

# Intelligent Controller LNL-X4420 with Two Reader Interfaces Quick Reference

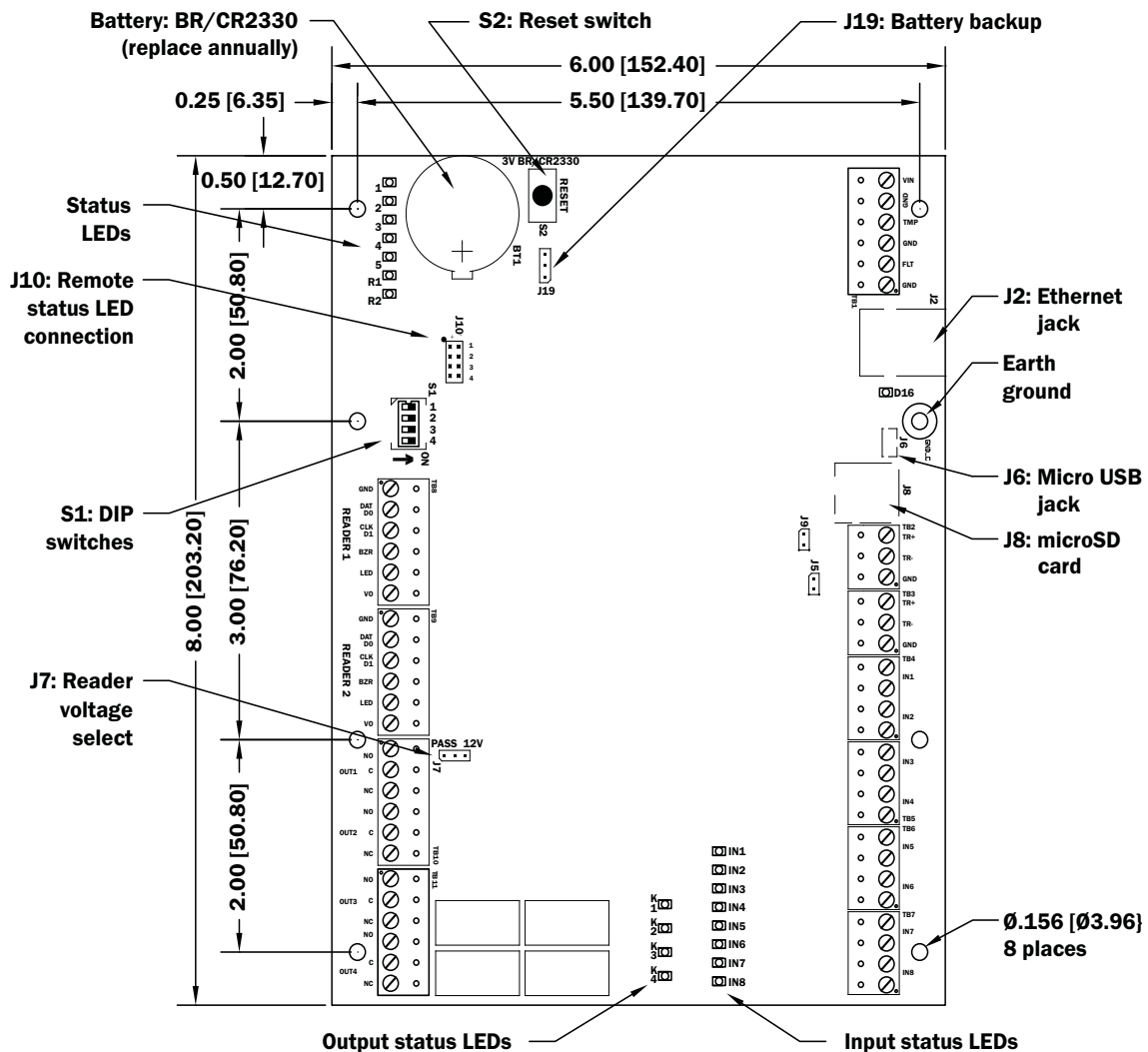
## General

The LNL-X4420 intelligent controller provides decision making, event reporting, and database storage for the LenelS2 hardware platform. Two reader interfaces provide control for two doors.

