motor nameplate for the full load amperage and set the MSTM (Micro Shunt Trip module) board to the motor full load amperage value. The MSTM board is located at the bottom of the controller stack and there are three dials to be adjusted, which are labeled "Full Load Amperage". Turn the dials, which are located on the upper left corner of the MSTM board so that the indicator on each dial points to the corresponding decimal value of the name plate current. For example, if the name plate current indicates a full load amperage of 185A, the dials should be adjusted so that the indicator on the left dial points to '1', the middle dial points to '8' and the right most dial points to '5'. Setting the dials in this fashion calibrates the breaker trip curve per NFPA 20.

The left most dial, which is labeled CT select, is set by the factory and should not require adjustment. The dial is used by the MSTM circuit to determine which current transformer the controller is equipped with. Incorrect setting of this dial will adversely affect the breaker trip curve. The appropriate setting depends on the size of breaker the controller is equipped with. Machines with 125A or 250A breakers should have this dial set to '0', machines with 400A or 600A breakers should have this dial set to '1', and machines with 800A breakers should have this dial set to '2'.

4. **Ensure that power components are secure and all power component connections (including bus bars to circuit breakers) are tight. Ensure that connections to the ISOLATING SWITCH and contactor(s) are properly tightened.**
5. **WARNING: TO PREVENT STARTING ON POWER UP, REMOVE RELAY(S) CRR AND CRS (IF SUPPLIED). RE-INSTALL AFTER SYSTEM IS ABOVE "STOP" PRESSURE SETTING ON CONTROLLER. ALTERNATIVELY, THE STANDBY MODE MAY BE USED.**
6. Close the cabinet door and close the ISOLATING SWITCH and CIRCUIT BREAKER-DISCONNECTING MEANS. After a few seconds power-up delay during which the Controller will display an initialization screen, verify that the Power Available led is on and that it is green. If equipped with a Transfer Switch, verify that the LED labeled ATS on Normal Power is green after a five-second delay.
8. With power turned on, *Bump* the motor to check for proper rotation by quickly pressing the Start and then the Stop buttons. If not correct, open the ISOLATING SWITCH and change any two leads on the load side of the M1 contactor. If the M2 contactor is supplied, change the same phase leads on the load side of M2.
9. Press the Start button. Verify that the motor starts properly and runs at full speed.

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10. Press the **Stop** button to stop the motor.
 11. Start and stop the motor with the **EMERGENCY MANUAL CONTROL** handle. Use one quick motion to the full **ON** position to start and one quick motion to the full **OFF** position to stop the motor.
 12. **If PHASE REVERSAL Fault occurs when pump rotation is correct, swap Wire Nos. 113 and 114 on the J2 plug located on the top of SPC (front) printed circuit board.**

Hubbell - Quick-Start LXi Programming Guide

Power On – The Main LCD screen displays time (military) in the upper left corner of the LCD screen. The date is not displayed, and will have to be checked and/or changed later in programming. Make a note of the system pressure shown in the upper right hand corner, it could be important later when programming start & stop pressures.

Press the DOWN scroll button - #2 - once – the Software Version screen will be displayed.

Press the DOWN scroll button a second time – the controller type/voltage, etc. will be shown.

Press the DOWN scroll button again – the start & stop pressure settings, the minimum run timing (in seconds), and the minimum run function enabled or disabled will be shown. Make a note of the settings, and then scroll back to the initial main LCD screen display. When pressing the buttons press them firmly for a second or so.

Press the ESC/DEL button and the Enter Access Code message is displayed. Enter the factory default password 1,2,3,4, hit ENTER. The password can be changed later if desired.

Using the scroll down button - select **PRESSURE SETTINGS**, hit ENTER.

Stop pressure is shown first. Hit ENTER, enter the stop pressure setting for the system, and hit ENTER again. Then scroll down and the screen will ask about the start pressure. Hit ENTER. Enter the start pressure and hit ENTER. Now hit ESC/DEL until you are back to the main LCD screen.

Using the scroll down button go the 4th LCD screen – this should display start and stop pressures entered into the memory. Scroll back to Main Screen.

Using the ESC/DEL button again, enter password. scroll to **TIMER CONFIG** menu, hit ENTER.

The minimum run time display shows, hit ENTER. Then enter in the minimum run time desired, in seconds, and hit ENTER again. Then scroll down to minimum run timer **ENABLED/DISABLED**. And Hit ENTER. Use the down scroll button (#2) to select enabled or disabled. Hit ENTER. Now the delayed start timer is displayed, hit ENTER and put in (in seconds) any delay in starting desired. Max. delay is 10 seconds. Hit

ENTER. Scroll down more and the Step Accelerating Time is shown. Hit ENTER and select seconds for accelerating, hit ENTER. Hit ESC/DEL to return to the Main Menu.

