

## *Installation Guide*

**Version A0**  
**Document Part Number 8200- 1179-01**  
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### **OVERVIEW**

This guide provides installation and connection information for RM2-4000-PI26 and RM2L-4000-PI26 Readers.

### **NOTE**

The RM2-4000-PI26 reader model is UL294 approved and not UL1076 approved. The RM2L-4000-PI26 reader model is both UL294 and UL1076 approved.

### **Reader Models**

The RM readers provide an enclosed RM-4 board with multiple read heads. The readers include two separate read heads in their enclosure – a multi-technology read head positioned behind the right hand side of the reader, and a separate Indala prox read head located behind the keypad portion of the reader. The multi-technology read head will read both low frequency (125KHz) HID prox cards and high frequency (13.56 MHz) smart cards.

FIGURE 1. Reader Models



**TABLE 1.** Part Numbers

| Reader Model                                          | Part Number    |
|-------------------------------------------------------|----------------|
| With keypad; built-in RM-4 DS interface board         | RM2-4000-PI26  |
| With keypad and LCD; built-in RM-4 DS interface board | RM2L-4000-PI26 |

### Supported Technologies and Card Formats

The RM Multi-Technology reader can read three major card technologies – HID prox, Indala prox, and 13.56 MHz smart card. Specific card formats supported include ISO 14443 A/B serial number, ISO 15693 serial number, iCLASS® serial number, MIFARE encrypted sector, DESFire serial number, FIPS 201 PIV-II, and most 125 KHz formats (HID, Indala 26-bit and CASI ProxLite).

#### NOTES

- UL has not evaluated the ability to “flash” new card protocols or formats directly to the reader.
- The RM Multi-Technology reader can be used to transition from a proximity system to a more advanced smart card system gradually over time, or to maintain the existing proximity card system while moving selected personnel to smart cards.
- UL has not evaluated Smart Card technology with this unit.
- UL has evaluated the Wiegand Proximity (26-bit only) card format for this unit.

### Proximity (125 KHz) Formats Supported

**TABLE 2.** Proximity (125 KHz) Formats Supported

| Proximity (125 KHz) Formats Supported | As Shipped: Default Mode (On) |
|---------------------------------------|-------------------------------|
| HID® 26 Bit                           | Yes                           |
| HID® Corporate 1000                   | Yes                           |
| HID® 36 Bit Wiegand                   | Yes                           |
| HID® 37 Bit Wiegand                   | Yes                           |
| Other HID® Pass-through Formats       | Yes                           |
| Indala 26 Bit                         | Yes                           |
| Deister Prox SmartFrame®              | Yes                           |
| (GE) Casi Rusco ProxLite              | Yes                           |
| Kantech ioProx                        | No                            |

**NOTE** Not all features have been evaluated by UL.

### Smart Card (13.56 MHz) Formats Supported

**TABLE 3.** Smart Card (13.56 MHz) Formats Supported

| Smart Card (13.56 MHz) Formats Supported                                           | Enabled by Default?                 |
|------------------------------------------------------------------------------------|-------------------------------------|
| MiFARE® Sector                                                                     | No                                  |
| MiFARE® Serial number, 32 Bit                                                      | Yes                                 |
| MiFARE® Serial number, 56 Bit                                                      | Yes                                 |
| MiFARE® Plus Serial number, 56 Bit                                                 | Yes                                 |
| MiFARE® DesFire Serial number, 56 Bit                                              | No                                  |
| MiFARE® DesFire® EV1 Serial number, 56 Bit                                         | No                                  |
| iCLASS® ISO 15693 Serial number, 64 Bit                                            | Yes                                 |
| * PIV, TWIC, CAC, FASC-N Read                                                      | Yes* (200-bit output)               |
| * PIV-I, 128 Bit, GUID                                                             | Yes* (if 200-bit output is enabled) |
| * PIV-C, 128 Bit, GUID                                                             | Yes* (if 200-bit output is enabled) |
| * Refers to cards issued under the U.S. Government Smart Card Initiative, HSPD-12. |                                     |

