Controllers 2

In This Chapter
√ LP2500 √ LP1502 √ LP4502 √ LP1501 √ MP02/VSRC-A

Mercury LP/Legacy Series Controllers

The Mercury LP Series controllers are designed with power, performance, and flexibility in mind. At the heart of the field hardware, the controller performs all intelligent decisions and provides real-time processing for the subcontroller(s) connected to it. It also provides battery-backed memory to store the configuration data, cardholder database, and event buffer information.

> ! *Replace the controller's 3V lithium battery annually.*

The Mercury LP Series includes six (6) controller models:

- LP2500 (Ethernet Panel) - Supports up to 64 subcontrollers (or 32 MR62e's) for a total of 64 doors/readers; includes an on-board Ethernet connection.
- LP1502 (2 Door) - Supports up to 32 subcontrollers (or 32 MR62e's) for a total of 64 doors/readers; includes an on-board Ethernet connection and one (1) on-board subcontroller.
- LP4502 - Supports up to 64 subcontrollers (or 32 MR62e's) for a total of 64 doors/readers; includes an on-board Ethernet connection and one (1) on-board subcontroller. The LP4502 features an embedded Linux operating system to enable third-party software applications, extensive communications support, and heightened IT security.
- LP1501/DController (DContr.) (1 Door) - Supports up to 16 MR62e's (or up to 8 traditional RS-485 devices) for a total of 17 doors/readers (including the 2 on-board readers); includes an on-board Ethernet connection and one (1) on-board subcontroller. The LP1501 is capable of using Power over Ethernet (PoE and PoE+).
- MP02 (2 Doors) - Supports 64 subcontrollers for a total of 64 doors/readers; includes 2 on-board reader ports and on-board Ethernet connection.

Mercury LP Series

LP2500 **LP1502** **LP4502** **LP1501/DContr.** **MP02/VSRC-A**

Ports

The Mercury LP Series has a dedicated host port for communication to the host that supports a micro USB (2.0) or RS-485 serial communication protocol as well as Ethernet 10/100. The RS-485 interface can be a 2-wire or 4-wire configuration. The host port is used to communicate configuration data and event/status reports.

Additional 2-wire RS-485 ports are used to communicate to downstream devices (subcontrollers). If a 4-wire port is required, two separate 2-wire ports can be combined into a single 4-wire port.

Best Practices

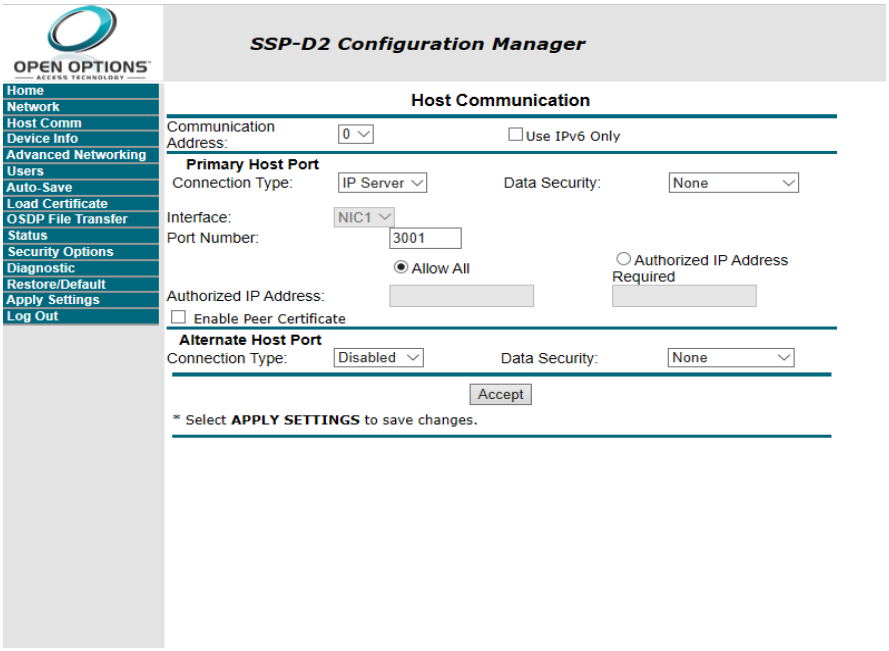
The following guidelines provide a more secure environment for the access control system's controllers:

1. The IP addresses assigned to the controllers should be inaccessible from the Internet. A firewall or private security VLAN is recommended.
2. **Create** a login (username and password) for the controller during installation.

> *The username and password are case-sensitive.*

3. After configuration is complete, **set** DIP switch 1 to OFF.
4. **Set** a Static IP Address for the server.
5. **Configure** the Authorized IP Address feature in the controller's Configuration Manager.

See page 2-5 for more information.



> *Operators can NOT assign an IP address in the 169.254.xxx.xxx range to a controller. This range is reserved for Automatic Private IP Addressing (APIPA). APIPA is used to assign an address when a device is configured for DHCP but DHCP servers are not available.*

> *For more information on maximizing controller security, see the DNA Fusion Hardening Guide.*

Assigning the Controller's IP Address

To configure the controller's initial settings, such as the IP address, the operator must first establish communication with the controller using one of five methods:

- Direct Connect
- MercZeroConf Tool
- Internal Webpage
- Installation Assistant Utility (IAU)
- ZeroConfig Tool

Direct Connect

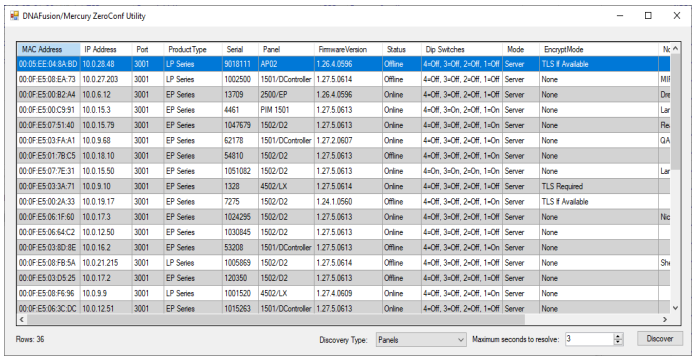
Prior to establishing an Ethernet connection, the operator can use a Ethernet cable to directly connect the controller board to a computer and configure the initial settings. Connect the cable directly to the computer and controller, open a web browser, and enter the static IP address assigned to the controller.

Verify the computers IP address is within the same range of the hardware default 192.168.0.251. If not, set the computer's IP range to a 192.168.0.X range.

MercZeroConf

The MercZeroConf is a tool that is used to discover controllers or network subcontrollers within a system. The MercZeroConf can be accessed once DNA Fusion is installed along with other discovery tools. This tool does not allow the user to change any of the information displayed in the utility. After clicking the Discover button, the utility displays network information regarding the Panels and Subcontrollers in the system. That information includes the following:

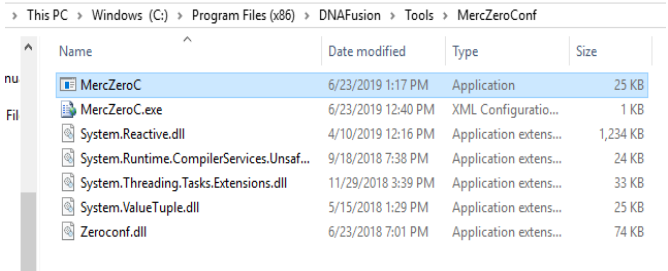
- MAC Address
- IP Address
- Port
- Product Type
- Product Type
- Serial
- Panel
- Firmware Version
- Status
- DIP Switches
- Mode
- Encrypt Mode
- Notes
- OEM Code



Clicking on any discovered panel in the MercZeroConf tool will open that panel's Internal Webpage. The Discovery Type drop-down allows the user to switch between discovering controllers and subcontrollers. Network subcontrollers (MR62e) are the only type of subcontroller that can be discovered using this tool. The tool can also be located in the Built-In Tools menu in DNA Fusion.

1. **Locate** the MercZeroConf folder.

   Default path: Local Disk (C:)/Program Files (x86)/DNAFusion/Tools/MercZeroConf.



2. **Double-click** on the MercZeroC application.
   The MercZeroConf tool opens.
3. **Select** the Discovery Type.
4. **Click** the Discover button.
5. **Click** on a Panel / Subcontroller.

> *To open the panel's Internal Webpage via the MAC address, double-click the panel's MAC address. The webpage's URL will contain the panel's MAC address, as oppose to the IP Address.*

6. Continue to Internal Webpage on page 2-4.

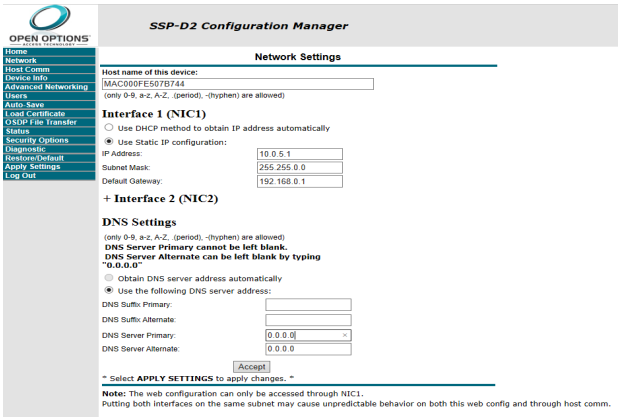
> *The Subcontroller Discovery Type will only located network subcontrollers (MR62e).*

Internal Webpage

1. **Open** a web browser and **enter** the controller's IP address in the address bar.
2. **Log in** using the default Username and Password.
   The Home screen of the Configuration Manager appears.

> *The default username is "admin" and the default password is "password." Open Options recommends creating a new user and turning DIP switch 1 OFF. For the MP02, press the Tamper Button 2 times.*

3. **Select** Network from the menu.
   The Network Settings screen appears.



4. **Select** Use Static IP Configuration and **enter** the IP Address, Subnet Mask, and Default Gateway information.

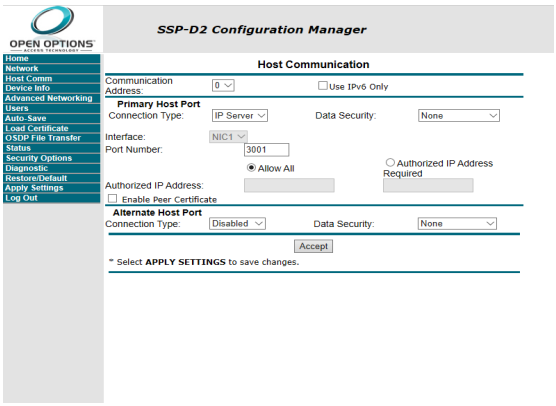
> *This information must be obtained from the customer.*

   OR

   Select Use DHCP Method to Obtain IP Address Automatically and **enter** the Host Name.

   By default, the host name consists of "MAC" followed by the numbers in the device's MAC address. The MAC Address can be located on the board.
5. **Click** Accept.
6. If desired, **select** Host Comm from the menu.
   The Host Communication screen appears.

7. **Configure** the settings as needed and **click** Accept to apply the changes.



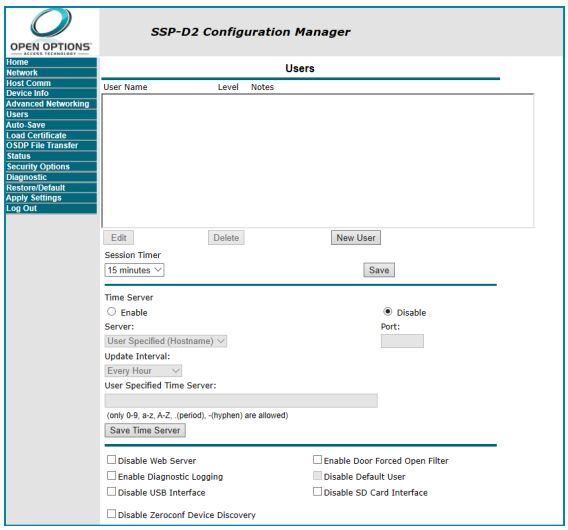
   - Communication Address - Identifies the address used to communicate with the controller. This setting must match the Physical Address field in DNA Fusion.
     - IP Configuration - **Set** the address to 0.
     - Serial Configuration - **Set** a unique address number for the Mercury LP controller.
   - Use IPv6 Only - Uses an IPv6 address.
   - Connection Type - Specifies the type of connection.
     - IP Server - Standard TCP/IP.
     - IP Client - Panel can be set to automatically phone in to send transaction information. Requires the operator to create a trigger/macro combination in DNA Fusion.
   - Data Security - If desired, **select** Password/AES encryption.
   - Port Number - Default is 3001.
   - If the Connection Type is set to IP Server, the controller can be configured to allow all IP addresses or only authorized IP addresses. This limits the IP addresses that can connect to the 3001 port. If used, **enter** the DNA server's IP address in the Authorized IP Address field.

8. If desired, **click** the Device Info option to view a summary of the settings.

   The Time and Product ID, as well as properties that have been configured (e.g. Firmware Version, Serial Number, Device Name, DIP Switches, etc.) is displayed.

9. **Select** Users from the menu.

   The Users screen appears.



10. If needed, **add** a new user:

    a. **Click** the New User button.

    The User Account dialog opens.

    b. **Select** an Account Level for the user.

    - 1 - Allows the user to view and edit all settings.
    - 2 - Allows the user to view, but not modify, the settings. Restricts access to the User and Restore/Default pages in the Configuration Manager.
    - 3 - Only allows the user to access the Device Info page.

    c. **Enter** a Username (4-10 characters) and a Password (6-10 characters) for the user.

    d. **Click** the Save button.

> *The* Username *and* Password *are both case-sensitive.*

11. **Configure** the settings and **click** Submit to apply any changes:

    - Password Strength - Determines the password requirements.
      - Low - Minimum 6-character length.
      - Medium - Minimum 6-character length. Two of the password strength criteria must be met.
      - High - Minimum 8-character length. Three of the password strength criteria must be met. Password is checked to verify that it is not based on the user name.
    - Session Timer - Determines the web session timeout. (Max = 60 min)

    If DIP switch 1 is ON, the following options will display in the Users screen:

    - Disable Web Server - Closes port 80 and disables access to the configuration webpage. To re-enable the web server, set DIP switch 1 back to the ON position and deselect the Disable Web Server checkbox.

- Disable Bonjour - If checked, the ZeroConfig tool can NOT be used for configuration. Both the Disable Bonjour and Disable Web Server checkboxes must be unchecked in order to discover and configure the device.

12. If desired, **select** Auto-Save from the menu.
    The Auto-Save screen appears. **Click** the Save Settings button to save any changes.
    - Startup Routine - Determines how the controller will perform if changes are lost.
    - Auto Save - If enabled, volatile memory is written to flash. The frequency of this action is specified in the Delay Before Save field.
13. If desired, **select** Restore/Default from the menu.
    The Restore Settings screen appears.
    - Restore Default - Reloads the factory settings.
    - Restore Current - Reloads the current operating settings.
14. **Click** the Apply Settings button to save all changes made in the Network and Host Comm settings.
15. **Click** Log Out to exit the Configuration Manager.

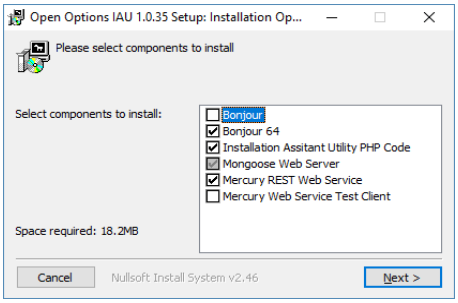
ZeroConfig Tool

1. **Set** all DIP switches to the ON position and **cycle** power.
   This allows the board to receive a default DHCP IP address.
2. **Open** the MercuryZeroConf application.
   Default location:
   32-bit OS - C:\Program Files\DNAFusion\Tools\ZeroConf\MercuryZeroConf.exe
   64-bit OS - C:\Program Files (x86)\DNAFusion\Tools\ ZeroConf\MercuryZeroConf.exe
   The MercuryZeroConfig dialog appears.
3. **Select** the desired Controller by the unique MAC Address and **click** the Configure button.
   The MAC Address is located on the controller and the box.
   The Configuration dialog for the selected controller opens.
4. If desired, **enter** any Notes relevant to the hardware component and **click** the Save Changes button.
5. **Select** Network from the dialog menu.
   The Network Settings screen appears.
6. **Select** Use Static IP Configuration and **enter** the IP Address, Subnet Mask, and Default Gateway information as well as the DNS Server Address.
   This information must be obtained from the customer.
7. **Click** the Save Changes & Reboot button to apply the configuration to the controller.
   If desired, **select** Advanced from the dialog menu to open the controller's internal webpage and configure additional settings.
   When Advanced is selected, ZeroConfig automatically creates a user and logs them in to the internal webpage. See page 2-4 for more information on the internal webpage.
8. **Close** the MercuryZeroConfig dialog.
9. **Set** all DIP switches to the OFF position and cycle power.
   This places the board in the normal operating mode.

