



# **HID Mercury™ LP1502 Controller**

## **Installation and Specifications**

PLT-05244, A.3  
June 2021

Powering  
**Trusted Identities**

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## What's new

Date	Description	Revision
June 2021	Minor updates.	A.3

A complete list of revisions is available in [Revision history](#).

# Section **01**

## Overview

## 1.1 LP1502 intelligent controller with two reader interfaces

The LP1502 intelligent controller provides decision making, event reporting, and database storage for the HID Mercury hardware platform. Two reader interfaces provide control for two physical barriers.

Host communication is via the on-board 10-BaseT/100Base-TX Ethernet port, or the Micro USB port (2.0) with an optional Micro USB to Ethernet adapter.

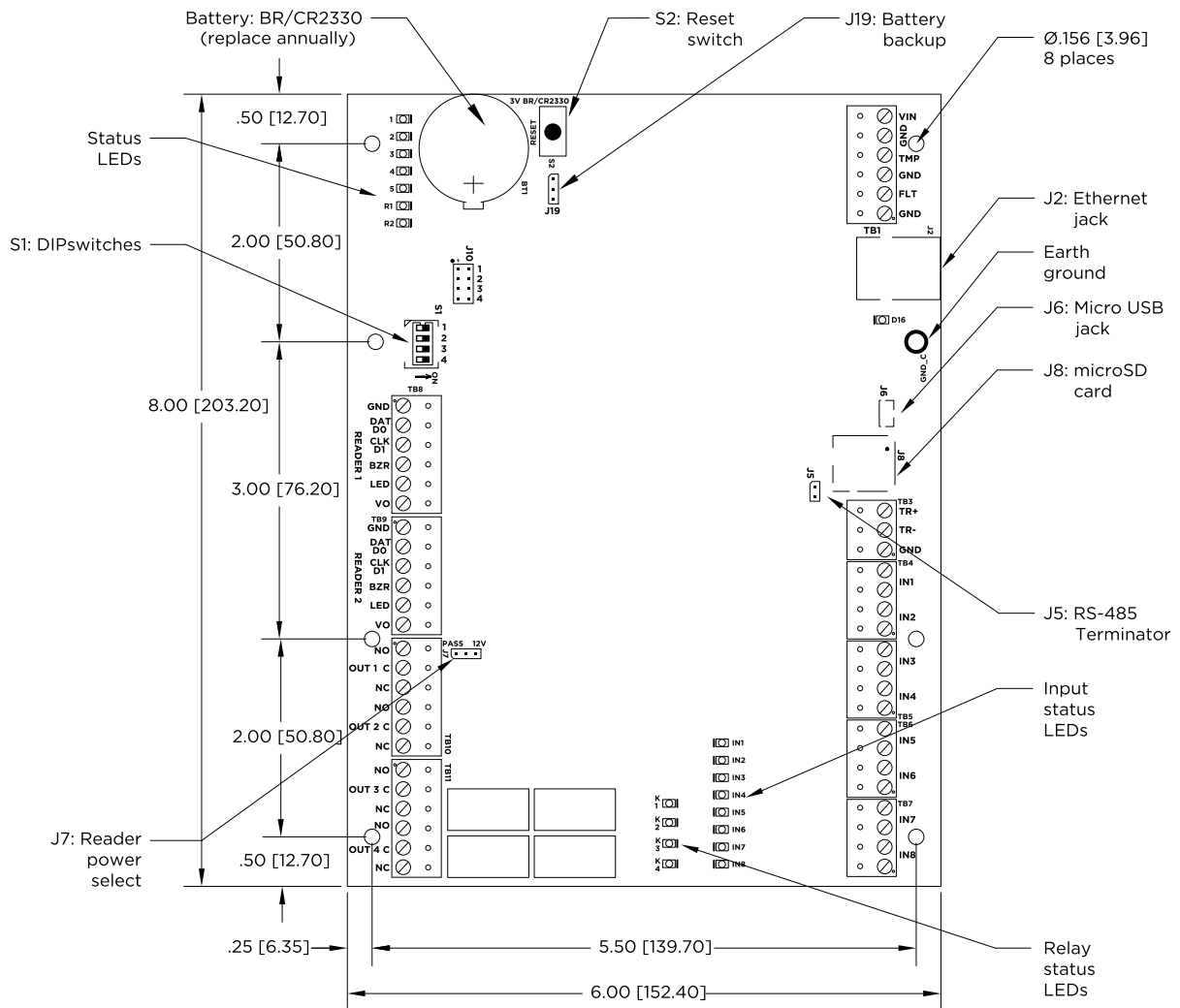
Each reader port can accommodate a reader that uses TTL (D1/D0, Clock/Data), F/2F (standard or supervised), or 2-wire RS-485 device signaling (OSDP reader for example), and also provides tri-state LED control and buzzer control (one wire LED mode only).