The LNL-X4420 communicates with the host via on-board 10Base T/100Base-TX Ethernet port or the Micro USB port (2.0) with an optional Micro USB to Ethernet adapter.

Two physical barriers can be controlled with the LNL-X4420. Each reader port can accommodate a read-head that utilizes TTL (D1/D0, Clock/Data), F/2F or 2-wire RS-485 electrical signaling (OSDP reader for example) and also provides tri-state LED control and buzzer control (one wire LED mode only). Four Form-C relay outputs may be used for door strike control or alarm signaling. Eight inputs are provided for monitoring the door contacts, exit push buttons, and alarm contacts. Input circuits can be configured as unsupervised or supervised. The LNL-X4420 requires 12 to 24 VDC for power.

## LNL-X4420 Hardware



## LNL-X4420 Wiring

Terminal Blocks 1-7 Connections		
TB1-1	Power Fault Input	GND
TB1-2		FLT
TB1-3	Cabinet Tamper Input	GND
TB1-4		TMP
TB1-5	Power Input	GND
TB1-6		VIN: 12 to 24 VDC
TB2-1	SIO Port 1 (2-wire RS-485)	GND
TB2-2		TR- (A) *
TB2-3		TR+ (B) *
TB3-1	SIO Port 2 (2-wire RS-485)	GND
TB3-2		TR- (A) *
TB3-3		TR+ (B) *
TB4-1	Input 2	IN2
TB4-2		IN2
TB4-3	Input 1	IN1
TB4-4		IN1
TB5-1	Input 4	IN4
TB5-2		IN4
TB5-3	Input 3	IN3
TB5-4		IN3
TB6-1	Input 6	IN6
TB6-2		IN6
TB6-3	Input 5	IN5
TB6-4		IN5
TB7-1	Input 8	IN8
TB7-2		IN8
TB7-3	Input 7	IN7
TB7-4		IN7

Terminal Blocks 8-11 Connections		
TB8-1	Reader 1	GND: Ground
TB8-2		DAT/D0: Data/Data 0/ TR- (A) *
TB8-3		CLK/D1: Clock/Data 1/ TR+ (B) *
TB8-4		BZR: Reader Buzzer
TB8-5		LED: Reader LED
TB8-6		VO: Reader Power
TB9-1	Reader 2	GND: Ground
TB9-2		DAT/D0: Data/Data 0/ TR- (A) *
TB9-3		CLK/D1: Clock/Data 1/ TR+ (B) *
TB9-4		BZR: Reader Buzzer
TB9-5		LED: Reader LED
TB9-6		VO: Reader Power
TB10-1	Out 1	NO: Normally Open Contact
TB10-2		C: Common
TB10-3		NC: Normally Closed Contact
TB10-4	Out 2	NO: Normally Open Contact
TB10-5		C: Common
TB10-6		NC: Normally Closed Contact
TB11-1	Out 3	NO: Normally Open Contact
TB11-2		C: Common
TB11-3		NC: Normally Closed Contact
TB11-4	Out 4	NO: Normally Open Contact
TB11-5		C: Common
TB11-6		NC: Normally Closed Contact

\* Terms A & B are from the RS-485 standard.

## Jumpers and Jacks

The LNL-X4420 processor hardware interface is configured using jumpers to setup the reader port power and end of line termination.

Jumpers	Set at	Description
J2	N/A	10-Base-T/100Base-Tx Ethernet Connection (Port 0)
J5	OFF	Port 2 RS-485 EOL Terminator is Off
	ON	Port 2 RS-485 EOL Terminator is On
J6	N/A	Micro USB Port (2.0)
J7		Reader Power Select *
	12V	12 VDC at Reader Ports
	PASS	VIN "Pass Through" to Reader Ports
J8	N/A	microSD Card
J9	OFF	Port 1 RS-485 EOL Terminator is Off
	ON	Port 1 RS-485 EOL Terminator is On
J10-1	N/A	Remote Status LED #1 **
J10-2	N/A	Remote Status LED #2 **
J10-3	N/A	Remote Status LED #3 **
J10-4	N/A	Remote Status LED #4 **
J19	OFF	Backup battery is OFF
	ON	Backup battery is ON. Refer to <a href="#">Memory and Real Time Clock Backup Battery</a> on page 7.

