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

Model 950/960 Proximity Reader Installation Guide

CASI RUSCO

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Introduction

This manual is an installation guide for the CASI-RUSCO Models 950 and 960 Proximity Perfect™ Readers. The Model 950 Reader is intended to be mounted on the surface of a window mullion or door frame, and it is specially tuned for installation on metal. The Model 960 Reader is intended to be mounted directly on glass and has double-sided indicators and a bi-directional read range.

Both readers consist of a metal boxed interface unit to be mounted in a secured area and one or two compact read heads that communicate over total cable lengths of up to 400 to 500 feet. The interface unit contains the circuitry that drives any combination of up to two Model 950 or 960 read heads. This performance is based on read heads manufactured after September 1, 2000.

NOTE: For read heads manufactured prior to December, 2000, and mixed heads, refer to the section entitled "Pinouts" beginning on page 15. The cable length for read heads manufactured prior to December, 2000, remains at 15 feet.

Product Features

The CASI-RUSCO Models 950 and 960 Proximity Perfect Readers offer:

- State-of-the-art architecture.
- The ability to read all ProxLite, ISO ProxLite, and Entrée badges.
- Miniature, unobtrusive read head design.
- Badge read range up to 4.3 inches (110 mm) for a Model 950 and 5.5 inches (140 mm) for a Model 960.
- A maximum of two 950 and 960 read heads may be connected to a single interface unit, both acting as the same reader.
- If two read heads are used, each can be mounted up to 200 feet from the interface, for a total of 400 feet of cable between the two heads.
- The Model 960 read head mounted on the secured side of a window can read badges on the unsecured side.
- DIP switches allow all Models 950 and 960 Readers to operate in one of four distinct operating modes: Wiegand, F/2F, Supervised F/2F, and Silent Supervised F/2F. Silent Supervised mode is ideal for installations where no audible or visual indication of communication loss with the microcontroller is desired at the reader.
- In the unsupervised modes (Wiegand and F/2F), the reader communicates with the microcontroller over a uni-directional Wiegand or F/2F data link that carries Proximity Perfect badge data only.

- In the Supervised modes (F/2F and Silent F/2F), the reader communicates with the microcontroller over a bi-directional F/2F data link that carries the following:
  - Proximity Perfect badge data
  - Supervision messages
  - Exit request and door contact status
  - Microcontroller acknowledgments and commands
- Intelligent bi-directional communication between the interface unit and microcontroller, which can be accomplished up to 5,500 feet (1676 m) over 22 AWG telephone cable.
- The interface unit has an integral beeper along with a provision for driving an installer-supplied remote +12VDC beeper.
- Weatherproof read head (Model 950 only).
- Built-in tamper switch on the interface unit with provisions for connecting additional installer-supplied tamper switches.
- The interface unit has a red LED, the read head has one yellow, and one green LED.
- Standard 12V operation.
- Rugged molded ABS construction with integral backplate.

Switch Settings

Two banks of four DIP switches located inside the interface unit are used to select the reader power level, operating mode, and internal beeper sound level.

CAUTION: Power should be removed from the reader while switch settings are changed.

Selecting Reader Power Level

The reader's power requirement is selected using four DIP switches. The optimum power level will vary with each installation. Higher power levels give improved read range for Proximity Perfect badges; while lower power levels allow greater cabling distance between the reader and the microcontroller. A detailed explanation is provided below. The reader's power requirements are unaffected by the connection of a second read head to the interface unit. The figure on the next page shows the location of the DIP switches. The tables that follow give the switch settings, read ranges, and cabling distances.

Explanation of Read Range/Cable Distance/Power Level:
Maximum badge read range is determined by the distance at which the field transmitted by the reader is just strong enough to *wake up* the badge. Therefore, the higher the reader's transmission power, the greater the badge read range will be. The trade-off for increased read range is a decrease in the maximum cabling distance between the reader and the microcontroller. The trade-off between read range and cabling distance is common to all proximity badge readers. The power selection switches on the Models 950 and 960 Readers allow the optimum power setting to be selected to suit individual installations.

For example: On the high power setting, giving the greatest badge read range, the reader typically requires 200mA of supply current from the microcontroller. If there is 1,000 feet of 22 AWG cable between the reader and the microcontroller, the total reader power and power return path is 2,000 feet. Since 22 AWG cable has a typical resistance of 16 ohms per 1,000 feet, the total resistance in the reader's power and power return wire is 32 ohms. By Ohms Law (V=IR), it follows that the total voltage dropped in the reader power and power return wires will be 6.4V (6.4V = 200mA x 32 ohms). Therefore, the reader supply voltage will drop from 12V at the microcontroller to 5.6V (12V - 6.4V) at the reader. Such a supply voltage is too low for the reader to function reliably.

If the low power setting is selected, the badge read range is reduced. However, the reader now typically requires only 75mA of supply current; therefore, the voltage drop in the power and power return wires is much less. In this case, the reader supply voltage will only be reduced to 9.6V, high enough for reliable operation.

