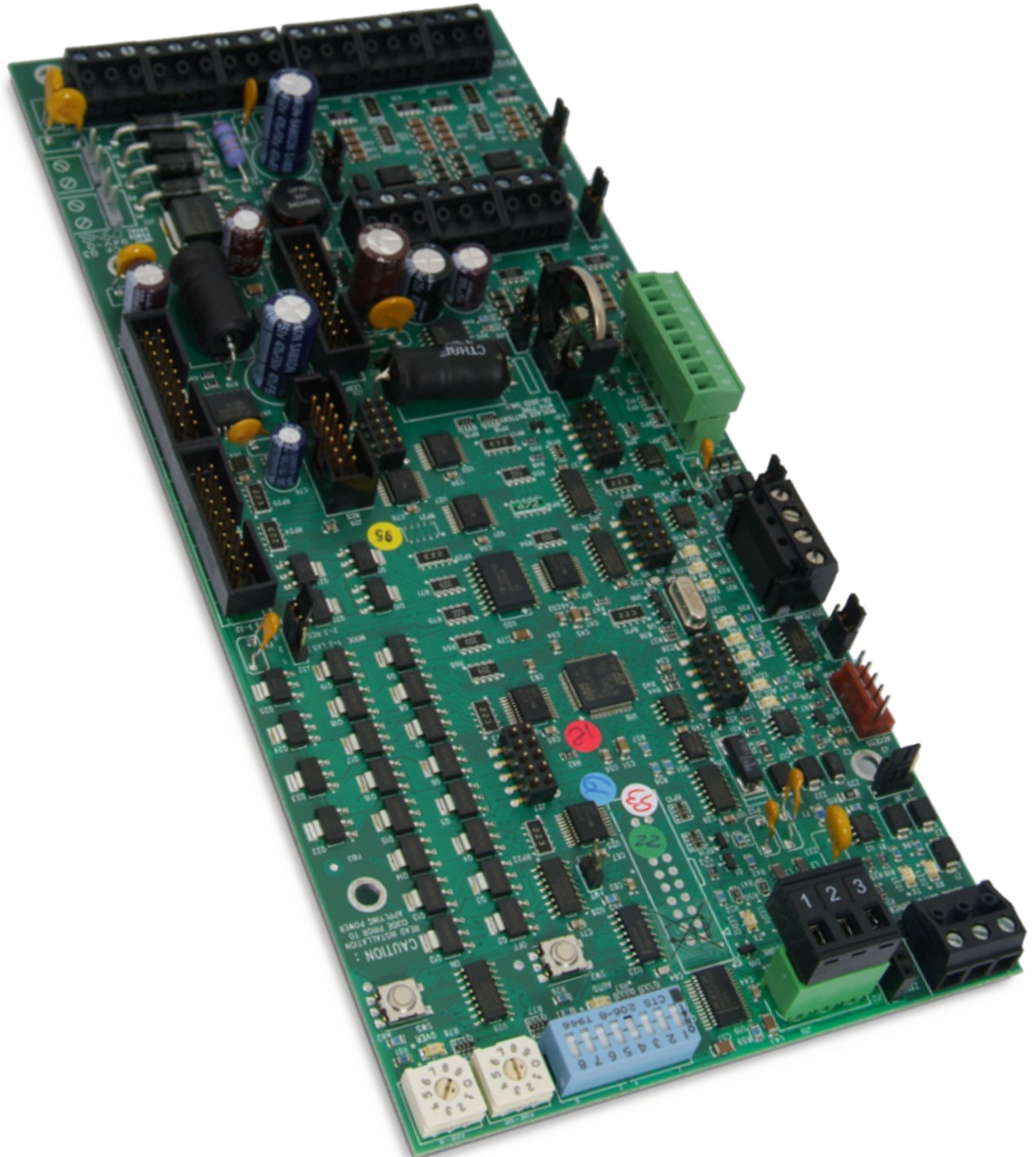


Hardware Component Locations, Configurations, and Connections



Attention

This section serves as a notice of the immediate or potential dangers involved when working with the equipment described throughout this manual. Any person involved in installation, maintenance, or service of the equipment should first carefully examine the equipment and read the instructions contained in this manual to ensure that personal and/or equipment injury is avoided.

The following safety messages appear throughout this manual to alert of immediate or potential danger to life as well as property.



Note : Indicates an important note.



Tip : Indicates a helpful tip or trick.



Safety Reminder : Applicable safety instructions will be included with this symbol.



DANGER : Indicates an immediately hazardous situation which ,if not avoided, will result in serious injury or death.



WARNING : Indicates a potentially hazardous situation which ,if not avoided, may result in serious injury or death.



CAUTION : Indicates a potentially hazardous situation which ,if not avoided, may result in minor or moderate injury.

Disclaimer

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designated to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Instructions contained in this user's guide should be performed only by qualified persons in accordance with local and national codes. Blue Ridge Technologies International, LLC and its affiliates assume no responsibility for any consequences related to the improper use of this manual.



Table of Contents

Document Overview	4
Hardware	
Component Location	5
Component Description	6
Network	
Connections	9
Dip and Rotary Switch Arrangement	11
Addressing	11
Protocols	12
Inputs	
Switches and Polarity	13
Analog	15
Digi-Touch	16
Troubleshooting the Lx5 Controller	17
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Document Overview

This document provides instructions for configuration of the following Blue Ridge Technologies Lx5 Controller products :

Aperio Relay Panel
Aperio Retrofit-Kit

Also applies to legacy products :

MAXIOM
Mezon
L2500, L2600, and L3500
LP3500
Qwik-Kit Pro

The LX5 controller has many features encompassed by hardware and software elements.

