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# **Models 440/445 Magnetic Stripe Readers Installation Guide**

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# Introduction

This manual is an installation guide for the Model 440/445 Magnetic Stripe Reader. The Model 440/445 readers offers state of the art architecture combined with a compact, aesthetically pleasing design. The Model 440/445 Reader uses F/2F magnetic stripe technology (ANSI Standard). The Model 445 features a tactile keypad to allow for rapid Personal Identification Number (PIN) entry for applications where PIN entry capabilities are required. The Model 440 is a reader-only unit (no keypad).

**Related Installation and Hardware Manuals:** Micro/2 Installation Guide, Micro/4-P Installation Manual, and Micro/5 Installation Guide.

## Product Features

- Weather resistant for outdoor use.
- Built-in intelligence which allows communication with the microcontroller.
- The reader communicates with the microcontroller via a supervised F/2F bi-directional data link which carries keypad data, magnetic stripe data, command responses, tamper switch status messages, and supervision messages to the microcontroller.
- For Micro/4 installations, an optional relay terminal function (RTF) card is available. The RTF card provides door strike and horn activation circuits, a terminal strip, and fuse.
- Communication between the reader and microcontroller is available over long distances (up to 2000 feet) which allows for system flexibility.
- LED indicators provide visual display of reader status.

## Technical Specifications

**Operating Temperature Range:** -30 to 70 degrees C. (-22 to 158 degrees F.).

**Humidity Range:** 0% to 80%, non-condensing

**Power Supply:** 12 V DC at 70 mA, 130 mA maximum

**Physical Dimensions:** 4.475" (H) X 4.475" (W) X 2.13" (D) with relay board, and 1.4" (D) without relay board.

**Color:** Light grey

**Maximum Cabling Distance:** 2,000 feet from reader to microcontroller.

# Functional Specifications

**Product Operation:** A magnetic read head detects patterns on a magnetic stripe card when the stripe is passed across it. The CASI-RUSCO system database then converts these patterns to binary numbers and verifies access authority.

**Application:** Intended for areas requiring a moderately high level of security for controlled access.

**Compatibility:** This reader interfaces to CASI-RUSCO Picture Perfect™ systems using the Micro/2/4 or Micro/5 Controllers and to Entry Perfect™ systems using Micro/2 or Micro/5 Controllers.

**Reader Technology Type:** CASI RUSCO Supervised F/2F magnetic stripe technology

**Reader Components:**

Model 440, P/N 430081501 .....Model 445, P/N 430081001

**Badge Formats:** 10 digit

**EPROM:** The Micro/2/4 Controller uses in the 8RP board: EPROM P/N 580196XXX (for 10 digit badges) or 580197xxx (for 12 digit badges). Obtain the latest revision. The Micro/5 Controller uses Flash EPROM P/N (depends on host software used).

**Mounting:** The reader is supplied with a back plate that mounts to a standard electrical double gang box, secured with two security screws. Sealing gaskets are provided between the reader and the wall. You must provide an environmental enclosure to ensure optimal protection from direct rain or ice. An optional back box for mounting on a solid wall can be ordered. A hex tamper key tool must be purchased to install the reader. A tool must be ordered using P/N 385001001.

**Appearance:** Sturdy light grey cast aluminum cover mounted on wall surface.

**Indicators:** Red LED indicates door strike closed, green LED indicates door strike open (valid badge read), and yellow LED is a signal to enter a PIN number.

**Micro/4 Relay Terminal Function Card (Optional):**

- Normally open type solid state relay.
- Maximum surge current 20A
- Maximum voltage +24V DC
- Maximum hold current 2A

# Parts List

Model 440 Magnetic Stripe Reader without Keypad .....	P/N 430081501
Model 445 Magnetic Stripe Reader with Keypad .....	P/N 430081001
Micro/4 Relay Terminal Function Card Kit (Optional) ....	P/N 520103001*
Back Box .....	P/N 470336502*
Hex Tamper Key.....	P/N 385001001*

\*Items marked with an asterisk (\*) can be ordered as spares or as replacement parts.

