

# **NT132 RFID System**

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*Installation Manual*

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### **Customer Service**

AXCESS™ INC. toll-free distributor support hotline is 1-800-577-6080. Representatives are available to answer your questions from 7:30 – 6:30 Central Standard Time.

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# General Installation Information

## **Safety**

- Personal safety is of first importance in the performance of any job.
- Installation and configuration of the NT132 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 ceiling, make sure they are properly attached to a structural member and accessible for maintenance.

## **Information Flags**

Information Flags 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**

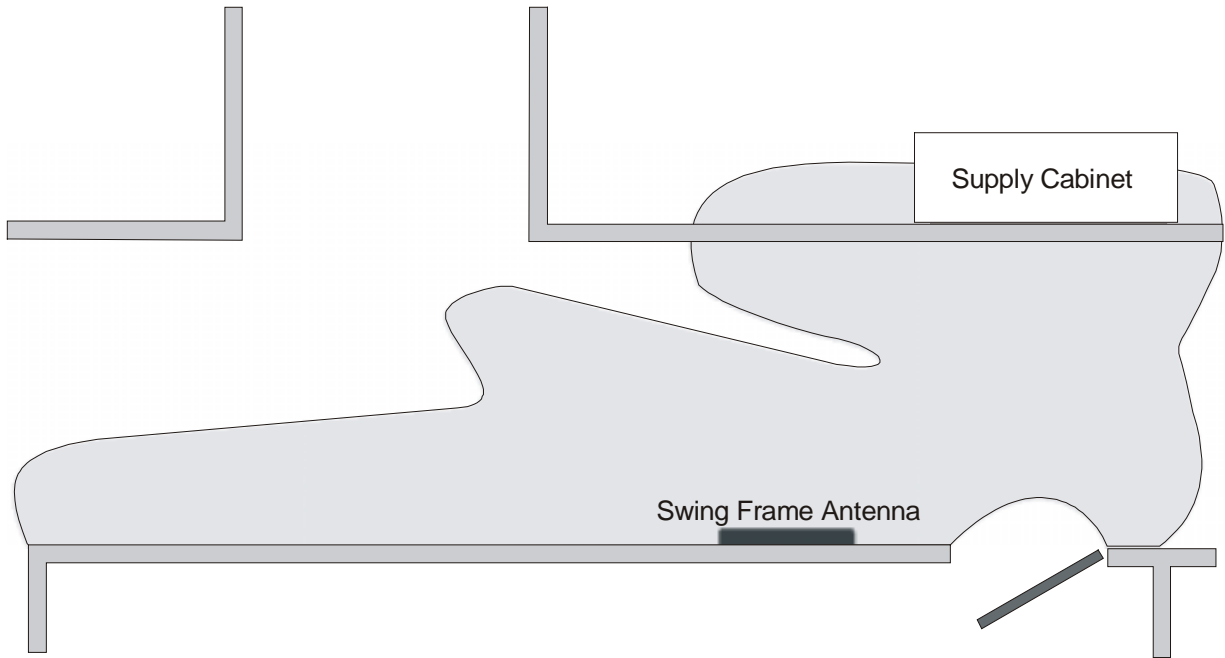
These sections provide helpful information that can make the installation go more smoothly and quickly.

**Installation Tips**



**IMPORTANT!** Bench test communications between the NT132 system and the controller or device to which it will be connected.

Lay the entire AXCESS NT132 system out and test the antenna fields before permanently installing any piece of the system.



**Figure 1** A real-life example of an antenna field. The gray area is the field of a Swing Frame Antenna mounted in a hall. Always test your field to ensure that you get the coverage you want.

**Waterproofing**

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

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 cable, and the sealant would then need to be reapplied.



**Things to Consider**

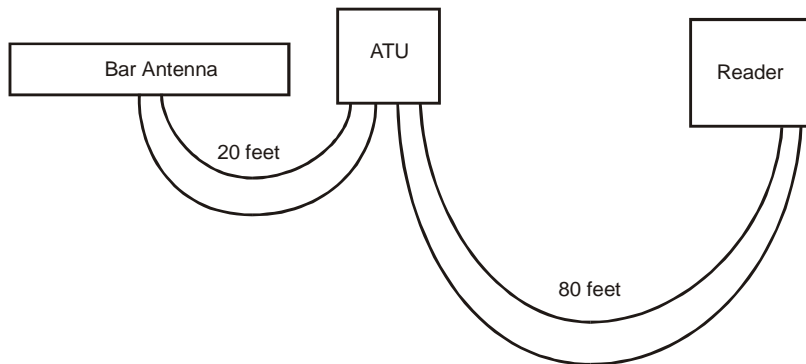


**IMPORTANT!** The Reader must be installed in a moisture-free environment at approximately room temperature and a minimum of 36 inches above the floor. Installation at eye height is recommended.

If possible, position the Reader and the ATU where they are not readily accessible to help prevent tampering or accidental damage.

**Cabling**

- Use only 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).
- The maximum recommended cable length between the Reader and ATU is 80 feet.
- The maximum recommended cable length between the ATU and the antennas is 20 feet.



**Figure 2 Maximum recommended cable lengths**



**IMPORTANT!** System performance may be adversely affected if a different cable is used, the cable lengths exceed recommendations, or if the cable is kinked.



**NOTE:** All distances are by cable run unless specified otherwise.

## Hand Tools, Equipment and Materials



**IMPORTANT!** You need to have the following materials on hand to ensure successful installation of the NT132 system.

These items are **not** supplied with the NT132 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). The length required for your installation will vary.
- Eight 3-Piece Crimp Type Male BNC Connectors (for example, Amphenol 31-320). Connectors can be damaged during crimping. Having more than eight on hand is recommended.
- Tape measure
- Power drill and bits
- Diagonal cutters
- Phillips and flathead screwdrivers, including a very small flathead screwdriver
- 4 # 10 Anchors, Plastic (for mounting the Reader in drywall or mortar)
- 4 # 10 Self threading screws
- 4 # 10 Washers
- 4 Screws for mounting the ATU
- Wire strippers
- Three blade rotary coaxial cable stripper
- BNC crimpers
- Multimeter
- Wire to connect to third-party devices (i.e., camera, door strike, etc.) as specified by the manufacturers.
- A computer to configure the Reader ID numbers
- A terminal communication program
- A straight-through (one-to-one) DB9 male to female serial cable. DO NOT use a null-modem cable or a null-modem adapter.

*Required for Road Loop Antenna Installation*

- 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 Reader Installation*

- AXCESS Wiegand Readers are standard SIA 26-bit. The Reader accepts Data Zero, Data One and Ground. Wires between the Reader and the Wiegand control panel should be 18 AWG, no longer than 500 feet. The wires should be green for Data Zero, white for Data One and black for Common Ground.

*Required for FTT Reader Installation*

- Unshielded, twisted-pair wire to connect Readers to each other. For details on network lengths, see *Network Specifications*, page 27
- Sensitive trigger, TTL relays to drive door strikes or other devices (for example, Altronix RBSN-TTL or Alarm Saf RBKS-124P)
- 22 AWG wire, maximum four feet in length, to connect the FTT Readers to the relays.
- Additional wire as specified by device manufacturer(s) to connect to external control devices (i.e., camera, door strike, etc.)
- A straight-through (one to one) RS-232 cable of sufficient length to connect the Serial Gateway 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 Serial Reader Installation*

- A straight-through (one to one) RS-232 cable of sufficient length to connect the Reader 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.

**Recommended**

- Ladder for Bar Antenna mounting
- 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 Readers easily
- Wiegand wedge for Wiegand system troubleshooting
- Instructions for all third party devices

# NT132 System Overview

## *History*

Radio Frequency Identification (RFID) systems have existed for many years. Initially, systems were developed so that military aircraft and ships could be quickly identified by electronic methods. Radio equipment (transponder) on a plane or vessel would broadcast a coded signal to identify it as a friend to an appropriate receiving station. A plane or vessel not able to transmit the correct identification would be considered a possible enemy. Similar technology is employed today for air traffic control as well as vessel identification in shipping lanes and ports – and the RF device is still called a transponder.

Other present-day applications include “tagging” vehicles, assets or people for identification within a designated area – or as they pass through portals. For example, a transmitting device can be placed on a laptop computer so it can be identified if carried out of a building. Further, if people in that building also carry transmitting devices, it is easy to ascertain not only that the computer left the building – but that it was not carried by the person to whom it was assigned!

Obviously, such technology has quickly found its way into disciplines such as vehicle entry, fleet management, inventory control, and controlled access to buildings or other areas.

## ***NT132 System Components***

The following diagram (Figure 3) shows a very basic AXCESS NT132 system. The system has the following components:

- A Reader to send radio signals to a transmitting antenna, receives radio signals from a receiving antenna and outputs the data to some device – a computer or a Wiegand control panel, for instance.
- A transmitting antenna to “wake up” any Tags in the area.
- An Antenna Tuning Unit (ATU) placed between the Reader and the Antennas to properly tune the transmitting antenna to its surrounding environment.
- Tags to receive wake-up radio signals and broadcast their IDs to the receiving antenna. Tags can be carried by individuals, placed on equipment or in vehicles.
- A receiving antenna to intercept radio signals from the Tags and to pass the signals to the Reader.
- One or more of the following: a computer for data storage, a peripheral device such as a light, buzzer, door strike, gate

controller, camera, etc., and/or a control panel that accesses a computer or a device.

An NT132 system may be as simple as a single Reader and Bar Antenna controlling the front door of a small office or it may comprise a network of interconnected devices and Readers controlled by a computer.

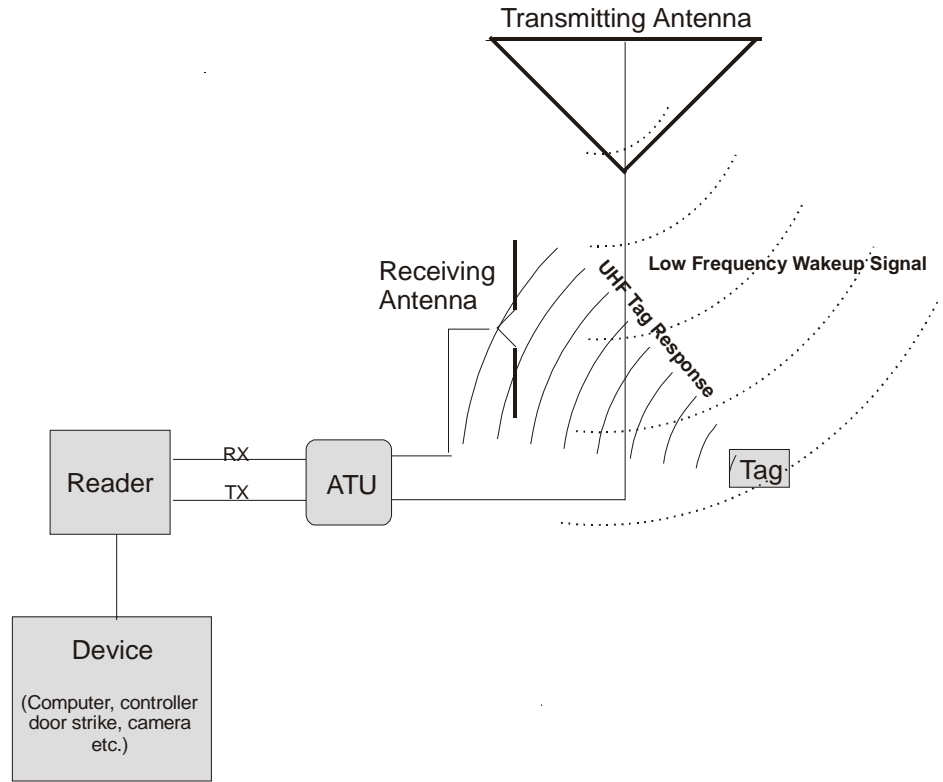


Figure 3 A simple AXCESS NT132 System

## Tags

A Tag is a very small transponder (transmitter + responder) that remains in a sleep state (off) until awakened. When the Tag receives a special wake-up signal from the Reader, the Tag will wake up (turn on) and emit a radio signal of its own. The signal emitted by the Tag is typically its pre-programmed identification number – but could include other data as well. The signal is generally used for detection, identification and location of people or objects.

An AXCESS Tag, encased in black or beige plastic, is about the size of a credit card and is approximately 200 mils thick. Some Tags have slots to attach personnel ID pictures to them. Other Tags may be attached permanently to vehicles or assets such as computers.

### Types of Tags

The typical types of Tags are:

#### *Passive Tags*

A passive tag does not have an on-board power source (battery). It is powered from the antenna radiation field of the transmitter that is trying to wake the tag up. It uses the same antenna for transmitting and receiving.

#### *Active Tags*

An active tag has its own battery and is capable of a greater transmit distance (range) than the passive tag. An active tag only has a transmitting antenna. It is common for active tags to continually transmit and the system will only report those tags in the reception field.

#### *AXCESS Tags*



AXCESS Tags, based on AXCESS NeuroTag technology, are a hybrid of active/passive and do not respond until awakened. The tag is in a “sleep” state that requires almost no power until the tag is activated. AXCESS Tags receive on a low frequency and transmit on an ultra high frequency.

The Tag checks the wakeup signal for proper modulation and a Reader ID code, then transmits its own ID number along with the Reader ID that woke it up.

## **Reader**

The Reader (Figure 4) originates the signal that is broadcast to wake the Tag. The Reader has the following purposes:

- Encode a transmission wake-up signal and transmit it via the antenna to the sleeping Tag.
- Decode the signal from the Tag via the receiving antenna. The Reader will convert the data to a format usable by a computer or Wiegand control panel for further processing of the information.
- Output data to a control device or a computer.



**Figure 4 AXCESS Reader – external view**

## **Types of Readers**

### *Serial*

This Reader 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 can accept RS-232C data.

### *Wiegand*

Wiegand Readers output Security Industry Association (SIA) 26-bit data to Wiegand control panels. It connects to the Wiegand control panel by three wires – Data One, Data Zero and Ground.

### *Free Topology Transceiver (FTT)*

FTT Readers can be used to create networks of Readers. They communicate with a computer using Echelon LonWorks<sup>TM</sup> and can control external devices via TTL controls.



## Antennas

Because the Tags receive and transmit at different frequencies, different antennas are used for each leg of the communication. Antenna construction is related to the wavelength (or fraction thereof) of its design frequency. Antennas designed for the Ultra High Frequency spectrum (to receive the transmit signal from the Tag) can be quite short. Antennas designed for Very Low Frequencies (to transmit the wake-up signal to the Tags) must be quite long. The transmitting antenna is a loop and the receiving antenna is a dipole.

### Types of Antennas

For interior use, antennas can be inconspicuously mounted – for example, hidden in a false ceiling or disguised as a common picture frame. Also, depending on type of installation, the transmitting antenna and receiving antenna may be combined into a single enclosure or may be built as separate units.

#### *Road Loop and Dipole Antennas*

The Road Loop and Dipole Antennas are used for identifying Tags in vehicles. The Road Loop Antenna is installed in the road surface and sends out wake-up signals. The Dipole Antenna is separate from the Road Loop Antenna and is mounted so that it can receive transmissions from the Tags.

#### *Bar Antenna*

The Bar Antenna has both transmitting and receiving antennas enclosed in a box that is approximately 2 feet long, 5 inches wide and 1 inch thick. It can be inconspicuously mounted above or next to a door or above the ceiling tiles.

#### *Swing Frame Antenna*

The Swing Frame Antenna has both transmitting and receiving antennas built into its frame. The antenna enclosure is designed as a picture frame so that it may be mounted unobtrusively on walls.

## **Antenna Tuning Unit (ATU)**

An Antenna Tuning Unit or ATU (Figure 5) maximizes the signal transmission from the Reader. It is installed between the Reader and the transmitting and receiving antennas.



**Figure 5 AXCESS ATU – external view**

On the bottom of the ATU, there are two jacks to connect to the transmitting and receiving antennas and two jacks to connect to the Reader.

### **Types of ATUs**

There are two kinds of ATUs currently provided. Although they require different methods of optimizing performance, they perform the same function.

#### *Toggle Switch ATU*

This ATU has a toggle switch, a rotary switch and a voltmeter. The antenna performance is tuned by toggling one switch between three positions and turning the other switch among ten positions. The voltmeter indicates when the optimal setting has been reached.

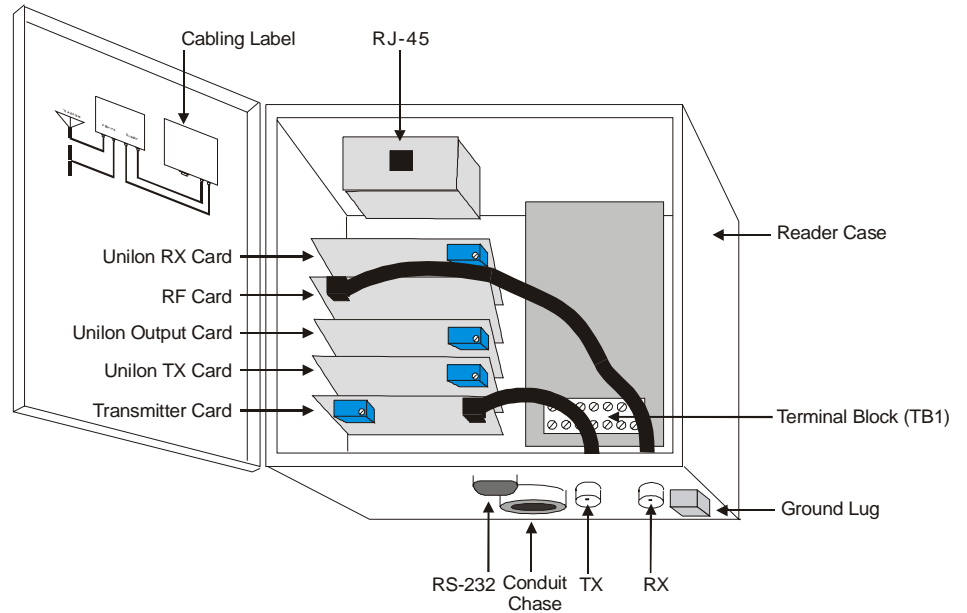
#### *Jumper ATU*

This ATU has eleven 3-pin headers and five LEDs. The antenna performance is tuned by moving jumpers on the headers. Optimal performance is indicated by the strength of the LEDs.