Figure 1: Interface Unit - Printed Circuit Board
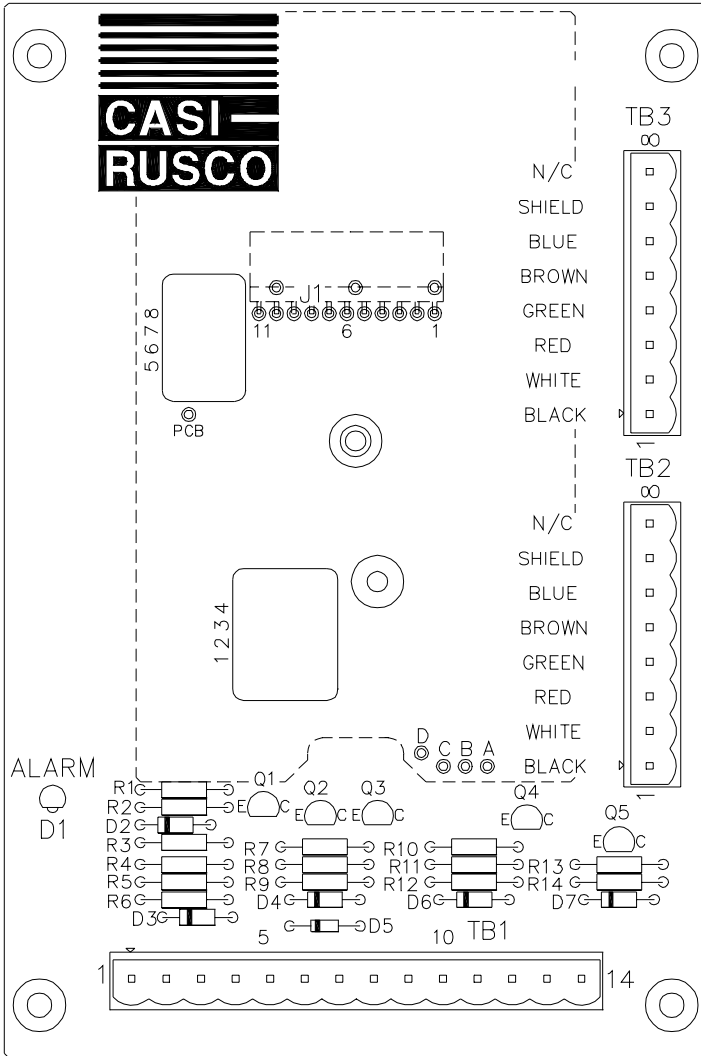
530192001A

CAUTION: Power should be removed from the reader while switch settings are changed.

The table below gives the switch settings for the three power levels.

TABLE 1: Power Level Switch Settings

Power Level	Switch 1	Switch 2	Switch 3	Switch 4
LOW	OFF	ON	ON	OFF
MEDIUM	ON	OFF	OFF	ON
HIGH	ON	ON	ON	ON

The table below gives the read ranges for each of the readers based on the power level settings and whether one or two read heads are connected to the interface unit. If a Model 950 and 960 read head are connected to the same interface unit, refer to the read ranges in the Dual 950 and Dual 960 columns. All read ranges are typical maximums, measured with up to 20 feet cable length between interface unit and read head.

TABLE 2: Read Range by Model Number

Power Level	Single 950	Dual 950	Single 960	Dual 960
LOW	2.8 in 70 mm	2.4 in 60 mm	3.1 in 80 mm	2.8 in 70 mm
MEDIUM	3.5 in 90 mm	3.1 in 80 mm	4.7 in 120 mm	4.3 in 110 mm
HIGH	4.3 in 110 mm	3.5 in 90 mm	5.5 in 140 mm	4.7 in 120 mm

in = inches
mm = millimeters

NOTE: The above distances are typically valid up to 100 feet between interface and read head. Beyond 100 feet, the range decreases to "almost contact" at 500 feet.

The table below gives the maximum cabling distances between the reader and the microcontroller for the three power levels.

TABLE 3: Cabling Distances

Power Level	13.6 Volts (see Note 1)		12 Volts (see Note 1)	
	18 AWG	**22 AWG**	**18 AWG**	**22 AWG**
LOW	5500 ft 1676 m	2000 ft 610 m	3500 ft 1067 m	1500 ft 457 m
MEDIUM	2200 ft 671 m	900 ft 274 m	1100 ft 335 m	450 ft 137 m
HIGH	600 ft 183 m	250 ft 76 m	See Note 2	See Note 2

ft = feet
m = meters

NOTES:

1. **Reader supply voltage measured at microcontroller: 13.6V is nominal when line powered, 12V is nominal when battery powered.**

2. **Not recommended for 12V, battery-backed installations.**

3. **All cabling distances are typical maximums.**

4. **Readers powered by a local 12VDC power supply will have a maximum cable distance of 5,500 feet (1676 m) of 22 AWG telephone wire for all power level settings.**

5. **In Wiegand mode, the maximum cable distance is 1,000 feet (305 m) of shielded cable.**

Selecting Operating Mode

The table below shows the DIP switch settings for the four operating modes.

TABLE 4: Operating Mode DIP Switch Settings

Operating Mode	Switch 5	Switch 6
Wiegand[1]	OFF	OFF
F/2F[2]	ON	OFF
Supervised F/2F[2]	OFF	ON
Silent supervised F/2F[2]	ON	ON

[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 is 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 and ProxLite badge data are sent out using a 12-digit F/2F format.

Selecting Internal Beeper Sound Level

The table below shows the DIP switch settings for the three beeper sound levels for the internal beeper. An optional installer-supplied remote beeper connected to TB1 is unaffected by these switch settings.

TABLE 5: Beeper Sound Level DIP Switch Settings

Beeper Sound Level	Switch 7	Switch 8
Normal	ON	ON
Low	ON	OFF
Off	OFF	ON

Mounting the Interface Unit

The interface unit should be mounted in a sheltered, secured location, such as above a ceiling. If one read head is used, it can be mounted 500 feet from the interface unit. If two read heads are used, each can be mounted up to 200 feet from the interface, for a total of 400 feet between the two heads. The cable that comes attached to the read head can be shortened to less than 20 feet, or can be extended with Belden 9536, 6-conductor #24 AWG shielded, or equivalent type cable, to a maximum of 500 feet. The read range varies from the typical numbers with distance. At 500 feet cable distance to read head, the range reduces to "almost contact."