**NOTE** Not all features have been evaluated by UL.

### FEATURES

- Universal compatibility with most 125 KHz Prox (including all HID® Prox formats and Indala 26-bit), all ISO 15693, and ISO 14443A credentials (badges, disk tags and key fobs). Reads both 125 KHz and 13.56 MHz credentials in the same reader.
- Electrical protection (reverse polarity diode protection on power lines).
- Data lines: high-speed transient voltage suppressor diodes.
- IP65-rated sealed electronics for deployment in both interior and exterior environments.
- Beep-on-card defaults to ON.
- PIV support – The reader supports a FASC-N read (low assurance read, 200-bit output) from all major PIV, TWIC and CAC cards, plus a 128-bit output from PIV-I and CIV cards.
- **MIFARE 7-byte CSN Support** - The reader firmware will be able to distinguish between a legacy MIFARE Classic card and a “next-generation” MIFARE classic card. The next generation MIFARE cards have a unique 7-byte serial number, not 4-byte. When presented to a reader, the next-gen card causes the reader to output a 56-bit CSN. Older cards still output a 32-bit CSN.

**NOTE** Not all features have been evaluated by UL.

### Controller Communications

- Wiegand
- Locally Flashable via RS485

### Open Standards Compliance

- ISO 14443A
- ISO 14443B
- ISO 15693

### Configure Using Program Card

- Pass-through - Default setting that allows the reader to send all data on the card.
- Fixed length - Reader can be configured to output a fixed length by padding or truncating data on the card.
  - ◆ (26-bit, 32-bit, 35-bit, 37-bit, 64-bit)
- CASI ProxLite
  - ◆ 44-bit pass-through
- MIFARE sectors
  - ◆ Select a sector (0-15)
  - ◆ Customize encryption keys
  - ◆ Specify data format (number of bits output)
  - ◆ Enable PIN-on Smart Card functionality
- FIPS 201 PIV-II
  - ◆ Customize FASC-N Weigand BCD output
    - 75-bit
    - 128-bit
    - 200-bit (default)
  - ◆ Customize the HMAC by changing the site key
  - ◆ Output HMAC
  - ◆ Output expiration date

## SPECIFICATIONS

| Specification                                         | Requirement                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Cable                                            | Recommended data cable is Belden #9841 or equivalent. The maximum length is 4000 feet (1212 meters) between the controller and the reader.                                                                                                                                    |
| Power Wiring                                          | Recommended power wiring is Belden #8461/8442 twisted pair. Maximum length depends on the wire gauge. Readers can be powered from a local power supply.                                                                                                                       |
| Temperature                                           | <ul style="list-style-type: none"> <li>Indoor: 32° F to 120° F (0° C to 49° C)</li> <li>Outdoor: -31° F to 151° F (-35° C to 66° C)</li> <li>Reader Display: 14° F to 151° F (-10° C to 66° C)</li> <li>Display with heater kit: -4° F to 151° F (-20° C to 66° C)</li> </ul> |
| Distance from P5 to the ARM-1                         | Maximum: 25 feet                                                                                                                                                                                                                                                              |
| Distance from P5 to the inputs                        | Maximum: 2000 feet                                                                                                                                                                                                                                                            |
| 1KW resistors for the NO and NC supervised inputs     | Locate as close as possible to the switch.                                                                                                                                                                                                                                    |
| Shielded, minimum 22 AWG stranded, twisted pair cable | Must be used to comply with UL.                                                                                                                                                                                                                                               |

## Power Requirements

- NOTES**
- Reader power to be supplied from **power limited** output of a Listed control unit or from a separately-supplied UL Listed, access control (**UL294**) or burglar alarm (**UL603**), power-limited **power** source with 4-hour standby capability.
  - Connection to the ARM-1 has not been evaluated by UL.

**TABLE 4.** Reader Power Supply Requirements

| Reader                                | Power Requirements: 12 VDC       |
|---------------------------------------|----------------------------------|
| RM2-4000-PI26<br>With Keypad          | 350 mA Max<br>Voltage Range: 12V |
| RM2L-4000-PI26<br>With Keypad and LCD | 350 mA Max<br>Voltage Range: 12V |
| Relay contact power limits            | Up to 30 VAC/DC, 3.3 A maximum   |

**INSTALLATION**

To Install the Reader:

1. Install the reader mount plate.
2. Wire the components.
3. Connect and ground the cable shields on the reader bus.  
(Refer to TAB 2010-15 “RM Reader ESD Protection Guidelines.”)
4. Set the reader address.
5. Install the ARM-1 relay boards (optional).
6. Install the heater kit (optional).
7. Mount the reader standard housing on the reader mount plate using the Software House security screwdriver (Part number 132-183).