# Reader Installation

## Introduction

The Reader is the brain of the NT132 system. Its functions include sending wakeup signals, receiving Tag signals, processing Tag data, and routing Tag data.



**Figure 6 Reader – internal view**

The Reader (Figure 6) in a typical AXCESS system consists of the following:

- A stack of sub-controller Printed Circuit Board (PCB) cards:
  - Unilon RX Card – decodes the signal sent from the receiving antenna through the RF card
  - RF Card – receives the signal from the receiving antenna
  - Unilon Output Card – sends the data to a controller or computer
  - Unilon TX Card – encodes the transmission signal
  - Transmitter Card – sends the signal to the transmitting antenna
- Two external female BNC connectors to connect to the Antenna Tuning Unit (ATU)

- External DB9 RS-232 female connector to connect to a computer or device
- Conduit chase for wiring access through the Reader case
- White terminal block with connections for Wiegand ground, Data One and Data Zero, and connections for 24V power and ground
- RJ45 connector used by AXCESS for programming the Reader's firmware

## **Reader Types**

### *Serial Reader*

This type of Reader can interface directly with the communications port of a computer or another control device that process standard EIA-232 serial data.

### *Wiegand Reader*

This is type of Reader outputs standard SIA 26-bit Wiegand data and is used when interfacing with a standard Wiegand controller.

For each Tag read, the Reader outputs data every 750 milliseconds. Duplicate Tag information is stored in the Reader's buffer for 12 seconds so that redundant Tag reads are ignored during the this time interval.

### *FTT Readers*

*FTT* (Free Topology Transceiver) Readers are for installations involving a network of Readers connected to one another. This is accomplished via twisted-pair wiring over a total distance of up to 8,800 feet. FTT Readers can also control devices according to data sent over the network by the host computer.

## **Required Materials**

The following materials are necessary for a successful installation:

- Power drill and bits
- Screwdrivers – Phillips and flathead
- 4 # 10 Anchors, Plastic (for mounting in drywall or mortar)
- 4 # 10 Self threading screws
- 4 # 10 Washers
- Depending on the surface that the Reader will be mounted on, you may need #10 molly bolts.

- Each Reader type has its own required materials for connecting to third-party devices. Please see the specific section for the Reader that you are installing.

### Mounting the Reader - All Types

All Readers have the same mounting requirements.



**IMPORTANT!** Before permanently mounting any piece of the AXCESS NT132 System, first lay out and test the entire system.

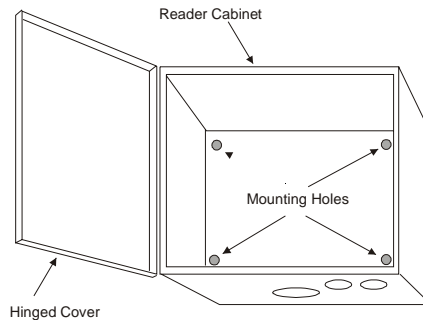
**Step 1:** Select a Reader location consistent with the type of antenna being installed. The Reader should be a minimum of 36 inches off the ground, preferably at eye-height.

**Step 2:** Mount the Reader securely with the cover hinge on the left and external connectors on the bottom (Figure 6). Screw holes are provided inside the cabinet for mounting to a wall (Figure 7).



**IMPORTANT!** When you mount the Reader, be careful not to damage the electronic components. A manual screwdriver is recommended for tightening the screws.

Other installation techniques may better satisfy specific site conditions - L-brackets or double-sided tape to mount the Reader, or placement of the Reader inside an enclosure on a shelf.



**Figure 7 Reader mounting holes**

**Step 3:** Go to the following sections for the type of Reader that you are installing:

Serial Reader – *Installation of a Serial Reader*, page 22.

Wiegand Reader – *Installation of a Wiegand Reader*, page 23.

FTT Reader – *Installation of an FTT Reader System*, page 25.

## Installation of a Serial Reader

### Required Materials

- A standard one-to-one connection RS-232 cable (computer modem cable) of sufficient length to connect the Reader to any device that accepts RS-232 as input. The length required for your installation will vary. One end needs to be a DB9 male connector.



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

### Connecting the Serial Reader to a Computer or Device

**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 DB9 female connector on the Reader.

**Step 2:** For the third-party device, configure the communications port settings to the following:

Baud Rate	4800
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

The Reader 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)



Note: Although the Serial Reader has a terminal block labeled with Wiegand Data Zero, Data One and Ground, it cannot be used to connect to a Wiegand control panel.

**Step 3:** Apply power to the Reader. See section *Connecting Power to the Reader – All Types*, page 32.

### Installation of a Wiegand Reader

#### Required Materials

- Black, white and green wire of sufficient length to connect the Reader to the Wiegand control panel. With 22-gauge wire, 200 feet of wire can be run. With 18 gauge, 500 feet can be run.
- A very small flathead screwdriver

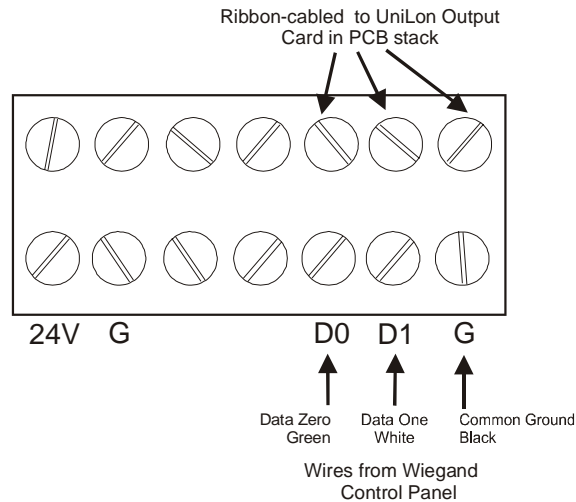


Figure 8 Wiegand Reader connections

#### Connecting the Wiegand Reader to a Wiegand Control Panel



Note: Although the Wiegand Reader has a serial output, it cannot be converted to a Serial Reader. The serial output can only be used for Reader configuration and diagnostics.

- Step 1:** Install the Wiegand control panel according to the instructions provided with that unit.
- Step 2:** Open the Reader case and disconnect the BNC connector running from the Transmitter card at the TX connector (Figure 6). This will give you access to the terminal block underneath.
- Step 3:** Loosen the white terminal block by unscrewing it. This will give you access to the terminals.
- Step 4:** The ground connection protects against any differential in voltage potential at each ground plane that may cause current to flow between the external panel and the Reader. Such a condition could damage and/or impact the performance of either or both units.

Run the ground wire from the Ground connection at the Wiegand control panel to the **G** terminal on the Terminal Block (TB1, see Figure 8) in the Reader. For standard Wiegand control panels, the Ground wire is black. Ensure that the termination is secure, but not over-tight. Route cables through the conduit chase at the bottom of the Reader.

**Step 5:** Run the Data One wire from the Wiegand control panel to **D1** on the Terminal Block. For standard Wiegand control panels, the Data One wire is white.

**Step 6:** Run the Data Zero wire from the Wiegand control panel to **D0** on the Terminal Block. For standard Wiegand control panels, the Data Zero wire is green.



Note: If Data One and Data Zero are connected backwards, the data will be garbled.

**Step 7:** Screw the white terminal block down.

**Step 8:** Reconnect the TX cable connector.

**Step 9:** Ensure the Wiegand control panel is wired correctly.

**Step 10:** Enter the Tag numbers into the panel's database according to the panel manufacturer's instructions.

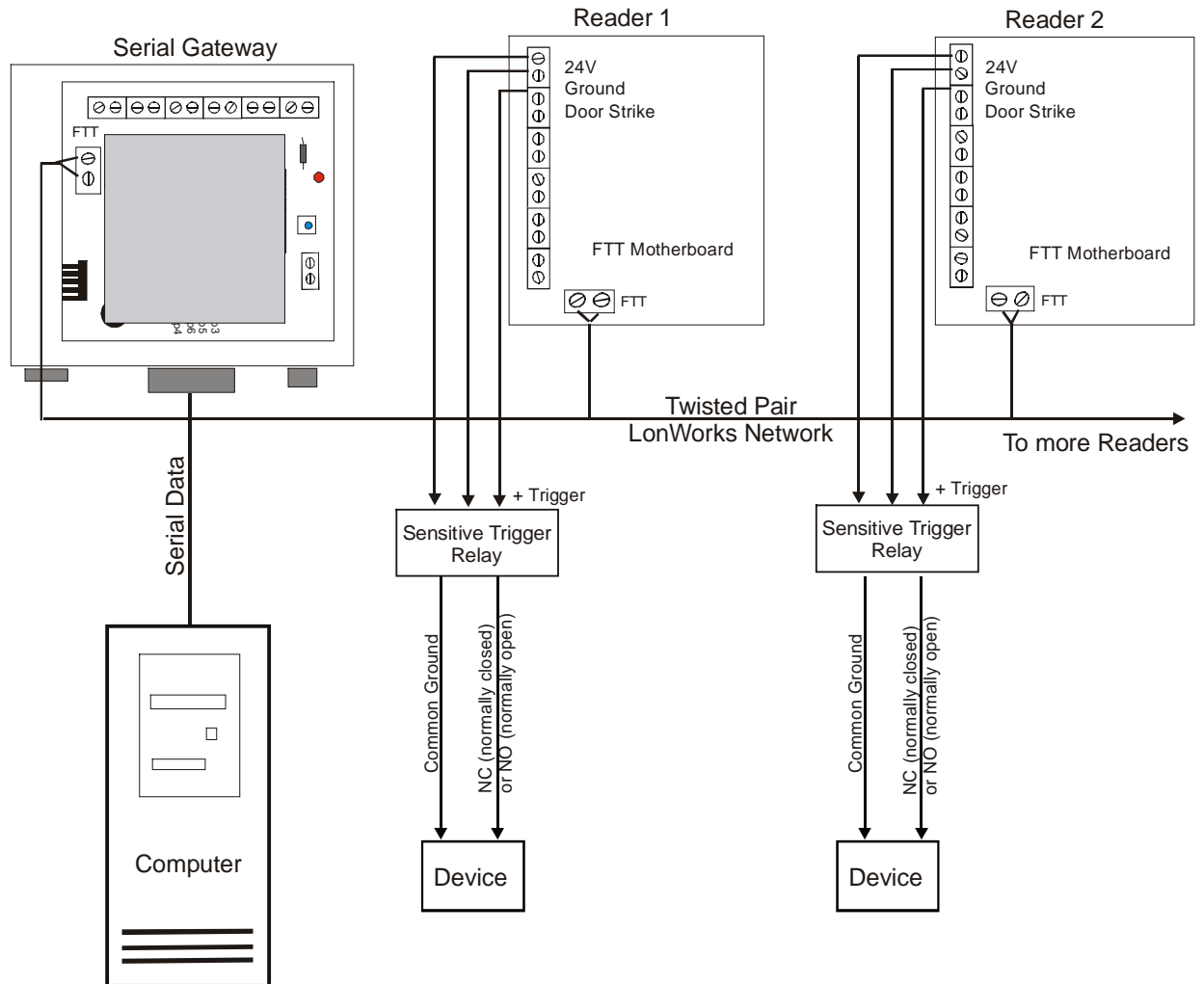
**Step 11:** Apply power to the Reader. See section *Connecting Power to the Reader – All Types*, page 32.



### Installation of an FTT Reader System

#### Introduction

The AXCESS *Free Topology Transceiver* (FTT) Reader System is for network applications involving multiple, interconnected Readers (Figure 9).



**Figure 9 FTT Reader system**

The FTT Reader System has at least one of each of the following:

- An FTT Reader that can connect to several external devices and to other FTT Readers.
- A computer to drive the system. The computer collects data from the tags. The computer may also send commands via the Readers to other devices that control doors, send alarms, turn on lights, etc.

- A Serial Gateway that converts the computer's RS-232 data to LonWorks data and vice versa. LonWorks is the protocol used to communicate with the FTT Readers. The Serial Gateway transmits data from the computer to the Readers via twisted pair wire. Up to thirty-one FTT Readers can be connected to the Serial Gateway.



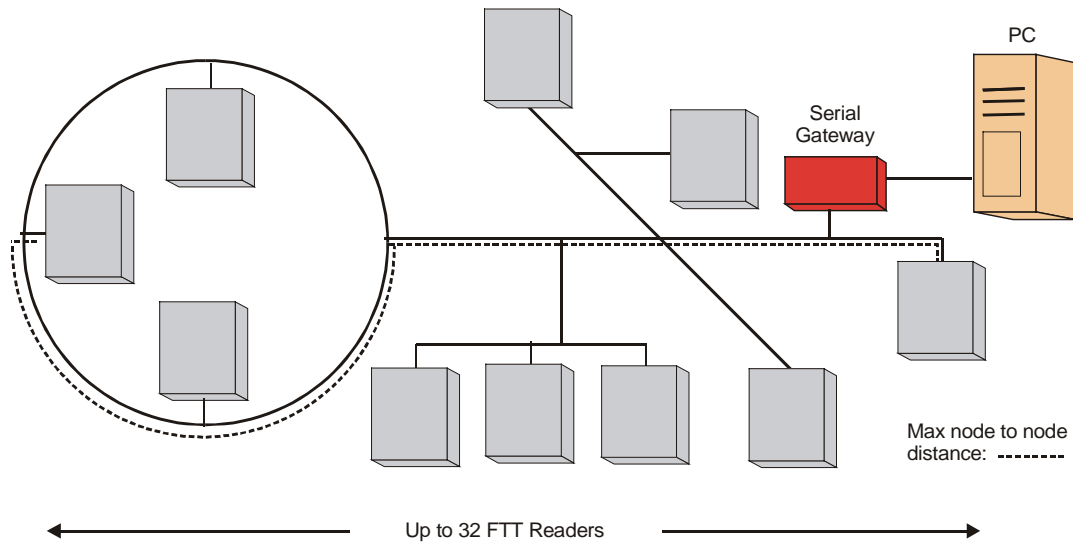
Note: Although the Serial Gateway has a terminal block, it cannot directly control any access devices. Do not wire access devices to the Serial Gateway.

### Required Materials

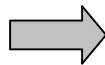
- Unshielded twisted pair wire to run between Readers. The type of cable chosen affects the cable distances allowed in the FTT network. The recommended cable lengths are given in the next section.
  - Belden 85102, 16 AWG, single twisted pair, stranded 9/29, unshielded, plenum
  - Belden 8471, 16 AWG, single twisted pair, stranded 9/29, unshielded, non-plenum
  - Level IV, 22 AWG, twisted pair, typically solid and unshielded
  - TIA 568A Category 5, 24 AWG, twisted pair, unshielded. This cable type is recommended because it allows for upgrades.
- Sensitive trigger, TTL relays to drive door strikes or other devices (for example, Altronix RBSN-TTL or Alarm Saf RBKS-124P)
- 22 AWG wire, max four feet in length, to connect the FTT Readers to the relays.
- Wire as specified by device manufacturers to connect the devices to the relays.
- An RS-232C straight-through cable with a DB9 male connector to connect the Serial Gateway to a computer.

**Network Specifications**

An FTT network can be comprised of a loop, star, bus or a mixture of wiring topologies (Figure 10).



**Figure 10 Example FTT network – a mixture of bus, star and ring wiring topologies**



**IMPORTANT!** Both of the following specifications must be met for proper system operation:

Cable Type	Max node to node distance	Max total wire length
Belden 85102	1640 feet (500 m)	1640 feet (500 m)
Belden 8471	1312 feet (400 m)	1640 feet (500 m)
Level IV	1312 feet (400 m)	1640 feet (500 m)
Category 5	820 feet (250 m)	1475 feet (450 m)

*Max Node to Node Distance*

The distance from each Reader to all other Readers on the network must not exceed the maximum node-to-node distance. If multiple paths exist, e.g., a loop topology, then the longest path should be used for calculations (Figure 10).

*Max Total Wire Length*

Maximum total wire length is the total amount of wire connected per network.