Figure 2: Mounting the Interface Unit
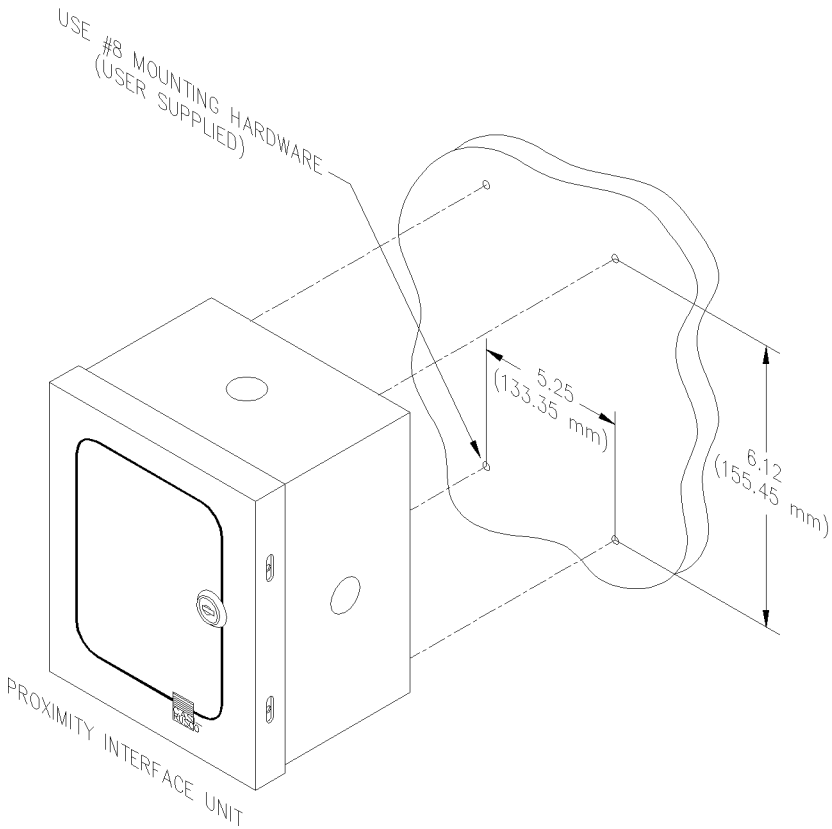
Mounting the 950 Read Head

The Model 950 read heads are designed to be mounted on the surface of a door frame or window mullion using the two security screws provided.

CAUTION: Readers should not be mounted within 3 feet (1 meter) of a computer terminal. Some terminals radiate electrical noise that may reduce the maximum read range.

Once the reader is attached to the mullion, place the self-adhesive lexan label on the front of the reader to cover the screw heads, and diffuse the LEDs.

Figure 3: Model 950 Reader - Mullion Mount
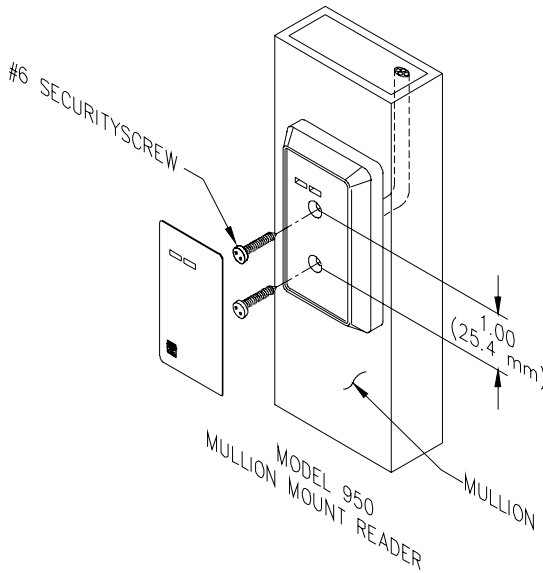
530070004D

Mounting the 960 Read Head

The Model 960 double-sided read heads are designed to be mounted directly onto a glass surface such as a window. Read heads can be mounted on any of the following types of glass surfaces without causing significant reduction in read range.

- Clear
- Tinted
- Reflective
- Glass tinting films

NOTE: Read range may be significantly reduced when the read heads are mounted on certain types of highly reflective or reinforced glass. CASI-RUSCO cannot guarantee that a specific glass, coating, or film will not cause a significant reduction in read range. CASI-RUSCO will test any glass type if a sample is supplied by the customer.

The read head should be positioned at least 6 inches (150 mm) from large metal objects, such as metal doors or window mullions.

CAUTION: Readers should not be mounted within 3 feet (1 meter) of a computer terminal. Some terminals radiate electrical noise that may reduce the effective maximum read range.

Follow the steps below.

1. Decide where to mount the read head, and determine the direction that the interface cable should exit.

2. Remove the selected "break-out" slot with a pair of needle-nose pliers.

3. Screw the two halves of the read head together while ensuring that the interface cable exits through the open "break-out slot."

4. **Be sure the glass surface is perfectly clean, grease free, and dry to ensure reliable read head adhesion.** Remove the backing film, accurately position the read head, and press it firmly against the glass. Maximum adhesive strength is attained after 24 hours.

5. Route the interface cable to the interface unit carefully so that you do not pull the read head off the glass.

6. Place the self-adhesive lexan label on the front of the reader to cover the screw heads, and diffuse the LEDs.

GLASS MODEL 960 MOUNT READER

GLASS

ADHESIVE FOR GLASS MOUNTING

LABEL

530070005C
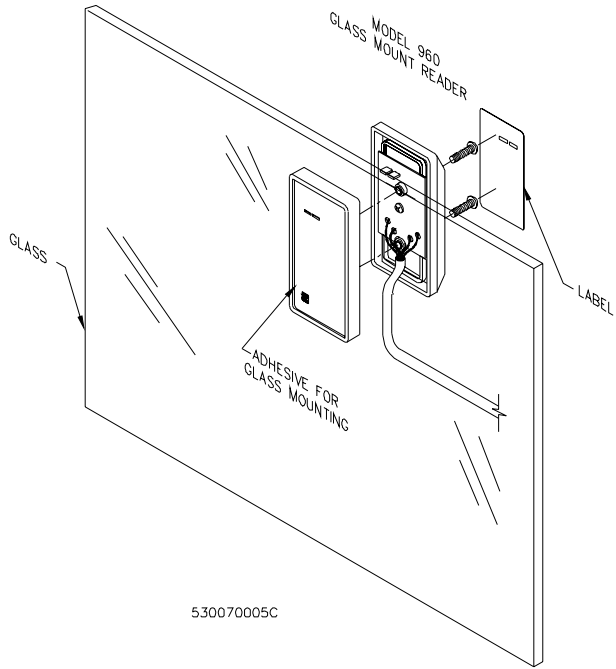
Connecting the Reader

CE/FCC Compliancy

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

- The cable connecting the Model 950/960 Reader to the Micro/5 must have its shield grounded at the Micro/5 as indicated in Figure 5.
- The cable connecting the 950/960 read head to the wall mount assembly must have its shield grounded as indicated in Figure 5.
- If a local power supply is used, the wires entering the 950/960 enclosure must be shielded and the shield terminated as indicated in Figure 5.