**Install the RM Mount Plate**

Figure 2 shows the standard housing, mount plate, and gasket. The readers conform to the same housing, mount plate, and gasket dimensions.

FIGURE 2. Standard Housing and Mount Plate

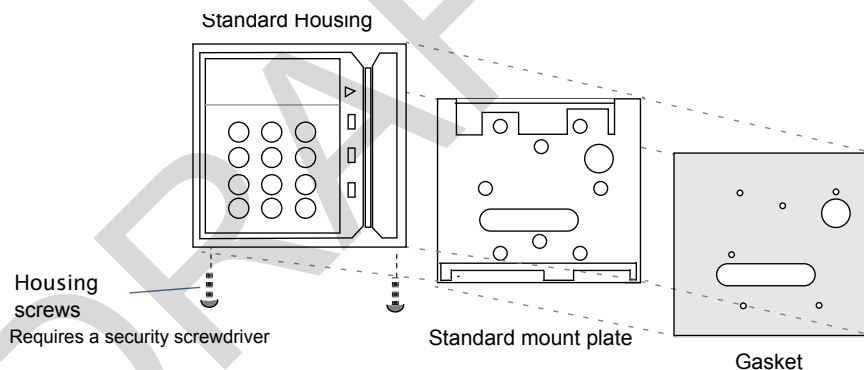
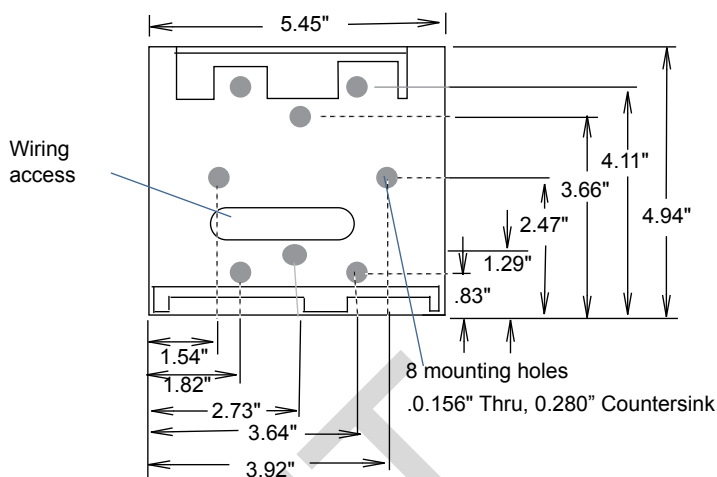


Figure 3 on page 7 shows the mount plate dimensions.

