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MaxiProx® DFM Reader – 5375

INSTALLATION GUIDE

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1 System Overview

MaxiProx® is a self-contained proximity reader. The two-piece polycarbonate enclosure has an O-ring that weather seals the enclosure pieces together and a cable fitting that seals the cable entry. The water-resistant unit is designed for outdoor use. The enclosure is mountable on a single gang electrical box. A bi-color LED and audible tone provide user feedback. Configurable open collector data outputs provide the data to the Host. Configurable DIP Switches and jumpers provide choice of data interfaces between Wiegand, Clock-and-Data, RS 232 and RS422. The data interface is configured as ordered from the factory, but can be changed in the field - please contact *HID Technical Support* for assistance. A tamper switch can alert the Host when the enclosure is opened. Internal DIP Switches and jumpers provide for configuration of the outputs, audible tone and LED control options. Installation of the MaxiProx reader consists of mounting, connecting the cable to the Host and +12VDC or +24VDC power, verifying the DIP Switch and jumper settings, verifying Auto-tune, and verifying the reading of a transponder.

1.1 Operation

Transponders (Proximity Cards or ProxKeys) are presented to the front of the MaxiProx. The LED is *red* when ready to read a transponder. The LED turns *green* and the beeper sounds when the transponder is read and the message is transmitted to the Host computer or interface panel. The system is ready for another transponder as soon as the LED returns to *red*. There is an anti-passback delay of about one and a half seconds before it will read the same card. The LED flash is typically 250 milliseconds long. The operation of the LED and beeper may be controlled by the Host, in which case the actual operation will depend on the programmed timing of the Host.

1.2 Parts List

1	MaxiProx reader	Qty 1 (included)
2	Installation Manual	Qty 1 (included)
3.	Cable Fitting	Qty 1 (included)
4	Label for front cover - HID logo	Qty 1 (included)
5	#6-32 x 1" flat head screw, for upper-left base mount screw	Qty 1 (included)
6	#6-32 x 1" black screw, for gang-box mounting	Qty 2 (included)
7	#6-32 x .75" flat head screw, for front cover mounting	Qty 1 (included)
8	Cable, 5 conductor, 22 AWG (Alpha 1295 C or equivalent)	See Install Cable
9	Power Supply – 2.0 A linear regulated	+24VDC, nominal (+21 TO 28.5VDC) Factory Default – P2 Shunt Jumper between P2 and P3 for 24V operation. For Europe, use ALTRONIX SMP3 (USER SUPPLIED TRANSFORMER AND BATTERY)
10	+12VDC Shunt Jumper – P2-1 to P2-2 for 12VDC operation	+12VDC, nominal (+11.6 to +20.9VDC) For Europe , use ALTRONIX SMP3 (USER SUPPLIED TRANSFORMER AND BATTERY)

1.3 Regulatory Approvals and Certifications

Underwriters Laborites listing	CE Mark
FCC Certification	European Declaration of Conformity
Foreign Countries EMC and/or Type Approvals	Pacemaker wearers should exercise caution when in close proximity to this product.

2 Installation Procedure

2.1 Preparation

Determine an appropriate mounting position for the MaxiProx. Install an electrical box or drill the appropriate mounting holes from inside the base with the cover removed for #6 fasteners. For optimum performance, the reader should be mounted at least 4 inches away from any metallic surface 12-inch x 12-inch or larger. The Auto-tune feature automatically compensates for incidental metal such as aluminum studs and conduit. The best method for installing the MaxiProx is by mounting the back of the reader to the mounting surface. Accomplish side mounting with an adapter or spacer (customer supplied) that mounts to the back of the reader.

CAUTION: The P2 shunt jumper is factory installed in the 24VDC position. Failure to install the P2 shunt jumper in the correct position will permanently damage the MaxiProx unit. The following states the P2 shunt jumper installation.

Power Supply Voltage	Jumper Position
+24 VDC (21-28.5VDC)	P2 across pin 2 and 3
+12 VDC (11.6-20.9VDC)	P2 across pin 1 and 2

2.2 Mounting and Installation

- When fastening the MaxiProx to the mounting surface, do not use a metallic fastener larger than a #6 screw.
- Avoid mounting the MaxiProx closer than 1 meter (40-inches) to another MaxiProx.

2.3 Mounting Applications

- Mount the MaxiProx to a gooseneck that is 1½-inch in diameter with a 4-inch diameter-mounting flange without degradation of read range. Mount the flange to a non-metallic adapter that will ease the installation of the MaxiProx to the flange. The read range will not be affected.
- The MaxiProx may be mounted to a 12-inch x 12-inch or larger metal plate with a 4-inch spacer used to separate the reader from the plate.
- Acrylic, Plexiglas, Lexan (polycarbonate) or other suitable plastics may be found in ½-inch to 1-inch stock. Mounting adapters may be fabricated from these materials that would be sturdy and not affect the performance of the MaxiProx. Plastic J-boxes can also be used.

2.4 Cable Preparation

Prepare the cable by cutting the cable jacket back 2 inches and strip the wires 1/4-inch. Tinning the wires is not required.