Figure 5: Typical Installation Using Shielded Cable/Drain Wire

CRIMP RING TERMINAL
USER SUPPLIED

DRAIN WIRE

SIDE OF WALL MOUNT ENCLOSURE
ASSEMBLY (TYP)

#8-32 SCREWLOCKS
SUPPLIED

SHIELDED CABLE, USER SUPPLIED.
TRIM SHIELD BACK TO CABLE CLAMP
INTERNAL TO ENCLOSURE.
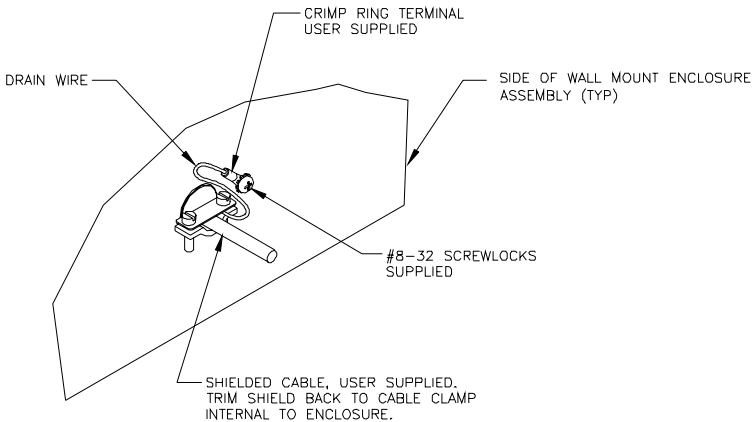
Outside of Proximity Interface Unit (Wall Mount Enclosure)

CRIMP RING TERMINAL
USER SUPPLIED

DRAIN WIRE

#8-32 SCREWS & STAR
WASHERS SUPPLIED

SHIELDED CABLE
USER SUPPLIED,
TRIM SHIELD BACK TO
CABLE CLAMP INTERNAL
TO ENCLOSURE
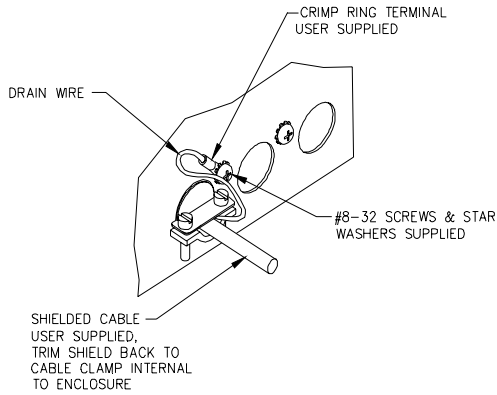
FIGURE: 1 OUTSIDE MICRO5 ENCLOSURE
INSTALLATION TYPICAL FOR
SHIELDED CABLE/DRAIN WIRE

Outside of Micro/5 Enclosure

CRIMP RING TERMINAL
USER SUPPLIED

DRAIN WIRE

#8-32 NUTS & STAR
WASHERS SUPPLIED

SHIELDED CABLE
USER SUPPLIED,
TRIM SHIELD BACK TO
CABLE CLAMP INTERNAL
TO ENCLOSURE
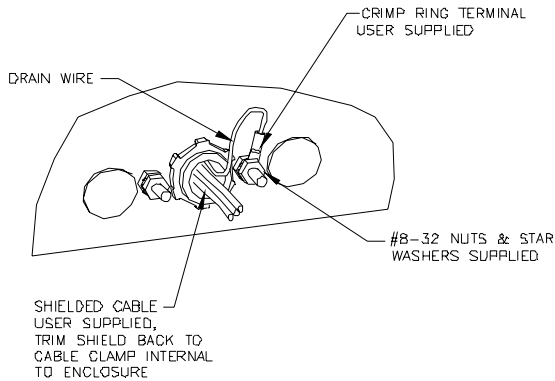
Inside of Micro/5 Enclosure

Connecting the Interface Unit to the Read Head(s)

The drawing below shows an overview of how to connect the interface unit to the read head(s). See the wiring diagrams that follow for details on connecting the read heads, interface unit, and microcontroller based on the mode of the reader.

Figure 6: Interface Unit to Read Head Connection
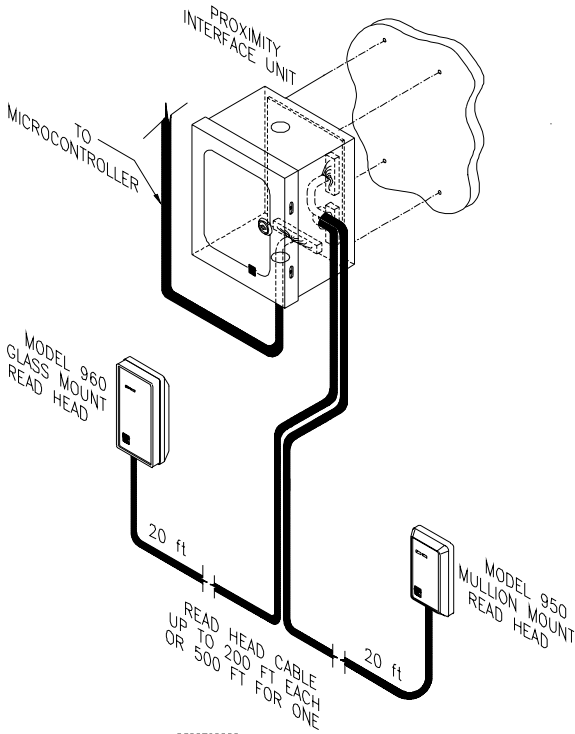
Pinouts

The table below shows terminal block TB1 position numbers and corresponding signals for connecting the interface unit to the microcontroller. Position 1 of TB1 is to the left as you view it inside the interface unit. See Figure 1: Interface Unit - Printed Circuit Board on page 4.