### Connecting the Serial Gateway to the PC

- Step 1:** Connect the male DB9 end of the straight-through serial cable to the female DB9 connector at the bottom of the Reader.
- Step 2:** Connect the other end of the serial cable to the PC.
- Step 3:** The Serial Gateway has pads so that it can be placed on top of or next to the PC.
- Step 4:** Configure the communications port settings on the PC as follows:

Baud	2400
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

The Serial Gateway 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:



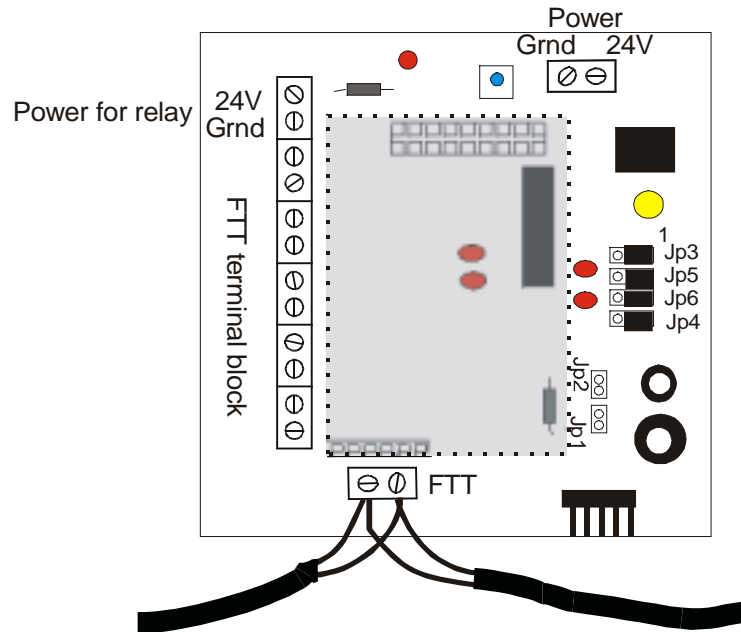
- Transmitted Data (pin 2)
- Received Data (pin 3)
- Signal Ground (pin 5)

### Connecting the Serial Gateway to an FTT Reader

- Step 1:** Prepare a sufficient length of twisted pair wire to connect the first Reader to the Serial Gateway.
- Step 2:** Insert the twisted pair wire into the terminal block labeled FTT in Figure 11 in the Serial Gateway and run it out the conduit chase.
- Step 3:** Run the twisted pair through the conduit chase of the Reader and insert the twisted pair wire into the FTT terminal block. You can connect up to four Readers by the FTT terminal block in the Serial Gateway; however, we recommend connecting only one or two. You can network up to thirty-one Readers together by twisted pair wire.

### Connecting FTT Readers to Each Other

- Step 1:** Prepare a sufficient length of twisted pair wire to connect the two Readers.



**Figure 11 FTT Motherboard. Gray area notes location of the LonWorks daughterboard.**

- Step 2:** Insert the twisted-pair wire into the terminal block labeled FTT (Figure 11) in the first Reader and run it out the conduit chase.
- Step 3:** Run the twisted pair through the conduit chase of the second Reader and insert the twisted pair wire into the FTT terminal block. Each terminal in the FTT terminal block can hold up to four wires, depending on gauge.



Note: When connecting Readers to each other, remember that shorter cabling makes for a better network because it improves transmission.

### Connecting an FTT Reader to a Device

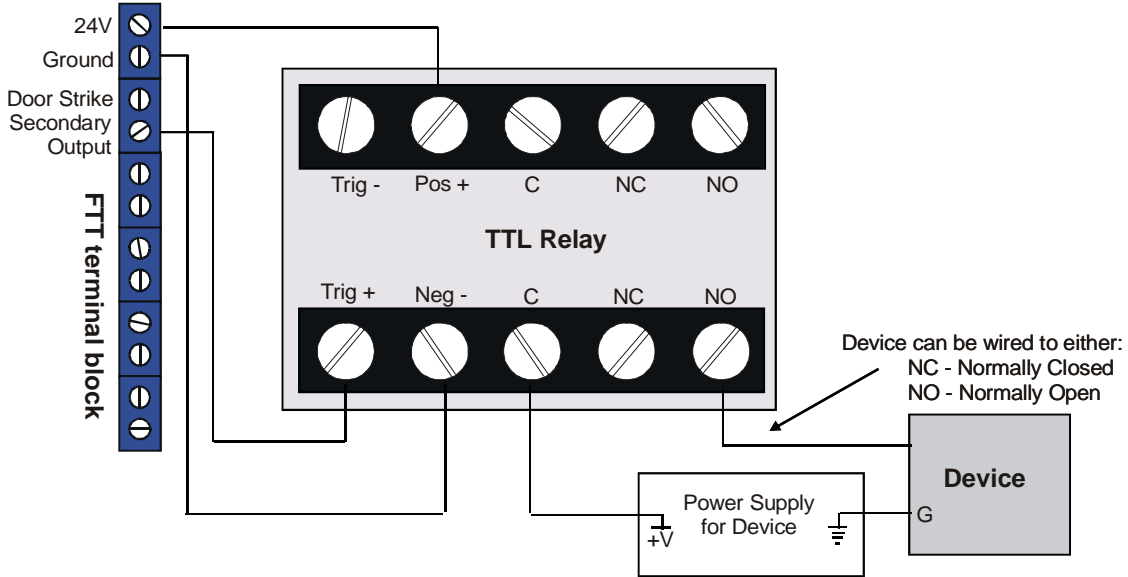
The FTT Reader has two outputs to control devices. These outputs can be found on the FTT Terminal block (Figure 11).

The terminals in the FTT terminal block are for the following:

Label	Purpose
24V	24V for powering the TTL relay
Gnd	Ground for the TTL relay
Door Strike	Trigger output with a 20 mA source/sink capability for triggering sensitive trigger relays.
Secondary Output	Trigger output with a 20 mA source/sink capability for triggering sensitive trigger relays.

➔ **IMPORTANT!** Do not use the Door Strike and Secondary Output terminals to drive relay modules directly. Such relays require 100 mA or more, well in excess of the FTT module's source power capacity. The FTT card can burn up. Using sensitive trigger, TTL relays (for example, Altronix RBSN-TTL or Alarm Saf RBKS-124P) is recommended.

➔ **NOTE:** The rolled-up serial cable connected to the RS-232 connector is for configuration and diagnostics. The FTT Reader cannot be converted to a Serial Reader.



**Figure 12 Wiring details for driving a device**

- Step 1:** Run 22 AWG wire (max length two feet) from the terminal labeled **GND** on the FTT terminal block through the conduit chase to the relay terminal labeled **Neg -**.
- Step 2:** Run 22 AWG wire (max length four feet) from the terminal labeled either **Door Strike** or **Secondary Output** on the FTT terminal block through the conduit chase to the relay terminal labeled **Trig +**.
- Step 3:** Run 22 AWG wire (max length four feet) from terminal labeled **24 V** on the FTT terminal block through the conduit chase to the relay terminal labeled **Pos +**.
- Step 4:** Connect the Common (**C**) terminal on the relay to **+V** on the device's power supply with manufacturer recommended wire.
- Step 5:** Connect Ground from the device's power supply to the device using manufacturer recommended wire.

**Step 6:** Connect either the Normally Open (**NO**) or Normally Closed (**NC**) terminal on the relay to the device with manufacturer recommended wire.

### **Applying Power to the Serial Gateway**

**Step 1:** Ensure that the 110V AC outlet is close by and easily accessible.

**Step 2:** Plug the AC adapter into the connector at the bottom of the Serial Gateway.

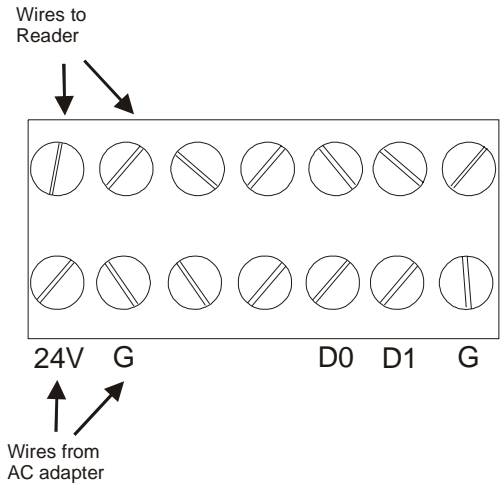
**Step 3:** Plug the adapter into 110 AC wall outlet or UPS.

**Connecting Power to the Reader – All Types**



**IMPORTANT!** Finish installing the Reader before applying power.

All Readers come with a 24V, 700 mA wall adapter that plugs into a 110 outlet. If uninterruptible power is an issue, a UPS can be used.



**Figure 13 Power terminals for the Reader**

**Grounding the Reader**

The Reader needs to be properly grounded. Failure to ground the Reader will result in erratic performance.

- Step 1:** Run 14 AWG wire from a solid earth ground to the ground lug on the outside of the Reader case (Figure 6).
- Step 2:** If the Reader is connected to a Wiegand control panel, ensure that the Wiegand control panel is similarly grounded.

**AC Adapter**

The AC adapter wires (Figure 14) are labeled as follows:



**Figure 14 AC adapter wires**

**Power** is marked with the dashed white line.

**Ground** is black and has the gauge information printed on it.



- Step 1:** Ensure that the 110 AC outlet is near the Reader and is easily accessible.
- Step 2:** Open the Reader case and disconnect the BNC connector running from the Transmitter card at the TX connector (Figure 6). This will give you access to the terminal block underneath.
- Step 3:** Loosen the white terminal block by unscrewing it. This will give you access to the terminals.
- Step 4:** Run the power wires through the conduit chase.
- Step 5:** Insert the positive 24V wire into the terminal labeled **24V** (Figure 13).
- Step 6:** Insert the ground wire into the terminal labeled **G**.
- Step 7:** Screw the white terminal block down.
- Step 8:** Reconnect the TX cable connector.
- Step 9:** Plug the AC adapter into a 110 outlet.

When power is supplied to the Reader, the LEDs on the card stack will light up.



Note: The open terminals on TB1 are for future enhancements.



**IMPORTANT!** The Reader comes with a factory-default ID number that needs to be changed to eliminate the possibility of cross talk. See the section *Configuring 3.x Reader Firmware*, page 35.



# Configuring 3.x Reader Firmware

A 3.x Reader can be configured by a terminal application to do the following:

- Set modes for reading either 2.0 Tags or 3.x Tags.
- Change the Reader ID number to eliminate the possibility of cross talk in multi-Reader applications.
- Place the Reader in diagnostics mode so that Reader and Tag performance can be monitored.

HyperTerminal is a convenient terminal application for communicating with a Reader since it is standard with the Windows™ operating system. Although other terminal emulation programs, such as ProCom, etc., can be used.

## **Required Materials**

- A computer with a terminal program and a free communications port. A laptop running Windows is recommended for convenience.
- A standard one-to-one computer modem RS-232 cable with a DB9 male connector.



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

## **Connecting a Computer to the Reader**

### **Serial and Wiegand Readers**

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

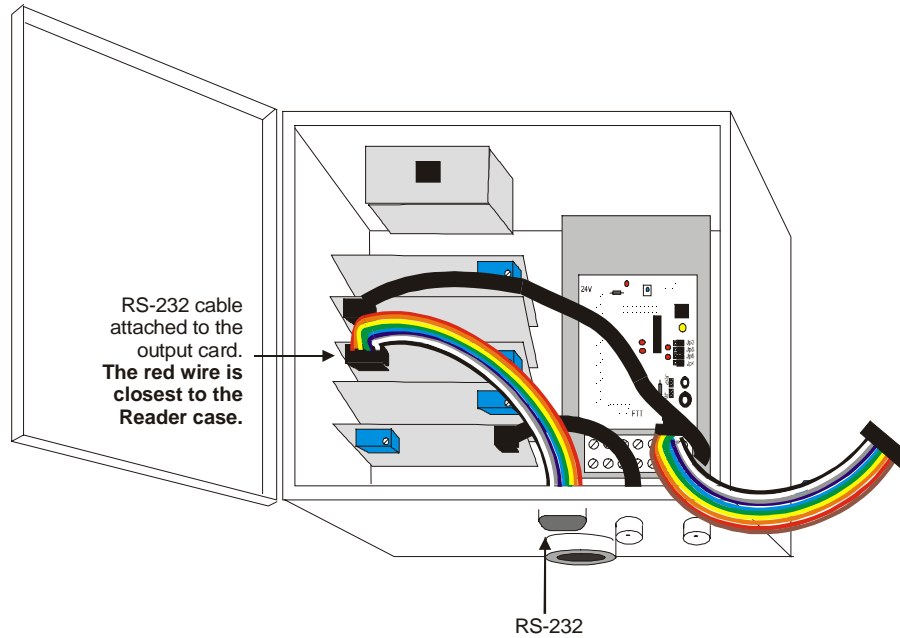
**Step 2:** Attach the other end of the RS-232 cable to the computer.

### **FTT Reader**

**Step 1:** Open the Reader case. There is a 9-wire ribbon cable connected to the RS-232 port. The other end is unconnected and tied. There is a 10-wire ribbon cable connecting the output card to the FTT motherboard (Figure 15).

**Step 2:** Disconnect the 10-wire ribbon cable from the output card.

**Step 3:** Connect the free end of the 9-wire ribbon cable to the output card (Figure 15). The red wire should be closest to the Reader case's hinges.



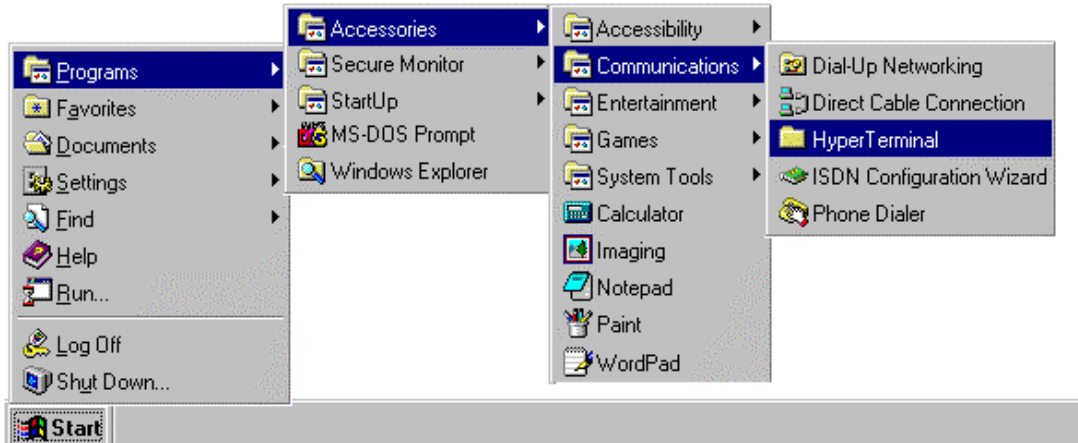
**Figure 15** FTT Reader with the output card disconnected from the FTT motherboard and connected to the RS-232 port.

- Step 4:** Attach the DB9 male connector of the RS-232 cable to the external RS-232 port on the Reader.
- Step 5:** Attach the other end of the RS-232 cable to the computer.

**Remember:** When you have finished communicating with the Reader, detach the 9-wire ribbon cable from the output card, reattach the 10-wire ribbon cable from the FTT motherboard to the output card and detach the computer from the Reader.

**Communicating with the Reader via HyperTerminal**

- Step 1:** On the computer's desktop, click the **Start** button. The Start menu will appear (Figure 16).
- Step 2:** From the Start menu, select **Programs, Accessories, Communications, HyperTerminal**.



**Figure 16 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 Reader 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 depending on the Reader type to which you are connecting:

**Serial Reader and Wiegand Reader:**

Bits per second (Baud)	4800
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

**FTT Reader:**

Bits per second (Baud)	2400
------------------------	------

Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

**Step 7:** Click the OK button. If you are connecting to a Serial Reader, the HyperTerminal's main window will display the five-digit ID numbers for any Tags in the field. Wiegand and FTT Readers will not output anything to the screen unless they are placed in diagnostics mode (See the section *Toggle Between Default and Diagnostic Modes*, page 42.)

### **Reader Commands**

The following is a list of commands that can be sent to the Reader via the terminal application.

<b>Code</b>	<b>Action</b>
*	Changes the Tag version that the Reader reads.  This should be checked to ensure that the Reader is reading the correct version of Tag. A Reader can only read 2.0 Tags or 3.x Tags; it cannot read both.
#	Changes the Reader ID to eliminate the potential of cross talk.
&	Turns on/off diagnostic mode.
\$	Allows the Reader to act on a 254 code in addition to its own ID number. This is only available for Wiegand Readers.

### Entering a Command

**Step 1:** In HyperTerminal's main window, press the Spacebar until the Reader responds with "Enter:" on the terminal screen. The Reader will now wait for input.



Note: When the Reader is waiting for input, it is paying attention only to the serial cable and is not receiving information from the antennas.

**Step 2:** Type one of the above commands at the "Enter:" prompt. For example,

**Enter: &**

Places the Reader into diagnostics mode.



**IMPORTANT!** Do not press the Enter key after you have typed the command; it is not necessary.

If the Reader receives no input after a few seconds, it displays the message, "Timed out." If you are communicating with an FTT Reader, the Reader displays the firmware version, jumper settings and Reader ID.

All outputs from the Reader are preceded by an indent to indicate that the string is not a Tag ID.

### ***Toggling between reading 3.x Tags and reading 2.0 Tags***

Readers can receive information from either 2.0 Tags or 3.x Tags, but not both. The toggle command lets you to switch between them.



**IMPORTANT!** Ensure that the Tag version the Reader is receiving matches the version stamped on the edge of the Tag case. If the Reader and Tags are mismatched, no Tag information will be output.

The Tag version information is stored so that the Reader will continue to read the same Tag version even if it has been powered off and powered back up.

**Step 1:** Type an asterisk ( \* ) at the “Enter:” prompt.

**Do not** press Enter.

The Reader will respond with, “Reading 2.0 tags.”