# Installing the Reader

The Model 440/445 can be mounted with a user-supplied double gang box or on a solid wall with a back box. In either case, a gasket is supplied with the reader to form a seal between the mounting plate of the reader and the mounting surface. The reader must be mounted within 2,000 feet of the microcontroller. Follow the steps below to install the reader.

1. Remove the mounting plate from the back of the reader. Attach the grounding screw to proper earth ground.
2. If this is the first reader on the door, install a relay board to the reader using kit, P/N 520103001. See [Figure 1, "Installation Diagram - Solid State Relay Kit"](#) on page 5. If this is the second reader on the door, a second relay card is not necessary.

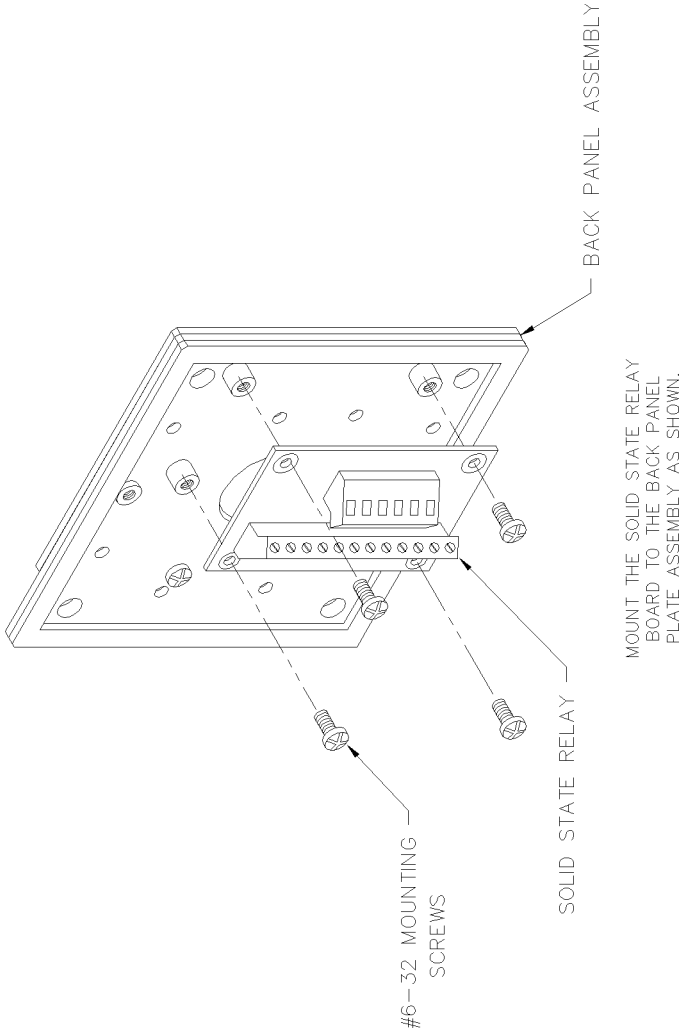
3. **For surface mounting to an interior/exterior double gang electrical box:** refer to [Figure 2, "Model 440/445 Gang Box Installation Diagram"](#) for mounting instructions.

**For solid wall mounting with a back box:** refer to [Figure 3, "Model 440/445 Back Box Installation Diagram"](#) and follow the steps below.