This LX5 Hardware User Guide focuses on the hardware features of the controller. In the guide components and related explanations are arranged according to function. The configuration of related elements is also discussed.

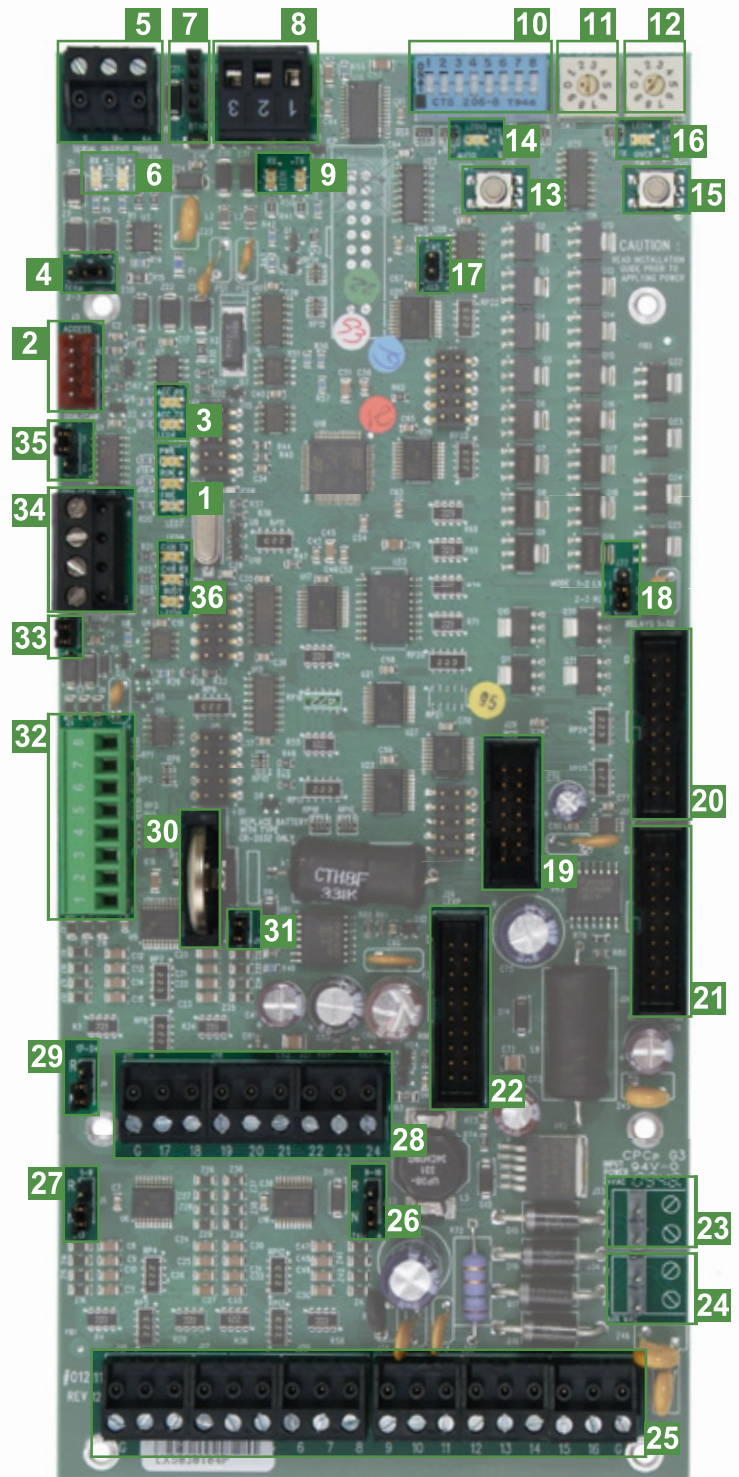
Refer to the USB Tech Kit User Guide for detailed LPPK software instructions including thorough explanations of the relationship of inputs and outputs through Groups.

For physical installation of Panels or Retrofit Kits, refer to the appropriate Mounting Instructions.

For network point descriptions and integration to a Building Automation System (BAS), refer to the Lx5 BACnet Integration Guide.

Hardware : Component Location

1. Lx5 Power LED, Run LED, and Error LED
2. Access port
3. Access Rx and Tx LEDs
4. Terminating jumper for serial output driver
5. Serial output driver port
6. Serial output driver Rx and Tx LEDs
7. Terminating resistor socket for BT485 terminating resistor
8. EIA-485 port
9. Network Rx and Tx LEDs
10. Dip switches (SW1)
11. Rotary switch (SW3)
12. Rotary switch (SW4)
13. Auto button (SW2)
14. Auto button LED
15. Override(Over) button (SW5)
16. Override(Over) button LED
17. Format (FMT) pins
18. Lx5/RCS jumper
19. RCS 14 pin port
20. 20 pin socket for outputs 1-32
21. 20 pin socket for outputs 33-60
22. LEXP socket
23. Input power 24VAC (terminal block included)
24. Aux power tap 24VAC (terminal block included)
25. Switch inputs 1-16
26. Jumper for switch inputs 9-16
27. Jumper for switch inputs 1-8
28. Switch inputs 17-24
29. Jumper for switch inputs 17-24
30. Battery holder
31. Battery jumper
32. Analog inputs 1-6
33. Jumper for terminating resistor for DigiTouch network
34. DigiTouch terminal block
35. Jumper for DDN/CAN network
36. DDN/CAN (DigiTouch) Rx, Tx and Busy LEDs



Hardware : Component Description

1 Power LED, Run LED, Error LED

Power LED should be on solid as long as Lx5 is connected to 24VAC. Run LED should always be blinking for normal processor activity. The Error LED will remain off except during power up and memory upload when blinking will occur.

