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REV	DESCRIPTION	DATE	APPROVED
7			

NOTE: Cover sheet is for Revision Control only, and is not to be sent with document.

REV																		
SHEET	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
REV																		
SHEET	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
REV STATUS																		
OF SHEETS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

TOLERANCES	APPROVALS	DATE	HID CORPORATION
.XX = +/- .03"	DWN G. FOSSEN	120799	IRVINE, CALIFORNIA
.XXX = +/- .010"	CHK		Installation Procedure
ANGLES = +/- 1°	APVD		ProxTrak Portal Reader
MATERIAL N/A	APVD		
FINISH N/A			P/N 6042-901-01 REV 7
SCALE N/A			SIZE A SHEET 0 OF 19

ProxTrak[TM] **Portal Reader Installation Procedure**
6042-901-01 Rev 7

Table of Contents

1. AMP100 ProxTrak^{TM} Portal Reader Installation Manual

1.1 Scope

This document describes the information necessary for physical installation, setup and programming for an HID Portal Reader. The dimensional, cabling, configuration and programming requirements are described in detail to provide assistance for the installation process.

1.2 Functional Summary

The AMP100 ProxTrak Portal Reader will perform all applicable RF operations (transactions) on any HID AMT100 Asset tags and HID Prox family Access cards. In addition, the Portal can detect individuals passing through the Portal. This gives the integrator the ability to control the actions around a doorway that is monitored by a Portal Reader. Also included are indicators in the form of a Beeper, LED's and an LCD Display module. Contact closures from 2 low voltage relays are available, if required by the application, for CCTV, door strikes or other functions.

The exciter circuit in the Reader produces a nominal 125KHz current in the exciter coil resulting in a 125KHz electromagnetic field which provides power and a fundamental clock to a tag. Commands are sent to the tag by an amplitude modulation sequence of this current resulting in modulation of the field. The ProxTrak^{TM} Portal Reader is designed for approval under all applicable emissions regulations.

1.3 FCC Notices

The FCC approval requires that this device complies with Part 15 of the FCC Rules; Operation is subject to the following two conditions: 1) This device may not cause harmful interference, 2) This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.4 Reference Documents

ProxTrakTM Multi-drop Protocol Specification HID P/N 0200-636
ProxTrak^{TM} Utilities Software Manual HID P/N xxxx-xxx
Wiegand Specification for ProxTrak^{TM} Portal HID P/N 0200-635
Atmel Corporation specification for AT24RF08 Asset Identification EEPROM
Asset ID^{TM} Programming Specification, IBM PC Company

2. Site Requirements

Because of the high sensitivity required to acquire asset and access tags in a volume the size of a Portal, some preliminary inspection of the property is required to determine if the site is suitable to install the ProxTrak Portal Reader. There may be electrical noise generators in the area of the installation that could prohibit the use of a Portal unless the noise generator can be moved, shielded or replaced. Refer to the General Interference Guidelines and "Location of other Proximity Readers" sections at the end of this manual. In addition there is a detailed "Environmental Radio Frequency Noise Test" that can be performed to verify the site complies with Portal requirements.

2.1 Physical Requirements

2.1.1 Floor

Floor must be level to within .1" over the footprint of the unit (approx. 42" X 42") also the floor must be solid and not have any give. The ceiling must be 92" high at the location of the portal.

2.1.2 Mounting

The portal must be secured to the floor using Redhead or similar anchors and at least one point along either of the vertical tubes or the crossover tube or at four points along the uprights.

2.2 Power Requirements

110V AC, 60Hz, 15A dedicated service within 6 feet of one corner of the unit
AC cable exit position must be specified at the time of ordering. Options include: High or low, Exit or Entrance, front or side exit. See the "ProxTrak - How to Order Guide" for details

2.3 Host or Panel Communication Requirements

Maximum cable lengths
RS232 is 150 feet (46 meters)
RS485 is 4000 feet (1230 meters)
Wiegand is 500 feet (154 meters)

2.4 Environmental Limits

Operation outside of the following parameters can result in improper operation and/or void the manufacturers warranty.

Operating Temperature Range   -0°C to 50°C (32°F to 122°F)
Storage Temperature Range -20°C to 65°C (-30°F to 149°F)
Operating Humidity Range 5% to 95% non-condensing
Operating Vibration Limit .01 g^2/Hz 20-2000Hz
Operating Shock Limit 10g, 11mS, Half Sine
Electromagnetic Environment See Sections 4 and 5

2.5 Materials

Enclosure Material UL Listed ABS
Size   40.5" W x 38" D x 89" H
Weight   226 lbs. 102.5 Kg

3. Physical Installation

3.1 Unpacking

Each unit will be shipped in several boxes. Each box will be marked with:
Model number
Serial number
Major assembly included
This information will be needed if technical support is required.

Packing List:
Controller assembly ………………………… P/N 6042-350
Antenna panel assembly, primary side …… P/N 6042-360
Antenna panel assembly, secondary side… P/N 6042-370
Threshold assembly ………………………… P/N 6042-380
Accessory kit – Controller assembly ……… P/N 6042-390
Accessory kit – Threshold assembly ……..P/N 6042-391
Accessory kit – Mounting ………………….. P/N TBD
Accessory kit – Misc ………………………. P/N TBD(manual, test tags/cards RS232 cable)

3.2 AMP100 Portal Reader Dimensions with mounting points
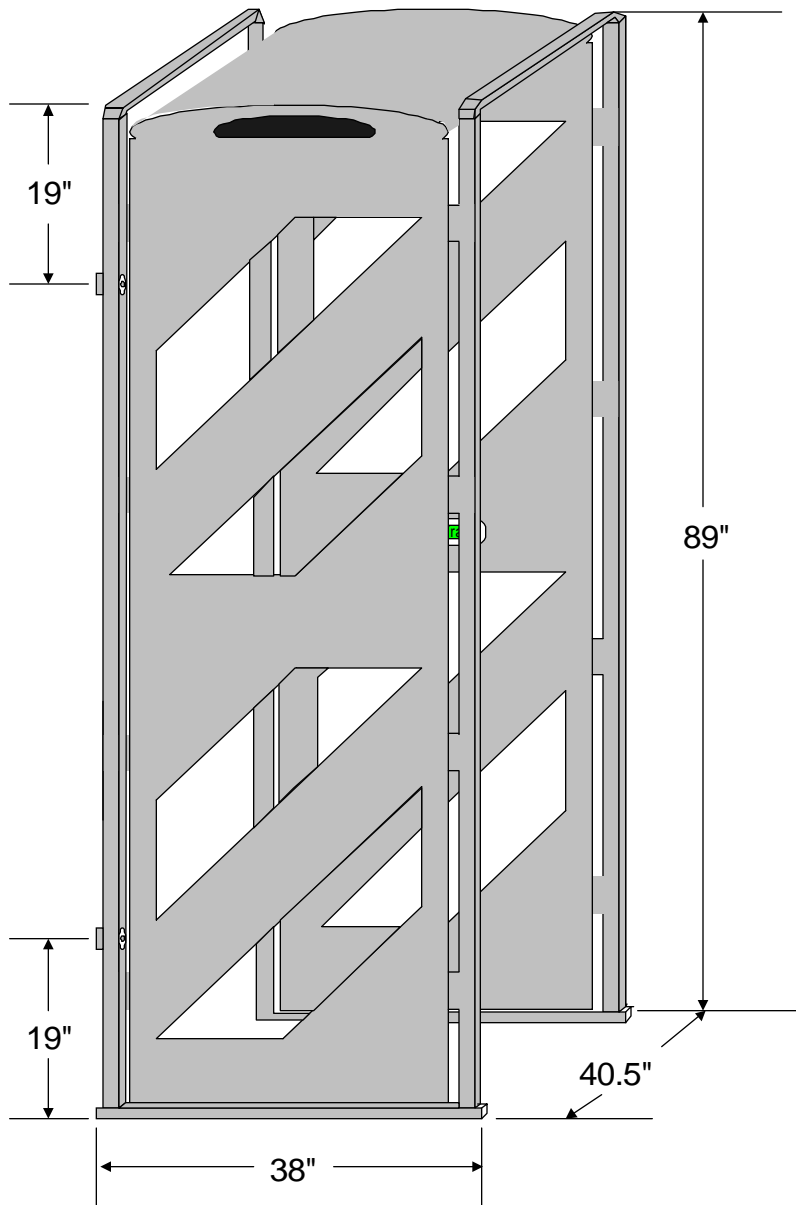
3.3 Mechanical Assembly Procedure

