ActiveTag™ System
Installation Manual

Notices

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FCC Rules

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna

- Increase the separation between the equipment and receiver

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

- Consult the dealer or an experienced radio/TV technician for help

Responsibilities

- AXCESS Inc. declines all liability for any damage that might result from any errors or omissions in this document or from improper installation.

- AXCESS Inc. can only guarantee the correct operation of its products if they are used with the software programs, systems, and consumables supplied or authorized in writing by AXCESS Inc.

- AXCESS Inc. recommends keeping the original packaging for transporting the equipment later.

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AXCESS INC.

Customer Service

AXCESS Inc. toll-free support line is 1-800-577-6080.
Representatives are available from 7:30 – 6:30 Central Time.

U.S. Patents

4,816,901	4,843,466	4,847,677
4,849,807	4,857,991	4,857,993
4,914,508	5,140,412	6,034,603

Other patents pending.

Table of Contents

General Installation Information

Safety

- Personal safety is of first importance in the performance of any job.

- Installation and configuration of the ActiveTag system should only be performed by experienced installers.

- Where practical or required by code, all wiring should be enclosed in conduit, or equivalent protection, firmly anchored to sturdy structural elements and protected from mechanical damage.

- Hand tools should be of good quality and properly maintained.

- Hand tools should be used in the applications for which they were intended.

- Always wear eye protection when using power tools.

- When drilling, cutting or drilling, do not damage wires, pipes or structural components.

- When installing antennas and related equipment above a ceiling, make sure they are properly attached to a structural member and accessible for maintenance.

Information Flags

Information flags in this document draw your attention to important information:

IMPORTANT!

These sections provide information you must have to ensure proper operation of hardware or software. If this advice is not followed, system recovery can be difficult or time-consuming. ALWAYS READ THESE ITEMS.

NOTE

These sections provide helpful information that can make the installation go more smoothly and quickly.

Hand Tools, Equipment and Materials

IMPORTANT! You need to have the following materials on hand to ensure successful installation of the ActiveTag system.

These items are **not** supplied with the ActiveTag System.

Required

- RG-58/U coaxial cable with 50-ohm impedance (nominal), solid copper center conductor, 55% tinned copper braid or better, 100% foil shield coverage (for example, Belden 9310). Finished length should be no more than 25 feet. If installed outside, the cable should be rated for direct burial.

- 3-piece crimp type male BNC connectors (for example, Amphenol 31-320). Connectors can be damaged during crimping. Having more than two on hand for each cable made is recommended.

- A computer or terminal device to configure the Activator and Receiver

- A terminal communication program such as HyperTerminal (standard with MS Windows installations)

- A straight-through (one-to-one) DB9 male to female serial cable. DO NOT use a null-modem cable or a null-modem adapter.

- Tape measure

- Power drill and bits

- Phillips and flathead screwdrivers, including a very small flathead screwdriver

- Needle-nose pliers

- Diagonal cutters

- Wire strippers

- Three blade rotary coaxial cable stripper

- BNC crimpers

- Multimeter

Required for Road Loop Antenna Installation (typically contracted)

- Saw for cutting the road surface (e.g., a walk-behind concrete saw)

- Two 1/8" saw blades with spacer – abrasive blades for asphalt or diamond blades for concrete

- Vacuum or compressed air to clean the cut

- Mounting or burying hardware – concrete nails, thin dowel for pushing wire into cut, etc.

- Road Sealant – For example, Bondo Flexible Embedding Sealer (P-606), 3M Detector Loop Sealant or Q-Seal sealant. It takes about a gallon of "Bondo" to seal the cuts for a 4x16-foot antenna.

Required for Wiegand Output

- Receiver Wiegand output is standard SIA 26-bit. The Receiver outputs *Data Zero, Data One* and *Ground*. Wires between the Receiver and the Wiegand control panel should be 18 AWG and no longer than 500 feet. The wires should be green for Data Zero, white for Data One, black for Common Ground and red for 5 VDC.

Required for Serial Output

- A straight-through (one to one) RS-232 cable of sufficient length to connect the Receiver to the system PC. It is recommended that the cable not exceed 50 feet in length. One end of the cable should be a male DB9 connector.

Required for Network Output

- RJ-45 cable for connecting to the LAN

Recommended

- Ladder

- Chalk for marking Road Loop Antenna placement

- Fishing line – 15 lb. test for pulling cable

- Tie wraps and anchors

- Battery powered screwdriver

- Duct tape

- A pair of walkie-talkies if more than one installer will be on site

- Laptop computer to connect to Receivers and Activators easily

- Wiegand wedge for Wiegand system troubleshooting

- Instructions for all third party devices

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ActiveTag System Overview

ActiveTag System Components

The following diagram (Figure 1) shows a very basic ActiveTag system. The system has the following components:

- **Activator** – transmits a wake-up signal, which includes its ID number, to the Tag.

- **Transmit Antenna** – an application-specific antenna used to broadcast the Activator's wake-up signal over a defined coverage area.

- **Tag** – receives the wake-up signal and broadcasts its location and identification information to a Receiver. Tags can be carried by individuals, placed on assets or equipment, or mounted in or on vehicles.

- **Receiver** – receives the Tag's broadcast and sends the data to some intelligent device – a computer or a Wiegand control panel, for instance.

- One or more of the following: a computer running an application or an intelligent controller.

An ActiveTag system can be as simple as a single Activator, Receiver, transmit antenna and control panel to authorize access through a door, or it can be a network of Receivers, Activators and other devices controlled by a computer.
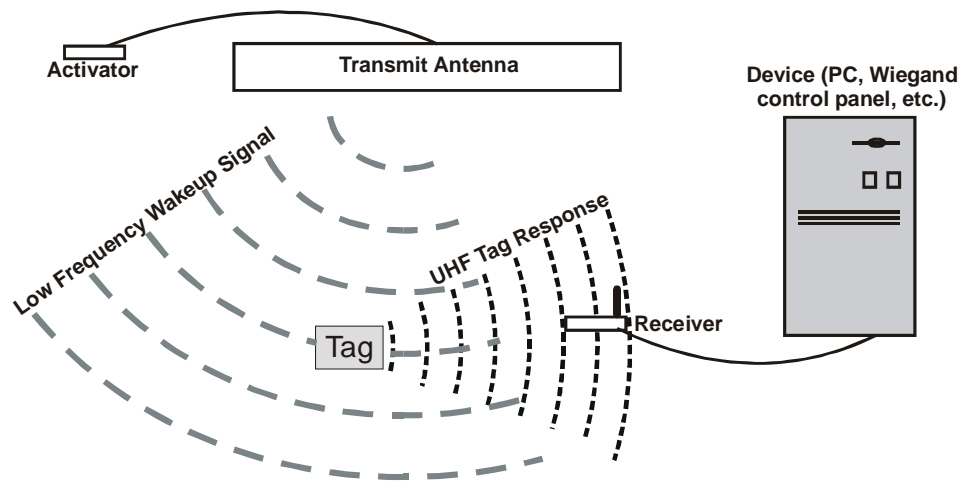
Figure 1 A simple ActiveTag System

Tags

A Tag is a small transponder that remains in a sleep state until activated. When the Tag receives a special Very Low Frequency (VLF) signal from the Activator, the Tag wakes up and emits an Ultra High Frequency (UHF) radio signal. The Tag's signal is typically its pre-programmed identification number and the Activator's identification number – but could include other data as well. The signal is generally used for detection, identification and location of people or objects. The Receiver accepts the Tag's transmitted information and forwards it to a PC or control device.

AXCESS Tags are specifically designed for personnel, asset or vehicle applications. The *Personnel Tag* provides hands-free identification of personnel for access control, people tracking and resource management applications. The Tag can be personalized by affixing a standard PVC identity card into a recess in the tag case.

The *Asset Tag* can be mounted to an asset for effective protection and monitoring. Multiple tags can be read simultaneously so that both the asset and its carrier can be identified. This allows the asset to be linked to one or more owners, thus providing maximum security with greater freedom of movement.

The *Vehicle Tag* can be mounted in the vehicle for automatic, hands-free vehicle identification, tracking or access control. Vehicle Tags are optimized for high-speed reads in vehicle applications such as access control (residential and commercial gates), equipment tracking and fleet management.

The *LED Test Tag*, which is also available from AXCESS Inc., flashes its LEDs when it is in the activation field, letting you know the extent of the coverage area of a transmit antenna.

Activator

The Activator (Figure 2) broadcasts an activation signal via the transmit antenna to wake up the tag. The transmitting antenna attaches to the BNC connector on top of the Activator. The wakeup signal writes the Activator's ID Number to the tag.
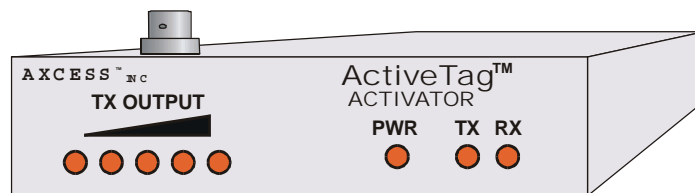
Figure 2 Activator

Receiver

The Receiver (Figure 3) has the following functions:

- Decode the signal received from the Tag via the receive antenna. The Receiver converts the data to a format usable by a computer or Wiegand control panel for further processing of the information.

- Filter Tag information according to its configuration settings.

- Send the data to a control device or a computer.

- Output control signals for activating TTL outputs or alarm points on panels.

Figure 3 Receiver

Filters

The Receiver can be configured to report only selected Tag data. For example, the Receiver can be programmed to respond to specific Activators in a multi-Activator environment. Configuration filters also determine what information is reported via the Wiegand interface.

Serial Output

The Receiver communicates using the EIA-232 standard, more commonly known as RS-232C. It can connect to a communications port on a computer or any device that accepts RS-232C data.

Wiegand Output

The Receiver can be configured to send Security Industry Association (SIA) 26-bit Wiegand data to control panels. The Receiver connects to the Wiegand port on the control panel by three wires – Data One, Data Zero and Ground.

IP Output

The Receiver can be configured to connect to an IP network. AXCESS Inc. supplies a Receiver with an integral Network Interface Unit (NIU) to convert data from serial to Ethernet TCP/IP format.

Transmit Antennas

Because Tags receive and transmit at different frequencies, different antennas are used for each leg of the communication. Antenna design is related to its frequency wavelength (or fraction thereof). The receive antenna supplied with the Receiver is designed for the UHF spectrum and is only seven inches tall. The VLF transmit antennas used by the Activator are loop antenna designs of varying lengths of wire based on the application

Types of Transmit Antennas

Bar Antenna

The Bar Antenna has a VLF transmitting antenna in an enclosure that is approximately 2 feet long, 5 inches wide and 1 inch thick. It can be mounted indoors near a door or above the ceiling tiles and is primarily used for personnel identification, access control or tracking applications

Picture Frame Antenna

The Picture Frame Antenna has a transmitting antenna built into its frame. The antenna may be mounted unobtrusively on interior walls. The front frame and glass are hinged so that the picture can be changed easily without removing the frame from its permanent wall mount position.

Road Loop

The Road Loop Antenna is a large VLF transmitting antenna most often used for activating Tags in vehicles or mobile equipment. The Road Loop Antenna is permanently installed in the road surface and is typically used in gate access applications. Its activation field is capable of covering one or more lanes.

Other Antennas

Wire loops of varying size and length can be constructed to activate tags for a variety of applications. For example, a loop of wire inside plastic conduit can be hung above a hallway to activate tags passing below. AXCESS INC. is regularly developing new antenna designs – contact *Distributor Support* for assistance in selecting or designing the best antenna for your application.

System Configuration Basics

Introduction

This chapter introduces installation and configuration concepts. It covers activation field behavior, application types (vehicle, personnel, asset) with example layouts, basic installation steps, and offers tips on installing the system.

Application Types

Vehicle

Vehicle applications focus on controlling access to a specified area – a gated community or a parking garage. The ActiveTag system integrates with 26-bit Wiegand control panels to open gates for those cars with valid Tags.

System Placement Guidelines

- Ensure that the vehicle is committed to the lane (i.e. will not swerve out of the lane) and will drive directly over the Road Loop Antenna.

- Place the Road Loop where you want the Tag to be activated. If you want the gate to be open when the car approaches it, the Road Loop should be placed well ahead of the gate. The Road Loop should be at least four feet away from any other vehicle detection or safety loops that might be installed.

- Mount the Tags in the rear window. Mount the Tags on the same side of the road that the receive antenna has been mounted.
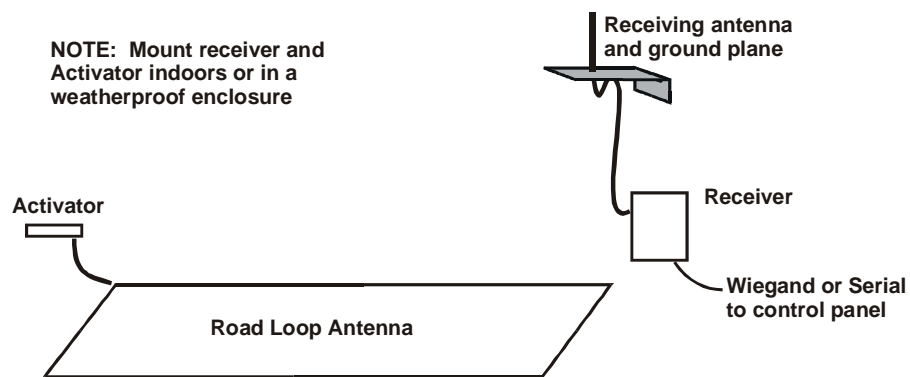
Figure 4 Simple vehicle configuration

Personnel and/or Asset

Personnel and asset applications focus on inconspicuously monitoring the movement of people and valuable assets in and out of a building or through sections of the building. The applications require that antennas be installed in hallways or near doorways.

System Placement Guidelines

The Antenna, Activator and Receiver can be mounted above the ceiling tiles above doors for personnel applications (Figure 5). Other suitable locations include on the wall, above the door, or under a carpet.   Placing the antenna under a carpet or floor covering is preferred for asset applications.
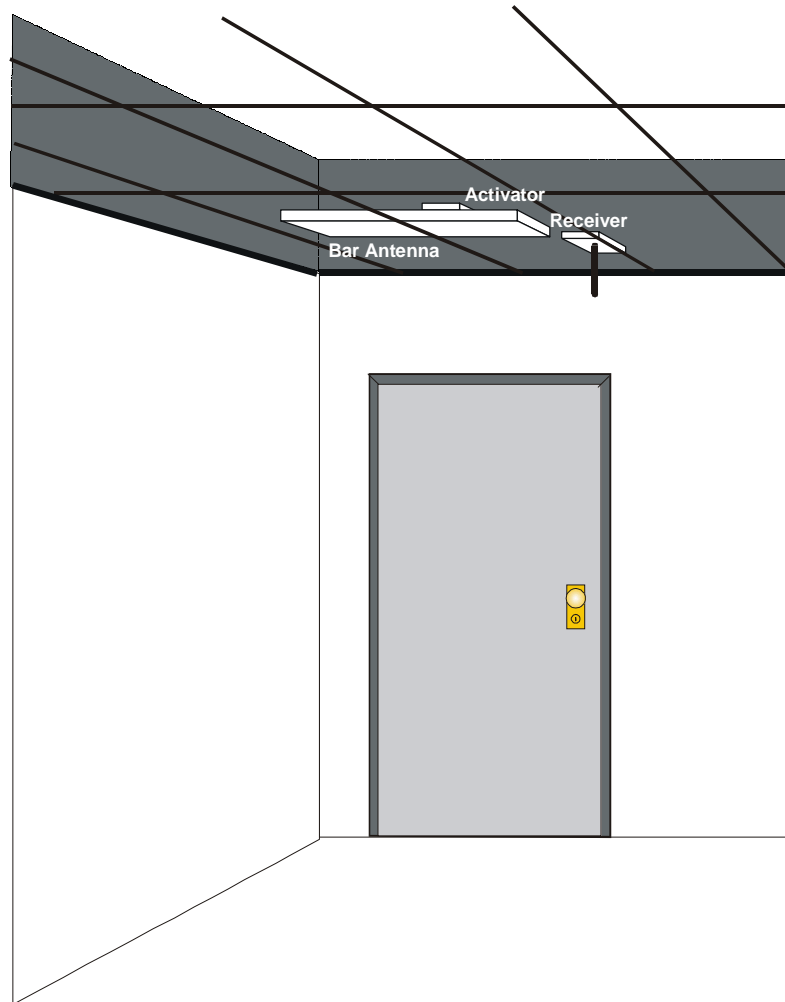
Figure 5 Simple personnel configuration

Multiple Activator Applications

Each Activator broadcasts its ID number, which the Tags then send to a Receiver. The Receiver uses the Activator ID to determine if it will send the Tag's data to the control device or computer (Figure 6).