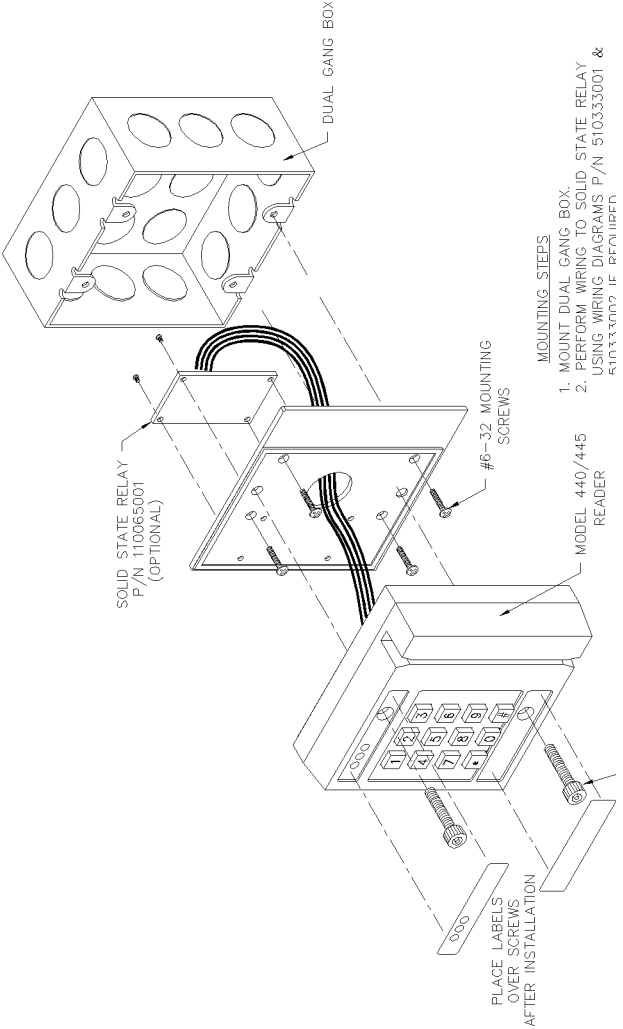
- a. Install conduit (3/4" diameter) and mount the back box to a wall in an appropriate location. Route the wires through conduit to the back box.
- b. Mount the reader mounting plate and gasket assembly to the back box using four (4) #6-32 mounting screws.
- c. Pull wires from the back box through the center hole of the mounting plate and gasket assembly and make connections to the reader. See [Figure 4, "Model 440/445 Reader w/Micro/4 Relay Terminal Function \(RTF\) Card"](#) on page 8 and [Figure 5, "Model 440/445 Reader w/External Relay to Microcontroller,"](#) on page 10.
- d. Push the wires back through the center hole of the mounting plate. Secure the reader to the mounting plate using the two tamper proof screws and the installation tool (P/N 385001001).
- e. Apply labels over the tamper proof screw heads as shown in [Figure 2](#) and [Figure 3](#).



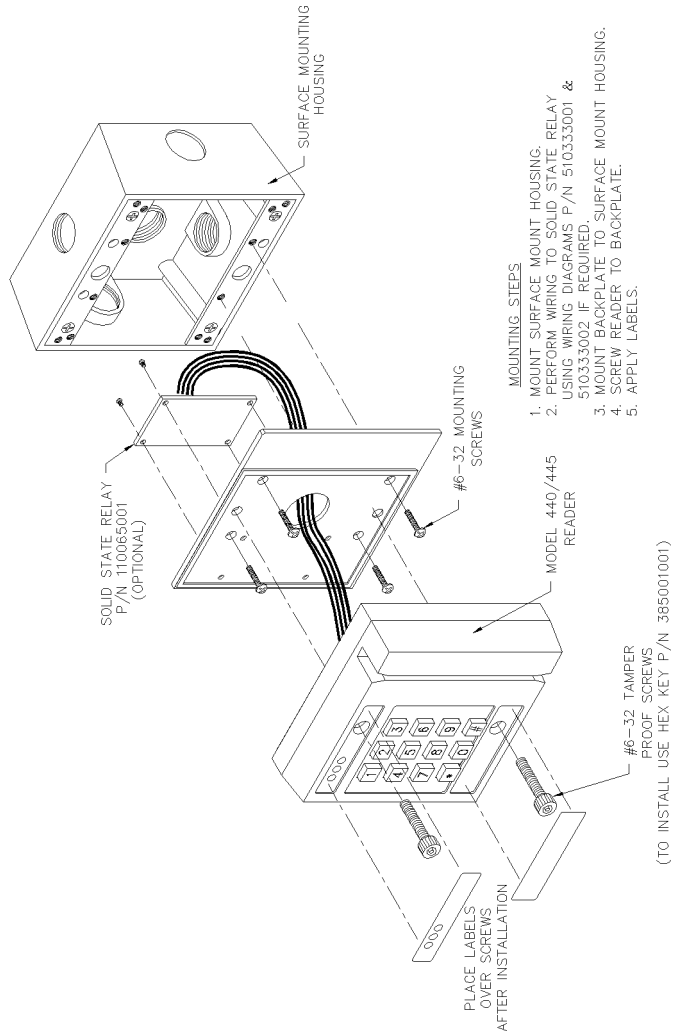
**FIGURE 1: Installation Diagram - Solid State Relay Kit**