2.5 Install Cable

Route the interface cable from the MaxiProx to the Host. Connect the MaxiProx DC power input to the Host or external power supply. Either +12VDC or +24VDC can be used.

CAUTION: The P2 shunt jumper is factory installed in the 24VDC position. Failure to install the P2 shunt jumper in the correct position will permanently damage the MaxiProx unit. The following states the P2 shunt jumper installation.

Power Supply Voltage	Jumper Position
+24 VDC (21-28.5VDC)	P2 across pin 2 and 3
+12 VDC (11.6-20.9VDC)	P2 across pin 1 and 2

Notes

- For Wiegand interface cable the maximum length is 500 feet (150m), 50 feet (15m) for RS232, and 4000 feet (1200m) for RS422.
- When using 5 conductor cable, the power supply and Host must have a common ground (voltage reference).
- 7-Conductor cable is required when using the *Hold* function or if the ground for the MaxiProx power supply is not common with the ground of the Host. TB2 terminal 3, Data Return, is to be connected to the ground of the Host. (Alpha 1296 C or equivalent).
- 7-Conductor cable is required when the *Hold* function is used, and the power supply and Host "ground" are separate. (Alpha 1297 C or equivalent).
- A 22 AWG twisted pair, shielded, stranded cable (Belden 9330 or equivalent) is often required for the tamper switch. Follow the recommendations of the manufacturer of the Host system. If the tamper input is a supervised input, the "end-of-line" resistor may be mounted in the enclosure between TB1-4 and TB1-5.
- The inner diameter of the cable fitting will accommodate a cable with an outer diameter of up to .260-inches.

2.6 Cable Connections

Install the cable fitting on the rear of the MaxiProx. Feed the cable through the cable fitting. Connect the wires to the terminal strip with the minimum length necessary. Do not leave extra loops of wire inside the reader housing. Connect the reader to the Host according to the terminal descriptions in the dimension diagram. Tighten the fitting to secure the cable. Connect the drain line of the shield to terminal TB1 Pin 2 (Power Supply Shield). If it is bare, cover it with heat shrink or tape to avoid short circuits to the other wires. Connect the opposite end of the drain line to the negative terminal and the frame connection of the power supply.

CAUTION: The P2 shunt jumper is factory installed in the 24VDC position. Failure to install the P2 shunt jumper in the correct position will permanently damage the MaxiProx unit. The following states the P2 shunt jumper installation.

Power Supply Voltage	Jumper Position
+24 VDC (21-28.5VDC)	P2 across pin 2 and 3
+12 VDC (11.6-20.9VDC)	P2 across pin 1 and 2

Table 1: TB1 Connector Definition

1	2	3	4	5
+DC	Shield Ground	Ground	Tamper Common	Tamper Select
Red	Drain	Black	---	---

Table 2: TB2 Connector Definition

1	2	3	4	5	6	7	8	9
DATA 0 DATA/TD/RX+	DATA 1 CLK/RD/RX	DATA RTN	GREEN LED	RED LED	BEEPER	HOLD/ CARD PRESENT	TX+ RS422	TX- RS422
Green	White		Orange	Brown	Yellow	Blue		

Note: On TB2, pins 1, 2 and 7 have multiple purposes, depending on the configured reader interface. In the above table, the first description is for Wiegand, the second for Clock-and-Data, the third for RS232, and the fourth is for RS422.

2.7 Dip Switch and Jumper Settings

Verify the default settings according to the model ordered, or set the DIP Switches and Jumper positions according to the following.

Table 3: DIP Switch and Jumper Settings

Switch	Default	Description
1. Interface mode 1	On	See Table 6: Mode Chart
2. Interface mode 2	On	See Table 6: Mode Chart
3. Interface mode 3	On	See Table 6: Mode Chart
4. Beeper control On/Off	On	On - beep after valid card read. Off - no beep after valid card read.
5. Green LED flash	Off	Off - flash after valid card read. On - no flash after valid card read.
6. Single/Dual external LED	Off	Off - single line LED control. On - dual line LED control.
7. Serial Baud 1 control	Off	See Table 7: Baud Rate Chart – RS232 and RS422
8. Serial Baud 2 control	Off	See Table 7: Baud Rate Chart – RS232 and RS422

Table 4: Interface Jumpers Description - P3 and P4

P3 and P4	1-2	See Table 6: Mode Chart
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Table 5: Switch Description - SW2

Switch	Default	Description
1. Serial Baud 3 control	On	See Table 7: Baud Rate Chart – RS232 and RS422
2. Note address 0	N/A	Unused
3. Note address 1	N/A	Unused
4. Note address 2	N/A	Unused
5. Note address 3	N/A	Unused
6. Note address 4	N/A	Unused
7. Unused		
8. Unused		