FIGURE 3. Mount Plate Dimensions



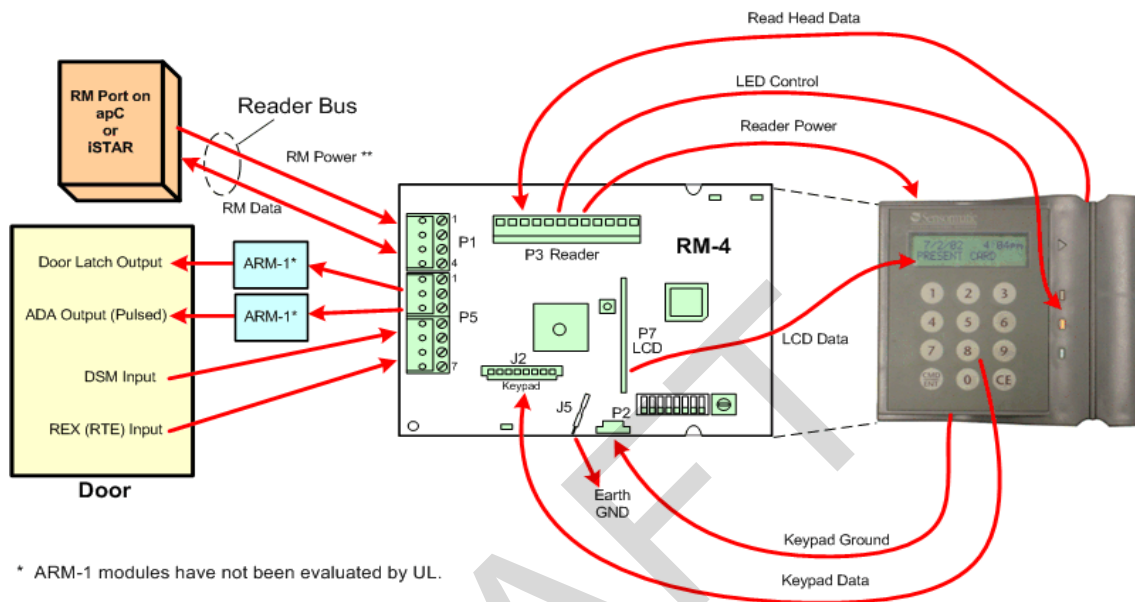
This device has been approved for outdoor use when properly installed with the RM Heater Kit Installation (P.N. 130-915) and the supplied gasket material. Position the gasket with the RM mount plate so that the mounting holes are properly aligned. Ensure that the gasket is placed between the mounting surface and mating surface of the RM mount plate. Fasten the RM mount plate to the mounting surface with the gasket material in between. Install the gasket so that no gaps or wrinkles are present.

The RM mount plate contains eight mounting holes. However, you do not have to use all eight holes; usually any four of the eight holes are adequate. The mounting holes are 0.156" and provide clearance for 6-32 flat head counter sunk bolts or screws.

## Wiring the Reader Components

Figure 4 shows reader connections.

FIGURE 4. Reader Connection



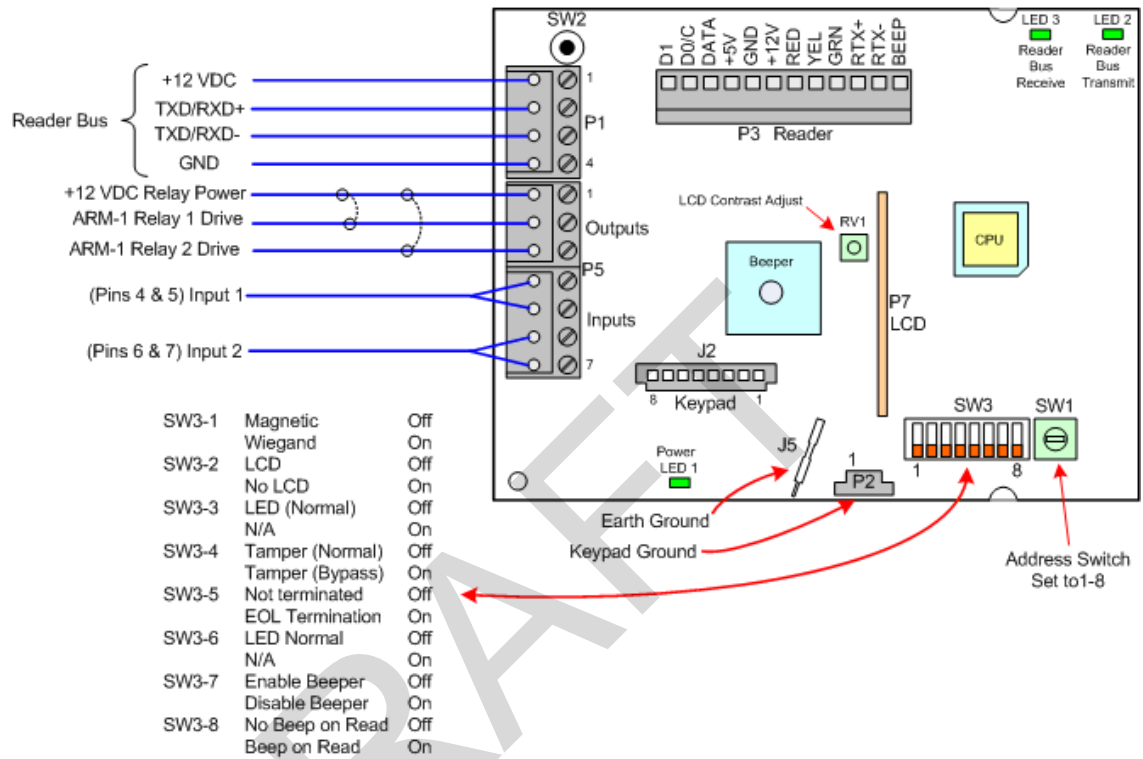
\* ARM-1 modules have not been evaluated by UL.