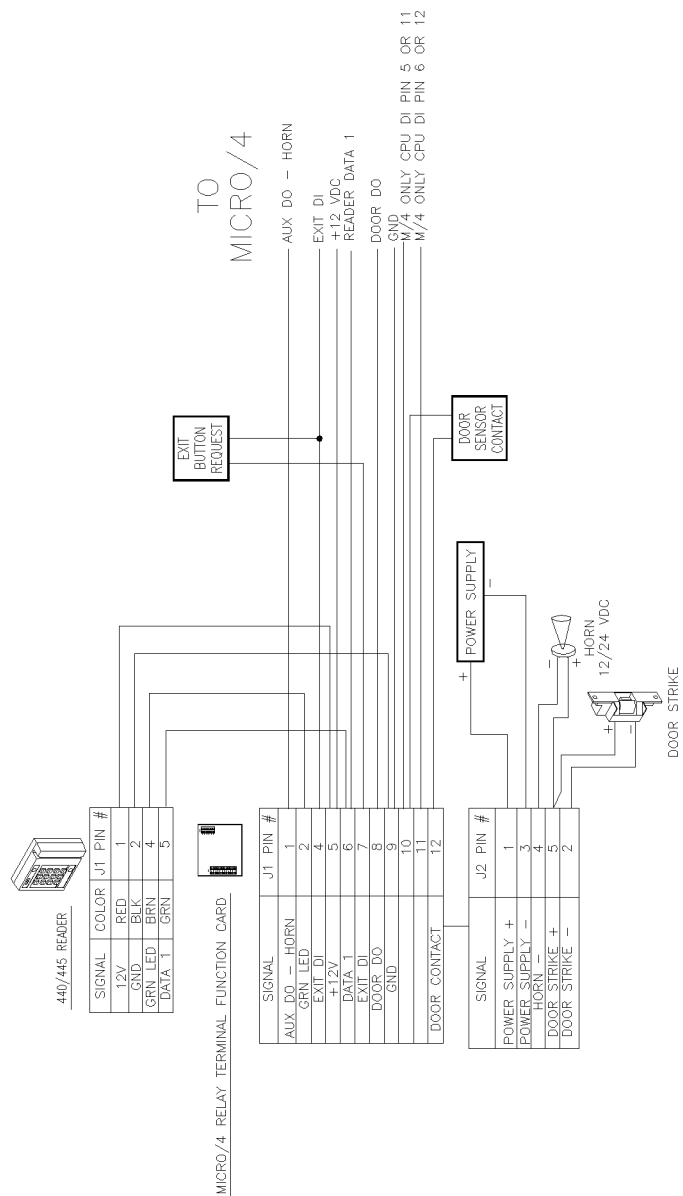
**FIGURE 2: Model 440/445 Gang Box Installation Diagram**



**FIGURE 3: Model 440/445 Back Box Installation Diagram**



**FIGURE 4: Model 440/445 Reader w/Micro/4 Relay Terminal Function (RTF) Card**



Notes: Unless otherwise specified:

1. Power supply for horn and strike (12 or 24VDC fused primary), horn, strike, exit switch, door contact, resistors provided by the installer/customer.
2. Relays mounted behind secure plate in electrical box.
3. Pull up resistors, 1K, 1/4W, required on data lines on runs over 500 ft. installed at micro connector, supplied by the installer.
4. Connect all shields together at micro end, connect to ground stud.
5. For high current (surge or holding current) strikes, connect strike and lead direct to power supply and not to pin 5 of RTF board. Pin 5 of RTF is fused 1A max.



Notes: Unless otherwise specified:

1. Protection diodes may be IN4002, IN4003 or IN4004 for the door strike assembly (supplied by the installer). For DC strikes only.
2. One amp fuse (supplied by the installer).
3. Power supply (fused primary) and relay provided by the installer/customer.
4. Relay coil resistance must be 180 ohms or greater at 12VDC.
5. Pull up resistors, 1K, 1/4W, required on data lines on runs over 50 ft. installed at micro connector, supplied by the installer.
6. Connect all shields together at micro end, connect to ground stud in lower left corner of cabinet using 14 AWG GRN. wire; no shield connections at reader.
7. Recommended cable is Belden 9388 for 400 to 1000 ft. runs. Micro to reader less than 400 ft. can be Belden 8725 (20 AWG) or equal. Identical substitutions can be made.

