# MR52 READER INTERFACE

Series 3

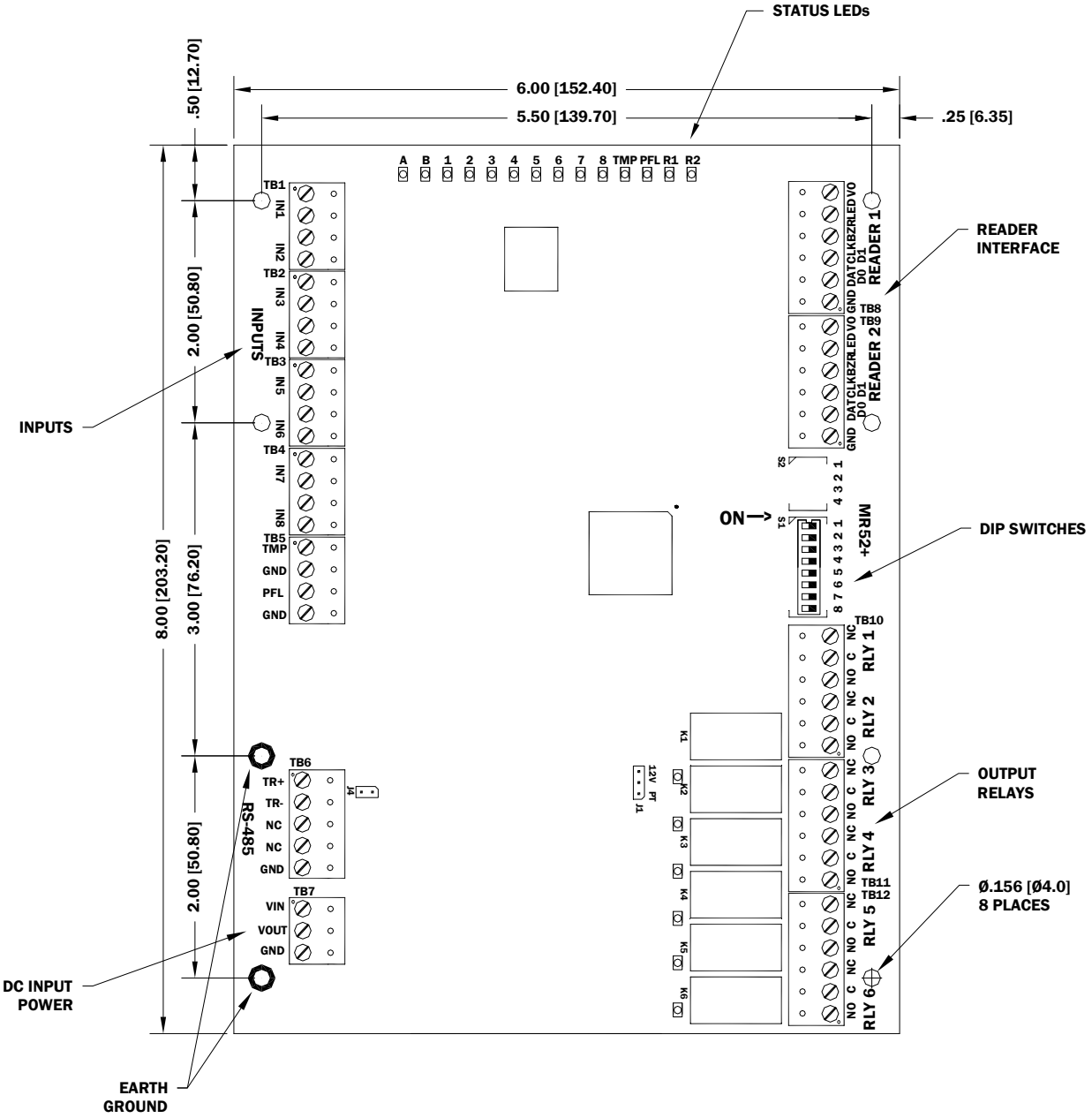
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Installation and Specifications:

## General:

The MR52 reader interface boards provide a solution to the OEM system integrator for interfacing to TTL (D1/D0, Clock/Data), F/2F, 2-wire RS-485 device and door hardware. The MR52 provides a tristate LED control and buzzer control. Six Form-C relay outputs may be used for strike control or alarm signaling. Eight inputs are provided that may be used for monitoring the door contact, request to exit push button and alarm contacts. Input circuits can be configured as unsupervised or supervised. The MR52 communicates to the controller via a 2-wire RS-485.

See the following figure for component location (some components shown are not present on the MR52).




Information Subject to Change Without Notice



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## Compatibility:

The MR52 is not functional unless it is connected to a controller board (refer to document T71-000-020 Rev. B for comprehensive installation instructions). The MR52 is compatible with the following AccessNsite UL Listed Commercial Proprietary Burglar Alarm and Access Control subassemblies:

- E2M — LifeSafety Power 20” x 16” x 4.5” Enclosure
- E4M — LifeSafety Power 24” x 20” x 6.5” Enclosure
- E8M — LifeSafety Power 36” x 30” x 6.5” Enclosure
- FPO75 — LifeSafety Power 6A/12V or 3A/24V 75W Power Supply
- FPO150 — LifeSafety Power 12A/12V or 6A/24V 150W Power Supply
- FPO250 — LifeSafety Power 20A/12V or 10A/24V 250W Power Supply
- C8P — LifeSafety Power, Power Controller Module
- D8P — LifeSafety Power, Power Distribution Module
- LP1501 — Mercury Intelligent Controller w/ One Access Point Interface
- LP1502 — Mercury Intelligent Controller w/ Two Access Point Interface
- LP2500 — Mercury Intelligent Controller
- LP4502 — Mercury High Capacity Intelligent Controller
- MRDT — Display Terminal
- MUX8 — Mercury 8/1 RS-485 Multiplexer

## Terminal Blocks:

| CONNECTION | | |
|---|---|---|
| TB1-1 | Input 1 | IN1 |
| TB1-2 | | IN1 |
| TB1-3 | Input 2 | IN2 |
| TB1-4 | | IN2 |
| TB2-1 | Input 3 | IN3 |
| TB2-2 | | IN3 |
| TB2-3 | Input 4 | IN4 |
| TB2-4 | | IN4 |
| TB3-1 | Input 5 | IN5 |
| TB3-2 | | IN5 |
| TB3-3 | Input 6 | IN6 |
| TB3-4 | | IN6 |
| TB4-1 | Input 7 | IN7 |
| TB4-2 | | IN7 |
| TB4-3 | Input 8 | IN8 |
| TB4-4 | | IN8 |
| TB5-1 | Tamper | TMP |
| TB5-2 | GND | GND |
| TB5-3 | Power Fault | PFL |
| TB5-4 | GND | GND |
| TB6-1 | RS-485 | TR+ |
| TB6-2 | | TR- |
| TB6-3 | | NC |
| TB6-4 | | NC |
| TB6-5 | | GND |
| TB7-1 | Power | VIN |
| TB7-2 | | VOUT |
| TB7-3 | | GND |