2 Access Port is used for firmware flash upgrades in the field.

3 Access Rx and Tx LEDs show, receive and transmit activity on the 5-pin Access port.

4 Jumper for Terminating Serial Output Driver enable/disables terminating resistor on network powered by the serial output driver. Enable with pin 2 and 3.

5 Serial Output Driver Port for future external devices.

6 Serial Output Driver Rx and Tx LEDs show, receive and transmit activity on the serial output driver port.

7 Terminating Resistor Socket for BT485 terminating resistor when needed on the EIA-485 network.

8 EIA-485 Network Port is the main port used for RS485 communications with the building automation system. On board isolation circuitry provides 500-volt isolation for the RS485 communication network. The terminal blocks can be removed from the Lx5 controller for easy installation or for quick replacement of an Lx5 controller.

9 EIA-485 Network Port Rx and Tx LEDs show, receive, and transmit activity on the 485 network.

10 Dip Switch (Hundreds, SW1) is used to set address and baud rate for Lx5 on the RS485 network. #1-6 are for baud rate settings. For address >99, #7 Up = 100, #8 Up= 200. (#7 ignored when #8 is up, maximum address is 255) See sections on addressing and baud rates for details.

11 Rotary Switch (Tens, SW3) is used to set address 1-99 for Lx5 on RS485 network.

12 Rotary switch (Units, SW4) is used to set address 1-99 for Lx5 on RS485 network.

13 Auto Button (SW2) is used to return Lx5 outputs to pre-override state (Auto Mode) after Over Button is used. Pressing Auto will return Lx5 to pre-override state and will allow execution of serial commands that were stored during override mode.

14 Auto Button LED shows solid On when Lx5 is not in override state or override-expired state. LED blinking warns that there is no .lpx file loaded into firmware.

15 Override(Over) Button (SW5) is manual override of Lx5 outputs. Press to override all outputs On and press again to override all outputs Off. Lx5 will not execute serial commands while in override mode. Serial commands received during override mode are stored until Lx5 is returned to Auto mode by pressing Auto button. With no button activity, Lx5 will go to "override-expired" state after approximately 15 minutes and be able to execute subsequent incoming serial commands. To return Lx5 outputs to full Auto mode, press Auto button at any time.

16 Override(Over) Button LED shows solid when all outputs are in manual override ON, Blinking when all outputs are in manual override OFF. LED is off when Lx5 is in Auto mode.

Hardware : Component Description

- 17 Format Pins can be shorted together to erase memory only if address set to zero. DO NOT use unless instructed to do so by technical support. Lost items will be BACnet control programs and .lpx files. These must be restored through use of LPPK and AppLoader programming tools.
- 18 Lx5/RCS Jumper is used to enable Lx5 control RK-4, SNRK-4, legacy RCS controllers and legacy L2900 series retrofit kits. Jump pins 2 and 3 for RCS mode.
- 19 RCS 14 Pin Port receives a 14-pin ribbon cable to control legacy RCS controllers and L2900 series retrofit kits. DO NOT “hot swap” this cable.
- 20 20 Pin Socket for Outputs 1-32 receives single ribbon cable including both relay 1-16 and relay 17-32 output cards. 20-pin cable may have 16-pin connector on other end depending on type of relay interface card. DO NOT hot swap. Ribbon cable may be disconnected to “disable” outputs while programming or testing Lx5 processor.
- 21 20 Pin Socket for Outputs 33-60 receives single ribbon cable including both relay 33-48 and relay 49-60 output cards. 20-pin cable may have 16-pin connector on other end depending on type of relay interface card. (These 3rd and 4th RIB cards are identical to 1st and 2nd RIB cards) DO NOT hot swap. Ribbon cable may be disconnected “disable” outputs while programming or testing Lx5 processor.
- 22 LEXP Socket provides connection of up to three optional input expansion modules using 20-pin ribbon cable. DO NOT hot swap this cable. See Switch input section below for details.
- 23 Input Power 24VAC transient protected, surge suppression to 1.8 joules. The terminal block can be removed from the Lx5 controller for easy installation or for quick replacement of an Lx5 controller.
- 24 Aux Power Tap for 24VAC accessories, runs off of input power, is interchangeable with input power pins.
- 25 Switch Inputs 1-16 for hard wire “home run” style override switches and occupancy sensors. The terminal blocks can be removed from the Lx5 for easy installation or quick replacement of the entire controller. Lx5 has 24 onboard input connections. Number of inputs is expandable to 120 via LEXP cards.
- 26 Jumper for Switch Inputs 9-16 for provides capability to select the Lx5 Controller to power its inputs or allow an external power source to power its inputs. Occupancy sensors that use 24VDC to power the sensor are typical applications that are externally powering an input. Jumper in the “N” position configures the inputs to be dry contact and powered by the Lx5 Controller. Jumper in the opposite position configures the inputs to be externally powered by up to 24VDC. Each jumper affects only its respective eight inputs only. There is one jumper for each of the Lx5 Controller’s eight inputs.
- 27 Jumper for Switch Inputs 1-8 (See above)
- 28 Switch Inputs 17-24 (See above)
- 29 Jumper for Switch Inputs 17-24 (see above)
- 30 Battery Holder for battery replacement type CR-2032, 3 volt. Battery does not function as long as Lx5 is powered. Battery is for backup of the real time clock and BACnet control programs during a power outage. All other programming is held in non-volatile memory.
- 31 Battery Jumper disengages battery same as if removing the battery. See previous entry.