If unable to access the Configuration *dialog in* ZeroConfig*, use the controller's internal webpage to configure the IP address. See page 2-4 for more information.*

Operators can NOT assign an IP address in the 169.254.xxx.xxx range to a controller. This range is reserved for Automatic Private IP Addressing (APIPA). APIPA is used to assign an address when a device is configured for DHCP but DHCP servers are not available.

Installation Assistant Utility (IAU) Installation



1. **Locate** the IAU folder.
2. **Follow** path: Local Disk (C:)/Program Files (x86)/DNAFusion/Tools/IAU.
3. **Install** the IAU.
4. During the IAU setup, **check** the Bonjour 64 component.
5. **Click** install to open the Bonjour Installer or click Browse to select a destination to download the installer.

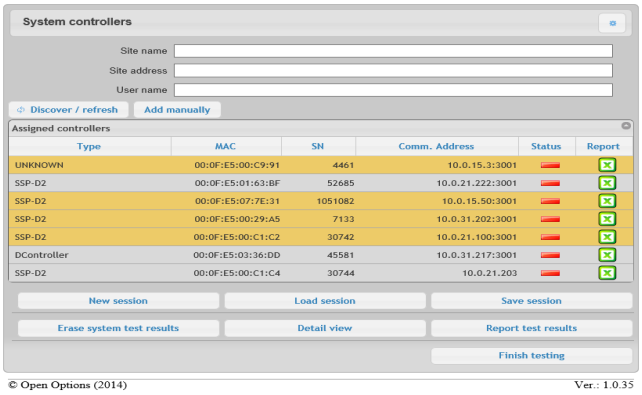
Configuration:

1. Once IAU setup is complete, **click** Close and **open** Internet Explorer.
2. **Type** localhost in the URL.

   The Installation Assistant Utility webpage opens.

   At the top of the IAU main page, the installer can add a Site name, a Site address, and a User name.

> *Any testing done BEFORE entering a User name will not show in the Verified by column of the report.*



3. To connect to the controller, **click** your selection from the discovery list or manually add it by clicking Add manually.

   A progress bar will appear showing the connection progress before bringing you to the controller's webpage.

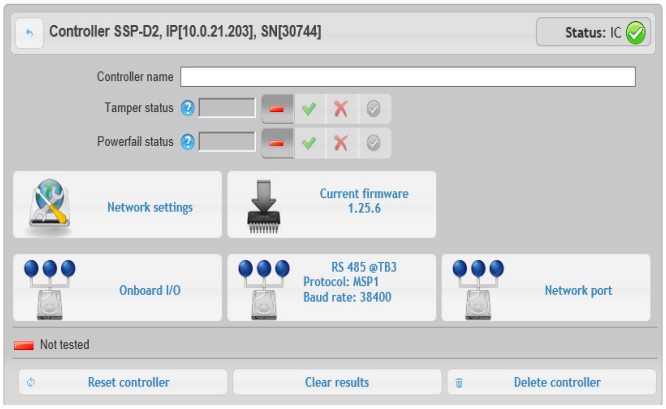
   Click the Discover/refresh button if a recently assigned controller is not shown in the Assigned controllers list.

> *All controllers must have DIP switch 1 set as well as no other active connections in order to successfully connect.*

Manually Adding a Controller:

1. On the Installation Assistant Utility webpage, **click** on the Add manually button.
2. **Click** on the Type: drop-down menu and **select** the correct controller type.
3. **Enter** the controllers MAC address.
4. **Enter** the controllers IP address or Host
5. **Click** Add to add the controller to the Assigned controllers list.

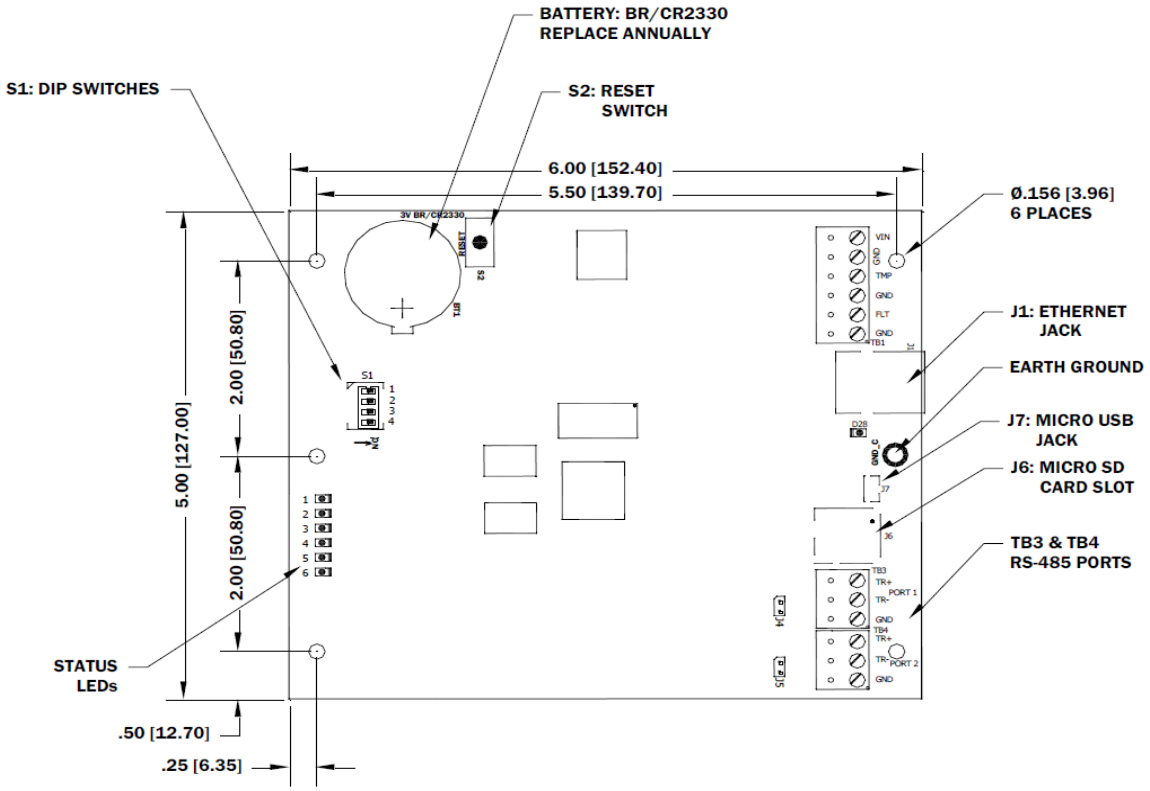
Multiple objects can be verified through the IAU tool. Selecting Network settings will redirect to the controller's internal webpage. See Pg. 2-4 for information about the Internal Webpage.



LP2500 Controller

The LP2500 controller provides processing for up to 64 downstream SIO devices (max. 64 readers/doors) capable of functioning independently without intervention from the host once programmed.

The LP2500 uses an on board 10-BaseT/100Base-TX Ethernet port (J1) to communicate with cloud or server-based hosts. Host communication is also allowed through the micro USB (2.0) jack (J7) with an optional micro USB-to-Ethernet adapter. The LP2500 requires 12 to 24 Vdc for power. Subcontroller connections require a 2-wire RS-485 multi-drop communication bus and connect using Port 1 and Port 2.



The LP2500 should be mounted at least 0.25" above any conductive surface.

Installation

To install the LP2500 controller:

1. If required, **mount** the LP2500 in an Open Options or Life Safety Power enclosure.
2. **Wire** the unsupervised alarm inputs for power fault and cabinet tamper monitoring.
3. **Wire** the server communication.
4. **Wire** the subcontroller communication.
5. **Wire** the power input.
6. **Remove** the plastic safety strip from the backup battery.
7. **Configure** the jumper and DIP switch settings. See page 2-13 for more information.
8. **Set** the board for the desired initial IP addressing mode.
9. **Configure** the network and port settings using any of the IP addressing tool. See pages 2-3 for more information.

Default Settings

Each LP2500 board ships with the following default configuration:

- DIP Switches: OFF
- IP Addressing: DHCP
- Network: Static IP Addressing = 192.168.0.251
- DNS Name: "MAC" followed by the 12-character MAC address
- Physical Address: 0
- Encryption: TLS (if Available)
- Default Gateway: 192.168.0.1
- DNS Server: 192.168.0.1
- Subnet Mask: 255.255.0.0
- Alternate Host Port: Disabled
- Login Name: admin
- Login Password: password

The username and password are case-sensitive.

Security

When installing the LP2500 ensure that the installation is done in a secure matter.

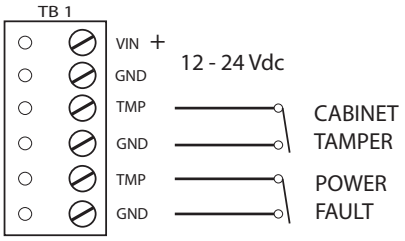
The installation process requires adding a user account(s) to the web configuration. Open Options recommends creating a user account with a secure password. Dip switches are positioned OFF for a normal operating setting.

The LP2500 is shipped with a default login account. To enable the default login, move DIP switch 1 from OFF to ON. The default login will be available for five (5) minutes once enabled. As a result, it's important that at least one user account is defined and the DIP switches on the LP2500 are set to OFF before the controller is commissioned. Open Options highly recommends not to configure the LP2500 with an IP address that is accessible form the public internet.

Options are available in the Configuration Manager for disabling SNMP, Zeroconfig, as well as the web configuration module. Additionally, data encryption can also be enabled over the host communication port. See the Open Options Hardening Guide for more information on security.

Power Supply

The LP2500 controller accepts a 12 to 24 Vdc power supply. Install the power source as close to the unit as possible and connect the VIN and GND ports on TB1 using a minimum of 18 AWG wires.



Connect the GND signal to earth ground at one location in the system. Multiple earth ground connections may cause ground loop problems and is not advised.

Alarm Inputs Wiring

Inputs TMP and FLT on TB1 are used for monitoring the cabinet tamper and power failure with normally closed (NC) contacts. The inputs are unsupervised and do not require EOL resistors. If these inputs are not used, connect the shorting wire that came attached to the input during shipment.

Host Communication Wiring

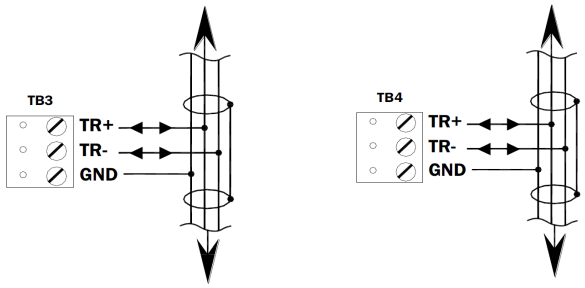
The LP2500 communicates to the host in one of two ways:

- 10Base-T/100Base-TX Ethernet Port
- Micro USB port (2.0) with an optional micro USB-to-Ethernet adapter

Downstream Communication Wiring

Termination jumpers should ONLY be installed on the devices at the end of the line; see Pg. 2-12 for jumper settings.

Ports 1 and 2 on the LP2500 controller require a 2-wire RS-485 interface. This type of interface allows multidrop communication on a single bus of up to 4,000 ft (1,219 m). Use twisted pairs (min. 24 AWG) with shield and 120 ohm impedance.



Wire the TR+, TR-, and GND connections on Ports 1 and 2.

Memory Backup Battery

The lithium battery, type BR2330 or CR2330, serves two purposes: it powers the controller's static RAM and real-time clock device when input power is interrupted, and it backs up the event buffer. The battery should be replaced annually. If the data in the static RAM is corrupted, all data—including flash memory—is considered invalid and is permanently erased.

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 the LP2500 board to continuously reboot.

The bulk erase function erases all configuration and cardholder databases.

1. **Set** DIP switches 1 and 2 to ON.
2. **Set** DIP switches 3 and 4 to OFF.
3. **Power up** the LP2500.

   LED 1 is on for 15 seconds while the LP2500 boots up.

> *If clearing the memory does not correct the initialization problem contact Technical Support.*

> *DO NOT CYCLE POWER during bulk erase process. Process may take up to 10 minutes.*

4. **Wait to Set** DIP switch 1 or 2 to OFF *AFTER* LED 1&2/3&4 Flash alternately (within a 10-second window).

   During the reset window, LEDs 1 & 2 and LEDs 3 & 4 flash alternately at a 0.5-second rate. When erasing memory, LED 2 flashes at a 2-second rate. DO NOT CYCLE POWER. The process may take 5 to 10 minutes to complete. LEDs 1 and 4 flash for 10 seconds after the memory has been erased, and then the LP2500 will reboot.

Hardware Setup

The LP2500 controller hardware is configured with a number of jumpers and a set of four (4) DIP switches. These jumpers/switches determine the port interface, end-of-line termination, and operating mode settings. Refer to the following tables for more information.

Jumper Settings

The table below describes the jumper settings for the LP2500. These settings vary depending on the communication protocol used.

Jumper(s)	Set at	Description
J1	N/A	10-BaseT/100Base-TX Ethernet Port
J2,J3	N/A	Factory Use Only
J4	OFF	Port 1 RS-485 EOL Terminator is OFF
	ON	Port 1 RS-485 EOL Terminator is ON
J5	OFF	Port 2 RS-485 EOL Terminator is OFF
	ON	Port 2 RS-485 EOL Terminator is ON
J6	N/A	MicroSD Card
J7	N/A	USB Port (2.0)

DIP Switch Settings

The LP2500 has two DIP switch locations:

- S1 – Configures the operating mode; see table below.
- S2 – If pressed, resets the controller.

Description	1	2	3	4
Use normal operating mode.	OFF	OFF	OFF	OFF
After initialization, enable default User Name (admin) and Password (password). Switch is read on the fly; no need to reboot.	ON	OFF	OFF	OFF
Use factory default communication settings (see page 2-10).	OFF	ON	OFF	OFF
Use OEM default communication settings. See Bulk Erase on page 2-12.	ON	ON	OFF	OFF
Bulk Erase prompt Mode. See Bulk Erase on page 2-12.	ON	ON	OFF	OFF
The LP2500 reports and functions like a EP2500. The setting is used only when the host software is not updated to the LP product line.	OFF	OFF	OFF	ON

All other switch settings are unassigned and reserved for future use.

Terminal Block Connections

The table below describes the terminal blocks for the LP2500.

Terminal Block	Description	Connection
TB 1-1	Power Input	VIN
TB 1-2		GND
TB 1-3	Cabinet Tamper	TMP
TB 1-4		GND
TB 1-5	Power Fault	FLT
TB 1-6		GND
TB 2	Not Used	N/A
TB 3-1	Downstream Communication (Port 1)	TR+
TB 3-2		TR-
TB 3-3		GND
TB 4-1	Downstream Communication (Port 2)	TR+
TB 4-2		TR-
TB 4-3		GND

Status LEDs

Power Up

All LEDs are OFF.

Initialization

LEDs 1 through 6 are sequenced during initialization.

LED 1 in ON for 15 seconds. Then LED's 2 through 6 are flashed once at the beginning of initialization. LED's 3 and 4 are ON for approximately one (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 one (1) seconds without a card database. Every 10,000 cards adds about two (2) seconds to the application initialization. When LEDs 1 through 4 flash simultaneously, data is being read from or written to flash memory. Do NOT cycle power during this state. If the sequence stops or repeats, perform one of the following steps:

- Power up and tag database as invalid
    1. **Remove** power to the LP2500 and **place** an insulator under the battery clip.
    2. **Wait** 5-10 seconds, **remove** the insulator, and **reapply** input power.
- Power up without loading the database into RAM
    1. **Remove** input power to the LP2500.
    2. **Set** the DIP switches to default mode.

       In default mode, the database is not loaded into RAM; see page 2-13 for DIP switch settings.
    3. **Reapply** power.
- Erase all configuration and database information (also erases card database for security reasons)
    1. **Perform** a bulk erase using the steps on page 2-12.

If clearing the memory does not correct the initialization problem, contact Open Options Technical Support.