| CONNECTION | | |
|---|---|---|
| TB8-1 | Reader 1 | GND: Ground |
| TB8-2 | | DAT/D0/TR- (A) See note 1 |
| TB8-3 | | CLK/D1/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/TR- (A) See note 1 |
| TB9-3 | | CLK/D1/TR+ (B) See note 1 |
| TB9-4 | | BZR: Reader Buzzer |
| TB9-5 | | LED: Reader LED |
| TB9-6 | | VO: Reader Power |
| TB10-1 | RLY 2 | NO: Normally Open Contact |
| TB10-2 | | C: Common |
| TB10-3 | | NC: Normally Closed Contact |
| TB10-4 | RLY 1 | NO: Normally Open Contact |
| TB10-5 | | C: Common |
| TB10-6 | | NC: Normally Closed Contact |
| TB11-1 | RLY 4 | NO: Normally Open Contact |
| TB11-2 | | C: Common |
| TB11-3 | | NC: Normally Closed Contact |
| TB11-4 | RLY 3 | NO: Normally Open Contact |
| TB11-5 | | C: Common |
| TB11-6 | | NC: Normally Closed Contact |
| TB12-1 | RLY 6 | NO: Normally Open Contact |
| TB12-2 | | C: Common |
| TB12-3 | | NC: Normally Closed Contact |
| TB12-4 | RLY 5 | NO: Normally Open Contact |
| TB12-5 | | C: Common |
| TB12-6 | | NC: Normally Closed Contact |

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

## Jumper and DIP Switch Usage:

| JUMPER | DESCRIPTION |
|---|---|
| J1 | Reader Power Select |
| | 12V = 12 Vdc at reader ports. ***** See note below ***** |
| | PT = VIN "Passed Through" to reader ports |
| J4 | RS-485 Termination, install in first and last units only |
| | All other jumpers are for factory use only |

**NOTE:** The input power (VIN) must be 20 Vdc minimum if the 12 Vdc selection is to be used.

Switches 1 to 5 select the device address. Switch 6 and 7 select the communication baud rate. Switch 8 enables encrypted communication. All other configuration settings are set via host software.

| S8 | S7 | S6 | S5 | S4 | S3 | S2 | S1 | SELECTION |
|---|---|---|---|---|---|---|---|---|
| | | | OFF | OFF | OFF | OFF | OFF | Address 0 |
| | | | OFF | OFF | OFF | OFF | ON | Address 1 |
| | | | OFF | OFF | OFF | ON | OFF | Address 2 |
| | | | OFF | OFF | OFF | ON | ON | Address 3 |
| | | | OFF | OFF | ON | OFF | OFF | Address 4 |
| | | | OFF | OFF | ON | OFF | ON | Address 5 |
| | | | OFF | OFF | ON | ON | OFF | Address 6 |
| | | | OFF | OFF | ON | ON | ON | Address 7 |
| | | | OFF | ON | OFF | OFF | OFF | Address 8 |
| | | | OFF | ON | OFF | OFF | ON | Address 9 |
| | | | OFF | ON | OFF | ON | OFF | Address 10 |
| | | | OFF | ON | OFF | ON | ON | Address 11 |
| | | | OFF | ON | ON | OFF | OFF | Address 12 |
| | | | OFF | ON | ON | OFF | ON | Address 13 |
| | | | OFF | ON | ON | ON | OFF | Address 14 |
| | | | OFF | ON | ON | ON | ON | Address 15 |
| | | | ON | OFF | OFF | OFF | OFF | Address 16 |
| | | | ON | OFF | OFF | OFF | ON | Address 17 |
| | | | ON | OFF | OFF | ON | OFF | Address 18 |
| | | | ON | OFF | OFF | ON | ON | Address 19 |
| | | | ON | OFF | ON | OFF | OFF | Address 20 |
| | | | ON | OFF | ON | OFF | ON | Address 21 |
| | | | ON | OFF | ON | ON | OFF | Address 22 |
| | | | ON | OFF | ON | ON | ON | Address 23 |
| | | | ON | ON | OFF | OFF | OFF | Address 24 |
| | | | ON | ON | OFF | OFF | ON | Address 25 |
| | | | ON | ON | OFF | ON | OFF | Address 26 |
| | | | ON | ON | OFF | ON | ON | Address 27 |
| | | | ON | ON | ON | OFF | OFF | Address 28 |
| | | | ON | ON | ON | OFF | ON | Address 29 |
| | | | ON | ON | ON | ON | OFF | Address 30 |
| | | | ON | ON | ON | ON | ON | Address 31 |
| | OFF | OFF | | | | | | 115,200 BPS, See note 1 below. |
| | OFF | ON | | | | | | 9,600 BPS |
| | ON | OFF | | | | | | 19,200 BPS |
| | ON | ON | | | | | | 38,400 BPS |
| OFF | | | | | | | | Encrypted communication not required<br>See note 2 below. |
| ON | | | | | | | | Encrypted communication required<br>See note 2 below. |

