

CASI-RUSCO...*Security Solutions for the 21st Century*

Model 980/981/990 Proximity Reader Installation Guide



**1155 Broken Sound Parkway NW
Boca Raton, Florida 33487
(561) 998-6100**

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Contents

Introduction	1
Product Features	1
Installation Overview	2
Mounting the Model 980 or 981 Reader	2
Mounting the Model 990 Reader	4
Selecting Operating Mode	5
Connecting the Reader	12
CE/FCC Compliancy	12
Cable Connections	13
Power Supply	14
Cable Lengths	14
Tuning and Read Range Adjustment	16
Read Range Adjustment	16
Tuning Adjustment	16
Testing the Reader	19
Troubleshooting Guide	20
All Installations	20
Unsupervised Modes Only	22
Supervised Modes Only	22
Technical Specifications	25
Functional Specifications	26

Figures

Figure 1:	Model 980/981 Reader - Mounting	3
Figure 2:	Model 990 Reader - Mounting	4
Figure 3:	Wiring Diagram, Models 980/981/990 - Supervised F/2F Mode	6
Figure 4:	Wiring Diagram, Models 980/981/990 - Unsupervised F/2F Mode	8
Figure 5:	Wiring Diagram, Models 980/981/990 - Unsupervised Wiegand Mode	10
Figure 6:	Typical Installation Using Shielded Cable/Drain Wire	12
Figure 7:	Tuning and Read Range Adjustment Controls	17
Figure 8:	Read Range and Current Draw Graph	18
Figure 9:	Badge to Reader Presentation	27

Introduction

This manual is an installation guide for the CASI-RUSCO Models 980, 981, and 990 Proximity Perfect Readers.

The Models 980, 981, and 990 Readers have an extended badge read range that provides "hands free" operation. To open a door, simply walk close by the reader with your badge. You do not need to use your hands to present the badge.

The only difference between these three reader models is their width and read range. The Models 981 and 990 are approximately twice as wide as the Model 980. The Models 980 and 981 are designed for wall mounting; the Model 990 is designed to be mounted on a 1.5 inch (48.3 millimeter) pipe. Their functionality is the same.

Product Features

- The Models 980, 981, and 990 Readers have the ability to read all Proximity Perfect™ and ProxLite badges™.
- With Proximity Perfect badges, the Model 980 has a 17 to 19 inch read range; and the Models 981 and 990 have a 24 to 26 inch read range. With ProxLite badges, the Model 980 has a 16 to 18 inch read range; and the Models 981 and 990 have a 22 to 24 inch read range. The read range is influenced by site conditions, reader tuning, reader power, and badge variability. Tuning and range controls are accessible so you can obtain the optimum read range for your site.
- Four modes of operation are available: Supervised, Silent Supervised, Wiegand, and F/2F. In Supervised mode, a disruption in communications or a tripped tamper switch causes the microcontroller to take the reader offline. In Silent Supervised mode, there is no audible indication at the reader when there is a loss of communication.
- A reader can be installed up to 2,000 feet from the power supply and still attain maximum read ranges.
- Weatherproof housing for outdoor use.
- Clear, logical interface with three LEDs and a beeper.
- An optional tamper switch can be installed, but is not built into the reader. If installed, the tamper control disables all badge reads and suspends micro supervision messages if the tamper switch is tripped.

Installation Overview

The following is the general sequence of steps to follow in installing the 980/981/990 Reader. Each step is explained in further detail in the sections that follows:

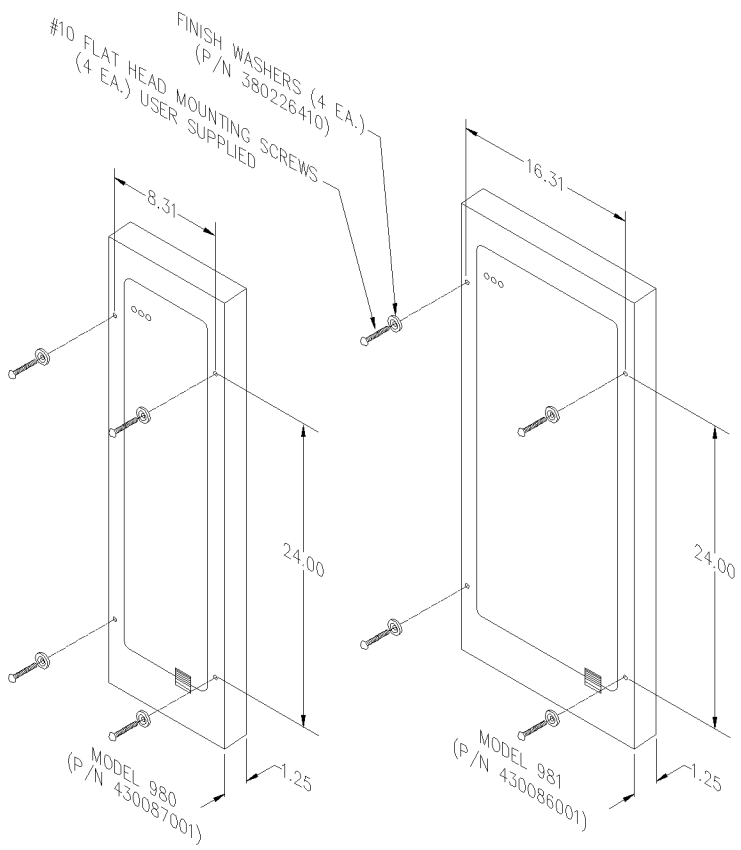
1. Install reader mounting and mounting reader. Refer to “Mounting the Model 980 or 981 Reader” on page 2 and “Mounting the Model 990 Reader” on page 4.
2. Selecting operating mode. Refer to “Selecting Operating Mode” on page 5.
3. Connect the reader. Refer to “Connecting the Reader” on page 12.
4. Test the reader. Refer to “Testing the Reader” on page 19.
5. If necessary, refer to “Troubleshooting Guide” on page 20.

Mounting the Model 980 or 981 Reader

The Model 980 or 981 Reader can be mounted on either an internal or external non-metallic wall using four screws. Some electronic equipment, particularly computer monitors, emit radio frequency interference that can cause a significant reduction of the maximum read range of the readers. Follow the guidelines below when mounting the readers.