Four Form-C relay outputs can be used for door strike control or alarm signaling.

Eight inputs are provided that can be used for monitoring the door contacts, exit push buttons, and alarm contacts. Input circuits can be configured as unsupervised or supervised.

The LP1502 requires 12 to 24 V DC for power.

## 1.2 LP1502 hardware



# Section **02**

## LP1502 wiring and setup

## 2.1 LP1502 connections

<b>TB1-1</b>	GND	Power fault input
<b>TB1-2</b>	FLT	
<b>TB1-3</b>	GND	Cabinet
<b>TB1-4</b>	TMP	Tamper input
<b>TB1-5</b>	GND	Power input
<b>TB1-6</b>	VIN: 12 to 24 V DC	

<b>TB2</b>	N/A	Not used
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<b>TB3-1</b>	GND	SIO port (2-wire RS-485)
<b>TB3-2</b>	TR- (B) <sup>1</sup>	
<b>TB3-3</b>	TR+ (A) <sup>1</sup>	

<b>TB4-1</b>	IN2	Input 2
<b>TB4-2</b>	IN2	
<b>TB4-3</b>	IN1	Input 1
<b>TB4-4</b>	IN1	

<b>TB5-1</b>	IN4	Input 4
<b>TB5-2</b>	IN4	
<b>TB5-3</b>	IN3	Input 3
<b>TB5-4</b>	IN3	

<b>TB6-1</b>	IN6	Input 6
<b>TB6-2</b>	IN6	
<b>TB6-3</b>	IN5	Input 5
<b>TB6-4</b>	IN5	

<b>TB7-1</b>	IN8	Input 8
<b>TB7-2</b>	IN8	
<b>TB7-3</b>	IN7	Input 7
<b>TB7-4</b>	IN7	

<b>TB8-1</b>	GND	Reader 1 - Ground
<b>TB8-2</b>	DAT/D0	Reader 1 - Data/Data 0/TR- (A) <sup>1</sup>
<b>TB8-3</b>	CLK/D1	Reader 1 - Clock/Data 1/TR+ (B) <sup>1</sup>
<b>TB8-4</b>	BZR	Reader 1 - Buzzer
<b>TB8-5</b>	LED	Reader 1 - LED
<b>TB8-6</b>	VO	Reader power

<b>TB9-1</b>	GND	Reader 2 - Ground
<b>TB9-2</b>	DAT/D0	Reader 2 - Data/Data 0/TR- (A) <sup>1</sup>
<b>TB9-3</b>	CLK/D1	Reader 2 - Clock/Data 1/TR+ (B) <sup>1</sup>
<b>TB9-4</b>	BZR	Reader 2 - Buzzer
<b>TB9-5</b>	LED	Reader 2 - LED
<b>TB9-6</b>	VO	Reader power

<b>TB10-1</b>	NO	Out 1 - Normally open contact
<b>TB10-2</b>	C	Out 1 - Common contact
<b>TB10-3</b>	NC	Out 1 - Normally closed contact

<b>TB10-4</b>	NO	Out 2 - Normally open contact
<b>TB10-5</b>	C	Out 2 - Common contact
<b>TB10-6</b>	NC	Out 2 - Normally closed contact

<b>TB11-1</b>	NO	Out 3 - Normally open contact
<b>TB11-2</b>	C	Out 3 - Common contact
<b>TB11-3</b>	NC	Out 3 - Normally closed contact

<b>TB11-4</b>	NO	Out 4 - Normally open contact
<b>TB11-5</b>	C	Out 4 - Common contact
<b>TB11-6</b>	NC	Out 4 - Normally closed contact

1. Terms (A) and (B) are from the RS-485 standard.

### 2.1.1 Jumpers and jacks

The LP1502 processor hardware interface is configured using jumpers to setup the reader port power and end of line termination.