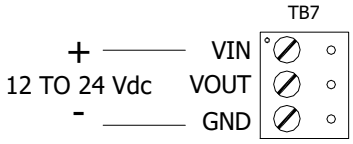
**Note 1:** Firmware revisions prior to 1.38.1, this setting is 2,400 BPS

**Note 2:** Firmware revisions prior to 1.38.1, SW8 is not defined. Set to the OFF position

## Board Installation and Power

A qualified service person, complying with all applicable codes, should perform all required hardware installation. For UL installations, install the unit in accordance with National Electrical Code NFPA 70. If installing in Canada, install the unit according to Part 1 of the Canadian Electrical code CSA C22.1. For UL installations, install the board in a UL 294/1076 listed enclosure. It is recommended that the MR52 be mounted 0.50" above any conductive surface. The MR52 accepts 12 to 24Vdc for power. The power source must be filtered. Locate the power source as close to the unit as possible. Connect power with a minimum of 18AWG wire. Keep a minimum of ¼" spacing between power limited outputs and non-power limited wiring. **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 the 12-24Vdc input.** The VOUT terminal on TB7 is the same as VIN.

**UL Note:** The MR52 module has been evaluated for use with the LifeSafety Power FPO75, FPO150, and FPO250 power supplies or any UL Listed Power Supply evaluated to UL 603 (Power Supplies for use with Burglar –Alarm Systems). It must be a UL Class 2 power supply of suitable ratings, with a minimum of 4 hours of standby power

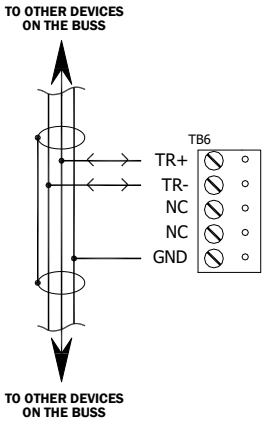



## Cable Routing and Connection

All low level input cables (reader cables, sensor input cables, controller communication cables, etc.) should be shielded and should preferably be run in grounded conduit or be run at least two feet from AC power, fluorescent lights, or other high energy sources. If conduit is used, do not run data cables in the same conduit as power cables.

## Communication Wiring (SIO Communication Port):

The MR52 communicates to a Mercury Security intelligent controller (LP2500 for example) via a half-duplex multi-drop 2-wire RS-485 interface. The total cable length is limited to 4,000 feet (1,219 meters). Use shielded twisted pair cable (minimum 24 AWG) with a drain wire and a characteristic impedance of 120 ohm. See specifications section. The last device on each end of the communication line should have the terminator installed (install jumper J4).



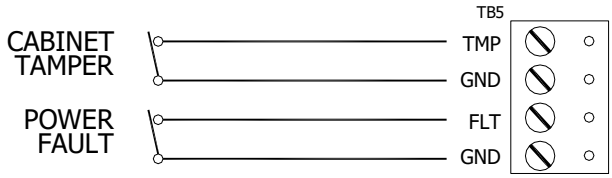

2-WIRE RS-485

(ONLY 2-WIRE RS-485 IS SUPPORTED)

## Cabinet Tamper and UPS Fault Input Wiring:

Inputs TMP and FLT are used for monitoring cabinet tamper and power failure, respectively, with normally closed contacts. These two inputs are for contact closure monitoring only and do not use EOL resistor(s). If these inputs are not used, install a short piece of wire at the input to indicate a safe condition.

For UL Applications a listed UL 634 Tamper Switch must be employed to monitor the door of the enclosure containing the MR52. Wire the tamper switch to the tamper input of the MR52.