- DO NOT mount within 12 feet of a computer monitor.
- DO NOT mount within 5 feet of another proximity reader.
- DO NOT mount on a metal wall or door.
- Keep the reader at least one foot from steel beams. You can use the reader tuning adjustment to compensate for small amounts of metal in the reader field. Items such as metal wall studs located behind dry wall should not cause a problem, but may reduce the maximum read range.

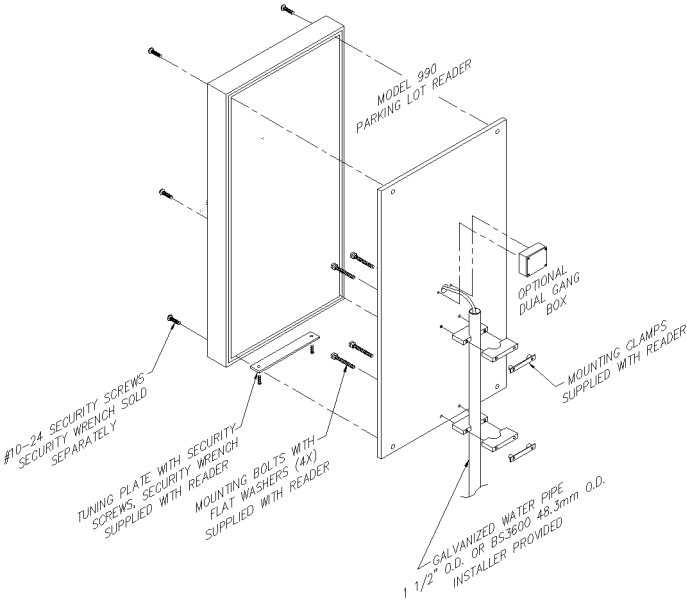
FIGURE 1: Model 980/981 Reader - Mounting



Mounting the Model 990 Reader

The Model 990 Reader is designed for outdoor installation. It should be mounted on a standard installer-provided 1.5 inch (48.3 millimeter) galvanized pipe.

FIGURE 2: Model 990 Reader - Mounting



Selecting Operating Mode

The table below indicates which wires should be connected to select each of the four operating modes.

NOTE: The word Connected in the table below indicates that the designated wires should be connected together at the reader interface cable.

TABLE 1: Selection of Operating Mode

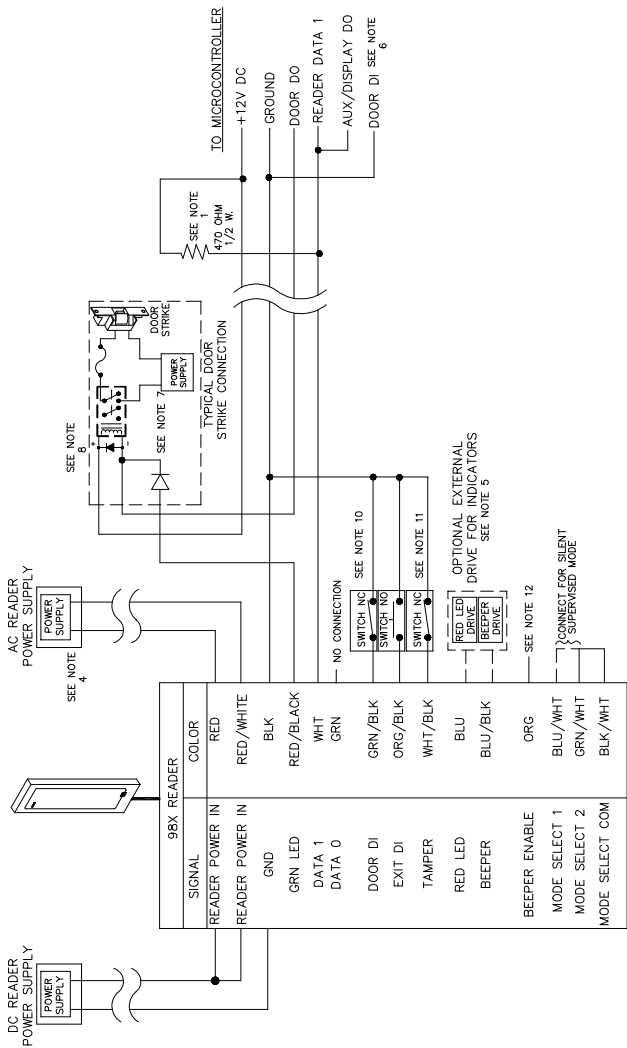
Operating Mode	Blue/ White	Green/ White	Black/White
Wiegand ¹	Open	Open	Open
F/2F ²	Connected	Open	Connected
Supervised F/2F ²	Open	Connected	Connected
Silent supervised F/2F ²	Connected	Connected	Connected

NOTES:

1. In the Wiegand operating mode, 2801, 2804, and 3201 Proximity Perfect badge data is sent out using 2801, 2804, and 3201 Wiegand format, respectively. Badge data for Proximity Perfect badges encoded using the 40-bit format are sent out using Wiegand format. All ProxLite badge data is sent out using 4401 Wiegand format.
2. In operating modes other than Wiegand, 2801, 2804, and Proximity Perfect badge data is sent out using a 10-digit F/2F format. Badge data for Proximity Perfect badges encoded using the 40-bit format are sent out using a 12-digit F/2F format. All ProxLite badge data is sent out using a 12-digit F/2F format.

See the wiring diagrams that follow for details on connecting the reader to the microcontroller and power supply based on the mode of the reader.