Table 6: Mode Chart

Mode	SW1-1	SW1-2	SW1-3	SW5-3	SW5-4	SW5-5	P3 & P4 Jumpers
Wiegand	ON	ON	ON	NA	NA	NA	1-2
Clock-and-Data	OFF	ON	ON	NA	NA	NA	1-2
RS232	ON	OFF	ON	NA	OFF	OFF	2-3
RS422 terminated	OFF	OFF	ON	ON	OFF	OFF	2-3
RS422 unterm.	OFF	OFF	ON	OFF	OFF	OFF	2-3

Table 7: Baud Rate Chart – RS232 and RS422

BAUD	SW1-7	SW1-8	SW2-1
9600	ON	ON	ON
4800	OFF	ON	ON
2400	ON	OFF	ON
1200	OFF	OFF	ON

Table 8: Switch Description - SW5

Switch	Default	Description
1. Data Isolation 1	On	See 1 below
2. Data Isolation 0	On	See 1 below
3. RS422 Terminating Resistor	On	See 5 below
4. Serial Hardware line setting 1	Off	See 6 below
5. Serial Hardware line setting 2	Off	See 7 below

1. *Open Collector Data Outputs SW5-1&2* when using Wiegand or Clock & Data Interface. Configure the data outputs so the MaxiProx is electrically isolated from the Host pull-up resistors. The default (standard) configuration is non-isolated outputs; switches SW5-1 & 2 are *ON*.

Note: When configuring the outputs as isolated, use separate power supplies for the MaxiProx and Host. These switches are unused when in RS232 or RS422 mode.

2. *Beeper Control SW1-4:* Enable or disable the on-board beeper. When enabled, the beeper tone sounds when the LED is green. SW1-4 in the *ON* position enables the beeper (the default).
3. *LED Control SW1-5:* The LED flashes after a valid card read. Control by both the MaxiProx and Host, or Host only. SW1-5 in the *OFF* position selects flash green after valid card read (the default).
4. *LED Mode SW1-6:* Single/Dual Mode. With SW1-6 *OFF* (default) it is in Single Mode. The LED is normally red, until internal or host control turns it green (only a single control line is necessary). If *ON*, it is in Dual Mode, and the LED is normally off (two control lines are necessary for host control of red and green).
5. *SW5-3 Terminating Resistor:* Some RS422 connections require that the RX- line be terminated with a resistor to RX+. If SW5-3 is in the *OFF* position, there is no terminating resistor on RX-. If SW5-3 is *ON*, then a 120-ohm resistor is connected between RX+ and RX-.
6. *SW5-4 Line Setting 1:* Use SW5-4 to configure the reader's interface configuration. SW5-4 should be in the *OFF* position for RS232 or RS422 operation.
7. *SW5-5 Line Setting 2:* Use SW5-5 to configure the reader's interface configuration. SW5-5 should be in the *OFF* position for RS232 or RS422 operation.

2.8 Tamper Switch

Connect the tamper switch to the Host, if provided by the Host. When the cover is removed, the tamper switch is released. The switch contacts available on TB1 Pins 4 and 5 and are either "normally open" or "normally closed" dependent upon the position of the jumper on P1. Install the jumper to connect pins 1 and 2 if you need the "normally open" contacts. Select the 2-3 position if you need the "normally closed" contacts. "Normally closed" refers to the condition of the switch when the case is open. The contacts are rated for 50 mA at 30 VDC.

2.9 Mounting

Mount the base of the MaxiProx that holds the electronics to the surface using the holes located on the base of the reader. There are 12 recessed holes for mounting. The holes are not through holes and require drilling before mounting. Chose the appropriate holes to be used and drill with a 5/32 (.156) inch bit. Use #6 screws only. (See Figure 2: MaxiProx interior view showing mounting hole locations, page 12).

2.10 Power Supply

The MaxiProx reader can be operated over the full range of 11.6-28.5VDC. Current requirements are 200-mA average and 700 mA peak at 12 VDC input. At 24 VDC (21 to 28.5 VDC) input the average current is 260 mA and peak is 1.2 A. A linear regulated supply rated at 2.0 A is recommended. Noise from devices such as switching power supplies, computer monitors, and arc welders can reduce the read range or make the unit inoperable. Keep these devices at least 10 ft away from the reader. With the MaxiProx and power supply wired together, apply power to the reader.

CAUTION: The P2 shunt jumper is factory installed in the 24VDC position. Failure to install the P2 shunt jumper in the correct position will permanently damage the MaxiProx unit. The following states the P2 shunt jumper installation.

Power Supply Voltage	Jumper Position
+24 VDC (21-28.5VDC)	P2 across pin 2 and 3
+12 VDC (11.6-20.9VDC)	P2 across pin 1 and 2

2.11 Auto-tune Operation

The MaxiProx is tuned correctly when the Auto-tune LED is *green*. If the LED is *red*, use a spacer to position the reader at minimum of 4 inches away from metal in the mounting surface.

2.12 Reader Testing

Apply Power to the reader and the LED will display a sequence of flashes and beeps, indicating the LED control mode. Two flashes of green and two beeps followed by a short delay, then one additional flash (beep), is the correct sequence for "Green Flash/Beep on valid read" (SW1-5 off). Three initial green flashes and beeps followed by a pause and then one additional beep indicate no Green Flash/Beep on valid read (SW1-5 on).