The Receiver uses the Activator ID to decide whether to send the data to the Wiegand control panel based on the Activator ID.   When sending data serially (or over the network), the Receiver reports the Activator ID. This information can be used to determine where a Tag is in a building.
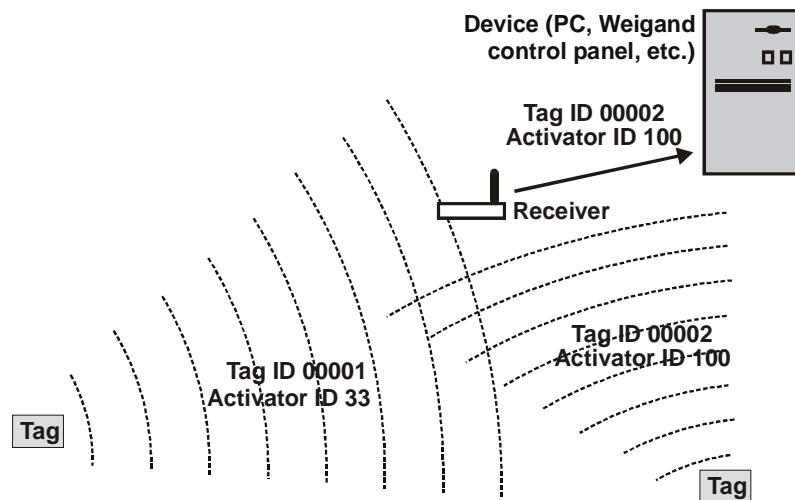
Figure 6 A Receiver can send data based on the Activator ID

IMPORTANT! All Activators are given the default ID number 127 at the factory. Each Activator in a multi-Activator application needs to be set with a unique ID number to ensure proper behavior of the system.

Installation Tips

Ensure that there are no other sources of similar radio frequencies nearby. Proximity card readers and clicker systems can affect the ActiveTag system, as can some radio-controlled sprinkler systems and military-grade communications systems.

For best results, the receiving antenna should be no more than 35 feet from an activated Tag to receive its signal.

Waterproofing

Any electrical parts of the system exposed to the elements must be waterproofed using sealing tape, waterproof boxes, sealing compounds, etc.

If applicable, the RG-58 cable should be rated for direct burial.

RTV rubber silicone sealant can be used on outside connections to protect them from the weather.

Note: The silicone seal can be broken by just pulling on a connector, and the sealant would then need to be reapplied.

Checking Activation Fields

Figure 7 shows a real-life example of an activation field. The gray area is the activation field of a Picture Frame Antenna mounted in a hall.

Activation Field

Swing Frame Antenna
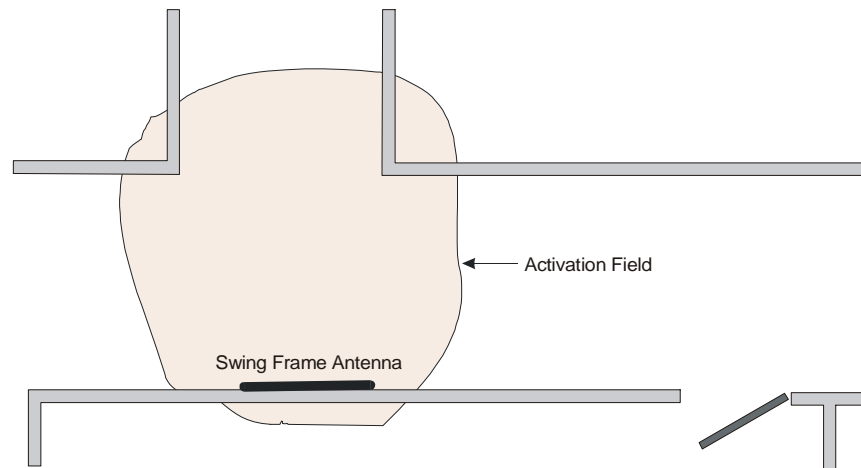
Figure 7 An activation field.

Always test your field to ensure that you get the coverage you want.

Also, ensure that the activation field does not cover any areas where Tags may be for long periods of time – a parking space next to the activation field, for instance.

Use the LED Test Tag and the TX Control on the Activator to modify the activation field. This is covered in the section *Resizing the Activation Field*, page 32.

Cable Length for Antennas

Best results are achieved when the antenna supplied with the Receiver is connected directly to its BNC connector. The maximum recommended cable length between the Receiver and the antenna is 25 feet (Figure 8). However, distances up to 50 feet are possible with minimal degradation in performance. When the receive antenna is to be located remote from the Receiver, it is recommended that one use an antenna bracket kit supplied by AXCESS Inc. or an AXCESS approved mounting method.

Receiving Antenna

RG-58 - 25 feet maximum
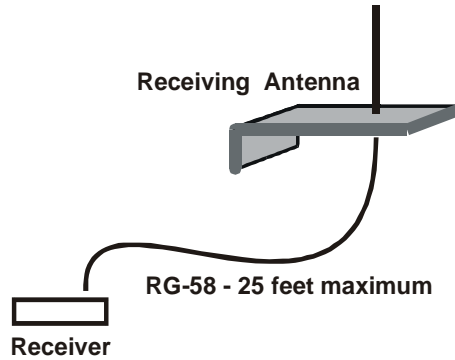
Receiver

Figure 8 Max distance between Receiver and receive antenna

Best results are achieved when the transmit antenna is no more than 50 feet from the Activator. However, distances of up to 100 feet are possible with minimal degradation in performance. Contact Customer Support for assistance with special installation needs.

RG-58 - 50 feet maximum

Activator

Transmitting Antenna
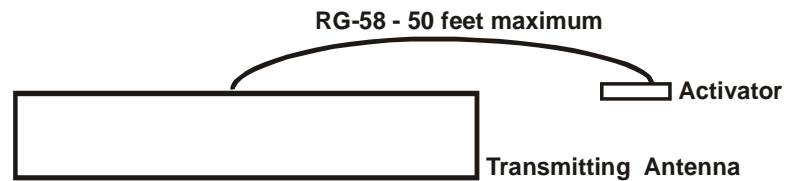
Figure 9 Max distance between Activator and transmit antenna

IMPORTANT! System performance may be adversely affected if a different cable is used, the cable length exceeds recommendations, the cable is kinked, or the BNC connectors are improperly installed.

Basic Installation Steps

The following list shows the order in which the ActiveTag system should be installed.

Step 1: **IMPORTANT!** Bench test communications between the ActiveTag system and the controller or device to which it will be connected.

Step 2: Configure the Activator – Give each Activator a unique ID number if there will be multiple Activators on site.

Step 3: Configure the output of the Receiver – for example, enable Wiegand output if required. If there are multiple Activators, program how the Receiver should respond to the Activator ID(s).

Step 4: Lay the entire ActiveTag system out and test the antenna fields before permanently installing any piece of the system.

Step 5: Install the Activator and Receiver.

Step 6: Install the transmit and receive antennas.

Step 7: Adjust the size of the activation field.

Step 8: Mount the Tags.

Step 9: Connect the system to the controller or software and test thoroughly.

Configuring and Installing the Activator

Introduction

The Activator creates and optimizes the radio signal that wakes up the Tag.
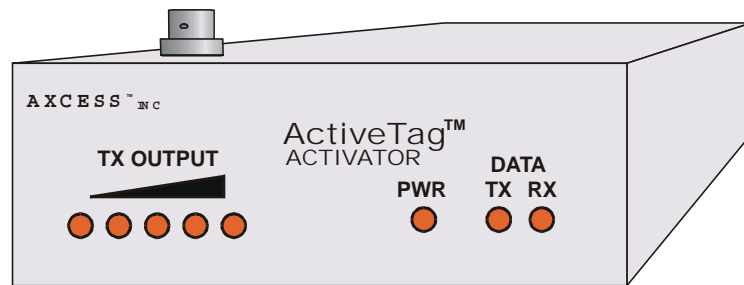
Figure 10 Front of the Activator
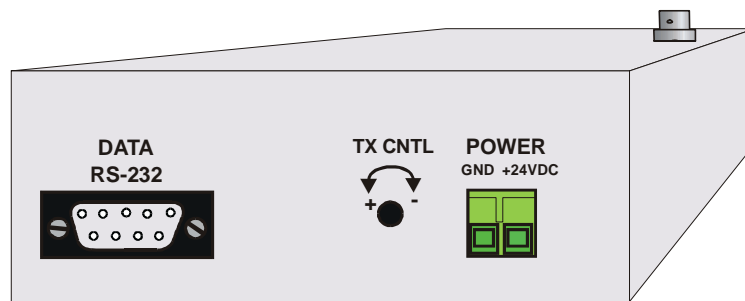
Figure 11 Back of the Activator

Activator IDs

An Activator sends its ID number in the wake-up signal. The Tag then transmits both its own ID and the device ID of the Activator to the Receiver. From this information, the Receiver uses the Activator ID to determine what action to take with the Tag data.

IMPORTANT! All Activators are given the same ID number (127) at the factory. Each Activator in a multi-Activator application needs to be set with a unique ID number to ensure proper behavior of the system.

Supplying Power

Activators come with a 24V DC, 1 Amp power transformer that plugs into a standard 110V AC outlet. The transformer is pre-wired into the terminal block at the factory. If uninterruptible power is an issue, a backup battery or UPS can be used.

Step 1: Connect the antenna to the Activator in order for the antenna auto-tune feature to function when power is applied. Auto-tune takes place whenever power is cycled.

Step 2: Plug the power terminal block into the back of the Activator (Figure 11).

Step 3: Plug the AC adapter into a 110-volt outlet.

When power is supplied to the Activator, the LEDs labeled PWR and TX on the front will light (Figure 10).

Setting the Activator ID

An Activator ID can be set by two methods:

- Serial commands (requires a computer or terminal device). This is the preferred method for setting the Activator ID

- Hardware jumpers if no terminal is available

Method 1: Serial Commands

Required Materials

- A computer or portable terminal with a free communications port. A laptop is recommended because it can be taken into the field easily.

- A terminal program for communicating with an Activator. HyperTerminal is convenient since it is standard with the Windows^{TM} operating system. Other terminal emulation programs, such as ProCom, etc., can also be used.

- A standard one-to-one (straight-through) computer modem RS-232 cable with a DB9 male connector for the Receiver and suitable connector for the PC/terminal.

    IMPORTANT! DO NOT use a null-modem cable or null-modem adapter.

Connecting a Computer to the Activator

Step 1: Ensure power is applied to the Activator.

Step 2: Attach the DB9 male connector of the RS-232 cable to the Data RS-232 port on back of the Activator.

Step 3:   Attach the other end of the RS-232 cable to an open com port on the computer.

Communicating via Windows HyperTerminal

Step 1:   On the computer's desktop, click the **Start** button. The Start menu will appear (Figure 12).

Step 2:   From the Start menu, select **Programs**, **Accessories**, **Communications**, **HyperTerminal.**
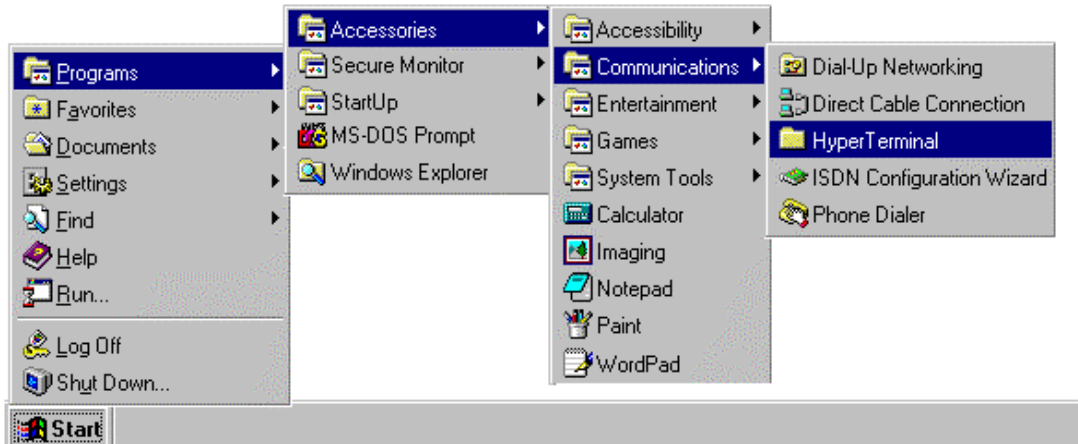
Figure 12 Accessing HyperTerminal from the Start Menu

Step 3:   In the *Explorer* window that appears, double-click the *Hypertrm.exe* icon. This launches the HyperTerminal application.

Step 4:   In the *Connection Description* dialog box that appears, enter any name for the connection in the *Name* field, and select the first icon in the *Icon* selection box. Click the **OK** button.

Step 5:   In the *Connect To* dialog box that appears, select the com port to which the Receiver or Activator is connected from the *Connect Using* drop-down list. The other options will gray out. Click the **OK** button.

Step 6:   In the *Com Properties* dialog box that appears, enter the following information:

Bits per second (Baud)	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Step 7:   Click the OK button.

Changing the Activator ID Number

If your ActiveTag system is using Version 5 Tags, type one of the numbers in Table 1 followed by an exclamation point (!). The number will be accepted at the Activator's ID number.

3	34	70	103
13	44	72	105
14	47	75	106
21	52	80	113
22	55	83	114
24	57	93	124
27	58	94	127 – default ID
33	69	100	

Table 1 Valid Activator IDs

If your system is using Version 6 Tags, type any number between 1 and 250 for the Activator ID. For example, if you type:

> **113!**

The Activator will respond with

> **I D = 113**

Method 2: Hardware

When set with jumpers, the Activator ID is a binary number represented by jumpers. A 1 is represented by a jumper on a header and a 0 is represented by an absence of a jumper.

ID	Jumpers	ID	Jumpers
3	0 0 0 0 0 0 1 1	70	0 1 0 0 0 1 1 0
13	0 0 0 0 1 1 0 1	72	0 1 0 0 1 0 0 0
14	0 0 0 0 1 1 1 0	75	0 1 0 0 1 0 1 1
21	0 0 0 1 0 1 0 1	80	0 1 0 1 0 0 0 0
22	0 0 0 1 0 1 1 0	83	0 1 0 1 0 0 1 1
24	0 0 0 1 1 0 0 0	93	0 1 0 1 1 1 0 1
27	0 0 0 1 1 0 1 1	94	0 1 0 1 1 1 1 0
33	0 0 1 0 0 0 0 1	100	0 1 1 0 0 1 0 0
34	0 0 1 0 0 0 1 0	103	0 1 1 0 0 1 1 1
44	0 0 1 0 1 1 0 0	105	0 1 1 0 1 0 0 1
47	0 0 1 0 1 1 1 1	106	0 1 1 0 1 0 1 0
52	0 0 1 1 0 1 0 0	113	0 1 1 1 0 0 0 1
55	0 0 1 1 0 1 1 1	114	0 1 1 1 0 0 1 0
57	0 0 1 1 1 0 1 0	124	0 1 1 1 1 1 0 0
58	0 1 0 0 0 1 0 1	127	0 1 1 1 1 1 1 1
69	0 1 0 0 0 1 1 0		

Table 2 Jumper settings for Activator IDs

Note: Before the Activator ID is set with jumpers, the default ID is 127, although there are no jumpers on the headers.