Jumpers	Set at	Description
<b>J1</b>	N/A	Factory use only
<b>J2</b>	N/A	10-Base-T/100Base-Tx Ethernet connection (Port 0)
<b>J3</b>	N/A	Factory use only
<b>J4</b>	N/A	N/A
<b>J5</b>	OFF	RS-485 EOL Terminator is OFF
	ON	RS-485 EOL Terminator is ON
<b>J6</b>	N/A	Micro USB port (2.0)
<b>J7</b>	<b>Reader power select. See caution below.</b>	
	12V	12 V DC at reader ports
	PASS	VIN "Pass Through" to reader ports
<b>J8</b>	N/A	microSD card
<b>J10-1</b>	N/A	Remote Status LED #1. <sup>1</sup>
<b>J10-2</b>	N/A	Remote Status LED #2. <sup>1</sup>
<b>J10-3</b>	N/A	Remote Status LED #3. <sup>1</sup>
<b>J10-4</b>	N/A	Remote Status LED #4. <sup>1</sup>
<b>J19</b>	OFF	Backup battery is OFF.
	ON	Backup battery is ON. See <a href="#">Memory and real time clock backup battery</a>

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



**Caution:** Install jumper J7 in the 12 V position **ONLY** if the input voltage (VIN) is greater than 20 V DC. Failure to do so may damage the reader or LP1502.



## 2.2 DIP switches

The four switches on S1 DIP switch configure the operating mode of the LP1502 processor. DIP switches are read on power-up except where noted. Pressing reset switch S2 causes the LP1502 to reboot.

1	2	3	4	Definitions
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, a re-boot is not required. See <b>IT security</b> for additional information.
OFF	ON	OFF	OFF	Use factory default communication parameters.
ON	ON	OFF	OFF	Use OEM default communication parameters. Contact system manufacture for details. See <b>Bulk erase configuration memory</b> .
ON	ON	OFF	OFF	Bulk Erase prompt mode at power up. See <b>Bulk erase configuration memory</b> .
X	X	X	ON	Makes the LP1502 report and function like an EP1502. To be used in situations where the host software has not been updated to support the LP series product line.

**Note:** All other switch settings for unassigned and are reserved for future use. X = don't care.



**Caution:** In the factory or OEM default modes, downloaded configuration/database is not saved to flash memory.

## 2.3 Factory default communication parameters

### Interface 1 (NIC1)

<b>Network: static IP address</b>	192.168.0.251
<b>Subnet mask</b>	255.255.0.0
<b>Default gateway</b>	192.168.0.1
<b>DNS server</b>	192.168.0.1
<b>Primary host port</b>	IP server, Data security: TLS if Available, port 3001, communication address: 0
<b>Alternate host port</b>	Disabled

## 2.4 Bulk erase configuration memory

The bulk erase function can be used for the following:

- 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 the LP1502 board to continuously reboot.

**Note:** If clearing the memory does not correct the initialization problem, contact Tech Support ([TechSupport@Mercury-Security.com](mailto:TechSupport@Mercury-Security.com)).

### 2.4.1 Bulk erase steps

1. Set S1 DIP switches 1 and 2 to **ON**, and 3 and 4 to **OFF**.
2. Apply power to the LP1502 board. LED 1 is on for about 15 seconds while LP1502 boots up.
3. Change DIP switches 1 or 2 to **OFF** Within 10 seconds after LEDs 1 and 2, and LEDs 3 and 4 start flashing alternately at a rate of 0.5 seconds. If these switches are not changed, the LP1502 board will power up using the OEM default communication parameters.
4. LED 2 will flash indicating that the configuration memory is being erased. Full memory erase takes up to 60 seconds.
5. When complete, only LEDs 1 and 4 will flash for about three seconds.
6. The LP1502 board will complete its initialization within two seconds after LEDs 1 and 4 stop flashing.