2.13 Power-Up Tune

Following this initial power up sequence the reader will perform power-up Auto-tune. It will beep and turn the access LED amber for ~1 second to indicate that a power-up tune test is about to begin. It will then attempt to tune. If it successfully tunes, it will give two quick beeps and a *green* on the access and tune LED's to indicate the reader is tuned. If unsuccessful, the unit will give a single 1.5-second beep with a *red* on the access and tune LED's. If Auto-tune is not successful, the installer should check for large areas of metal less than 4 inches from the back of the unit.

2.14 Periodic Auto-tune

Periodic Auto-tune retunes every 1-minute.

2.15 Supervisor Mode

During idle periods in normal operation, a periodic supervisor 1-byte transmission is sent to the host controller over the Wiegand interface every 1 minute. Supervisor Mode is only available in Wiegand Interface Mode.

2.16 Install Cover

Replace the top cover and top cover screw. Make sure that the Auto-tune indicator LED remains in a steady green state. If the LED is red, remove the cover and re-mount the unit using a non-metallic spacer to position it further away from the mounting surface. Reinstall the cover, verify Auto-tune, and install the front label over the top cover screw and the Auto-tune indicator lens.

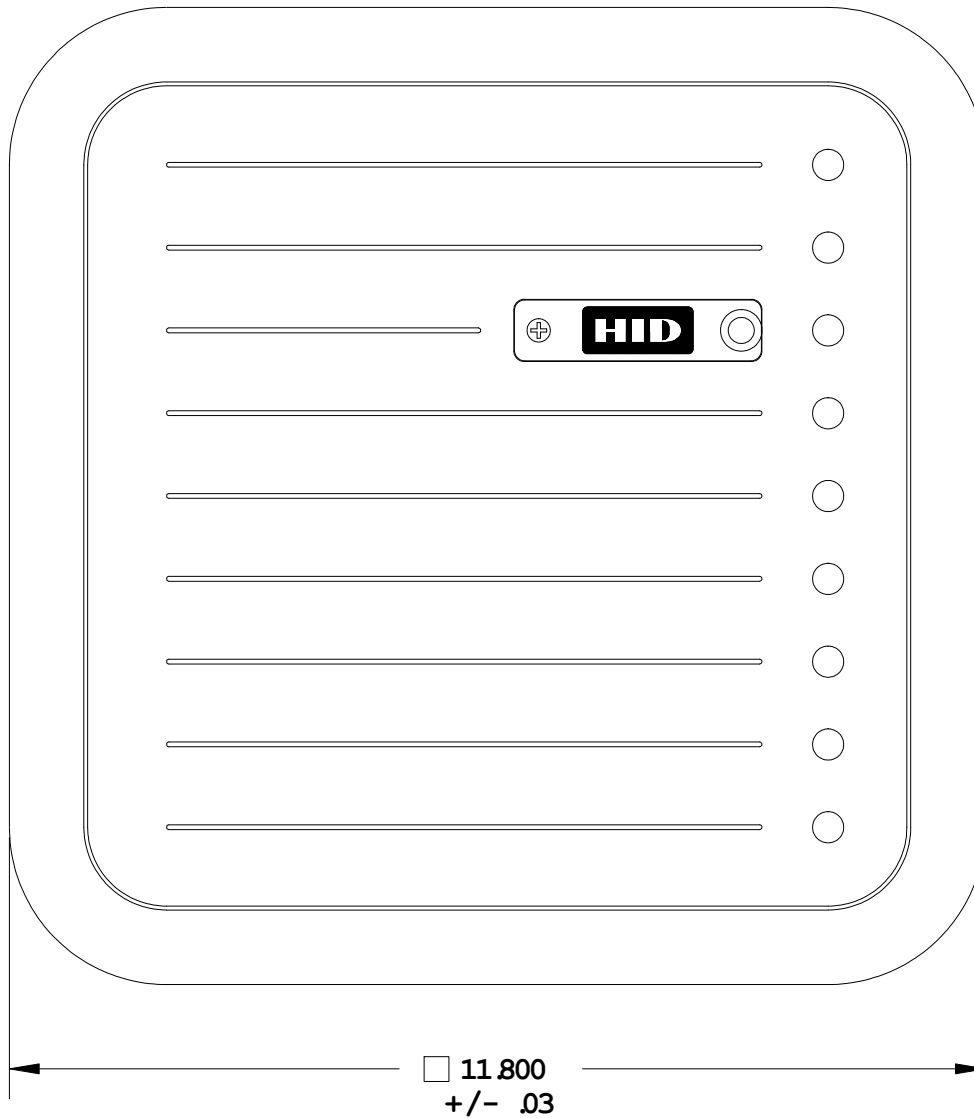


Figure 1: MaxiProx Front View