The portal must be assembled in an area where there is at least 96 inches of clearance between the floor and the ceiling.

Start with the Portal assemblies located near where the Portal will be installed. The portal will be assembled on one side and then tipped upright. It may then be moved into place.

On each major component there will be a red dot indicating the doorway side or edge.

Support the base perpendicular to the floor with the doorway edge up (the doorway edge is the edge nearest from the crossover wires embedded in the bottom). Stand the Primary Panel assembly on its entrance edge (the primary panel assembly is the one with the LCD module), red dot up, and fasten it to the Threshold assembly with the LCD facing towards the inside of the portal. Use 8 of the tapered machine screws, four in each of the corner supports in the uprights. Repeat for the secondary panel assembly. Install cross over tubes and route cables as shown in Figure 1

Note - Use precautions to guard against static discharges to any exposed electronics when handling the Controller assembly.

Place the Controller assembly on its entrance edge and slide the left and right edges onto the Panel assemblies gray mounting blocks. Note that the fans are located closest to the Primary side. Use the hex key head 10-20's (4 each with washers), screwed into the threaded insert in the controller assembly. Add the 4 1", 6-32 pan-heads in the through-holes, with the washer and nut on the top, to each gray bracket.

The Portal can now be stood upright. Be sure to lift the top end straight up, without stressing the Portal by tilting it to the right or left; lift using the lower gray structural pieces. Do not lift the white antenna assemblies or the upper gray members. The Portal is not designed to be put into use without structural support provided at the doorway. (See "Door frame mounting"), below.

3.4 Electrical Assembly

3.4.1 Cable Connections
Connect cables as shown.

A1-Portal Electronics Assembly

+ 5VDC

P1 P2 P3
P4
A3 - Sensor I/O Bd

- 40VDC   +40VDC

Fan

P2   P1
Sensors   Rcvr-Pri
Power   Rcvr-Sec

P1 P1
A2 - Exciter Amplifier Assembly
P2 P2

P5 Exciter

P6 FSK

P7 FSK

A1 - DSP Bd Assembly

P8

P9 I/O

Fan

+/- 12VDC

P10 P11 P12
Comm I/O   LCD

Fan Power TB

A3 - Secondary Antenna Panel   Door Side   A2 - Primary Antenna Panel

Exciter Antenna

Exciter Antenna

A2-LCD

A1-FSK Rdr

P1
2
P1
3

P1
2
P1
3

A1-Rcvr Antenna Summing Bd

A2-Rcvr Antenna Summing Bd

A3-Rcvr Antenna Summing Bd

A4-Rcvr Antenna Summing Bd

P1

A3-Sensors

P1

A5-Sensors

Exciter Antenna

Exciter Antenna

3.5 Door Frame Mounting

3.5.1 Installation Accessory Kit
Each unit will be supplied with an installation accessory kit containing the following:
Mounting screws
Mounting washers
Mounting spacers
Cable egress/fitting kit

3.5.2 Mechanical Mounting Procedure
The Portal requires a external support structure such as a doorway frame, a structural wall nearby or external supports designed to support the Portal frame from movement caused by incidental forces such as people, carts, dollies or other items that may come into contact with the Portal in general use. The most common method of mounting is attaching the Portal to the doorframe. This method includes positioning the Portal Reader close to the doorframe, allowing for a direct mount to the framework via the appropriate fasteners for wood, steel or aluminum.

With this mounting method, the doorframe must be 35 to 41 inches inside width for an effective mounting structure. The AC line cord must not exit on the face of the Portal frame that will be used for mounting. The position of the AC cord can be specified at the time of ordering. An example of a doorframe mount is shown below.

Door frame mount - viewed from the top
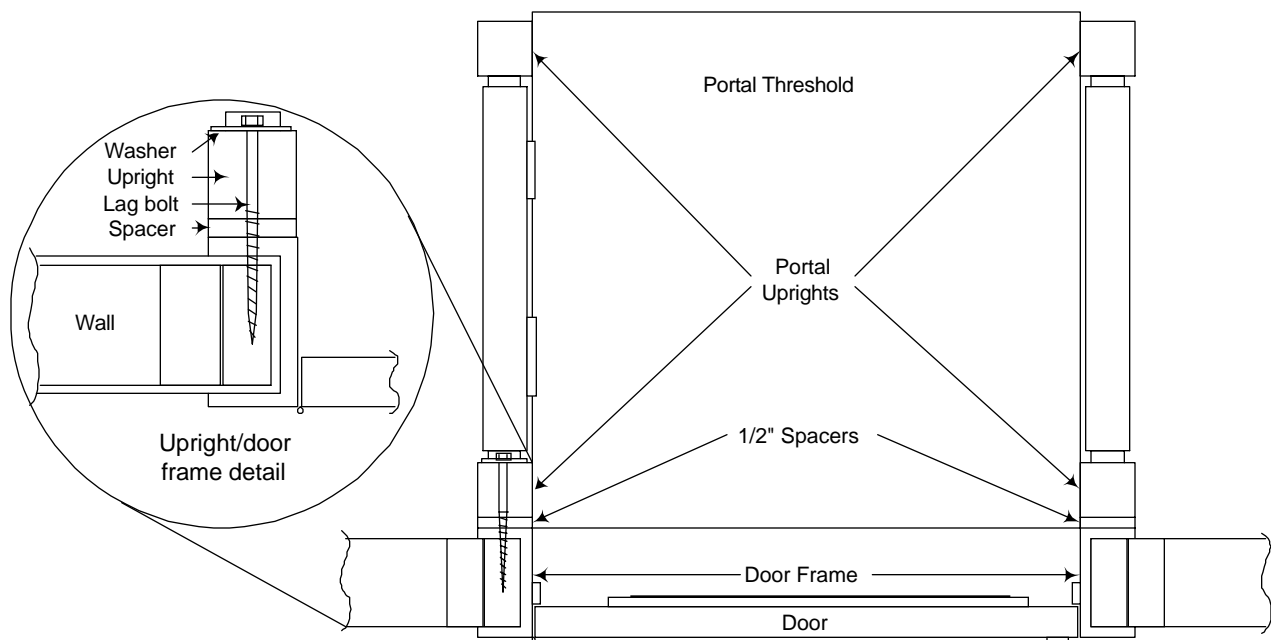
Definition of "exit" and "entrance" - Since the Portal is mostly used as an exit reader, you enter the Portal on the end away from the door, and you exit the Portal at the doorway end. The two uprights that are on the exit end of the Reader are devoid of cables between in a certain span of 51 inches in the center of the vertical dimensions of the Portal. This is the space available for mounting the Portal to the doorframe. Lag bolts, washers and the spacers (See insert) are included with the Accessory kits. The Lag bolts, washer,