TABLE 6: Terminal Block TB1 Positions/Signals

Terminal Position #	Signal
1	+12 VDC
2	Ground
3	Red LED Control
4	Green LED Control
5	Yellow LED Control
6	Reader Data 0
7	Reader Data 1
8	Beeper Control
9	Remote Beeper Drive
10	Door DI (Door Contact Switch)
11	Exit DI (Exit Request Button)
12	Tamper
13	Tamper Ground
14	Beeper Ground

CAUTION: The read heads have improved performance over read heads manufactured before December, 2000. Therefore, if the read head is to be used as a second read head or as a replacement in a two-head application, the following precautions for wiring changes must be observed.

To determine if read head was manufactured before December, 2000, one of the following conditions will exist:

- Read head part number label reads, **REV. A**.

- If the read-head cable at the interface has a shrink wrap label with the text, **DO NOT EXTEND OR CUT.**

- If there is an existing second read head, the connections are reversed at the connector (Red on 4 and Green on 3).

- If both read heads fail to work when the new read head is installed.

If ONE read head is new and one read head is old, then connect using the appropriate *New Wiring* configuration, as shown in Figure 7, Read Head Cable Pinouts.

If BOTH read heads are new, then connect using the appropriate *New Wiring* configuration without the diode, as shown in Figure 7, Read Head Cable Pinouts.

The diode is included in this package and has the orientation shown below:

The diode is to be inserted between the RED lead from the read head and Terminal 3 on the interface. If you cannot determine the version of the existing read head, the diode can be installed between the RED lead and Terminal 3, in either version without detriment.

Wire Color	TB2/3 #
Black	1
White	2
Red	3
Green	4
Brown	5
Blue	6
Shield	7
No Connection	8
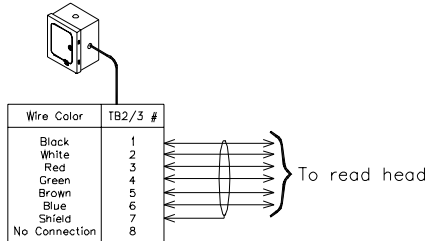
To read head

NOTE: Read head can be connected to the interface
unit terminal block TB2 or TB3.

If two read heads are being used,
keep in mind that the total wire distance
between the two heads is 400 feet.
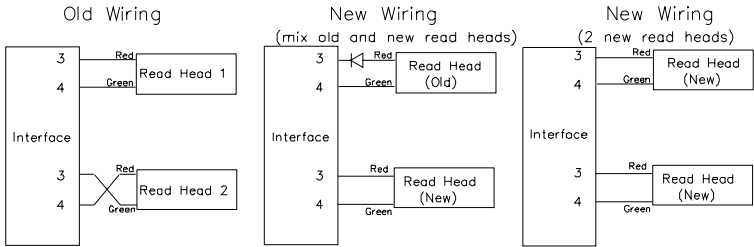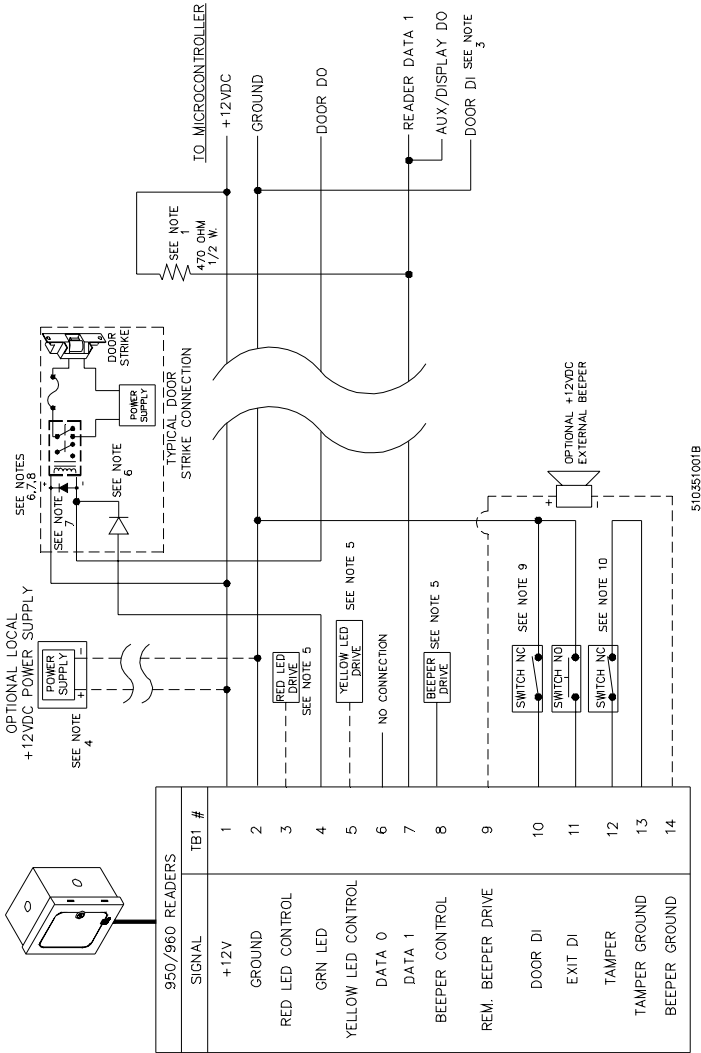
Old Wiring — Interface — 3, 4 Red Green — Read Head 1; 3, 4 Red Green — Read Head 2

New Wiring (mix old and new read heads) — Interface — 3, 4 Red Green — Read Head (Old); 3, 4 Red Green — Read Head (New)

New Wiring (2 new read heads) — Interface — 3, 4 Red Green — Read Head (New); 3, 4 Red Green — Read Head (New)

510351004D

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. 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.

3. Refer to the appropriate system manual to determine whether this connection is required for door switch operation.

4. If using a local power supply, do not connect +12V line from the microcontroller to the reader. However, the negative side of the power supply must be connected to the micro (TB1, position 2 on the reader port). Keep wiring from power supply to reader, less than 50 feet.