## Reader Wiring:

Each reader port supports a reader with TTL (D1/D0, Clock/Data), F/2F, or 2-wire RS-485 signaling (OSDP reader for example). Power to the reader is selectable: 12 Vdc (VIN must be greater than 20 Vdc), or power is passed-through (PT) from the input voltage of the MR52 (TB7-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.

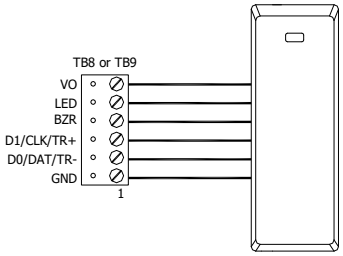
To fully utilize each reader port:

- 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)

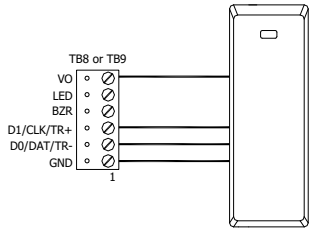
| 12V PT | READER POWER |
|---|---|
|  | 12 Vdc IS AVAILABLE ON READER PORTS (VIN>20 Vdc) |
|  | VIN POWER IS "PASSED THROUGH" TO READER PORTS |

**J1 – Reader Port Power Select**

If the input voltage to the MR52 is 12 Vdc, jumper J1 **MUST** be in the PT position.

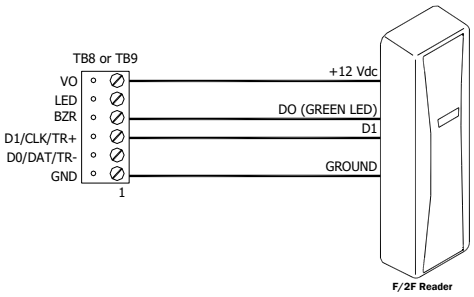



**Typical D1/D0 – Clock/Data Reader**

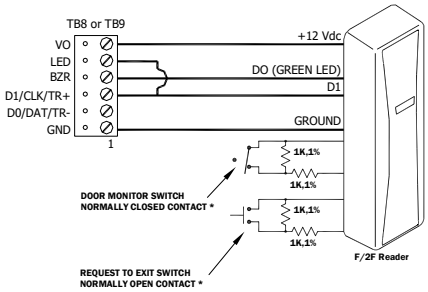



**Typical 2-Wire RS-485 Device**

* 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

## Input Circuit Wiring:

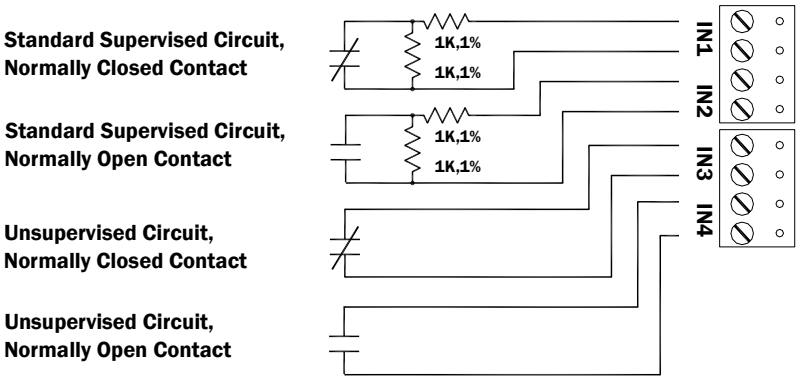
The MR52 offers eight inputs which are located on terminal blocks TB1 through TB4. Four of the inputs are typically used for door contact and Request-To-Exit (REX) monitoring for each door. The remaining inputs are often used for monitoring miscellaneous inputs such as motion detectors, panic switches, or door contacts that have no associated reader.