Running

LED	Description	Indicator
1	Online/Offline and Battery Status	Online = 80% ON, Offline = 20% ON Double Flash = Low Battery
2	Host Communication Activity (Serial Port 1)	Flashing = Host Activity
3	Port 1 Communication Activity	Flashing = Port Activity
4	Port 2 Communication Activity	Flashing = Port Activity
5	Unassigned	N/A
6		
D28	Host Communication Activity (Ethernet Port 0)	Flashing = Host Activity
YEL	On-Board Ethernet Speed (Yellow LED)	OFF = 10 Mbs, ON = 100 Mbs
GRN	On-Board Ethernet Activity (Green LED)	OFF= No Link, ON = Good Link Flashing = Ethernet Activity

Specifications

The LP2500 is for use in low-voltage, Class 2 circuits only. Installation must comply with all fire and electrical codes.

Primary Power:	*Voltage:*	12 to 24 Vdc ± 10%, 250 mA max. (USB current not available)
	Current:	12 Vdc @ 240 mA (325 mA w/ CoBox Micro) nominal 24 Vdc @ 135 mA (175 mA w/ CoBox Micro) nominal
Memory and Clock Backup:		3 V Lithium, type BR2330 or CR2330
Ports:	*Primary (Ethernet) Port 0:*	10/100 Base-T Ethernet high-speed port
	Micro USB Port:	5 Vdc, 500 mA max. (add 270 mA to primary power current)
	Downstream Ports 1 & 2:	2 each: 2-wire RS-485: 2,400 to 115,200 bps, async., half-duplex, 1 start bit, 8 data bits, and 1 stop bit
Inputs:		2 unsupervised, dedicated for cabinet tamper and power fault monitoring
Wire Requirements:	*Power:*	1 twisted pair, 16 to 18 AWG
	RS-485:	24 AWG, 4,000 ft (1,219 m) max., twisted pair w/ shield; 120 Ohm
	Ethernet:	Category 5e cabling minimum
	Alarm Input:	1 twisted pair, 30 ohms max.
MicroSD Card:	*Format:*	microSD or microSDHC: 2 GB to 8 GB
Mechanical:	*Dimension:*	5” (127 mm) W x 6” (152.4 mm) L x 1” (25 mm) H
	Weight:	4.1 oz (115 g) nominal
Environmental:	*Temperature:*	0 to 70 °C, operating -55 to +85 °C, storage
	Humidity:	5 to 95% RHNC
UL294, 6th Edition Performance Levels	*Standby Power:*	Level: I
	Endurance:	Level: IV
	Line Security:	Level: I
	Destructive:	Level: I

Specifications are subject to change without notice.

This product is not intended for outside wiring as covered by Article 800 in the National Electrical Code, NFPA 70.

Category 5e cabling is the minimum performance category recommended.

NOTES:

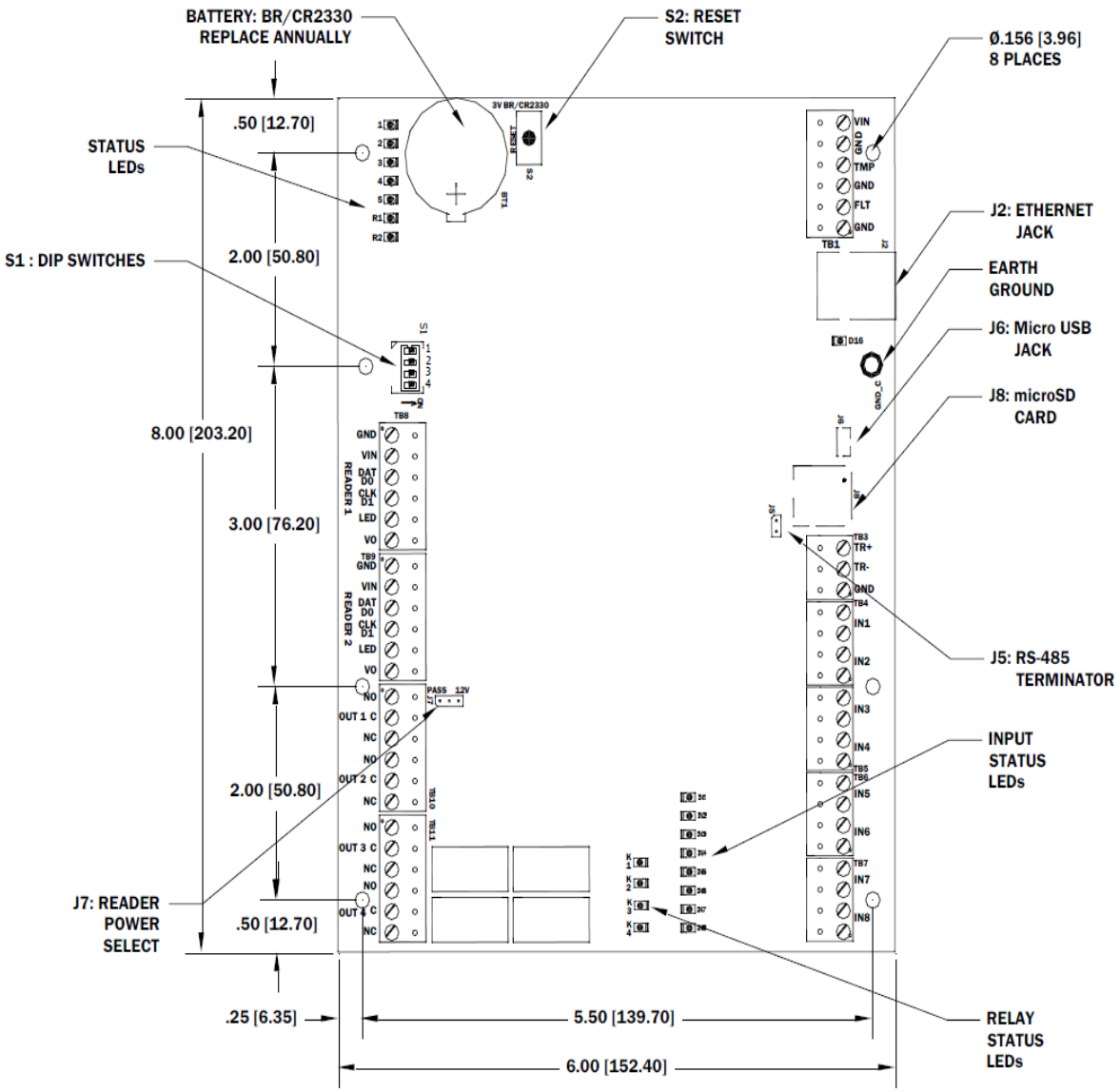
LP1502 Controller

The multi-port LP1502 is dual card reader panel for controlling two doors and managing up to 64 readers. The LP1502 is capable of performing numerous access control applications without host intervention. The LP1502 supports OSDP, OSDP Secure Channel, keypads, biometric readers, Wiegand, clock and data, magnetic stripe, F/2F and supervised F/2F reader, technologies.

The LP1502 communicates with the host via 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 (Reader 1 and Reader 2) can accommodate a reader that utilizes TTL (D1/D0, Clock/Data), standard or supervised F/2F, or 2-wire RS-485 device signalling and also provides tri-state LED control, and buzzer control (one wire LED mode only). Four (4) Form-C relay outputs (TB10 and TB11) may be used for door strike control or alarm signalling. Eight (8) inputs circuits (TB3 Through TB7) may be configured as unsupervised or supervised.

The LP1502 should be mounted at least 0.25" above any conductive surface.



Installation

To install the LP1502 controller:

1. If required, **mount** the LP1502 in an Open Options or Life Safety Power enclosure.
2. **Wire** the unsupervised alarm inputs for power fault and cabinet tamper monitoring.
3. **Wire** the server communication.
4. If applicable, **wire** the subcontroller communication.
5. If applicable, **wire** the on-board readers.
6. **Wire** the input circuit.
7. **Wire** the relay circuit.
8. **Wire** the power input.
9. **Remove** the plastic safety strip from the backup battery.
10. **Configure** the jumper and DIP switch settings. See page 2-23 for more information.
11. **Set** the board for the desired initial IP addressing mode.
12. **Configure** the network and port settings using the network addressing tools provided. See pages 2-3 for more information

Default Settings

Each LP1502 board ships with the following default configuration:

- DIP Switches: OFF
- IP Addressing: DHCP
- Network: Static IP Addressing = 192.168.0.251
- DNS Name: "MAC" followed by the 12-character MAC address
- Physical Address: 0
- Encryption: TLS (if available)
- Default Gateway: 192.168.0.251
- DNS Server: 192.168.0.1
- Subnet Mask: 255.255.0.0
- Alternate Host Port: Disabled
- Login Name: admin
- Login Password: password

The username and password are case-sensitive.

Security

When installing the LP1502 ensure that the installation is done in a secure matter.

The installation process requires adding a user account(s) to the web configuration. Open Options recommends creating a user account with a secure password. Dip switches are positioned OFF for a normal operating setting.

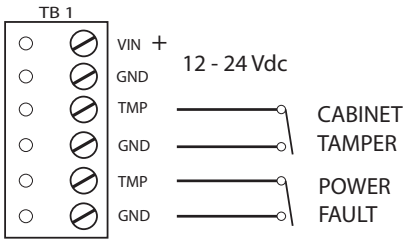
The LP1502 is shipped with a default login account. To enable the default login, move DIP switch 1 from OFF to ON. The default login will be available for five (5) minutes once enabled. As a result, it's important that at least one user account is defined and the DIP switches on the LP1502 are set to OFF before the controller is commissioned. Open Options highly recommends not to configure the LP1502 with an IP address that is accessible form the public internet. Options are available in the Configuration Manager for disabling SNMP, Zeroconfig, as well as the web configuration module. Additionally, data encryption can also be enabled over the host communication port.

Power Supply

The LP1502 controller accepts a 12 to 24 Vdc power supply. Install the power source as close to the unit as possible and connect the VIN and GND ports on TB1 using a minimum of 18 AWG wires.

Alarm Inputs Wiring

Inputs TMP and FLT on TB1 are used for monitoring the cabinet tamper and power failure with normally closed (NC) contacts. The inputs are unsupervised and do not require EOL resistors. If these inputs are not used, connect the shorting wire that came attached to the input during shipment.



Connect the GND *signal to earth ground at one location in the system. Multiple earth ground connections may cause ground loop problems and is not advised.*

Host Communication Wiring

The LP1502 communicates to the host in one of two ways:

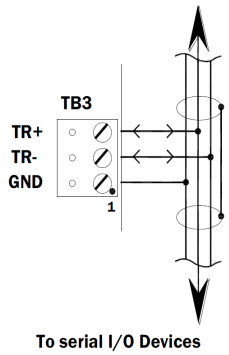
- 10Base-T/100Bast-TX Ethernet Port
- Micro USB (2.0) Port with optional micro USB-to-Ethernet adapter

Downstream Communication Wiring

Terminal Block 3 (TB3) on the LP1502 requires a 2-wire RS-485 interface to connect to downstream subcontrollers. The interface allows for multi-drop communication on a single bus of up to 4,000 ft (1,219 m). Use twisted pairs (min. 24 AWG) with shield for communinication. The J5 termination jumper should only be installed on the devices at the end of the line (see page 2-23 for jumper settings).

Wire the TR+, TR-, and GND connections on TB3 as illustrated above.

Install the termination jumper (J5) *ONLY on the panels 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 and Data), F/2F (standard or supervised) or 2-wire RS-485 signalling (OSDP). Power to the reader is configured via J7 jumper. See page 2-23 for Jumper Settings.

If 12V is selected, the VIN must be greater than 20 Vdc. If PASS if selected, power is passed through from the input voltage of the LP1502 (VIN on TB1) and is current limited to 150mA for each reader port.

> *Readers that require a different voltage or have high current requirements should be powered separately.*

The TB8 and TB9 reader ports are 6-wire interfaces that include a buzzer control wire (BZR) and an LED control wire (LED). Refer to the manufacturer specifications for cabling requirements. In the 2-wire LED mode, the buzzer output is used to drive the second LED. Use DNA Fusion to configure the reader port settings. See page 3-41 in the Technical Installation Manual for more information.

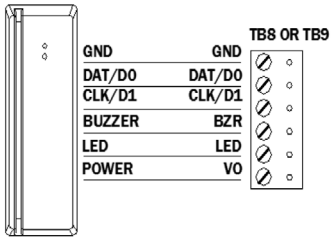
To fully utilize each report port:

- TTL signalling requires a 6-conductor cable (18 AWG).
- F/2F signalling requires a 4-conductor cable, shielded.
- RS-485 signalling requires two 2-conductor cable for power (18 AWG) and one cable for communication (24 AWG, with drain wire and shield).

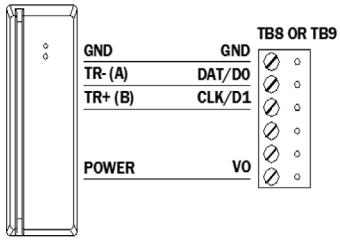
> *If input voltage to the LP1502 is 12 Vdc, jumper J7 MUST be in the PASS position.*

12V PASS	READER POWER
	12 Vdc IS AVAILABLE ON READER PORTS (VIN≥20 Vdc)
	VIN POWER IS "PASSED THROUGH" TO READER PORTS

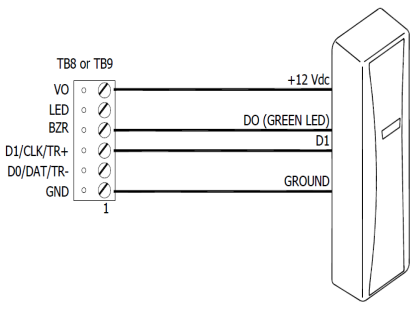
J7 – Reader Power Select



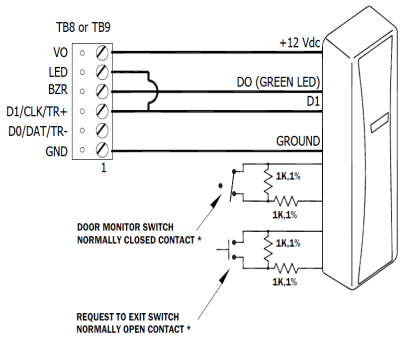
Typical D1/D0 or Clock/Data Reader



Typical 2-wire RS-485 Device (OSDP Reader for Example)



Typical Unsupervised F/2F Reader



Typical Supervised F/2F Reader

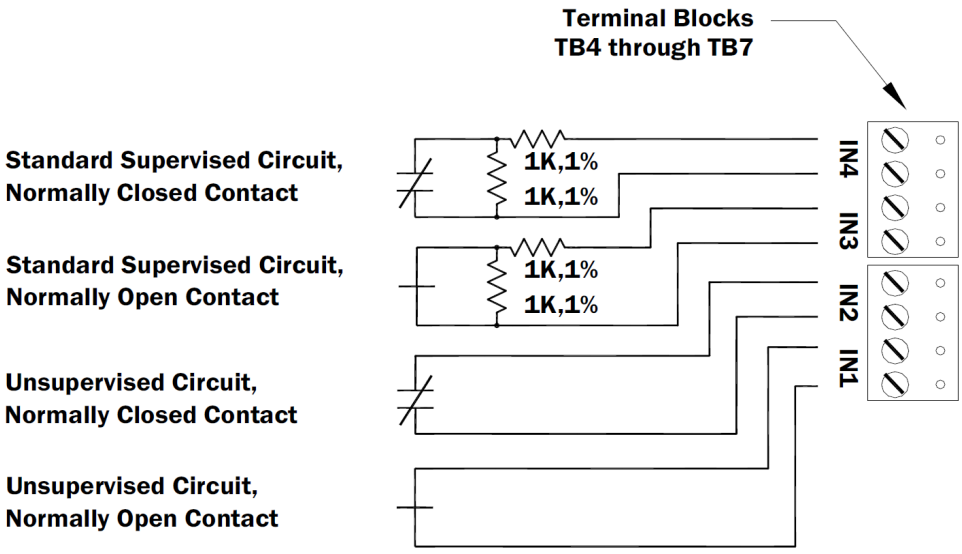
Input Circuit Wiring

The LP1502 controller contains eight (8) inputs that are used to monitor the door position, request-to-exit (REX), and/or alarm contacts. Connect the alarm inputs (IN1-IN8) on terminal blocks TB4 through TB7 using twisted-pair cables.

Input circuits can be configured as supervised or unsupervised. When unsupervised, reporting is limited to Open and Closed states. However, when supervised, the input circuit will report not only Open and Closed states, but also Open Circuit, Shorted, Grounded, and Foreign Voltage. Use DNA Fusion to configure the input settings. See page 3-43 in the Technical Installation Manual for more information.

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

If supervised inputs are used, the installer must add two resistors to the circuit to facilitate proper reporting. The standard supervised circuit requires 1k Ohm, 1% resistors and should be located as close to the input as possible.

