

LP1502 Intelligent Controller

with Two Reader Interfaces

Installation and Specifications:

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

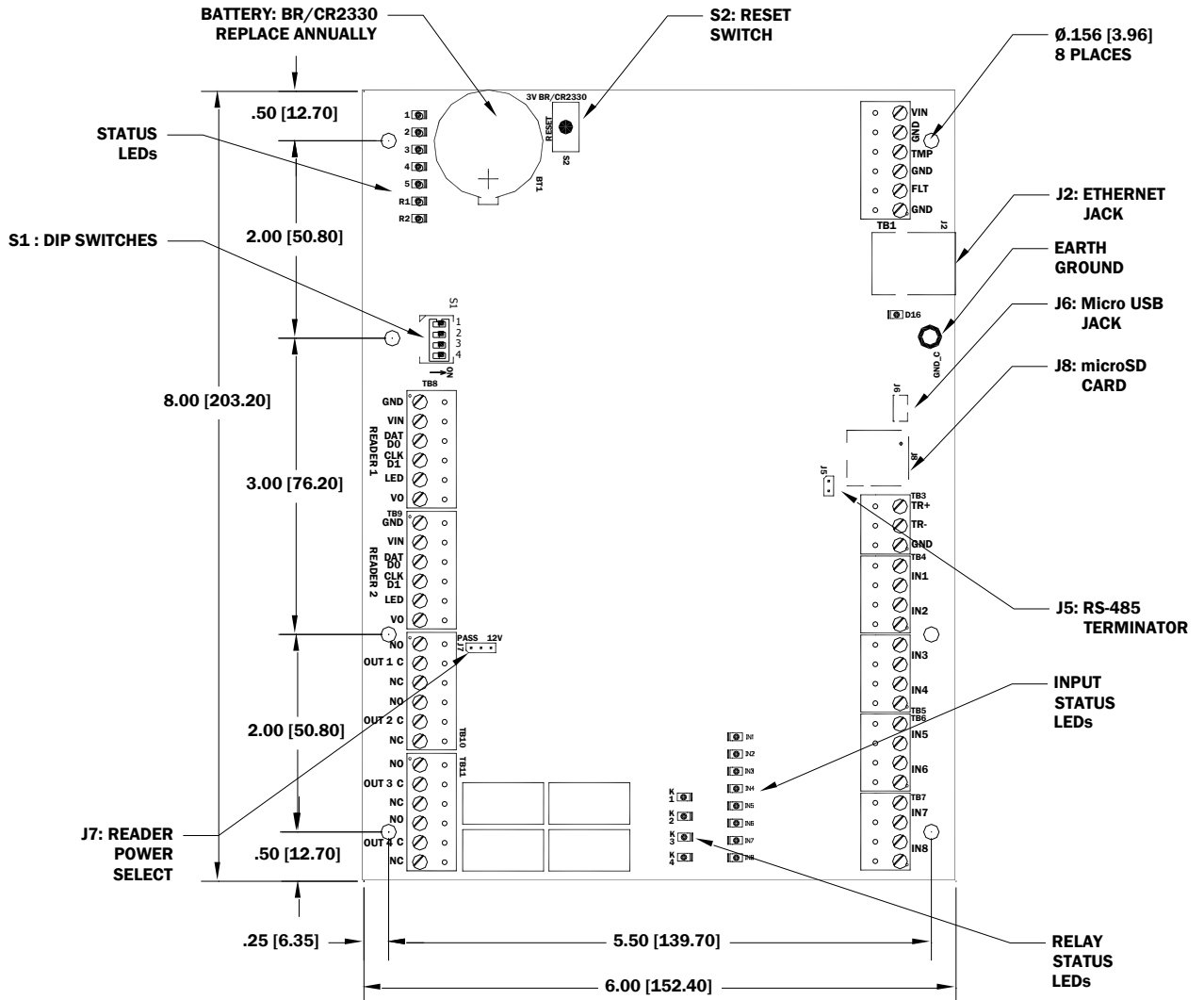
1. General:

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

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 can accommodate a reader that utilizes TTL (D1/D0, Clock/Data), F/2F (standard or supervised) or 2-wire RS-485 device signaling (OSDP reader for example) and also provides tri-state LED control, and buzzer control (one wire LED mode only). Four Form-C relay outputs may be used for door strike control or alarm signaling. Eight inputs are provided that may be used for monitoring the door contacts, exit push buttons and alarm contacts. Input circuits may be configured as unsupervised or supervised. The LP1502 requires 12 to 24 Vdc for power.