The inputs can be configured as unsupervised or supervised. When using unsupervised circuits, reporting consists of only the open or closed states. Supervised circuits are used to provide greater protection against circuit tampering. A supervised input circuit requires two end-of-line (EOL) 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. The resistor network provides a different input resistance to the MR52 board for four different possible circuit states. This is sometimes referred to as four-state supervision.

Consider the "Standard Supervised Circuit, Normally Open Contact" circuit shown in the figure below. When the monitored contact changes to the closed state, the MR52 board sees a 1k Ohm resistance because one of the resistors is shorted out. This would be reported by the access control system as the secure state. When the monitored contact opens, the MR52 board sees a 2k Ohm resistance because current then flows through both resistors. This would be reported by the access control system as an alarm condition. If someone were to tamper with the cable by shorting the wires somewhere between the resistor network and the MR52 board this would be reported by the access control system as a short circuit alarm condition. Finally, if someone were to tamper with the cable by cutting one or both of the wires somewhere between the resistor network and the MR52 board this would be reported by the access control system as an open circuit alarm condition. Two other conditions that can be reported are grounded*, and foreign voltage*.

Custom EOL resistances may be configured via the host software. For UL, circuits must be supervised using only 1k ohm, 1% listed accessory EOL resistors.

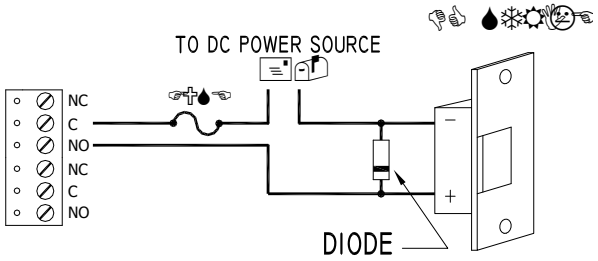
***** Grounded and foreign voltage states are not a requirement of UL 294 and therefore not verified by UL.



## Relay Circuit Wiring:

Six Form-C contact relays are provided for controlling door strikes or other devices. 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 a 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 electromagnetic feedback to the relay circuit that can cause damage and premature failure of the relay and affect the operation of the MR52. For this reason, it is recommended that either a diode be used to protect the relay when DC power for the lock or an MOV (metal oxide varistor) be used when using AC power for the lock. Locate the protection circuit as close to the load as possible (within 12 inches [30 cm]), as the effectiveness of the circuit will decrease if it is located further away. Wire should be of sufficient gauge to avoid voltage loss.




**DIODE SELECTION:**

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

**UL Note**: Door strike wiring has only been evaluated for DC strikes. AC strike wiring has not been evaluated by UL. The DC Source must be a UL Listed Power Supply evaluated to UL 603 (Power Supplies for use with Burglar –Alarm Systems). It must be a power limited power supply of suitable ratings, with a minimum of 4 hours of standby power. The relay shall be wired to enforce fail safe operation.

## Status LEDs:

Power-up: All LED's OFF

Initialization: Once power is applied, initialization of the module begins. When initialization is completed, LEDs A through R2 are briefly sequenced ON then OFF

Run time: After the above sequence, the LEDs have the following meanings:

**A LED**: Heartbeat and On-Line Status:
Off-line: 1 sec rate, 20 % **ON**
On-line: Non-encrypted communication: 1 sec rate, 80 % **ON**
Encrypted communication:
.1 sec **ON**, .1 sec **OFF**, .1 sec **ON**, .1 sec **OFF**, .1 sec **ON**, .1 sec **OFF**, .1 sec **ON**, .3 sec **OFF**

**A LED Error Indication:**
Waiting for application firmware to be downloaded: .1 sec **ON**, .1 sec **OFF**.

**B LED**: SIO Communication Port Status:
Indicates communication activity on the SIO communication port

**1 LED:** Input Status: IN1
**2 LED:** Input Status: IN2
**3 LED:** Input Status: IN3
**4 LED:** Input Status: IN4
**5 LED:** Input Status: IN5
**6 LED:** Input Status: IN6
**7 LED:** Input Status: IN7
**8 LED:** Input Status: IN8
**TMP:** Cabinet Tamper