Note: Once an Activator ID is set by jumpers, it cannot be reset with serial commands. In order for serial commands to take effect, the jumpers must be removed. However, even with the jumpers removed the Activator will maintain the ID that had been set with jumpers until reprogrammed with the serial command.

Step 1: Power down the Activator.

Step 2: Using needle-nose pliers, place jumpers on headers JP12 through JP19 (Figure 13) to represent the ID number in binary. A jumper on a header represents a one and absence of a jumper is a zero. JP12 is the least significant bit and JP19 is the most significant bit.
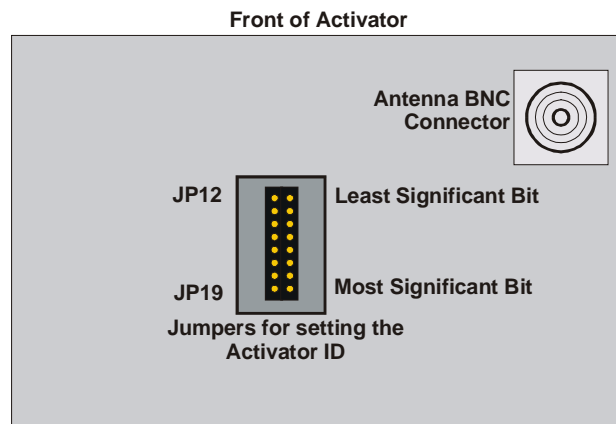
Figure 13 Activator ID jumpers

Activator ID 13- 00001101

Activator ID 100 - 01100100
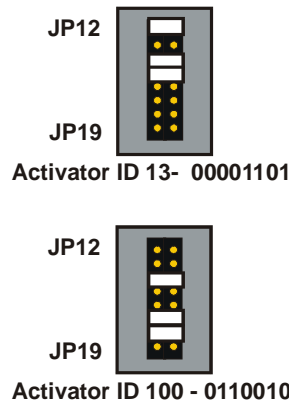
Figure 14 Examples of Activator IDs

IMPORTANT! Ensure that the Receiver is configured to accept the new Activator ID so that it may process the Tag data properly. Please see the section Configuring the Receiver, page 34, for instructions on programming the Receiver to respond to the new Activator ID.

Other Serial Port Commands

There are also commands available to list a help screen and change the baud rate of the Activator's serial port.

Receiving Help

Typing a question mark (?) displays a help screen listing all commands available for the Activator:

```
c = 4800cps
d = 9600cps
e = 19200cps
<Num>! = ID
t = Automatic Tuning
<Num>s = Set Tuning
```

Changing the Baud Rate

If you want to connect the Activator to a serial device, you can change the Activator's baud rate to match the baud rate of the device. The following baud rates are permissible:

Baud Rate	Command
4800	c
9600	d – This is the default baud rate
19200	e

Table 3 Baud Rates

Type a lower case letter representing the desired baud rate (Table 3). You do not need to press the Enter key. For example:

```
c
```

This will change the baud rate to 4800 bps. After you have set the baud rate, you will need to adjust the port settings of the serial device.

Tuning the Activation Field

The Activator tunes the activating antenna to its environment. It can either be given commands to tune the antenna or it will automatically tune the antenna upon powering up.

To tune the activating antenna via serial command, type the letter:

```
t
```

Note: The Set Tuning command (<Num>s) listed in the help screen was created for testing the system. Use the t command or cycle the power on the system to tune the antenna.

Activator Installation

The Activator originates the signal that is broadcast by the transmit antenna. The Activator should be installed as close as possible to the transmit antenna, and up to 50 feet away by cable distance from the antenna. Distances up to 100 feet are possible in some cases with minimal effect on system performance. Contact Distributor Support for assistance with extended distance installations. The shorter the cable, the better the system will perform.

Required Materials

The following materials are necessary for a successful installation:

* Power drill and bits

* Screwdrivers – Phillips and flathead

* Two screws (for wall mount)

Note: Depending on the surface that the Activator will be mounted on, you may want to use #10 molly bolts.

Mounting the Activator

IMPORTANT! Before permanently mounting any piece of the ActiveTag System, first lay out and test the entire system.

The Activator should be a maximum of 50 feet from the transmit antenna for best performance.

Holes on the bottom of the Activator allow it to be mounted vertically to a wall or other surface.

IMPORTANT! Cycle the power on the Activator after attaching the transmitting antenna.

Resizing the Activation Field

The area of Tag activation can be controlled by adjusting the size of the activation field. For example, you may want to shrink the activation field for a Picture-Frame antenna to concentrate the field near a doorway, preventing activation of tags further up the hall.

Note: Each Activator is shipped from the factory with its activation control adjusted to its highest level.

Adjusting the Field

The size of the activation field is controlled by the TX CNTL screw on the back of the Activator (Figure 15). The screw can turn in one direction 30 times. After it has been turned 30 times in one direction, it will make a soft clicking sound. The clicks indicate that continuing in this direction will no longer have an effect on the field's size. When you hear this sound, the wake-up field has been adjusted to one extreme or the other.

TX CNTL
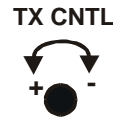
Figure 15 Adjusting the size of the activation field

To reduce the activation field - Rotate the TX CTRL screw **clockwise** with the supplied tuning wand. Constantly check the field with an LED Test Tag to ensure that the field is the size that you want.

IMPORTANT! The system will stop functioning if the activation control is turned down too low. To fix this, turn the screw *counter-clockwise* until it clicks. Then slowly reduce the field by turning the TX CNTL screw clockwise while checking its size.

To enlarge the activation field – Turn the screw **counter-clockwise**. When it clicks, it has been turned up as high as possible.

After the field is adjusted, cycle the power on the Activator.

750.001.004 R0033

Configuring the Receiver

Introduction

The Receiver receives the Tag's broadcast signal via its receiving antenna and sends the Tag data to a PC or control device based on how it has been programmed to respond to the Activator ID.

Figure 16 Front of the Receiver
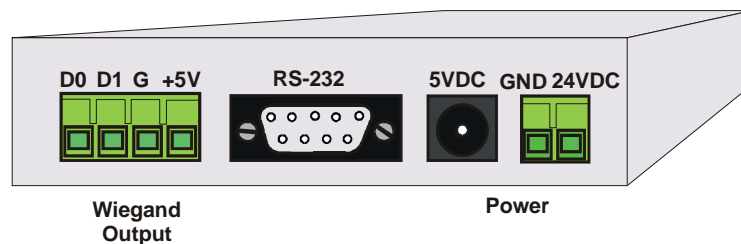
Figure 17 Back of the Receiver

Connecting Power to the Receiver

All Receivers come with a 5 VDC, 400 mA power transformer that plugs into a 110 VAC outlet. If uninterruptible power is an issue, a backup battery or UPS can be used. When power is supplied to the Receiver, the power indicator LED on the front will light up.

Step 1: Ensure that the 110 VAC outlet is near the Receiver and is easily accessible.

Step 2: Plug the AC adapter into the jack labeled **5VDC** on the **back** of the Receiver (Figure 17).

Step 3: Plug the unit into the power outlet.

Configuring the Receiver

Receiver Defaults

The Receiver has the following factory default settings:

- Wiegand and TTL output capabilities enabled.

- Wiegand and serial output is enabled.

- Tag data with any valid Activator ID will be output.

- No Wiegand data will be output for panic or tamper Tag alarms.

- Neither TTL output will fire for valid Tag data or panic or tamper Tag alarms.

- Diagnostics are turned off.

- Serial output is set at 9600 baud with long format – RRRAAAFFFTTTTT where RRR is the Receiver ID, AAA is the Activator ID, FFF is the facility code and TTTTT is the Tag ID.

- Receiver ID is 001.

These settings can be modified with commands given to the Receiver via HyperTerminal.

Required Materials

- A computer with a terminal program and a free communications port.

- A standard one-to-one computer modem RS-232 cable with a DB9 male connector (Receiver end) and a suitable connector for the PC/terminal end.

  IMPORTANT! DO NOT use a null-modem cable or null-modem adapter.

Connecting a Computer to the Receiver

Step 1: Attach the DB9 male connector of the RS-232 cable to the RS-232 port on the Receiver.

Step 2: Attach the other end of the RS-232 cable to the computer.

Communicating via HyperTerminal

Step 1: Start HyperTerminal. Details can be found in the section *Communicating via Windows HyperTerminal,* page 27

Step 2: In the Connection Description dialog box that appears, enter any name for the connection in the Name field, and select the first icon in the Icon selection box. Click the OK button.

Step 3: In the Connect To dialog box that appears, select the com port to which the Receiver is connected from the Connect Using drop-down list. The other options will gray out. Click the OK button.

Step 4: In the Com Properties dialog box that appears, enter the following information:

Bits per second (Baud)	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Step 5: Click the OK button.

Receiver Responses

All commands have the basic format of <number><character>. It is unnecessary to press the Return key after typing the command.

When a command is given to the Receiver, the Receiver will respond with one of the following codes:

00 Command completed successfully

05 Value entered is out of bounds

06 Invalid or unknown command

Note: Other command-specific responses are documented with the corresponding command.

Setting up a Wiegand System

Responding to Activator IDs

By default, the Receiver will only output Wiegand data from Tags activated by Activator ID 127. To change the Activator ID, type the new Activator ID number followed by a capital W:

`<number>W`

This is known as a Wiegand ID. The default is to only output reads corresponding with this Activator.

To enable the Receiver to respond to multiple Activator IDs, type:

33c

The Wiegand output of the Receiver will now include all tag reads from Activators listed as valid Activator ID's for serial output in addition to the Wiegand ID. See **Responding to Activator IDs**, page 38, for the list of Activator IDs and how to configure them.

To return the Wiegand output to the single the single Wiegand Activator ID, type:

19c

Alarm Output

By default, the Receiver does not output Tag data containing alarm codes from Panic or Tamper Tags via the Wiegand port. To enable alarm data output, type:

26c

To disable alarm data output (default state), type:

12c

Setting up a Serial or LAN System

Setting the Baud Rate

The following commands are available for configuring the Receiver's serial port:

Command	Action
23c	Set the baud rate to 4800.
24c	Set the baud rate to 9600. Default.
25c	Set the baud rate to 19200 for NIU connections.

Serial Output

The default format for Tag data sent out the serial port is:

R R R A A A F F F T T T T T LF CR

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Where **R R R** is the Receiver ID, **A A A** is the Activator ID, **F F F** is the facility code, **T T T T** is the Tag ID number, **CR** is Carriage Return, and **LF** is Line Feed.

To make the Receiver backwards compatible with AXCESS NT132 systems, type:

> 36c

The serial output will now have the short format:

> A A A F F F T T T T T LF CR

To return to the long format out (default), type:

> **21c**

Optimizing Serial Output

The speed at which the Receiver processes data can be maximized by eliminating the extra steps required to output Wiegand data and check TTL output control settings.

To optimize serial output, turn off the Receiver's Wiegand output by typing:

> 29c

To restore Wiegand output (default), type

> **15c**

If your installation does not require TTL outputs, it can be further optimized by disabling TTL outputs with the following command:

> 35c

Note: This command will also disable Wiegand ouputs.

To restore TTL output operations, type:

> **20c**

Note: When the Network Receiver is sending data via the serial port, the LED labeled DATA TX will alternately flash from red to green. Observing this LED on the front of the unit will help in verifying proper operation of a Network Receiver.

Responding to Activator IDs

The only Tag data that a Receiver will output via the serial port must contain a valid Activator ID. The Receiver maintains a list of valid Activator IDs. By default, the Receiver accepts Tag data from Activators with the following IDs:

3	34	70	103
13	44	72	105
14	47	75	106
21	52	80	113
22	55	83	114
24	57	93	124
27	58	94	127 – default ID
33	69	100	

Table 4 Default Activator IDs

Deleting an Activator ID

If the Receiver picks up signals from two or more activation fields and you want the Receiver to only send data from a select set of activation fields, delete the unwanted Activator ID(s) from the Receiver's list. To delete an Activator ID, type the ID number followed by a minus sign:

`<number>-`

If the Activator ID has not been programmed into the Receiver, the Receiver will respond with the error code:

`04`

You must have at least one Activator that the Receiver can respond to. If you try to delete all the Activator IDs, the Receiver will respond with the error code:

`03`

And will not allow you to delete the last Activator ID.

Clearing Accepted Activator IDs

To remove all the accepted Activator IDs, type:

`37c`

The Receiver will still pass the default Activator ID 127.

Adding an Activator ID

To add an Activator ID, type the Activator ID followed by a plus sign:

`<number>+`

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If the entry is a duplicate, the Receiver will respond with the error code:

> 01

If more than 34 Activator IDs have been entered – the maximum number the Receiver can hold – the Receiver will respond with error code:

> 02

You will need to delete some Activator IDs on the list to make room.

Restoring Default IDs

To reset the list to the valid Activator ID numbers, type:

> 34c

All Tag data from Activator IDs listed in Table 4, page 38, and status codes 000 (alarm from Panic or Tamper Tags) and 254 through 255 will be output to the PC or control device.

Setting the Receiver ID

Receiver IDs are used by ActiveTrac software to determine from which zone a Tag reported. By default, the Receiver ID is 001. To give the Receiver a new ID, type:

> <number>I

Where <number> is between 000 and 999.

Enabling TTL outputs (Logic Control)

The ActiveTag Receiver has two Transistor-Transistor-Logic (TTL) outputs – each can be set to go from Low (inactive) to High (active) upon a tag read. The **output level is 3.3VDC.**   The following table provides a list of configuration commands.

TTL output 1	TTL output 2	Action
<number>D	<number>E	Set the length of the activation signal in seconds. Valid numbers are 000 through 255. The default is 005 seconds.
10c	11c	Set output to go from **Low** to **High**.
16c	17c	Do not activate TTL output for a valid Tag read. Default
30c	31c	Activate TTL output for a valid Tag read.
13c	14c	Do not activate TTL output when alarm code received from a Panic or Tamper Tag. Default.

27c	28c	Activate TTL output when alarm code received from Panic or Tamper Tag.

Diagnostic Mode

Diagnostic Mode allows you to troubleshoot the ActiveTag system by displaying all data received from all Tag broadcasts picked up by the Receiver -- including Tag data with Activator IDs that have not been programmed into the Receiver.

To enter Diagnostic Mode, type:

     39c

The following is an example of how the Receiver will respond:

     00110602401234
     00110602423235

Where **001** is the Receiver ID; **106** is the Activator ID; **024** is the Site Code and **01234** and **23235** are the IDs of Tags in the field. If the serial output has been set to short format, then the Receiver ID will not be displayed.

Diagnostic Outputs

The Receiver will output every Tag transmission that it receives, whether or not the Tag data contained a valid Activator ID.

IMPORTANT! Do not use Diagnostic Mode as the standard Receiver output to interface with your software. Diagnostic Mode allows cross-talk – Receivers will output data for Tags awakened by any 132 kHz signal – all Activators, any interference, etc.

Code 254

In some earlier tag versions, code 254 is broadcast in place of an Activator ID to indicate that a Tag was activated by a valid activation field -- but could not to determine the Activator's ID number. By default, later tag versionsare not programmed to transmit a 254 code.