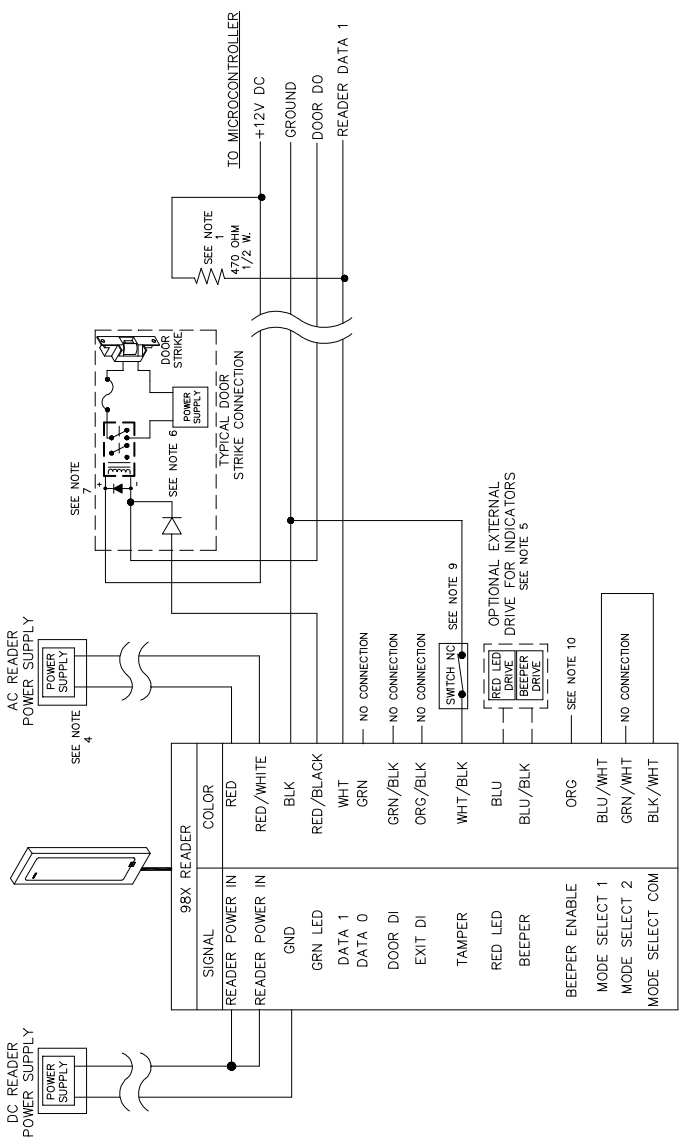
FIGURE 3: Wiring Diagram, Models 980/981/990 - Supervised F/2F Mode



NOTES (Unless otherwise specified):

1. For Micro/2/4/5 only: a 470 ohm, 1/2W pull-up resistor, is required between +12VDC and READER DATA 1. The pull-up resistor should be installed at the microcontroller terminal block. Resistors are supplied with the reader.
2. Shielded cable is recommended in electrically noisy environments.
3. If you are using shielded cable, connect all shields together at the micro end, then connect them to the ground stud in the lower left corner of Micro/2/4/5 cabinets using 14 AWG wire. Do not connect the shields at the reader.
4. Use a 16VAC to 25VAC, or a 20VDC to 28VDC 1/2 amp power supply. Refer to the reader manual for more information on power supplies and cabling.
5. Switching the external indicator drives to GND activates the indicator. High impedance deactivates the indicators. These drives may also be connected to user-supplied, external indicator driving circuitry.
6. Refer to the appropriate system manual to determine whether this connection is required for door switch operation.
7. The installer-supplied blocking diode may be a 1N4002, 1N4148, or similar diode. It should be located in a secured area.
8. The installer-supplied protection diodes for the door strike assembly may be 1N4002, 1N4003, or 1N4004.
9. The fuse, power supply, door strike, and relay are provided by the installer.
10. If you are not using the door contact switch, tie the DOOR DI (green/black) wire to GND (black) wire.
11. If the installer-supplied tamper switch is not being used, tie the TAMPER (white/black) wire to GND (black) wire.
12. Tie the BEEPER ENABLE (orange) wire to GND (black) wire to disable the beeper.

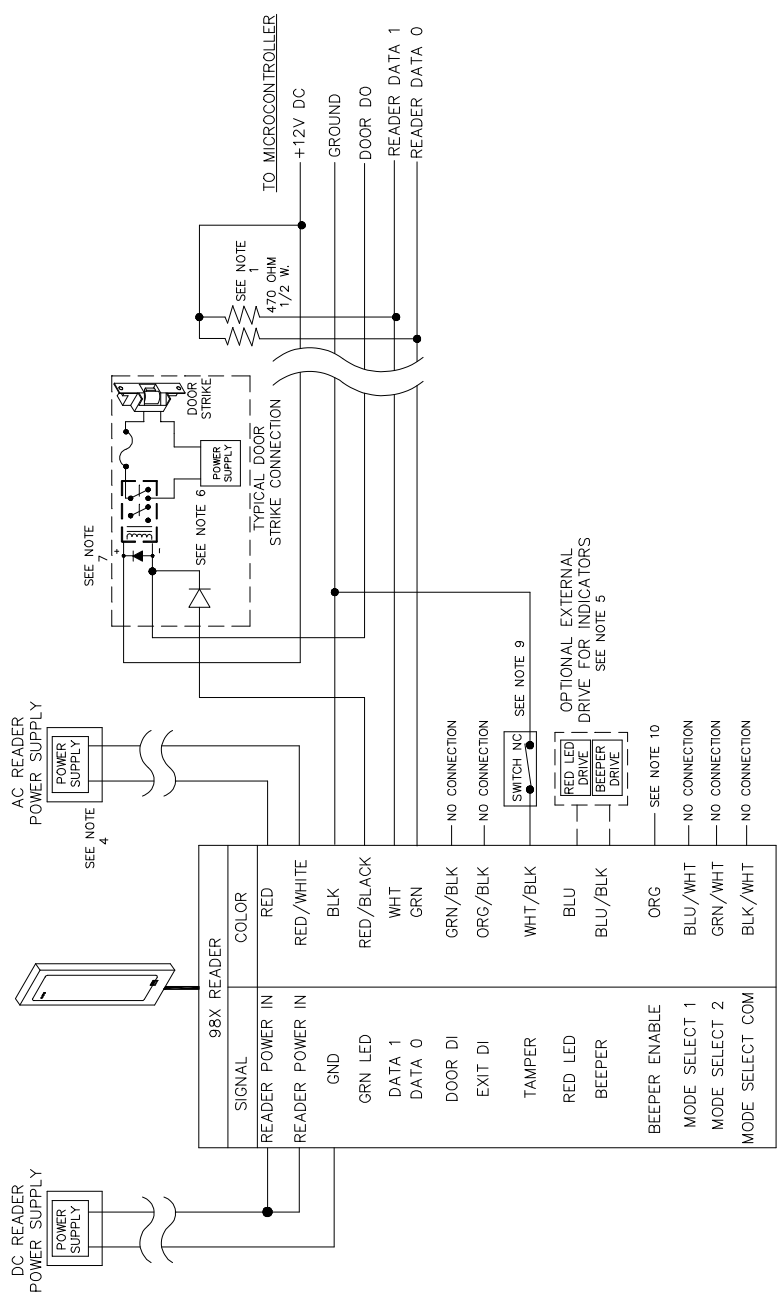
FIGURE 4: Wiring Diagram, Models 980/981/990 - Unsupervised F/2F Mode