**PFL:** Power Fault

Input in the inactive state: OFF (briefly flashes ON every 3 seconds)
Input in the active state: ON (briefly flashes OFF every 3 seconds)
Input in a trouble state: Rapid Flash

**R1** LED**:** reader port 1:
Clock/Data Mode: Flashes when data is received, either input
D1/D0 Mode: Flashes when data is received, either input
RS-485 Mode: Flashes when transmitting data
F/2F Mode: Flashes when data/acknowledgment is received

**R2** LED**:** reader port 2:
Clock/Data Mode: Flashes when data is received, either input
D1/D0 Mode: Flashes when data is received, either input
RS-485 Mode: Flashes when transmitting data
F/2F Mode: Flashes when data/acknowledgment is received

**K1** through **K6** LEDs**:** Illuminates when output relay RLY 1 (K1) through RLY 6 (K6) is energized.

Every three seconds, LEDs **A** through **R2** are pulsed to their opposite state for 0.1 sec.

## Specifications:

Revision D assembly:

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 ± 10 %, 550 mA maximum (reader current not included) |
| Outputs: | Six Form-C relays:<br>Normally open contact (NO) contact: 5 A @ 30 Vdc resistive<br>Normally closed contact (NC) contact: 3 A @ 30 Vdc resistive |
| Inputs: | Eight unsupervised/supervised, standard EOL: 1k/1k ohm, 1%, ¼ watt<br>Two unsupervised, dedicated for cabinet tamper and UPS fault monitoring |
| Reader Interface: | |
| Power:<br>(jumper selectable) | 12 Vdc ± 10 % regulated, 300 mA maximum each reader<br>(input voltage (VIN) must be greater than 20 Vdc)<br>or<br>12 to 24 Vdc ± 10 % (input voltage passed through), 300 mA maximum each reader |
| Data Inputs: | TTL compatible, F/2F or 2-wire RS-485 |
| LED Output: | TTL compatible, 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 |
| Communication: | 2-wire RS-485: 9600, 19200, 38400 or 115200 bps |
| Cable requirements: | |
| Power: | 1 twisted pair, 18 AWG |
| RS-485 I/O devices: | 1 twisted pair with drain wire and shield, 24 AWG, 120 ohm impedance, 4,000 feet (1,200 m) maximum |
| Alarm inputs: | One twisted pair per input, 30 ohms maximum |
| Outputs: | As required for the load |

| | |
|---|---|
| Reader data (TTL): | 6-conductor, 18 AWG, 500 feet (150 m) maximum |
| Reader data (F/2F): | 4-conductor, 18 AWG, 500 feet (150 m) maximum |
| Reader data (RS-485): | 1 twisted pair with drain wire and shield, 24 AWG, 120 ohm impedance, 2,000 feet (610 m) maximum |

Mechanical:

| | |
|---|---|
| Dimension: | 6 in. (15 2mm) W x 8 in. (203 mm) L x 1 in. (25 mm) H |
| Weight: | 11 oz. (312 g) nominal |

Environment:

| | |
|---|---|
| Temperature: | -55 to +85 °C, storage<br>0 to +70 °C, operating |
| Humidity: | 5 to 95 % RHNC |

UL294, 6th edition Performance Levels:

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

**Warranty**

AccessNsite warrants the product is free from defects in material and workmanship under normal use and service with proper maintenance for one year (30 days for repaired or replaced products) from the date of shipment. AccessNsite assumes no responsibility for products damaged by improper handling or installation. This warranty is limited to the repair or replacement of the defective unit. Returns must be accompanied by a Return Material Authorization (RMA) number obtained from customer service, and prepaid postage and insurance. AccessNsite's obligation under this warranty shall not arise until Buyer returns the defective product to AccessNsite's facility or another specified location.

There are no expressed warranties other than set forth herein. AccessNsite 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.

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