5. Switching the external indicator drives to GND activates the indicator. High impedance de-activates the indicator. 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 you are not using the door contact switch, tie the DOOR DI (TB1 position 10) wire to GND (TB1 position 2).

10. An optional installer-supplied, normally closed, tamper switch should be connected in series with the standard interface unit tamper switch.

11. Tie the BEEPER ENABLE (Orange) wire to GND (Black) wire to disable the beeper.
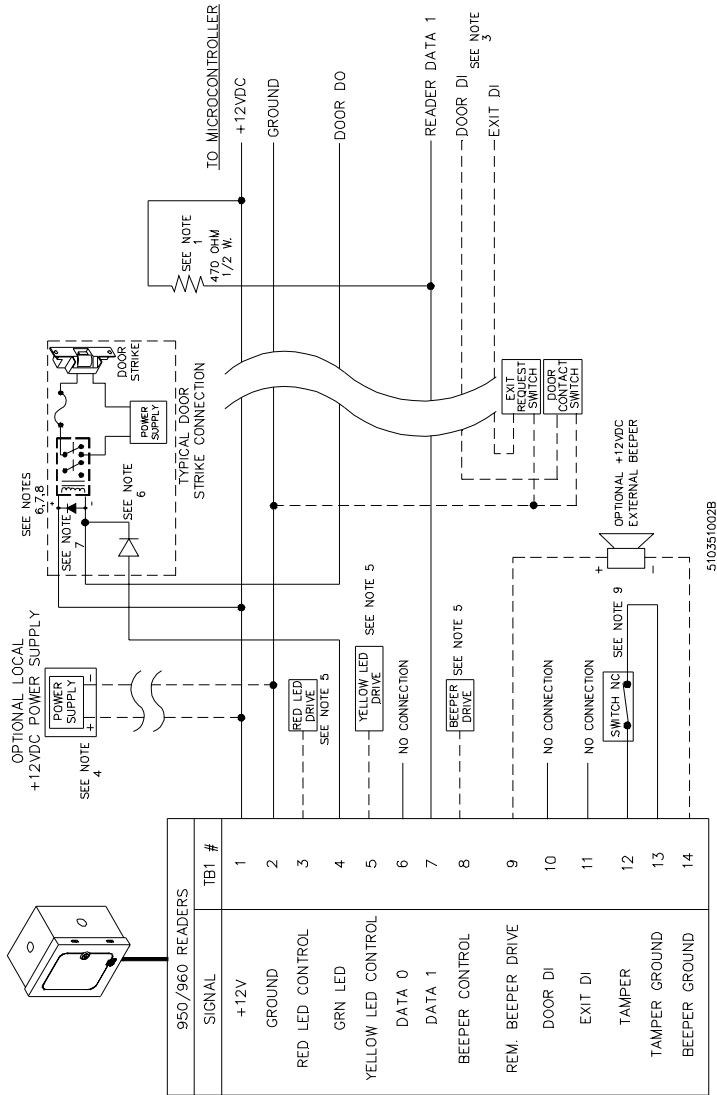
Figure 9: Wiring Diagram, Model 950/960 - Unsupervised F/2F Mode

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. 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.

3. Refer to the appropriate system manual for specific wiring details.

4. If using a local power supply, do not connect +12V line from the microcontroller to the reader. However, the negative side of the power supply must be connected to the micro (TB1, position 2 on the reader port). Keep wiring from power supply to reader, less than 50 feet.

5. Switching the external indicator drives to GND activates the indicator. High impedance de-activates the indicator. 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. An optional installer-supplied, normally closed, tamper switch should be connected in series with the standard interface unit tamper switch.

Figure 10: Wiring Diagram, Model 950/960 - Unsupervised Wiegand Mode

TO MICROCONTROLLER

+12VDC
GROUND
DOOR DO
READER DATA 0
READER DATA 1
DOOR DI
EXIT DI — SEE NOTE 3

SEE NOTE 1
470 OHM
1/2 W.

DOOR STRIKE

POWER SUPPLY

TYPICAL DOOR STRIKE CONNECTION

EXIT REQUEST SWITCH
DOOR CONTACT SWITCH

SEE NOTES 6,7,8
SEE NOTE 7
SEE NOTE 6

OPTIONAL +12VDC EXTERNAL BEEPER

51035100 3B

OPTIONAL LOCAL +12VDC POWER SUPPLY
POWER SUPPLY
SEE NOTE 4

RED LED DRIVE — SEE NOTE 5
YELLOW LED DRIVE — SEE NOTE 5
BEEPER DRIVE — SEE NOTE 5
NO CONNECTION
NO CONNECTION
SWITCH NC — SEE NOTE 9

950/960 READERS SIGNAL	TB1 #
+12V	1
GROUND	2
RED LED CONTROL	3
GRN LED	4
YELLOW LED CONTROL	5
DATA 0	6
DATA 1	7
BEEPER CONTROL	8
REM. BEEPER DRIVE	9
DOOR DI	10
EXIT DI	11
TAMPER	12
TAMPER GROUND	13
BEEPER GROUND	14

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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. 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.

3. Refer to the appropriate system manual for specific wiring details.

4. If using a local power supply, do not connect +12V line from the microcontroller to the reader. However, the negative side of the power supply must be connected to the micro (TB1, position 2 on the reader port). Keep wiring from power supply to reader, less than 50 feet.

5. Switching the external indicator drives to GND activates the indicator. High impedance de-activates the indicator. 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. An optional installer-supplied normally closed tamper switch should be connected in series with the standard interface unit tamper switch.

Model 950/960 Proximity Reader   23

Testing the Reader

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

1. Check all cabling and electrical connections from the read head(s) to the interface unit and the interface unit to the microcontroller. Refer to the wiring diagrams.

2. Verify that the microcontroller is properly configured. Refer to the appropriate CASI-RUSCO microcontroller manual.

3. Verify that the interface unit switches are properly set for the power setting, cabling type, distance, and desired mode of operation. See "Switch Settings" on page 3.

