

**433.92 MHz**

# ***Operations Manual***

**Reader family ACT.T.L**

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The information contained in this document is constantly subject to revision (see Rev. number at bottom of page).

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## **1. Product Description**

### **1.1 Scope**

This document describes the physical characteristics, functional requirements and software features contained in the ActiveRFID 433 MHz product. It lists the product specifications, as well as environmental and operational criteria.

### **1.2 Purpose**

The purpose of this document is to describe the ActiveRFID features, functions and options. Included in this document will be details on the installation, the operations and any other special considerations necessary to setup and operate the product.



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## **2. Product Operations**

### **2.1 Hardware Description**

This is a TTO (Tag talk only) Radio Frequency Identification system whereby the ActiveRFID Tag transmits its data at factory set intervals to the Reader.

### **2.2 Reader**

The Reader provides RF to digital translation of the signal produced by the ActiveRFID RF Electronic Transponders, referred to herein as "Tags", when placed in the proximity of a Reader. The Reader detects and filters data bits emitted from compatible RF Tags then converts bits into the associated computer format of ASCII RS232/RS485, Wiegand, or Ethernet communications protocols. Advanced error detection algorithms provide error-free operation.

Unlike similar systems, the Reader does not need an external Antenna, although external Antennas are available to increase range. The PCB etched Antenna receives the Tag's transmission. This saves greatly in installation time and costs. The Reader can also operate on variable power sources of 8vdc to 28vdc. Connection to the Reader is made using low-cost shielded twisted pair cables (22 AWG up to 21 feet, above 21 feet 16 AWG is recommended) and easy to use angle entry screw terminal connectors further simplify installation.

### **2.3 Tags**

Standard Tags transmit their data signal in 1 of 2 standard time intervals, 1.5, or 2.0 seconds. The overall time of Tag transmission is 4 milliseconds. Tags can be provided timed to transmit at any time interval required. Faster time intervals lessen Tag battery life while longer intervals lengthen Tag battery life. Talk to your ActiveRFID contact for more information.



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### 3. Quick Start Hardware Installation Guide

#### 3.1 Mounting the Reader

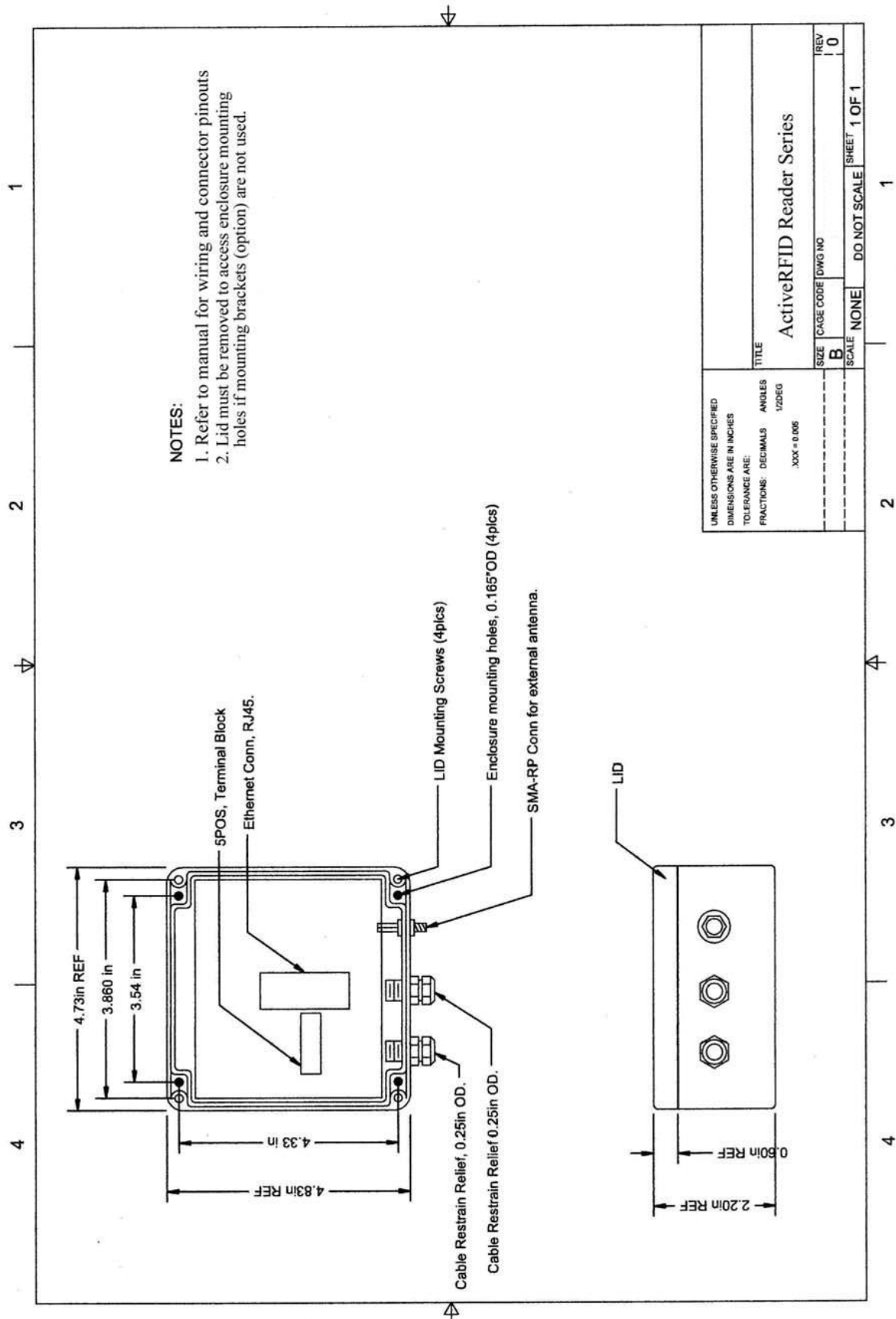
The Reader contains 4 mounting holes accessible by removing the lid. Note that these mounting holes are located just to the inside of the 4 lid screws yet outside the lid gasket trace such that the integrity of the IP67 housing for watertight purposes is not compromised. The diameter of the mounting screw holes is 0.165" so be sure to use a screw of equal or lesser diameter. For best range performance, the Reader should be oriented in a standing position, such that the PCB is perpendicular to the ground as depicted below. If the Reader is to be mounted outside and exposed to various weather conditions, the cable glands should be oriented down in order to prevent ingress of water from rain or snow. Also cables should be coiled to create a drain loop below the Reader. What the Reader is mounted to makes little difference, metallic or non-metallic, concrete, wood, metallic siding or a metal pole. Since most applications require the Reader to be tuned to a specific range, the tuning functions will compensate for the environment in which the Reader is placed. It should be noted that this is an IP67 rated box, however once the cable glands were added for cabling entry, the box is no longer watertight or IP67 rated. To return the box to a watertight seal, apply Plumber's putty or plumber's tape to the cable glands after wires are inserted but prior to re-tightening the cable glands.