spacer combinations (4 each) should be mounted at the 4 mounting locations listed in the Portal picture in the "Reader dimension drawing", above.

The inside cover of each of the Panels will have to be removed to facilitate installing the lag bolts into the installation holes.

For some installations it may be necessary to replace the lag bolts with longer machined bolts, and mount clear through to the other side of the wall for a more secure mount.

Other Doorways may be wider or narrower than the Portal dimensions. In these cases, the installations may require adapter brackets mounted to the Portal at the 4 locations. These brackets could then be used for doing an inside mount on the doorway, or outside mounts on the wall.

4. System Checkout and Test

4.1 Power Supply Check

Power up the system and check the system voltages per Table 1

A1-A1 DSP Board
    U1-5   +5 VDC +/- .1 VDC
    U1-12 +3.3VDC +/- .05VDC
    U1-18 +2.5VDC +/- .05VDC

A1-A2 Exciter Assembly
    +40 VDC   +/- 1 VDC
    -40 VDC   +/- 1 VDC

A2-A5 Sensor Bd
    P1-1   +12 VDC   +/- .5VDC

A3-A3 Sensor Bd
    P1-1   +12 VDC   +/- .5VDC

4.2 Exciter Tuning

Procedure to tune exciter and check exciter current

4.3 Receiver Null

Procedure to check receiver antenna nulls and tuning

4.4 System Performance

With the AMT100 included in the accessory kit test the read performance of the portal (put in free running mode and power up). Also check the performance with the access card

5. Installation into an Asset Management System

5.1 Input and Output Signal Information

All cabling into and out of the portal must be shielded type cable, Alpha 129XC or similar. The connectors must be AMP 6749810 series or an exact replacement.

5.1.1 Serial cable for Host communications

The communication cable is connected to connector P10 on the DSP Bd Assembly. This is a DB-9 style connector.

5.1.1.1 Maximum Cable Lengths

RS485 4000 feet (1230 meters)
RS232 150 feet (46 meters).

5.1.1.2 Communications Pin Assignments

P10	Signal Name
1	RS232 TD (Xmit Data)
2	RS232 RD (Rcv Data)
3	RS232 Signal Ground
4	RS485+
5	RS485-
6	RS485 Signal Ground

5.1.2 Relays

Two SPDT dry contact relays are provided for local use. These are controlled by the portal through commands from the host or settings in the EEPROM.

P11	Signal Name
1	Relay 1 NC
2	Relay 1 NO
3	Relay 1 Common
4	Relay 2 NC
5	Relay 2 NO
6	Relay 2 Common

Relay Specifications
Contact arrangement: SPDT (1 form C)
Contact ratings: DC - 28V@1Amp AC - 120V @ .5A
Contact resistance: 100mΩ max @ 6VDC - 1Amp
Life expectancy: 10 million actuations
UL file E43203

5.1.3 Wiegand Interface

P8	Signal Name
1	Data 0
2	Data 1
4	Signal Return
5	Green LED
6	Red LED
7	Beeper

The ProxTrak Reader Wiegand specifications HID P/N 0200-635 is available upon request for those users who require the Wiegand format.

5.1.4 Second FSK Reader

If a second or outside reader is required please contact HID Technical Support for further information.

6. Setup and Configuration

6.1 Configuration Jumpers on the DSP Controller Board

Caution: Power must be off and Static protection must be used when changing any jumper or switch settings.

2 pin jumper locations	Description
P2-7 to 8	Boot mode – normal (always in)
P2-1 to 2	Boot mode – must be removed for normal boot mode
P2-3 to 4	Boot mode – must be removed for normal boot mode
P15-4 to 6	RS232 selected (2 to 4 would be RS485)
P15-3 to 5	RS232 selected (1 to 3 would be RS485)
P23-2 to 3	Beeper enabled (Move to connect 1 and 2 to disable
P28-2 to 3	RS485 terminating resistor – in for end of the line termination (last reader)
P46-1 to 2	Flash programming enable. Move to connect 3 and 4 to disable Flash programming. Default – 3 to 4

6.2 Serial Communication

The communication channel to the Host is provided via RS485 or RS232, selectable by jumpers on the DSP Control Board.

6.2.1 RS485

The RS485 option is the default setting, since it is capable of multi-drop points and can be connected at long cable distances. The interface defaults to 19,200 baud, 1 stop, 8 data bits and no parity. Other selections are 4800, 9600 and 38,400 baud.

The RS485 configuration is selected by placing 2 jumpers on the DSP Control Board. See the "Configuration Jumpers" section for details.

For RS485, a 2 wire interface is supported - use 485+ and 485- . Shield should be connected to only one end (master end – Host or panel). For 2 wire 485, each device must have a proper earth ground for proper communications operation.

For 3 wire 485 - If a third wire is used for a Signal return, use a 100 ohm, ¼ Watt resistor to Pin 6 of the above table, to limit ground fault currents.

6.2.2 RS232

The RS232 option works identically to the RS485, with the exception of the hardware limits; no multi-drop and the cable distance is limited. There are no differences in the firmware or software requirements of the protocol. The RS232 configuration is selected by placing 2 jumpers on the DSP Control Board. See the "Configuration Jumpers section".

A 3 wire RS232 interface is supported – Use TD, RD and Signal ground.

6.2.3 RS485 and RS232 Connector Terminal Assignments

P10	Signal Name
1	RS232 TD (Xmit Data)
2	RS 232 RD (Rcv Data)
3	RS232 Signal Ground
4	RS485+
5	RS485-
6	RS485 Signal Ground

6.2.4 Baud Rate and Node Address

Selection of the baud rate and node address for multi-drop communication is done on Switch 7. See the Switch settings section for details.

6.3 Polled mode

See the ProxTrak Multi-Drop Serial Protocol (Document number 0200-636) for a complete description of the Commands from the Host, Messages from the Reader, packet formats, and suggested Polled operation. This Protocol uses a binary formatted packet that minimizes transaction overhead and maximizes speed while providing a multi-point communication pathway.