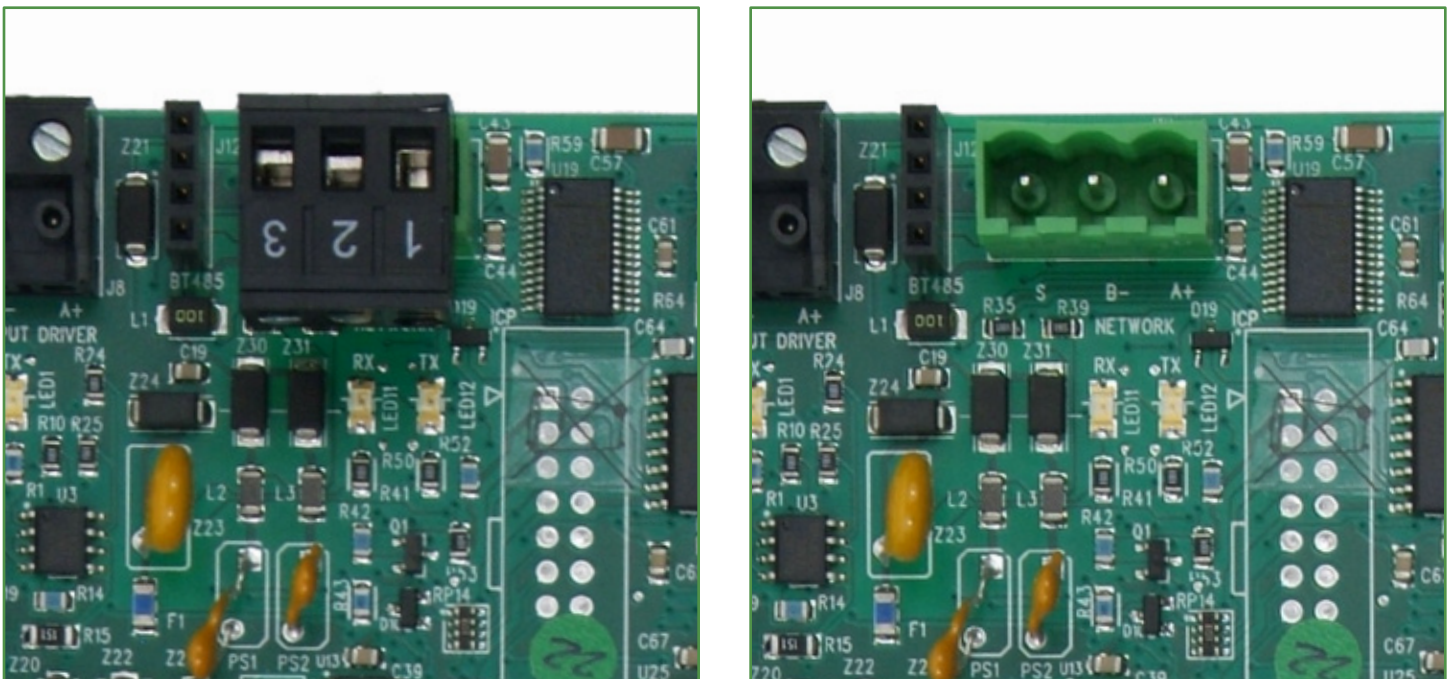
Hardware : Component Description

- 32 Analog Inputs 1-6 provides 6 inputs for accepting 0-5 VDC signals from photo sensors such as Blue Ridge LS5 series. Power (5V) and return (G) are also provided to power the sensors from the Lx5.
- 33 Jumper for Terminating Resistor for DigiTouch network when Lx5 is end-of-line device on the DDN (DigiTouch) network. Remove if Lx5 is not the EOL device on DDN network.
- 34 DigiTouch Network Port receives the 4-wire (DDN) network for DigiTouch addressable override switches and addressable sensor input modules. The terminal blocks can be removed from the Lx5 controller for easy installation or for quick replacement of an Lx5 controller.
- 35 Jumper for DDN/CAN Network switches the port from DDN mode to CAN mode.
- 36 DDN/CAN (DigiTouch) Rx,Tx and Busy LEDs show the DDN network outbound/inbound communication and processor activity.

Network : Connections

The Lx5 is capable of being networked to a Building Automation System over a two or three wire EIA-485 communication network. A terminal block is provided to connect the one shield and two communication wires. Employ a twisted pair of 18 AWG stranded 600V insulated wire with a shield (Belden 8760 or equivalent) when constructing EIA-485 network. (EIA-485 wires are not provided by Blue Ridge)

1. Disconnect power to the Lx5
2. For ease of wiring remove the EIA-485 Terminal Block to reveal terminal labels. (Figure 1)
3. Terminal blocks are screw type. Land wires by unscrewing, inserting the stripped wire, and tightening the screw. Connect incoming and outgoing communication wires (-) to (-) and (+) to (+) on the EIA-485 connector.
4. When a shield wire is used, either splice incoming and outgoing shield wires together or connect to shield (S) terminal on the EIA-485 connector.
5. Reinstall the EIA-485 Terminal Block.
6. Reconnect power to the Lx5.