\*\* All interconnections shall not leave the protected premise.

**NOTE** UL has not evaluated the ARM-1.

**Wiring the Inputs, Outputs, Reader Bus** Figure 5 shows RM-4 P1 and P5 wiring.

FIGURE 5. RM-4 Wiring Requirements



#### NOTES

- SW3-7 and SW3-8 refer to the Beeper on the RM-4.
- P3 BEEP refers to the Beeper on the read head, if it exists. There is no Beeper on the reader read heads. Some third-party readers that are connected to a standalone reader have beepers.

#### SETTING UP THE READER

To Set Up the Reader:

- Set the Reader Address Switch, SW1 (a 16 position rotary switch, see Figure 5), to a number from one to eight. Each Reader along the bus must have a unique address.
- The SW3-1, SW3-2, SW3-3, and SW3-6 Configuration Switches are factory preset for the readers, as shown in Figure 5 on page 9.
- Note that you can override SW3-4, SW3-5, SW3-7 and SW3-8 if desired.



To properly terminate an RS-485 line, only the last unit on the bus should have SW3-5 in the On (closed) position.

## Grounding and Shielding

### Single RM Reader

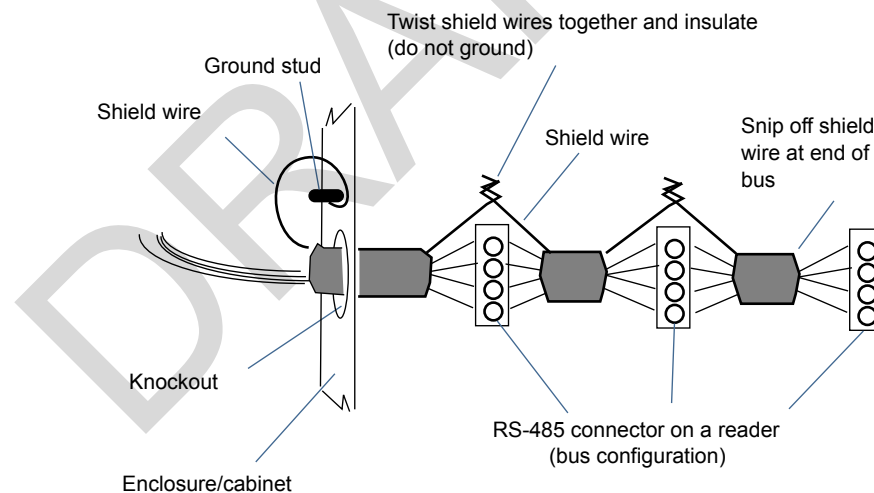
- When connecting a single RM reader to the reader bus, use twisted pair, shielded minimum 24 AWG cable. Attach the shield at the controller end. (Refer to TAB 2010-15 “RM Reader ESD Protection Guidelines.”)
- Attach a local earth ground (18 or 22 gauge) wire to the J5 component on the RM reader.

### Multiple RM Bus Devices

When wiring an RM reader to a bus with multiple devices, such as other RM-4s, I/8s, or R/8s:

- Attach the shields along the bus together (insulate each connection). Snip off the shield wire at the end of the bus, see [Figure 6](#).
- Attach the shield to the ground at only one point – at the ground stud inside the controller
- Attach a local earth ground (18 or 22 gauge) wire to the J5 component on the RM reader.