6.4 Simplex mode

There is a Simplex mode, which allows the use of a general purpose Serial communication utility for connecting to the Reader. This is a simple way to get Reader data that only requires a one way interface. There is an initial start-up message that puts out status information, and then ID information is sent out when Access cards and or Asset tags have been acquired. This is an ASCII interface and it will work with either RS232 or RS485 for testing with one Host and one Reader. To turn on the Simplex mode, Turn on Switch 7, position 1. Also, since polling from the Host is not recommended in Simplex mode, use the free-running mode setting of the switches, Switch 8, position 3, On.

6.5 LCD interface

The LCD interface is used for sending messages to the user of the Portal. If the Reader is in the default mode, the messages will need to be sent from the host to the Reader using the Send Message to Display command. In the LCD Test mode, Access cards ID's and the Asset tag Count will be displayed. The Tag count is a number that is incremented from 1 to 5 when additional Asset ID's are acquired. The count is reset when an Access card is read. Turn Switch 6, Position 7 - ON to turn on the test mode.

6.6 Tag Command options

The communication protocol required is the HID "ProxTrak Multi-Drop Serial Protocol" and should be referenced when developing applications with the Portal Reader.

The Asset tags require communication from the Reader to facilitate selecting the tag, acquiring tag ID data and setting the Tamper bit and subsequently shutting down the tag to allow other tags to be available for acquisition. There are several options available to the user that can be used to facilitate getting these commands to the tag quickly and with flexibility. There are Automatic Tag commands and Host controlled Tag commands. There is also a version of the Automatic Tag command function called the Failsafe mode that is activated automatically if the communication to the Reader from the Host is interrupted.

6.6.1 Default Tag commands

Default Tag commands are programmable in EEPROM. When the Reader resets or after power-up, it reads the EEPROM to find out which command or sequence of commands it should send to the Tag every time it acquires a new Tag ID. The normal default tag command is a Set Quiet command. This can be changed to include the Set Tamper command. See the AT24RF08 command descriptions in the Atmel specification.

6.6.2 Failsafe Tag commands

The Failsafe feature allows the user to change the Default Tag Command setting to be a new Tag command in the event that the communication fails between the Reader and the Host. After a fixed delay (default is 30 seconds, programmable) from the last host command, the Failsafe Tag Command goes into effect. If the Reader has switched to the failsafe mode due to communication problems, the first successful poll will have a bit set in the Tag ID message, alerting the Host that the failure has occurred since the last successful poll.

6.6.3 Host controlled Tag commands

The Set Tag Command can be sent from the Host to override the current Default Tag command. The Reader accepts the Set Tag Command from the Host and replaces the current default Tag command. It will perform the new tag command on every newly acquired tag indefinitely until a new Set Tag Command, reset or power cycle.

6.6.3.1 Individual ProxTrak™ Commands

Host commands can be sent to a specific Asset ID tag. When the ID has been acquired and transferred to the Host during the normal polling process, the Host can then send an Individual Tag command to ProxTrak Tag, based on the ID. The Reader accepts the Individual Tag command(s) from the Host and sends it to the tag if currently available in the field. If the tag is not currently in the field, the Reader sends a failure response to the Host after a 1-second timeout.

6.6.3.2 Global ProxTrak™ Commands

Host commands can be sent globally to Asset ID tags by sending Global Tag Command, which contains the specific tag command. The Reader accepts the Global Tag command from the Host and sends it to all tags that are currently available in the field.

Refer to the ProxTrak Multi-Drop Serial protocol specification for a complete description of the Set Tag command, Individual Tag command, Global Tag command and EEPROM locations for setting the Default Tag command and the Failsafe tag command.

6.7 Indicators

Indicators include the Red/Green LED, Beeper, Relay 1 and Relay 2. Each indicator also has its own programmable duration setting. Some default indicator actions are pre-programmed for Power up, Access card read, Asset card read and when a Tag Command has been sent to ProxTrak tags. These default actions can be changed during the Portal set-up. If these default actions are not sufficient, the Indicator command can be used. This command can be sent at any time from the Host, over-riding any current actions. Refer to the ProxTrak™ Serial Protocol. Each Indicator has a list of up to 32 specific sequences, including individual flash, flash twice, flash three times, cycle on/off, etc.

6.7.1 Red/Green LED and Beeper in the Access control Reader

The Red/Green LED and beeper is located on the face of the ThinLine™ reader, and will activate using the default actions listed in the indicator actions and respond to the Indicator command.

6.7.2 Red/Green LED and Beeper located on the DSP controller electronics.

There is Red/Green LED and beeper located on the Controller electronics of the Portal reader, and will activate using the default actions listed in the indicator actions and respond to the Indicator command. This internal Beeper has a jumper for disabling/enabling the feature. Refer to the Jumper settings. The beeper can be disabled by moving jumper P23 to connect pins 1 and 2.

6.7.3 Relay 1 and Relay 2

The Relays are located on the PCB and have connections available to select the normally open or normally closed terminals. They can be included in the default indicator actions and can be activated with the Indicator command. See the terminal strip connections available in the cabling requirements section.

6.8 EEPROM Configuration information

Refer to the EEPROM configuration table, below and in the in the ProxTrakTM Serial Protocol for the memory locations that set the following configurable features of the Reader. The EEPROM can be changed and tested by using the Write EEPROM and Read EEPROM commands – also described in the Protocol specification. Test software that provides an easy user interface is provided with each Portal Reader. Refer to the ProxTrak Utilities Users Manual for more information.

6.8.1 Indicators (LED's, Beeper, Relays) duration's

All five indicators have a 1 byte value. The byte specifies the basic duration used by the Reader to activate the indicators. Refer to the table of Indicator actions, below. The references to long, medium and short flashes (beeps, clicks) are based on this duration.

The default indicator duration bytes factory defaults are programmed as follows (100mSec/count):

Indicator	Byte Value (HEX)	Duration
Red LED	10	1.6 Sec
Green LED	10	1.6 Sec
Beeper	10	1.6 Sec
Relay 1	10	1.6 Sec
Relay 2	10	1.6 Sec

Note: To use the table defaults for an example; a duration of 1.6Sec; Long = 1.6Sec, Medium = .4Sec, Short = .1Sec. Also, if the Indicator duration is switched to "Fast" (see switch settings), all duration's will be 4 times shorter than the default (in the above example, Long would become .4 sec, medium, 100mSec, and short, 25mSec). Up to 32 actions can be specified for each device, except Relay 2, which has 16 actions.

6.8.2 Programmable indicator responses on major events

There are 3 bytes for each major event to define the indicator actions. The events include Power-up, Access Card read, Asset Tag read and an Individual Tag Command has been executed.