**Caution:** Do not remove power during the bulk erase process.

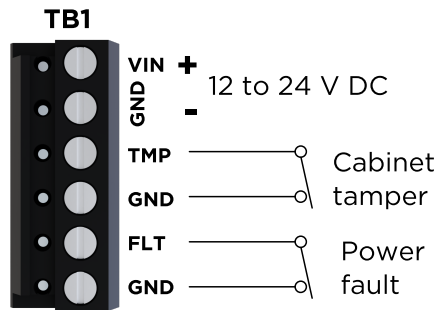
## 2.5 Input power, cabinet tamper and UPS fault input wiring

The LP1502 requires 12 to 24 V DC 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 V DC input!**

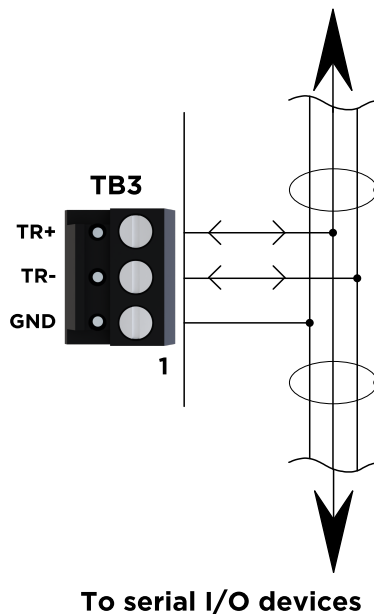
There are two dedicated inputs for cabinet tamper and UPS fault monitoring. Normal (safe) condition is a closed contact. If these inputs are not used, install a jumper wire.



## 2.6 Communication wiring

The LP1502 controller communicates with the host via the on-board Ethernet 10-BaseT/100Base-TX port, and/or the USB port (2.0) with an optional USB to Ethernet adapter.

The serial I/O device communication port (TB3) is a 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 with drain wire and shield, 120Ω impedance, 24 AWG, 4,000 feet. (1,219 m) maximum for communication.



**Caution:** 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.

## 2.7 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 V DC (VIN must be greater than 20 V DC), or power is passed-through (PASS) from the input voltage of the LP1502 (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 manufacture 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.



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) and one cable for communication (24 AWG, with drain wire and shield).

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

**Note:** 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.

### J7 - Reader power select

12V PASS	Reader power
	12 V DC is available on reader ports (VIN > 20 V DC)
	VIN power is "passed through" to reader ports