\* Install jumper J7 in the 12V position ONLY if the input voltage (VIN) is greater than 20 VDC. Failure to do so may damage the reader or LNL-X4420.

\*\*Observe polarity connection to LED. External current limiting is not required.

## DIP Switches

The four switches on S1 DIP switch configure the operating mode of the LNL-X4420 processor. DIP switches are read on power-up except where noted.

Pressing reset switch S2 causes the LNL-X4420 to reboot.

1	2	3	4	Definition
OFF	OFF	OFF	OFF	Normal operating mode.
ON	X	OFF	OFF	After initialization, enable default User Name (admin) and Password (password). The switch is read on the fly, no need to re-boot. For more information refer to <a href="#">IT Security</a> on page 8.
OFF	ON	OFF	OFF	Use factory default communication parameters. *
ON	ON	OFF	OFF	Use LenelS2 default communication parameters. * Contact system manufacturer for details. See <a href="#">Bulk Erase Configuration Memory</a> on page 4.
ON	ON	OFF	OFF	Bulk Erase prompt mode at power up. See <a href="#">Bulk Erase Configuration Memory</a> on page 4.
X	X	X	ON	Makes the LNL-X4420 report and function like an LNL-4420. To be used in situations where the host software has not been updated to support the LNL-X series product line.

X = ON or OFF. All other switch settings are unassigned and reserved for future use.

\* In the factory or LenelS2 default modes, downloaded configuration/database is not saved to flash memory.

### ***Factory Default Communication Parameters***

Interface 1 (NIC1)

- Network: static IP address: 192.168.0.251
- Subnet Mask: 255.255.0.0
- Default Gateway: 192.168.0.1
- DNS Server: 192.168.0.1
- Primary Host port: IP server, Data Security: TLS if Available, port 3001, communication address: 0
- Alternate Host Port: Disabled

## **Bulk Erase Configuration Memory**

The bulk erase function can be used for the following purposes:

- Erase all configuration and cardholder database (sanitize board, less third party applications)
- Update OEM default parameters after OEM code has been changed
- Recover from database corruption causing LNL-X4420 board to continuously reboot

If clearing the memory does not correct the initialization problem, contact LenelS2 OnGuard Technical Support.

### **Bulk Erase Steps**

***Important:*** Do not remove power during steps 1-6.

1. Set S1 DIP switches: 1 & 2 "ON" and 3 & 4 "OFF."
2. Apply power to the LNL-X4420 board. LED 1 on for about 15 seconds while LNL-X4420 boots up.
3. After the LNL-X4420 boots up, watch for LEDs 1 & 2 and 3 & 4 to alternately flash at a 0.5 second rate.
4. Within 10 seconds after the above pattern starts, change switches 1 or 2 to "OFF." If these switches are not changed, the LNL-X4420 board will power up using the OEM default communication parameters.
5. LED 2 will flash indicating that the configuration memory is being erased. Full memory erase takes up to 60 seconds, usually a lot less.  
When complete, only LEDs 1 & 4 will flash for about 3 seconds.
6. The LNL-X4420 board will complete its initialization in 2 seconds after LEDs 1 & 4 stop flashing.

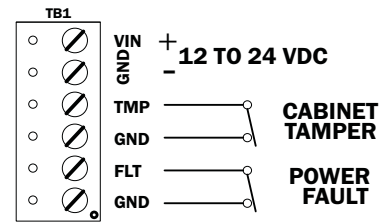
## Input Power, Cabinet Tamper, and UPS Fault Input Wiring

The LNL-X4420 requires 12 to 24 VDC power. Locate power source as close to the unit as possible. Connect power with minimum of 18 AWG wire.

**Connect the GND signal to earth ground in ONE LOCATION within the system. Multiple earth ground connections may cause ground loop problems and is not advised.**

**Observe POLARITY on 12 to 24 VDC input.**

There are two dedicated inputs for cabinet tamper and UPS fault monitoring. Normal (safe) condition is a closed contact. If these inputs are not used, install a jumper wire.