NOTES (Unless otherwise specified):

1. For Micro/2/4/5 only: a 470 ohm, 1/2W pull-up resistor is required between + 12VDC and READER DATA 1. The pull-up resistor should be installed at the microcontroller terminal block. Resistors are supplied with the reader.
2. Shielded cable is recommended in electrically noisy environments.
3. If using shielded cable, connect all shields together at the micro end, then connect them to the ground stud in the lower left corner of Micro/2/4/5 cabinets using 14 AWG wire. Do not connect the shields at the reader.
4. Supply with a 16VAC to 25VAC, or a 20VDC to 28VDC 1/2 amp power supply. Refer to the reader manual for more information on power supplies and cabling.
5. Switching the external indicator drives to GND activates the indicator. High impedance deactivates indicators. These drives may also be connected to user-supplied, external indicator driving circuitry.
6. The installer-supplied blocking diode may be a 1N4002, 1N4148, or similar diode. It should be located in a secured area.
7. The installer-supplied protection diodes for the door strike assembly may be 1N4002, 1N4003, or 1N4004.
8. The fuse, power supply, door strike, and relay are provided by the installer.
9. If the installer-supplied tamper switch is not being used, tie the TAMPER (white/black) wire to GND (black) wire.
10. Tie the BEEPER ENABLE (orange) wire to GND (black) wire to disable the beeper.

FIGURE 5: Wiring Diagram, Models 980/981/990 - Unsupervised Wiegand Mode



NOTES (Unless otherwise specified):

1. For Micro/2/4/5 only: two 470 ohm, 1/2W pull-up resistors are required; one between +12VDC and READER DATA 1, the other between +12VDC and READER DATA 0. The pull-up resistors should be installed at the microcontroller terminal block. Resistors are supplied with the reader.
2. Shielded cable is required. Belden 8725 wire is recommended. Do not pair DATA 1 and DATA 0.
3. When using shielded cable, connect all shields together at the micro end, then connect them to the ground stud in the lower left corner of Micro/2/4/5 cabinets using 14 AWG wire. Do not connect the shields at the reader.
4. Supply with a 16VAC to 25VAC, or a 20VDC to 28VDC 1/2 amp power supply. Refer to the reader manual for more information on power supplies and cabling.
5. Switching the external indicator drives to GND activates the indicator. High impedance deactivates indicators. These drives may also be connected to user-supplied, external indicator driving circuitry.
6. The installer-supplied blocking diode may be a 1N4002, 1N4148, or similar diode. It should be located in a secured area.
7. The installer-supplied protection diodes for the door strike assembly may be 1N4002, 1N4003, or 1N4004.
8. The fuse, power supply, door strike, and relay are provided by the installer.
9. If the installer-supplied tamper switch is not being used, tie the TAMPER (white/black) wire to GND (black) wire.
10. Tie the BEEPER ENABLE (orange) wire to GND (black) wire to disable the beeper.

Connecting the Reader

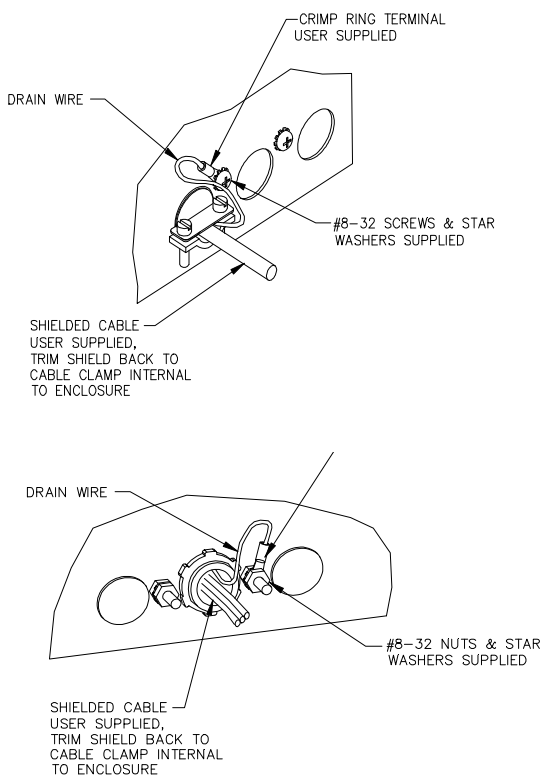
CE/FCC Compliancy

NOTE: As of January 1, 1996, all new European installations **MUST** be CE compliant.

To make the Model 980/981/990 Reader installation CE and FCC compliant, the following conditions must be met:

- The cable connecting the Model 980/981/990 Reader to the Micro/5 must have its shield grounded at the Micro/5 according to Figure 6.
- When installing the Model 980/981/990 Reader, the shield of the cable provided with the reader **MUST** be connected to the shield of the power source cable and subsequently tied to earth ground.

FIGURE 6: Typical Installation Using Shielded Cable/Drain Wire



Cable Connections

The table below shows the reader interface cable color codes and functions for connection to the microcontroller and power supply.

NOTE: A wire color given as orange/black is read as an orange wire with a black stripe.

TABLE 2: Cable Connections

Wire Color	Signal	Operation
Red and Red/White	Reader Supply Voltage AC	Connect to 16 to 25VAC.
Red or Red/White	Reader Supply Voltage DC	Connect to 20 to 28VDC.
Black	Ground	Connect to microcontroller ground.
Red/Black	Green LED	Typically connected to door DO, low to turn on.
White	Wiegand 1 or F/2F Data	Connect to microcontroller.
Green	Wiegand Data 0	Connect to microcontroller if using Wiegand mode.
Green/Black	Door Status Switch	Connect to ground to indicate a door closed in supervised mode.
Orange/Black	Exit Request Switch	Connect to ground to generate an exit request in supervised mode.
White/Black	Tamper	Connect to ground for normal operation. Open for tamper.
Blue	Red LED	Ground to turn on.
Blue/Black	Beeper	Ground to turn on.
Orange	Beeper Enable	Open to enable the beeper. Ground to disable.
Blue/White	Mode Select 1	Refer to Table" 1," Selection of Operating Mode," on page 5.
Green/White	Mode Select 2	Refer to Table" 1," Selection of Operating Mode," on page 5.
Black/White	Modes Select Common	Refer to Table" 1," Selection of Operating Mode," on page 5.