FIGURE 6. Reader Shield Wiring



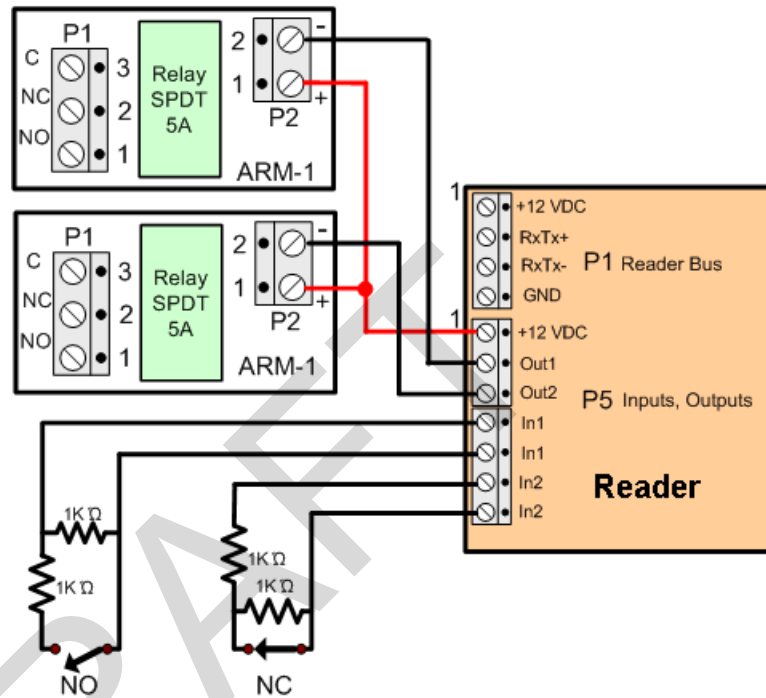
## Setting Module Address and EOL Termination

To set the module address, set SW1 (16 position rotary switch) to a number from one to eight. Every reader on a bus must have a unique address.

To set RS-485 EOL (End of Line) termination, set SW3-5 to the On (closed) position if the module is the last unit on the bus. If the module is not the last unit on the bus, SW3-5 should be Off (open).

Figure 7 shows how to connect ARM-1 relay modules to the reader outputs and how to wire NO (Normally Open) and NC (Normally Closed) supervised inputs.

FIGURE 7. Reader Input/Output Connections



### Installing the ARM-1 Relay Module

Two ARM-1 relay components can be connected to the reader through the P5 connector (Table 5).

- RM P5-1 is the common (+12 VDC) pin for either ARM-1.
- RM P5-2 is the output drive (GND) for the first relay.
- RM P5-3 is the output drive (GND) for the second relay.

TABLE 5. ARM-1 Wiring

| Module (131-192) | Wiring                                     |
|------------------|--------------------------------------------|
| ARM-1 Relay      | ARM P2-1 to RM P5-1<br>ARM P2-2 to RM P5-2 |
| ARM-2 Relay      | ARM P2-1 to RM P5-1<br>ARM P2-2 to RM P5-3 |

### Installing the Heater (optional)

The readers require a heater kit (Model C130-915) when installed outdoors in an environment where temperatures may drop below 40° F (5° C).

The Model **C130-915** heater kit contains the following parts:

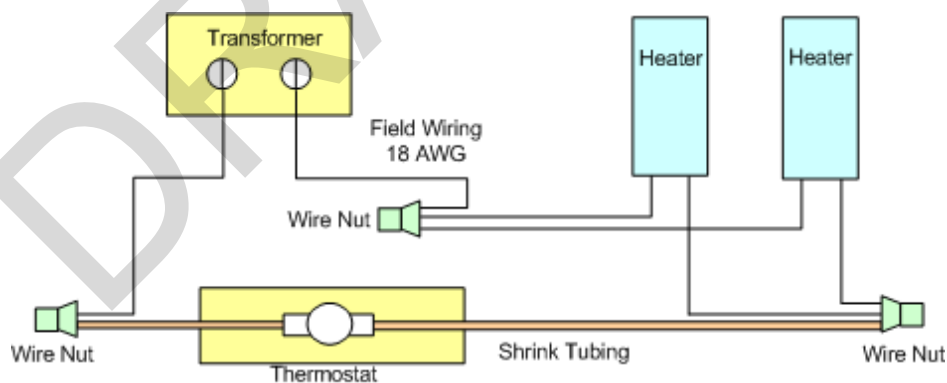
**TABLE 6.** Heater Parts

| Quantity | Description                                         |
|----------|-----------------------------------------------------|
| 1        | Transformer 12 VAC 40VA                             |
| 2        | Heater Strips                                       |
| 1        | Thermostat (turns on at 40 ° F)                     |
| 3        | Wire nuts                                           |
| 2        | 6-32 x 1/4" screws to mount thermostat to RM plate. |

Part number **C130-915A** is supplied without a transformer. A UL Listed Class 2 transformer rated output 12 VAC, 40 VA is required for proper installation.