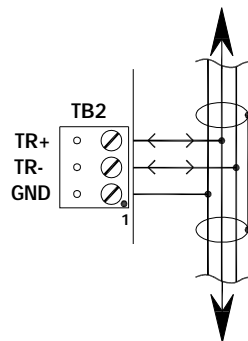


## Communication Wiring

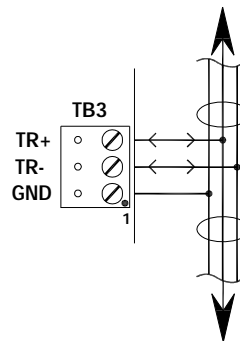
The LNL-X4420 controller communicates to the host via the on-board Ethernet 10-BaseT/100Base-TX port and/or the Micro USB port (2.0) with an optional Micro USB to Ethernet adapter.

The serial I/O device communication ports, TB2 for port 1 and TB3 for port 2, are 2-wire RS-485 interface which can be used to connect additional I/O panels. The interface allows multi-drop communication on a single bus of up to 4,000 feet (1,219 m). Use 1-twisted pair, shielded cable, 120 ohm impedance, 24 AWG, 4,000 ft. (1,219 m) maximum for communication.

Port 1: To Serial I/O Devices



Port 2: To Serial I/O Devices



**Important:** Install the termination jumper ONLY on the panel at each end of the RS-485 bus. Failure to do so will compromise the proper operation of the communication channel.

## Reader Wiring



Each reader port supports a reader with TTL (D1/D0, Clock/Data), F/2F (standard or supervised) or 2-wire RS-485 signaling (OSDP reader for example). Power to the readers is selectable: 12 VDC (VIN must be greater than 20 VDC), or power is passed-through (PASS) from the input voltage of the LNL-X4420 (TB1-VIN), 300 mA maximum per reader port. Readers that require different voltage or have high current requirements must be powered separately. Refer to the reader manufacturer's specifications for cabling requirements. In the 2-wire LED mode, the buzzer output is used to drive the second LED. Reader port configuration is set via the host software. Do not terminate any RS-485 devices connected to a reader port.

To fully utilize each reader port:

- TTL signaling requires a 6-conductor cable (18 AWG)
- F/2F signaling requires a 4-conductor cable
- RS-485 signaling requires two 2-conductor cables. Use one cable for power (18 AWG, 1-pair) and one cable for communication (24 AWG, 1-pair, shielded)

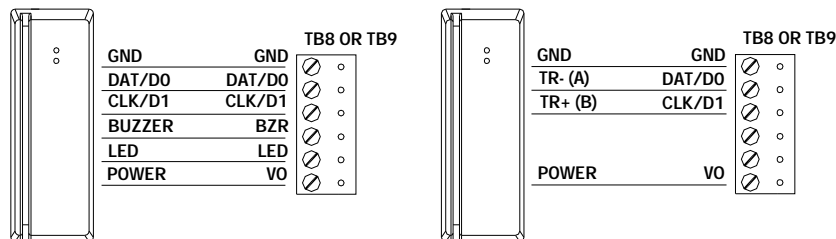
**Notes:** For OSDP cable lengths greater than 200 ft (61 m) or EMF interference, install 120Ω +/- 2Ω resistor across RS-485 termination ends.

Data 0 and Data 1 wires for Wiegand may be reused for OSDP. However, standard Wiegand cable may not meet RS-485 twisted pair recommendations. The reuse of cable works best on shorter cable lengths at lower data rates.

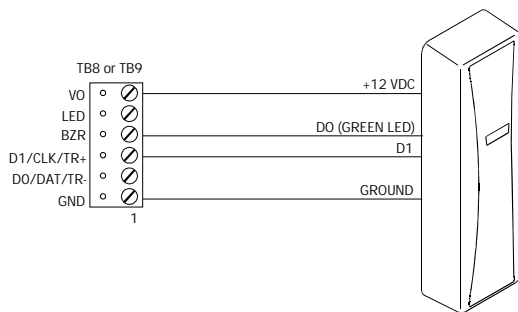
12V PASS	J7 Reader Power Select
	12 VDC is available on reader ports (VIN is greater than or equal to 20 VDC).
	VIN power is “passed through” (PASS) to reader ports.