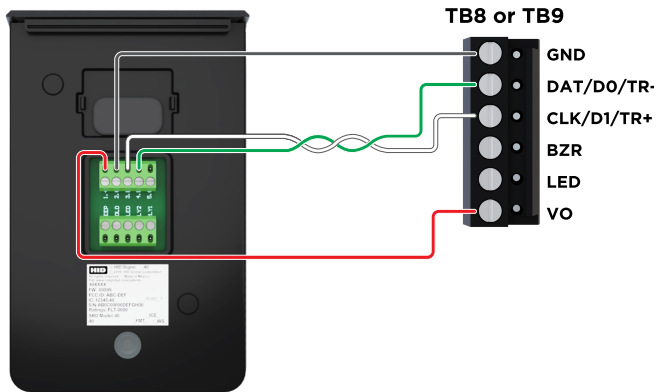


**Caution:** If the input voltage to the LP1502 is 12 V DC, jumper J7 **MUST** be in the **PASS** position.

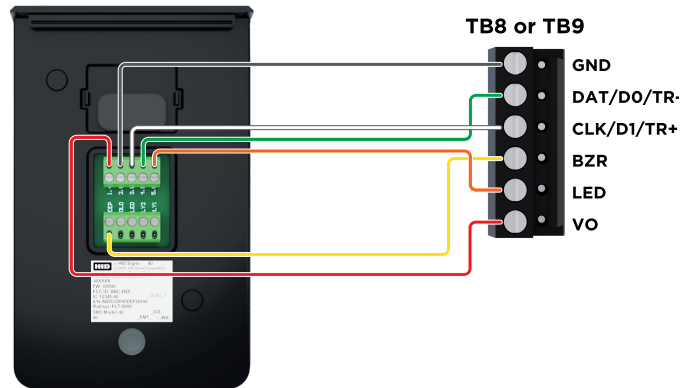
Input power	Reader power select	Reader output	Notes
24 V DC	Pass-through	24 V DC	
24 V DC	12 V DC	12 V DC	
12 V DC	Pass-through	12 V DC	
12 V DC	12 V DC	0 V DC	<b>Caution:</b> Do not use

### 2.7.1 Reader wiring diagrams

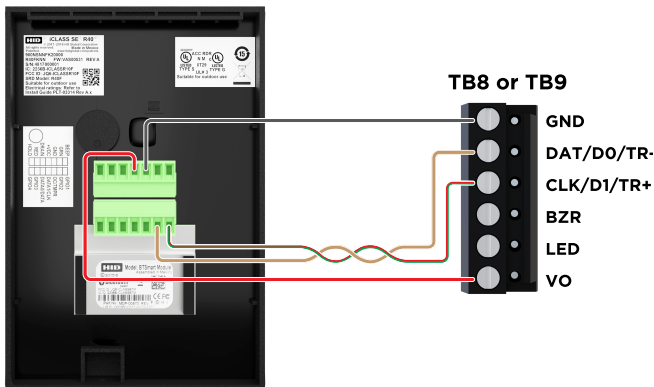
**Typical reader 1  
(OSDP installation)**



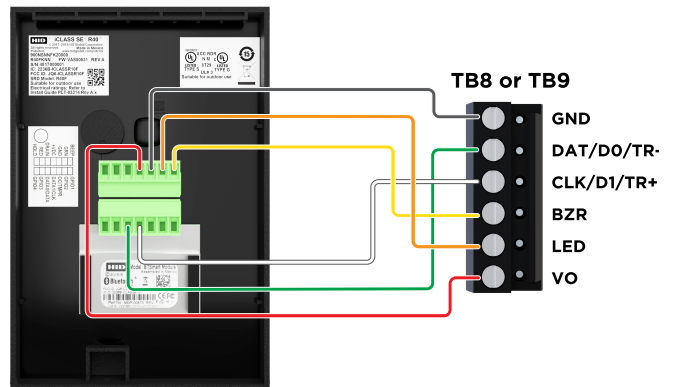
**Typical reader 1  
(Wiegand or Clock/Data installation)**



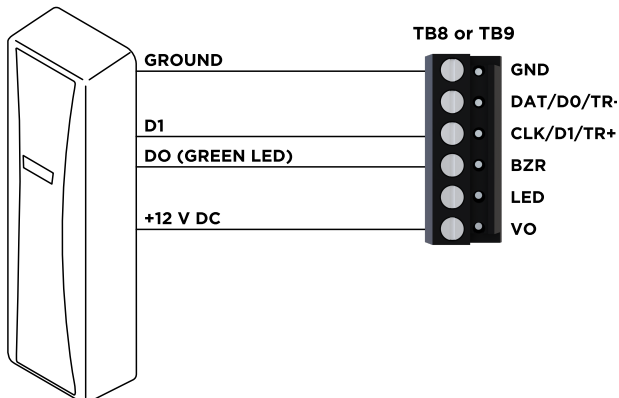
**Typical reader 2  
(OSDP installation)**