Default settings for Events	3 byte Indicator Command (HEX)			Indicator Descriptions
	Extra bits/Red er	Green/Beeper gb	Relay1/Relay2 r1r2	
Power up default	E4	55	00	Two Med Red Flashes off, Two Med Green Flashes on, Two Med Beep on, Relays off
Access Tag read	02	25	88	Short Red Flash off, Short Green Flash off, Med Beep on, Relays no change
ProxTrak Asset Tag read	02	33	88	Short Red Flash off, Short Green Flash on, Short Beep on, Relays no change
Tag operation performed (other than Set Quiet)	AC	0D	88	Three Med Red Flashes off, Three Green Med Flashes on, Three Med Beeps, Relays no change

6.8.3 Default tag command

This setting programs the Tag command that will be used for each Asset Tag in the field. The factory default is a Set Quiet command.

6.8.4 Failsafe activation timeout

Specifies how long the Reader waits from power up without Host Comm or after the absence of Host communication to switch the Automatic Tag command over to the Fail safe Tag command.

6.8.5 Failsafe tag command

This setting programs the Tag commands that the Reader will use if the communication to the Host has been interrupted for a time equal to the Failsafe activation timeout. The factory default is a Set Quiet command.

6.8.6 Multiple Adjacent Unit Interface (Maui)

Maui is a scheme for 125kHz detection and anti-collision used in the ProxTrak Portal Reader. It is a method of handling 125KHz interference for multiple readers by waiting for the interference to go away and resuming with normal operation, interspersing their on times in an orderly fashion; if 2 Readers are close enough to detect each other, they will synchronize by alternating their exciter cycles to avoid interference.

6.9 Wiegand Output

Refer to the Wiegand specification for the complete description of the Wiegand output formats.
A 26 bit format is generated for Asset ID's acquired by the Portal Reader. The 26 bit format sends an 8 bit Facility code and 16 bit "card data" enclosed in parity bits for error detection. 2 formats are supported. An IBM tag type is supported by parsing part of the Manufacturing code, and including it in the "card data". A Legacy tag type is supported that sends the least significant 16 bits of the legacy data as the "card data".
For Access cards (and fobs) the data is passed from the card to the output directly, making the system compatible for 26, 35, 37bit etc. bit formats.

6.10 Download new Acquisition Processor (AP) code

Refer to the Download instructions found with the ProxTrak^{TM} Utilities software, included with each Portal Reader.

6.11 Diagnostics

6.11.1 Set Calibration command
The Reader performs an auto-calibrate of all receivers and returns a Calibration response, which includes the Exciter phase value.

6.11.2 Status Request Command
The Reader responds with a Data block message which includes the Status byte and a noise byte. The Status byte includes information about the last acquisition status and a set of error codes. The noise byte is an indication of the number of transitions in the receiver cycle during the highest exciter level and the most significant bit represents an alert that the MAUI delays had to be activated as a result of an interfering 125kHz interference.

6.11.3 H/W Configuration
The Hardware configuration command tests the switch blocks and returns switch settings in the H/W Configuration response message.

6.11.4 Reset Command
Sending a $0D command resets the Reader.

7. Tables – Switch settings, EEPROM Settings and Indicator actions

Switch Settings - Caution: Power must be off and Static protection must be used when changing these switches.

7.1 Acquisition Processor switches

Note: In general the acquisition switches are factory and troubleshooting settings only – the Main configuration changes are done on the Communication section Switches – Switch 6, 7, 8 and 9, shown below.

Switch 2 – Acquisition testing
1. De-multiplexed data capture Channel (Receiver) 1
2. De-multiplexed data capture   Channel (Receiver) 2
3. De-multiplexed data capture   Channel (Receiver) 3
4. De-multiplexed data capture   Channel (Receiver) 4
5. Header capture   If On, F/W allows Header from strongest channel to be at 0x80008000
6. ID Capture   If On, F/W allows next ID from the strongest channel to be at 0x80008000
7. Skip auto-null   If On, skips auto-null at power-up
8. Spare   Not used

Switch 3 – Acquisition testing (continued)
1. Miller code generator   If On, generates a Miller coded tag number for de-bugging purposes
2. Checksum validation   If On, Reader requires a checksum for validating Asset tags
3. A/D loop-back   If On, Reader generates an data stream for the digital filtering algorithms
4. Disable Dynamic Auto-null   If On, Disables the dynamic auto-null
5. Run Mode   If On, Forces CP Run mode ("RN" on LED's)
6. Programming mode   If On, no programming on power-up, normal operating mode ("FL") on LED's
7. Skip FSK Reader   Along with switch 8 (Lsbit), it is the number of cycles skipped for the FSK mode After a successful Access read.
8. Skip FSK Reader   Along with switch 7 (Msbit), it is the number of cycles skipped for the FSK mode, after a successful Access read.

Switch 4 – Acquisition testing (continued)
1. Force I phase   If On, Acquisition is always on I phase
2. Force Q phase   If On, Acquisition is always on Q phase
3. 180 degree phase shift   If On, data is shifted 180 degrees
4. Daughter board type   Off for current daughter board
5. Daughter board type   Off for current daughter board
6. Daughter board type   Off for current daughter board
7. Daughter board type   Off for current daughter board
8. Daughter board type   Off for current daughter board

Switch 5 – Acquisition testing (continued)
1. Filter Setting   If On, Band-pass filter (Used for 2D systems
2. ID averaging   Along with switch 3, it is 2-to-the-nth ID's that are averaged (Lsbit)
3. ID averaging   Along with switch 2, it is 2-to-the-nth ID's that are averaged (Msbit)
4. Channel for Maui detection   Along with switch 5, receiver used for Maui (LSBit)
5. Channel for Maui detection   Along with switch 4, receiver used for Maui (MSBit)
6. Maui enable   If On, Maui enabled
7. Force Maui threshold   If On, Sets Maui threshold to 0x40
8. Single Tag Mode   If On, Only one Asset read per cycle to improve speed

7.2 Communication Processor Switches:

Switch 6 – Read, Report modes

1. Set Tamper Latch Mode   If On, set tamper latch bit. If off, Set Quiet bit.
2. Re-Report   If On, Tag ID's are always reported. If off only new tag ID's are reported
3. Indicator re-reports   If On, Indicators report for every tag. If off only new tags are reported
4. Fast Indicator duration   If On, indicators are 4X faster than default duration's.
5. Acquisition test reports If On, Sends receiver and power level reports on serial port. (If switch block switch 7 is on LCD will be updated) Simplex always responds with test data.
6. Spare   Not used
7. LCD test mode   If On, LCD reports ID and sensor messages, off is Host control of LCD
8. Test LCD type   If On, LCD is single line, off is dual line

Switch 7 – Serial Settings (all off)

1. Simplex serial output   (On, off) If On, Simplex Serial output
2. Baud Rate   On -- 4800   On -- 9600   Off -- 38,400   Off -- 19,200
3. Baud Rate   On – 4800   Off – 9600   On – 38,400   Off – 19,200
4. Node address, Bit 0   On = 1   Off = 0
5. Node address, Bit 1   On = 1   Off = 0
6. Node address, Bit 2   On = 1   Off = 0
7. Node address, Bit 3   On = 1   Off = 0
8. Node address, Bit 4   On = 1   Off = 0
Note: Data is always 8 bits, no parity, 1 stop bit

Switch 8 – Hardware options and test modes

1. MaxiTrak mode   If On, Firmware is put in MaxiTrak Mode
2. FSK Exciter   If On, Uses the same exciter for access and assets
3. Free Running   If On, Acquisition is free-running regardless of Host polls
4. Output Port   If On, LED port switches to an output port, Off is not used
5. Hardware demod. for FSK If On, FSK data has been demodulated in h/w, if off, firmware must demodulate raw data.
6. Spare   Not used
7. Spare   Not used
8. Spare   Not used

Switch 9 – Initialization and overrides

1. Switch Over-ride   (On, off) If On, firmware disregards all switches and uses EEPROM
2. Reset to Factory defaults   (On, off) If On, at power-up, EEPROM is set to firmware values
3. EEPROM unlock   (On, off) If On, allow writes to reserved EEPROM area
4. Flash Mode bit 0   Not used
5. Flash Mode bit 1   Not used
6. Spare
7. Spare
8. Set Wiegand Facility code   If On, Unit resets and assigns the facility code of the next read Access card to an EEPROM location. This FAC code will be inserted into all Wiegand messages.