**Note:** Install jumper J7 in the 12V position ONLY if the input voltage (VIN) is greater than 20 VDC. Failure to do so may damage the reader or the LNL-X4420.

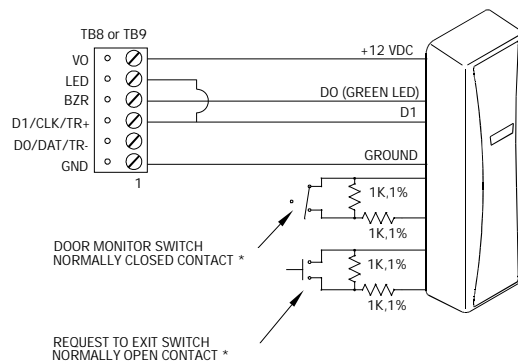
*Typical D1/DO or Clock/Data Reader      Typical 2-wire RS-485 Device (such as OSDP Reader)*



*Typical Unsupervised F/2F Reader*



*Typical Supervised F/2F Reader*



\* Jumper: Connect D1 and LED on supervised F/2F readers.

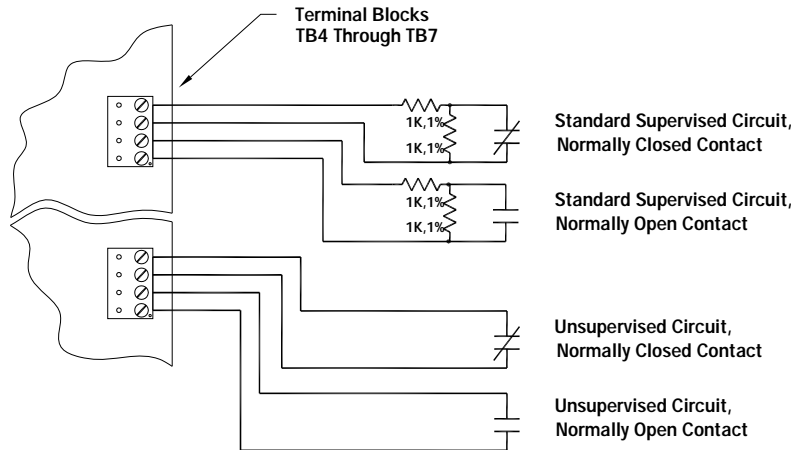
## Input Circuit Wiring

There are 8 inputs that are typically used to monitor door position, request to exit, or alarm contacts. Input circuits can be configured as unsupervised or supervised. When unsupervised, reporting consists of only the open or closed states. When configured as supervised, the input circuit will report not only open and closed, but also open circuit, shorted,

grounded,\* and foreign voltage.\* A supervised input circuit requires two resistors be added to the circuit to facilitate proper reporting. The standard supervised circuit requires 1k ohm, 1% resistors and should be located as close to the sensor as possible. Custom end of line (EOL) resistances may be configured via the host software.

\* Grounded and foreign voltage states are not a requirement of UL 294 and therefore not verified by UL.

The input circuit wiring configurations shown are supported but may not be typical.



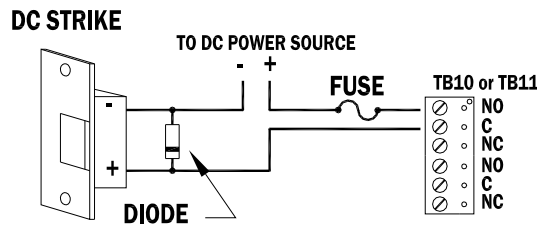
## Relay Circuit Wiring

Four relays with Form-C contacts (dry) are provided for controlling door lock mechanisms or alarm signaling. Each relay has a Common pole (C), a Normally Open pole (NO) and a Normally Closed pole (NC). When controlling the delivery of power to the door strike, the Normally Open and Common poles are typically used. When momentarily removing power to unlock the door, as with a magnetic lock, the Normally Closed and Common poles are typically used. Check with local building codes for proper egress door installation.