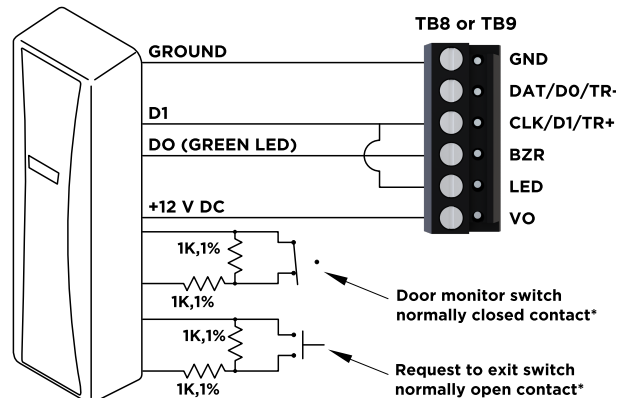
**Typical reader 2  
(Wiegand or Clock/Data installation)**



**Typical unsupervised F/2F reader**



**Typical supervised F/2F reader**



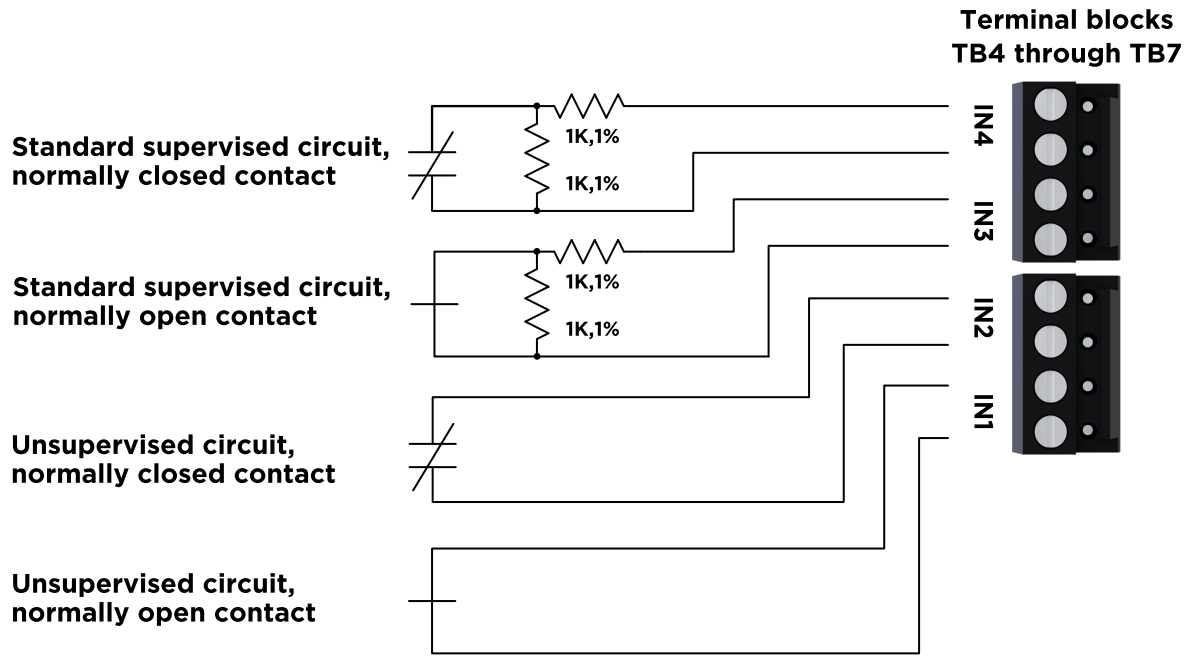
**Jumper D1 to LED on supervised F/2F reader**

\*Inputs on supervised F/2F readers may be unsupervised or supervised (supervised shown).

## 2.8 Input circuit wiring

There are eight 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 1kΩ, 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.