For example:

**Enter: \***

**Reading 2.0 tags.**

**Step 2:** To switch back to reading 3.x Tags, press the Spacebar until the “Enter:” prompt appears, then type an asterisk at the “Enter:” prompt.

The Reader will respond with “Reading 3.x tags.”



### Changing the Reader ID Number



**IMPORTANT!** All Readers are given the same ID number (127) at the factory. Each Reader needs to be set with a unique ID number to eliminate the possibility of cross talk (i.e., a Tag broadcasting to an incorrect Reader) in multi-Reader applications.

**Step 1:** At the "Enter:" prompt, type a pound sign ( # ) followed by a two-number code (01-32). See Table 1 for codes and their corresponding Reader ID numbers.

**Do not** press Enter.

The Reader will respond with "Selected Value: #NN" where NN is the code that you entered, and "Reader ID=XXXXX" where XXXXX is the new Reader ID number corresponding to the code entered.

For example, if you type:

**Enter: #10**

The Reader will respond with

**Selected Value: #10**

**Reader ID=00106**

The new Reader ID number will be kept even after a power off/on cycle.

Code to Enter	Reader ID #	Code to Enter	Reader ID #
00	00000	16	00080
01	00033	17	00113
02	00034	18	00114
03	00003	19	00083
04	00100	20	00052
05	00069	21	00021
06	00070	22	00022
07	00103	23	00055
08	00072	24	00024
09	00105	25	00057
10	00106	26	00058
11	00075	27	00027
12	00044	28	00124
13	00013	29	00093
14	00014	30	00094
15	00047	31	00127

**Table 1 Reader ID codes and numbers**

## **Toggling Between Default and Diagnostic Modes**

Diagnostic mode allows you to troubleshoot the NT132 system. It displays information that the Tag broadcasts to the Reader – the Reader ID, Site Code and Tag ID number.

**Step 1:** At the “Enter:” prompt, enter an ampersand ( & ).

**Do not** press Enter.

The Reader will respond with “Diagnostics ON”

A Reader reporting 3.x Tag information will output 15 digits to the terminal screen:

**R R R R R S S S S S T T T T T**

Where:

**R** – The 5-digit Reader ID as returned by the Tag

**S** – The 5-digit Site Code of the Tag

**T** – The 5-digit Tag ID number

A Reader reporting 2.0 Tag information will output 10 digits to the terminal screen:

**S S S S S T T T T T**

Where:

**S** – The 5-digit Site Code of the Tag

**T** – The 5-digit Tag ID number

For example, turning on the diagnostics mode for Reader reporting 3.x Tags looks like this:

**Enter: &**

The Reader will respond with

**Diagnostics ON**

**001060002401234**

**001060002423235**

**001060002467843**

00106 is the Reader ID; 00024 is the Site Code and 01234, 23235 and 67843 are the IDs of the Tags that are in the field.

### **Code 254**

When the Tag determines that a Reader signal is present but cannot determine the Reader ID number, the Tag returns 254 for Reader ID as a code indicating that it could not pick up the Reader ID number. When the Reader is in default mode, it will not report the 254 code as it would with a regular Tag read.

### Wiegand Output

Although a Wiegand Reader will output Tag data to HyperTerminal as rapidly as it receives it, it will still buffer the data being sent to the Wiegand control panel. The Reader will output data to the control panel for one Tag read every 750 milliseconds. Duplicate Tag information is stored in the Reader's buffer for 12 seconds so that duplicate Tag reads are ignored during this time interval. When a Wiegand Reader is in diagnostics mode, all Tag information is sent to the control panel including the 254 code.

### Turning off the Diagnostics Mode

**Step 1:** Turn off the diagnostics mode by pressing the Spacebar until the "Enter:" prompt appears and then typing an ampersand ( & ).

The Reader will respond with "Diagnostics OFF."



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

The diagnostics mode is not stored permanently, and when the Reader is powered on again it will start in default mode, in which the diagnostics are turned off.

### ***Bypass Mode - Enabling Action on 254 Code***

When 3.x Tags cannot determine the Reader ID, they transmit back a 254 code in place of a Reader ID. In default mode, the Reader will not report or act on this code. It will only report Tag messages which include its own ID number. A Wiegand Reader can be set to report messages with both its ID number and code 254. This is useful at sites where vehicles travel quickly over a Road Loop Antenna and the Tags may not have time to resolve the Reader ID number.

**Step 1:** At the "Enter:" prompt, type a dollar sign ( \$ )

The Wiegand Reader will respond with "ReaderID 254 ON"



**IMPORTANT!** Do not turn on the bypass mode on a Reader that is within the range of another Reader. This will cause crosstalk.

**Step 2:** Turn off the bypass mode by pressing the Spacebar until the "Enter:" prompt appears and then typing the dollar sign ( \$ ).

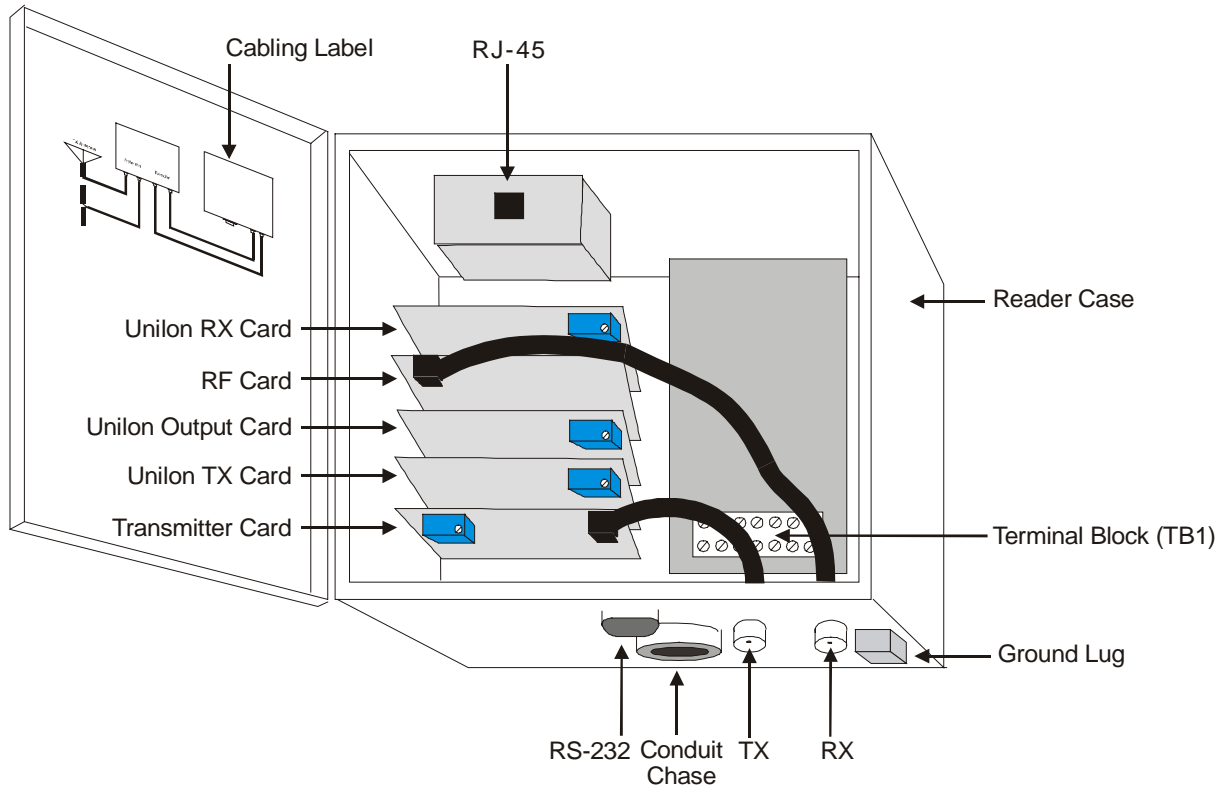
The Wiegand Reader will respond with "ReaderID 254 OFF"

The bypass mode is stored so that the Reader will continue to report 254 messages even if it has been powered off and powered back up.

### Unilon Reset Buttons

Each Unilon card in the Reader's PCB stack (Figure 17) has a reset button that provides revision numbers and jumper configurations for the card.

The reset buttons can also be pressed when the Reader has been subjected to static discharge or power glitches.



**Figure 17 PCB stack cards**

The cards perform the following functions:

- Unilon RX Card – decodes the signal sent from the receiving antenna via the RF Card.
- RF Card – receives the signal from the receiving antenna
- Unilon Output Card – sends the data to a controller or computer
- Unilon TX Card – encodes the signal to transmit
- Transmitter Card – sends the signal to the transmitting antenna

The RX, TX and Output Unilon Cards (Figure 18) appear to be physically the same with the exception of jumper placement, which configures them for their respective tasks.

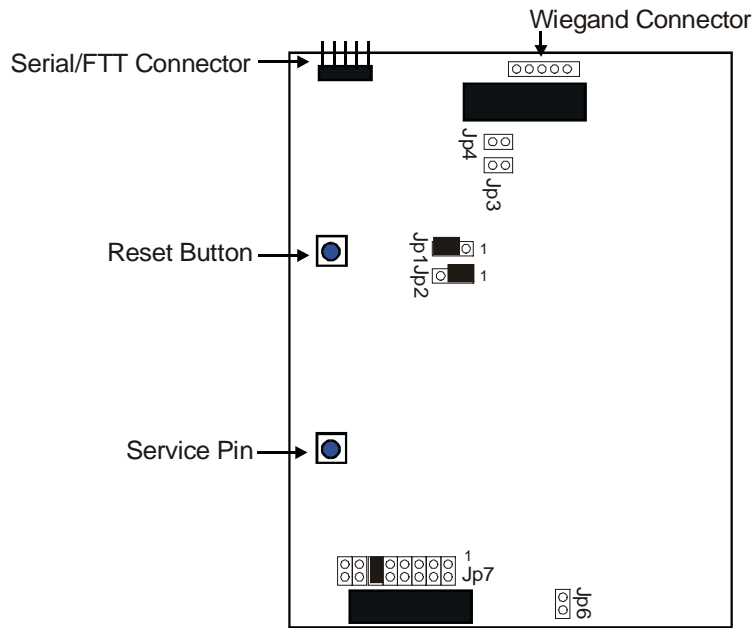


Figure 18 Unilon card

Depending on how the card is set up, there may be a serial cable connected to the top of the card and the jumper shunts may be in different places.



**IMPORTANT!** Do not press the Service Pin. If the Service Pin is accidentally pressed, cycle the power off and on to put the Reader into a known state.

### Viewing Unilon Card Information

**Step 1:** Connect the Reader to a PC and access the Reader with a terminal application. See the section *Configuring 3.x Reader Firmware*, page 35, for instructions.

**Step 2:** Press the reset button on the Unilon RX Card. The Reader will display to the screen the firmware name, its revision number and the jumper settings separated by dollar signs ( \$ ).

For example, when pressing the reset button on a Unilon RX Card, the following information may be seen on the terminal screen:

**200rx \$Revision: 1.6 \$Receive JP1=2-3 JP2=2-3**

**Step 3:** Press the reset button on the Unilon TX Card. The Reader will display to the screen the firmware name, its revision number and the jumper settings separated by dollar signs ( \$ ).

For example:

**200ltx \$Revision: 1.5 \$Transmit JP1=2-3 JP2 1-2**

**Step 4:** Press the reset button on the Unilon Output Card. The Reader will display to the screen the firmware name, its revision number, the jumper settings and its ID number separated by dollar signs ( \$ ).

For example:

**200sera \$Revision: 1.5 \$Serial JP1=2-3 JP2 1-2  
ID=033**





# Antenna Tuning Unit (ATU) Installation

## *Introduction*

Each access control point (e.g. door, roadway, etc.) has at least two antennas:

- A Low Frequency (LF) loop antenna that broadcasts a *wakeup* signal at 132 kHz to any Tags that may be within the antenna field of radiation.
- A dipole antenna designed for the Ultra-High Frequency (UHF) range for receiving a response signal (315 MHz) from each Tag.

For road-loop sites, the two antennas are separate to accommodate unique installation and distance requirements.

For interior installations, the two antennas are packaged in a single housing that can be inconspicuously mounted near the access monitoring point.

An ATU optimizes the performance of one antenna pair to its environment.

## *Installation Considerations*

When selecting a location for each ATU, keep in mind that it should be mounted:

- within **20 feet** cable length of its antennas
- within **80 feet** cable length of the Reader

Review the appropriate antenna section in this manual prior to installing each ATU. The ATU should be mounted in a location that provides protection from the elements and easy access for cabling and system tuning.



**IMPORTANT!** Place the ATU in a waterproof box if it is mounted outside.

In some installations, it may be desirable to install the ATU out of sight (e.g. above ceiling tiles).

### **Required Materials**

The following materials are necessary for successful installation:

- 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). The length required for your installation will vary. The maximum length recommended is 80 feet between the Reader and ATU and 20 feet between the ATU and each antenna. AXCESS cannot guarantee performance if these parameters are exceeded.
- Four 3-piece crimp type male BNC connectors (for example, Amphenol 31-320). Note: extras are recommended in case of damage during crimping.
- Power drill and bits
- Four mounting screws
- Diagonal cutters
- Phillips and flathead screwdrivers
- Three blade rotary coaxial cable stripper
- BNC crimpers
- Multimeter

### **Prerequisite Tasks**

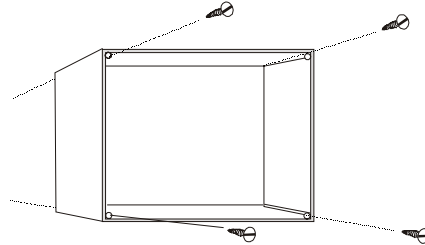
It is assumed that the following task has already been completed.

- The **Reader has been installed**. If not, refer to the appropriate section in this document and install the Reader before continuing.

### Mounting the ATU



**IMPORTANT!** Lay out and test the entire NT132 System before permanently mounting any piece of the system.



**Figure 19 Mounting screw channels for the ATU**

**Step 1:** The ATU should be mounted a minimum of 36 inches off the ground, preferably at eye height. Mark and drill the holes for mounting the ATU.

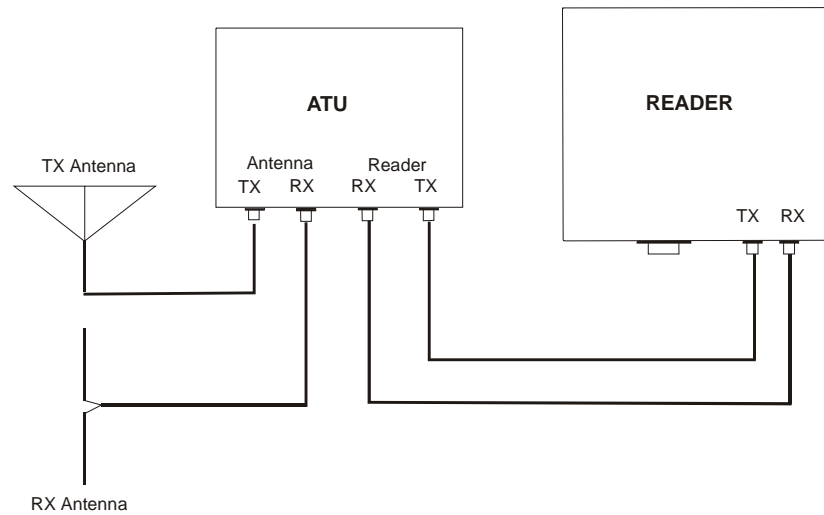
**Step 2:** Mount the ATU with the connectors pointing down. There are screw channels at each corner of the ATU for mounting purposes (Figure 19).



**IMPORTANT!** If the ATU has a voltmeter, install the ATU with the connectors pointing down. This orients the voltmeter so that it reads accurately. For more information on voltmeters and toggle switch ATUs, see the section *Adjusting Performance with a Toggle Switch ATU*, page 74.

## Cabling the ATU

Figure 20 shows the cabling between the ATU and the Reader – and between the ATU and the associated antennas.



**Figure 20 ATU connections**



**IMPORTANT!** All coaxial cable between the ATU and the Reader must be RG-58/U with 50-ohm impedance (nominal), solid copper center conductor, 55% tinned copper braid or better, 100% foil shield coverage (for example, Belden 9310). Cable must be terminated at both ends with 3-piece crimp type male BNC connectors. See *Appendix A: Coaxial Cable*, page 101, for directions on how to prepare the cable.

**Connecting the ATU to the Reader**

- Step 1:** Measure the length between the ATU and the Reader for the connecting cable run. The cable length should not exceed 80 feet.
- Step 2:** Cut two lengths of coaxial cable. Each length should equal the measured cable distance from the ATU to the Reader. Ensure that you give yourself some slack in the cable length.
- Step 3:** Attach a male BNC connector to each end of each cable.
- Step 4:** Run one cable from the Reader's connector labeled **TX** to the connector labeled **Reader TX** on the ATU.
- Step 5:** Run the other cable from the Reader's connector labeled **RX** to the connector labeled **Reader RX** on the ATU.

**Connecting the ATU to the Antennas**

See the following sections for each antenna type:

To connect the ATU to a Bar Antenna – *Installing the Bar Antenna*, page 70.

To connect the ATU to a Road Loop Antenna – *Road Loop Layout & Connecting to the ATU*, page 61

To connect the ATU to a Dipole Antenna - *Installing the Dipole Antenna*, page 56

To connect the ATU to a Swing Frame Antenna - *Installing the Swing Frame Antenna*, page 71



Note: Do not dress (tie-wrap) the cables until the installation is complete and tested. Once the system is operating properly, finish the cabling.