Power Supply

The Models 980, 981, and 990 Readers are designed to provide maximum flexibility to the installer.

- The reader may be operated on a wide range of voltages, either AC or DC, including 24 volt strike power.
- Current required for maximum read range is up to 500 milliamperes (mA); for minimum read range 75mA.

NOTE: Since the reader includes its own switching regulator, the actual reader current draw will vary with the voltage supplied. The higher the voltage at the reader, the less the current draw. Since the voltage at the reader varies inversely with cable length, the current draw varies directly with cable length. The 500mA requirement is based on maximum cable length and lowest voltage. Never exceed the voltage limits given.

- Multiple readers may use the same supply if it is capable of delivering the total required current. Calculate the total current required by multiplying the number of readers by the current required per reader.
- The voltage at the power supply and the reader will be different depending on the gauge and length of the cable used to provide reader power.

WARNING: Never provide more than 25VAC or 28VDC to a reader.

Cable Lengths

The two tables in this section define the maximum cable lengths allowed between the reader and power supply. These lengths vary depending on the read range adjustment. Table 3, "Maximum Power Supply Cable Length with Maximum Read Range Adjustment" shows the cable lengths allowed when the reader is set for maximum read range. Table 4, "Maximum Power Supply Cable Length with Minimum Read Range Adjustment" shows the lengths allowed when the reader is set for minimum read range.

TABLE 3: Maximum Power Supply Cable Length with Maximum Read Range Adjustment

Power Supply Voltage	Maximum cable length in feet/meters using...		
	22 AWG	20 AWG	18 AWG
16VAC	100 / 30	150 / 46	250 / 76
24VAC	825 / 251	1300 / 396	2000 / 610
20VDC	50 / 15	100 / 30	150 / 46
24VDC	325 / 99	500 / 152	800 / 244
28VDC	575 / 175	900 / 274	1400 / 427

TABLE 4: Maximum Power Supply Cable Length with Minimum Read Range Adjustment

Power Supply Voltage	Maximum cable length in feet/meters using...		
	22 AWG	20 AWG	18 AWG
16VAC	600 / 183	950 / 290	1500 / 457
24VAC	5000 / 1524	5500 / 1676	5500 / 1676
20VDC	350 / 107	550 / 168	900 / 274
24VDC	1950 / 594	3000 / 914	4700 / 1433
28VDC	3500 / 1067	5000 / 1524	5500 / 1676

NOTES:

1. In the Supervised and F/2F modes, the maximum reader-to-microcontroller cabling distance is 5,500 feet (1676 meters) for all power supply voltages and wire gauges.
2. The maximum reader-to-microcontroller cabling distance in Wiegand mode is 1,000 feet (305 meters) of shielded cable.

Tuning and Read Range Adjustment

The Models 980, 981, and 990 Readers have tuning and range adjustment controls. The tuning control allows you to tune the reader to work best in its surrounding environment. The range control allows you to increase or decrease the current draw and as a result, the read range.

Accessing the controls:

1. Remove the two security screws at the bottom of the reader housing. Once this cover is removed, you will see three holes. Within the center hole is a power jack that is used to connect the power plug with test leads (provided with the reader).
2. Connect a **DC ammeter** which is set for at least 500mA. With power applied to the reader, the total current draw of the reader is displayed on the ammeter.

Read Range Adjustment

The range adjustment is located within the hole on the right side of the reader (while facing the reader).

- Turning this control clockwise with a small flat-headed screwdriver causes the current and read range to decrease.
- Turning this control counterclockwise causes the current and the read range to increase.

Tuning Adjustment

The reader is tuned when it leaves the factory; therefore, little adjustment is usually required in the field. The tuning should be checked after the reader has been installed to ensure maximum read range. The tuning control is located within the hole on the left (facing the reader).

- Set the read range adjustment to the middle of its adjustment range. This prevents the built-in current limiting circuitry from falsely indicating that the reader is tuned.
- The reader is tuned by slowly adjusting the tuning control with a small flat-headed screwdriver until the current read on the DC ammeter is at a minimum reading.
- Always turn the tuning control in the direction that decreases the current reading. Minimum current is reached when the current reading starts to increase if the control is turned in either direction.
- There are stops built into the control. DO NOT FORCE THE CONTROL.

FIGURE 7: Tuning and Read Range Adjustment Controls

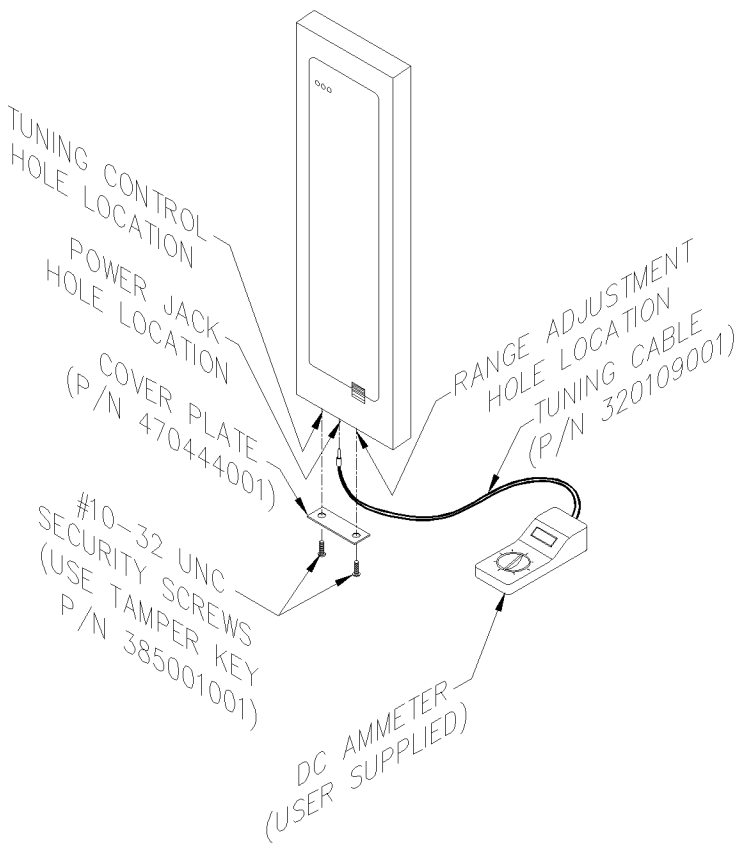
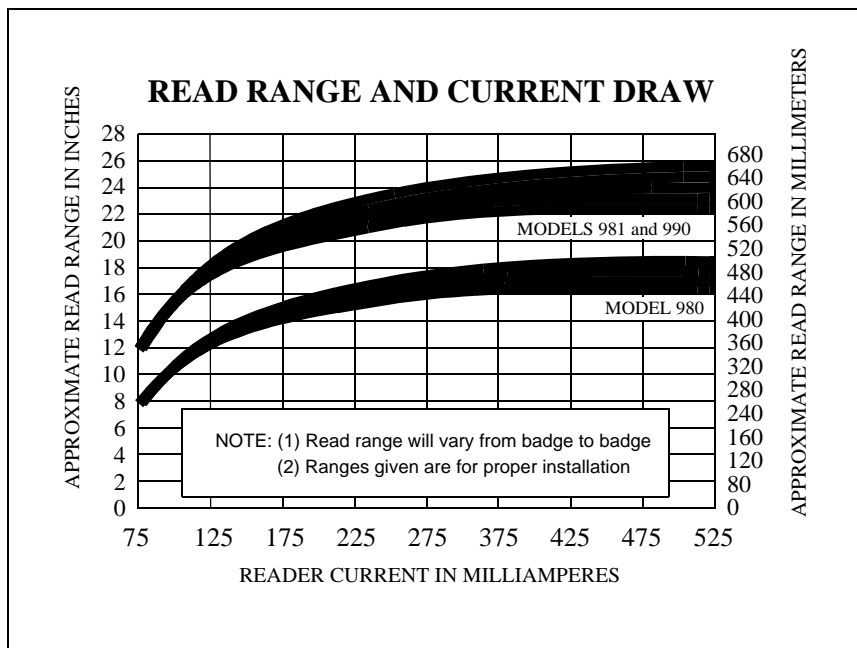