2. LP1502 Hardware:



LP1502 Layout

Information Subject to Change Without Notice

3. LP1502 Wiring and Setup:

CONNECTION		
TB1-1	Power Fault	GND
TB1-2	Input	FLT
TB1-3	Cabinet	GND
TB1-4	Tamper Input	TMP
TB1-5	Power Input	GND
TB1-6		VIN: 12 to 24 Vdc
TB2	N/A	Not Used
TB3-1	SIO Port (2-wire RS-485)	GND
TB3-2		TR- (B) See note 1
TB3-3		TR+ (A) See note 1
TB4-1	Input 2	IN2
TB4-2		IN2
TB4-3	Input 1	IN1
TB4-4		IN1
TB5-1	Input 4	IN4
TB5-2		IN4
TB5-3	Input 3	IN3
TB5-4		IN3
TB6-1	Input 6	IN6
TB6-2		IN6
TB6-3	Input 5	IN5
TB6-4		IN5
TB7-1	Input 8	IN8
TB7-2		IN8
TB7-3	Input 7	IN7
TB7-4		IN7

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

Note 1: Terms A & B are from the RS-485 standard

Jumpers and Jacks:

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

JUMPERS	SET AT	DESCRIPTION
J1	N/A	Factory Use Only
J2	N/A	10-Base-T/100Base-Tx Ethernet Connection (Port 0)
J3	N/A	Factory Use Only
J4	N/A	N/A
J5	OFF	RS-485 EOL Terminator is Off
	ON	RS-485 EOL Terminator is On
J6	N/A	Micro USB Port (2.0)
J7	Reader Power Select. See Note 2	
	12V	12 Vdc at Reader Ports
	PASS	VIN "Pass Through" to Reader Ports
J8	N/A	microSD Card



Note 2:


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

DIP Switches:

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

1	2	3	4	Definitions
OFF	OFF	OFF	OFF	Normal operating mode.
ON	X	OFF	OFF	After initialization, enable default User Name (admin) and Password (password). The switch is read on the fly, no need to re-boot. See IT Security section for additional information.
OFF	ON	OFF	OFF	Use factory default communication parameters.
ON	ON	OFF	OFF	Use OEM default communication parameters. Contact system manufacture for details. See Bulk Erase below.
ON	ON	OFF	OFF	Bulk Erase prompt mode at power up. See Bulk Erase below.
X	X	X	ON	Makes the LP1502 report and function like an EP1502. To be used in situations where the host software has not been updated to support the LP series product line.

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

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

Factory Default Communication Parameters:

Interface 1 (NIC1)

Network: static IP address: 192.168.0.251

Subnet Mask: 255.255.0.0

Default Gateway: 192.168.0.1

DNS Server: 192.168.0.1

Primary Host port: IP server, Data Security: TLS if Available, port 3001, communication address: 0

Alternate Host Port: Disabled

4. 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 LP1502 board to continuously reboot

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

Bulk Erase Steps: **Do not remove power during steps 1-8.**

1. Set S1 DIP switches to: 1 & 2 "ON", 3 & 4 "OFF".
2. Apply power to the LP1502 board. LED 1 on for about 15 seconds while LP1502 boots up.
3. After the LP1502 boots up, watch for LEDs 1 & 2 and 3 & 4 to alternately flash at a 0.5 second rate.
4. Within 10 seconds after the above pattern starts, change switches 1 or 2 to "OFF". If these switches are not changed, the LP1502 board will power up using the OEM default communication parameters.
5. LED 2 will flash indicating that the configuration memory is being erased.
6. Full memory erase takes up to 60 seconds, usually a lot less.
7. When complete, only LEDs 1 & 4 will flash for about 3 seconds.
8. The LP1502 board will complete its initialization in 2 seconds after LEDs 1 & 4 stop flashing.

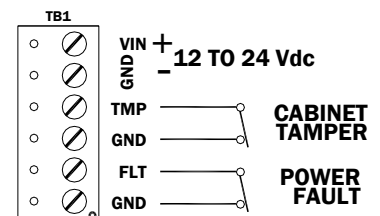
5. Input Power, Cabinet Tamper and UPS Fault Input Wiring:

The LP1502 requires 12 to 24 Vdc power. Locate power source as close to the unit as possible. Connect power with minimum of 18 AWG wire.

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

Observe POLARITY on 12 to 24 Vdc input!