Using the ESC/DEL button again, enter password. Scroll to Time & Date Menu. Hit ENTER. At Set time hit enter again. Then put in correct time in hours, minutes, seconds (remember this is military time). Enter hours, then hit ENTER, enter minutes, then hit ENTER, then enter seconds and hit ENTER.

Then the date display comes on, put in the correct month, date, and year, using ENTER between each. Hit ENTER to return to Main LCD screen.

If the Phase Reversal LED is lit and the pump rotation is correct, swap wires 113 and 114 on the J2 plug located on the top of the front (SPC) printed circuit board.

Hyper Terminal LXi Download Instructions

**Important read complete document first before attempting a
HYPER TERMINAL DUMP**

This document is written for the first time user of Hyper Terminal and the first time user of the serial port on the Lxi control board. The instructions are based on a windows based laptop. A laptop is preferred to do the Hyper Terminal connection because of possible grounding problems when connected to an external power source.

To use Hyper Terminal you will need a RS232 cable or a serial communications cable typically a 9-pin D male to 9-pin D female. On some of the newer laptops with the XP operating systems there is no serial port. On PC's with no serial port you can use the USB ports if you have a USB to Serial adaptor, there are several on the market. The one used in the test was from Belkin part # F5U409, but Belkin no longer makes it. Keyspan makes one that looks like it and the part number is USA-19HS available from CompUSA.

The following are the steps used to setup and use Hyper Terminal with the Lxi controller.

- 1) If possible turn power off the controller before connecting the serial cable to the Lxi control boards serial port J14, this will prevent possible damage to the control board.
- 2) Observe the position of the black J2 jumper or PC shunt connection behind RL7 and RL6, this jumper selects which serial port is used, it should be selected for J14, see photo.
- 3) Turn power back on LXi control, wait for boot to finish, go into menu and set the serial port of the Lxi control board.
 - A) Press the Esc/Del key
 - B) Enter password 44057, press Enter key
 - C) Scroll to Serial Comm Cfg Menu, press Enter key
 - D) Display reads Serial Comms Enable, selection off, scroll to ON, press Enter
 - E) Scroll to Baud Rate Settings, press Enter and scroll to 38400, press Enter
 - F) Scroll to Parity, press Enter, press 0 (N=0), press Enter
 - G) Scroll to Data Bits (7 or 8), press Enter, select 8, press Enter
 - H) Scroll to Stop Bits (1 or 2), press Enter, select 1, press Enter

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- I) This finishes the controller's comm port setup, press Esc/Del, twice and you should be back at the Main Window display.
 - 4) Turn on laptop, and wait for boot to finish.
 - 5) Connect serial cable to serial port or connect serial cable to USB adaptor and connect it to USB port.
 - 6) Go to Start and click on it, Program window comes up.
 - 7) In PROGRAMS go to ACCESSORIES, click on ACCESSORIES.
 - 8) Under ACCESSORIES find
 - A) Win98 or Win95 find Hyper Terminal
 - 1) Win95 you may have to find the Hyperterm.exe file
 - B) XP go to communications, under communications find Hyper Terminal
 - 9) Click on Hyper Terminal or Hyperterm.exe for Win95.
 - 10) Two windows open, New Connection- Hyper Terminal and Connection Description
 - 11) In Connection Description name the connection, something you will associate with the Hyper link (example: LXi, HyperTerm, dump, test) connection, click OK
 - 12) A CONNECT TO window appears, ignore the area code and information referring to phones. Go to the drop down window connection and you will find different connections, you will choose the a serial port and click OK
 - A) For XP laptops with no serial port go to Start and click on, then click on control panel find Systems icon and click on it
 - B) XP will bring up System Properties click on Hardware then on Device Manager, then Ports (com & LPT) click on Ports, find the comm port for the USB adaptor, this is the one you will select in the drop down window, click OK.
 - 13) You will then get another window Comm Port Settings with drop down windows
 - A) Bits per second, Scroll to 38000, Press Enter
 - B) Data bit, Scroll to 8, Press Enter
 - C) Parity, Scroll to NONE, Press Enter
 - D) Stop bit, Scroll to 1,) Press Enter
 - E) Flow Control, Scroll to Xon/Xoff, Press Enter
 - F) Click on APPLY, then OK
 - 14) You have your Hyper Terminal window open, if everything is right, in lower left corner of the Hyper Terminal window it should say **connected**.
 - 15) At top of the windows tool bar find transfer and click on it.
 - 16) A drop down appears, find CAPTURE TEXT, click on it.
 - 17) A window to save the text file to appears, you can browse to a folder in My Documents then give the file a name, (exam: test, hyper, LXi) **remember this name**.
 - 18) Click on save, and you will return to your, Hyper Terminal Window
 - 19) **Do shift D – a capital D, this is the command for a full dump of the control boards memory.**
 - 20) If nothing happens, review communication port settings.
 - 21) If data is scrolling across the window every thing is OK, the dump may take a moment.
 - 22) The next thing is finding the data; remember the name you gave the file, go to MY Documents.
 - 23) If the file is not there go to START right click on START, a small window opens.
 - 24) Click on search, it bring up a window, enter the name of the file in the window under

(all or part of file name).