Other System Switches:

Switch 1 -   Reset switch
Switch 10 -   Vandal switch
Switch 11 -   Presence simulator switch
Switch 12-   Exit simulator switch

Switch 13 -   Calibration initiation switch

7.3 EEPROM Memory map table

Hex	Dec	Name	Description	Default
$00 - $27	000 - 039	FT	40 Reserved, 32 used, 8 spare	Factory table - Exciter
$28	040	Red	Red LED Duration byte	$10 - 1.6 Sec (.4 Sec if "fast" switch is on)
$29	041	Green	Green LED Duration Byte	$10 - 1.6 Sec (.4 Sec if "fast" switch is on)
$2A	042	Beeper	Beeper Duration Byte	$10 - 1.6 Sec (.4 Sec if "fast" switch is on)
$2B	043	Relay1	Relay 1 Duration Byte	$10 - 1.6 Sec (.4 Sec if "fast" switch is on)
$2C	044	Relay2	Relay 2 Duration Byte	$10 - 1.6 Sec (.4 Sec if "fast" switch is on)
$2D	045		Reserved	
$2E	046		Reserved	
$2F	047	Failsafe activation time	Number of seconds before Failsafe activation after Comm failure	$1E - 30 Seconds
$30 - $32	048 - 050	Power up Indicator	3 bytes to describe the indicator status on Power-up	$E4 $55 $00; Two Med Red Flashes off, Two Med Green Flashes on, Two Med Beeps on, Relays off
$33 - $35	051 - 053	Access read indicator	3 bytes to describe the indicator action on an Access Control Read	$02 $23 $88; Short Red Flash off, Short Green Flash off, Med Beep on, Relays no change
$36 - $38	054 - 056	ProxTrak read Indicator	3 bytes to describe the indicator action on an Asset tag Read	$02 $33 $88; Short Red Flash off, Short Green Flash on, Short Beep on, Relays no change
$39 - $3B	057 - 059	Host Tag command performed	3 bytes to describe the indicator action when a ProxTrak command has been executed from the Host	$AC $0D $88; Three Med Red Flashes off, Three Green Med Flashes on, Three Med Beeps, Relays no change
$3C - $44	060 - 068		9 Reserved, 0 used	Spares
$45	069	Switch Block 2 Read and Report	b0: Set Tamper Latch (Disable Assets mode) on b1: Re-report ID's b2: Indicator re-report b3: Fast indicators b4: Acquisition test reports b5: EEP database b6: LCD reports b7: Test LCD installed	$00; Read and Report options - (Mirror of Switch Block 2)
$46	070	Switch Block 3 Serial Configuration	b0: Simplex Serial Output (1 = on, 0 = Off) b2 - b1: Baud Rate 11 = 4800 01 = 9600 10 = 38,400 00 = 19,200 b7 - b3: Node Address (00000 - 11111)	$00; Serial Configuration; (Mirror of Switch Block 3)

$47	071	Switch Block 4 Hardware and Test Options	b0: ProxTrak mode b1: Access control exciter b2: Asynchronous acquisition b3: Status LED's disable b4: H/W demodulator b5: Low gain b6: 8 receivers b7: 2nd Access Reader	$00; Hardware and Test Options; (Mirror of Switch Block 4)
$48	072	FT	Not used	Spare
$49	073	Failsafe Tag Command Size	Failsafe Tag Command Size (1 byte)	$01
$4A - $5B	074 - 091	Failsafe Tag Command	Failsafe Tag Command Byte(s)	$16; (Set Quiet bit command)
$5C	092	Default Tag Command Size	Tag Command Size (1 byte)	$01
$5D - $6E	093 - 110	Default Tag Command	Tag Command Byte(s)	$16; (Set Quiet bit command)
$6F	111	Response Timeout	Reader sends Nothing to Send or empty Tag ID Message (0 to 23 seconds)	$0B; (1 second)
$70	112	Maui Timeout	Reader activates cycle if Maui threshold has been exceeded for this time (0 to 25.5 seconds)	$46; (700mS)
$71	113	Maui Threshold	Level required by the interferer to activate Maui delays (0 to 255)	$FF; ($FF causes Maui to be disabled)
$72 - $7F	114 - 127	FT	14 Reserved, 10 used	Factory table - Timing and calibration values

7.4 Indicator actions

Extra Bit	Action# Nibble	Action # (Hex)	Action Description	Comments
0	0000	0	OFF	
0	0001	1	ON	
0	0010 0100 0110	2 4 6	Short Flash OFF Medium Flash OFF Long Flash OFF	Flash Duration set in "Set configuration", or defaults to 1.6Sec on Power-up
0	0011 0101 0111	3 5 7	Short Flash ON Medium Flash ON Long Flash ON	Short = 1/16th Duration Medium = ¼ Duration Long = Duration
0	1010 1100 1110	A C E	Short Flash Cycle OFF/ON Medium Flash Cycle OFF/ON Long Flash Cycle OFF/ON	The Cycle action can be used to alternate Red and Green if used in the same indicator command.
0	1011 1101 1111	B D F	Short Flash Cycle ON/OFF Medium Flash Cycle ON/OFF Long Flash Cycle ON/OFF	Cycle action toggles device indefinitely at Duration rate. Note - ON/OFF or OFF/ON indicate start/stop state.
0	1000	8	No change for that indicator	This action allows commands to be sent to other indicator(s), without effecting the current status of the indicator for which it is used.
0	1001	9	Spare	
1	0000	0	Spare	
1	0001	1	Spare	
1	0010 0100 0110	2 4 6	TWO Short Flashes OFF TWO Medium Flashes OFF TWO Long Flashes	The extra bit allows special actions; in this case, two flashes can be activated with one indicator command.
1	0011 0101 0111	3 5 7	TWO Short Flashes ON TWO Medium Flashes ON TWO Long Flashes ON	
1	1000	8	No change for that indicator	This action allows commands to be sent to other indicator(s), without effecting the current status of the indicator for which it is used.
1	1001	9	Spare	
1	1010 1100 1110	A C E	THREE Short Flashes OFF THREE Medium Flashes OFF THREE Long Flashes OFF	The extra bit allows special actions; in this case, three flashes can be activated with one indicator command.
1	1011 1101 1111	B D F	THREE Short Flashes ON THREE Medium Flashes ON THREE Long Flashes ON	

The Actions above apply to Red LED, Green LED, Beeper, Relay 1 and Relay 2. "Flash(es)" is to be interpreted as "flash(es)", "beep(s)" or "click(s)", as appropriate.