FIGURE 8: Read Range and Current Draw Graph



This graph shows the relationship between the read range and current draw. The current draw on this graph is based on a minimum reader voltage input. Actual current will vary with the power supply voltage. Refer to the explanation under “Power Supply” on page 14 for further information.

Testing the Reader

Follow the steps below to verify that the reader is working correctly.

1. Check all cabling and electrical connections from the reader to the microcontroller.
2. Verify that the microcontroller is properly configured. Refer to the appropriate CASI-RUSCO microcontroller manual.
3. Apply power to the reader and verify that the yellow LED is on. You may want to use a multimeter to test the voltage at the reader interface cable. The data line wires and door DO wires should all read approximately 12V.
4. Check that the proper version of firmware is installed in the microcontroller. Refer to the appropriate microcontroller manual.
5. When all wires are connected to the reader, ensure that the supervision function is operating properly (if a supervised mode is selected) by verifying that the reader is not sounding a short triple beep every 30 seconds and the red LED is not flashing slowly (every 2 seconds). If such an alarm is present, refer to the troubleshooting guide in the next section.

NOTE: In silent supervised mode, no indication of loss of supervision is provided, except badges will not be read.

6. Select a known good Proximity Perfect or ProxLite test badge. Be sure the badge is properly entered in the host system, and the micro badge data format matches the reader.
7. Check that the door is secure. Present the badge to the reader. Observe that the reader beeps briefly and the yellow LED blinks off.
8. Open the door. This verifies that the door strike operates correctly. The green LED should be on.

Troubleshooting Guide

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

This section of the manual is split into three sections. The first is applicable to all installations, the second provides additional diagnosis for unsupervised readers, and the final section provides additional diagnosis for supervised readers.

All Installations

All LEDs are on and the beeper is on (if enabled): This is usually an indication that the reader's voltage is too low. This may be caused by having the wrong power supply or too long a cable between the reader and the microcontroller/power supply.

1. Check that a 16 to 24VAC or a 20 to 28VDC power supply is being used and the reader ground wire is connected to the microcontroller.
2. Adjust the read range control for lower current draw if the cable distance is too long. This may correct the problem.
3. If the problem is still present, measure the power supply voltage at the reader interface cable. The measurement and power connections should be made between the red and red/white wires. This voltage should be greater than 15VAC or 19VDC. If the voltage is too low, correct the wiring or power supply. If the voltage is correct, replace the reader.

None of the LEDs are on: Check that the beeper is enabled (orange wire open), then present a known good Proximity Perfect or ProxLite test badge to the reader, while listening for the beeper. Be sure the badge is properly entered in the host system, and the micro badge data format matches the reader.

If the beeper sounds, the reader is faulty and should be replaced. If the beeper does not sound, check the power connections to the reader and check the reader supply voltage.

The green LED is always on: The green LED indicates that the door strike is open.

1. Disconnect the red/black wire. If the green LED stays on, the reader is faulty and should be replaced. If the green LED goes off, the problem is probably not in the reader.

2. Reconnect the red/black wire and measure its voltage. Low voltage turns on the green LED. If the voltage is low, check to see if the host system is turning on the door strike.

The beeper doesn't sound and the yellow LED doesn't blink when a badge is presented to the reader OR The badge read range is very poor:

When the beeper sounds and the yellow LED blinks off, it indicates that a badge has been read and its data has been sent to the microcontroller.

NOTE: The beeper will not sound if it has been disabled.

The maximum read distance should be 24 to 26 inches for the Models 981 and 990, and 17 to 19 inches for the Model 980. See Figure 8 "Read Range and Current Draw Graph," on page 18. This range is measured at the center of the reader with the badge presented in the same plane as the reader. See Figure 9 "Badge to Reader Presentation," on page 27. If the reader is not reading within this range and the range control is set to the maximum (fully counterclockwise), check the following:

1. Verify that the reader is tuned correctly. See "Tuning and Read Range Adjustment Controls" on page 17.
2. If the unit is properly tuned, noise in the system is probably causing the low read range. See "Mounting the Model 980 or 981 Reader" on page 2 to verify that you have mounted the reader in the proper operating environment.
3. Verify that the black wire is tied to a good earth ground. This is normally done at the microcontroller, but it may also be done at your local reader power supply.
4. If you have tested the reader with only one badge, it is possible that the badge is causing the problem. Try a different badge and be sure that no other badge is in the reader's field causing interference. There is a two second *same badge delay* built into the reader. The same badge is read only once every two seconds. Be sure two seconds have passed when testing badges. It is easy to confuse the time delay with erratic read range.
5. Be sure that there is no electronic noise source close to the reader. Computer monitors and field disturbance sensors (safety loops for gates) can cause this type of problem. If possible, move the reader to a different location or remove (turn off) any potential noise sources. Sometimes just rotating the antenna away from a noise source improves the read range.
6. Be sure your power supply is not generating noise. If you are using a switching supply or poorly regulated linear supply, this could be causing the problem. Temporarily change the supply to a different type; try 24 volts AC if available. If you have a long cable from the

power supply to the reader, measure the reader voltage. The voltage at the reader should be greater than 20 volts DC or 16 volts AC depending on the type of power supply.