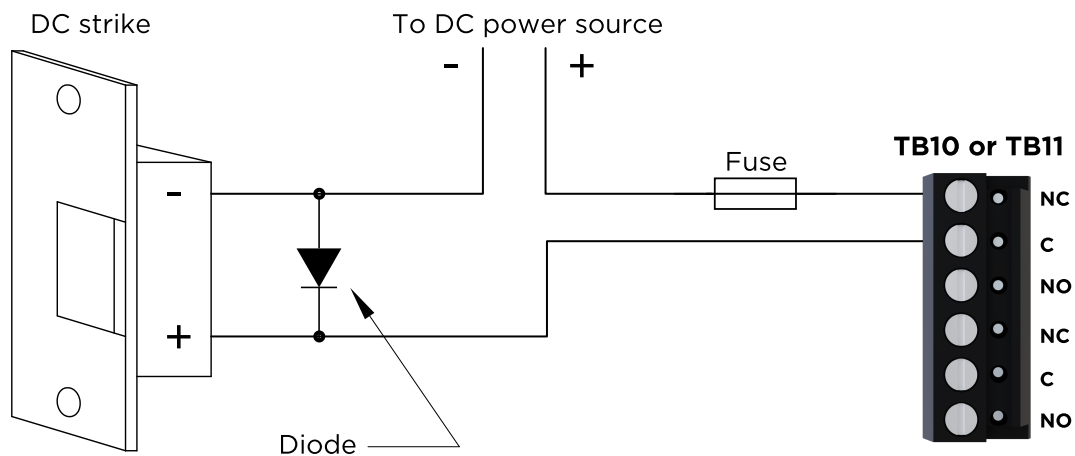
\*Grounded and foreign voltage states are not a requirement of UL 294 and therefore not verified by UL  
The input circuit wiring configurations shown are supported but may not be typical:



## 2.9 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 mag 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 and affect the operation of the LP1502. It is recommended that a diode is 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 V DC or 24 V DC strike, diode 1N4002 (100V/1A) typical.

## 2.10 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 position (J19) from **OFF** to **ON** to enable the battery backup.

**Battery type:** BR2330 or CR2330.

## 2.11 Status LEDs

### 2.11.1 Power-up

All LEDs are OFF.

### 2.11.2 Initialization

After power is applied or reset switch pushed, LED 1 is ON for about 15 seconds, then LEDs 2, 3, 4, 5, 6, R1, R2, IN1, IN2, IN3, IN4, IN5, IN6, IN7 and IN8 are flashed once at the beginning of initialization. LEDs 3 and 4 is turned 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 will add about 2 seconds to the application initialization. When LEDs 1, 2, 3 and 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 the bulk erase procedure, see [Bulk erase configuration memory](#).

### 2.11.3 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 or Micro USB port)
3	Internal SIO communication activity
4	External SIO communication activity
5	Unassigned
R1	<b>Reader 1:</b> 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	<b>Reader 2:</b> 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	Flashes with Ethernet traffic
YEL	Ethernet speed: OFF = 10Mb/S, ON = 100Mb/S
GRN	OFF = No link, ON = Good link, Flashing = Ethernet activity
IN1	Input IN1 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>
IN2	Input IN2 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>
IN3	Input IN3 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>
IN4	Input IN4 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>
IN5	Input IN5 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>
IN6	Input IN6 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>



LED	Description
IN7	Input IN7 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>
IN8	Input IN8 status: OFF = Inactive, ON = Active, Flash = Fault. <sup>1</sup>
K1	Relay K1: ON = Energized
K2	Relay K2: ON = Energized
K3	Relay K3: ON = Energized
K4	Relay K4: ON = Energized

1. 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.

## 2.12 IT security

Ensure that the LP1502 is installed securely. Create user accounts to the web configuration page using secure passwords.

Ensure all DIP switches are to be in the **OFF** position for the normal operating mode.

The LP1502 is shipped from the factory with a default login account, which is enabled when DIP 1 is moved from **OFF** to **ON** (See [DIP switches](#)). The default login user name (admin) and password (password) will be available for five minutes once the DIP switch is toggled. It is therefore important that at least one user account is defined, and the DIP switches are set to **OFF** before the LP1502 is commissioned.

Configuring the LP1502 with an IP address that is accessible from the public is **not** recommended.

The following options are available for enhanced network security:

- Disable SNMP.
- Zeroconf discovery.
- The web configuration module.
- Enable data encryption over the host communication port.