Door lock mechanisms can generate feedback to the relay circuit that can cause damage and premature failure of the relay plus affect the operation of the LNL-X4420. For this reason, it is recommended that a diode be used to protect the relay. Wire should be of sufficient gauge to avoid voltage loss.

## Diode Selection

Diode current rating: 1x strike current. Diode breakdown voltage: 4x strike voltage. For 12 VDC or 24 VDC strike, diode 1N4002 (100V/1A) typical.



## Memory and Real Time Clock Backup Battery

The static RAM and the real time clock are backed up by a lithium battery when input power is removed. This battery should be replaced annually. If data in the static RAM is determined to be corrupt after power up, all data, including flash memory, is considered invalid and is erased. All configuration data must be re-downloaded.

During installation and while the unit is not powered, change the jumper (J19) position from **OFF** to **ON** to enable the battery backup.

Battery type: BR2330 or CR2330.

## IT Security

When installing the LNL-X4420, it is important to ensure that it is done in a secure manner.

Upon installation, the user accounts to the web configuration page should be created with secure passwords, and that all DIP switches are in the OFF position for the normal operating mode. The LNL-X4420 is shipped from the factory with a default login account, which is enabled when DIP 1 is moved from OFF to ON. The default login user name and password will be available for five minutes once enabled. Therefore, it is important that at least one user account is defined, and the DIP switches are set to OFF before the LNL-X4420 is commissioned. It is also highly recommended **not** to configure the LNL-X4420 with an IP address that is accessible from the public Internet.

To further enhance network security, options are available to disable SNMP, Zeroconf discovery, as well as the web configuration module itself. Additionally, data encryption can be enabled over the host communication port.

## Status LEDs

**Power-up:** All LEDs OFF.

**Initialization:** After power is applied or the reset switch is pressed, LED 1 is ON for about 15 seconds, then LEDs 2 through 6, R1, R2, and IN1 through IN8 are flashed once at the beginning of initialization.

LEDs 3 and 4 turn ON for approximately 1 second after the hardware initialization has completed, then the application code is initialized. The amount of time the application takes to initialize depends on the size of the database, about 1 second without a card database. Each 10,000 cards adds about 2 seconds to the application initialization.

When LEDs 1 through 4 flash at the same time, data is being read from or written to flash memory; do not cycle power when in this state.

If the sequence stops or repeats, perform [“Bulk Erase Steps”](#) on page 4.



**Running:** After initialization is complete, the LEDs have the following meanings:

LED	Description
1	Off-line / On-line and battery status
	Off-line = 20% ON, On-line = 80% ON
	Double flash if battery is low
2	Host communication activity (Ethernet)
3	Internal SIO communication activity
4	External SIO communication activity (Port 1)
5	External SIO communication activity (Port 2)
R1	Reader 1 Clock/Data or D1/D0 mode: Flashes when Data is Received, either input F/2F mode: Flashes when Data/Acknowledgment is Received RS-485 mode: Flashes when Transmitting Data
R2	Reader 2 Clock/Data or D1/D0 mode: Flashes when Data is Received, either input F/2F mode: Flashes when Data/Acknowledgment is Received RS-485 mode: Flashes when Transmitting Data
D16	Ethernet activity
YEL	Ethernet Speed: OFF = 10Mb/S, ON = 100Mb/S
GRN	OFF= No link, ON = Good link, Flashing = Ethernet activity
IN1 - IN8	OFF = Inactive, ON = Active, Flash = Fault *
K1 - K4	ON = Energized

\* If this input is defined, every three seconds the LED is pulsed to its opposite state for 0.1 seconds, otherwise, the LED is off.

## Specifications

The interface is for use in low voltage, Class 2 circuits only.

The installation of this device must comply with all local fire and electrical codes.