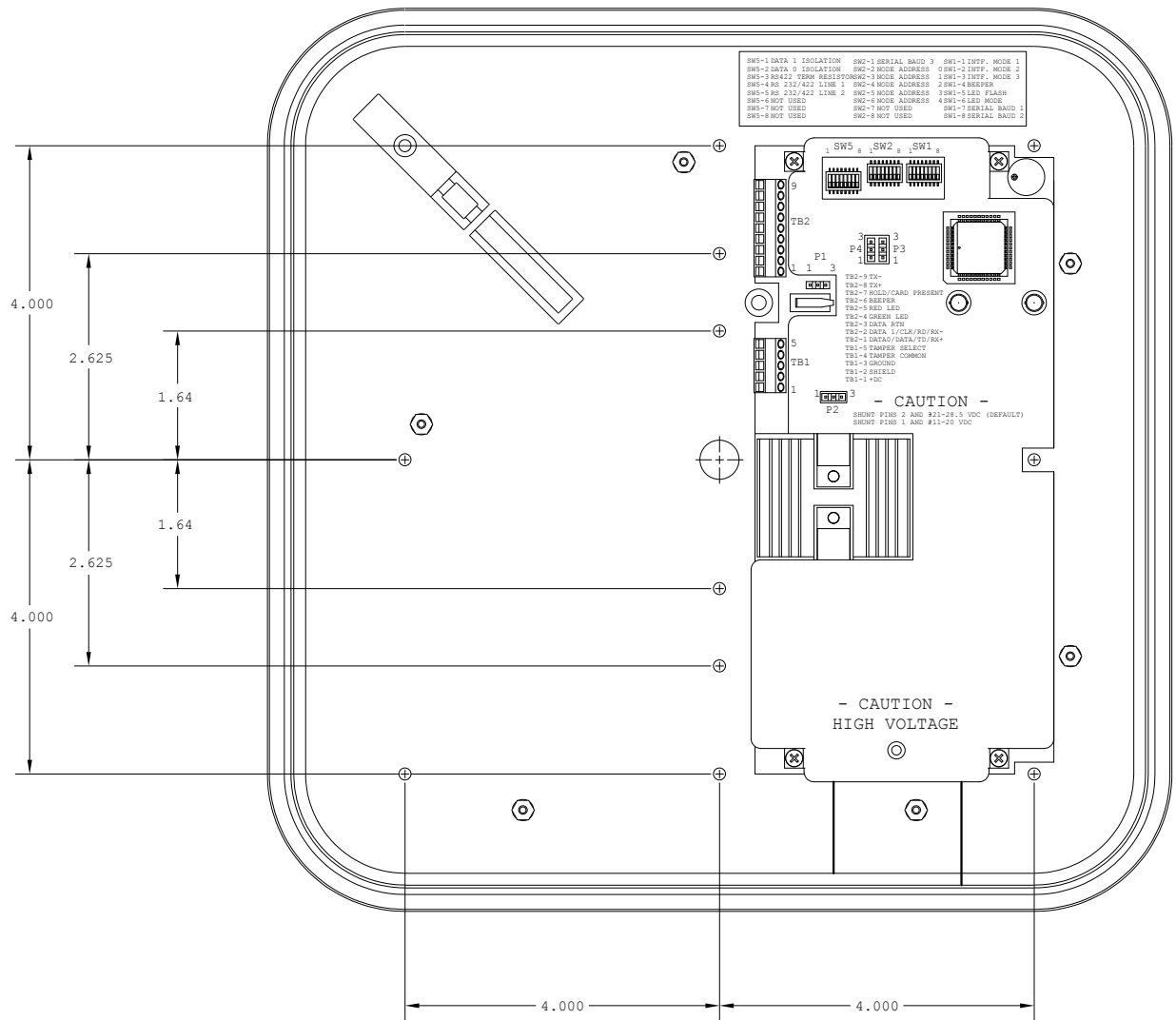


Figure 2: MaxiProx interior view showing mounting hole locations

3 Installation Guidelines

3.1 Power Supply

The recommended power supply is 12 or 24VDC, nominal, 2.0A current rating, linear regulated. The MaxiProx cycles through varying power stages and has a peak current demand of approximately 1.2A when in long range read mode. Average current consumption is about 260mA. *Failure to provide an adequate current capacity power supply will result in reduced read range.*

CAUTION: The P2 shunt jumper is factory installed in the 24VDC position. Failure to install the P2 shunt jumper in the correct position will permanently damage the MaxiProx unit. The following states the P2 shunt jumper installation.

Power Supply Voltage	Jumper Position
+24 VDC (21-28.5VDC)	P2 across pin 2 and 3
+12 VDC (11.6-20.9VDC)	P2 across pin 1 and 2

The use of a Power Switching Supply is not recommended for two reasons:

1. This type of supply does not provide adequate response to rapid transient current loads and also generates radio frequency (RF) interference in the same band that the reader receives data and;
2. The power supply may generate noise that is large enough to be transmitted or conducted to the MaxiProx that interferes with the reception of a card signal. Some switching power supplies are not able to provide adequate regulation to the MaxiProx reader.