8. Portal Functional Description

The ProxTrak Portal Reader integrates the Access control and Asset control functions in the same Reader, styled in a fashion resembling a styled metal detector at the airport. The combination of Access and Asset controls, with the ability to track presence of individuals, creates a powerful Reader that can be used to expand the capability of the traditional Access control system to include Asset tracking and management. The doorway sized unit enables the integrator to pursue hands-free Asset control, increasing throughput, reducing paperwork, and bring asset management to a new level of traceability and ease of use.

The Access control feature is a reader similar to our popular ThinLine™ Product, integrated as a presentation style reader so that tailgating and other activity around the Portal can be closely monitored.

8.1 Operating Cycle

Upon power up and during operation, the Reader performs various self-diagnostic and optimization operations. Messages from this process are sent to the host (if requested). See the Protocol Spec for more information.

After initialization, the Reader responds to polls from the host by starting a scanning cycle, or in free-running mode, periodically steps through the scanning sequence by searching for Access or Asset tag data. Before starting the scanning sequence the Reader detects interfering 125kHz equipment. In a mode called Maui (Multiple Adjacent Unit Interface), if a 125KHz source above a threshold power is detected, the Reader waits for a quasi-random interval before another attempt. This process allows the Reader to get in sync with another Reader that is close enough to be detected, and get successful acquisitions when traditional Reader technologies would not.

If an Asset or Access tag is detected, its identification is transmitted to the host as described in the Protocol Specification. The Reader acquires the information regarding Asset and Access tags and the entrance and exit sensors, and passes them along to the host.

The decisions regarding interpretation of the data and the resulting actions, are implemented by the system integrator.

8.2 RFID Tag and card types

8.2.1 Asset tags

The ProxTrak Portal Reader will perform transactions with any Asset ID™ compatible Asset tag including the HID AMT100 Asset Management Tag and Asset ID™ source tags in IBM™ computers. Read area is within the full volume of the Portal. The Reader outputs a 12 byte ID string imbedded in the "TAG ID message". Asset ID™ is a registered trademark of IBM PC Company.

8.2.1.1 Asset tag types

The system is designed to read up to 5 Asset tags within its range. The Multi-Tag technology has been developed by Atmel Corp and as a result, there are 8 tag types available. Any tag that is programmed will be one of the eight tag types. If up to 5 different tag types are in the range of the reader, they will be read successfully. If tags that are the same tag type are present in the field, the Atmel design results in timing collisions, and the read performance is reduced.

8.2.2 Access cards

The ProxTrak Portal Reader will read HID ProxCard Access cards, ProxKey FOBs and IsoProx cardse. The Reader outputs a 6 byte ID string imbedded in the "Tag ID message"..

8.3 Acquisition functions

The acquisition cycle of the ProxTrak Portal Reader begins either by the reception of a Poll (or indicator command) from the Host or if in "Free running" mode it will cycle independently of the Host. See Switch Settings.

8.3.1 Asset tag Reception

Multi-tag algorithm - Up to five Asset tags can be acquired at a given moment. The acquisition of Asset tags requires that the receiver and exciter work in conjunction to receive the Asset tag header, send the acknowledge modulation, receive the data from a selected tag, and send the appropriate command modulation back to the tag. Refer to the Atmel AT24RF08 description for a complete specification, state diagram and Asset tag features.

8.3.2 Access Card Options

The portal will operate in one of two modes to read access cards, "Presentation Mode" or "Hands Free Mode". The modes are selected with switches, see the Switch Settings section for details.

8.3.2.1 Presentation Access Control Reader

The Access control function is similar to a traditional HID family of proximity Readers, such as the ThinLine^{TM} Reader. Access data is collected by time division multiplexing the Access function with the Asset tag reading function. The data from the Access cards is put into a 6 byte field in the Tag ID Message to be communicated to the Host via the serial port. Note the LED and beeper in the ThinLine^{TM} reader are used as programmable indicators.

8.3.2.2 Hands Free Access Card Reader

In this mode the portal will read a HID ProxCard when a person enters the portal. The card does not have to be presented to a reader or specific location within or near the portal. This allows a user to pass through the portal without having to pause or present his access card.

8.3.3 Exciter

8.3.3.1 125kHz exciter description

The excitation for Asset tags is generated by developing a 125kHz current in a coil, creating a magnetic field, which energizes the Tags and cards, allowing them to return their respective ID and other stored information to the ProxTrak Portal Reader. The ThinLine^{TM} Reader installed in the Portal is controlled by the Portal hardware to energize and read Access control cards.

9. General Interference Guidelines

The portal is susceptible to outside RF noise sources (radiators) that generate frequencies from 50KHz up to 140KHz. The effect on the Portal performance is dependent on the received signal strength at the portal receiver antennas. The received signal strength is dependent on the angle between the radiator and the Portal receive antennas, the strength of the radiated signal and the distance between the two devices.

Some types of offending devices are computer monitors (CRT type), Laptop computers, Access Control Devices etc.

If a Portal performance is being effected by some external RF noise source the following steps should be tried to isolate the source of the interfering signal and to minimize the interference.
Isolate the device that is producing the noise by turning electronic devices OFF one at a time until the portal performance returns
Try turning the offending device and check for a return of performance.
If a computer monitor is the offending device, change the screen resolution settings.
Move the device farther from the portal.

10. Location of other HID Proximity Readers

Figure 4-1 shows the relative positioning of a portal and other proximity readers for testing that is presented in this section. Figure 4-2 contains a chart gives the distance (in inches) between another HID proximity reader and a portal at the point at which the performance of the portal is reduced to zero (first number) and where the performance is just being effected (second number in the column). The orientations presented are representative and selected to determine the interaction between portal and other readers. The field generated out the back of a reader is as strong as the field out the front, thus the test configurations shown are adequate. The type of reader used to take the measurements is also noted in the spread sheet.