Wiegand Output

While a Receiver sends Tag data to HyperTerminal as rapidly as it's received, it will still buffer the data being sent to the Wiegand control panel. When a Receiver that has been configured to output Wiegand data is in Diagnostic Mode, all Tag information is sent to the control panel. Therefore, it's recommended Wiegand output be disabled -- or, disconnect the Wiegand terminal when in *Diagnostics* mode.

Turning off Diagnostic Mode

To turn off the Diagnostic mode, type:

22c

IMPORTANT! Always turn off Diagnostic Mode when finished. Failure to do so can result in cross-talk, garbled output and erratic control device performance.

Viewing Configuration Settings

To see the configuration settings of the Receiver, type:

38c

The Receiver will respond with its configuration settings. The following is an example of the response:

```
127|33|34|106

Config: DDDDDDDD*DD   D=005 E=005 I=001 L=125
T=013 W=127
```

Where the list of numbers is the list of valid Activator IDs. The eleven characters – Ds and *s – indicate the following:

D   Default setting

*   Changed setting

The following is the list of the default settings in order:

1. Wiegand data output on alarm OFF

2. TTL output 1 on alarm OFF

3. TTL output 2 on alarm OFF

4. Wiegand data output ON

5. TTL output 1 on valid read OFF

6. TTL output 2 on valid read OFF

7. Serial data output ON

8. Serial Activator IDs for Wiegand OFF

9. Transmit long Tag ID format ON

10. Diagnostic mode OFF

11. Wiegand/TTL output capabilities ON

The rest of the configuration is for the following:

D   TTL output 1 signal duration in seconds

E   TTL output 2 signal duration in seconds

I   Receiver ID

L   Redundant Tag buffer for Wiegand output in tenths of a second (See **Appendix C: Advanced Wiegand Configuration** for more information)

T   Interval between Wiegand outputs in tenths of a second

W   Wiegand Activator ID number

Configuring the NIU

Introduction

The Network Interface Unit (NIU) is provided with Receivers that can connect to a LAN/WAN. The NIU allows the Receiver to connect to the LAN by providing a fixed IP address to the Receiver and converting the Receiver's serial data to TCP/IP packets. The NIU consists of a DB25 serial port, a 10 base 100 Ethernet connection (RG45), and a power transformer.

Like the Receiver, the NIU must be configured via a terminal emulation program such as *HyperTerminal*.

In order to allow PC applications to connect to the Receiver and gain access to the tag read data, the NIU must be assigned a fixed IP address.

If you plan to have a PC and the Receiver(s) on a private hub (not connected to the company network or the Internet), then you can assign any IP addresses. For example, the PC could be 200.200.200.1. [Note: On the PC, the IP address is set in Settings, Control Panel, Network, TCP/IP components, Properties, IP Address, Specify an IP address, fill in 200.200.200.1, for Subnet Mask fill in 255.255.255.0, click OK, click OK, PC will reboot.] The first Receiver could be at 200.200.200.2 and the next at 200.200.200.3. The procedure below describes how to setup the IP address and other parameters on the NIU.

If you plan to put the Receiver on the corporate network, or the Internet, you will need to get an IP address assigned by your network manager. The PC application software will not work with dynamic IP address assignment. Once you have the IP address from the network manager, the procedure below describes how to assign that address to the NIU.

Connecting the NIU to the PC

Step 1:   **IMPORTANT!** Ensure that the NIU's power is **OFF**.

Step 2:   Connect one end of the null-modem serial cable to the DB25 port of the NIU (Figure 18).

Step 3:   Connect the other end of the null-modem cable to an open com port on your computer.
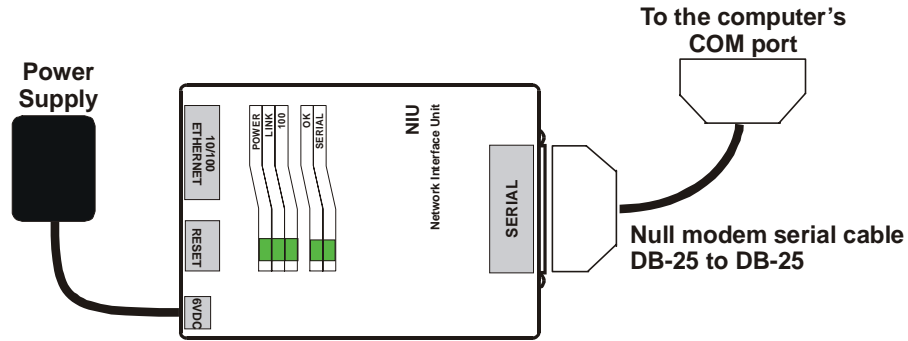
Figure 18 Connecting the NIU to the computer

Step 4: Launch HyperTerminal.

Step 5: In the Com Properties dialog box, enter the following information:

Bits per second (Baud)   9600

Data Bits   8

Parity   None

Stop Bits   1

Flow Control   Hardware

Step 6: Click the OK button. You now have an active connection to the NIU with HyperTerminal.

Step 7: Power up the NIU. After 30 seconds, the NIU initialization screen will appear and information will scroll past.

Step 8: After you see **%%Ethernet Address xx-xx-xx-xx-xx-xx** line, press the Enter key.

Step 9: At the **Local_1>** prompt, type **set priv**. The NIU will prompt you for a password.

Step 10: Type the default password, **system**. The password will not appear on the screen when it is typed.

Step 11: At the **Local_1>** prompt, type **change ipaddress xxx.xxx.xxx.xxx**, where xxx.xxx.xxx.xxx is the IP address that you want to give to the NIU.

Step 12: Enter **change subnet mask xxx.xxx.xxx.xxx** at the **Local_1>** prompt. The typical subnet mask is 255.255.255.0.

Step 13: To specify a gateway, type **change gateway xxx.xxx.xxx.xxx** at the **Local_1>** prompt. A gateway should be specified when you want to connect to the NIU from another network. Your network manager will be able to supply the gateway address if needed.

Step 14: To ensure that no other network IP address assignment protocols – BOOTP, DHCP or RARP – reassign the IP address, type the following commands at the prompt:

`Local_1> Change DHCP disable`

`Local_1> Change BOOTP disable`

`Local_1> Change RARP disable`

Step 14: At the `Local_1>` prompt, type `show server`. The terminal will display the IP information that you have provided. Ensure that it is correct.

Setting up the Serial Port

The serial port on the NIU should be configured so that it can communicate with the Receiver. To properly configure the serial port, type the following commands at the `Local_1>` prompt:

Command	Description
`Change modem control enable`	Allows the NIU to monitor for a valid serial connection
`Change flow control none`	Direct serial port not to use flow control
`Change break none`	This command tells the NIU to ignore the Break key. The Break key can allow a person to leave an active session and return without disconnecting.
`Change serial delay 0`	Changes the amount of time the NIU will allow characters to accumulate before sending them out. Set the delay to 0.
`Change access remote`	Programs the NIU to accept network connections.
`Change verify disable`	Controls informational messages whenever a session is connected, disconnected or switched.
`Change silentboot enable`	Prevents the NIU from sending status messages upon bootup.
`Change speed 9600`	Sets the baud rate to 9600.

The `Show Port` command provides information on the serial port settings.

IMPORTANT! Once you set the speed, you MUST disconnect from HyperTerminal and restart the NIU for changes to take effect.

Connecting the Receiver and the NIU

Using the CAT 5 cable (straight through cable with RJ 45 on both ends) supplied with the NIU, connect from the 10/100 ETHERNET Port on the NIU to the Hub or the network, and cycle power on the NIU. PC applications will be able to connect to the IP address you assigned to the NIU and using port 3001.

Using a DB 9 to DB 25 (straight through) cable, connect from the Receiver to the NIU. Connect from the DB 9 labeled **RS-232** on the Receiver to the DB 25 labeled **SERIAL** on the NIU.

Modifying the NIU Configuration

If you need to connect to the NIU to change parameters, the best method is "telnet". From a DOS window on the PC, type **telnet xxx.xxx.xxx.xxx** where xxx.xxx.xxx.xxx is the IP address you assigned to the NIU.

At the **username** prompt, type **user**

At the **Local_2>** prompt, type **set priv**

At the **password** prompt, type **system**

At this point, you can enter and of the commands, you used before, including "show server" and "show port".

You will not be able to access the NIU through the serial port unless you disable silent boot by typing **change silentboot disable**, and then pressing Enter at the "bootmode commands" prompt.

Installing the Receiver

Connecting to a Wiegand Control Panel

Connecting to a Wiegand control panel requires black, white and green wire of sufficient length to connect the Receiver to the Wiegand control panel. With 22-gauge wire, 200 feet of wire can be run. With 18 gauge, 500 feet can be run.

Step 1: Install the Wiegand control panel according to the instructions provided with that unit.

Step 2: Run the ground wire from the Ground connection at the Wiegand control panel to **G** on the Receiver (Figure 19). The terminal block on the Receiver can be removed for ease of wiring. For standard Wiegand control panels, the Ground wire is black. Ensure that the termination is secure, but not over-tight.
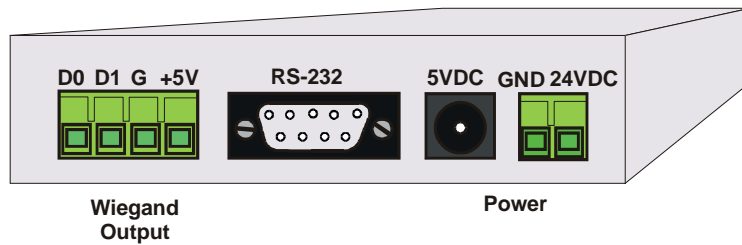
Figure 19 Wiegand Connections

Step 3: Run the Data One wire from the Wiegand control panel to **D1** on the Receiver. For standard Wiegand control panels, the Data One wire is white.

Step 4: Run the Data Zero wire from the Wiegand control panel to **D0** on the Receiver. For standard Wiegand control panels, the Data Zero wire is green.

IMPORTANT: Wire the Receiver to the Wiegand control panel carefully. Wiring Ground to a Data terminal can short the Receiver. Do not wire Data One and Data Zero backward – the data will be garbled.

Step 5: Ensure the Wiegand control panel is wired correctly.

Step 6: Add the Tag IDs to the panel's database according to the panel manufacturer's instructions.

Wiegand Output

The following shows the SIA standard 26-bit data format that is output from the Receiver:

`E S S S S S S S H H H H H H H L L L L L L L O`

Where

`E` is the even parity bit, calculated over bits 2 – 13.

`S S S S S S S` is the site code. Bit 2 is the most significant bit. By default, the Tag's site code is 025. Tags can be ordered from AXCESS Inc. with other site codes.

`H H H H H H H` is the high byte of the Tag ID number. Bit 10 is the most significant bit.

`L L L L L L L` is the low byte of the Tag ID number. Bit 18 is the most significant bit.

`O` is the odd parity bit, calculated over bits 14 – 25.

Connecting to a Serial Device

The Receiver is a DCE (Data Circuit-terminating Equipment) device, and data is output through a DB9 female RS-232 connector. Only the following pin assignments are used:

- Transmitted Data (pin 2)

- Received Data (pin 3)

- Signal Ground (pin 5)

Use a standard one-to-one RS-232 cable (also known as a straight-through or modem cable) of sufficient length to connect the Receiver to your PC or serial device. One end of the cable should be a DB9 male connector.

IMPORTANT! DO NOT use a null-modem cable or adapter.

Step 1:   Attach the female end (it can be either DB25 or DB9 according to the device serial connector) of the cable to the third-party device. Connect the DB9 male end to the RS-232 port on the Receiver.

Step 2:   For the third-party device, enter the following port settings:

Baud Rate	Receiver's programmed baud rate. Default 9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Serial Output

The Receiver outputs serial data in ASCII 8-bit decimal format (each ASCII character is represented by eight bits). Serial data has a different format than Wiegand data (see below) and data is always unbuffered – that is, every Tag read is output. Serial data has the following format by default:

> R R R A A A F F F T T T T T LF CR

Where:

`R R R` is the Receiver ID number

`A A A` is the Activator ID number

`F F F` is the facility code

`T T T T T` is the Tag ID number

`CR` is Carriage Return (in hex, 0D)

`LF` is Line Feed (in hex, 0A)

If the Receiver had been configured to interface with older systems, then the output has the following format:

> A A A F F F T T T T T LF CR

Wiring TTL Outputs to TTL outputs

A terminal block and leads for activating two TTL outputs are provided with the Receiver.

Step 1: Remove the receiving antenna.

Step 2: Remove the nut at the base of the receiving antenna BNC connector.

Step 3: Gently open the case.

Step 4: Place the terminal block on the J9 header (Figure 20) Run the wires out the provided hole in the Receiver case. The wires have a knot tied to provide strain relief.
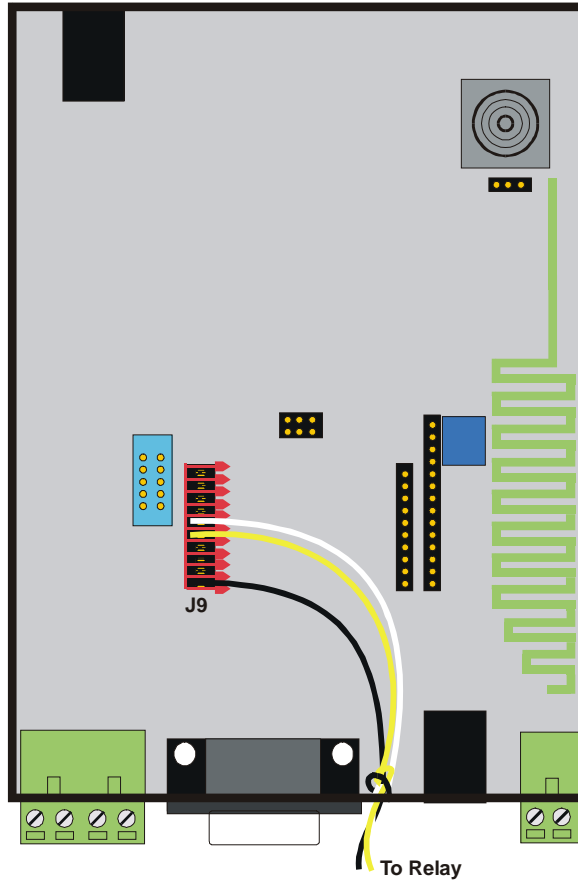
Figure 20 Plugging in the relay wires

Step 5:   Close the case, reaffix the nut and replace the receiving
antenna.

Step 6:   Wire an external relay according to Figure 21. Altronix
RBSN-TTL ultra-sensitive relay module is recommended.
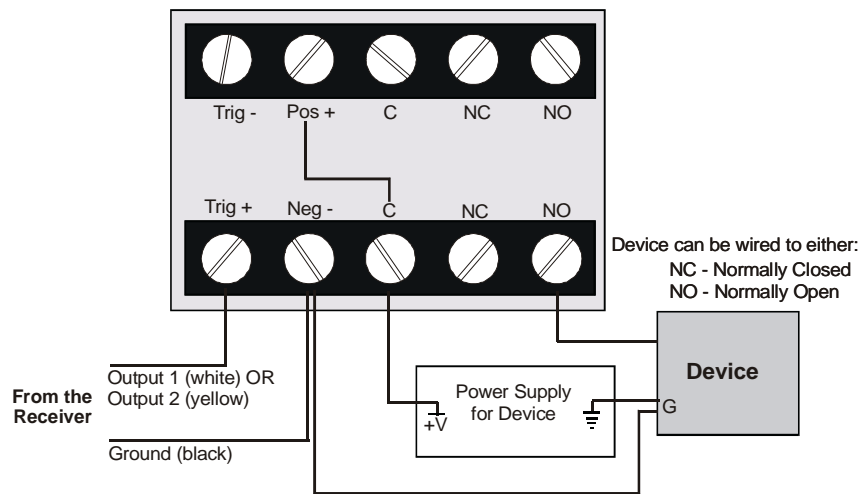
Figure 21 Wiring a relay

Connecting to the NIU and the Network

IMPORTANT! Power down the NIU and the Receiver before connecting them.