3.2 Installation near metal

Read range will be reduced if located on metal surfaces or in the vicinity of metal objects. The amount of reduction will be a factor of the amount of metal and the distance the reader is from the metal. Metal near the reader absorbs energy from the reader excite field and affects the signal being received from the card by re-directing excite field transmissions into the receiver circuitry. Moving the reader away from the metal objects reduces energy loss.

Try to limit the amount of metallic materials installed near the MaxiProx. Use a plastic electrical box if possible. Avoid installing conduit and other metal hardware within 2-inches of the back of the reader or closer than 4-inches from large metal surfaces. The typical read distance specification (24-29 inches at 21-28.5 VDC or 21-26 inches at 12 VDC) refers to operation without metal in the vicinity of the reader. The read distance will be reduced if metal is installed nearby.

The MaxiProx generates a magnetic field on all sides of the reader. Any metal that conducts electricity, especially metal that contains iron, steel or copper will interfere with the field and reduce the effective read range (this will happen even if the metal is behind the reader). It helps to put a non-metallic spacer between the reader and the metal object.

3.3 Radio Frequency Interference

Motors and electronic devices generate RF noise that may interfere with the reception of the signal from a transponder. The affect of RF noise is typically a reduction of read range. The MaxiProx is susceptible to RF interference, as are all devices that receive RF signals. The read range is affected by the amount of interference (noise) in the area. Common sources of RF interference are power supplies, electrical and electronic equipment, some types of lighting, computers and monitors, motors and generators. Moving the reader to a location known to be free of interference and testing read range there will help to isolate RF interference as a factor in low read range situations.

The MaxiProx should not be mounted within six feet of any monitors (VDTs or CRTs) because the scan frequencies of most monitors include frequencies that may interfere with the signal received from the access control cards.

3.4 Transponder Types

The type of transponder used affects the read range of the MaxiProx. The various styles of HID cards and transponders use different types of antennas. The antenna type will determine the read range for that type of transponder. The Vehicle ID tag provides the longest read range at 32-36 inches; the ProxCard II is 24-29 inches. The IsoProx / DuoProx is 17-20 inches. The ProxKey reads at a distance of 15-17 inches.

Note: The above are recommended installation procedures. All local, state and national electrical codes have precedence.

4 Application Notes

The Application Notes section includes information about Wiegand, Clock-and-Data, and RS232/RS422 Card Message specification.

4.1 Wiegand Interface

The following outlines the MaxiProx Wiegand Interface.

4.1.1 Message Format

In the Wiegand format, the ID card is programmed with a specific bit pattern and the reader acquires the data, checks the customer code and generally sends out the same bit pattern as previously programmed on the card. Consult factory for variations to this method. A 26 bit Wiegand format will be used in the examples below.

The 26 bits of transmission from the reader to the panel consists of two parity bits and 24 code bits. The bits are transmitted in the order described. The first bit transmitted is the first parity bit, P1; it is even parity calculated over the first 12 code bits. The last bit transmitted is the second parity bit, P2; it is odd parity calculated over the last 12 code bits:

Code Format

										1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6		
P1	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	P2

Parity Format

										1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6			
P1	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	P2

- P1: First, or even parity bit
- C: Code bits
- P2: Second, or odd parity bit
- E: Bits for calculation of even parity
- O: Bits for calculation of odd parity

Data format within the 24 code bits which includes the portioning of the bit, the designation of the *Most Significant Bit (MSB)* or the *Least Significant Bit (LSB)* shall be subject to definition by the panel and reader manufacturers and may remain proprietary.

4.1.2 Output Specification

The specifications of voltage, current, power and timing are from the perspective of the reader. A common signal ground is defined as a voltage reference that is common to both the reader and the control panel. The voltages for the data outputs are referenced from the power supply ground located at the reader. The voltage measured for the power to the reader is referenced from the power supply-return connection location at the reader, not at the source of the power.

The voltage, current, and timing of the data pulses are measured at the reader in reference to the power supply/signal ground at the reader. The voltage, current and timing of a signal driving an auxiliary input device on a reader is measured at the control panel that is controlling the input device (with reference to the signal ground at the panel).

4.1.3 Signal Levels

The *Data One*, *Data Zero*, and LED Control conductors connect signals between the reader and the panel. The logic levels are defined as follows:

Table 9: Logic Levels

Voltage Levels	Data Outputs (Data0 and Data1)		Control Inputs (LED's, Hold, Beeper)	
	Minimum	Maximum	Minimum	Maximum
Voh	3.5V	5.5V	3.5V	5.5V
Vol	0.0V	0.5V	0.0V	0.5V
Ioh	0.0mA	5.0mA	-1.0mA	0.0mA
Iol	-25.0mA	0.0mA	0.0mA	25.0mA

4.1.4 Data Pulses

The *Data One* and *Data Zero* signals are normally held at a logic high level until the reader is ready to send a data stream. The reader places asynchronous low pulses on the appropriate data lines to transmit the data stream to the panel. The following timing parameters shall be observed:

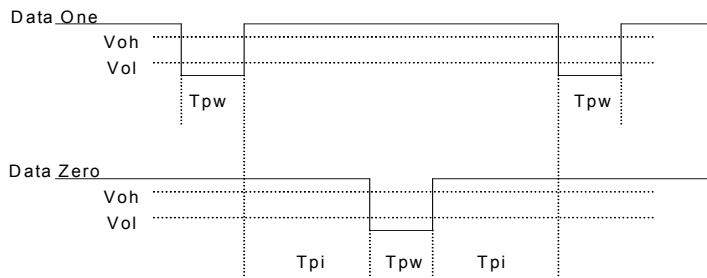


Table 10: Data Pulses - Timing Parameters

- Tpw Pulse Width Time - 30uS (minimum) to 50uS (maximum)
- Tpi Pulse Interval Time - 1.8mS (minimum) to 2.2mS (maximum)

4.1.5 Example Output

The following is an example of an ID card with the number of “816” decimal, which will be output by the MaxiProx reader, the number “02004CA0661” hex.

Note: The customer code is never transmitted or displayed.

customer code	10 zeros	sentinel	parity bit	even	facility code	card number	parity odd			
[0 0 0 0 0 1]	[0 0 0 0 0 0 0 0 0 0]	[1]	[0]	[0 1 1 0 0 1 0 1]	[0 0 0 0 0 1 1 0 0 1 1 0 0 0 0]	[1]				
0	2	0	0	4	C	A	0	6	6	1
Wiegand Output				0	C	A	0	6	6	1
Hex code numbers				[6	5]	[0	3	3	0]	
Decimal conversion				[101]	[0816]			

4.2 Clock-and-Data Interface

The following sections outline the MaxiProx Clock-and-Data Interface.

4.2.1 Message Format

The Clock-and-Data interface consists of three signals, Card Present, Data and Strobe/Clock. The interface is a serial data stream, which is controlled with a clock/strobe that indicates when data is valid. All signals are quiescent high. *Card Present* goes low when data is about to be sent and remains low until the whole data stream is completed. *Data* is the signal that determines the “ones” and “zeros”. *Strobe/Clock* is the signal that indicates when data is valid for each cycle.

The *Track 2* message format is a stream of binary bits that are grouped into HEX characters. The message starts with leading zeros, followed by a start sentinel, data, end sentinel, LRC and trailing zeros. Each HEX character has error correction in the form of a parity bit. Each character consists of five bits. The maximum number of characters for a magnetic strip card encoded on *Track 2* are 40, this product will output less than 40 characters. The data consists only of BCD digits, the remaining HEX digits, A to F, are used for the start and end sentinel, data separators and control. Only hex B and F are used, A, C D and E are not used. The message will consist of a minimum of 210 bits.

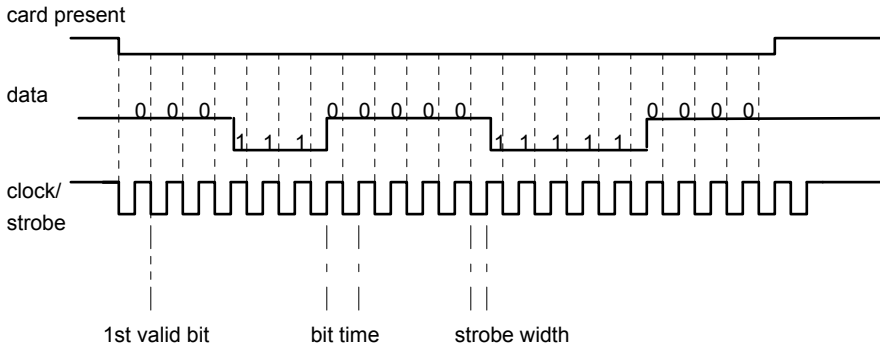
The bits of a character are in the order 1248P, where parity is odd over the four bits. The LRC is the Xoring of the message, starting with the start sentinel and ending with the end sentinel. The LRC does not include the parity bits of the characters in the Xoring. LRC does include its own odd parity bit that covers the four bits that are the result of the Xoring.

<leading zeros><Start Sentinel><data><data>.....<data><End sentinel><LRC><trailing zero>

Customer code 0,1, 63, 72 and 73 (existing customer codes) cards will be read and output in the *Track 2* format. The data on these cards will be packed into the *Track 2* format in segments of three bits, so the character does not exceed a BCD seven.

4.2.2 Data Timing

The outputs, Card Present, Data and Strobe are low going signals and the following timing chart describes the timing.



Note: the first 25 bits and trailing bits are zeros, not shown above.

Table 11: Data Timing - Timing Chart

- bit time = 1.5ms (default)
- strobe width = bit time/3 (33% of bit time), default = 500us
- *Clock/Strobe* is valid 1.5ms (one clock cycle, min) after card present is asserted
- *Data* is valid 10us (min) before the negative edge of clock/strobe
- *Card Present* returns to the high-level 50 ms (max) after the last clock/strobe.