# Dipole Antenna Installation

## Introduction

The Dipole Antenna receives signals transmitted by the Tags and works in association with the Road Loop Antenna.



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

## Required Materials

The following materials must be on hand in order to successfully install the Dipole Antenna:

- 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) to connect the Dipole Antenna to the ATU. The length required varies by installation. However, it is recommended that the length of cable not exceed 20 feet.
- Two 3-piece crimp type male BNC connectors. The section *Appendix A: Coaxial Cable*, page 101, demonstrates how to prepare coaxial cable for a BNC connector.
- Four screws or bolts for mounting the bracket
- Three blade rotary coaxial cable stripper
- Phillips and flathead screwdrivers
- Tape measure

## Prerequisite Tasks

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

- The **ATU has been installed**. If not, refer to the appropriate section in this document and install the ATU before continuing with the Dipole Antenna installation.
- The **Reader has been installed**. If not, refer to the appropriate section in this document and install the Reader before continuing with the Dipole Antenna installation.

## ***Installing the Dipole Antenna***



**IMPORTANT!** Before permanently mounting the Dipole Antenna, lay out and test the entire NT132 system.

### **Installation Guidelines**

The length of the coaxial cable between the Dipole Antenna and the ATU should not exceed **20 feet**.

The Dipole Antenna should be mounted:

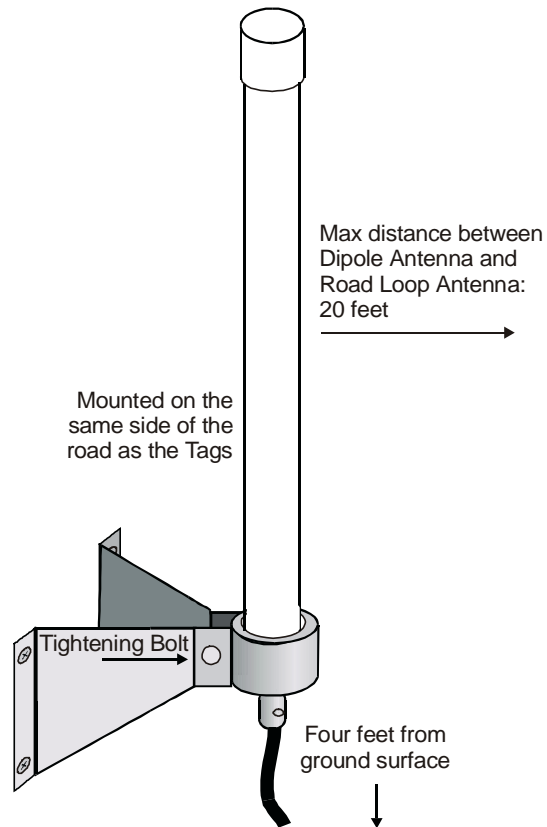
- **Within 20 feet** (sight distance) of the Road Loop Antenna.
- **After** or aligned with the Road Loop Antenna.
- **On the same side of the road** as the Tags are mounted in the vehicles.
- **Four to six inches** from any surface and **four feet** from the ground for optimal performance.
- **Vertically**. Horizontal positioning degrades system performance.

**Do not** mount the Dipole Antenna behind any large object as this may reduce system performance.

**Step 1:** Mount the Dipole Antenna vertically with the cable connector at the bottom (Figure 21).

The bracket should wrap the antenna at the bottom of the plastic tube. Use the bolt to tighten the bracket around the Dipole Antenna.





**Figure 21 Dipole Antenna mounting**

- Step 2:** Measure the cable distance between the Dipole Antenna and the ATU. It should not exceed 20 feet.
  - Step 3:** Cut a length of cable that equals the cable length measured and attach the BNC connectors to both ends of the RG-58/U coaxial cable (See *Appendix A: Coaxial Cable*, page 101).
  - Step 4:** Connect one end of the cable to the Dipole Antenna.  
If the Dipole Antenna will be exposed to the weather, treat the connection with RTV rubber silicone sealant after everything is installed.
  - Step 5:** Connect the other end of the coaxial cable to the **Antenna RX** connector on the ATU.
- ⇒ Note: Do not dress-wrap or tie-down the cables until the system has been tested.
- Step 6:** Turn on the system and adjust the ATU in accordance with the instructions in the *Maximizing Antenna Performance with the ATU* section, page 73.

### Optional Dipole Antenna Installation

If the 20-foot cable run to the ATU prevents you from mounting the Dipole Antenna within specifications. You can run connect the Dipole Antenna directly to the Reader. Remember to keep the Dipole Antenna within 20 feet of the Road Loop Antenna.

**Step 1:** Measure the cable distance between the Dipole Antenna and the Reader. It should not exceed **100 feet**.

**Step 2:** Cut a length of cable that equals the cable length measured and attach the BNC connectors to both ends of the RG-58/U coaxial cable (See *Appendix A: Coaxial Cable*, page 101).

**Step 3:** Connect one end of the cable to the Dipole Antenna.

**Step 4:** If the Dipole Antenna will be exposed to the weather, treat the connection with RTV rubber silicone sealant after everything is installed.

**Step 5:** Connect the other end of the coaxial cable to the **RX** connector on the Reader.



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

**Step 6:** Turn on the system and adjust the ATU in accordance with the instructions in the *Maximizing Antenna Performance with the ATU* section, page 73.

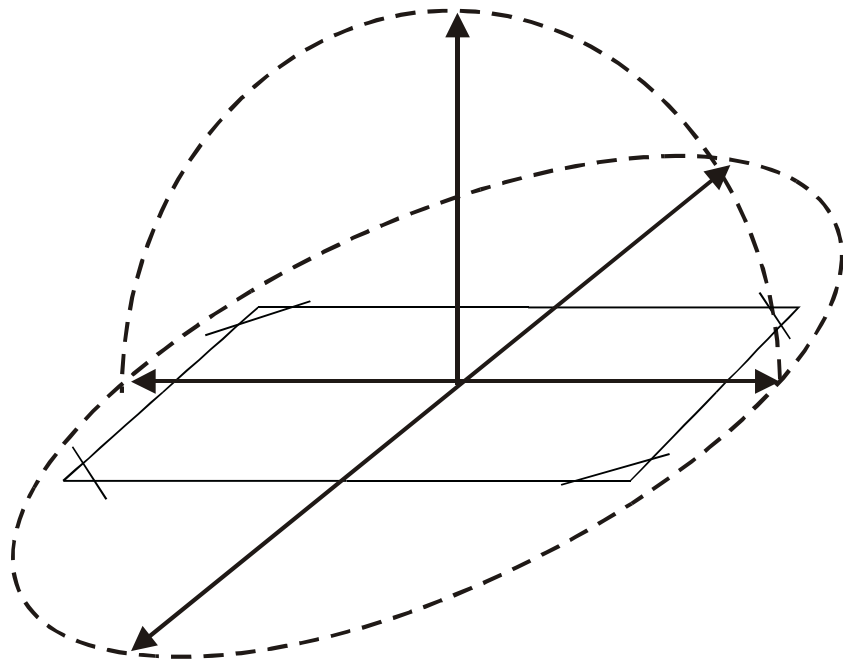
# Road Loop Antenna Installation

## *Introduction*

The Road Loop Antenna is a transmitting antenna that works in conjunction with the Dipole Antenna. Road Loop Antenna wire is available in lengths that will accommodate roadways or gate entrances up to 70-feet in width.

The Figure 22 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.

Antenna fields are affected by the type of pavement, amount of rebar, and nearby power lines. For these reasons, it is strongly recommended that the Road Loop be laid out and tested before it is permanently mounted.



**Figure 22 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 1/4" x 3 1/4" x 4 1/2" triangular wood template for cutting corners
- Vacuum or compressed air for cleaning the cut
- A thin dowel for pressing the Road Loop antenna into the cut
- Road sealant - AXCESS recommends Flexible Embedding Sealer (P-606) supplied by Bondo Corporation. 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:

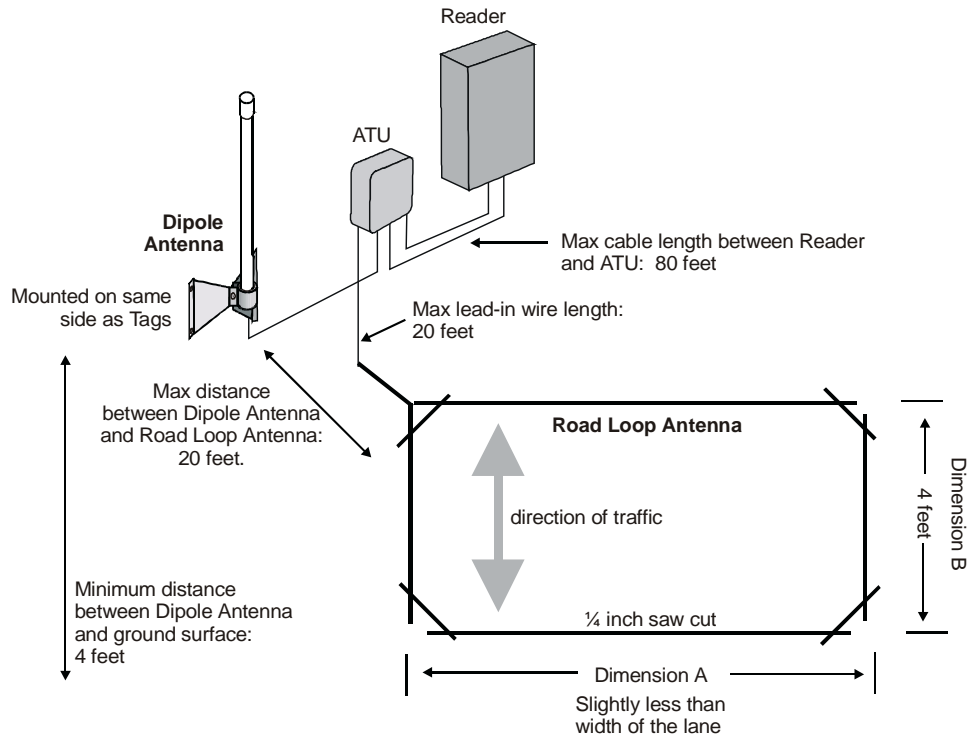
- The **ATU has been installed**
- The **Reader has been installed.**
- The **Dipole Antenna has been installed**
- All **connector/coax cabling** (except for Road Loop) is complete.
- If applicable, the **Wiegand or other controller has been installed.** If not, refer to the Original Equipment Manufacturer's (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 NT132 system.

**Road Loop Layout & Connecting to the ATU**

- Step 1:** If used for gate access, position the Road Loop Antenna far enough before the entrance to allow the gate to be fully open by the time a vehicle reaches it. The gate will be activated when the Tag is over the Road Loop.
- Step 2:** If there is a safety loop for the gate, do not use the same cut. Placing the Road Loop with the safety loop will change the inductance of the Road Loop. If they are installed on top of each other, there will be interference between them and neither is likely to operate properly.



**Figure 23 Road Loop Antenna installation diagram**

- Step 3:** Mark the outline of the antenna (yellow contractor's crayon, chalk, etc.). For neatness, ensure that the sides of the loop rectangle are parallel or perpendicular to surrounding buildings, fences, etc., as appropriate and ensure that the corners are 90 degrees.

The long sides (Dimension A, Figure 23) will measure the actual width of the antenna purchased (i.e., 14 feet, 20 feet, 26 feet, etc.) and be slightly shorter than the width of the road.



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

- Step 4:** If necessary, drive square concrete nails (or similar) into the road surface at the corners to provide the proper

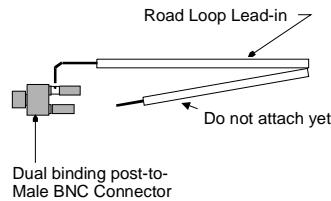
rectangular shape to the antenna when laying down the wire.

**Step 5:** Feed one end of the Road Loop wire to the ATU.



**IMPORTANT!** The **total** length of lead-in wire (the Road Loop wire from the Road Loop to the ATU) must not exceed 20 feet. **Do Not Twist** the wire as you run it from the Road Loop to the ATU.

**Step 6:** Insert the end of the Road Loop wire at the ATU into one side of a binding post-to-BNC connector (Figure 24). Tighten the binding post terminal to secure the lead.



**Figure 24 Attaching Road Loop wire to the post-to-BNC connector**

**Step 7:** Connect the BNC-end of the Road Loop wire to the **Antenna TX** connector on the ATU.

**Step 8:** Carefully feed Road Loop wire on toward the loop marked on the roadway. Secure the wire with duct tape as you proceed.

**Step 9:** 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.

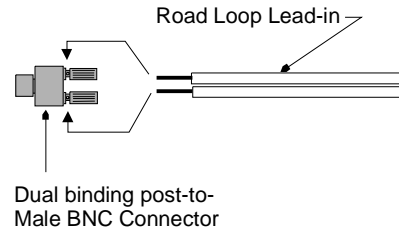
**Step 10:** When back to the feed point, continue around the loop a second time if the Road Loop is shorter than 36 feet (do not allow the two wires to twist) and return to the feed point.



**IMPORTANT!** For a Road Loop wider than 36-feet, use only a single loop of wire.

**Step 11:** After one or two complete loops (see note above), continue to lead the wire back to the ATU or junction point. Do not allow the wires to twist.

**Step 12:** 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 25).



**Figure 25 Post to Male BNC Connector**

- Step 13:** If any third-party equipment will also be installed, lay it out at this time.
- Step 14:** Turn on the system and adjust the ATU according to the instructions in the *Maximizing Antenna Performance with the ATU* section, page 73.
- Step 15:** Using an LED Test Tag, ensure that the transmit field of the Road Loop extends 7 or 8 feet above ground level and 15 to 24 feet horizontally. The Road Loop Antennas with greater widths have larger fields.
- Step 16:** After ensuring proper operation, remove the wire loop and concrete nails to allow cutting the groove into the roadway.

### **Common Layout Problems**

If the transmit field of the Road Loop Antenna does not have the proper range, check the following:

- Is there power-line interference (or similar) directly under the roadbed? If so, the Road Loop Antenna may have to be moved.
- Has part of the Road Loop Antenna inadvertently been twisted? If so, correct the condition.
- Does lack of continuity with a multimeter indicate a break in the loop or lead-wire? If so, correct the condition.
- Have all connectors been correctly installed? **This is frequently the cause of problems.** Correct if necessary.
- After checking these items, re-check the ATU tuning again.

## Installing the Road Loop Antenna

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 3 1/4" x 3 1/4" x 4 1/2" (Figure 26).

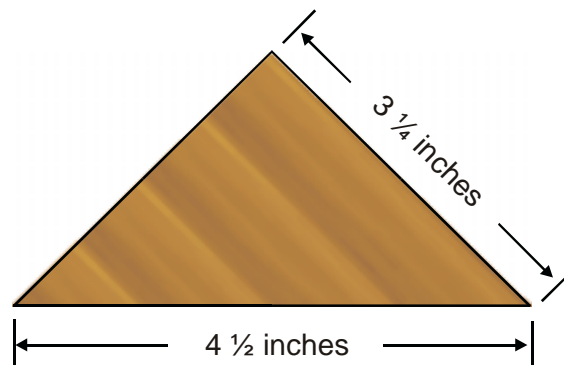


Figure 26 Plywood corner template

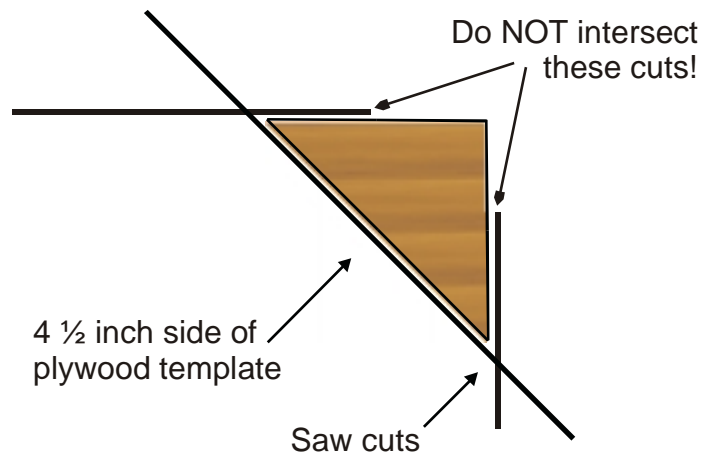


Figure 27 Using the template to mark corner cuts

- Step 3:** At the corner closest to the ATU, mark your lead-in cut.
- Step 4:** Review your progress one last time for correctness.



**Step 5:** Cut a groove that is at least a ¼" wide with the concrete saw. Set the cutting depth to a minimum of 1 ½" 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 6:** Use vacuum or compressed air to thoroughly clean out the groove.

**Step 7:** 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. A tongue depressor or pencil eraser works well.

**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.

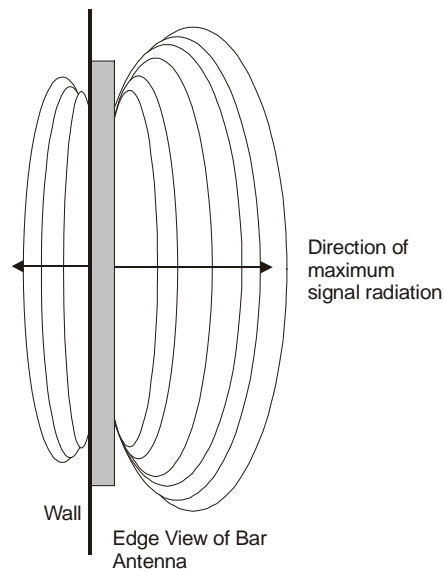


# Bar Antenna System Installation

## *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 28). Partial rotation of the antenna forward or backward, and from side-to-side will produce noticeable results.