# Section **03**

## 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.

<b>Primary power</b>	12 to 24 V DC $\pm$ 10%, 500 mA maximum (reader and USB ports not included)
<b>Reader ports</b>	600 mA maximum (add 600 mA to primary power current)
<b>Micro USB port</b>	5 V DC, 500 mA maximum (add 270 mA to primary power current)
<b>Memory and clock backup battery</b>	3 Volt Lithium, type BR2330 or CR2330
<b>microSD card</b>	Format: microSD or microSDHC; 2GB to 8GB
<b>Host communication</b>	Ethernet: 10-BaseT/100Base-TX and Micro USB port (2.0) with optional adapter: pluggable model USB2-OTGE100
<b>Serial I/O device</b>	One each: 2-wire RS-485, 2,400 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit
<b>Inputs</b>	Eight unsupervised/supervised, standard EOL: 1k/1k $\Omega$ , 1%, ¼ watt
	Two unsupervised dedicated for cabinet tamper and UPS fault monitoring
<b>Outputs</b>	Four relays, Form-C with dry contacts
	Normally open contact (NO) contact: 5 A @ 30 V DC resistive
	Normally closed contact (NC) contact: 3 A @ 30 V DC resistive

<b>Reader interface</b>	
<b>Power (jumper selectable)</b>	12 V DC $\pm$ 10% regulated, 300 mA maximum each reader (input voltage (VIN) must be greater than 20 V DC)
	or
	12 to 24 V DC $\pm$ 10 % (input voltage (VIN) passed through), 300 mA maximum each reader
<b>Data inputs</b>	TTL compatible, F/2F or 2-wire RS-485
<b>RS-485 Mode</b>	9,600 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit. Maximum cable length: 2000 feet. (609.6 m)
<b>LED output</b>	TTL levels, high>3 V, low<0.5 V, 5 mA source/sink maximum
<b>Buzzer output</b>	Open collector, 12 V DC open circuit maximum, 40 mA sink maximum

<b>Cable requirements</b>	
<b>Power and relays</b>	1 twisted pair, 18 to 16 AWG
<b>Ethernet</b>	CAT-5, minimum
<b>RS-485</b>	
<b>I/O Device port</b>	1 twisted pair, shielded, 120 $\Omega$ impedance, 24 AWG, 4,000 feet. (1,219 m) max.
<b>Reader port</b>	1 twisted pair, shielded, 120 $\Omega$ impedance, 24 AWG, 2,000 feet. (610 m) max.
<b>Alarm input</b>	1 twisted pair, 30 $\Omega$ maximum

Environmental	
Storage temperature	-55 to +85°C
Operating temperature	0 to +70°C
Humidity	5 to 95% RHNC

Mechanical	
Dimension	8 inches (203.2 mm) W x 6 inches (152.4 mm) L x 1 inches (25 mm) H
Weight	9 oz. (255 g) nominal, board only

### UL294, 6<sup>th</sup> edition Performance Levels

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

These specifications are subject to change without notice.

## 3.1 Warranty

Mercury Security warrants the product is free from defects in material and workmanship under normal use and service with proper maintenance for one year from the date of factory shipment. Mercury Security assumes no responsibility for products damaged by improper handling or installation. This warranty is limited to the repair or replacement of the defective unit.

There are no expressed warranties other than set forth herein. Mercury Security does not make, nor intends, nor does it authorize any agent or representative to make any other warranties, or implied warranties, and expressly excludes and disclaims all implied warranties of merchantability or fitness for a particular purpose.

Returns must be accompanied by a Return Material Authorization (RMA) number obtained from customer service, and prepaid postage and insurance.

## 3.2 Liability

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. Mercury Security is not liable under any circumstances for loss or damage caused by or partially caused by the misapplication or malfunction of the product. Mercury Security's liability does not extend beyond the purchase price of the product.

## 3.3 Regulatory

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.

## Revision history

Date	Description	Revision
June 2021	Minor updates.	A.3
April 2021	Added reader power select table in <a href="#">2.7 Reader wiring</a> .	A.2
January 2021	Add J19: Battery backup call out to the hardware diagram.	A.1
October 2020	Initial release.	A.0



# Powering Trusted Identities

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