The recommended measurements are to determine the signal interaction between the portal and any nearby HID proximity reader. Refer to the appropriate column in Figure 4-2 for the separation between the portal and any particular reader.
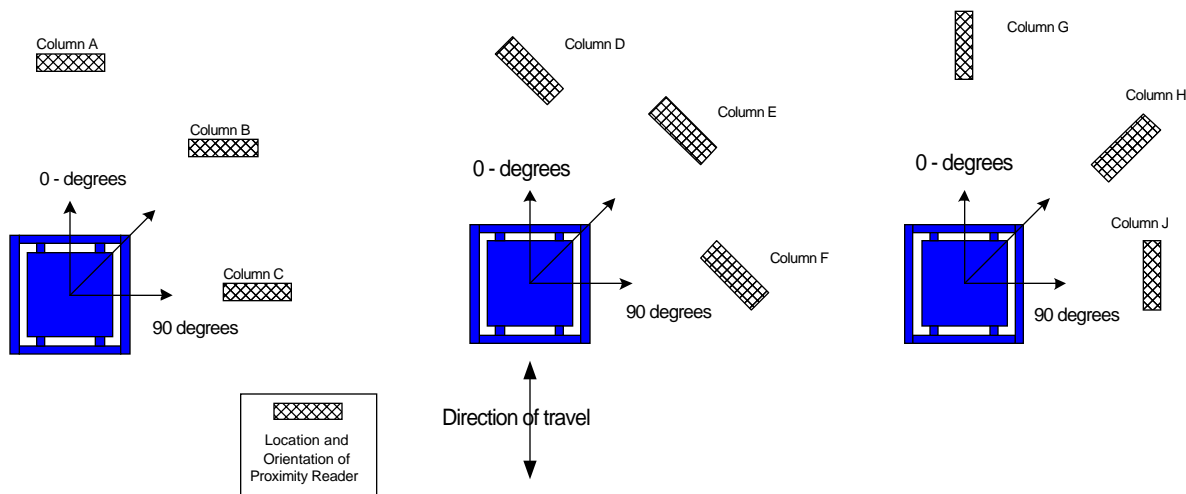

Figure 4-1. Test Set-Up Conditions for Portal and other Proximity Reader

|	A	B	C	D	E	F	G	H	J
MiniProx	28/32	29/41	28/52	22/28	27/63	36/55	33/70	35/48	33/70
ProxPro	41/53	48/55	38/54	33/48	45/57	42/69	30/35	48/74	42/82
ProxPro+	51/187	96/119	74/99	92/122	77/87	145/23	102/103	88/120	165/240
MaxiTrak	29/32	22/32	26/34	24/31	34/58	31/40	22/39	31/42	48/64
Portal	94/265	103/146	111/117	75/88	118/150	117/185	84/96	116/187	139/146

Figure 4-2. Interference Distances

11. Environmental Radio Frequency Noise Test

The following is a description of a test (or measurements) to be completed to ensure that the portal is able to interact with other RFID readers.

11.1 Required Equipment
- Spectrum Analyzer (HP3585A)
- "Standard" antenna (MaxiTrak antenna) mounted on tripod with degree markings
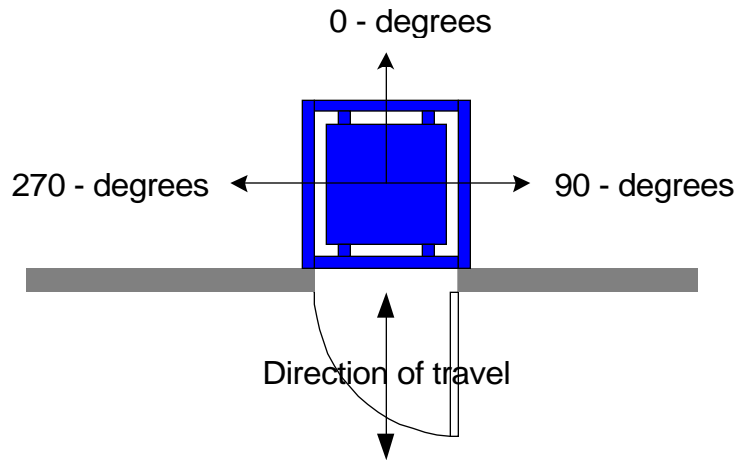

Figure 5-1 Portal Orientation

11.2 Test Procedure

NOTE: This procedure should be performed during a normal work period, i.e. elevators or escalators running, computer monitors running in their normal mode of operation, any access readers in the area turned on etc.

Setup tripod in the center of the proposed unit location starting with the antenna oriented towards the 0° mark (see Figure 5-1) and approx. 42" above the floor. Connect to the spectrum analyzer and setup analyzer as follows:
1. Set Scan Range from 80 kHz to 200 kHz
2. Use 1 Meg ohm input impedance
3. Set Resolution Bandwidth to 1 kHz
4. Set Video Bandwidth to 3 kHz

Ensure that the amplitude at a frequency between 80 kHz and 200 kHz does not exceed the maximum noise level amplitudes shown in Figure 5-2 for that frequency. This procedure is repeated for

Figure 5-2. RF Maximum Noise (0 degrees)
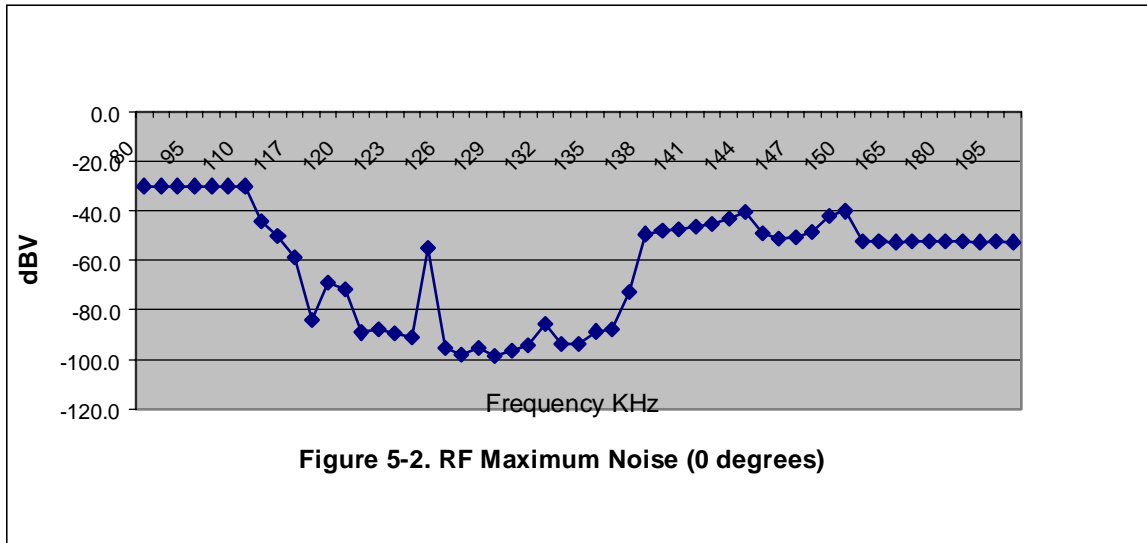
intervals of 22.5^0 between 0^0 and 180^0. The RF Maximum Noise levels for each of these additional positions are shown in Figures 5-3 through 5-10.

Door frame mount - viewed from the top

Figure 5-4. RF Maximum Noise (45 degrees)

Figure 5-5. RF Maximum Noise (67.5 degrees)

Figure 5-6. RF Maximum Noise (90 degrees)

Figure 5-7. RF Maximum Noise (112.5 degrees)

Figure 5-8. RF Maximum Noise (135 degrees)

Figure 5-9. RF Maximum Noise (157.5 degrees)

Figure 5-10. RF Maximum Noise (180 degrees)