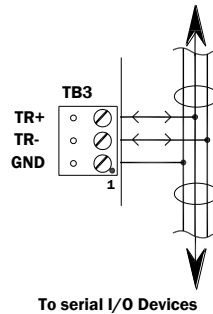
There are two dedicated inputs for cabinet tamper and UPS fault monitoring. Normal (safe) condition is a closed contact. If these inputs are not used, install a jumper wire.



6. Communication Wiring:

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

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



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

7. Reader Wiring:

Each reader port supports a reader with TTL (D1/D0, Clock/Data), F/2F (standard or supervised) or 2-wire RS-485 signaling (OSDP reader for example). Power to the readers is selectable: 12 Vdc (VIN must be greater than 20 Vdc), or power is passed-through (PASS) from the input voltage of the LP1502 (TB1-VIN), 300 mA maximum per reader port. Readers that require different voltage or have high current requirements must be powered separately. Refer to the reader manufacture specifications for cabling requirements. In the 2-wire LED mode the buzzer output is used to drive the second LED. Reader port configuration is set via the host software.

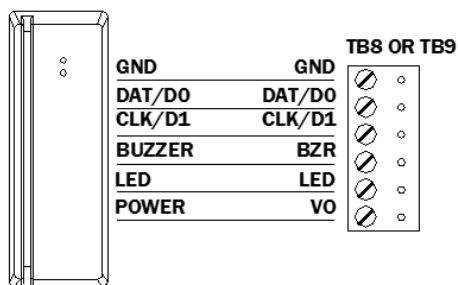
To fully utilize each reader port:

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

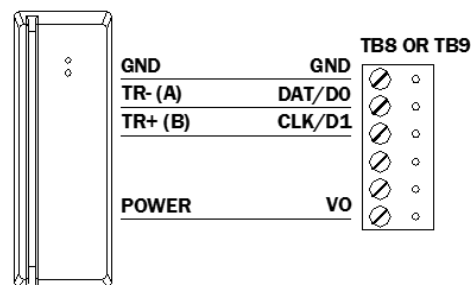
12V PASS	READER POWER
	12 Vdc IS AVAILABLE ON READER PORTS (VIN > 20 Vdc)
	VIN POWER IS "PASSED THROUGH" TO READER PORTS

J7 – Reader Power Select

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

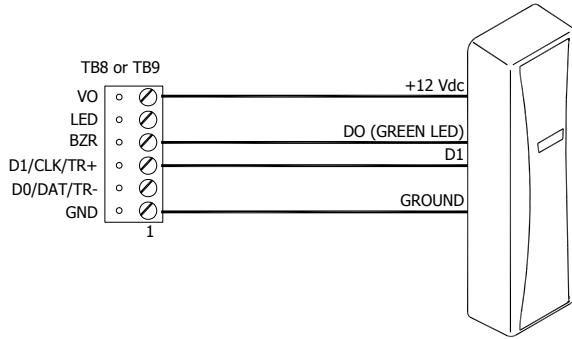


Typical D1/D0 or Clock/Data Reader

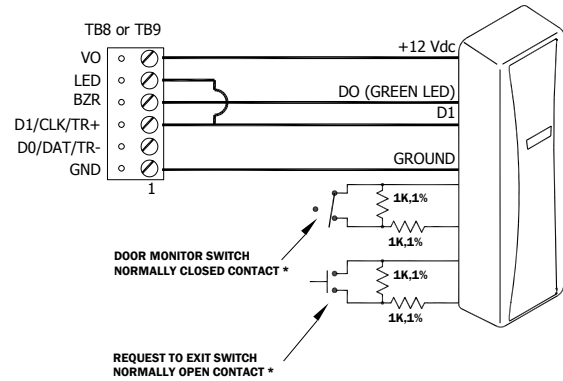


Typical 2-wire RS-485 Device
(OSDP Reader for Example)