Step 1: Using a DB-25 to DB-9 cable, plug the DB-9 connector into the RS-232 port on the Receiver. Plug the DB-25 connector into the DB-25 port on the NIU (Figure 22).

Step 2: Connect the NIU to a hub on your LAN with an RJ-45 to RJ-45 cable.

Step 3: Power up the NIU. Upon power up, the NIU sends information through its serial port that can modify the settings of the Receiver. Wait 1 minute before powering up the Receiver so that the Receiver does not receive the serial data from the NIU.
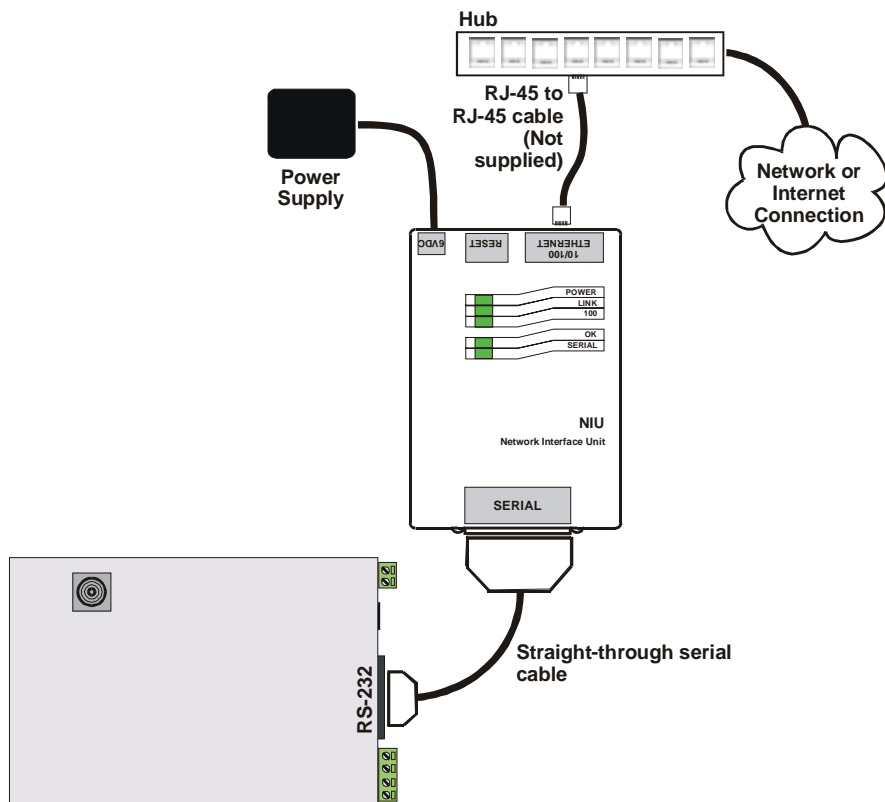
Figure 22 NIU – ActiveTag Receiver connections

Mounting the Receiver

For best results, the Receiver should be within 35 feet of an activated Tag.

The receiving antenna should not be blocked by metal or brick.

The following diagrams show various mounting positions for the Receiver. Two mounting holes on the bottom of the Receiver can be used to mount the Receiver to a wall (Figure 23). Double-sided tape can also be used to mount the Receiver. The receiving antenna can be placed through acoustic tile in a ceiling (Figure 24).
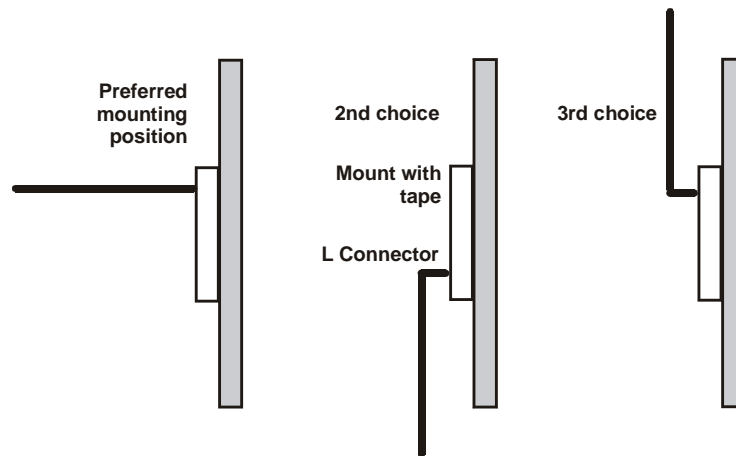
Figure 23 Receiver wall mount positions

IMPORTANT! If an L connector is used, the receiving antenna must be positioned as shown in Figure 23, away from the Receiver.
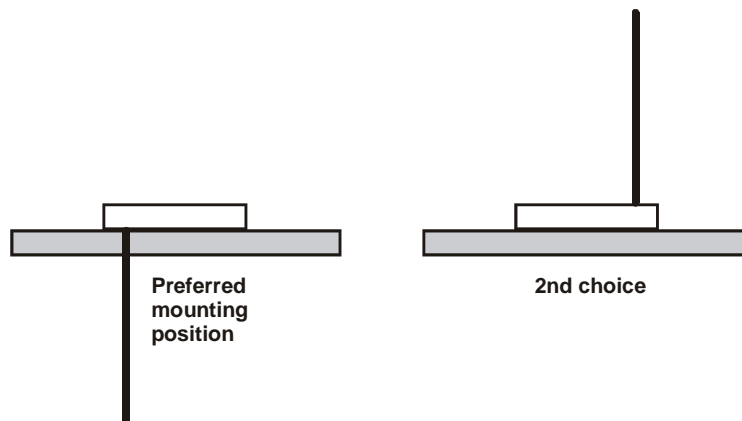
Figure 24 Receiver ceiling mount positions

Mounting the Receiving Antenna Separately

In some installations, such as vehicle applications, it may be necessary to mount the receiving antenna separately from the Receiver. Detaching the receiving antenna allows you to place the antenna closer to activated Tags and to place the Receiver in a more advantageous location, such as an electrical closet or inside a waterproof enclosure.

AXCESS Inc provides a ground plane bracket for such applications (Figure 25).

Drip Loop
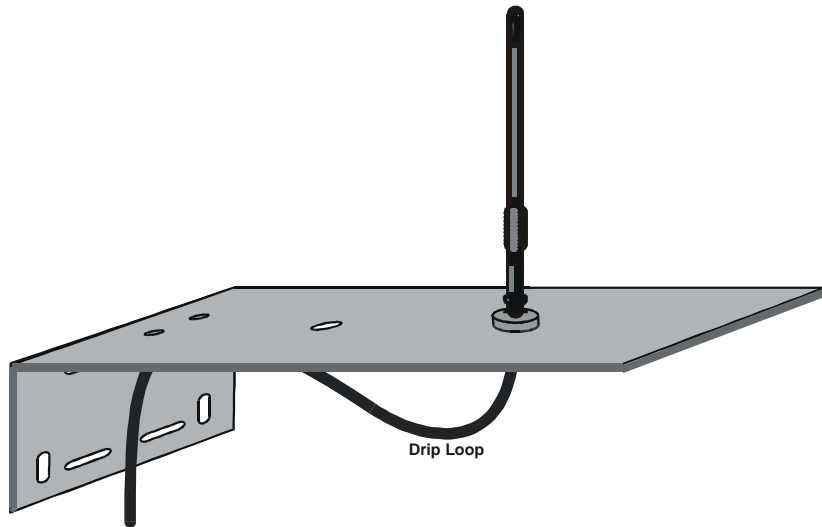
Figure 25 Receiving antenna ground plane

IMPORTANT! The receiving antenna should be no more that 25 feet by cable run from the Receiver.

Step 1: Cut the coaxial cable with sufficient length to connect the receiving antenna to the Receiver. The cable length should not exceed 25 feet.

Step 2: Attach BNC connectors to both ends of the cable.

Step 3: Remove the receive antenna from the Receiver.

Step 4: Connect one end of the cable to the receive antenna connector on the Receiver.

Step 5: Connect the receiving antenna to the top of the ground plane bracket and the other end of cable to the bottom of the connector. If installed outdoors, ensure that there is a drip-loop in the RG-58 cable below the receiving antenna.

Step 6: Position the receiving antenna and ground plane as close as possible to the area where tags are activated.

Step 7: The ground plane can be mounted in a variety of positions on walls or poles using the mounting holes and hardware provided.

Road Loop Antenna Installation

Introduction

The Road Loop Antenna is designed for vehicle applications. Road Loop Antenna wire is available in lengths that will accommodate roadways or gate entrances up to 36-feet in width. For antennas wider than 36 feet, contact AXCESS Inc. Customer Support at 800-577-6080.

The Figure 26 shows a simplified diagram representing the field generated by a Road Loop Antenna. In reality, antenna fields are lobed and asymmetrical, but the longest range will still be along the longest sides. If you are installing a Road Loop Antenna in a multi-level parking garage, keep in mind that the field extends up and down from the Road Loop.

Antenna fields are affected by the type of pavement, amount of rebar, and nearby power lines. For these reasons, **it is <u>strongly</u> recommended that the Road Loop be laid out and tested before it is permanently mounted**.
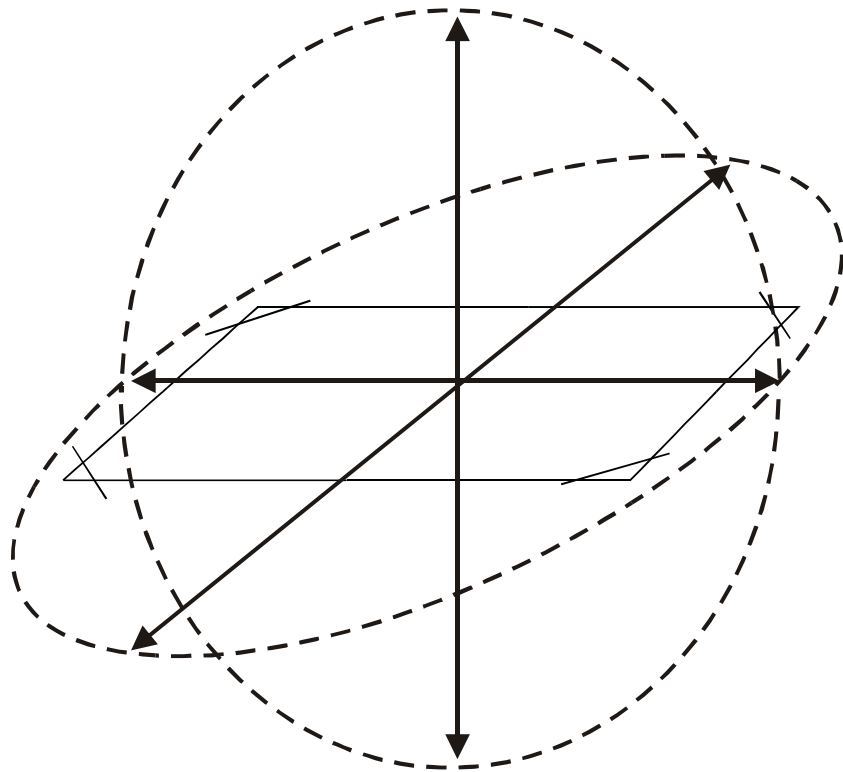
Figure 26 A Road Antenna transmit field.

Required Materials

 IMPORTANT! Have the following materials on hand for the installation of the Road Loop Antenna:

- Chalk for marking antenna placement

- Concrete nails or duct tape for holding antenna wire down during initial placement

- Multimeter for continuity check

- A saw for cutting the road surface

- Two 1/8" saw blades with spacer, either abrasive (for asphalt) or diamond (for concrete)

- A 3 ¼" x 3 ¼" x 4 ½" triangular wood template for cutting corners (described later in the chapter)

- Vacuum or compressed air for cleaning the cut

- A thin dowel for pressing the Road Loop antenna into the cut

- Road sealant - AXCESS recommends Bondo Flexible Embedding Sealer (P-606). As a substitute, you can use either 3-M's Detector Loop Sealant or Q-Seal sealant.

 IMPORTANT! To ensure proper system operation, do not substitute antenna kit components. Road Loop Antenna wire must be ordered in specific sizes.

Prerequisite Tasks

The following tasks need to be completed before proceeding with the Road Loop Antenna installation:

❑ If applicable, the **Wiegand or other controller has been installed**. If not, refer to the Original Equipment Manufacturer's (OEM) manuals.

❑ Ensure that there is no power-line interference directly under the road surface.

 IMPORTANT! Before permanently installing the Road Loop Antenna, lay out and test the entire ActiveTag system.

Road Loop Layout & Connecting to the Activator

Step 1: An AXCESS Inc. RFID tag will be activated and read when it is over the Road Loop, however it may take a second or two for the controller to process the Tag information and activate the gate motor.

Step 2: If there is a safety loop for the gate, do not use the safety loop's cut for the Road Loop Antenna. If the Road Loop Antenna and the safety loop are installed together, there

will be interference and neither is likely to operate properly. Place the loops at least four feet apart whenever possible.
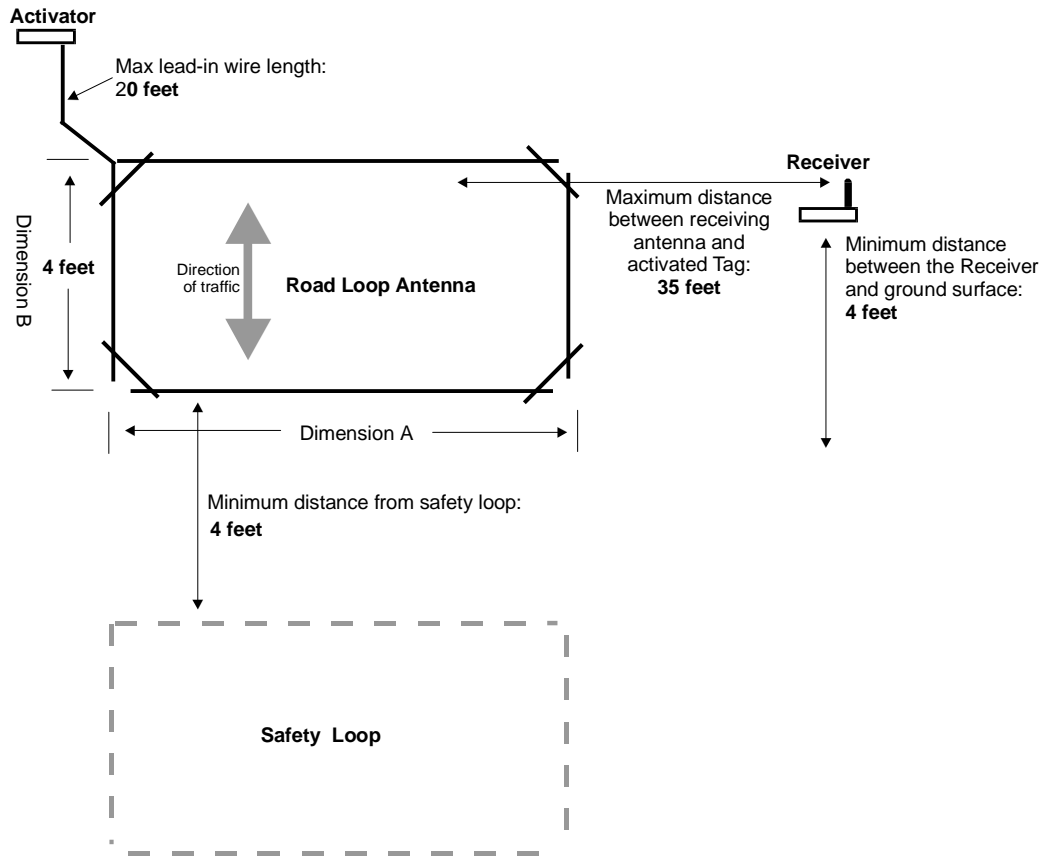
Figure 27 Road Loop Antenna installation diagram

Step 3:   Mark the outline of the antenna (yellow contractor's crayon, chalk, etc.). Ensure that the corners are 90 degrees.