4. Apply power to the reader, and verify that the yellow LED at the read head(s) is on. You may want to use a multimeter to test the voltage at the interface unit TB1 using ground (position 2) as a reference. Power (position 1), data lines (positions 6 & 7), and door DO (position 4) should all read approximately 12V.

5. Check that the proper version of firmware is installed in the microcontroller. Refer to the appropriate microcontroller manual.

6. Close the tamper switch by closing the interface unit door. 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). You must press the tamper switch in order to check the red LED since it will turn on as soon as you open the interface unit door. If an alarm is present, refer to the Troubleshooting Guide.

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

7. Select a known good Proximity Perfect, ProxLite, ISO ProxLite, or Entrée test badge. Be sure the badge is properly entered in the host system, and the micro badge data format matches the reader.

8. Check that the door is secure. Present the badge to the reader. Observe that the interface unit beeps briefly, and the yellow LED on the read head blinks off.

9. Observe that the green LED turns on indicating a valid access has been granted by the host.

10. Open the door. This verifies that the door strike operates correctly.

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.

NOTE: When you open the interface unit door to check the red LED, be sure to press the tamper switch to temporarily bypass the tamper alarm. Remember that opening the door causes a tamper condition which turns on the red LED.

All Installations

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

1. Measure the reader supply voltage at the microcontroller. It should read between 12 and 15VDC. If the voltage is correct, continue to step 2 below. If the voltage is incorrect, refer to the appropriate microcontroller manual and correct the voltage.

2. Set the reader to low power mode if the cable distance is too long (See Table 1, "Power Level Switch Settings," on page 5). This may correct the problem.

3. If the problem is still present, while in low power mode, measure the voltage between TB1 position 1 (power) and TB1 position 2 (ground) on the interface unit. This voltage should be greater than 8VDC and less than or equal to the reader supply voltage. If the voltage is too low, correct the wiring. If the voltage is correct, replace the reader.

None of the LEDs are on: Check that the beeper is enabled (See Table 5, "Beeper Sound Level DIP Switch Settings," on page 7), then present a known good Proximity Perfect, ProxLite, ISO ProxLite, or Entrée test badge to the reader while listening for the beeper. 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 at TB1 position 1 on the interface unit.

The green LED is always on: The green LED indicates that the door strike is open. It is controlled by the input on TB1 position 4.

1. Disconnect the wire on TB1 position 4 on the interface unit. If the green LED stays on, the reader is faulty and should be replaced. If the green LED goes off, then the problem is most likely not in the reader.

2. Reconnect the wire on TB1 position 4 and measure the voltage at TB1 position 4. 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 sent to the microcontroller.

NOTE: The interface unit beeper will not sound if it has been disabled (See Table 5, "Beeper Sound Level DIP Switch Settings," on page 7).

1. Verify that the read heads are correctly wired as shown in "Read Head Cable Pinouts" on page 17.

2. Check that the Model 960 Reader is not mounted on or within 6 inches of a large metal object, such as a metal door or window mullion.

3. Check the reader supply voltage onTB1 position 1 at the interface unit.

4. Check that the reader is not mounted within 3 feet (1 meter) of a computer terminal or within 10 inches (250 mm) of another Proximity Perfect reader. The only exception to the 10-inch limit is for 950 read heads mounted back-to-back on a mullion.

5. Present a Proximity Perfect test badge (known to be working) to the read head. If the beeper and yellow LED still fail to indicate a valid badge read and send, replace the reader with a reader that you know is working correctly. If this corrects the problem, the original reader is faulty and should be replaced. If this does not correct the problem, the badge is probably defective.

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 DO is wired correctly. Refer to the appropriate wiring diagram.

2. Disconnect the wire from TB1 position 4 on the interface unit and connect TB1 position 4 to ground, TB1 position 2. 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.

The 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: Indicates a tamper violation. Verify that the interface unit door is closed or the interface unit tamper switch is temporarily pressed. If it is either, verify that any additional installer-supplied tamper switch(es) are wired correctly. Refer to the appropriate wiring diagram.

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.

NOTE: When you open the interface unit door to check the red LED, be sure to press the tamper switch to temporarily bypass the tamper alarm. Remember that opening the door causes a tamper condition which causes the red LED to flash.

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 at the microcontroller.

2. Verify that the correct pull-up resistor is installed on the microcontroller. See Figure 8: Wiring Diagram, Model 950/960 - Supervised F/2F Mode on page 18.

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 has 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 flashes fast (every 400ms): Indicates that the microcontroller has requested a PIN entry. Check the reader configuration on your system to be sure 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 read head, 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 acknowledgment is received during this time, the reader resends the data causing the beeper to sound again and the LED to blink off. After the third unacknowledged attempt, the reader stops trying and indicates a communications error. 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 400ms): Indicates a tamper violation. Verify that the interface unit door is closed or the interface unit tamper switch is temporarily pressed. If it is, verify that any additional installer-supplied tamper switch(es) are wired correctly. Refer to the appropriate wiring diagram.

The beeper and/or red LED are always on: The microcontroller may command the reader to turn on the red LED and the beeper as long as the reader DIP switches are not set to disable the beeper. If the door status switch input (TB1 position 10) is not tied to ground, the reader informs the system that the door is open. The system may then activate the alarm at the reader. If this is not the problem, then the system software probably told the reader to activate its alarm. Refer to the appropriate system manual for conditions that cause the software to activate the alarm. 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: -35° C to +66° C (-31° F to 151° F).

Humidity Range: 950 Read Head - Weatherproof
960 Read Head - 0% - 95% Noncondensing
Interface Unit - 0% - 95% Noncondensing

Index of Protection: 950 Read Head - IP 65
960 Read Head - IP 40
Interface Unit - IP 40

Physical Dimensions:

Model 950 -   3.00 in(H) x 1.75 in(W) x 0.50 in(D)

77 mm(H) x 45 mm(W) x 13 mm(D)

Model 960 -   3.05 in (H) x 1.80 in (W) x 0.80 in (D)

78 mm(H) x 46 mm(W) x 21 mm(D)

Interface Unit - 7.25 in(H) x 8.25 in(W) x 4.0 in(D)

185 mm(H) x 210 mm(W) x 102 mm(D)

Parts Lists:
• Model 950 Reader (light gray)/Interface Unit
• Model 950 Reader (black)/Interface Unit
• Model 960 Reader (light gray)/Interface Unit
• Model 960 Reader (black)/Interface Unit
• 2-Sheet Metal Security Screws
• 2 Read Head Labels (light gray)
• 2 Read Head Labels (black)
• Additional 950 Read Head, Mullion Mount (optional), light gray
• Additional 950 Read Head, Mullion Mount (optional), black
• Additional 960 Read Head, Glass Mount (optional), light gray
• Additional 960 Read Head, Glass Mount (optional), black
• Spanner & Hand Driver Kit (optional)

Maximum Read Range: Determined by the reader's power level setting and cable length to read head. See Table 2, "Read Range by Model Number," on page 5.