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



Typical Unsupervised F/2F Reader



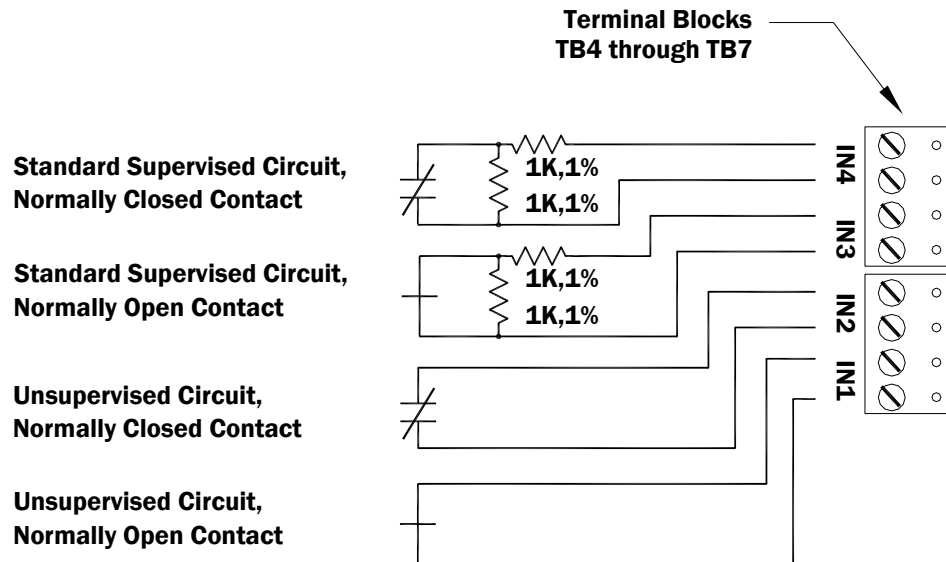
Typical Supervised F/2F Reader

⚠ Jumper D1 to LED on supervised F/2F readers

8. Input Circuit Wiring:

There are 8 inputs that are typically used to monitor door position, request to exit, or alarm contacts. Input circuits can be configured as unsupervised or supervised. When unsupervised, reporting consists of only the open or closed states. When configured as supervised, the input circuit will report not only open and closed, but also open circuit, shorted, grounded*, and foreign voltage*. A supervised input circuit requires two resistors be added to the circuit to facilitate proper reporting. The standard supervised circuit requires 1k ohm, 1% resistors and should be located as close to the sensor as possible. Custom end of line (EOL) resistances may be configured via the host software.

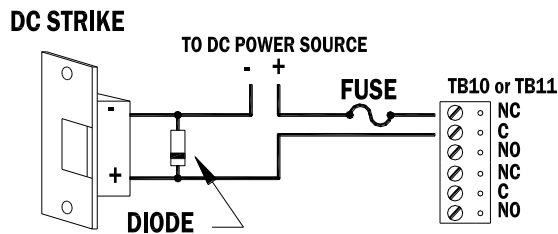
* Grounded and foreign voltage states are not a requirement of UL 294 and therefore not verified by UL
The input circuit wiring configurations shown are supported but may not be typical:



9. Relay Circuit Wiring:

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

Door lock mechanisms can generate feedback to the relay circuit that can cause damage and premature failure of the relay plus affect the operation of the LP1502. For this reason, it is recommended that a diode be used to protect the relay. Wire should be of sufficient gauge to avoid voltage loss.



Diode Selection:

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

10. Memory and Real Time Clock Backup Battery:

The static RAM and the real time clock are backed up by a lithium battery when input power is removed. This battery should be replaced annually. If data in the static RAM is determined to be corrupt after power up, all data, including flash memory, is considered invalid and is erased. All configuration data must be re-downloaded. Remove the insulator from the battery holder after installation. Battery type: BR2330 or CR2330.

11. IT Security

When installing the LP1502, it is important to ensure that it is done in a secure manner.

Upon installation, the user accounts to the web configuration page should be created with secure passwords, and that all DIP switches are in the off position for the normal operating mode. The LP1502 is shipped from the factory with a default login account, which is enabled when DIP 1 is moved from OFF to ON. The default login user name and password will be available for five minutes once enabled. Therefore, it is important that at least one user account is defined, and the DIP switches are set to OFF before the LP1502 is commissioned. It is also highly recommended not to configure the LP1502 with an IP address that is accessible from the public Internet.

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

12. Status LEDs:

Power-up: All LED's OFF.

Initialization: After power is applied or reset switch pushed, LED 1 is ON for about 15 seconds, then LED's 2, 3, 4, 5, 6, R1, R2, IN1, IN2, IN3, IN4, IN5, IN6, IN7 and IN8 are flashed once at the beginning of initialization. LEDs 3 and 4 is turned ON for approximately 1 second after the hardware initialization has completed, then the application code is initialized. The amount of time the application takes to initialize depends on the size of the database, about 1 second without a card database. Each 10,000 cards will add about 2 seconds to the application initialization. When LED's 1, 2, 3 and 4 flash at the same time, data is being read from or written to flash memory, do not cycle power when in this state. If the sequence stops or repeats, perform the bulk erase procedure, see section 4.