(Figure 1)

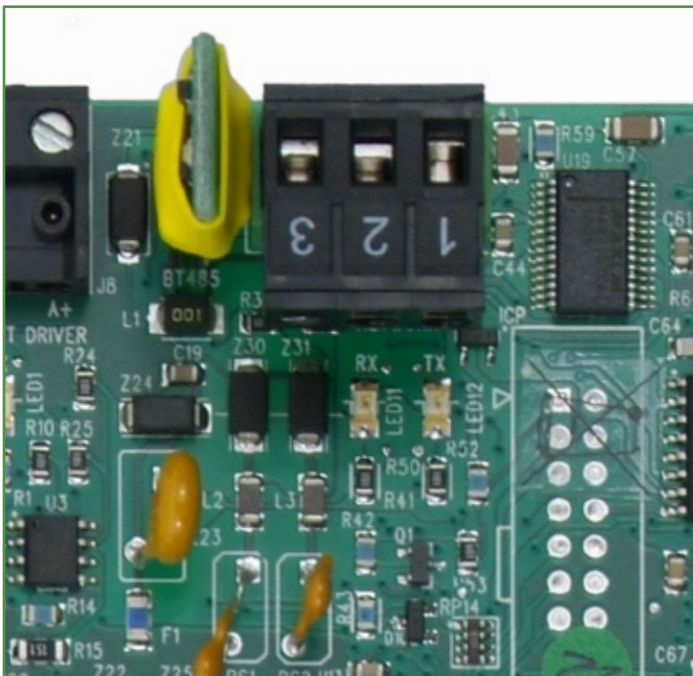


Before handling any components on the circuit board, the technician should be grounded to prevent damaging the board.

Network : Connections

If an Lx5 is operated as an End-of-line device (first or last controller on a network) provided part BT485 may be necessary. Consult Blue Ridge Technical Support prior to ordering and installation. (Figure 2)

1. Install BT485 in plug labeled BT485 adjacent to the EIA-485 terminal.



(Figure 2)



Before handling any components on the circuit board, the technician should be grounded to prevent damaging the board.



NOTE
Older Tech Kits (with serial cable) will not communicate while BT485 is fitted.

Network : Dip and Rotary Switch Arrangement

These switches configure addressing and BACnet Integration protocols. (Figure 3)

Network : Addressing

Rotary Switches : addresses 1-99

Rotary Switch SW4 sets single digits (1's place)

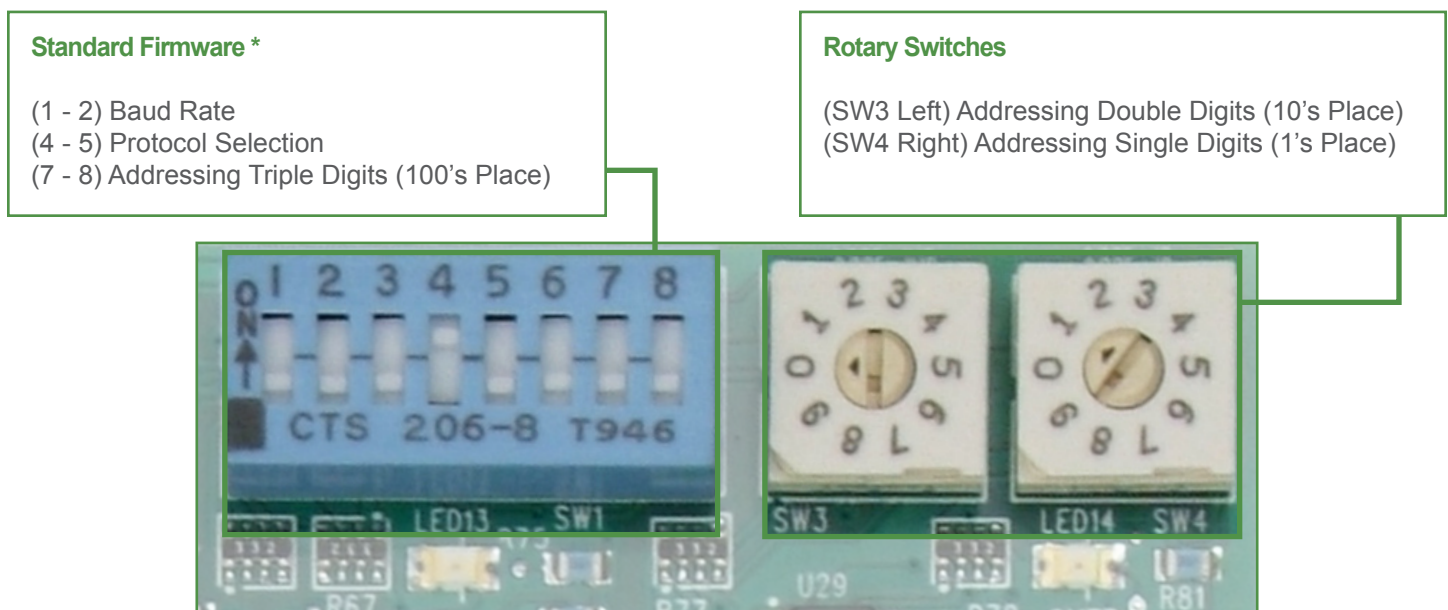
Rotary Switch SW3 sets double digits (10's place)

Dip Switches 7 and 8 : addresses 100-255

Dip Switch 7 in ON position adds 100 to the Rotary Switches' address. (Dip Switch 8 must be off)

Dip Switch 8 in ON position adds 200 to the Rotary Switches' address. (Dip Switch 7 must be off)

1. Set desired address
2. Power cycle the controller



(Figure 3)