The long sides (Dimension A, Figure 27) will be shorter than the width of the road or lane.

IMPORTANT! The short sides (Dimension B) of the road loop antenna should **always** measure 4 feet.

Step 4:   If necessary, drive concrete nails (or similar) into the road surface at the corners to provide the proper rectangular shape to the antenna when laying down the wire.

Step 5:   Insert the end of the Road Loop wire at the Activator into one side of a binding post-to-BNC connector (Figure 28). Tighten the binding post terminal to secure the lead.

Road Loop Lead-in

Do not attach yet

Dual binding post-to-
Male BNC Connector
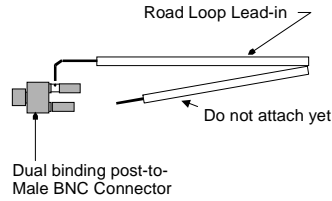
Figure 28 Attaching Road Loop wire to the post-to-BNC connector

Step 6: Connect the BNC-end of the Road Loop wire to the BNC antenna connector on the Activator.

Step 7: Carefully feed Road Loop wire around the pre-marked loop drawn on the roadway (Step 3). Secure the wire with duct tape as you proceed.

IMPORTANT! The **total** length of lead-in wire between the Road Loop and the Activator must not exceed 20 feet. Keep twist in the wires to a minimum as you run them from the Road Loop to the Activator.

Step 8: At the loop feed point, begin to lay wire around the loop (using the concrete nails to maintain the corners). Again, secure the loop to the surface with duct tape.

Step 9: When back to the feed point, continue around the loop to complete the appropriate number of wraps according to the chart below (do not allow the two wires to twist).

Antenna Width (Dimension A)	Antenna Length (Dimension B)	Number of Wraps	Inductance in Microhenrys (uH)	Min Wakeup Range (ft)
4 Feet	36 Feet	2	110	17
4 Feet	34 Feet	2	109	15
4 Feet	32 Feet	2	107	16
4 Feet	30 Feet	2	101	16
4 Feet	28 Feet	2	99	15
4 Feet	26 Feet	3	96	17
4 Feet	24 Feet	3	154	14
4 Feet	22 Feet	3	151	14
4 Feet	20 Feet	3	147	14
4 Feet	18 Feet	3	138	13
4 Feet	16 Feet	3	130	17
4 Feet	14 Feet	4	130	19
4 Feet	12 Feet	4	173	17
4 Feet	10 Feet	4	154	15
4 Feet	8 Feet	4	122	16
4 Feet	6 Feet	4	110	15

Each combination of loop-width, loop-length and wraps of wire will produce a specific antenna inductance (measured in Microhenrys) – providing maximum power to the antenna. But, more wraps than recommended will NOT produce more range; rather, it will degrade performance!

The "Inductance" column in the chart is included only for those installers having an inductance meter. If you do not have an inductance meter, that column is of no value.

Step 10: After the correct number of loops (see above) have been completed, continue to lead the wire back to the Activator. Again, keep twist to a minimum.

Step 11: Carefully review the installation to this point. If everything is correct, cut away the excess wire, trim and attach the other end of the Road Loop wire to the other half of the binding-post-to-BNC connector (Figure 29).

Road Loop Lead-in

Dual binding post-to-Male BNC Connector
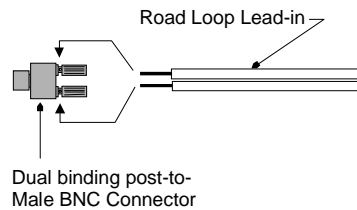
Figure 29 Post to Male BNC Connector

Step 12: Cycle the power of the Activator and check the strength of the TX Output LEDs.

Step 13: Using an LED Test Tag, ensure that the activation field of the Road Loop extends adequately for desired coverage from the center of the Road Loop (Figure 26). Antennas with greater width (dimension A) have larger fields.

Step 14: After ensuring proper operation, remove the wire loop and concrete nails to allow cutting the groove into the roadway.

Installing the Road Loop Antenna (Frequently contracted)

A normal antenna installation should take about two hours using a walk-behind concrete saw with an abrasive blade to cut asphalt. Two 1/8" blades with a spacer will be required.

The same antenna should take about three hours to cut in concrete using a diamond cut blade. Two 1/8" blades with a spacer will be required.

Step 1: Confirm that the loop is correctly marked on the road surface.

Step 2: Lay out the 45-degree corner cuts. It is helpful to create a template with the dimensions 3¼" x 3¼" x 4½" (Figure 30).
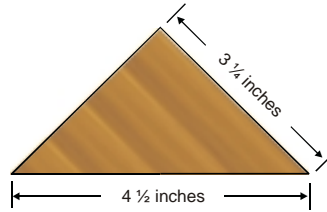
Figure 30 Plywood corner template
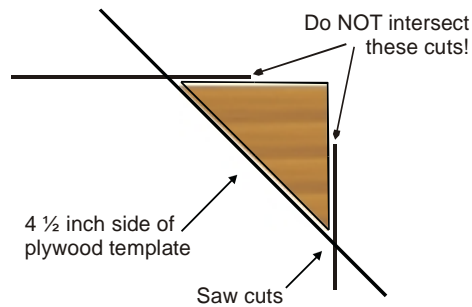
Figure 31 Using the template to mark corner cuts

Step 3: At the corner closest to the Activator, mark a lead-in cut.

Step 4: Cut a groove that is at least a ¼" wide with the concrete saw. Set the cutting depth to a minimum of 2" deep.

⟹ **IMPORTANT!** Do not let the corners intersect when sawing. You could cut out a chunk of pavement!

When sawing the corner cuts, cut approximately 1" to 1½" past the loop sides. This will maintain the saw cut depth at the 45-degree turn.

Step 5: Thoroughly clean out the groove with a vacuum or compressed air.

Step 6: Insert the loop and lead-in into the cut grooves. **Do not** use a metal object to push the antenna loop into the saw cut as it may damage the wire. A tongue depressor or pencil eraser works well.

⟹ **Step 7:** **IMPORTANT!** Cycle the power of the Activator and check the strength of the TX Output LEDs.

Step 8: Test the system.

Step 9: Dress and/or tie-wrap all cables and seal all exterior BNC connections with rubber silicone sealant.

Step 10: Seal the cut with an antenna loop sealant, for example, Bondo Flexible Embedding Sealer (P-606), 3M Detector Loop Sealant or Q-Seal sealant. It takes about a gallon of "Bondo" to seal the cuts from a 16-foot antenna.

Bar Antenna Installation

Introduction

The Bar Antenna typically receives signals transmitted by personnel and asset Tags (transponders). The Bar Antenna is an excellent antenna for mounting above or beside a doorway (sometimes above the ceiling tile) to monitor or control access to an entry/exit point of a facility.

Antennas of this type radiate RF energy most efficiently in a direction broadside to the antenna – and radiating less energy off the edges (Figure 32). Partial rotation of the antenna forward or backward, and from side-to-side will produce noticeable results.

Direction of maximum signal radiation

Wall

Edge View of Bar Antenna
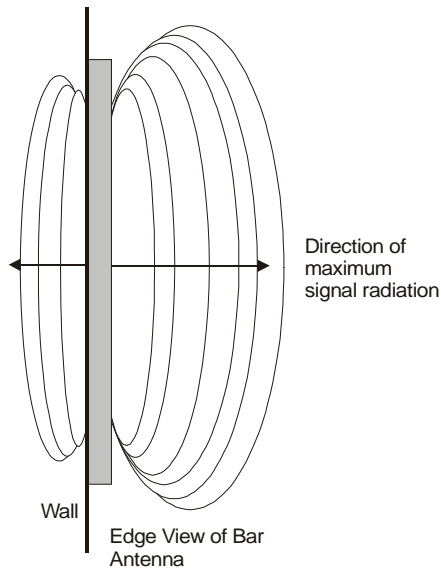
Figure 32 Bar Antenna signal radiation

To ensure proper system operation, **do not substitute antenna components.**

Prerequisite Tasks

IMPORTANT! Before permanently installing the Bar Antenna, lay out and test the entire ActiveTag system.

Installation Considerations

Determine the *approximate* installation site of the Bar Antenna. Use the following guidelines:

• Figure shows different mounting positions for the Bar Antenna. Try each one before permanently mounting.

- The Bar Antenna should be within 50 feet (cable length) of the Activator.

- The Bar Antenna should be located at least 4 inches from any metal.
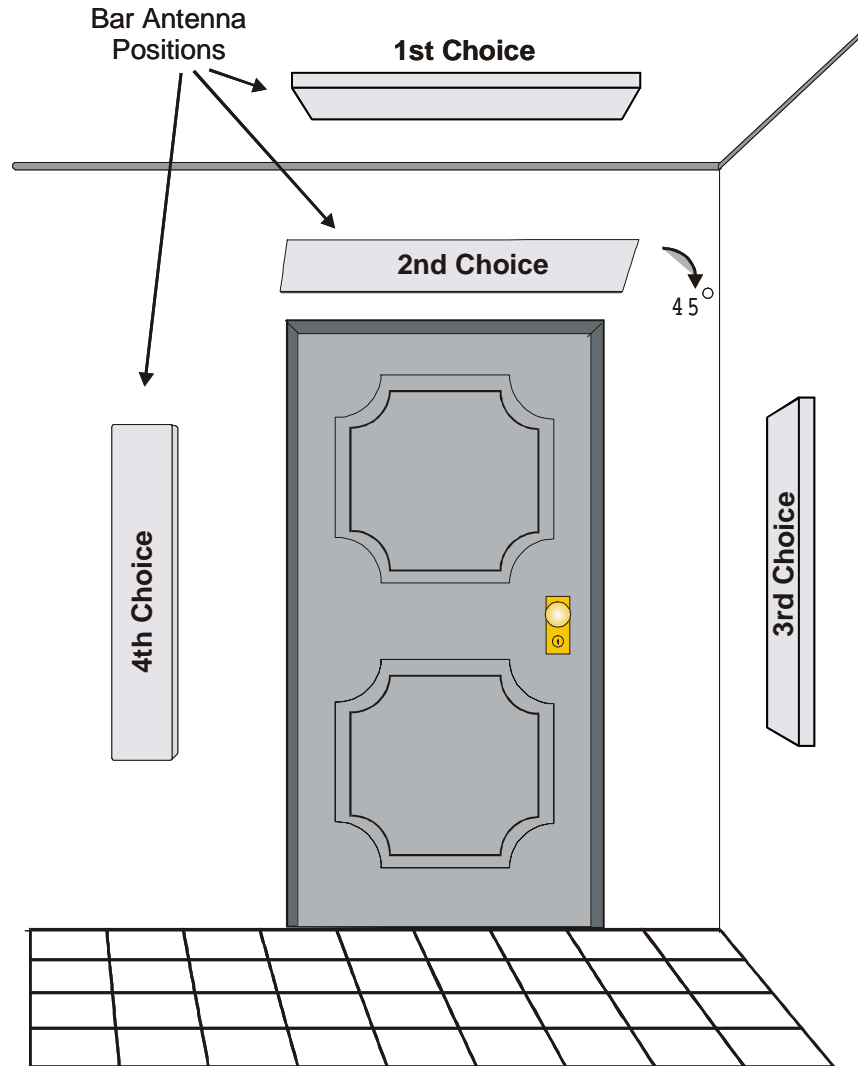
Figure 33 Installation points for the Bar Antenna

- Orient the Bar Antenna so that the wake-up field provides maximum coverage of the access or monitoring area (door), etc. Keep in mind what will be tracked with the antenna – personnel would carry Tags in their shirt or pants pocket, Tags on laptops would be carried closer to the floor.

  IMPORTANT! Test each position shown in Figure 33. Tilting the Bar Antenna may also improve performance.

If mounting the Bar Antenna on the ceiling, mount it flat with the front of the case pointing at the floor.

- If applicable, follow the guidelines in the manufacturer's documentation for placement and wiring of any controller or peripheral device.

Installing the Bar Antenna

Step 1: Measure the cable run distance between the Activator and the Bar Antenna and cut a length of RG-58/U coaxial cable.

Step 2: Attach the BNC connectors to each end of the cable.

Step 3: Connect one end of the cable to the female BNC connector labeled **TX** on the back of the Bar Antenna and connect the other end to the BNC connector on the Activator.

Note: Although the Bar Antenna has an RX connector, it is not used for an ActiveTag installation.

Note: Do not dress-wrap or tie-down the cables until the antenna has been permanently installed and the system has been tested.

Step 4: **IMPORTANT!** Cycle the power of the Activator and check the strength of the TX Output LEDs.

Step 5: Test various Antenna locations by positioning the LED Test Tag at strategic points, i.e., along the edges of the doorway, along the floor – ensuring complete coverage of the doorway or monitoring zone.

Step 6: Attach the open Bar Antenna base to wall using supplied anchors and screws. If you want to install the Bar Antenna at an angle, wood wedges or flexible metal brackets can be used.

Step 7: Place the plastic cover over the base and align holes on the sides of the case and cover.

Step 8: Insert the rivet bases through aligned holes.

Step 9: Insert plastic screws into the rivet bases and push until the screws are tight.

Step 10: Tighten the screws with a hand-held screwdriver.

Step 11: The plastic rivets are removable with a screwdriver if it is ever necessary to open the Bar Antenna case.

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Picture Frame Antenna Installation

Introduction

A Picture Frame Antenna allows you to mount an antenna in plain sight without detracting from office surroundings. In a Picture Frame Antenna, the transmitting and receiving antennas are built into a picture frame. You can place a picture of your choosing in the frame and hang the Antenna on the wall near the access or monitoring point.

Prerequisite Tasks

IMPORTANT! Before permanently installing the Picture Frame Antenna, lay out and test the entire ActiveTag system.

Installing the Picture Frame Antenna

Step 1: Cut the coaxial cable with sufficient length to connect the Picture Frame Antenna to the Activator. The cable length should not exceed 50 feet.

Step 2: Attach BNC connectors to both ends of the cable.

Step 3: Attach the TX connector on the back of the Picture Frame Antenna to the BNC connector on the Activator.

Note: Although the Picture Frame Antenna has an RX connector, it is not used in an ActiveTag installation.

Step 4: **IMPORTANT!** Cycle the power of the Activator and check the strength of the TX Output LEDs.

Step 5: Position the antenna in its approximate final location – but do not permanently install it at this time. Have a helper hold the antenna in various positions until maximum coverage is achieved.

Step 6: Test the system by positioning the LED Test Tag at strategic points to ensure complete coverage. It will light up and flash when it is within the field.

Step 7: Permanently mount the Picture Frame on the wall using the mounting holes at the bottom and top of the frame and dress/tie-wrap all cabling.

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Tags

Types of Tags

LED Test Tag

The LED Test Tag allows you to verify proper system operation and to detect the presence of an activation field or RF interference.

Personnel Tag

The Personnel Tag's communications are optimized for multi-Tag reads. The Tag case is recessed for flush mounting of a personalized PVC card and has a slot for a clip, lanyard, etc.