The above timing is representative of a magnetic stripe card traveling at 8.9 inches per second. The timing is to be adjustable for cards traveling at 4 inches per second to 20 inches per second. This relates to bit times of 3.3 ms and 666us, respectively. There are 75 bits per inch on *Track 2*.

4.2.3 Output signal Levels

Inputs: low threshold = 0.8 volts high threshold = 3.5 volts

4.2.4 Bit structure

The reader will read an 1849 or compatible chip that is encoded with 44 bits of data. The data will be programmed in accordance with ProxGuard formatting. The data will be packed into the ABA/ISO *Track 2* message format in accordance with the following rules based on customer code:

Case 1:

Customer Code = 0, 1, 63, 72, 73 or other, will have the data output as follows.

The output is in the **Track 2** character format but the bits are packed in sets of three bits (octal):

```
cccCCCC a bcd efg hij klm nop qrs tuv wxy zAB CDE FGH IJK
```

Where cccCCCC is the customer code, abc...IJK is the programmed data on the card.

```
1248p 1248p 1248p1248p 1248p1248p 1248p1248p1248p1248p 1248p 1248p 1248p 1248p1248p1248p
<B> c000p Ccc0p CCC0p a000p dcb0p gfe0p jih0p mlk0p pon0p srq0p vut0p yxw0p BAz0p EDC0p HGF0p KJI0p <F><LRC>
```

Case 2:

Customer Code = 74 are structured as follows:

```

421 8421 8421 8421 8421 8421 8421 8421 8421 8421
CCC CCCC 1 aaaa bbbb cccc dddd eeee ffff gggg hhhh iiii
CCC CCCC      - Customer code
1              - fixed bit "1"
aaaa          - Most significant nibble of message
bbbb          - Second MSN
cccc          - next nibble
hhhh          - least significant nibble of message
iiii          - LRC of nibbles aaaa to hhhh, start (B) and end sentinel (F) (xor of the nibbles or the even parity of the
                respective column)
    
```

The output from the reader will look like the following:

```

1248p 1248p 1248p 1248p 1248p 1248p 1248p 1248p 1248p 1248p
<B> <aaaap> <bbbbp> <cccp> <dddp> <eeep> <fffp> <gggp> <hhhp> <F> <iiip>
start data a data b data c data d data e data f data g data h end LRC
    
```

The message structure follows the ISO/ABA *Track 2* standard. The first character is a start sentinel: B (hex), which is followed by data. After the data there is an end sentinel: F (hex), followed by an LRC. The LRC is the xoring of the message in accordance to the bit position. Each character has an odd parity bit that covers bit 1 to bit 4 of the nibble.

A typical message:

B 1 2 3 F LRC the bits broken down:

```

1248p 1248p 1248p 1248p 1248p 1248p
11010 10000 01000 11001 11111 00101
B   1   2   3   F   4
start < data > end LRC
    
```

4.2.5 Bit Stream

The bit stream will consist of 25 leading zeros, the message and fill with zeros until the end of the message. The message will consist of a minimum of 210 bits.

Example

```

00000000000000000000000000000000 11010 10000 01000 11001 11111 00100 000000000000000...000000
                                B   1   2   3   F   LRC
    
```

4.2.6 Output Specification

```

Vol = 0.8 V
Voh = 3.5 V
sink = 25 ma
source = 5 ma
    
```

4.3 RS232 and RS422 Card Message Specification (Send Mode Only)

When Access Cards (transponders) are presented to the MaxiProx reader, the reader sends a message. The message is in the following format:

```
CCDDDDDDDDDDXX<CR><LF>
```

^ First character sent

All characters C, D and X are ASCII encoded, hexadecimal digits. (i.e., the hex value 7 is sent as an ASCII character 7 or the hex value E is sent as an ASCII character E).

The CC field is reserved for use by HID Global Corporation. The valid values are 00 through 7F.

The DDDDDDDDDD field is the transponders (Access Card) data. The valid values are 0000000000 through 1FFFFFFF (ASCII).

The XX field is a computed checksum. The checksum is calculated by first grouping the message data into the pairs CC DD DD DD DD DD. Each pair of characters represents one byte of data. Then each pair of characters is converted from ASCII to their respective hex values. At this point, the 6 bytes are added together. The checksum is equal to the least significant 8 bits of the result.

<CR> is the ASCII code for a carriage return. (0D hex)

<LF> is the ASCII code for a line feed. (0A hex)

For example, if the MaxiProx reads a transponder (Access Card) that contains the value CC=00 and DDDDDDDDDD=01234ABCDE, the reader will report the ASCII message 0001234ABCDE08<CR><LF>.

Note: Each of the characters is ASCII encoded. The actual bytes (hex value) that are sent to the host are:

```
<30><30><30><31><32><33><34><41><42><43><44><45><30><38><0D><0A>
```

The checksum was computed by adding 00 + 01 + 23 + 4A + BC + DE = 208 hex. The checksum is the least significant 8 bits of this result or 08 hex. The communications settings are 9600-75Hz BAUD, 8 bits, 1 stop bit, no parity.