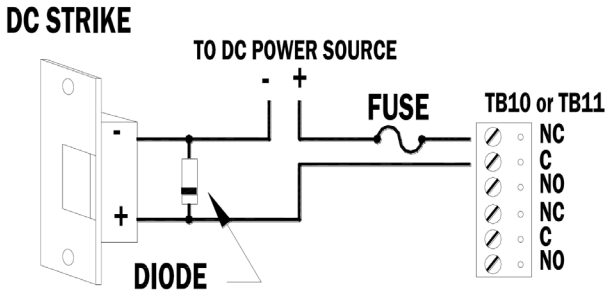


Relay Circuit Wiring

Four (4) relays with Form-C contacts, located on TB10 and TB11, provide the ability to control door lock mechanisms, alarm signals, and other output devices. The relay contacts are rated at 5 A @ 30 Vdc for Normally Open (NO) and 3 A @ 30 Vdc for Normally Closed (NC), dry contact configuration.

Each relay consists of three poles: Common (C), Normally Open (NO), and Normally Closed (NC). When controlling the delivery of power to the door strike, the Normally Open and Common poles are used. When power is momentarily removed to unlock a door, such as with a maglock, the Normally Closed and Common poles are used. Check with local building codes for proper egress door installation.

Door lock mechanisms may generate feedback to the relay circuit that causes damage and/or premature relay failure. For this reason, DNA Fusion recommends using a diode.



Diode Selection:

Diode current rating: 1 x strike count

Diode breakdown voltage: 4 x strike voltage

For 12 Vdc or 24 Vdc strike, diode 1N4002 (100 V/1 A) typical

Memory Backup Battery

The LP1502's static RAM and real-time clock are backed up by a lithium battery when input power is interrupted. The battery (type BR2330 or CR2330) should be replaced annually. If the data in the static RAM is corrupted, all data—including flash memory—is considered invalid and is permanently erased. All configuration data must then be re-downloaded.

Bulk Erase Configuration Memory

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

- Erase all configuration and cardholder database (sanitized board, less third party applications).
- Update OEM default parameters after OEM code has been changed.
- Recover from data corruption causing LP1502 board continuously reboot.

The bulk erase function erases all configuration and cardholder databases.

1. **Set** DIP switches 1 and 2 to ON.
2. **Set** DIP switches 3 and 4 to OFF.
3. **Power up** the LP1502. LED 1 is on for 15 seconds while the LP1502 boots up.
4. **Set** DIP switch 1 or 2 to OFF within a 10-second window.

   During the reset window, LEDs 1 & 2 and LEDs 3 & 4 flash alternately at a 0.5-second rate. When erasing memory, LED 2 flashes at a 2-second rate. DO NOT CYCLE POWER. The process may take 5 to 10 minutes to complete. LEDs 1 and 4 flash for 10 seconds after the memory has been erased, and then the LP1502 will reboot.

If clearing the memory does not correct the initialization problem, contact technical support.

DO NOT CYCLE POWER during the bulk erase process. Process may take up to 10 minutes.

Hardware Setup

The LP1502 controller hardware is configured with a number of jumpers and a set of four (4) DIP switches. These jumpers/switches determine the port interface, end-of-line termination, and operating mode settings. Refer to the following tables for more information.

Jumper Settings

The table below describes the jumper settings for the LP1502.

Jumper(s)	Set at	Description
J1	N/A	Factory Use Only
J2	N/A	10Base-T/100Base-TX Ethernet Connection
J3, J4	N/A	Factory Use Only
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	12V	12 Vdc at Reader Ports (must be <20 Vdc)
	PASS	VIN "Passed Through" to Reader Ports
J8	N/A	MicroSD Card

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

DIP Switch Settings

The LP1502 has two DIP switch locations:

- S1 - Configures the operating mode; see table below.
- S2 - If pressed, resets the controller.

Description	1	2	3	4
Use normal operating mode.	OFF	OFF	OFF	OFF
After initialization, enable default User Name (admin) and Password (password). Switch is read on the fly; no need to reboot.	ON	OFF	OFF	OFF
Use factory default comm settings (see page 2-17).	OFF	ON	OFF	OFF
Use OEM default comm settings. See Bulk Erase on page 2-21.	ON	ON	OFF	OFF
Bulk erase prompt mode at power up. See page 2-21 for information about Bulk Erase.	ON	ON	OFF	OFF
The LP1502 reports and functions like a EP1502. The setting is used only when the host software is not updated to the LP product line. This is also known as "Legacy Mode"	OFF	OFF	OFF	ON

All other switch settings are unassigned and reserved for future use.

Terminal Block Connections

The table below describes the terminal blocks for the LP1502.

Terminal Block	Description	Connection
TB 1-1	Power Input	VIN
TB 1-2		GND
TB 1-3	Cabinet Tamper	TMP
TB 1-4		GND
TB 1-5	Power Fault	FLT
TB 1-6		GND
TB2	Not Used	N/A
TB 3-1	Downstream Communication (2-wire RS-485)	TR+
TB 3-2		TR-
TB 3-3		GND
TB 4-1	Input 1	IN1
TB 4-2		IN1
TB 4-3	Input 2	IN2
TB 4-4		IN2
TB 5-1	Input 3	IN3
TB 5-2		IN3
TB 5-3	Input 4	IN4
TB 5-4		IN4
TB 6-1	Input 5	IN5
TB 6-2		IN5
TB 6-3	Input 6	IN6
TB 6-4		IN6
TB 7-1	Input 7	IN7
TB 7-2		IN7
TB 7-3	Input 8	IN8
TB 7-4		IN8
TB 8-1	Reader 1	GND
TB 8-2		DAT/D0
TB 8-3		CLK/D1
TB 8-4		BZR
TB 8-5		LED
TB 8-6		VO
TB 9-1	Reader 2	GND
TB 9-2		DAT/D0
TB 9-3		CLK/D1
TB 9-4		BZR
TB 9-5		LED
TB 9-6		VO
TB 10-1	Output Relay 1	NO
TB 10-2		C
TB 10-3		NC

Terminal Block	Description	Connection
TB 10-4	Output Relay 2	NO
TB 10-5		C
TB 10-6		NC
TB 11-1	Output Relay 3	NO
TB 11-2		C
TB 11-3		NC
TB 11-4	Output Relay 4	NO
TB 11-5		C
TB 11-6		NC

Status LEDs

Power Up

All LEDs are OFF.

Initialization

After power is applied, LED 1 is ON for about 15 seconds. LEDs 3-6, R1, R2, and IN1-IN8 are sequenced during initalization.

LEDs 3 and 4 are turned ON for approximately one (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 one (1) second without a card database. Every 10,000 cards adds about two (2) seconds to the application initialization. When LEDs 1, 2, 3, and 4 flash simultaneously, data is being read from or written to flash memory. Do NOT cycle power during this state.

Running

If the sequence stops or repeats, perform one of the steps listed on ***pg. 2-13.***

LED	Description	Indicator
1	Online/Offline and Battery Status	Online = 80% ON, Offline = 20% ON Double Flash = Low Battery
2	Host Communication Activity (Ethernet or Micro USB port)	Flashing = Host Activity
3	Internal Subcontroller Communication	Flashing = SIO Activity
4	External Subcontroller Communication	Flashing = SIO Activity
5	Unassigned	N/A
R1	Reader 1: Clock/Data or D1/D0 Mode	Flashing = Data Received
	Reader 1: F/2F Mode	Flashes when Data/Acknowledgment is Received
	Reader 1: RS-485 Mode	Flashing = Transmitting Data

LED	Description	Indicator
R2	Reader 2: Clock/Data or D1/0 Mode	Flashing = Data Received
	Reader 2: RS-485 Mode	Flashing = Transmitting Data
	Reader 2: F/2F Mode	Flashes when Data/Acknowledgment is Received
D16	Host Communication Activity (Ethernet Port 0)	Flashing = Host Activity
YEL	On-Board Ethernet Speed (Yellow LED)	OFF = 10 Mbs, ON = 100 Mbs
GRN	On-Board Ethernet Activity (Green LED)	OFF= No Link, ON = Good Link Flashing = Ethernet Activity
IN1-IN8	Input Status (1-8)	ON = Active, OFF = Inactive Flashing = Trouble
K1-K4	Relay Status (1-4)	ON = Energized

Specifications

The LP1502 is for use in low-voltage, Class 2 circuits only. The installation of the controller must comply with all fire and electrical codes.

Power:	*Primary Power:*	12 to 24 Vdc ± 10%, 500 mA max. (reader and USB port current 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:		3V Lithium, BR2330 or CR2330
Ports:	*Primary (Ethernet) Port 0:*	10Base-T/100Base-TX Ethernet high-speed port
	Micro USB Port (2.0):	optional adapter: plugable model USB2-OTGE100
	Downstream Port:	2-wire RS-485: 2,400 to 115,200 bps, async., half-duplex, 1 start bit, 8 data bits, and 1 stop bit.
Inputs:	2 unsupervised	dedicated for cabinet tamper and power fault monitoring
	8 unsupervised/supervised	standard EOL: 1k/1k ohm, 1%, 1/4 watt
Outputs: *(4 Relays, Form-C)*	*Normally Open (NO) Contact:*	5 A @ 30 Vdc resistive
	Normally Closed (NC) Contact:	3 A @ 30 Vdc resistive
MicroSD Card	*Format:*	microSD or microSDHC: 2 GB to 8 GB
Reader Interface:	*Reader Power: (jumper selectable)*	12 Vdc ± 10% regulated (input voltage (VIN) must be greater than 20 Vdc) or 12 to 24 Vdc ± 10% (input voltage passed through); current limited to 300 mA for each reader
	Data Inputs:	TTL-compatible inputs, F/2F, or 2-wire RS-485 standards supported.
	RS-485 Mode:	9,600 to 115,200 bps, async., half-duplex, 1 start bit, 8 data bits, and 1 stop bit. Max. cable length: 2000 ft (609.6 m)
	LED Output:	TTL levels, high > 3 V, low < 0.5 V, 5 mA source/sink max.
	Buzzer Output:	Open collector, 12 Vdc open circuit maximum, 40 mA sink maximum
Wire Requirements:	*Power and Relays:*	1 twisted pair, 16 to 18 AWG
	RS-485:	SIO device port: 1 twisted pair, shielded, 120 ohm, 24 AWG, 4,000 ft (1,219 m) max. Reader port: 1 twisted pair, shielded, 120 ohm, 24 AWG, 2000 ft (1,219 m) max.
	Ethernet:	CAT-5e, minimum
	Alarm Input:	1 twisted pair, 30 ohms max.

Data Memory:		6 MB standard
Mechanical:	*Dimension:*	8” (203.2 mm) W x 6” (152.4 mm) L x 1” (25 mm) H
	Weight:	9 oz (255 g) nominal, board only
Environmental:	*Temperature:*	0 to 70 °C, operating -55 to +85 °C, storage
	Humidity:	5 to 95% RHNC
UL294, 6th Edition Performance Levels	*Standby Power:*	Level: I
	Endurance:	Level: IV
	Line Security:	Level: I
	Destructive Attack:	Level: I

Specifications are subject to change without notice.

This product is not intended for outside wiring as covered by Article 800 in the National Electrical Code, NFPA 70.

Category 5e cabling is the minimum performance category recommended.

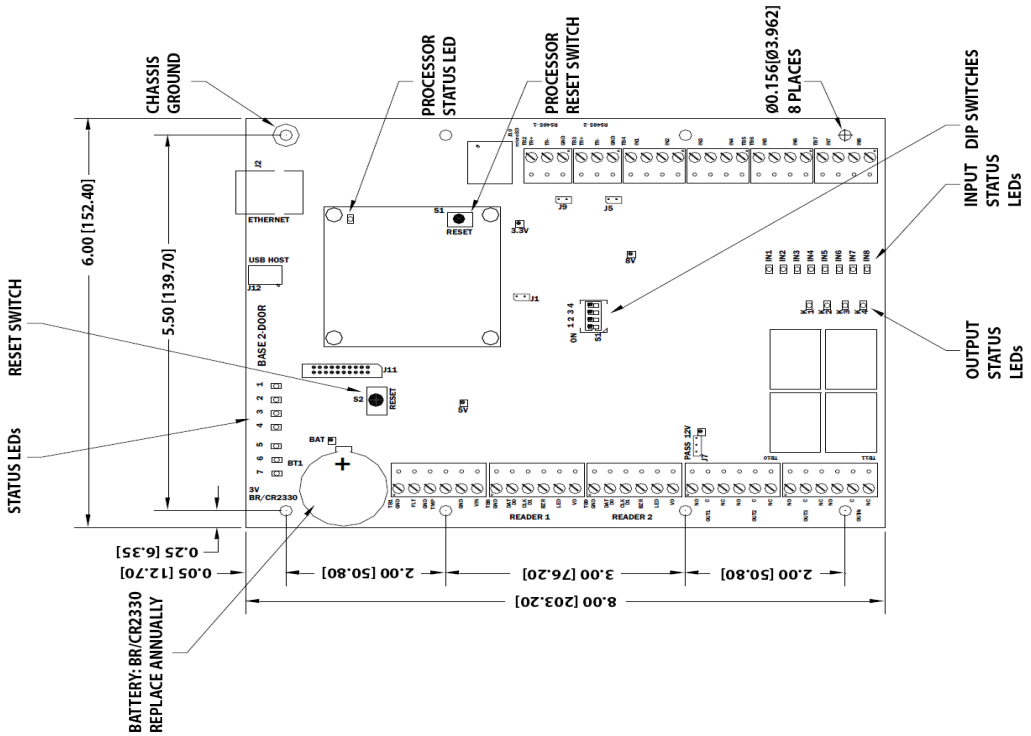
LP4502 Controller

The LP4502 is a high-performance intelligent controller compatible with DNA Fusion version 6.5 and above. It is scalable to 64 downstream SIO devices (max. 64 readers/doors) and supports large card populations with a storage capacity of up to two million cardholders and 50,000 event transactions. The LP4502 features an embedded Linux operating system to enable third-party applications, extensive communications support, and heightened IT security capabilities. It also complies with the BACnet standard to support future development for building automation and control systems, e.g. HVAC, lighting, etc.

The LP4502 communicates to the host via the on-board 10Base-T/100Base-TX Ethernet port. Two ports (TB2 and TB3) are available for connecting to downstream devices via a 2-wire RS-485 interface.

Each reader port (TB8 and TB9) can accommodate a read-head that uses Wiegand, magnetic stripe, or 2-wire RS-485 electrical signalling standards. Both ports also provide tri-state LED control and buzzer control (1-wire LED mode only). Four (4) Form-C relay outputs can be used for strike control or alarm signalling. The relay contacts are rated at 5 A @ 30 Vdc, dry contact configuration. Eight inputs (TB4-TB7) are available for monitoring the door contacts, request-to-exit (REX), and alarm contacts.

The LP4502 should be mounted at least 0.25" above any conductive surface.



Installation

To install the LP4502 controller:

1. If required, **mount** the LP4502 in an Open Options or Life Safety Power enclosure.
2. **Wire** the unsupervised alarm inputs for power fault and cabinet tamper monitoring.
3. **Wire** the server communication.
4. If applicable, **wire** the subcontroller communication and on-board readers.
5. **Wire** the input and relay circuits.
6. **Wire** the power input.
7. **Remove** the plastic safety strip from the backup battery.
8. **Configure** the jumper and DIP switch settings. See page 2-33 and 2-34 for more information.
9. **Configure** the controller's initial IP address and network settings. See page 2-3 for more information.

Default Settings

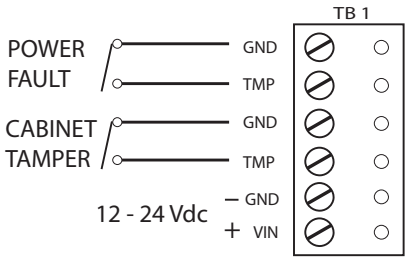
Each LP4502 board ships with the following default configuration:

- DIP Switches: OFF
- IP Addressing: DHCP
- Network: Static IP Addressing = 192.168.0.251
- DNS Name: "MAC" followed by the 12-character MAC address
- Physical Address: 0
- Serial Port Settings: No flow control
- Encryption: None
- Baud Rate: 38400
- Login Name: admin
- Login Password: password

The username and password are case-sensitive.

Power Supply

The LP4502 controller accepts a 12 to 24 Vdc power supply. Install the power source as close to the unit as possible and connect the VIN and GND ports on TB1 using a minimum of 18 AWG wires.