Primary Power:	12 to 24 VDC $\pm$ 10%, 550 mA maximum (reader and USB ports not included)
Reader Ports:	600 mA maximum (add 600 mA to primary power current)
Micro USB Port:	5 VDC, 500 mA maximum (add 270 mA to primary power current)
Memory and Clock Backup Battery:	3 Volt Lithium, type BR2330 or CR2330
microSD Card	Format: microSD or microSDHC; 2GB to 8GB
Host Communication:	Ethernet: 10-BaseT/100Base-TX and Micro USB port (2.0) with optional adapter: pluggable model USB2-OTGE100
Serial I/O Device	Two each: 2-wire RS-485, 2,400 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit

Inputs:	Eight unsupervised/supervised, standard EOL: 1k/1k ohm, 1%, ¼ watt Two unsupervised dedicated for cabinet tamper and UPS fault monitoring
Outputs:	Four relays, Form-C with dry contacts Normally open contact (NO) contact: 5 A @ 30 VDC resistive Normally closed contact (NC) contact: 3 A @ 30 VDC resistive
Reader Interface:	
Power: (jumper selectable)	12 VDC ± 10% regulated, 300 mA maximum each reader (input voltage (VIN) must be greater than 20 VDC) or 12 to 24 VDC ± 10% (input voltage (VIN) passed through), 300 mA maximum each reader
Data Inputs:	TTL compatible, F/2F or 2-wire RS-485
RS-485 Mode:	9,600 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit. Maximum cable length: 2000 ft. (609.6 m)
LED Output:	TTL levels, high>3 V, low<0.5 V, 5 mA source/sink maximum
Buzzer Output:	Open collector, 12 VDC open circuit maximum, 40 mA sink maximum
Cable Requirements:	
Power and Relays:	1 twisted pair, 18 to 16 AWG
Ethernet:	CAT-5, minimum
Reader data (TTL):	6-conductor, 18 AWG, 500 feet (150 m) maximum
Reader data (F/2F):	4-conductor, 18 AWG, 500 feet (150 m) maximum
Reader data (RS-485):	1 twisted pair, shielded, 120 ohm impedance, 24 AWG, 2,000 ft. (610 m) maximum
RS-485 I/O Devices:	1 twisted pair, shielded, 120 ohm impedance, 24 AWG, 4,000 ft. (1,219 m) maximum
Alarm Input:	1 twisted pair, 30 ohm maximum, typically 22 AWG @ 1000 ft. (304.8 m)
Environmental:	
Temperature:	Storage: -55 to +85 °C (-67° to 185° F) Operating: 0 to +70 °C (32° to 158° F)
Humidity:	5 to 95% RHNC
Mechanical:	
Dimension:	8 in. (203.2 mm) W x 6 in. (152.4 mm) L x 1 in. (25 mm) H
Weight:	10.65 oz. (302 g) nominal, board only

UL 294, 7th edition Performance Levels:

Feature	Level
Standby Power	I
Endurance	IV
Line Security	I
Destructive Attack	I

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**Note:** Outputs are Power limited/class 2 when powered by external power limited/class 2 power supply model LNL-AL400ULX or LNL-AL600ULX-4CB6.

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These specifications are subject to change without notice.

## UL Listed Installations

- For access control-only installations using DC power, power shall be provided by a UL 294 or UL 603, class 2 power supply with appropriate ratings.
- For burglar alarm installations, backup power is not provided. A UL 603 listed, class 2 power supply with appropriate ratings shall be used that provides a minimum four hours of standby power after notification of loss of AC power.
- Locations and wiring methods shall be in accordance with the National Electrical Code, ANSI/NFPA 70.

## Regulatory Information

### FCC Compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### Liability

It is expressly understood and agreed that the interface should only be used to control exits from areas where an alternative method for exit is available. This product is not intended for, nor is rated for operation in life-critical control applications. LenelS2 is not liable under any circumstances for loss or damage caused by or partially caused by the misapplication or malfunction of the product. LenelS2's liability does not extend beyond the purchase price of the product.

### Certifications

For certification information, refer to the hardware documentation for the host application.

### Product Warnings and Disclaimers

THESE PRODUCTS ARE INTENDED FOR SALE TO, AND INSTALLATION BY, AN EXPERIENCED SECURITY PROFESSIONAL. LENEL S2 CANNOT PROVIDE ANY ASSURANCE THAT ANY PERSON OR ENTITY BUYING ITS PRODUCTS, INCLUDING ANY "AUTHORIZED DEALER", IS PROPERLY TRAINED OR EXPERIENCED TO CORRECTLY INSTALL SECURITY RELATED PRODUCTS.

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