# Power Up Tests

Verify connections with a multimeter by testing voltage levels at the reader RTF card. All measurements are done on connector J1. Using ground (Pin 9) as a reference, the power (Pins 3 and 5) and data lines (Pins 4 and 6) should measure 8 to 12 volts. The door DO (Pin 8) should measure approximately 12 volts. The green LED line (Pin 2) should measure slightly less than the door DO. Refer to the appropriate Micro Installation Guide.

## Operational Tests

Perform the following test to verify that the Model 440/445 Magnetic Stripe Reader is operating correctly.

1. Check all cabling and electrical connections from reader to microcontroller.
2. On the Reader board, make sure DIP switches are set correctly for the microcontroller (refer to the appropriate CASI-RUSCO microcontroller manual).
3. Make sure the latest version of the EPROM is installed.
4. When all four wires are connected to the reader, be sure the supervision function is operating properly and the reader is not making a beeping sound. Close the tamper switch by joining the reader and backplate so that the tamper alarm is suppressed.
5. Select a test card with a known badge number. Enter the badge into the host system. If the reader is used with a keypad, assign a four-digit PIN.
6. Pass the card through the reader.
7. If used with a keypad, enter the four digit PIN code when the yellow LED lights.
8. Observe the LED; green indicates a valid access.
9. Open the door.
10. Verify proper host system operation.
11. Check the other installed readers.

Repeat this test procedure with each installed Model 440/445 Reader.



# Troubleshooting

If the operation of a component is in doubt, substitute a known good component and retry the system. Always verify wiring against the wiring diagrams before powering up the system. See the Troubleshooting Chart below.

If you see this:	Do this:
Red LED does not come on at power up.	<ol style="list-style-type: none"><li>1. Check power lines in reader cable.</li><li>2. Make sure microcontroller has power.</li><li>3. If there is power at the reader but the red or green LEDs do not come on, the reader may require service.</li></ol>
Reader beeps at half-second intervals.	Tamper switch is activated. Close the back cover of the reader to deactivate the tamper.
Reader beeps at one-second intervals.	<ol style="list-style-type: none"><li>1. Reader and microcontroller are not communicating. Check all wiring.</li><li>2. Check DIP switch settings at the microcontroller.</li><li>3. Make sure correct versions of firmware are installed in the microcontroller and reader.</li><li>4. Ensure that the AUX DO or DISPLAY DO and READER DATA 1 are jumpered at the microcontroller.</li></ol>
Green LED does not come on during a valid access.	<ol style="list-style-type: none"><li>1. If the red LED <b>does not</b> go out during the valid access as well, check the DO wiring from the microcontroller to the reader.</li><li>2. If the red LED <b>does</b> go out, replace the green LED.</li></ol>

If you see this:	Do this:
Card reads are erratic	<ol style="list-style-type: none"><li data-bbox="402 151 841 180">1. Clean the read head periodically.</li><li data-bbox="402 191 674 220">2. Check card quality.</li><li data-bbox="402 232 876 323">3. Check for loose wires from the read head to the reader's printed circuit board.</li><li data-bbox="402 334 876 456">4. If any resistors are shown on the wiring diagram, make sure that they are installed and are the correct value.</li><li data-bbox="402 467 759 527">5. Check earth ground at the microcontroller.</li></ol>
Reader does not beep when the keys are pressed (keypad reader).	<ol style="list-style-type: none"><li data-bbox="402 557 876 647">1. If the red LED is not lit, the reader does not have power. Re-check the wiring.</li><li data-bbox="402 659 894 750">2. Make sure the reader is on-line with the microcontroller. If not, correct and retry.</li><li data-bbox="402 761 876 852">3. If the keypad appears normal and a valid PIN entry <b>does</b> open the door, replace the beeper element.</li></ol>

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