Figure 8 shows how to wire the RM heater kit.

**FIGURE 8.** RM Heater Kit Wiring

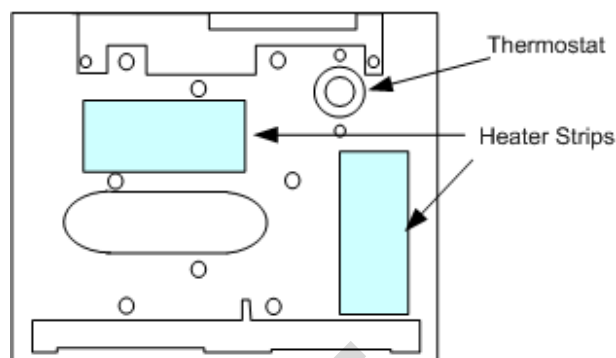


**Notes:**

- 1.) Heater strips are connected in parallel as shown.
- 2.) Install thermostat and all wire nut connections inside the junction box, as close to the mounting place as possible, not in reader housing.

Figure 9 on page 13 shows the location of the heater strips and thermostat on the RM mount plate.

FIGURE 9. RM Installation



### Applying Heater Strips

To Apply Heater Strips:

1. Clean the attachment surface of the RM mount plate with a solvent such as alcohol (use all required precautions when handling solvents).
2. Carefully remove the release film from the adhesive.
3. Locate the heater on the clean surface of the RM mount plate exactly as shown in Figure 9.
4. Gently roll the heater strip in place to remove air bubbles.
5. For maximum adhesion, do not apply pressure to the heater strips for 72 hours.

**NOTE** Air gaps or bubbles under the heater cause localized overheating and possible heater burnout. Also, application of adhesives at temperatures below 50° F is not recommended.

### Installing the Thermostat

To Install the Thermostat:

1. Fasten the thermostat to the RM mount plate with the body of the device facing the junction box and the face sitting flat against the RM mount plate surface.
2. With the back (or outside) surface facing up, align the thermostat such that the screw holes of the thermostat allow for the 6-32 x 1/4" screws to secure the device to the RM mount plate.
3. Use two (Quantity 2) 6-32 x 1/4" screws to mount the thermostat to the RM mount Plate. Tighten the screws allowing the thermostat to be sufficiently secured to the RM mount plate. Do not over tighten the screws.

## TESTING READERS

To Test the Readers:

1. Properly configure Readers, Inputs, and Outputs using the C•CURE Administration application and put the reader Online.

2. Measure the supply voltage to the reader.

The voltage can be measured between pin 1 (+12 VDC supply) and pin 4 (ground) on the P4 connector. The voltage must be +12 VDC (+/-5%).

3. Check the reader address setting.

The reader must be set to an *unused* address, between 1 and 8, when connected to the apC or iSTAR. Use rotary switch SW1 to set the reader address.

4. Check the reader for communications to the controller by observing LED2 and LED3. (RM2L-4000-PI26 only)

5. Check the supervised inputs. Configure the inputs on the controller using the C•CURE Administration application.

With no switches or resistors connected to the supervised input 1 and 2 lines, the C•CURE Monitoring application should report inputs as “Open Loop”. When you connect the 1,000-ohm resistor to the input terminals, the C•CURE Monitoring application should report that the input as “Deactivated”. Supervised inputs #1 is found at pins 4 and 5 of P5. Supervised input #2 is found at pins 6 and 7 of P5.

6. Check the outputs.

The outputs can be functionally tested by using the “momentary activate” feature in the C•CURE Monitoring application. When the outputs are momentarily activated, the signal will change state for a few seconds.