Connect the GND *signal to earth ground at one location in the system. Multiple earth ground connections may cause ground loop problems and is not advised.*

Alarm Inputs Wiring

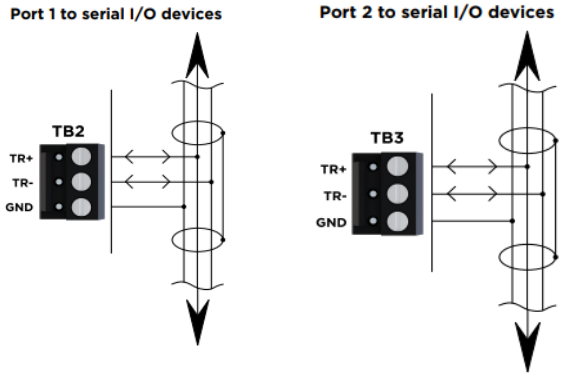
Inputs TMP and FLT on TB1 are used for monitoring the cabinet tamper and power failure with normally closed (NC) contacts. The inputs are unsupervised and do not require EOL resistors. If these inputs are not used, connect the shorting wire that came attached to the input during shipment.

Communication Wiring

The LP4502 controller communicates to the host via the on-board 10Base-T/100Base-TX Ethernet port.

Ports 1 and 2 (TB2 and TB3) require a 2-wire RS-485 interface to connect to downstream subcontrollers. The interface allows multidrop communication on a single bus of up to 4,000 ft (1,219 m). Use 1 twisted-pair with drain wire and shield, 120 ohm impedance, and minimum 24 AWG for communication. The J5 and J9 termination jumpers should only be installed on the devices at the end of the line (see page 2-33 for jumper settings).

Wire the TR+, TR-, and GND connections on TB2 and TB3 as illustrated below.



Install The Jumpers ONLY on the panels at each end of the RS-485 bus. Failure to do so will compromise the proper operation of the comms channel.

Reader Wiring

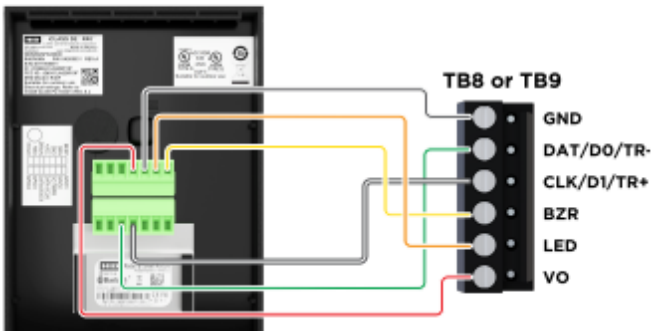
Each reader port supports Wiegand, magnetic stripe, and 2-wire RS-485 electrical interfaces. Power to the reader is configured via the J7 jumper (see page 2-33 for more information).

If 12V is selected, the VIN must be greater than 20 Vdc. If PASS is selected, power is passed through from the input voltage of the LP4502 (VIN on TB1) and is current limited to 180 mA for each reader port.

Readers that require a different voltage or have high current requirements should be powered separately.

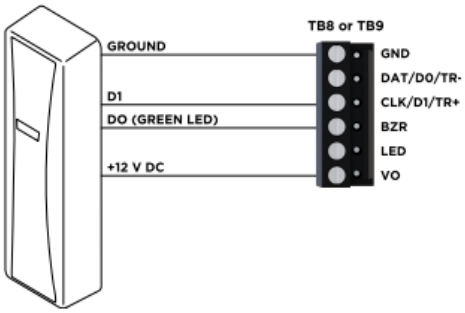
The TB8 and TB9 reader ports are 6-wire interfaces that include a buzzer control wire (BZR) and an LED control wire (LED). Refer to the manufacturer specifications for cabling requirements. In the 2-wire LED mode, the buzzer output is used to drive the second LED. Use DNA Fusion to configure the reader port settings. See page 3-41 in the Technical Installation Manual for more information.

Typical reader 2
(Wiegand or Clock/Data installation)



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

Typical unsupervised F/2F reader

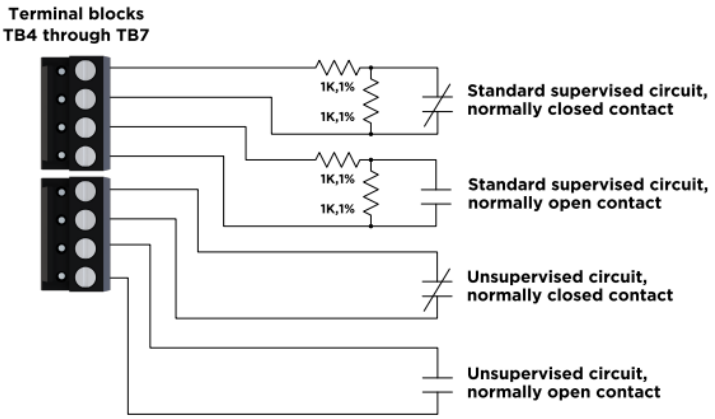


Input Circuit Wiring

The LP4502 controller contains eight (8) inputs that are used to monitor the door position, request-to-exit (REX), and/or alarm contacts. Connect the alarm inputs (IN1-IN8) on terminal blocks TB4 through TB7 using twisted-pair cables.

Input circuits can be configured as supervised or unsupervised. When unsupervised, reporting is limited to two (2) states: Open or Closed. When supervised, the input circuit reports six (6) states: Open, Closed, Open Circuit, Shorted, Grounded, and Foreign Voltage. Use DNA Fusion to configure the input settings. See page 8-75 in the DNA Fusion User Manual for more information.

If supervised inputs are used, the installer must add two resistors 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.

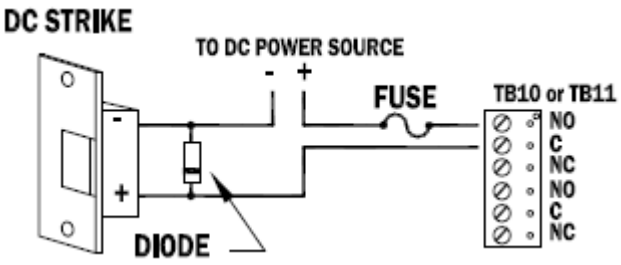


Relay Circuit Wiring

Four (4) relays with Form-C contacts, located on TB10 and TB11, provide the ability to control door lock mechanisms, alarm signals, and other output devices. The relay contacts are rated at 5 A @ 30 Vdc, dry contact configuration.

Each relay consists of three poles: Common (C), Normally Open (NO), and Normally Closed (NC). When controlling the delivery of power to the door strike, the Normally Open and Common poles are used. When power is momentarily removed to unlock a door, such as with a maglock, the Normally Closed and Common poles are used. Check with local building codes for proper egress door installation.

Door lock mechanisms may generate feedback to the relay circuit that causes damage and/or premature relay failure. For this reason, DNA Fusion recommends using a diode to protect the relay. See details below.



Diode Selection:

Diode current rating: 1 x strike count

Diode breakdown voltage: 4 x strike voltage

For 12 Vdc or 24 Vdc strike, diode 1N4002 (100 V/1 A) typical

Memory Backup Battery

The LP4502's static RAM and real-time clock are backed up by a lithium battery when input power is interrupted. The battery (type BR2325 or BR/CR2330) should be replaced annually. If the data in the static RAM is corrupted, all data (including flash memory) is considered invalid and is permanently erased. All configuration data must then be re-downloaded.

Bulk Erase Configuration Memory

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

- Erase all configuration and cardholder databases (sanitize board).
- Update OEM default parameters after OEM code has been changed.
- Recover from database corruption causing the LP4502 board to continuously reboot.

To perform a bulk erase:

1. **Set** DIP switches 1 and 2 to ON.
2. **Set** DIP switches 3 and 4 to OFF.
3. **Power up** the LP4502. LED 1 is on for 15 seconds while the LP4502 boots up.
4. **Set** DIP switch 1 or 2 to OFF within a 10-second window.

   During the reset window, LEDs 1 & 2 and LEDs 3 & 4 flash alternately at a 0.5-second rate. When erasing memory, LED 2 flashes at a 2-second rate. DO NOT CYCLE POWER. The process may take 5 to 10 minutes to complete. LEDs 1 and 4 will flash for 8 seconds after the memory has been erased. The LP4502 will reboot 8 seconds after LEDs 1 and 4 stop flashing (no LEDS are on during this time).

> *If clearing the memory does not correct the initialization problem, contact DNA Fusion Technical Support.*

> *DO NOT CYLCE POWER during the bulk erase process. Process may last up to 10 minutes.*

Hardware Setup

The LP4502 controller hardware is configured through a number of jumpers and a set of four (4) DIP switches. These jumpers/switches determine the port interface, end-of-line termination, and operating mode settings. Refer to the following tables for more information.

Jumper Settings

The table below describes the jumper settings for the LP4502.

Jumper(s)	Set at	Description
J1	N/A	Factory Use Only
J2	N/A	10Base-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
J7	12V	12 Vdc at Reader Ports*
	PASS	VIN "Passed Through" to Reader Ports
J8	N/A	Processor Connection to Base Board
J9	OFF	Port 1 RS-485 EOL Terminator is OFF
	ON	Port 1 RS-485 EOL Terminator is ON
J10	N/A	MicroSD - Not Supported
J11	N/A	Factory Use Only
J12	N/A	USB - Not Supported
JP3	ON	Located on Processor Board; Factory Use Only - Must be installed

*The input power (VIN) must be a minimum of 20 Vdc if 12V is selected.

DIP Switch Settings

The LP4502 has two DIP switch locations:

- S1 - Configures the operating mode; see table below.
- S2 - If pressed, resets the controller.

Description	1	2	3	4
Use normal operating mode.	OFF	OFF	OFF	OFF
After initialization, enable default User Name (admin) and Password (password). Switch is read on the fly; no need to reboot.	ON	OFF	OFF	OFF
Use factory default communication settings (see page 2-30).	OFF	ON	OFF	OFF
Use OEM default communication settings. See Bulk Erase on page 2-33.	ON	ON	OFF	OFF
Disable TLS secure link; switch is only read when logging on.	OFF	OFF	ON	OFF
Enable auto DHCP assignment; assigns a default IP address to the controller.	ON	ON	ON	ON

All other switch settings are unassigned and reserved for future use.

Terminal Block Connections

The table below describes the terminal blocks for the LP4502.

Terminal Block	Description	Connection
TB 1-1	Power Fault	GND
TB 1-2		FLT
TB 1-3	Cabinet Tamper	GND
TB 1-4		TMP
TB 1-5	Power Fault	GND
TB 1-6		VIN
TB 2-1	Downstream Communication (Port 1)	TR+
TB 2-2		TR-
TB 2-3		GND
TB 3-1	Downstream Communication (Port 2)	TR+
TB 3-2		TR-
TB 3-2		GND
TB 4-1	Input 1	IN1
TB 4-2		IN1
TB 4-3	Input 2	IN2
TB 4-4		IN2
TB 5-1	Input 3	IN3
TB 5-2		IN3
TB 5-3	Input 4	IN4
TB 5-4		IN4
TB 6-1	Input 5	IN5
TB 6-2		IN5

Terminal Block	Description	Connection
TB 6-3	Input 6	IN6
TB 6-4		IN6
TB 7-1	Input 7	IN7
TB 7-2		IN7
TB 7-3	Input 8	IN8
TB 7-4		IN8
TB 8-1	Reader 1	GND
TB 8-2		DAT/D0
TB 8-3		CLK/D1
TB 8-4		BZR
TB 8-5		LED
TB 8-6		VO
TB 9-1	Reader 2	GND
TB 9-2		DAT/D0
TB 9-3		CLK/D1
TB 9-4		BZR
TB 9-5		LED
TB 9-6		VO
TB 10-1	Output Relay 1	NO
TB 10-2		C
TB 10-3		NC
TB 10-4	Output Relay 2	NO
TB 10-5		C
TB 10-6		NC
TB 11-1	Output Relay 3	NO
TB 11-2		C
TB 11-3		NC
TB 11-4	Output Relay 4	NO
TB 11-5		C
TB 11-6		NC

Status LEDs

Power Up

All LEDs are OFF.

Initialization

LEDs 1-7 and IN1-IN8 flash once at the start of the initalization.

LED 4 is turned ON for approximately one (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 three (3) seconds without a card database. Every 10,000 cards adds about three (3) seconds to the application initialization. When LEDs 1, 2, 3, and 4 flash simultaneously, data is being read from or written to flash memory. Do NOT cycle power during this state.

If the sequence stops or repeats, perform one of the steps listed on Pg. 2-13.

Running

LED	Description	Indicator
1	Online/Offline and Battery Status	Online = 80% ON, Offline = 20% ON Double Flash = Low Battery
2	Host Communication Activity (Ethernet Port 0)	Flashing = Host Activity
3	On-board Sucontroller Communication	Flashing = SIO Activity
4	Downstream Port 1 Communication	Flashing = Port 1 Activity
5	Downstream Port 2 Communication	Flashing = Port 2 Activity
6	Reader 1: Clock/Data or D1/D0 Mode	Flashing = Data Received
	Reader 1: RS-485 Mode	Flashing = Transmitting Data
7	Reader 2: Clock/Data or D1/0 Mode	Flashing = Data Received
	Reader 2: RS-485 Mode	Flashing = Transmitting Data
YEL	On-Board Ethernet Speed (Yellow LED)	OFF = 10 Mbs, ON = 100 Mbs
GRN	On-Board Ethernet Activity (Green LED)	OFF= No Link, ON = Good Link Flashing = Ethernet Activity

Specifications

The LP4502 is for use in low voltage, Class 2 circuits only. The installation of the controller must comply with fire and electrical codes.

> *This product is not intended for outside wiring as covered by Article 800 in the National Electrical Code, NFPA 70.*

> *Category 5e cabling is the minimum performance category recommended.*

Primary Power:	*Voltage/Current:*	12 to 24 Vdc ± 10%, 500 mA max. (reader current not included)
Memory and Clock Backup:		3 V Lithium, type BR2325, BR2330, CR2330
Ports:	*Ethernet Port 0:*	10Base-T/100Base-TX Ethernet high-speed port
	Downstream Ports 1 & 2:	2-wire RS-485: 2,400 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit
Inputs:		2 unsupervised, dedicated for cabinet tamper and power fault monitoring 8 supervised, dedicated for door position monitoring, request-to-exit, and alarm contacts
Outputs:		4, Form-C, 5 A @ 30 Vdc, resistive
Reader Interface:	*Reader Power: (jumper selectable)*	12 Vdc ± 10% regulated or 12 to 24 Vdc ± 10% (input voltage passed through); current limited to 180 mA for each reader
	Data Inputs:	TTL-compatible inputs, magstripe and Wiegand standards supported. Max. cable lengh: 500 ft (152 m)
	RS-485 Mode:	9,600 to 38,400 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit. Max. cable length: 2000 ft (609.6 m)
	LED Output:	TTL levels, high > 3 V, low < 0.5 V, 5 mA source/sink max.
	Buzzer Output:	TTL levels, high > 3 V, low < 0.5 V, Low = Active, 5 mA source/sink max.
Wire Requirements:	*Power:*	1 twisted pair, 18 to 16 AWG
	RS-485:	SIO Ports: 1 twisted pair w/ drain wire and shield, 120 ohm impedance, 24 AWG, 4,000 ft (1,219 m) max. Reader Ports: 1 twisted pair with drain wire and shield, 120 ohm impedance, 24 AWG, 2,000 ft (609.6 m) max.
	TTL Reader:	22 to 16 AWG, depending on length and requirements, shielded
	Ethernet:	CAT-5e, minimum
	Alarm Input:	1 twisted pair, 30 ohms max., typically 22 AWG @ 1000 ft (304.8 m)
Data Memory:		96 MB standard

Mechanical:	*Dimension:*	8” (203.2 mm) W x 6” (152.4 mm) L x 0.78” (20mm) H
	Weight:	10.65 oz (302 g) nominal
Environmental:	*Temperature:*	0 to 70 °C, operating -55 to +85 °C, storage
	Humidity:	5 to 95% RHNC

Specifications are subject to change without notice.