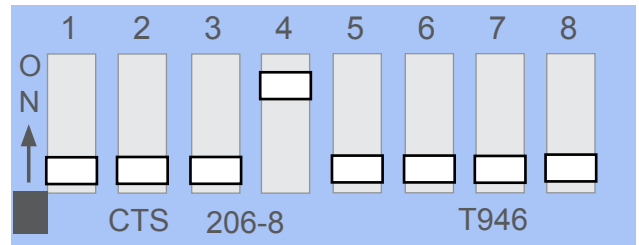
* Firmware must be specified when ordering

Network : Protocols

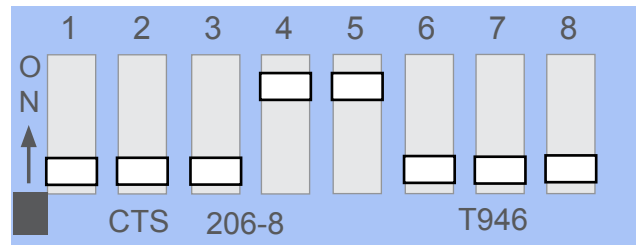
These Protocols are standard with Aperio firmware specification.

LPPK Programming Protocol

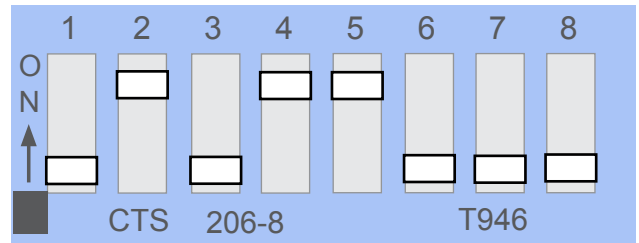
Except for 7 or 8 (used for addressing) only dip switch 4 will be ON for programming.



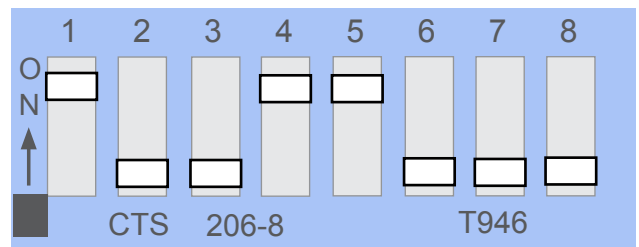
BACnet MSTP Protocol : 9600



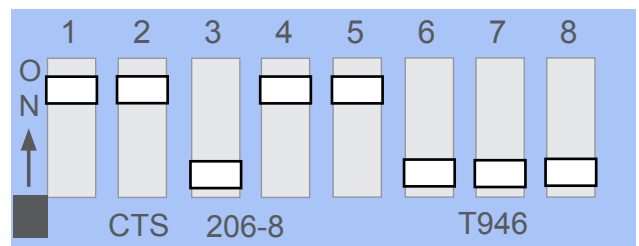
BACnet MSTP Protocol : 19200



BACnet MSTP Protocol : 38400



BACnet MSTP Protocol : 76800

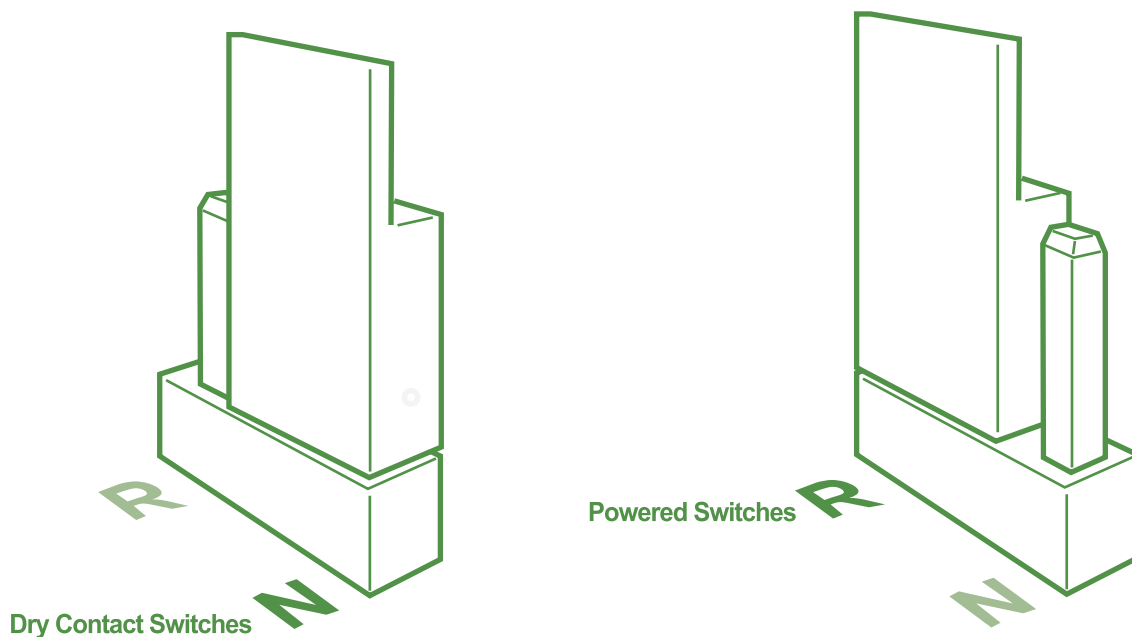


Inputs : Switches and Polarity

Switch input connections are made on the controller. The Lx5 is equipped with 24 programmable inputs. Input expansion cards (LEXP) increase input capacity in increments of 32 inputs. LEXP cards are jumper addressed A, B, C, and D at the factory. Always power down the Lx5 before connecting or removing card.