An RM2L-4000-PI26 and RM2L-NH can be used in area/partition for signal acknowledgement.

7. Check the reader interface.

The reader interface can only be tested by presenting a card with the appropriate technology to the reader. Reading a card will cause the display to show “Access Granted” or “Access Denied,” depending on the clearance of the card.

## CONFIGURATION NOTES

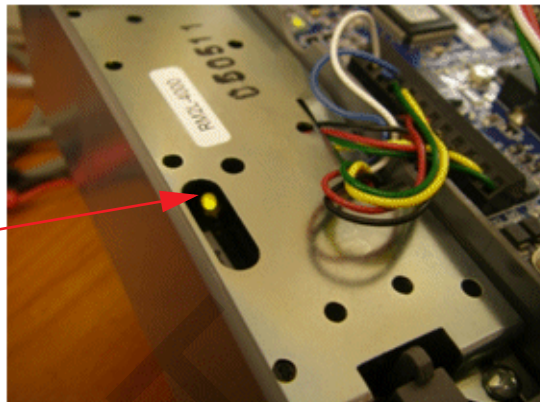
The change to the default reader settings requires the use of special program cards that are available from the Software House Applications Department. Program cards are used to set a specific MIFARE read key and change other settings including card technologies to be read.

To Program a Card Reader:

1. Power cycle the reader.
2. Present the .INI card. The reader’s internal amber LED turns off within the read head compartment to indicate the reader is ready for the first program card.
3. Present the first program card. The amber LED turns on solid.

4. If there are more program cards, repeat steps 2 and 3 until you have presented the necessary number of program cards.
5. The reader is configured for the specified option(s) and is ready for use.

Amber LED

**Flash Upgrade**

For information about upgrading the firmware revision, refer to the PDF document entitled *SWH Readers Download Firmware to Reader* posted on the Software House Member Center.

## Compliance

| Specification                  | Description                                   |                       |
|--------------------------------|-----------------------------------------------|-----------------------|
| UL294 5 <sup>th</sup> Edition  | Access Control System                         | USA                   |
| UL1076 5 <sup>th</sup> Edition | Proprietary Alarm Units                       | USA                   |
| IEC60950-1                     | ITE – Safety                                  | International         |
| EN60950                        | ITE – Safety                                  | EU                    |
| EN55022-:2010                  | ITE – Radio Disturbance Characteristics       | EU                    |
| EN55024                        | ITE – Immunity Characteristics                | EU                    |
| EN50130-4:2011<br>IEC 62599-2  | Alarm systems – Electromagnetic Compatibility | EU                    |
| RoHS                           | Restriction of hazardous substances           | EU                    |
| FCC 47 CFR part 15             | FCC – unintentional transmitter               | USA - Class A         |
| ICES-003/NMB-003 Issue 5       | Canada – unintentional transmitter            | Canada - Class A      |
| AS/NZS CISPR 22:2009           | ITE – Radio Disturbance Characteristics       | Australia/New Zealand |

### Canadian Radio Emissions Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

### United States

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the device is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

**CAUTION:** Equipment changes or modifications without the approval of the party responsible for compliance could void the user's authority to operate the equipment and could create a hazardous condition.

## UL Listing

The following requirements must be adhered to:

- RM2L-4000-PI26 and RM2-4000-PI26 readers are Underwriters Laboratories Inc. (UL) Listed to Standard UL 294, Access Control System Units.
- RM2L-4000-PI26 reader is Underwriters Laboratories Inc. (UL1076).
- The RM2-4000-PI26 and the RM2L-4000-PI26 readers installed in accordance with the National Electric Code (ANSI/NFPA 70) or the Canadian Electric Code as required by local authorities.
- When purchased modularly, the reader module assembly is only for field replacement in the RM housing.

## Important Safety Information



### LIFE SAFETY REQUIREMENT:

- A fail-safe mechanism override must be installed at each card reader exit to allow people to leave the secure area in case of electromechanical device failure.



### 2002/96/EC (WEEE directive):

- Products marked with this symbol cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling, return this product to your local supplier upon the purchase of equivalent new equipment, or dispose of it at designated collection points.

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