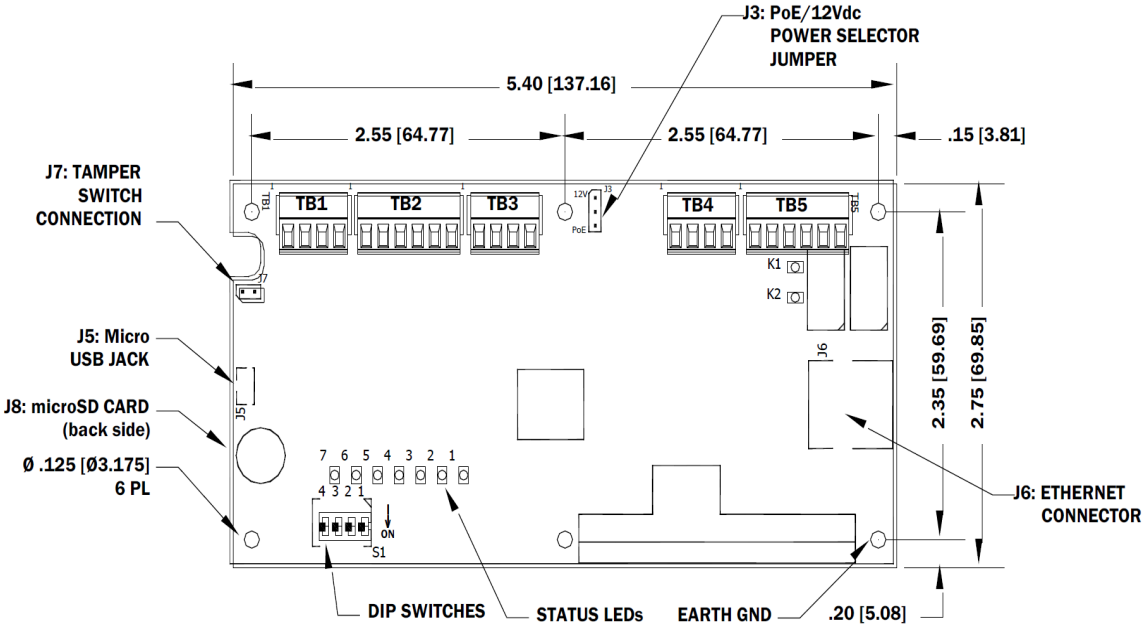
LP1501

The LP1501 is PoE-capable (PoE or PoE+) controller that provides support for up to 8 directly connected SIO devices or up to 16 external devices (MR51e's or RS-485 SIOs) for a total of 17 readers (including the on-board reader). The LP1501 includes two (2) on-board reader ports capable of supporting OSDP Secure Channel, keypads, biometric readers, Wiegand, clock and data magnetic stripe, F/F2, and supervised F/F2 that provide control for one (1) ACM in a single or paired reader configuration, as well as an on-board 10Base-T/100Base-TX Ethernet port for upstream communication.

> *If using an MR51e (NSC-100) or MR62e (NSC-200), it must be on the same subnet as the LP1501.*

The LP1501, which accepts either Power over Ethernet (PoE) or an external 12 Vdc power supply, is capable of storing 240,000 cardholders and up to 50,000 offline events. System configuration and cardholder information are stored in flash memory, while event log buffer information is stored in battery-backed memory.

> *For UL compliance, the Power Sourcing Equipment (PSE) such as a PoE or PoE+ enabled network switch and/or PoE or PoE+ power injectors must be UL Listed under UL294B.*



The first reader port can accommodate a reader that uses TTL (D1/D0, Clock/Data), F/F2, or 2-wire RS-485 device signalling (OSDP readers, for example), also provides tri-state LED control, and buzzer control (one wire LED mode only). This reader port can utilize multiple 2-wire RS-485 multi-drop devices such as up to two (2) OSDP readers or up to eight (8) remote serial I/O devices. The second reader port also accommadates a reader that uses TTL (D1/D0, Clock/Data), or F/2F signalling and provides tri-state LED control, and buzzer control.

Two (2) Form-C relay outputs can be used for strike control or alarm signaling. The relay contacts are rated at 2 A @ 30 Vdc, dry contact configuration. Two (2) inputs are provided for monitoring the door contacts, requests-to-exit, or alarm contacts.

Installation

The LP1501 with the Dcontr. enclosure is an enclosed panel with a mounting footprint that matches the enclosures of the MR62e (NSC-200).

To install the LP1501 in the Dcontr. Enclosure:

1. To remove the enclosure, **press down** on the latch on top of the enclosure and **gently press** a screwdriver or small tool into the slot on the bottom of the enclosure.

   An optional set screw can be installed bottom of the enclosure, above the slot as added security.
2. **Mount** the enclosure in the desired location.

   The DController enclosure is suitable for indoor installations only. Outdoor installations should be placed inside a NEMA enclosure rated for the particular environment.
3. **Wire** the subcontroller communication and on-board readers and door components.
4. **Connect** the Ethernet cable to the Ethernet jack on the LP1501.
5. **Wire** the subcontroller communication.
6. **Wire** the power supply to the unit if PoE or PoE+ is not being used.
7. **Feed** the wires through the strain relief connectors.
8. **Tighten** the sealing nut to secure cables.
9. **Configure** the IP address using the addressing tools provided on page 2-3.

Default Settings

Each LP1501 ships with the following default configuration:

- DIP Switches: OFF
- IP Addressing: DHCP
- Network: Static IP Addressing = 192.168.0.251
- DNS Name: "MAC" followed by the 12-character MAC address
- Physical Address: 0
- Encryption: TLS (if available)
- Default Gateway: 192.168.0.1
- DNS Server: 192.168.0.1
- Subnet Mask: 255.255.0.0
- Alternate Host Port: Disabled
- Login Name: admin
- Login Password: password

The username and password are case-sensitive.

Security

When installing the LP1501 ensure that the installation is done in a secure matter.

The user accounts to the web configuration should be created with secure passwords upon installation. Verify that all DIP switches are in the OFF position to for the normal operating mode.

The LP1501 is shipped with a default login account. To enable the default login, move DIP switch 1 from OFF to ON. The default login will be available for five (5) minutes once enabled. As a result, it's important that at least one user account is defined and the DIP switches on the LP1501 are set to OFF before the controller is commissioned. Open Options highly recommends not to configure the LP1501 with an IP address that is accessible from the public internet.

To further enhance security, options are available to disable SNMP, Zeroconfig discovery, as well as the web configuration module. Additionally, data encryption can also be enabled over the host communication port. For more information about securing hardware, see the Open Options Hardening Guide.

Power Supply

There are two means of powering the LP1501 via Power-over-Ethernet (PoE / PoE+) or a local 12 V power supply. Jumper 3 (J3) must be moved to match the power option. Powering the LP1501 using a local 12 V power supply is completed by wiring the power supply to the VIN and GND terminals on the terminal block 4 (TB 4).

> *For UL compliance, the Power Sourcing Equipment (PSE) such as a PoE or PoE+ enabled network switch and/or PoE or PoE+ power injectors must be UL Listed under UL294B.*

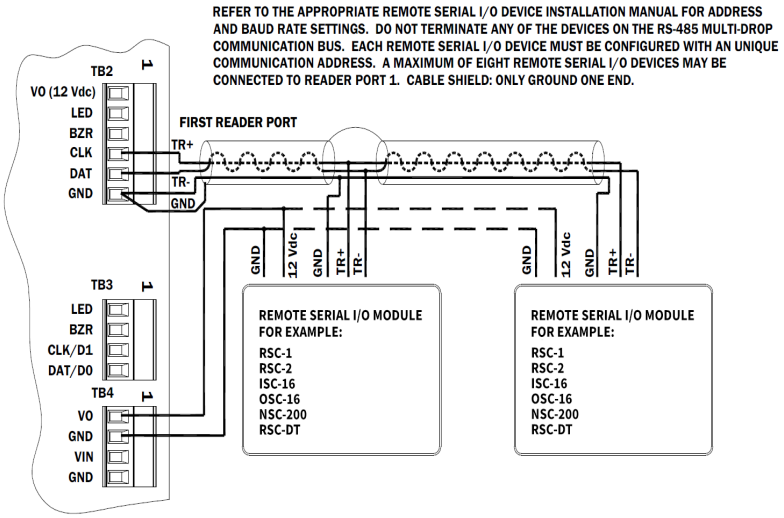
> *The minimum conductor gauge permitted to connect between the PSE or power injector and the PD shall be 26 AWG.*

Host Communication Wiring

The LP1501 communicates to the host computer via the on-board 10-BaseT/100Base-TX Ethernet interface (J6). Connect the network cable to the Ethernet connection on the LP1501.

Downstream Communication Wiring

The first reader port (TB 2) is used to establish communication between the LP1501 and downstream RS-485 subcontroller(s). The LP1501 supports up to eight (8) 2-wire RS remote serial I/O devices using MSP1 protocol or two (2) OSDP readers.

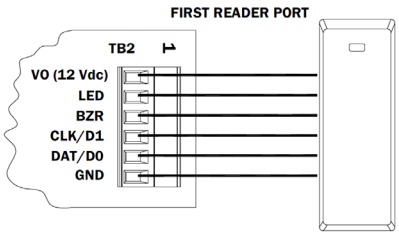


Reader Port 1 - Remote Serial I/O Devices using MSP1 Protocol (2-Wire RS485)

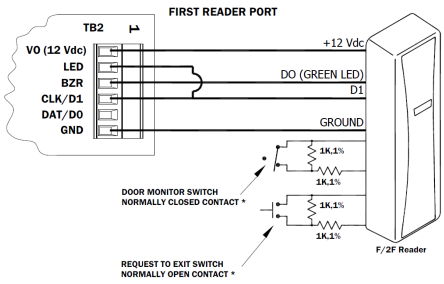
Reader Communication Wiring

Reader Port 1 Wiring

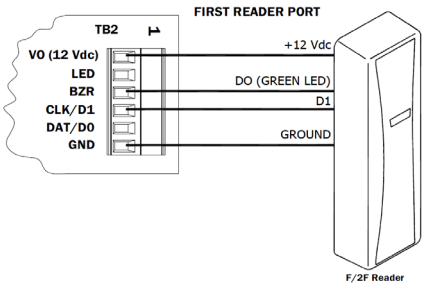
Reader Port 1 (TB 2) supports TTL (D1/D0, Clock/Data), F/F2, or 2-wire RS-485 device signaling (Example: OSDP readers) as wells as tri-state LED control and buzzer control (one-wire LED mode only). Power to the first reader port requires 12 Vdc at 300 mA maximum.



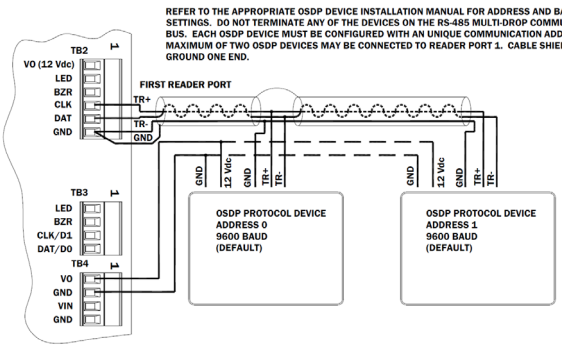
Reader Port 1
Typical D1/D0 or Clock/Data Reader



Reader Port 1
Typical Supervised F/2F Reader



Reader Port 1
Typical Unsupervised F/2F Reader

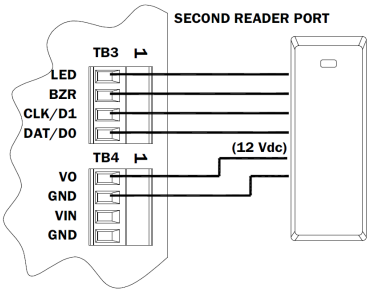


Reader Port 1
OSDP Protocol Devices (2-wire RS-485)

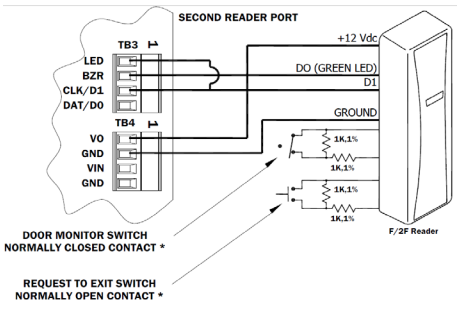
> *When powering remote devices form the LP1501, be cautious not to exceed the maximum current limit. See* Specifications *for more information*

Reader Port 2 Wiring

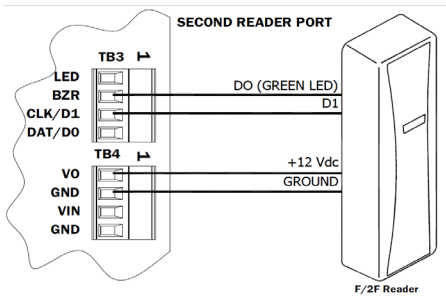
Reader Port 2 (TB 3) supports TTL (D1/D0, Clock/Data), F/F2 as well as tri-state LED control and buzzer control (one-wire only). Power is established via the 12 Vdc auxiliary power supply output (TB 4).



Reader Port 2
Typical D1/D0 or Clock/Data Reader



Reader Port 2
Typical Supervised F/2F Reader



Reader Port 2
Typical D1/D0 or Clock/Data Reader

In the 2-wire LED mode, the buzzer output is used to drive the second LED. Reader port configuration is set in DNA Fusion. If two (2) OSDP devices are used, Reader Port 2 will **NOT** support a third reader. If only one (1) OSDP devices is configured, then Reader Port 2 is available for a second reader. The maximum cable length is 2,000 ft. (610m). Do not terminate any RS-485 devices connected to Reader Port 1.

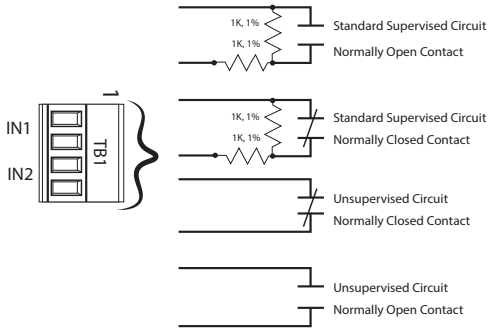
Input Circuit Wiring

The LP1501 contains two (2) inputs, which are located on the IN1 and IN2. Typically, these inputs are used to monitor door position, request-to-exit, or alarm contacts. Input circuits can be configured as unsupervised or supervised. When configured as unsupervised, reporting consists of only the open and closed states. When configured supervised, reporting also includes open circuit, shorted, grounded, and foreign voltage. A supervised input circuit requires two (2) 1k ohm, 1% resistors installed to facilitate proper reporting. The resistors should be located as close to the sensor as possible. Custom end-of-line (EOL) resistances may be configured in DNA Fusion.

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

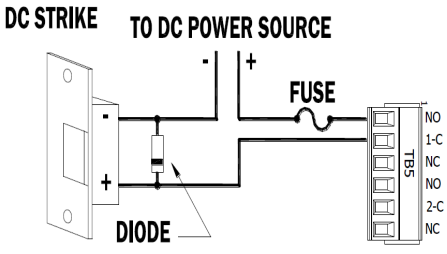
Grounded and foreign voltage states are not a requirement of UL 294 and therefore not verified by UL.

Relay Circuit Wiring



The LP1501 contains two (2) Form-C contact relay outputs to control door lock mechanisms and alarm signaling devices. The relay contacts are rated at 2 A @ 30 Vdc, dry contact configuration. 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 NO and C poles are used; when momentarily removing power to unlock the door, as with a maglock, the NC and C poles are 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 relay failure. For this reason, Open Options recommends using either a diode or MOV to protect the relay.



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 Backup Battery

The LP1501's static RAM (SRAM) is backed up by a rechargeable battery when input power is removed or interrupted. The battery retains the data for approximately three (3) days. If the data in the SRAM is corrupted, all data (including flash memory) is erased. All configuration data must then be re-downloaded to the controller.

Bulk Erase Configuration Memory

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

- Erase all configuration and cardholder database (sanitize board).
- Update OEM default parameters after OEM code has been changed.
- Recovered from database corruption causing the LP1501 to continuously reboot.

The bulk erase function erases all configuration and cardholder databases.

1. **Set** DIP switches 1 & 2 to ON.
2. **Set** DIP switches 3 & 4 to OFF.
3. **Power up** the LP1501, LED 1 will be on for about 15 seconds while the LP1501 boots up.
4. **Set** DIP switch 1 or 2 to OFF within a 10-second window.

   During the reset window, LEDs 1 & 2 and LEDs 3 & 4 flash alternately at a 0.5-second rate. When erasing memory, LED 2 flashes at a 2-second rate. DO NOT CYCLE POWER. The process may take up to 5 to 10 minutes to complete. LEDs 1 and 4 flash for 10 seconds after the memory has been erased, and then the LP1501 will reboot.

> *If clearing the memory does not correct the initialization problem, contact Technical Support.*

> *DO NOT CYCLE POWER during the bulk erase process. Process my take up to 10 minutes.*

Hardware Setup

Jumpers and DIP switches set up the LP1501's port interface, end-of-line termination, and operating mode configuration. Refer to the following tables for more information.

Jumper Settings

The table below describes the jumper settings for the LP1501 board.