The door does not open and the green LED does not turn on when a badge is presented:

1. Verify that the badge and reader are properly entered into the system.
2. Verify that the door strike and the green LED are wired correctly. Since the green LED and the door strike are separate indicators, this problem is not an indication of a defective reader.

The green LED does not turn on, but the door strike unlocks the door when a valid badge is presented:

1. Verify that the door digital output (DO) is wired correctly. Refer to the appropriate wiring diagram.
2. Disconnect the red/black wire (green LED) and connect it to the microcontroller ground (black wire). If the green LED is now on, the reader is good and the connection to the reader is defective. If the green LED does not turn on, replace the reader.

Green LED turns on but the door does not open: Verify correct door strike wiring and operation. The reader is functioning properly.

Unsupervised Modes Only

Beeper sounds a short triple beep every 30 seconds and the red LED is on: This indicates a tamper violation. If an optional tamper switch is not being used, verify that the white/black wire is connected to ground (black wire). If it is, the reader is faulty and should be replaced.

Supervised Modes Only

Reader sounds a short triple beep every 30 seconds and the red LED flashes every two seconds: The reader has lost communication with the microcontroller.

1. Check the reader to microcontroller wiring. Refer to the appropriate installation drawing. Verify that the AUX DO is jumpered to the READER DATA 1 on the microcontroller.
2. Verify that the correct pull-up resistor is installed on the microcontroller.
3. Verify that the microcontroller has the correct firmware for a supervised reader. Refer to the manual that came with your

microcontroller for instructions.

4. Try the reader on a different reader input of the microcontroller. If this corrects the problem, then the microcontroller is probably causing the problem.
5. Replace the reader with one you know is working correctly. If this corrects the problem, then the reader is probably faulty and should be replaced.
6. If none of the above steps have identified the problem, there may be a significant noise source present in the installation which is interfering with the reader-to-microcontroller communications. If this is the case, use shielded wire for reader-to-microcontroller connections.

The green LED always flashes fast (every 400 milliseconds): This indicates that the microcontroller has requested a PIN entry. Check the reader configuration on your system to be sure that a keypad reader was not selected.

The beeper sounds and the yellow LED blinks off more than once when a valid badge is presented: The beeper sounds and the yellow LED blinks off every time badge data is sent to the microcontroller. When a badge is presented to the reader, data is transmitted from the badge to the reader. The reader interprets and checks the data received to make sure it has not been corrupted. The reader then sends the data to the microcontroller and waits approximately 1/3 of a second for the microcontroller to acknowledge receipt. If no acknowledge is received during this time, the reader re-sends the data, causing the beeper to sound again and the LED to blink off. After the third unacknowledged attempt, the reader stops sending badge data and indicates a communications error.

The reader continues sending status messages to the microcontroller every second until an acknowledgment is received. Once the reader receives an acknowledgment, it begins reading badges again, the beeper stops sounding, and the red LED stops flashing. This feature is useful in troubleshooting marginal installations where a high level of electrical noise may cause the reader to make multiple attempts at communications.

1. If multiple beeps occur regularly, refer to the installation drawings to verify that the correct pull-up resistor has been added to the microcontroller.
2. Replace the reader with one you know is working correctly. If this solves the problem, the original reader is probably faulty and should be replaced. If the problem persists, use shielded cable between the microcontroller and the reader.

The reader sounds a short triple beep every 30 seconds and the red LED flashes quickly (every 400 milliseconds): This indicates a tamper violation. If an optional tamper switch is not being used, verify that the white/black wire is connected to ground (black wire). If it is, then the reader is faulty and should be replaced.

The beeper and/or red LED are on: The microcontroller may command the reader to turn on the red LED and the beeper as long as the orange wire is not grounded to disable the beeper. This indicates that the system told the reader to activate its alarm. Check that the door status switch input (green/black wire) is tied to ground. If the door switch is used, be sure the switch is closed. If it appears that no such system command is active, replace the reader with one you know works correctly. If this solves the problem, the original reader is faulty and should be replaced.

Technical Specifications

Operating Temperature Range: -31° F to 151° F (-35° C to +66° C)

Humidity Range: Weatherproof

Index of Protection: IP 65

Physical Dimensions:

Model 980 - 30.31 in (H) x 9.31 in (W) x 1.25 in (D)
770 mm (H) x 237 mm (W) x 32 mm (D)

Model 981 - 30.31 in (H) x 17.31 in (W) x 1.25 in (D)
770 mm (H) x 440 mm (W) x 32 mm (D)

Model 990 - 30.31 in (H) x 17.31 in (W) x 1.75 in (D)
770 mm (H) x 440 mm (W) x 44 mm (D)

Parts List:

- Model 980 Reader
- Model 981 Reader
- Model 990 Reader
- 5/32" Hex Tamper Key Tool
- Tuning Cable
- 4 Finish Washers
- Cover Plate
- 2 Tamper Proof Screws
- 2 Resistors
- Transformer 110V to 24VAC (optional)

Refer to the CASI-RUSCO Product Catalog for part numbers and ordering information.

Maximum Read Range: Determined by the reader's read range adjustment (see "Tuning and Read Range Adjustment" on page 16) and installation environment. Using Proximity Perfect badges, the expected read range on a properly installed reader is 17 to 19 inches for a Model 980 and 24 to 26 inches for Models 981 and 990. Using ProxLite badges, the expected read range on a properly installed reader is 16 to 18 inches for a Model 980 and 22 to 24 inches for Models 981 and 990. The read range varies from badge to badge. See "Read Range and Current Draw Graph" on page 18.

Maximum Cabling Distance: The maximum cable distance between the reader and the power supply varies depending on the wire gauge and power supply used. See “Cable Lengths” on page 14.