**Figure 28 Bar Antenna signal radiation**

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

## Required Materials



**IMPORTANT!** The following materials should be on hand for the installation of the Bar Antenna:

- 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) of sufficient length to reach the ATU. The maximum recommended cable length is 20 feet.
- 2 three-piece crimp type male BNC connectors – see page 85 for installing BNC connectors
- Three-blade rotary coaxial cable stripper
- Phillips and flathead screwdrivers
- Step ladder for positioning the Bar Antenna above the door or ceiling.

## Prerequisite Tasks

The following tasks should be completed:

- The **ATU has been installed**. If not, refer to the appropriate section in this document and install the ATU before continuing with the Bar Antenna installation.
- The **Reader has been installed**. If not, refer to the appropriate section in this document and install the Reader before continuing with the Bar Antenna installation.

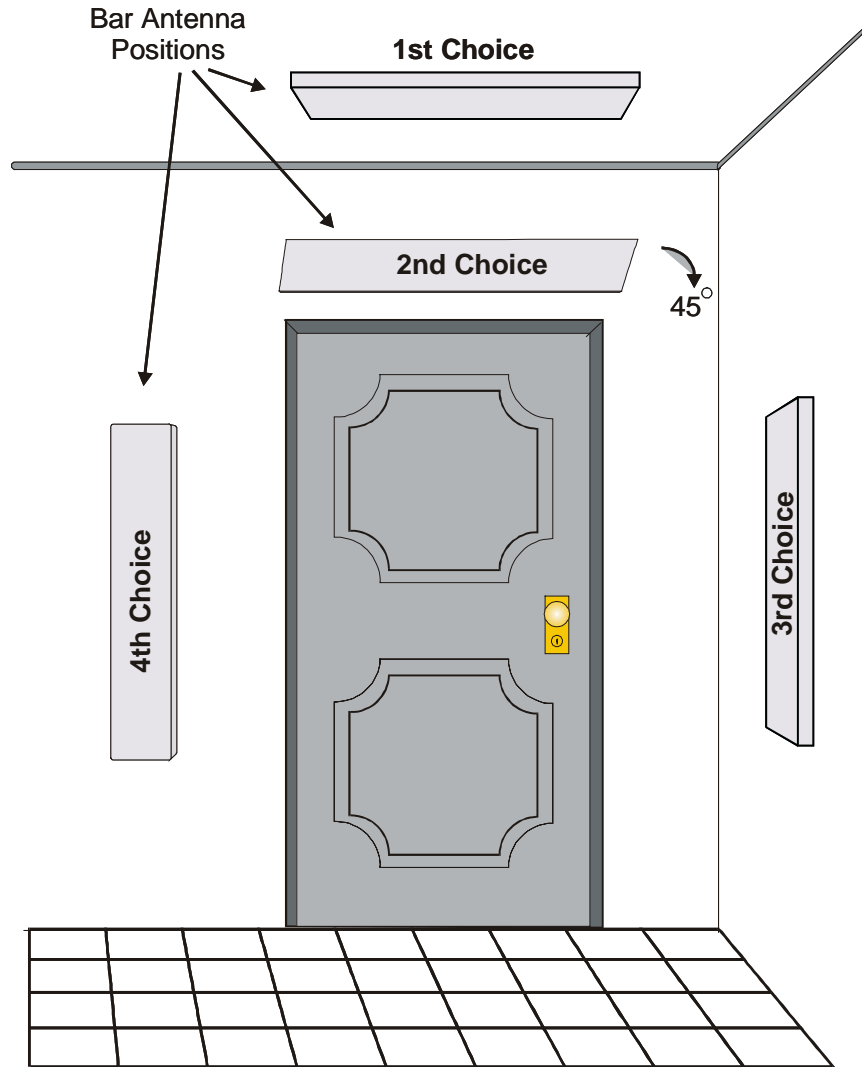


**IMPORTANT!** Before permanently installing the Bar Antenna, lay out and test the entire NT132 system.

## Installation Considerations

Determine the *approximate* installation site of the Bar Antenna and of any third-party gate controller if one is being used. Use the following guidelines:

- The ATU should be located no more than 20 feet (cable length) from the antenna. A good location is directly above the doorway where the Bar Antenna is to be installed – above the ceiling tiles if desired, but accessible for tuning (Figure 29)
- The Bar Antenna should be located at least 4 inches from any metal.



**Figure 29 Installation points for the Bar Antenna**

- Orient the Bar Antenna so that the radiation 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. The read-range for the Bar Antenna is about 8 to 12 feet.



**IMPORTANT!** Test each position shown in Figure 29. 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 ATU and the Bar Antenna and cut two lengths of RG-58/U coaxial cable.

**Step 2:** Attach the BNC connectors to each end of both cables.

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



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:** 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 ATU labeled **TX Antenna**.

**Step 5:** Apply power to the Reader. See the *Connecting Power to the Reader – All Types* section, page 32.

**Step 6:** Tune the ATU in accordance with the instructions in the *Maximizing Antenna Performance with the ATU* section, page 73.

**Step 7:** 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 8:** Attach the open Bar Antenna base to wall using supplied anchors and screws. If you want to install the Bar Antenna at the optimal angle, wood wedges or flexible metal brackets can be used.

**Step 9:** Place the plastic cover over the base and align holes on the sides of the case and cover.

**Step 10:** Insert the rivet bases through aligned holes.

**Step 11:** Insert plastic screws into the rivet bases and push until the screws are tight.

**Step 12:** Tighten the screws with a hand-held screwdriver.

**Step 13:** The plastic rivets are removable with a screwdriver if it is ever necessary to open the Bar Antenna case.

# Swing Frame Antenna System Installation

## *Introduction*

A Swing Frame Antenna allows you to mount an antenna in plain sight without detracting from office surroundings. In a Swing 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.

## *Required Materials*



**IMPORTANT!** The following materials are necessary for the installation of the Swing Frame Antenna:

- 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) of sufficient length to reach the ATU. The recommended maximum length is 20 feet.
- 4 3-piece crimp type male BNC connectors – see page 85 for installing BNC connectors
- Three blade rotary coaxial cable stripper
- Four mounting screws
- Phillips and flathead screwdrivers

## *Prerequisite Tasks*

The following tasks should be completed:

- The **ATU has been installed**. If not, refer to the appropriate section in this document and install the ATU before continuing with the Swing Frame Antenna installation.
- The **Reader has been installed**. If not, refer to the appropriate section in this document and install the Reader before continuing with the Swing Frame Antenna installation.



**IMPORTANT!** Before permanently installing the Swing Frame Antenna, lay out and test the entire NT132 system.

## *Installing the Swing Frame Antenna*

- Step 1:** Cut two coaxial cables with sufficient length to connect the Swing Frame Antenna to the ATU. The cable lengths should not exceed 20 feet.

- Step 2:** Attach BNC connectors to both ends of each cable.
- Step 3:** Attach the RX connector on the back of the Swing Frame Antenna with the **RX Antenna** connector on the ATU.
- Step 4:** Attach the TX connector on the back of the Swing Frame Antenna with the **TX Antenna** connector on the ATU.
- 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:** Apply power to the Reader. See the *Connecting Power to the Reader – All Types* section, page 32.
- Step 8:** Tune the ATU. See the section *Maximizing Antenna Performance with the ATU*, page 73.
- Step 9:** Permanently mount the Swing Frame on the wall using the mounting holes at the bottom and top of the frame and dress/tie-wrap all cabling.



# Maximizing Antenna Performance with the ATU

Because the antenna transmits by inductive coupling at low frequency, it is subject to environmental detuning, due to where the antenna is mounted, what material it is mounted on, etc.

For this reason, it is impossible to factory pre-tune antennas for optimized generation of the *wakeup* signal.

Currently, ATUs have one of two methods of adjustment - toggle switch or jumper. While the methods for adjusting performance are different, the ATUs are functionally the same.

## Adjusting Antenna Performance

**Step 1:** Apply power to the Reader.

**Step 2:** Open the Reader. Ensure that the card stack has four LEDs lit and is emitting a ticking sound.



**Step 3:** Open the ATU cover. NOTE! You will see **either** a toggle switch and rotary dial (Figure 30) or a series of 11 jumpers (Figure 33). To tune an ATU with jumpers, see page 75.

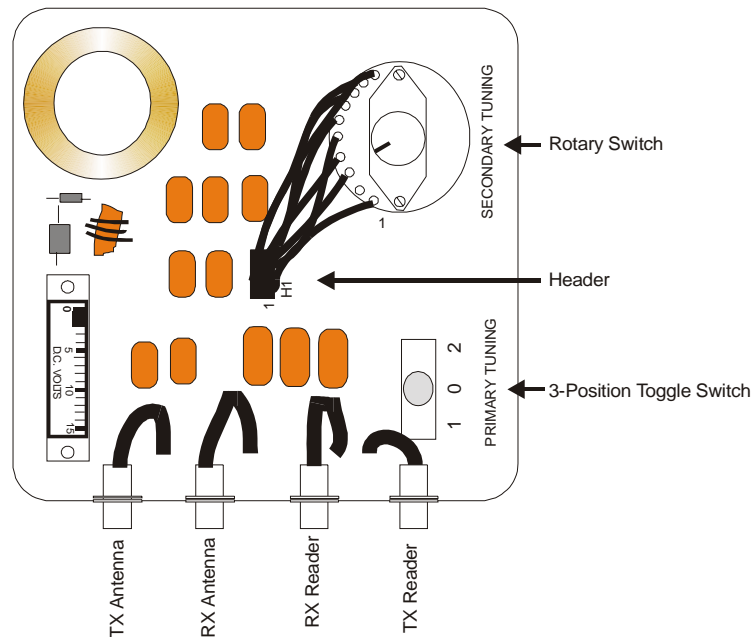


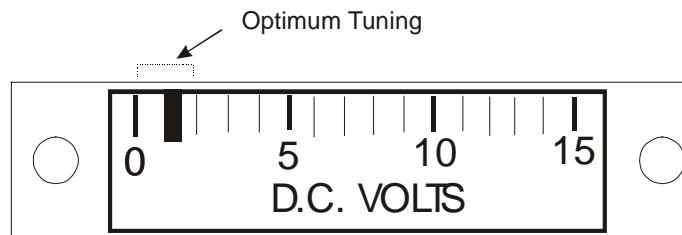
Figure 30 ATU with toggle and rotary switches

### Adjusting Performance with a Toggle Switch ATU



**Step 1:** **IMPORTANT!** Ensure that the wires running from the toggle switch are plugged into the header. This sometimes disconnects during shipping. The connector should be oriented such that position 1 on the rotary dial is connected to pin 1 on the header (Figure 30).

**Step 2:** Put the toggle switch into position 0, turn the rotary switch knob, and watch the voltage meter. Note the position that provides the peak voltage level on the voltage meter (if any).



**Figure 31 Voltage meter showing optimum tuning**

**Step 3:** Repeat Step 2 with the toggle switch in positions 2 and 1.

There are a total of 30 combinations available (10 positions on the rotary switch, and 3 on the toggle switch) for determining optimum tuning. Check all positions for peak meter level.

**Step 4:** Reset the positions of the rotary dial and the toggle switch that gave the highest voltage on the meter (0 to 4 volts). 1 to 2 volts is a typical optimum reading.

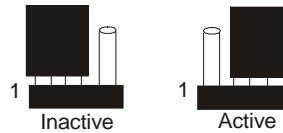


Note: The ATU must be mounted with its connectors pointing down for the voltmeter to read accurately.

### Adjusting Performance with a Jumper ATU

When you open the ATU, the jumpers will be in the positions shown in Figure 33. The goal is to set the jumpers so that largest voltage is produced, as shown by the strength of the five LEDs.

Jumpers can be placed in one of two positions on a header:



**Figure 32 Jumper positions on a header. Pin 1 is labeled.**

**Inactive** – jumper is placed on pins 1 and 2.

**Active** - jumper is placed on pins 2 and 3.

The various headers control different types and numbers of capacitors:

Jp1 through Jp9 – each header adds/removes a small capacitor (0.01  $\mu$ F) to/from the circuit.

Jp10 – adds/removes one big capacitor (0.1  $\mu$ F) to/from the circuit.

Jp11 – adds/removes two big capacitors to/from the circuit.

**Step 1:** Ensure that all jumpers are placed in the **Inactive** position.

**Step 2:** On header Jp1, place the jumper in the **Active** position and watch the LEDs.

When tuned correctly, LEDs 1 through 4 will be strongly strobing, and LED 5 will be flickering, showing a strong signal. Make note of the jumper positions that create this display.

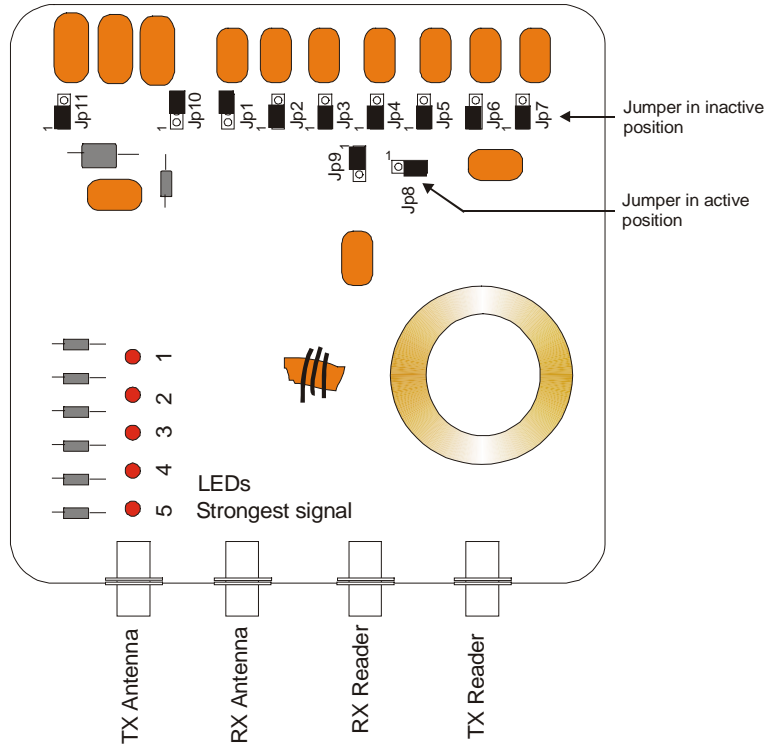
**Step 3:** On header Jp2, place the jumper in the **Active** position and watch the LEDs for a strong signal.

**Step 4:** One at a time, place the jumper in the Active position on headers Jp3 through Jp9 and watch the LEDs for a strong signal.

**Step 5:** Place all jumpers in the **Inactive** position on all the headers.

**Step 6:** On header Jp10, place the jumper in the Active position.

**Step 7:** One at a time, place the jumper in the Active position on headers Jp1 through Jp9 and watch the LEDs for a strong signal.



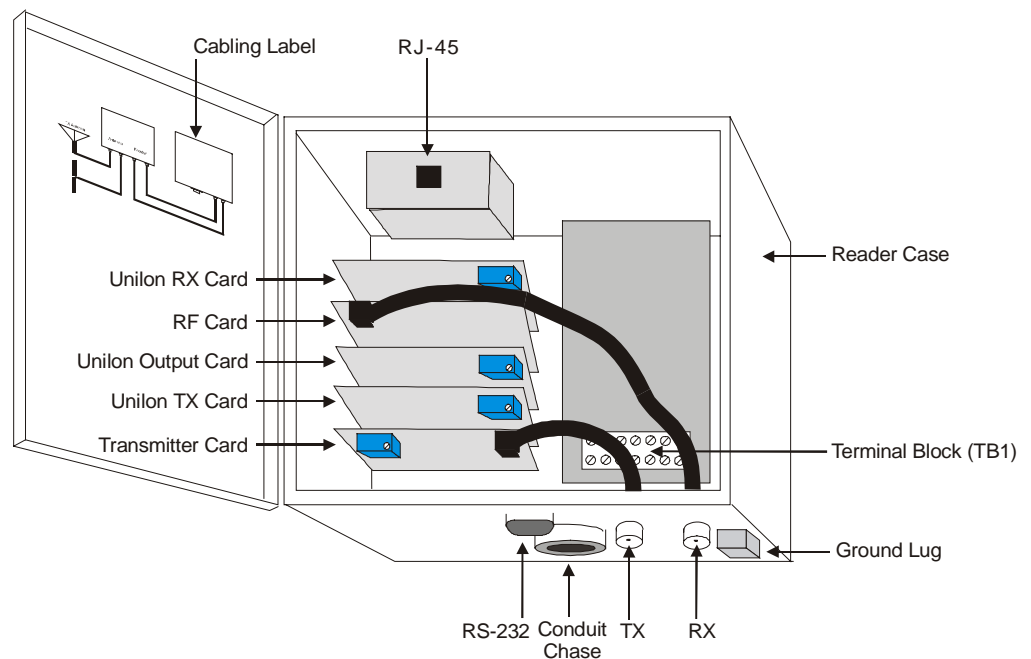
**Figure 33 ATU with jumpers in original positions**

- Step 8:** Place jumpers in the **Inactive** position on all the headers.
- Step 9:** On header Jp 11, place the jumper in the Active position.
- Step 10:** One at a time, place the jumper in the Active position on headers Jp1 through Jp9 and watch the LEDs for a strong signal.
- Step 11:** Place jumpers in the **Inactive** position on headers Jp1 through Jp9, keeping the jumper on header Jp 11 in the active position.
- Step 12:** Place the jumper in the Active position on header Jp10.
- Step 13:** One at a time, place the jumper in the Active position on headers Jp1 through Jp9 and watch the LEDs for a strong signal.
- Step 14:** When you have tested all the positions, reset the jumpers to the position that gave the strongest voltage as indicated by the strength of the LED lights.