Jumpers	Set At	Selected
J1	N/A	Factory Use Only
J2	N/A	Factory Use Only (A, B, & C pads)
J3	PoE	LP1501 is powered from the Ethernet connection (fully compliant to IEEE 802.3af)
	12V	LP1501 is powered from an external 12 Vdc power source connected to TB4-3 (VIN) and TB4-4 (GND)
J4	N/A	Factory Use Only
J5	N/A	Micro USB Port (2.0)
J6	N/A	10Base-T/100Base-TX Ethernet Connection
J7		Cabinet Tamper: Normally Open Switch
J8	N/A	MicroSD Card

DIP Switch Settings

The LP1501's DIP switch S1 configures the operating mode. See table below for more information.

Description	1	2	3	4
Use normal operating mode.	OFF	OFF	OFF	OFF
After initialization, enable default User Name (admin) and Password (password). Switch is read on the fly; no need to reboot.	ON	OFF	OFF	OFF
Use factory default communication settings (see page 2-40).	OFF	ON	OFF	OFF
Use OEM default communication settings. See Bulk Erase on page 2-44.	ON	ON	OFF	OFF
Bulk erase prompt mode at power up. See Bulk Erase on page 2-44.	ON	ON	OFF	OFF
The LP1501 reports and functions like a EP1501. The setting is used only when DNA Fusion has not been updated. Contact Technical Support for more information.	OFF	OFF	OFF	ON

All other switch settings are unassigned and reserved for future use.

Terminal Block Connections

The table below describes the terminal blocks for the LP1501.

Terminal Block	Description	Connection
TB 1-1	Input 1	IN1
TB 1-2		IN1
TB 1-3	Input 2	IN2
TB 1-4		IN2
TB 2-1	Downstream and Reader Communication (Reader Port 1)	VO
TB 2-2		LED
TB 2-3		BZR
TB 2-4		CLK/TR+
TB 2-5		DAT/TR-
TB 2-6		GND
TB 3-1	Reader Communication (Reader Port 2)	LED
TB 3-2		BZR
TB 3-3		CLK/DATA 1
TB 3-4		DAT/DATA 0
TB 4-1	Auxillary Power Output	VO
TB 4-2	Auxillary Ground	GND
TB 4-3	Power Input (12 Vdc)	VIN
TB 4-4	Power Ground Input	GND
TB 5-1	Relay Output 1	NO
TB 5-2		1-C
TB 5-3		NC
TB 5-4	Relay Output 2	NO
TB 5-5		2-C
TB 5-6		NC

Terminal Block 2-4 and 2-5 are utilized connections for downstream RS-485 communication.

Status LEDs

Power Up

All LEDs are OFF.

Initialization

LEDs 1 through 6 are sequenced during initialization.

LED 1 in ON for 15 seconds. Then LED's 2 through 6 are flashed once at the beginning of initialization. LED's 3 and 4 ON for approximately one (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 one (1) seconds without a card database. Every 10,000 cards adds about two (2) seconds to the application initialization. When LEDs 1 through 4 flash simultaneously, data is being read from or written to flash memory. Do NOT cycle power during this state. If the sequence stops or repeats, perform one of the following steps:

- Power up and tag database as invalid
    1. **Remove** power to the LP1501 and **place** an insulator under the battery clip.
    2. **Wait** 5-10 seconds, **remove** the insulator, and **reapply** input power.
- Power up without loading the database into RAM
    1. **Remove** input power to the LP1501.
    2. **Set** the DIP switches to default mode.

       In default mode, the database is not loaded into RAM; see page 2-40 for information.
    3. **Reapply** power.
- Erase all configuration and database information (also erases card database for security reasons)
    1. **Perform** a bulk erase using the steps on page 2-44.

If clearing the memory does not correct the initialization problem, contact Open Options Technical Support.

Running

After initialization is complete, the LEDs indicate the following information.

LED	Description	Indicator
1	Online/Offline and Battery Status	Online = 80% ON, Offline = 20% ON Double Flash = Low Battery
2	Host Communication Activity	Flashing = Host Activity
3	Readers (Combined) Reader 1 Activity	Clock/Data or D1/D0 Mode = Flashes when data is received on either port
		RS-485 = Flashes when data is transmitted on either port
		F/2F Mode=Flashes when Data/ Acknowledgment is received
4	Input Status (IN1)	ON = Active, OFF = Inactive Slow Flash = Polling, Fast Flash = Trouble
5	Input Status (IN2)	ON = Active, OFF = Inactive Slow Flash = Polling, Fast Flash = Trouble
6	Cabinet Tamper	
7	Reserved for Future Use	Not Used
D9	Relay K1	ON = Energized
D10	Relay K2	ON = Energized
YEL	On-Board Ethernet Speed (Yellow LED)	OFF = 10 Mbs, ON = 100 Mbs
GRN	On-Board Ethernet Activity (Green LED)	OFF= No Link, ON = Good Link Flashing = Ethernet Activity

Specifications

The LP1501 is for use in low-voltage, Class 2 circuits only. The installation of this controller must comply with fire and electrical code.

Power Input*:	*PoE:*	12.95 W, Class 3, compliant with IEE 802.3af
	PoE+:	25 W, Class 3, compliant with IEE 802.3at
	Power Supply:	12 Vdc ± 10%, 1.8 A maximum
Power Output:	*PoE: Voltage/Current*	12 Vdc @ 650 mA, including reader and AUX output
	PoE+or External 12 Vdc: Voltage/Current	12 Vdc @ 1.25 A including reaer and AUX output
Host Communication:	*Ethernet:*	10Base-T/100Base-TX
	MicroUSB (2.0) with optional adapter:	Pluggable model USB2-OTGE100
Inputs:		2 unsupervised/supervised, programmable end-of-line resistors, 1k/2k ohm, 1% 1/4 W watt standard, and dedicated tamper input
Output Relays:		2 outputs, Form-C contacts: 2 A @ 30 Vdc
Backup Battery		SRAM Rechargeable battery
MicroSD Card	*Format:*	MicroSD or microSDHC; 2 GB to 8 GB
Reader Interface:	*Reader Power:*	12 Vdc ± 10% or local power supply (12 Vdc); PTC limited 300 mA max.
	Reader Data Inputs:	Two TTL reader ports OR one 2-wire RS-485 reader port capable of supporting two readers
	RS-485 Mode:	9600 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit. Max. cable length = 4000’ (1,219 m)
	LED Output:	TTL-compatible, high > 3 V, low < 0.5 V, 5 mA source/ sink maximum
	Buzzer Output:	Open collector, 12 Vdc open circuit max., 40 mA sink max.
Wire Requirements:	*Power:*	1 twisted pair, 18 AWG min.
	Ethernet:	CAT-5e min.
	Alarm Input:	1 twisted pair per input, 30 ohm max. loop resistance
	Outputs:	As required for the load
	Reader Data (TTL):	18 AWG, 6-conductor with shield, 500 ft (152 m) max.
	Reader Data (RS-485)	24 AWG, 120 ohm impedance, twisted pair with shield, 2000 ft (610 m) max.
	Reader Data (F/F2)	18 AWG, 4-conductor with shield, 500 ft (152 m) max.
Data Memory:		6 MB standard

Environmental:	*Temperature:*	0 to 70 °C, operating / -55 to +85 °C, storage
	Humidity:	5 to 95% RHNC
Mechanical:	*Dimension:*	2.75” L (70 mm) x 5.50” W (140 mm) x 0.96” H (24 mm) without bracket, 3.63” L (70 mm) x 5.50” W (140 mm) x 1.33” H (24 mm) with bracket
	Weight:	3.6 oz. (360 g) without bracket 4.43 oz. (125.5 g) with bracket
UL294, 6th Edition Performance Levels	*Standby Power:*	Level: I
	Endurance:	Level: IV
	Line Security:	Level: I
	Destructive Attack:	Level: I

Specifications are subject to change without notice.

PoE power is to be supplied by a listed ITE or Access Control System Unit (ALVY), power limited, PoE+ injector or PoE+ Ethernet switch providing 42.5 - 57 Vdc, 25.5 W for maximum power.

UL Listing Requirements

When installing a UL-listed system, consider the following requirements:

1. **Power** the devices from a UL-294 listed power source. Do not use PoE to supply the power.
2. **Provide** a standby power source.
3. **Ensure** that portal-locking devices and electromagnetic locks comply with all UL-294 requirements.
4. **Evaluate** the equipment for use in a Pollution Degree 2 environment.
5. **Install** the equipment in accordance with national and local electrical codes.
   The installer should be a qualified technician.
6. **Install** the equipment in an indoor location.

This product is not intended for outside wiring as covered by Article 800 in the National Electrical Code, NFPA 70.

Category 5e cabling is the minimum performance category recommended.

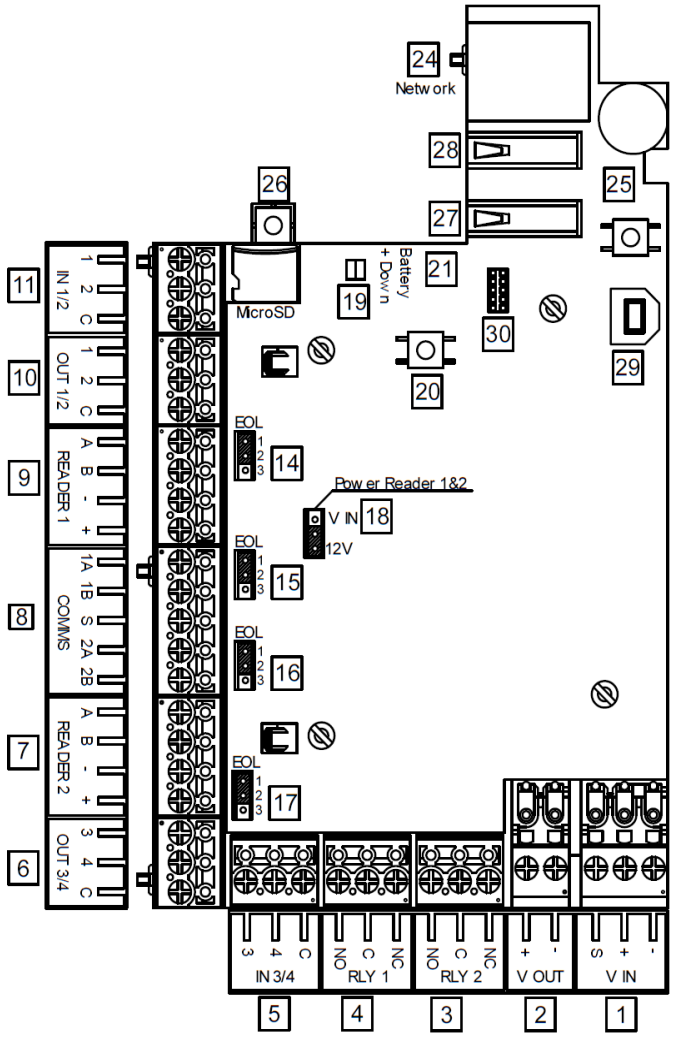
Compliance with IEEE 802.3 (at or af) specifications was not verified as part of UL 294/B.

NOTES:

MP02/VSRC-A Controller

The MP02 is an intelligent controller built by Mercury for DNA Fusion and SMS. For the purpose of this documentation will be referred to only as the MP02. The MP02 is capable of decision making, event reporting, and database storage. The MP02 is supports comunications to subcontrollers, allowing support for up to 64 doors/readers. The MP02 communicates with the host via on-board 10Base-TX Ethernet Port.

The MP02's two reader interface allows support for two openings. Both reader ports support readers that utilize TTL (D1/D0, Clock/Data), F/2F or 2-wire RS-485 electrical signalling (IE: OSDP readers). The controller also provides reader LED control (one-wire LED mode only). Two Form-C Relay outputs may be used for door strike control and alarm signalling. Four programmable inputs are provided for monitoring the door contracts, exit push buttons, and alarm contacts.



Installation

To install the MP02 controller:

1. If required, **mount** the MP02 in an Open Options or Life Safety Power enclosure.
2. **Wire** the network communication.
3. If applicable, **wire** the subcontroller communication
4. **Wire** on-board readers.
5. **Wire** the input and relay circuits.
6. **Wire** the power input.
7. **Configure** jumper settings. See page 2-63.
8. **Configure** the controller's initial IP address and network settings. See page 2-3 for more information.

Default Settings

Each MP02 board ships with the following default configuration.

- IP Addressing: DHCP
- DNS Name: “MAC” followed by the 12-character MAC address
- Physical Address: 0
- Data Security: TLS (if available), port 3001
- Default Gateway: 192.168.0.1
- DNS Server: 192.168.0.1
- Subnet Mask: 255.255.0.0
- Default Username: admin
- Default Password: password

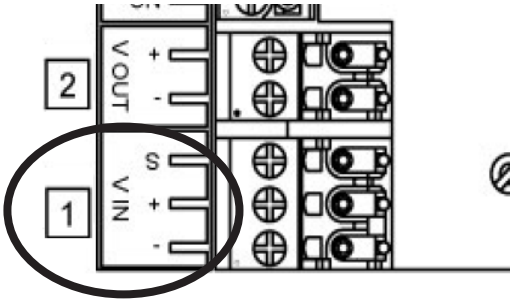
Security

When installing the MP02, ensure that the controller is installed in a secure manner. Upon installation, the user accounts to the web configuration page should be created with secure passwords. The MP02 is shipped with a default login account that is enabled when holding down the reset button (20). The default login user name and password will be available for five minutes once enabled. Ensure that at least one user account is defined. Open Options does not recommend configuring the IP address for the public intranet.

Power Supply

The MP02 requires 12 to 24 Vdc power. Local power source must be in close proximity to the MP02. A minimum of 18 AWG wire is recommended to connect the power supply to the controller. Connect the GND signal to the earth ground, to one location within the system.

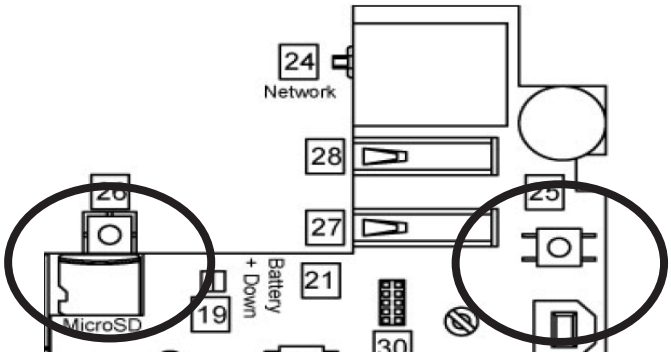
> *Multiple earth ground connections may cause loop problems and is not advised. Observe polarity on 12-24 Vdc input.*



POWER INPUT (1)		
V IN	Ground	-
	Input Voltage	+
	Shield (connect to chassis ground)	S

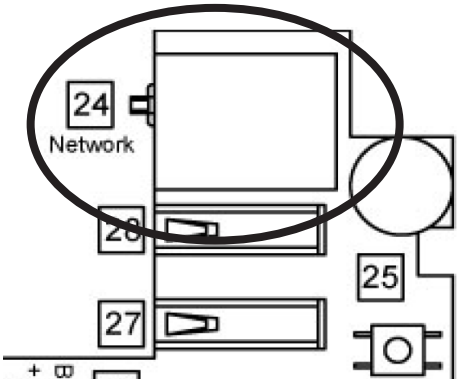
Alarm Inputs

There are two dedicated buttons for cabinet tamper monitoring. One tamper button (26) is located underneath the board that is meant to monitor the removal of the board from an enclosure. The second tamper button (25) is located adjacent to the USB ports (27 and 28) and is used for monitoring the when the enclosure is open.



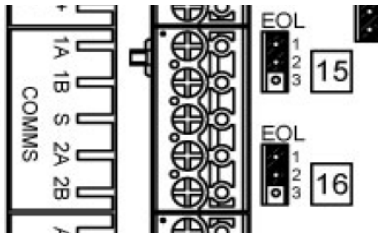
Host Communication Wiring

The MP02 controller communicates to the host via the on-board Ethernet 10-BaseT/100Base-Tx port (24).



Downstream Communication Wiring

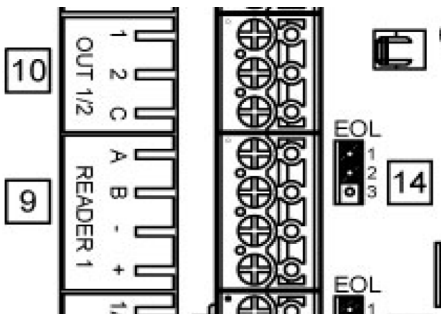
The RS-485 Communication port (8) is located between the Reader 1 port and the Reader 2 port. Channels 1A and 1B, and 2A and 2B, are 2-wire RS-485 interfaces that are used to connect additional I/O panels. The interface allows multi-drop communication on a single bus of up to 4,000 feet (1,219 m). Use 1-twisted pair, shielded cable, 120 ohm impedance, 18 AWG, 4,000 (1,219 m) maximum for communication.