Personnel Tag with Panic Alarm

The Personnel Tag with panic alarm is the same as the Personnel Tag except it transmits a duress signal when a pressure switch beneath the PVC card is pressed.

Asset Tag

The Asset Tag is the same as the Personnel Tag except it does not have a slot or PVC card recess.

Asset Tag with Tamper Detect

The Asset Tag with tamper detect is the same as the Asset Tag except it transmits an alarm signal upon tampering/removal. Tampering with or removing the Tag from the asset will cause the Tag to emit an alarm code.

Vehicle Tag

The Vehicle Tag is the same as the Personnel Tag except its communications are optimized for high-speed reads. The Vehicle Tag does not have a PVC card recess.

Clicker Tag

The Clicker Tag will transmit its ID and an Activator ID of 127 when it is pressed. It can also be activated by an activation field.

Harsh Environment Vehicle Tag

Same as the Vehicle Tag except longer operating life (5-7 years) and greater range of operating temperatures (-40 to +185 F)

Metal Mount Equipment Tag

Same as the Harsh Environment Tag except its robust design is suitable for exterior mounting direct to metal surfaces. It attaches to metal using screws or rivets through two 1/8" mounting holes. The Metal Mount Tag does not have an LED.

Tag Labeling

The Tag is labeled on its beveled edge. The format for labeling is as follows:

FCCID:N6E-132-TAG VnnYYMXXTTTTT

where:

FCCID:N6E-132-TAG	FCC information
Vnn	Tag version
YY	Last two digits of the year of manufacture.
M	Month the Tag was made. A, B and C represent October, November and December, respectively. Other months are represented by standard numeric convention (1 for January, etc.)
XX	Site code, in hexadecimal format. At present, this value is 19 for site code 25.
TTTTT	Factory ID, a unique preprogrammed ID number that is stored permanently in the Tag.

Note: The actual ID number may vary for custom programmed Tags. The custom ID number, if any, will be printed on the other beveled edge.

The LED Test Tag

The LED Test Tag indicates the presence of an activation field or error condition by lighting LEDs (Figure 34).
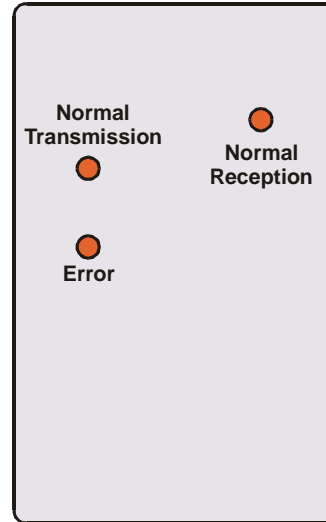
Figure 34 LED Test Tag

If the Test Tag is in a strong activation field, the Normal Reception LED will flash. The Normal Transmission LED will light with the sending of Tag data. The Error LED will flash or remain on if the activation field is not optimized or if the Activator ID is not clear. A steady flashing at the edge of an activation field is normal – this indicates that the field is dropping off.

Mounting Tags to Assets

Note: Only an extreme level of prevention is a guarantee against loss or damage at the hands of a determined thief. However, when assets are tagged as described here, they will remain tagged for tracking purposes even under heavy industrial or business usage.

Required Materials

- LED Test Tag

- Mounting materials for asset Tags – cyanoacrylate (ProCement from ProTec Technology, Super Glue), MEK (methyl ethyl ketone), double-sided tape, or a Mylar enclosure that has a sticky back

- Latex gloves if you are using one of the above adhesives

- Washable marker or pencil

> **IMPORTANT!** Before using either cyanoacrylate or MEK, consult the vendor's instructions and the compound's Material Safety Data Sheet.

For all assets, mount the Asset Tag with the flat side attached to the asset.

Testing Mounting Positions

Some electronic devices (for example, laptop computers) generate radio frequency emissions (noise) that may activate Tags, causing them to transmit. This unintended activation and transmission could result in unnecessary battery drainage.

Use the following procedure for mounting a Tag to a laptop:

Step 1: Turn on the laptop and ensure that the screen is on.

Step 2: Place the cover in a comfortable working position.

Step 3: Place the Tag flat side down on the outside of the laptop cover.

Step 4: Observe the Tag's LED as you slide it on the laptop cover – find a location that does not activate the LED.

Step 5: Ensure that when the Tag is mounted, it will not interfere with a docking station.

Step 6: **IMPORTANT!** Ensure that the Tag can be read by the Receiver when the laptop is carried normally through the wake-up field. In addition, place the Tag on the laptop where it cannot be easily pried off or removed. Do not place the Tag on a removable surface (i.e., battery cover).

Step 7: Once a location is found, use a pencil to trace around the edge of the LED Test Tag.

Mounting the Asset Tag with Adhesive

Step 1: Use a cyanoacrylate adhesive (for example, ProCement from ProTec Technology). Practice the following steps with similar materials of lesser value until the proper amount of adhesive and application pressure is established.

Step 2: Closely follow the instructions provided with the adhesive kit. You may have to lightly sand the surface inside the marked area if the asset is painted or has a protective surface applied.

Step 3: Wearing latex gloves, thoroughly clean the sanded area with the supplied isopropyl alcohol pad.

Step 4: Carefully apply adhesive to the back of the Tag that will be bonded to the asset. Ensure a continuous bead close to the edge, but not so thick that the excess will ooze beyond the edge once the Tag is positioned.

Step 5: Carefully position the Tag onto the marked area of the asset, applying pressure for the time specified in the instructions.

Mounting a Tamper Tag

Tamper Tags have double-sided tape already applied. Be very careful when permanently mounting the Tag. Moving the Tamper Tag once it has been mounted will cause the Tag to enter alarm mode.

Step 1: Remove the protective tape covering the adhesive on the back of the Tamper Tag.

Step 2: Press the Tag firmly to the asset.

Mounting Tags to Vehicles

Required Materials

- LED Tag

- Mounting materials – Velcro tape, double-sided tape, Mylar enclosure

- Washable marker or pencil

Mounting locations

The first choice for mounting a Tag in a vehicle is on the upper left or upper right side of the back window. Tags should be mounted on the side that is closest to the receive antenna. It should not be mounted on defroster wires. The Tag should be mounted at least 2.5 inches away from top and sides.

Other mounting places include the upper right or left corner of the windshield, hanging off the rear view mirror, and above either the right or the left visor.

Testing for the Best Tag Location

This test is primarily for Tags that need to be mounted in the front windshield area. This test may not be necessary for back window mounting.

Step 1: With the car out of range of the Road Loop Antenna, sit in the car and hold LED test tag five inches from the top and the side on the window.

Step 2: Start the car -- while watching the LED to see if it lights. (Note: this may occur in some vehicles due to alternator noise.)

Step 3: If the Tag turns on, move the tag up/right ½ inch and repeat test until the Tag no longer turns on.

Step 4: Mark the spot you found on the windshield with some scotch tape or a washable marker.

Note: The LED light can be hard to see in bright daylight. Shield the LED with your hand while holding it against the windshield.

Step 5: Test the various positions to find the one that works best for your installation and the vehicles involved.

Mounting a Vehicle Tag

Step 1: Apply mounting tape/Velcro on the back of the Tag. Push the mounting tape/Velcro securely on the back of the Tag.

IMPORTANT! To receive maximum range from the antenna, the Tag must be mounted with the back of the Tag facing the glass at least 3 inches from the dashboard.

Step 2: If using Velcro, apply one side of the Velcro mount to the location where the LED Tag was successfully tested. Then mount the Tag with the other piece of Velcro onto the Velcro on the windshield.

Step 3: If using double-sided tape, peal the cover off the double-sided tape attached to the Tag. Firmly apply the Tag to the windshield location you found earlier and press the Tag to the windshield ensuring solid contact.

Tags and Personnel

Required Materials

- Mounting materials – clips, chains, etc.

Personnel Tags can be threaded onto a chain, placed in a pocket, or hooked on a clip. A picture ID card can fit in the Tag's recess.

Operating Panic Tags

To send an alarm message, press the button for at least .5 seconds. The Tag will transmit an alarm code for one minute, then begin to operate normally in addition to transmitting the alarm code so that it can be tracked.

The alarm mode can be turned off by pressing the button for three seconds after the initial one minute of alarm mode. The Tag will reset in three seconds. The Tag will not broadcast when the button is pressed or during the reset phase. The Tag can be placed in alarm mode again after the reset period.

Appendix A: Troubleshooting the System

Required Materials

The following materials are necessary for troubleshooting:

- LED Test Tag

- A regular Tag

- Tape measure for measuring fields and cable

- A computer for interfacing directly with the Receiver and Activator – a laptop is ideal

- A terminal emulation application such as HyperTerminal

- A one-to-one serial cable with a DB9 male connector

- Multimeter

Check the Site

Step 1: Check the cable length – there should be a maximum of 50 feet between the Activator and transmitting antenna. If the cable is too long, it will need to be shortened.

Step 2: Check the distance between activated Tags and the receiving antenna – ensure that the receiving antenna is within 35 feet of activated Tags.

Step 3: Ensure that the system is protected from the elements. Exposed equipment should be waterproofed.

Check the Cables and Connectors

Most of the problems encountered with the ActiveTag system lie with the cables. This includes having little or no range on the antennas.

Step 1: Ensure that RG-58/U with 100% foil shield coverage is used.

Step 2: Ensure that the connectors are not free spinning. Replace any connectors on cables that freely spin.

Step 1: Check the continuity of the cables. There must be continuity from end of the cable to the other (center conductor) but **no** continuity between center and braid.

Check the Activator

Step 1: Test the range of the activation field with the LED Test Tag and compare it to the range listed Appendix E: Specifications, page 87.

Step 2: If the activation field is smaller than desired, cycle the Activator's power and check the TX Output LEDs. Also, ensure that the activation field is turned up. See the section *Resizing the Activation Field*, page 32.

Step 3: If the activation field is larger than desired, then the field needs to be adjusted. See the section *Resizing the Activation Field*, page 32.

Check the Transmitting Antenna

Road Loop

Step 1: Ensure that there is not a splice in the Road Loop Antenna.

Step 2: Test a Road Loop Antenna for continuity across the ends of the lead wires. If continuity does not exist, there is a problem with the Road Loop wire.

Step 3: Connect the Road Loop Antenna leads into the BNC-to-dual-binding-post adapter for continuity. If continuity does not exist, the adapter is faulty. Replace the adapter.

Step 4: Ensure that the layout of the system is within specifications:

The loop layout 4 feet x ordered width. The Road Loop should be installed on the right side of the lane and the longest length should go across the width of the lane.

Number of wraps appropriate for the length of the antenna. See the section *Road Loop Antenna Installation,* page 55, for further information on wrapping the Road Loop.

Step 5: Ensure that the Road Loop is laid out correctly in the lane – the longest side should go across the width of the lane.

Step 6: Ensure that the Road Loop is installed on the right-hand side of the lane.

Step 7: Reduce the activation field. See the section Resizing the Activation Field, page 32.

Bar and Picture Frame Antennas

Step 1: Ensure that the Activator is connected to TX connector on the antenna.

Step 2: Ensure that the antenna has been positioned correctly. The Bar and Picture Frame Antennas are for indoor use only.

Step 3: Ensure the TX CTRL on the Activator is turned to maximum. See the section Resizing the Activation Field, page 32.

Check the Tags

Ensure that the Tags are properly mounted. Tags should not be mounted in an area that can wake them up when they are not in the antenna field. They should be mounted in such a way that they can be activated when they enter the antenna field.

If the Tags are mounted on vehicles, ensure that they are beige. Black Tags become hotter than beige Tags in direct sunlight and can warp under extreme conditions.

Check the Reception

If the wake-up field is functioning but Tags are not being read, then there may be a problem with the reception portion of the system.

Step 1:   Ensure that the Receiver has power.

Step 2:   Ensure that the tag is programmed into the system if appropriate – i.e., for Wiegand control panels.

Check the Output and Connections to Third-Party Devices

Serial

Step 1:   Ensure that the RS-232 cable is properly seated.

Step 2:   Ensure that the Receiver has power.

Step 3:   Ensure that the communications port settings on the serial device are correct: that the baud rate matches the rate the Receiver has been programmed with, eight data bits, no parity, one stop bit, no flow control.

Wiegand

**Step 1:**   Ensure that the Wiegand control panel complies with the SIA 26-bit standard.

Step 2:   Ensure that Data Zero, Data One and Ground are wired to the Wiegand control panel correctly.

Step 3:   Ensure that the Tags and site code are entered correctly into the panel.

Step 4:   Ensure that the data is buffered correctly. See Appendix C: Advanced Wiegand Configuration, page 81.

Appendix B: Coaxial Cable
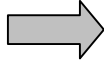
The **number one problem** encountered during installation is wiring technique and connectors. Ensure that no stray braid wires are touching the center contact pin when pushing it into the connector. This may cause the equipment to function intermittently or with reduced range. Good wiring techniques will eliminate considerable troubleshooting time later in the installation.

Required Materials

- RG-58/U coaxial cable with 50-ohm impedance (nominal), solid copper center conductor, 55% tinned copper braid or better, 100% foil shield coverage (for example, Belden 9310).

- 3-blade rotary coaxial cable stripper

- 3-piece crimp type male BNC connector (for example, Amphenol 31-320). Screw-on connectors are **NOT** recommended. They short to ground easily and can be pulled apart.

- Diagonal cutters

- BNC crimpers

- Multimeter with continuity check

Attaching the BNC Connector

Step 1: Cut RG-58/U coaxial cable and trim jacket.

Step 2: Slip the crimp sleeve over the cable. Place the contact pin onto the inner conductor. The end of contact and insulator must be butting and square.

Step 3: Ensure that the pin goes to center, braid to shield

Step 4: Crimp with appropriate tooling.

Step 5: Flare the outer braid and gently but firmly push the contact into the connector housing until a gentle snap is felt, indicating the contact is in place.

Step 6: Slip the crimp sleeve in place, butting the flange against the connector body.

Step 7: Crimp with the appropriate tool.