Maximum Cabling Distance: The maximum cable distance between the interface unit and the microcontroller is influenced by a number of factors including wire gauge and reader power level setting. See Table 3, "Cabling Distances," on page 6.

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: Nominal 12VDC, 75mA, 150mA, or 200mA, depending on the power setting selected. See Table 1, "Power Level Switch Settings," on page 5. The power requirements are not significantly affected by the connection of a second read head to the interface unit.

Color: Light Gray and Black

Connection: The interface unit has a 14-position terminal block for connection to the field wiring. Two 8-position terminal blocks provide connection points for two read heads.

Functional Specifications

Product Operation: The reader transmits a ***wake-up*** field extending all around the read head. When a badge is presented, energy from the field powers the electronics inside the badge allowing it to transmit its unique data to the reader. The read head 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 read head on an imaginary semi-circle centered on the read head, as shown below. Since two read heads can be connected to a single interface unit, it is possible for badges to be in the ***wake-up*** field of both read heads at the same time. In this case, the data from one badge may interfere with the data from the other badge causing neither badge to be read. Although 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 push button.

Figure 11: Badge to Reader Presentation
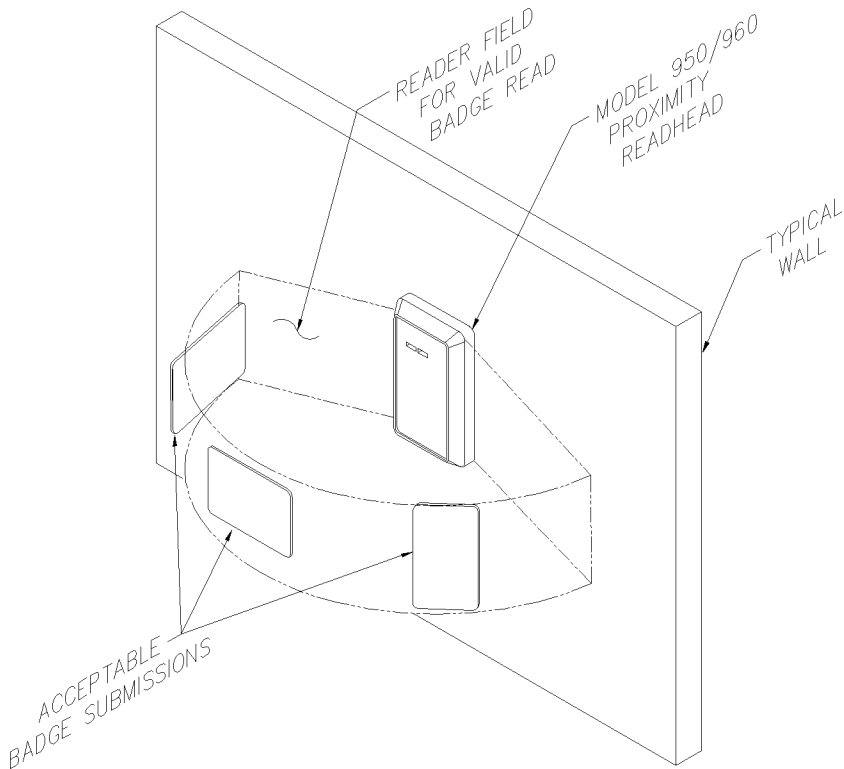
Application: Intended for areas requiring high levels of security for controlled access.

Compatibility: Interfaces to all CASI-RUSCO systems as well as many other 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, ISO ProxLite, and Entrée badges.

Mounting: The Model 950 mullion mount reader is attached to the surface of the mullion by two security screws. The Model 960 window mount reader is attached directly to the inside of the window by a film adhesive covering the flat side of the reader.

Indicators: Red, yellow, and green LEDs and a beeper are incorporated into the reader. The yellow and green LEDs are mounted on the read head (both sides of the 960); while the red LED and the internal beeper are mounted inside the interface unit. The interface unit includes drive circuitry for an optional installer-supplied remote beeper.

- **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 400ms) to indicate a tamper condition.

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

  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 indicates 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 this operation. The beeper sounds briefly to indicate that a valid badge has been read and sent to the microcontroller. A short, triple beep sounds every 30 seconds to indicate a reader tamper. In the normal supervised mode, a short, triple beep every 30 seconds also indicates a disruption in communications with the microcontroller.

An external device can be connected to all LEDs and the beeper at the 14-position terminal block TB1 inside the interface unit. In this case, the LEDs and beeper can be driven by the reader or the external device. Driving the appropriate TB1 position to a low voltage activates the indicator. This low voltage can be sensed by the external device even when the indicator is driven by the reader.

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. The reader continues sending the data every second until an acknowledgment is received. 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. 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: The Model 950/960 Readers incorporate a tamper switch inside the interface unit. An additional installer-supplied tamper switch may also be connected to TB1. While the door on the interface unit is open, all badge reading functions are disabled; and a tamper condition is indicated by a triple beep every 30 seconds. In the Wiegand and F/2F modes, the red LED stays on continuously during a tamper condition (this can be sensed by a low voltage on TB1 position 3). In both supervised modes, the red LED flashes fast (every 400 ms) and all communications with the microcontroller are suspended, taking the reader offline.

Door Contact and Exit Request Inputs: The Models 950 and 960 Readers have a normally closed door contact switch input and a normally open exit request switch input on TB1. 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.