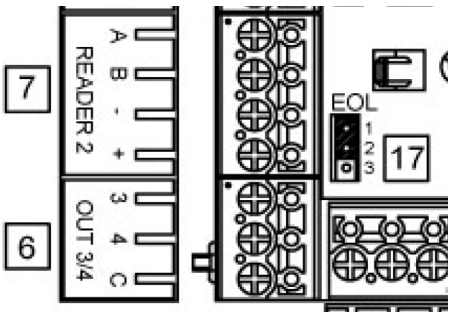


Install the termination jumper ONLY on the panel at each end of the RS-485 bus. Failure to do so will compromise the proper operation of the operation channel.

Reader Wiring

Reader 1 port (9) and Reader 2 port (7) support readers with D1/D0, Clock/Data, or 2-wire RS-485 signaling. Reader port configuration is set in DNA Fusion.

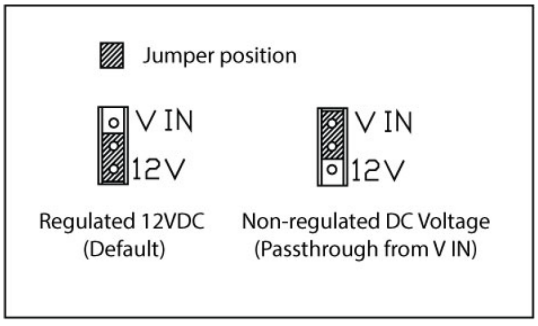




Power to the reader is selectable (18) by moving the jumper to 12V or V IN. If 12V is selected, input voltage must be greater than 20 Vdc to deliver voltage to the reader. If the jumper is set to V IN, input voltage is "passed-through" to the reader. Readers that require different voltage requirements should be powered separately. See reader manufacture specifications for cabling requirements. Do NOT terminate any RS-485 devices connected to the reader port.

*Install jumper in the 12V position **ONLY** if the input voltage is greater than 20 Vdc. Serious damage to the reader or the MP02 can occur if this jumper is set incorrectly. Check reader's manufacturer's voltage requirements.*

[18] - READER POWER VOLTAGE SELECTOR	
10-24VDC reader output voltage based on input voltage (V IN) and jumper 18 settings.	
12V	Regulated 12VDC to reader (Default) Minimum 20 VDC is required to be connected to the MP02 at [1] V IN in order to properly supply regulated 12VDC to reader
V IN	Non-regulated DC Voltage passed to reader DC Voltage connected to the MP02 at [1] V IN is not regulated and passed through to the reader



Reader Termination (14 & 17) jumpers are located next to the next to each reader port (9 & 7). Reader ports 1 and 2 will operate using CLK/Data or D0/D1 if the jumper is removed.

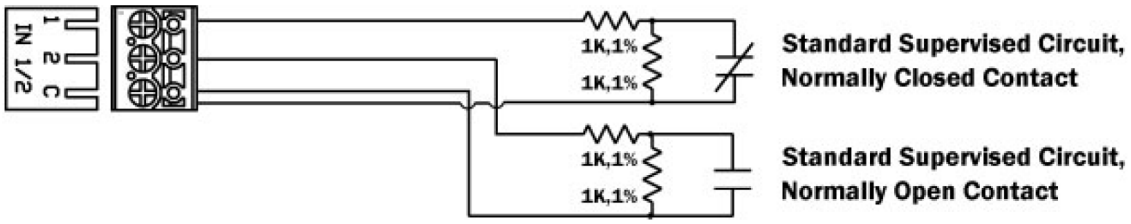
[14] & [17] - READER TERMINATION	
All EOL jumpers shown in default position Jumper on pins 1 & 2 will work as CLK/Data or D0/D1 with jumpers removed.	
[14]	Reader 1 termination settings
[17]	Reader 2 termination settings

Input Circuit Wiring

There are four inputs (11 and 5) that are used to monitor door position, REX (request to exit), or contact alarms. Input circuits can be configured to report as unsupervised or supervised. When unsupervised, reporting consists the open and close states of the door. 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 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 DNA Fusion.

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

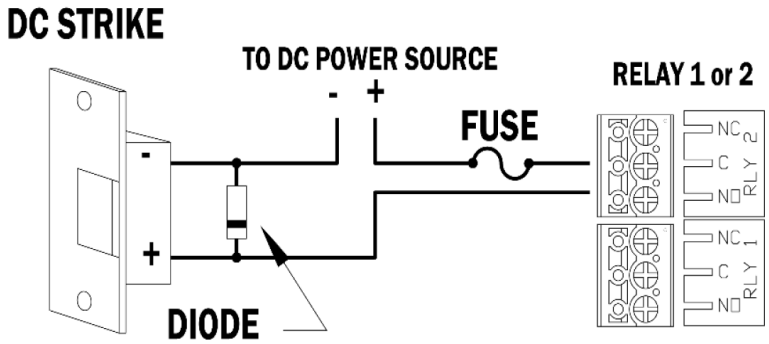
The input circuit wiring configurations shown are supported, but may not be typical:



Relay Circuit Wiring

Two relays (3 and 4) with Form-C contacts (dry) are provided for controlling door lock mechanisms or alarm signalling. Each relay has Common pole (C), a Normally Open pole (NO), and a Normally Closed pole (NC). When controlling the delivery of the power to the door strike, the Normally Open and Common poles are typically used. When momentarily removing power to unlock the door, as maglock, the Normally Closed and Common poles are typically used. Check with local building codes for proper egress door installation.

The 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 MP02. For this reason, a diode is recommended to protect the relay. See page 2-65 for wire gauge information.



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 Backup Battery

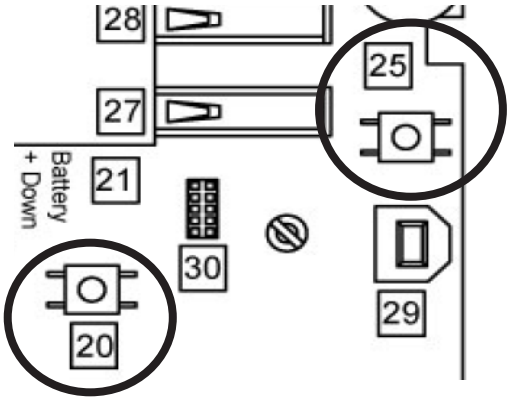
The static RAM and clock are backed up by a lithium battery when input power is removed. Open Options recommends replacing the battery annually. Remove the battery from the holder (21) and replace with a BR/CR2032 type battery.

Factory Reset

The Reset Button (20) on the MP02 is used for rebooting and powering down. The Tamper Button (25) is used with the Reset Button to perform default resets.

1. **Press** and **hold** the Tamper Button (25) and **press** Reset Button (20) 3 times. A one second beep follows.

   The MP02 defaults to DHCP if the network has a DHCP server, and will assign the MP02 an IP address. If the network doesn't have a DHCP server, the IP address will use a 169.XXX.X.XX IP range. See page 2-3 for configuring an IP address.



Reset to Default Settings

1. Using the MercZeroConfig tool, **locate** the MP02.
2. **Double-click** on the MP02.

   The Configuration Manger opens.

   - If needed**, press** the Tamper Button (25) two times to enable the default username and password.
3. Once logged in, **select** the Restore/Default tab.
4. **Select** the Restore Default button.

Controller Restart

To reset the board, **press** and **hold** the Reset Button (20) until the short beeps begin and continue to hold until after 10 short beeps followed by 2 long beeps. The controller will shut down and reboot. The configured network settings will be retained on reboot.

Controller Shutdown

Press and **hold** the Reset Button (20) until a short sequence of beeps begin and continue to hold until after 10 short beeps followed by 2 long beeps. The controller will power down. The configured network settings will remain unchanged on restart.

Hardware Setup

The MP02 controller is configured with multiple jumpers. The jumpers determine the interface of the ports and end-of-line termination (EOL). There are additional features on the MP02 that are reserved for future use.

Jumper and Port Settings

See MP02 diagram on page 2-57 for the location of the jumpers and ports.

Jumper(s)	Set At	Description
Reader Power Select (18)	12V	12 Vdc at Reader ports
	V IN	Power is "Passed through" to reader
Reader Termination (14 & 17)	1 & 2	Default Position
	2 & 3	EOL Termination
RS-485 Termination (15 & 16)	1 & 2	Default Position
	2 & 3	EOL Termination
Ethernet Connection (24)	N/A	10Base-T/100Base Ethernet Connection
USB Ports (27, 28, 29)	N/A	Reserved for future use
Console / Debugging Port (30)	Manufacturer Use Only	Used for debug and / or monitoring status of the MP02 controller

Terminal Block Connections

See MP02 diagram on page 2-57 for the location of the each terminal Block.

Terminal Block	Description	Connection(s)
V IN (1)	Ground	-
	Input Voltage	+
	SHIELD (connected to Chassis ground)	S
V OUT (2)	Ground	-
	Output Voltage	+
RLY 1 (4)	Normally Closed	NC
	Common	C
	Normally Open	NO
RLY 2 (3)	Normally Closed	NC
	Common	C
	Normally Open	NO
IN 1/2 (11)	Common	C
	Host-Defined Input 2	2
	Host-Defined Input 1	1
IN 3/4 (5)	Common	C
	Host-Defined Input 4	4
	Host-Defined Input 3	3
Reader 1 Port (9)	(CLK) DATA 0/GPI01	A
	(CLK) DATA 1/GPI02	B
	Ground	-
	Power	+

Terminal Block	Description	Connection(s)
OUT 1/2 (10)	Green LED	1
	Not Used	2
	Not Used	C
Reader 2 Port (7)	(CLK) DATA 0/GPI01	A
	(CLK) DATA 1/GPI02	B
	Ground	-
	Power	+
OUT 3/4 (6)	Green LED	1
	Not Used	2
	Not Used	C
RS-485 Communication (8)	Channel 1 - RS-485	1A
	Channel 1 - RS-485	1B
	Common Signal Ground	S
	Channel 2 - RS-485	2A
	Channel 2 - RS-485	2B

Status LED

The Status LED (19) indicates power to the board as well as host communications.

Additional Components

Component	Description
Reset Button (20)	Used to reset the controller or to revert to default settings. See page 6 for more information.
Tamper Button (25)	Used to alert if cabinet door is opened. May require additional connection
Underside Tamper Button (26)	Located underneath the board. Alerts if the board is removed from the mounted location or enclosure.

Specifications

The MP02 controller is used in low voltage, Class 2 circuits only. The installation of the MP02 must comply with fire and electrical codes.

Primary Power:	*Primary Power:*	12 to 24 Vdc ±, 560 mA max
	Current:	260 mA without on-board readers connected.
	Reader Ports:	180 mA per reader port
Memory and Clock backup:		3 V Lithium, type BR/CR2032
Ports:	*Primary (Ethernet) Port:*	10Base T/100Base-TX
	Downstream Port:	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:		Four unsupervised/supervised, standard EOL: 1K/1K ohm, 1%, 1/4 watt
Outputs:		2 relays, Form-C with dry contacts: 2 A @ 30 Vdc resistive
Reader Interface:	*Reader Power: (jumper selectable)*	12 Vdc ± 10% regulated, 180 mA max each reader (input voltage (1) must be greater than 20 Vdc) or 12 to 24 Vdc ± 10% (input voltage (1) passed through), 180 mA max
	Data Inputs:	TTL compatible 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: 2,000 ft (609.6 m)
	LED Output:	TTL levels, high > 3 V, Low < .5 V, 5 mA source/sink max
Wire Requirements:	*Power and Relays:*	1 twisted pair, 18 to 16 AWG
	Ethernet:	CAT-5 min
	Reader Data (TTL):	6-conductor, 18 AWG. 120 ohm impedance, shielded, 2,000 ft (1,219 m) max
	Reader Data (RS-485):	1 twisted pair, shielded. 24 AWG, 4,000 ft (1,219 m) max
	RS-485 I/O Devices:	1 twisted pair, shielded. 120 ohm impedance, 24 AWG, 4,000 ft (1,219 m) max
	Alarm Input:	1 twisted pair, 30 ohms max, typically 22 AWG @ 1,000 ft (304.8 m)
Mechanical:	*Dimension:*	3.5” (89 mm) W x 6” (152.4 mm) L x 0.75” (19 mm) H
	Weight:	4.8 oz (136 g) nominal, board only
Environmental:	*Temperature:*	-40 to 55 C
	Humidity:	0 to 95% RHNC

Specifications are subject to change without notice.

VSRC-A Specific Items:

When dealing with the SMS controller VSRC-A vs the DNA Fusion Controller MP02 the following items are different.

Working with a known IP Address:

1. Open Internet Explorer. If the Controller is new the Default IP address is as follows:

IP Address: 192.168.168.200

Subnet: 255.255.255.0

Otherwise in the internet explorer search bar type in the following with the default IP Address replaced with the current IP Address:

https://192.168.168.200/

2. Select “More info” and “Continue to this Website”.

3. Type in the boards Username and Password to access the software. It is important to note that the default username and password must be changed when fi rst logging into a new board:

Default Username: SMSAdmin
Default Password: SECAdmin1

5. Type in the desired “Board IP Settings” in the “Main Settings page” and “Save Main Settings”. Your board is now confi gured to the new IP Settings.

Dipswitch Settings:

Description	1	2	3	4
Use normal operating mode/Discoverable Onboard Web Server.	ON	OFF	OFF	OFF
Reserved for Future Use	OFF	ON	OFF	OFF
VSRC-A	OFF	OFF	OFF	OFF
VRCNX-A0	OFF	OFF	ON	ON
VRCNX-A1	OFF	OFF	OFF	ON
VCRNX-A2/A3	OFF	OFF	ON	ON

The Dipswitch’s on the VSRC-A are digital and can be set up in the Options menu once you have logged into the Board. Dip Switch 1 allows for the Graphic User Interface or GUI to be accessed through Internet Explorer and other similar windows. If turned off , the board will be inaccessable unless the following is done:

1. Press and Hold the Tamper Switch (25) AND Press and Release the Reset Button (20) 3 times in succession. Release the Tamper Switch (25) . A 1 second beep will be heard on the 2nd and 3rd Reset Button activations.

Releasing the Tamper Switch will generate a 2 second beep.

Access and log into the Confi guration Application within ten (10) minutes, select Options, and reset Dipswitch 1 = ON and click “Save Options” to reallow this feature permanently.

Factory Reset:

The Reset Button labeled 20 on the onboard mounted VSRC-A is used for Rebooting, Powering Down and Resetting, in conjunction with the Tamper Button 25 , the VRCNX-A as indicated below. The controller will produce 3 long beeps followed by a series of shorter beeps at a faster interval when depressed.

Reboot:

Press and Hold the backplane mounted VSRC-A Reset Button 20 until the short beeps begin and for nine (9) short beeps or less. The controller will shut down and reboot. The confi gured Network Settings (IP Address, etc.) will be retained on reboot.

Power Down:

Press and Hold the backplane mounted VSRC-A Reset Button 20 until the short beeps begin and continue to hold until after 10 short beeps followed by 2 long beeps. The controller will power down. The confi gured Network Settings (IP Address, etc.) will be retained on restart. Disconnect and reconnect power to restart the controller.

Reboot and Reset to Default IP Address:

Press and Hold the backplane mounted VSRC-A Reset Button 20 and Tamper Button 25 until the short beeps begin and for nine (9) short beeps or less. The controller will shut down and reboot. The confi gured Network Settings (IP Address, etc.) will be reset to the factory default (192.168.168.249) on reboot.

Power Down and Reset to Default IP Address:

Press and Hold the backplane mounted VSRC-A Reset Button 20 and Tamper Button 25 until the short beeps begin and continue to hold until after 10 short beeps followed by 2 long beeps. The controller will power down. The confi gured Network Settings (IP Address, etc.) will be reset to factory default (192.168.1686.249) on restart. Disconnect and reconnect power to restart the controller.

Mercury LP Series Controller Comparison

The following table provides a comparison overview for the LP Series controllers.

Controller Type	Memory	Cardholder Capacity	# of Sub-Controllers	# of Doors/ Readers	# of MR62e's	Host Ports	RS-485 Ports
LP2500	15 MB	600,000	64 (0-31 & 0-31)	64	32	2	2
LP1502	6 MB	240,000	32 (0-31)	2 On-Board / 64 Total	32	1	1
LP4502	96 MB	2,000,000	64 (0-31 & 0-31)	2 On-Board / 64 Total	32	1	2
LP1501 (DContr.)	6 MB	240,000	8 (RS-485)	1 On-Board / 17 Total	16	1	1
MP02/ VSRC-A	16 MB	600,000	64	2 On-board / 32 Total	32	1	2