Step 8: Test for continuity of the inner conductor from connector to connector. Test for continuity between connectors. Test for insulation between inner conductor and connectors.
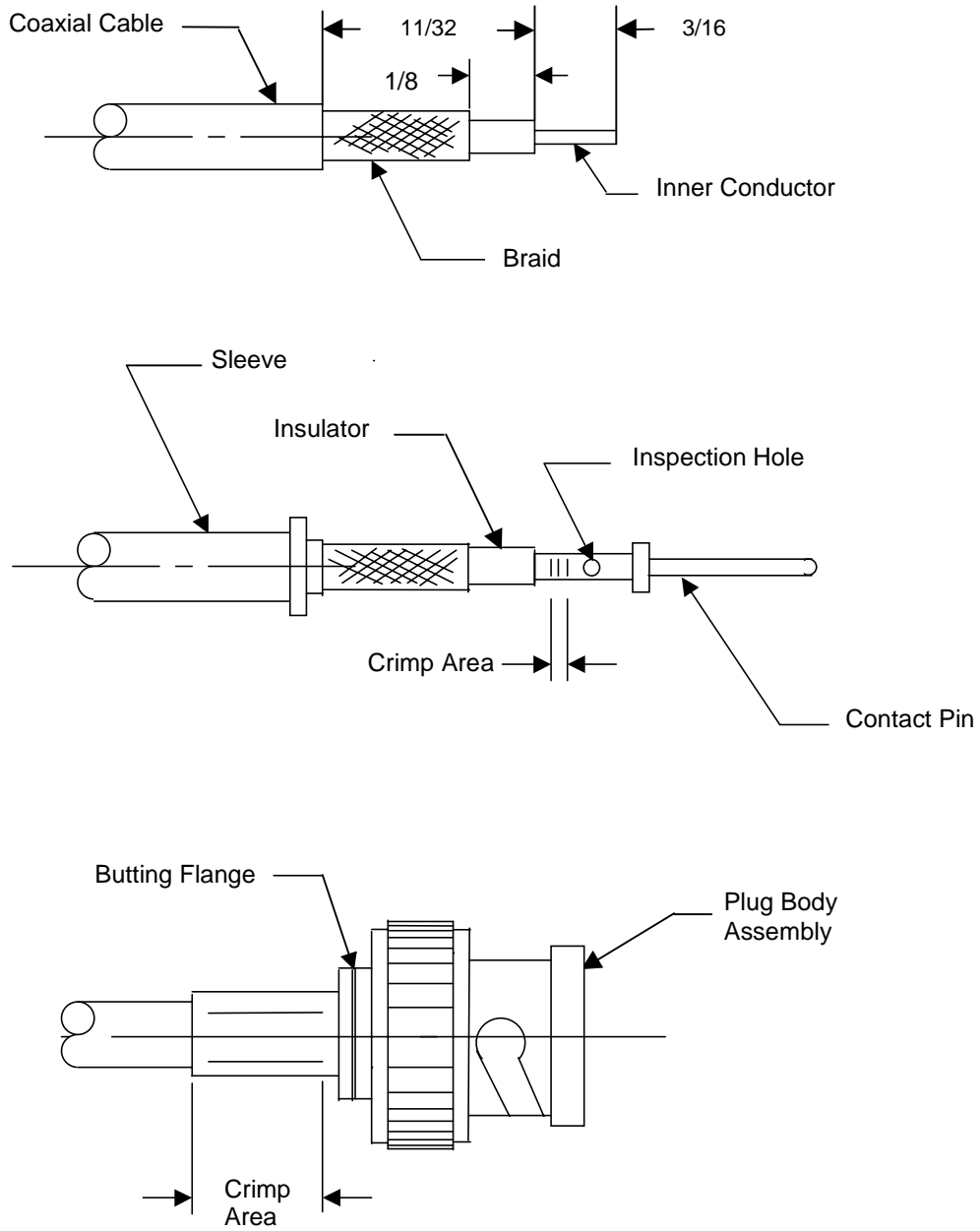
Coaxial Cable

11/32

3/16

1/8

Inner Conductor

Braid

Sleeve

Insulator

Inspection Hole

Crimp Area

Contact Pin

Butting Flange

Plug Body
Assembly

Crimp
Area

Figure 35 Dimensions for Coaxial Cable Termination

Appendix C: Advanced Wiegand Configuration

Data Buffering

Setting the Time between Outputs

By default, the Receiver sends Tag data every 1.3 seconds. Depending on your control panel, you may need to change the interval between data outputs. Your panel may be able to accept data faster than once every 1.3 seconds, or it may need a longer interval between outputs.

To change the interval between Tag outputs, type a number followed by a capital T. This number is the time in tenths of a second that the Receiver will wait between Tag outputs. Valid numbers are between 0 and 255. For example, if you want the Receiver to wait 2 seconds between Tag outputs, type the following:

> `20T`

Changing the Duplicate Tag Buffer

Once a Tag is reported, its information is stored in the Receiver's buffer for 12.5 seconds. During which time, the Receiver will not report duplicate information for that Tag. After 12.5 seconds, if the Tag's transmission is still being received, the Tag will be reported again. If more than ten Tags are received in the 12.5 seconds, the earliest Tag information is overwritten by new Tag data.

To change the length of time that Tag data will remain in the duplicate buffer, type a number between 0 and 255 followed by a capital L:

> `<number>L`

This number is the time in tenths of a second that a particular Tag's entry will remain in the duplicate buffer.

For example, if you want the Receiver to wait five seconds before transmitting duplicate information, type:

> `50L`

Appendix D: Receiver Commands

Network Receiver Commands
All commands issued to the Network Reader are preceded by a numeric entry followed by an alpha character. Any command that is not preceded by a numeric entry will be ignored.

The 'c' command set is used for all commands that do not require entry of a specific numeric value, such as setting a specific configuration attribute ON or OFF. The format for 'c' commands is **<code>c** where <code> is a two digit numeric command code that determines the specific action to be taken by the Receiver. For example, the command "15c" sets the Wiegand output flag to ON, and "29c" sets Wiegand output to OFF.

In addition to 'c', there are additional commands that allow the user to input specific values for certain attributes of the Receiver. The format for these commands is **<number><character>** where <number> is the three-digit ASCII number for the input value and <character> is an ASCII letter or symbol that determines the specific attribute to be modified in the Receiver. For example, the command **<number>I** is used to set the Receiver's Device ID. The <number> value must be within the range specified for each command in order to be valid.

The commands supported by the Network Receiver are as follows:

Global Configuration and Output Control
<number>I   set Device ID for Network Receiver; valid numbers = 0 thru 999 (default = 001)

20c   set Wiegand/TTL interrupts to ON; i.e. enable Wiegand/TTL capabilities (default)
35c   set Wiegand/TTL interrupts to OFF; i.e. disable Wiegand/TTL capabilities
              (Note: Setting Wiegand/TTL interrupts to OFF via command 35c maximizes the speed at
              which tag read data will be processed and output over a serial or TCP/IP connection.)

**22c   set serial diagnostics output to OFF; i.e. output tag data per configuration settings
              (default)**
39c   set serial diagnostics output to ON; i.e. output tag read data in diagnostic format

38c   return and display current configuration information; i.e. Device ID, Valid ID list, and
              configuration settings/values

40c   output Supervisory "ping" response; i.e. receiver's Device ID and firmware version

Configure/Control Serial Output
23c   set serial data rate to 4800 baud
24c   set serial data rate to 9600 baud (default)
25c   set serial data rate to 19200 baud

18c   set tag read serial output to ON; i.e. output tag read data (default)
32c   set tag read output to OFF; i.e. disable tag read data output

21c   set serial output to the long format RRRAAAFFFTTTTT (default)
              where RRR = Receiver ID, AAA = Activator ID or Status Code, FFF = Facility Code, TTTTT =
              Tag ID

36c   set serial output to short format AAAFFFTTTTT
              where AAA = Activator ID or Status Code, FFF = Facility Code, TTTTT = Tag ID

Configure/Control Wiegand Output
15c   **set Wiegand output to ON; i.e. report tag read data via Wiegand port (default)**
29c   set Wiegand output to OFF

<number>W   **set single valid Wiegand Activator ID; valid numbers = 1 thru 250 (default = 127)**

<number>L   **set tag redundancy buffer time in tenths of seconds; valid numbers = 0 thru 255**
(default = 125 or 12.5 seconds)

<number>T   **set time between tag read outputs in tenths of seconds; valid numbers = 0 thru**
255

(default = 13 or 1.3 seconds)

19c   **set Wiegand Activator ID filter to ON, i.e. output only tag data valid per the Wiegand**
Activator ID as set by the <number>W command (default)
33c   set Wiegand Activator ID filter to OFF, i.e. outputs all tag reads validated by both the Wiegand
Activator ID and the Valid ID list

12c   **set Wiegand alarm output to OFF; i.e. do not output data if Status Code = 000 (default)**
26c   set Wiegand alarm output to ON; i.e. output tag data when Status Code = 000

(Note: The Wiegand filters, buffers and settings do not affect the serial output. Unless Wiegand output
is set to ON via command 15c, no data will be output via Wiegand regardless of the other settings.)

Configure/Display Valid ID List
<number>+   add new Device ID or Status Code to Valid ID list; valid numbers = 0 thru 255
           (Note: maximum of 34 entries in Valid ID list)

<number>-   delete a Device ID or Status Code to Valid ID list; valid numbers = 0 thru 255
           (Note: Valid ID list must have a minimum of one entry)

34c   **set Valid ID list to default values; i.e. V5 Activator IDs and Status Codes (default)**

37c   clear Valid ID list; i.e. delete all IDs/Codes from 000 to 255 except 127 (Note: List cannot be
empty)

38c   return and display current configuration information; i.e. Device ID, Valid ID list, and
           configuration settings/values

Configure/Activate TTL output Control
10c   turn on TTL output 1 now
11c   turn on TTL output 2 now

13c   **set TTL output 1 alarm flag to OFF; i.e. do not turn on TTL output 1 if Status Code = 000**
(default)
27c   set TTL output 1 alarm flag to ON; i.e. turn on TTL output 1 if Status Code = 000

14c   **set TTL output 2 alarm flag to OFF; i.e. do not turn on TTL output 2 if Status Code = 000**
(default)
28c   set TTL output 2 alarm flag to ON; i.e. turn on TTL output 2 if Status Code = 000

16c   **set TTL output 1 valid read flag to OFF; i.e. do not turn on TTL output 1 on valid tag**
read (default)
30c   set TTL output 1 valid read flag to ON; i.e. turn on TTL output 1 on valid tag read (per the
Valid ID list)

17c   **set TTL output 2 valid read flag to OFF; i.e. do not turn on TTL output 2 on valid tag**
read (default)

31c   set TTL output 2 valid read flag to ON; i.e. turn on TTL output 2 on valid tag read (per the Valid ID list)

<number>D thru 255   **set control TTL output 1 signal duration time in seconds; valid numbers = 0**

            (default = 5 seconds)

<number>E thru 255   **set control TTL output 2 signal duration time in seconds; valid numbers = 0**

            (default = 5 seconds)

Network Receiver Command Responses

The response to a command will be either a two-digit response code or the specific information requested by a query command. Due to the limited processing capability of the Receiver, the application software (ActiveTrac) manages the process as follows:

      (a) buffers all outgoing commands;
      (b) sends commands one at a time (minimum 100 ms delay between commands);
      (c) confirms responses; and
      (d) resends commands if no response is received within a specified time-out period.

The following set of response codes is output by the Network Receiver to acknowledge receipt and processing of configuration and control commands:

      00   Command completed successfully (ACK)
      01   Duplicate Device ID (response for command <number>+)
      02   Valid ID list full (response for command <number>+)
      03   Valid ID list must contain at least one entry (response for command <number>-)
      04   Device ID not found (response for command <number>-)
      05   Invalid entry (response for <number> commands when value entered is not allowed)
      06   Invalid command (response for an invalid or unknown command entry)

The following data is output in response to query and supervisory commands:

38c   [Content: Device ID, Valid ID list, configuration settings/values; Format: Refer to installation manual]

40c   [Content: Device ID, firmware version; Format: Refer to installation manual]

Sequential Command List

\<number\>D	**set control TTL output 1 signal duration time in seconds (0-255,5)**
\<number\>E	**set control TTL output 2 signal duration time in seconds (0-255,5)**
\<number\>I	**set Device ID for Network Receiver (0-999)**
\<number\>L	**set tag redundancy buffer time in tenths of seconds (0-255, 125)**
\<number\>T	**set time between tag read outputs in tenths of seconds (0-255, 13)**
\<number\>W	**set single valid Wiegand Activator ID (1-250, 127)**
\<number\>+	add new Device ID or Status Code to Valid ID list (0-255, max 34)
\<number\>-	delete a Device ID or Status Code to Valid ID list (0-255, min. 1 entry)

10c	turn on TTL output 1 now
11c	turn on TTL output 2 now
12c	**set Wiegand alarm output to OFF**
13c	**set TTL output 1 alarm flag to OFF**
14c	**set TTL output 2 alarm flag to OFF**
15c	**set Wiegand output to ON**
16c	**set TTL output 1 valid read flag to OFF**
17c	**set TTL output 2 valid read flag to OFF**
18c	**set tag read serial output to ON**
19c	**set Wiegand Activator ID filter to ON**
20c	**set Wiegand/TTL output interrupts to ON**
21c	**set serial output to the long format (RRRAAAFFFTTTTT)**
22c	**set serial diagnostics output to OFF**
23c	set serial data rate to 4800 baud
24c	**set serial data rate to 9600 baud**
25c	set serial data rate to 19200 baud
26c	set Wiegand alarm output to ON
27c	set TTL output 1 alarm flag to ON
28c	set TTL output 2 alarm flag to ON
29c	set Wiegand output to OFF
30c	set TTL output 1 valid read flag to ON
31c	set TTL output 2 valid read flag to ON
32c	set tag read output to OFF
33c	set Wiegand Activator ID filter to OFF
34c	**set Valid ID list to default values (per V5 list)**
35c	set Wiegand/TTL output interrupts to OFF
36c	set serial output to short format (AAAFFFTTTTT)
37c	clear Valid ID list (except 127)
38c	return and display current configuration data
39c	set serial diagnostics output to ON
40c	return and display Supervisory data

Appendix E: Specifications

Receiver

Dimensions

Height: 1 inch

Width: 4.5 inches

Depth: 5.5 inches

Input Current: 24V DC at 50 mA for Serial Receiver

                 200 mA for LAN/WAN Receiver

Frequency: Receives at 315 MHz

Connectors

- DB9 Female RS-232 (to the computer/device)
- BNC Female (in from receiving antenna)
- Power terminal block
- Wiegand terminal block
- 2 power jacks (one auxiliary)

Power

Adapter
110 AC to 4.4V DC - plugs into a 110 AC outlet and supplies 400 mA of current to power the Receiver.

Input: 120V AC, 60 Hz

Output: 4.4V DC, 400 mA nominal

Activator

Dimensions

Height: 1.5 inch

Width: 3.5 inches

Depth: 6.5 inches

Input Current: 24V DC at 700 mA.

Frequency: Transmits at 132 kHz

Connectors

- Female BNC - TX (out to transmitting antenna)
- DB9 Female RS-232 (to the computer/device)
- Power jack

Power

Adapter

110 AC to 24V DC - plugs into a 110 AC outlet and supplies 1 A of current to power the Activator.

Input:	120V AC, 60 Hz
Output:	24V DC, 1 A nominal
No load:	31.4V DC

Antennas

Road Loop Antenna

Dimensions

Length:	4' X width of the road loop
Gauge:	18
Weight:	Approx. 1 lb per 10 feet of wire
Frequency:	Transmits at 132 kHz
Coverage:	16 – 24 feet for a single lane 4' x 16' loop, can be greater with larger loops

Connectors
- Dual binding post to male BNC (to Activator)

Bar Antenna

Dimensions

Length:	38 inches
Width:	5 inches
Depth:	1 inch
Weight:	2.3 pounds
Frequency:	Transmits at 132 kHz
Coverage:	8 –12 feet typical (typical)

Connectors
- Terminal - TX (to Activator)

750.001.004 R0033

Picture Frame Antenna

Dimensions

Standard: 16" x 20" x 2"

                 Weight: 6.7 pounds

                 Coverage: 8 feet (typical)

Large: 20" x 26" x 2"

                 Weight: 8.1 pounds

                 Coverage: 10 feet (typical)

Frequency: Transmits at 132 kHz

Connectors
- Female BNC - TX (to Activator)

Tag

Personnel Tag / Personnel Tag with Panic Alarm / Vehicle Tag / Asset Tag / Asset Tag with Tamper Detect

Length: 3.4 inches

Width: 2.2 inches

Thickness: 0.25 inch

Weight: Less than 1 ounce

Operating Life: 3-5 years

Operating Temperature: 0 to +160 F (-20 to +70 C)

Frequency: Transmit: 315 MHz

                         Receive: 132 kHz

Harsh Environment Vehicle Tag

Length: 3.4 inches

Width: 2.2 inches

Thickness: 0.4 inch

Weight: 1 ounce

Operating Life: 5-7 years

Operating Temperature: -40 to +185 F (-40 to +85 C)

Frequency: Transmit: 315 MHz

                         Receive: 132 kHz

Metal Mount Equipment Tag

Length:	2 inches
Width:	4 inches
Thickness:	0.5 inch
Weight:	2 ounces
Operating Life:	5-7 years
Operating Temperature:	-40 to +185 F (-40 to +85 C)
Frequency:	Transmit: 315 MHz
	Receive: 132 kHz

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