The inputs can be set in LPPK software as Momentary on, Momentary off, Momentary on/off, Maintained, Linked, or State change. Each eight input section has an accompanying jumper that sets polarity (5 to 24 VDC or dry 0 VDC). Each jumper set has 3 pins allowing two positions. One position is labeled (N) normal polarity for dry contact switches (0 VDC). The second position entitled (R) reverse polarity for powered switches (5 to 24 VDC). The jumper must be set before wiring. (Figure 4) (See page 16 for Jumper location)

1. Remove power to the controller.
2. Set jumpers to desired position.
3. Connect the switches to the controller. Connect one lead from the switch to ground terminal (G) and the other to the appropriate input terminal. Momentary switches which have both an ON and OFF contact requiring two input terminals on the controller.
4. Reconnect power to the controller.



(Figure 4)



Before handling any components on the circuit board, the technician should be grounded to prevent damaging the board.

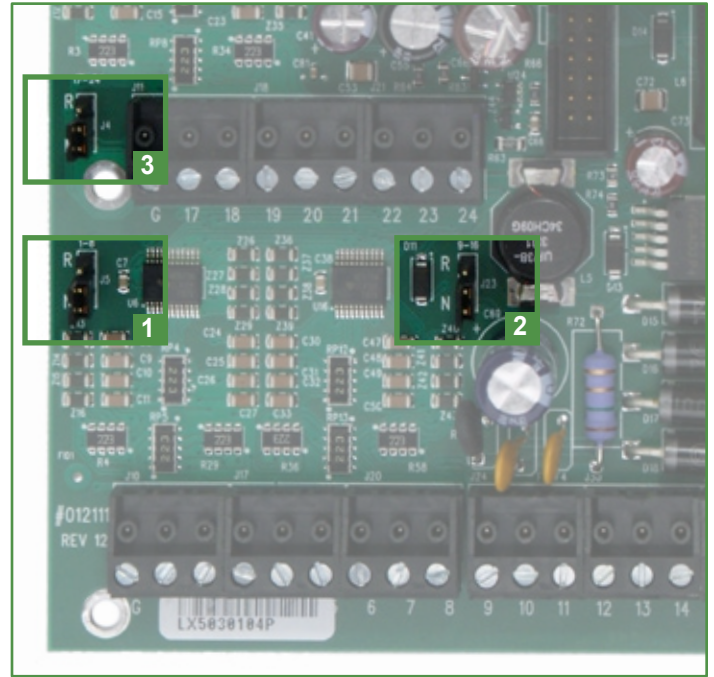


If one switch input is dry (0 VDC) the entire section of eight switch inputs must also be dry contacts and the associated jumper must be in the (N) position. If one switch input is powered (5 to 24 VDC) the entire section of eight switch inputs must also be powered and the associated jumper must be in the (R) position.

Inputs : Switches and Polarity

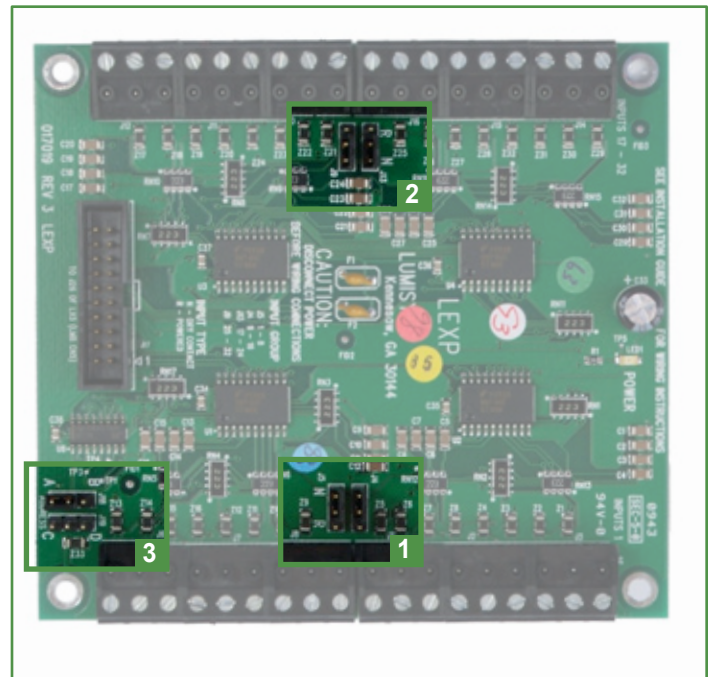
Lx5

- 1 Switch Input Jumpers : J5 (1-8)
- 2 Switch Input Jumpers : J23 (9-16)
- 3 Switch Input Jumpers : J4 (17-24)



LEXP

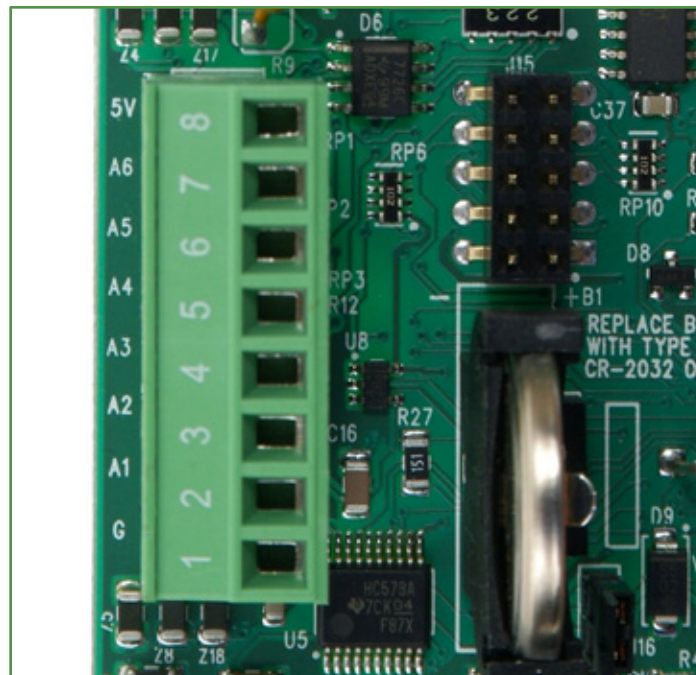
- 1 Switch Input Jumpers : J4 (1-8), J5 (9-16)
- 2 Switch Input Jumpers : J13 (17-24), J9 (25-32)
- 3 Identification Jumpers : J18 (A-B), J19 (C-D)