# Modifying Antenna Range: Adjusting the Transmitter Card

## Introduction

Each Reader contains a card stack that has five sub-boards, each of which has a specific function. The transmitter card controls the voltage output to the transmit antenna. If the Reader's connectors are at the bottom, then the transmitter card is on the bottom of the stack (Figure 34). This card also can be identified by the faint chirping sound it makes and the cable that goes to the TX connector on the outside of the Reader.



**Figure 34 Reader – Internal View**

The transmitting antenna puts out a “wakeup” field that activates Tags entering that field. The area of Tag activation can be controlled by adjusting the size of the transmit field. By turning down the voltage to the transmit antenna, you shrink the transmit field. This is useful when a transmission field extends beyond its desired area. For example, you may want to shrink a transmission field for a Road Loop so that the size of the field is only a lane wide. This prevents accidental activation of Tags in another lane – for instance, a parking garage with entrance and exit gates right next to each other.



Note: Each Reader is shipped from the factory with the voltage level adjusted to its highest level.

### **Required Materials**

The following materials are necessary for successful adjustment of the transmission field:

- A very small flathead screwdriver

### **Adjusting the Transmission Field**

The output voltage is controlled by the blue adjustable pot on the transmitter card. This pot is a thirty-turn pot -- it can rotate in one direction 30 times. After it has been rotated 30 times, it will make a soft clicking sound as it is turned, indicating that the pot can no longer be turned in this direction and have an effect. When you hear this sound, the transmitter card has been adjusted to one extreme or the other.



**IMPORTANT!** There are four blue adjustable pots in the card stack. Refer to Figure 34 to ensure that you tune the correct one.

**To lower the voltage level and reduce the transmission field -**

Rotate the pot **clockwise**. The volume of the chirping will also be reduced. Constantly check the field to ensure that it has the range that you want.



**IMPORTANT!** The system will stop functioning if the voltage is turned down too low. To fix this, turn the pot counter-clockwise until the pot clicks and the chirping from the transmitter card can be heard. Then back the field down again without turning off the voltage to the system.

**To increase the voltage level and enlarge the transmission field**

- Rotate the pot **counter-clockwise**. The volume of the chirping will also increase. When the pot makes a clicking noise it has been turned up as high as possible.

**When you have adjusted the field**, retune the ATU. See the chapter *Maximizing Antenna Performance with the ATU*, page 73.

# Tag Mounting

Because of the low frequency used for transmission, Tags can be mounted in a variety of positions on assets and vehicles without the signal being blocked. Personnel can carry Tags on chains, clips, pockets or purses.

## ***Mounting Tags to Assets***

### **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.

### **Mounting a Tag to a Laptop Computer**

Some electronic devices (for example, laptop computers) generate radio frequency emissions (noise) that may activate 2.0 Tags, causing them to transmit. This unintended wakeup and transmission could result in unnecessary battery drainage. 3.0 Tags, although they may wake up, will recognize the wakeup frequency as noise and will not transmit.

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:** Position the cover so that it is in a comfortable working position.
- Step 3:** Place the LED Test Tag flat side down on the outside of the laptop.
- Step 4:** Observe the LED Test Tag 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 Reader when the laptop is carried normally through the transmit 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.

**Step 8:** 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 9:** 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 10:** Wearing latex gloves, thoroughly clean the sanded area with the supplied isopropyl alcohol pad.

**Step 11:** 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 12:** Carefully position the Tag onto the marked area of the asset, applying pressure for the time specified in the instructions.



**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.



## 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 Dipole Antenna.

Other mounting places include the lower right or left corner of the windshield, behind the rearview mirror, and above either the right or the left visor.



**IMPORTANT!** Placing a Tag directly on the dashboard in very hot climates is not recommended.

### 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 locate a spot about 3 inches from the dashboard and hold LED test tag there.
- Step 2:** Turn on the car while watching the LED to see if it turns on. (Note: this usually happens only in older vehicles with very noisy alternators.)
- Step 3:** If the Tag turns on, move the tag up 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 (Figure 35). Push the mounting tape/Velcro securely on the back of the Tag.



**Figure 35 Back of a 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 off 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.



**Figure 36 Velcro applied to window**

**Step 3:** If using double-sided tape, peel 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.



# Troubleshooting the System

## *Introduction*

The purpose of this chapter is to determine which portion of the system is not functioning and to provide guidelines for fixing the problem.

## *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 Reader – 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 Power*

**Step 1:** Open the Reader case. The LEDs on the PCB card stack should be lit, indicating that power is supplied. If the LEDs are not lit, check your power connections. If the Reader is driving relays, use the multimeter to ensure that the total power draw is below 200 mA.

**Step 2:** Open the ATU case. If you have a toggle switch ATU, the voltage meter should indicate some voltage – between 1.0 V and 5.0 V. If you have a jumper ATU, then the LEDs should be lit. If you do not have power to the ATU, check the cables from the Reader to the ATU. The ATU receives its power from the Reader via the RG-58/U cable. This is one reason this cable is specified for the NT132 system.

### ***Check the Site***

- Step 1:** Ensure that there are no other sources of similar radio frequencies nearby. Proximity card readers and clicker systems can affect the NT132 system, as can radio-controlled sprinkler systems and military-grade communications systems.
- Step 2:** Determine if metal is attenuating the signal. If a Road Loop is mounted in concrete, rebar can impact performance. If a Dipole Antenna is mounted less than six inches away from metal, it will lose reception range. If the antennas are too close to metal, move them away.
- Step 3:** Check the cable lengths – there should be a maximum of 80 feet between the Reader and the ATU and 20 feet between the ATU and antennas. If the cables are too long, they will need to be shortened.
- Step 4:** Ensure that the system is protected from the elements. Exposed equipment should be waterproofed.

### ***Trace the Cables***

- Step 1:** Trace the cable from the transmitting antenna to the **TX ANTENNA** connector on the ATU.
- Step 2:** Trace the cable from the **TX Reader** connector on the ATU to the **TX** connector on the Reader.
- Step 3:** Trace the cable from the receiving antenna to the **RX ANTENNA** connector on the ATU
- Step 4:** Trace the cable from the **RX Reader** connector on the ATU to the **RX** connector on the Reader.

### ***Check the Connectors***

- Step 1:** Ensure that the connectors are not free spinning.
- Step 2:** Replace any connectors on cables that freely spin.

### ***Check the Antennas and Cables for Continuity***

Continuity is a direct connection or dead short between two points on a cable. Continuity can expose bad cables or problems with connections.

- Step 1:** Turn off the power to the Reader.
- Step 2:** Disconnect all the cables between the Reader, the ATU and the antennas.
- Step 3:** Check each cable for continuity. If continuity is present in a cable, then the cable is shorted. Redo the cable.

### **Reception**

The reception portion of the system should not exhibit continuity. If continuity is found during any of the following steps, fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.

- Step 4:** Check the **RX** connector on the Reader for continuity. If there is continuity, then there is a problem with the Reader.
- Step 5:** Connect the coax cable from the **RX** connector on the Reader to the **RX Reader** connector on the ATU and check for continuity in the **RX Antenna** connector. If there is continuity, then there is a problem with the ATU.
- Step 6:** Check the **RX** connector on the antenna for continuity. If continuity exists, then there is a problem with the antenna.
- Step 7:** Connect the coax cable from the receiving antenna to the **RX Antenna** connector on the ATU. If there is continuity, then there is a problem with the ATU.

### **Transmission**

The transmission portion of the system should have continuity. If continuity is not present, then follow the directions given for each step.

- Step 8:** Check the **TX** connector on the Reader for continuity. If continuity **does not** exist, there is a problem with the Reader. Fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.
- Step 9:** Connect the coax cable to the **TX** connector on the Reader and check for continuity at the other end. If there is no continuity, the cable is bad. Redo the cable.
- Step 10:** Connect the other end of the coax cable to the **TX Reader** connector on the ATU and check for continuity in the **TX Antenna** connector. If continuity does not exist, then there is a problem with the ATU. Fill out the Customer Support

Questionnaire (page 107) and call Customer Support at 1-800-577-6080.

*Road Loop Antenna*

- Step 11:** Test a Road Loop Antenna for continuity by checking both ends of the antenna. If continuity does not exist, there is a problem with the Road Loop. Fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.
- Step 12:** Plug the antenna into the BNC banana connector and test for continuity. If continuity does not exist, the banana connector is faulty. Replace the banana connector.
- Step 13:** Plug the BNC banana connector into the TX Antenna connector on the ATU. Check for continuity on the TX Reader connector. If continuity does not exist, there is a problem with the ATU. Fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.

*Bar and Swing Frame Antennas*

- Step 12:** Check a Bar Antenna or Swing Frame Antenna for continuity by testing the TX connector on the back of the antenna. If continuity does not exist, fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.
- Step 13:** Connect the coax cable to the antenna and check for continuity at the other end of the cable. If continuity does not exist, there is a problem with the cable. Redo the cable.
- Step 14:** Connect the other end of the cable to the TX Antenna connector on the ATU and check for continuity on the TX Reader connector. If continuity does not exist, then there is a problem with the ATU. Fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.



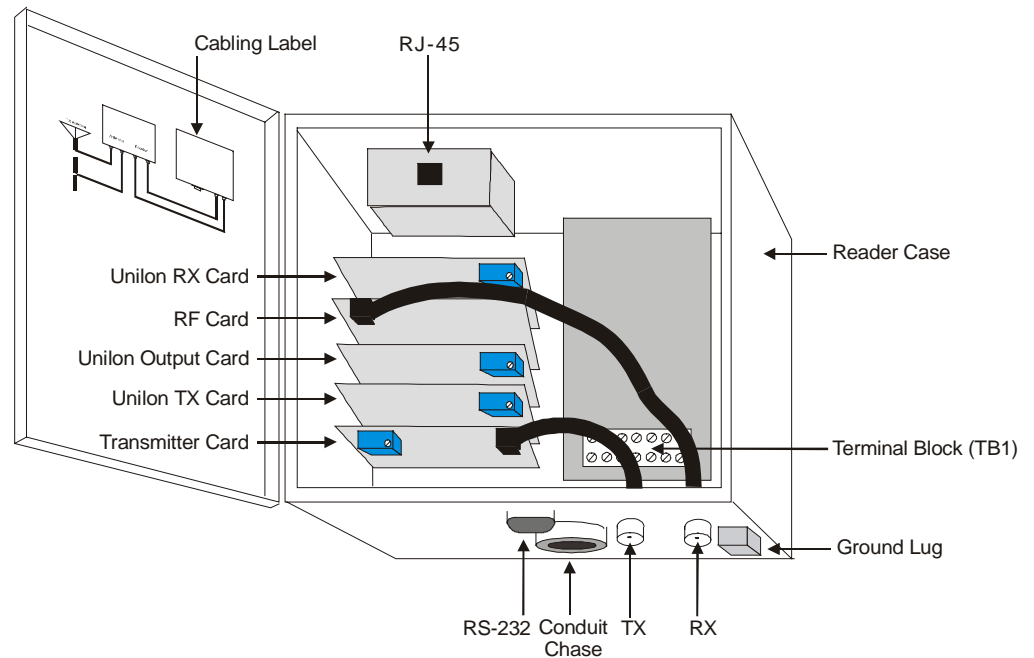
### Check the ATU

- Step 1:** Ensure that the ATU is displaying voltage – either by LEDs or on the voltage meter. If the voltage is inadequate, retune the ATU. See the chapter *Maximizing Antenna Performance with the ATU*, page 73
- Step 2:** If you have a Toggle Switch ATU, ensure that the 10-wire header is properly seated. See the section *Adjusting Performance with a Toggle Switch ATU*, page 74. Check the Transmission Field
- Step 1:** Check the range specifications for the transmitting antenna listed in the *Appendix B: Specifications* chapter, page 103.
- Step 2:** Test the range of the transmitting antenna with the LED Test Tag.
- Step 3:** If The LED Test Tag does not light, check the power, the cables and the transmitting antenna. There is also the possibility that the LED Test Tag is not working. Hook the Reader to a PC and use another Tag in the field. See the chapter *Configuring 3.x Reader Firmware*, page 35.
- Step 4:** If the range is smaller than desired, then the signal needs to be adjusted. Be aware however that various environmental conditions can impact antenna performance. See the section *Maximizing Antenna Performance with the ATU*, page 73.
- Step 5:** If the range is larger than desired, then the signal needs to be adjusted. See the section *Modifying Antenna Range: Adjusting the Transmitter Card*, page 77.
- Step 6:** Open the Reader case and listen for the repetitive chirping emanating from the transmitter board in the Reader. If the chirp is not heard, retune the transmitter card in the Reader. See the section *Modifying Antenna Range: Adjusting the Transmitter Card*, page 77.
- Step 7:** If none of the suggested solutions work, fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.

**Check the Reception**

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

- Step 1:** Disconnect the receiving antenna.
- Step 2:** Attach the Reader to a computer and place it into diagnostics mode. See the chapter *Configuring 3.x Reader Firmware*, page 35.
- Step 3:** Place a Tag (ensure that the tag is programmed into the system if appropriate – i.e., for Wiegand control panels) directly on top of the transmitter board in the Reader case. (Figure 37).
- Step 8:** If no Tag information appears on the computer screen, place another Tag on the board. If there is still no output, check which Tag version the Reader is set to report. See the section *Toggling between reading 3.x Tags and reading 2.0 Tags* page 40.
- Step 9:** If the Reader is set for the correct version of Tags and there is still no output, fill out the Customer Support Questionnaire (page 107) and call Customer Support at 1-800-577-6080.



**Figure 37 Reader Transmitter Card**

### ***Check the Output and Connections to Third-Party Devices***

If the transmission and reception portions of the system seem fine, but the output is incorrect or absent, check the connections to the devices that receive system output.

#### *Serial Reader*

**Step 1:** Ensure that the communication port settings are correct:

Baud Rate	4800
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

#### *Wiegand Reader*

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

**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.

#### *FTT Reader*

**Step 1:** Ensure that the Reader is not in diagnostics mode.

**Step 2:** Ensure that the LonWorks wiring is correct.

**Step 3:** Ensure that Serial Gateway is connected to the PC and that the communication port settings are correct:

Baud Rate	2400
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None



# Common Problems with NT132 Components

## *Cable*

### **Problem: The NT132 System has reduced range**

Most of the problems encountered with the NT132 system lie with the cables. This includes having little or no range on the antennas. Check these items first:

- Step 1:** Ensure that RG-58/U with 100% foil shield coverage is used.
- Step 2:** Ensure that the cable lengths are within specifications: no more than 80 feet between the Reader and the ATU and no more than 20 feet between the ATU and the antennas.
- Step 3:** Ensure that the connectors are well fastened and in good order.
- Step 4:** Ensure that TX is connected to TX and RX is connected to RX on the Reader, ATU and antennas.
- Step 5:** Check the continuity of the cables. See page 87 for details on checking continuity.

## *Power*

### **Problem: The NT132 System has no range**

- Step 1:** Check that all LEDs in the Reader are on. LEDs indicate that the Reader is receiving power.
- Step 2:** Check that the Reader has power. Information on providing power can be found on page 32.
- Step 3:** Use the multimeter to check voltage into the white terminal block.

## *ATU*

### **Problem: The ATU meter does not show any voltage**

- Step 1:** Tune the ATU. See page 73 for information.
- Step 2:** Check if the LEDs in the Reader are on. If not, ensure that the Reader has been connected to power. Information on providing power can be found on page 32.

- Step 3:** Ensure that the 10-wire header is seated properly in the ATU. See page 74 for a discussion of seating the header.
- Step 4:** Ensure that RG-58/U with 100% foil shield coverage is used.
- Step 5:** Ensure that the cable lengths are within specifications: no more than 80 feet between the Reader and the ATU and no more than 20 feet between the ATU and the antennas.
- Step 6:** Ensure that the connectors are well fastened and in good order.
- Step 7:** Ensure that TX is connected to TX and RX is connected to RX on the Reader, ATU and antennas.
- Step 8:** Check the continuity of the cables. See page 87 for details on checking continuity.

**Problem: The ATU meter oscillates but will not adjust**

- Step 1:** Ensure that the 10-wire header is seated properly in the Toggle Switch ATU. See page 74 for a discussion of seating the header.

**Road Loop Antenna**

**Problem: The Road Loop Antenna has no range**

- Step 1:** Ensure that RG-58/U with 100% foil shield coverage is used.
- Step 2:** Ensure that the cable lengths are within specifications: no more than 80 feet between the Reader and the ATU and no more than 20 feet between the ATU and the antennas.
- Step 3:** Ensure that the connectors are well fastened and in good order.
- Step 4:** Ensure that TX is connected to TX and RX is connected to RX on the Reader, ATU and antennas.
- Step 5:** Check the continuity of the cables. See page 87 for details on checking continuity.
- Step 6:** Check the Road Loop Antenna and the banana connector for continuity.
- Step 7:** Ensure that there is not a splice in the Road Loop Antenna.
- Step 8:** Ensure that the ATU is tuned properly. See page 73 for information.
- Step 9:** Ensure the 10-wire header is seated properly in the Toggle Switch ATU. See page 74 for a discussion of seating the header.