25) Under (LOOK in) scroll to local hard drive (C)

26) Click on SEARCH, you will find your file in the window to the right.

27) If everything was done and successfully, you will have created a file for the next time and will not required you to do the laptops serial port configuration.

IF YOU CAN NOT DO THE DATA DUMP

1) Check Comm Port of Serial port of laptop.

2) Close out of Hyper terminal.

3) Go back to in Win95 Hyper Terminal and Click on it, you will get a window That will have a file with the name of the connection you made in item 11.

4) Right click on it, go to properties and click on it-you will see you configuration Window

a) Confirm items 12 & 13- you may have to redo port assignments if more than one port is available.

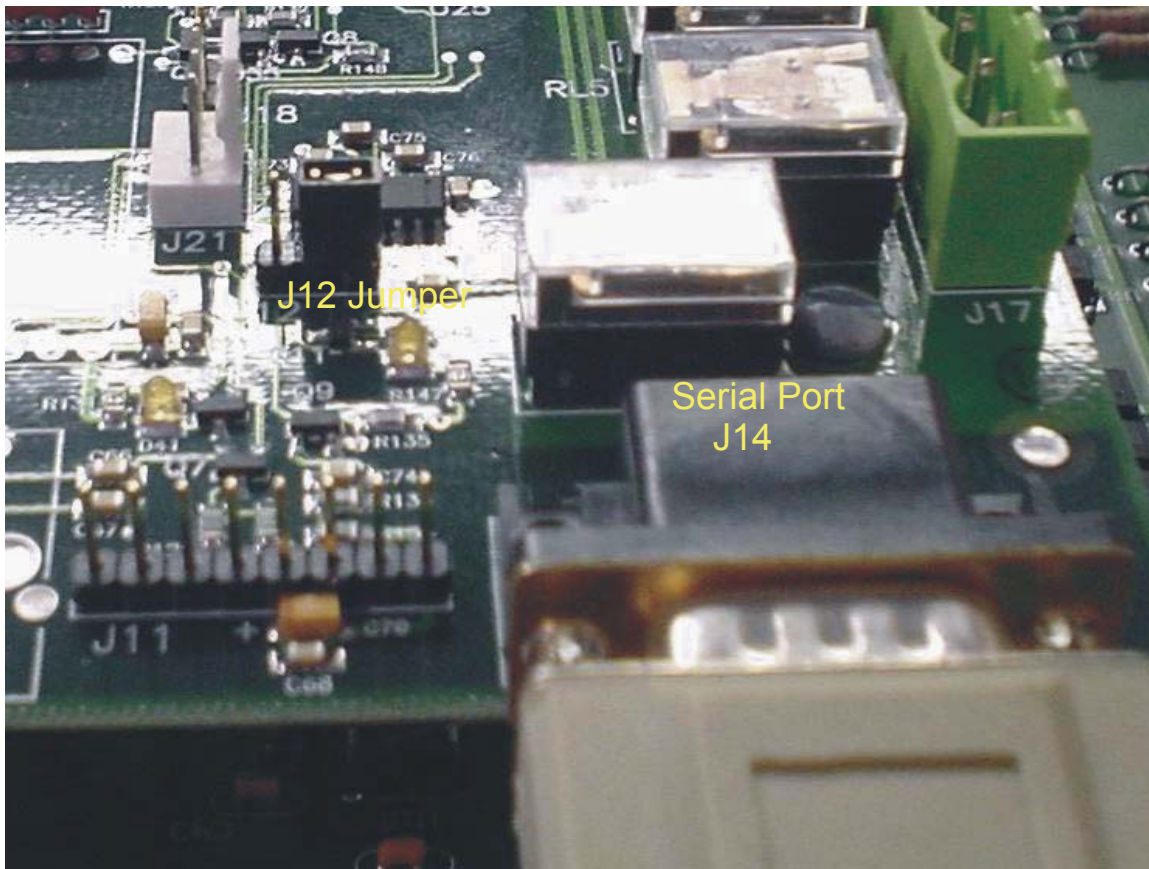


Photo shows correct relationship of J12 jumper and Serial Port J14