NOTE: The reader will work well with unshielded cable in most environments. No company, including CASI-RUSCO, can guarantee that data will be reliably transmitted over long distances on unshielded cable in every installation.

Power Supply: Installer supplied, 16 to 24VAC or 20 to 28VDC. Current required for maximum read distance is 500mA (maximum), for minimum read distance is 75mA. Optimum read range is achieved if a DC power supply is used.

Color: Light Grey

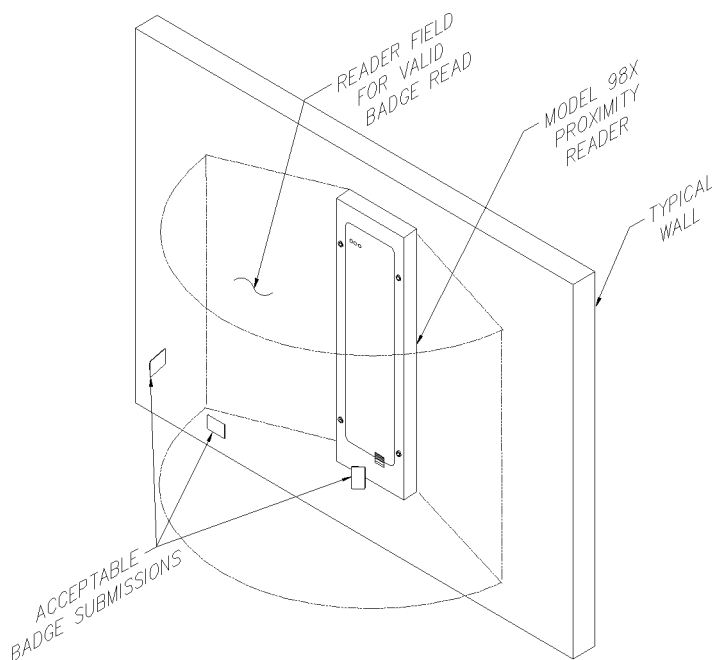
Connection: The reader is supplied with a 15-conductor shielded interface cable that is approximately four feet long.

Functional Specifications

Product Operation: The reader transmits a **wake-up** field extending all around the reader. When a badge enters this field, energy from the field powers the electronics inside the badge allowing it to transmit its unique data to the reader. The reader receives, interprets, and checks the data, sending only uncorrupted badge data to the microcontroller. Due to the nature of the **wake-up** field, the maximum read range will be realized only if the badge is presented to the reader on an imaginary semi-circle centered on the reader, as shown on the next page. While the reader will read and send another badge’s data immediately, the risk of multiple badge reads is reduced by a two second **same badge send** delay.

In the supervised modes, the reader also monitors and reports the status of a normally closed door contact switch and a normally open exit request pushbutton.

FIGURE 9: Badge to Reader Presentation



Application: Intended for areas requiring high levels of security for controlled access.

Compatibility: Interfaces to all CASI-RUSCO systems.

Reader Technology Types: CASI-RUSCO Proximity Perfect Read/Write technology and CASI-RUSCO ProxLite Read Only technology.

Badge Formats: CASI-RUSCO Proximity Perfect badges encoded with 2801, 2804, 3201, or 40-bit data formats; or CASI-RUSCO ProxLite badges.

Mounting: Mounts on an internal or external non-metallic wall through four front accessible screw holes.

Indicators: Red, yellow, and green LEDs and a beeper are incorporated into the reader.

- **Red LED:** If the optional tamper switch is installed, the red LED turns on continuously to indicate a tamper in the Wiegand and F/2F modes. In the supervised modes, the red LED flashes rapidly (every 400 milliseconds) to indicate tamper condition.

If communications with the microcontroller are lost while in the supervised modes, the red LED flashes slowly (once every 2 seconds) to indicate this loss.

In both supervised modes, the red LED may also be turned on and off by the microcontroller to indicate an alarm state. Consult the appropriate system manual for details on this operation.

- **Yellow LED:** Normally on when power is applied to the reader. Blinks off briefly to indicate that a badge has been read and sent to the microcontroller.
- **Green LED:** Normally used to indicate that the microcontroller has activated the door strike.
- **Beeper:** In both supervised modes, the beeper may be sounded by the microcontroller to indicate an alarm state. Consult the appropriate system manual for details on the operation. The beeper sounds briefly to indicate that a valid badge has been read and sent to the microcontroller. A short triple beep every 30 seconds to indicate a reader tamper. In the normal supervised mode, a short triple beep every 30 seconds indicates a disruption in communications with the microcontroller.

External connection can be made to the red LED, green LED, and the beeper via the reader interface cable. Driving the appropriate wire to a low voltage with an open collector driver or relay activates the indicator. If the indicator is driven by the reader, this can be sensed by a low voltage on the wire.

Supervised F/2F Mode Operation: In the supervised modes, the reader sends badge data or reader status data to the microcontroller approximately once every second and waits for an acknowledgment from the microcontroller. If an acknowledgment is not received after the third attempt, the reader stops reading badges, the red LED starts flashing slowly (every 2 seconds), and a short triple beep sounds every 30 seconds, unless silent supervised mode is selected. The reader continues sending the data every second until an acknowledgment is received. Once the reader receives an acknowledgment, it begins reading badges again, the beeper stops sounding, and the red LED stops flashing.

Badge Read Operation: Each time the reader sends badge data, the yellow LED blinks off briefly and the beeper sounds.

Reader Tamper Operation: A tamper switch is not built into the reader. However, one can be installed that breaks the connection between the tamper wire and ground. If a tamper switch is not being used, be sure to tie the tamper input to ground. If a tamper condition is detected, all badge reading functions are disabled and a triple beep sounds every 30 seconds. In the Wiegand and F/2F modes, the red LED stays on continuously during a tamper condition. This condition can be sensed by a low voltage on the blue wire. In both supervised modes, the red LED flashes fast (every 400 milliseconds) and all communications with the microcontroller are suspended, taking the reader offline.

Door Contact and Exit Request Inputs: The Models 980, 981, and 990 Readers have a normally closed door contact switch input and a normally open exit request switch input. In the supervised modes, the state of both switch inputs is periodically reported to the microcontroller, but changes to switch inputs are reported immediately. In the Wiegand and F/2F modes, these switch inputs have no function. If a door switch is not being used and the reader is in supervised mode, tie the door switch input to ground.

NOTES