- Step 10:** Ensure the pot on the TX card in the Reader is turned to maximum output.
- Step 11:** Ensure that the LEDs on the PCB stack in the Reader are lit. Information on providing power can be found on page 32.
- Step 12:** Ensure the TX cable in the Reader is seated properly on the TX card.
- Step 13:** 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 Layout & Connecting to the ATU*, page 61, for further information on wrapping the Road Loop.

- Step 14:** Check environmental conditions:

No rebar under the Road Loop Antenna.

No power line interference directly above or below the Road Loop Antenna.

No other RFID systems operating nearby.

**Problem: The Road Loop activates Tags in another lane**

- Step 1:** Ensure that the Road Loop is laid out correctly in the lane – the longest side should go across the width of the lane.
- Step 2:** Ensure that the Road Loop is installed on the right-hand side of the lane.
- Step 3:** Reduce the transmit voltage by adjusting the pot on the transmit card in the Reader. See the chapter *Modifying Antenna Range: Adjusting the Transmitter Card*, page 77.

## ***Dipole Antenna***

**Problem: The Dipole Antenna has diminished or no range**

- Step 1:** Ensure that RG-58/U with 100% foil shield coverage is used.
- Step 2:** Ensure that the cable lengths are within specifications: no more than 80 feet between the Reader and the ATU and no more than 20 feet between the ATU and the antennas.
- Step 3:** Ensure that the connectors are well fastened and in good order.
- Step 4:** Ensure that TX is connected to TX and RX is connected to RX on the Reader, ATU and antennas.
- Step 5:** Check the continuity of the cables. See page 87 for details on checking continuity.
- Step 6:** Hook the Dipole Antenna directly to the Reader to test its range.
- Step 7:** Swap the nonfunctioning Dipole Antenna with another Dipole to check if it is a Dipole Antenna problem.

## ***Bar Antenna***

**Problem: The Bar Antenna has diminished or no range**

- Step 1:** Ensure that RG-58/U with 100% foil shield coverage is used.
- Step 2:** Ensure that the cable lengths are within specifications: no more than 80 feet between the Reader and the ATU and no more than 20 feet between the ATU and the antennas.
- Step 3:** Ensure that the connectors are well fastened and in good order.
- Step 4:** Ensure that TX is connected to TX and RX is connected to RX on the Reader, ATU and antennas.
- Step 5:** Ensure that the Bar Antenna has been positioned correctly. The Bar Antenna is for indoor use only.
- Step 6:** Ensure that the ATU is tuned. See page 73 for information.
- Step 7:** Check for continuity on the connectors, cable, loop and dipole. The loop should have continuity. The dipole should be checked from the end of the dipole to the terminal and should have continuity. Check to see if continuity goes from loop to BNC connector. Check Dipole continuity from terminal block to BNC connector. See page 87 for details on checking continuity.



- Step 8:** Check the 10-wire header within the Toggle Switch ATU to be sure that it is seated properly. See page 74 for a discussion of seating the header.
- Step 9:** Check the LEDs within the Reader to be sure they are on.
- Step 10:** Check the Reader to see if it is connected to a power source. Information on providing power can be found on page 32.
- Step 11:** Check to see if the 30-turn pot adjustment switch is turned to the maximum on the TX card in the Reader. See the chapter *Modifying Antenna Range: Adjusting the Transmitter Card*, page 77.
- Step 12:** Check for any environmental interference affecting the system performance.

### **Swing Frame Antenna**

**Problem:** The Swing Frame Antenna has diminished or no range

- Step 1:** Ensure that RG-58/U with 100% foil shield coverage is used.
- Step 2:** Ensure that the cable lengths are within specifications: no more than 80 feet between the Reader and the ATU and no more than 20 feet between the ATU and the antennas.
- Step 3:** Ensure that the connectors are well fastened and in good order.
- Step 4:** Ensure that TX is connected to TX and RX is connected to RX on the Reader, ATU and antennas.
- Step 5:** Ensure that the Swing Frame Antenna has been positioned correctly. The Swing Frame Antenna is for indoor use only.
- Step 6:** Ensure that the ATU is tuned. See page 73 for information.
- Step 7:** Ensure that the 10-wire connector is well seated in the Toggle Switch ATU. See page 74 for a discussion of seating the header.
- Step 8:** Check for continuity on the connectors, cable and transmit antenna. The transmit antenna should have continuity. See page 87 for details on checking continuity.
- Step 9:** Check the LEDs within the Reader to be sure they are on.
- Step 10:** Check the Reader to see if it is connected to a power source. Information on providing power can be found on page 32.
- Step 11:** Check to see if the 30-turn pot adjustment switch is turned to the maximum on the TX card. See the chapter

*Modifying Antenna Range: Adjusting the Transmitter Card, page 77.*

- Step 12:** Check for any environmental interference affecting the system performance.

## ***Wiegand Reader***

### **Problem: The Wiegand Reader is not working**

- Step 1:** Ensure that the Wiegand Control Panel complies with the SIA 26-bit standard.
- Step 2:** Ensure that the internal RX and TX cables are properly seated.
- Step 3:** Ensure that the RS-232 cable is properly seated.
- Step 4:** Ensure that the LEDs on the PCB card stack are lit. All but the Transmitter card should have lit LEDs.
- Step 5:** Ensure that the Transmitter card is chirping.
- Step 6:** Verify the jumper settings on the Unilon cards against the information in the manual. See the section *Unilon Reset Buttons*, page 45.
- Step 7:** Ensure that the Reader has power. Information on providing power can be found on page 32.
- Step 8:** Ensure that the Wiegand cable to the terminal block is properly seated.
- Step 9:** Ensure that the wires are connected correctly to the Wiegand control panel.

## ***Serial Reader***

### **Problem: The Serial Reader is not working**

- Step 1:** Verify the jumper settings on the Unilon cards against the information in the manual. See the section *Unilon Reset Buttons*, page 45.
- Step 2:** Ensure that the internal RX and TX cables are properly seated.
- Step 3:** Ensure that the Transmitter card is chirping.
- Step 4:** Ensure that the RS-232 cable is properly seated.
- Step 5:** Ensure that the LEDs on the PCB card stack are lit. All but the Transmitter card should have lit LEDs.
- Step 6:** Ensure that the Reader has power. Information on providing power can be found on page 32.

- Step 7:** Ensure that the communications port settings on the serial device are correct: 4800 baud, eight data bits, no parity, one stop bit, no flow control.

### ***FTT Reader***

**Problem: The FTT Reader is not working**

- Step 1:** Ensure that the Transmitter card is chirping.
- Step 2:** Verify the jumper settings on the Unilon cards against the information in the manual. See the section *Unilon Reset Buttons*, page 45.
- Step 3:** Ensure that the internal RX and TX cables are properly seated.
- Step 4:** Ensure that the RS-232 cable is properly seated.
- Step 5:** Ensure that the LEDs on the PCB card stack are lit. All but the Transmitter card should have lit LEDs.
- Step 6:** Ensure that the Reader has power. Information on providing power can be found on page 32.
- Step 7:** Ensure that the FTT network wires are properly connected.

### ***Serial Gateway***

**Problem: The Serial Gateway is not working**

- Step 1:** Ensure that the FTT network wires are properly connected.
- Step 2:** Ensure that power is provided to the Serial Gateway. See page 31 for information on how to apply power.
- Step 3:** Ensure that the communications port settings on the PC are correct: 2400 baud, eight data bits, no parity, one stop bit, no flow control.

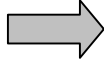
### ***Tags***

**Problem: The Tags are not being picked up by the system**

- Step 1:** 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.

**Step 2:** 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.

# Appendix A: 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)
- 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:** Crimp with appropriate tooling.
- Step 4:** 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 5:** Slip the crimp sleeve in place, butting the flange against the connector body.
- Step 6:** Crimp with the appropriate tool.
- Step 7:** Test for continuity of the inner conductor from connector to connector. Test for continuity between connectors. Test for insulation between inner conductor and connectors.

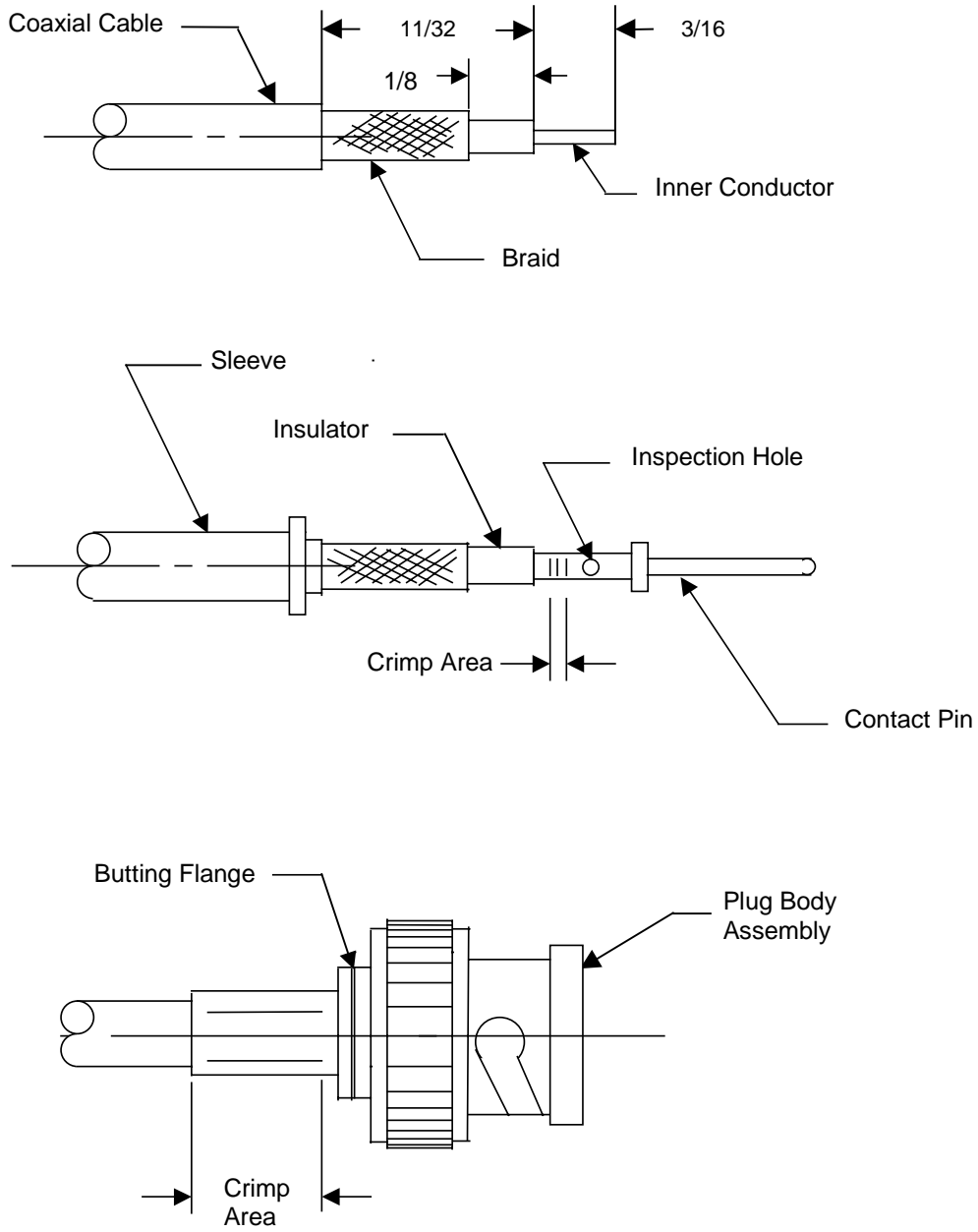


Figure 38 Dimensions for Coaxial Cable Termination

# Appendix B: Specifications

## *Reader*

### **Dimensions**

Height:	8 inches
Width:	8 inches
Depth:	4 inches
Weight:	3.5 pounds (slight variance between models)
Input Current:	24V DC at 700 mA. Voltage range: 21.60V DC – 28.80V DC
Frequency:	Transmit: 132 kHz Receive: 315 MHz

### **Connectors**

- Female BNC - TX (to the ATU)
- Female BNC - RX (to the ATU)
- DB9 Female RS-232 (to the computer/device)
- Ground lug
- Internal terminal block (for power and Wiegand)
- Internal Free Topology Transceiver terminal (FTT Readers only)
- Internal relay terminal (FTT Readers only)

### **Power**

#### *Adapter*

110 AC to 24V DC - plugs into a 110 AC outlet and supplies 700 mA of current to power the Reader which draws 500 mA and a device such as a door strike (FTT Readers only) that draws up to 200 mA.

Input:	120V AC, 60 Hz
Output:	24V DC, 700 mA nominal
No load:	37.5V DC

## ***Serial Gateway***

### **Dimensions**

Height:	3 inches
Width:	5 inches
Depth:	2 inches
Weight:	1 pound
Power:	24V DC at 700 mA

### **Connectors**

- External DB9 Female RS-232 (to the computer)
- External power connector
- Internal Free Topology Transceiver terminal
- Internal relay terminal (not used)

### **Power Adapter**

Input:	120V AC, 60 Hz
Output:	24V DC, 700 mA nominal
No load:	37.5V DC

## ***Antenna Tuning Unit (ATU)***

### **Dimensions**

Height:	5 inches
Width:	5 inches
Depth:	3 inches
Weight:	Toggle Switch version - 1.2 pounds Jumper version - 1 pound

### **Connectors**

- Female BNC - TX (in from transmitting antenna)
- Female BNC - RX (in from receiving antenna)
- Female BNC - TX (out to Reader)
- Female BNC - RX (out to Reader)



## **Antennas**

### **Road Loop and Dipole Antenna System**

#### *Road Loop Antenna*

##### Dimensions

Length:	4' X width of the road loop
Gauge:	18
Weight:	Approx. 1 lb per 10 feet of wire
Frequency:	Transmit: 132 kHz
Coverage:	16 – 24 feet for a 4' x 6' loop ***; can be much greater with larger loops

##### Connectors

- Dual binding post to male BNC (to ATU)

#### *Dipole Antenna*

##### Dimensions

Length:	23 inches
Diameter:	1 inch
Weight:	0.8 lbs.
Frequency:	Receive: 315 MHz
Coverage:	30 feet

##### Connectors

- Female BNC (to ATU)

### **Bar Antenna System**

#### *Dimensions*

Length:	38 inches
Width:	5 inches
Depth:	1 inch
Weight:	2.3 pounds
Frequency:	Transmit: 132 kHz Receive: 315 MHz

Coverage: 8 –12 feet typical (typical)

*Connectors*

- Terminal - TX (to ATU)
- Terminal - RX (to ATU)

**Swing Frame Antenna System**

*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: Transmit: 132 kHz  
Receive: 315 MHz

*Connectors*

- Female BNC - TX (to ATU)
- Female BNC - RX (to ATU)

**Tag**

*Dimensions*

Length: 3.4 inches  
Width: 2.2 inches  
Thickness: 0.25 inch  
Weight: Less than 1 ounce  
Frequency: Transmit: 315 MHz  
Receive: 132 kHz  
Power: Embedded lithium battery

# Customer Support Questionnaire

The following questions need to be answered before Axxess Inc, Technical Staff will be able to assist you. Please have the answers to these questions before you contact an Axxess Inc, customer service representative at (800) 577-6080 and fax a copy to (972) 407-9085.

## General

Describe the problem with the entire system: \_\_\_\_\_

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What type of Axxess Inc, NT132 system did you purchase? (Vehicle Control, Asset Management, Personnel Management or a combination) What Axxess Inc, components did you purchase?

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## Tags

Version number (printed on bezel) \_\_\_\_\_

How/Where are the tags mounted? \_\_\_\_\_

## Reader

What type of Reader(s) do you have?                      Serial                      Wiegand                      FTT-10

Serial number(s) (printed under the lip of the Reader by the white terminal block) \_\_\_\_\_

Version number (found on the inside cover of Reader): \_\_\_\_\_

What are the user-configurable settings? (Reader ID number, Tag type read) \_\_\_\_\_

Are the lights on the PCB stack lit in the Reader?    Y    N

Is the Reader making a chirping noise?                      Y    N

## ATU

Do you have any voltage or lights on the ATU?                      Y    N

If there is voltage, what is the voltage? \_\_\_\_\_                      If there are lights, how many are lit? \_\_\_\_\_

**Antennas**

What type of Antenna(s) do you have?      Bar      Swing Frame      Road Loop & Dipole  
Other      Dimensions \_\_\_\_\_

Are the antennas connected to the system?      Y      N

How many feet away from the edge of the antenna is the LED Test Tag before it lights? \_\_\_\_\_

Do you have multiple transmitting and receiving antennas in close proximity to each other?      Y      N      If yes, how many? \_\_\_\_\_

**Additional Equipment**

What third-party equipment is connected to the entire system? Give brands and model numbers.

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Who is installed the NT132 system? \_\_\_\_\_

**Attach a rough sketch of the facility noting the placements of the Antennas, Reader, third-party controllers, cable, distances and any other pertinent data.**

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