Inputs : Analog

The Lx5 Controller comes with six analog inputs for the LS5 Series Photocells. Each LS5 photocell ships with one 3 wire pigtail wiring harness. The photocell is powered by 5V from the Lx5 Controller. The power circuit includes the Red (5V hot) and the Black (ground) wires. The yellow wire carries the 0-5V input signal from the photocell which is then scaled to a value used by the LPPK Software.* All analog inputs are connected to the Analog Input Socket. (Figure 5)

1. Remove power from Lx5.
2. Join red wires from all LS5 sensors into pigtails and connect terminal 8 (marked 5V) on the Analog Input Socket.
3. Connect each yellow signal wire from each LS5 sensor into individually marked A1-A6 on the Analog Input Socket.
4. Join black wires from all LS5 sensors into pigtails and connect terminal 1 (marked G) on the Analog Input Socket.
5. Reconnect power to the Lx5.



(Figure 5)

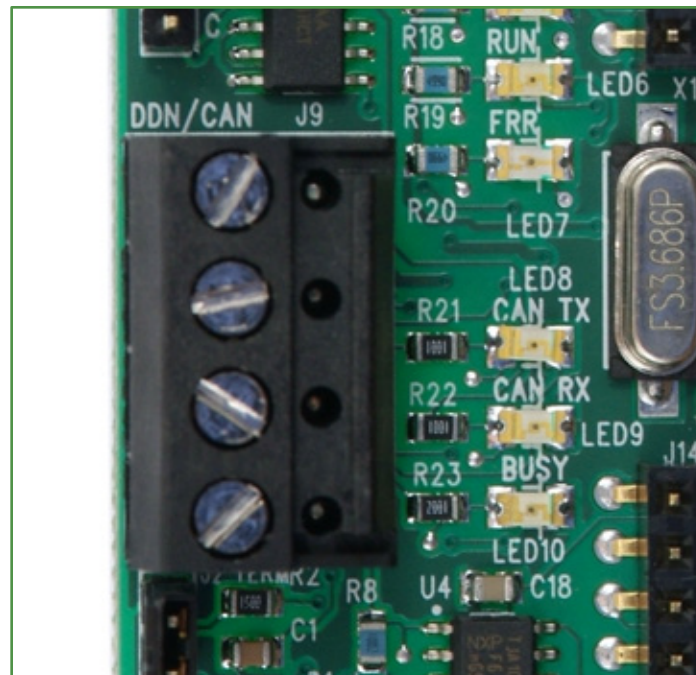
* Refer to LS5 Installation Guide for detailed wiring instructions.

Inputs : Digi-Touch

The Lx5 can be used to loop power up to 10 Digi-Touch switches. Higher quantities of switches may be incorporated with a 24VDC auxiliary power supply (Contact Blue Ridge for details). *

Connect the network of switches to the Lx5 Digi-Touch Terminal Block (marked DDN/CAN) and set the jumper to DDN (D position). Both Digi-Touch switches and Lx5 terminals are marked (24, L, H, and G) Correct orientation must be maintained when making connections. (Figure 6)

1. Remove power from Lx5.
2. For ease of wiring remove the Digi-Touch Terminal Block to reveal terminal labels.
3. Connect the power wire to the terminal marked 24.
4. Connect the Low Side signal wire to the terminal marked L.
5. Connect the High Side signal wire to the terminal marked H.
6. Connect the ground wire to the terminal marked G.
7. Reinstall the Digi-Touch Terminal Block.
8. Reconnect power to the Lx5.



(Figure 6)

* Refer to Digi-Touch Installation Guide for detailed instructions.

Troubleshooting the Lx5 Controller

Be sure to check the Blue Ridge website <www.BRTint.com> for latest troubleshooting support.

Outputs Will Not Turn On

Verify power is connected to the Lx5 Controller. There should be LEDs illuminated.

Verify there is at least 24 VAC present to the secondary of the transformer supplying power to the Lx5 Controller. Use a voltmeter to check the power.

Check to see if Maintained Input Priority for the group to that is not responding to control commands is not set to Maintained Off Priority or Maintained On/Off Priority.

Verify that the output ribbon cable connector is properly seated.

Press the OVER push button to see if all the relays will turn on. If so, then the output portion of the Lx5 Controller is operating properly.

Verify that the connector to output (relay or Circuit breaker) is properly seated.

Use LPPK to verify that the Lx5 Controller sees the input change state. Use an alligator clip or shorting wire to test the input terminal by shorting the input to ground. An X should appear on the LPPK View Input State screen.

Verify the input jumpers are in the correct location.

Verify the input device is operating properly.

Controller not communicating or Communication LED TX / RX Not Blinking

Verify the LPPK cable or network cable is connected correctly.

If you are using LPPK verify that the correct communication port is selected.

Verify the controller is addressed properly.

Confirm dip switches are properly set.