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

LED	DESCRIPTION
1	Off-Line / On-Line and Battery Status
	Off-Line = 20% ON, On-Line = 80% ON
	Double Flash if Battery is Low
2	Host Communication Activity (Ethernet or Micro USB port)
3	Internal SIO Communication Activity
4	External SIO Communication Activity
5	Unassigned
R1	Reader 1: Clock/Data or D1/D0 Mode: Flashes when Data is Received, Either Input F/2F Mode: Flashes when Data/Acknowledgment is Received RS-485 Mode: Flashes when Transmitting Data
R2	Reader 2: Clock/Data or D1/D0 Mode: Flashes when Data is Received, Either Input F/2F Mode: Flashes when Data/Acknowledgment is Received RS-485 Mode = Flashes when Transmitting Data
D16	Flashes with Ethernet Traffic
YEL	Ethernet Speed: OFF = 10Mb/S, ON = 100Mb/S
GRN	OFF = No Link, ON = Good Link, Flashing = Ethernet Activity
IN1	Input IN1 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
IN2	Input IN2 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
IN3	Input IN3 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
IN4	Input IN4 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
IN5	Input IN5 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
IN6	Input IN6 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
IN7	Input IN7 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
IN8	Input IN8 Status: OFF = Inactive, ON = Active, Flash = Fault. See Note 3.
K1	Relay K1: ON = Energized
K2	Relay K2: ON = Energized
K3	Relay K3: ON = Energized
K4	Relay K4: ON = Energized

Note 3: If this input is defined, every three seconds the LED is pulsed to its opposite state for 0.1 seconds, otherwise, the LED is off.

13. Specifications:

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

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

Primary Power: 12 to 24 Vdc \pm 10 %, 500 mA maximum (reader and USB ports not included)

Reader Ports: 600 mA maximum (add 600 mA to primary power current)

Micro USB Port: 5 Vdc, 500 mA maximum (add 270 mA to primary power current)

Memory and Clock

Backup Battery: 3 Volt Lithium, type BR2330 or CR2330

microSD Card: Format: microSD or microSDHC; 2GB to 8GB

Host Communication: Ethernet: 10-BaseT/100Base-TX and Micro USB port (2.0) with optional adapter: pluggable model USB2-OTGE100

Serial I/O Device: One each: 2-wire RS-485, 2,400 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit

Inputs: Eight unsupervised/supervised, standard EOL: 1k/1k ohm, 1%, ¼ watt
Two unsupervised dedicated for cabinet tamper and UPS fault monitoring

Outputs: Four relays, Form-C with dry contacts
Normally open contact (NO) contact: 5 A @ 30 Vdc resistive
Normally closed contact (NC) contact: 3 A @ 30 Vdc resistive

Reader Interface:

Power: 12 Vdc ± 10 % regulated, 300 mA maximum each reader
(jumper selectable) (input voltage (VIN) must be greater than 20 Vdc)
or
12 to 24 Vdc ± 10 % (input voltage (VIN) passed through), 300 mA maximum each reader

Data Inputs: TTL compatible, F/2F or 2-wire RS-485

RS-485 Mode: 9,600 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit. Maximum cable length: 2000 ft. (609.6 m)

LED Output: TTL levels, high>3 V, low<0.5 V, 5 mA source/sink maximum

Buzzer Output: Open collector, 12 Vdc open circuit maximum, 40 mA sink maximum

Cable requirements:

Power and Relays: 1 twisted pair, 18 to 16 AWG

Ethernet: CAT-5, minimum

RS-485:
(I/O Device Port): 1 twisted pair, shielded, 120 ohm impedance, 24 AWG, 4,000 ft. (1,219 m) max.
(Reader Port): 1 twisted pair, shielded, 120 ohm impedance, 24 AWG, 2,000 ft. (610 m) max.

Alarm Input: 1 twisted pair, 30 ohms maximum

Environmental:

Temperature: -55 to +85 °C, storage
0 to +70 °C, operating

Humidity: 5 to 95 % RHNC

Mechanical:

Dimension: 8 in. (203.2 mm) W x 6 in. (152.4 mm) L x 1 in. (25 mm) H

Weight: 9 oz. (255 g) nominal, board only

UL294, 6th edition Performance Levels:

<u>Feature</u>	<u>Level</u>
Standby Power	I
Endurance	IV
Line Security	I
Destructive Attack	I

These specifications are subject to change without notice.

Warranty

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

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

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

Liability

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