Note: It is important to not feed both the power and communications lines through a single cable gland as the gland will not tighten down well enough to maintain watertight integrity.





#### 4. ActiveRFID Reader Drawing







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#### **4.1 Cabling the Reader - Power**

The Reader is delivered with two power connection options, either with a quick connect single male pole jack mounted in the Reader in place of the first cable gland shown above, or with the cable gland only. Users ordering the quick connect jack probably also ordered the AC adaptable power supply which has a mating connector. Users providing their own power will need to loosen the first cable gland, insert their power wiring, apply Plumber's Putty or Plumber's tape and then re-tighten the cable gland. See page 16 for power and wiring specifications, and the illustrations on pages 17, 18 and 19 for terminal connections.

#### **4.2 Cabling the Reader - Communications**

Wiegand – Use the second cable gland (center) to install Wiegand wiring and see the illustrations on pages 17-19 for terminal connections.

Serial Users – The Reader is delivered with two connection options, either a 9 PIN serial connector externally cabled to the box running through the second cable gland, or with bare pigtailed wiring (tinned) such that custom lengths of your own wiring can be added.

Ethernet users – An RJ45 connector is located on the inside of the Reader box at the center. It was not possible to flush mount the connector in the side of the box for quick connection and still preserve the watertight integrity. Users must run Ethernet cabling through the second cable gland then crimp or apply their own RJ45 connector.

#### **4.3 Mounting an External ANT-CP Flat Panel Directional Antenna**

To cable the Reader to the external Antenna, all cabling and connections are provided. Simply use the farthest right most connector on the Reader depicted in the photo above and follow the directions on how to bypass the internal Antenna on page 20. Go to Appendix A on page 34.



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## 5. Quick Start Operations Guide

Note1: Although a USB port exists for communication with the Reader for initial setup, it is not necessary for users of Serial and Ethernet to install a USB drive and use the USB port. You can if you like, but the same communications and setup can be accomplished via serial or Ethernet ports. Wiegand users must use the USB port. There is a separate Quick Start Guide for Wiegand users.

Note2: This Quick Start section assumes the Reader is fully cabled and ready for operation. If not, please cable the Reader using the instructions in this manual then return to this section.

### 5.1 Reading Tags

Simply plug the power supply into the Reader and into an AC outlet. At this point you will see a red LED in the upper left corner of the PCBA illuminate solid, indicating power is on. If Tags are within range you will hear a beep each time a Tag is read and the red LED will blink off and then back on with each successive read. Congratulations, you have just successfully installed the Reader and are achieving Tag reads. If there is more than 1 Tag within range all should be reading successfully.

### 5.2 Interfacing the Reader to your PC – Serial (RS232, RS422, RS485 & USB)

#### **5.2.1 HyperTerminal**

Windows 7 and Windows Vista operating systems do not provide HyperTerminal. It is possible to download HyperTerminal. For all other Windows operating systems, HyperTerminal is provided as standard and executing the link provided will bring a HyperTerminal screen up with all the Reader's factory default settings preset in HyperTerminal Properties except for the appropriate COM port. Since we do not know your COM port, we cannot predefine this for you.

With the Reader plugged into your PC's COM port, apply power to the Reader and you will see a startup message similar to this:

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(0180)-v.1.07

Tags should begin reporting to your HyperTerminal screen and the Reader should begin beeping (reading Tags). If nothing appears on your screen, change your COM port. In order to do so, select the Disconnect icon, then File, Properties, pull down and select the correct COM port, select OK, then select the Call icon. You must disconnect and reconnect in this fashion each time in order for HyperTerminal to recognize the change of COM port.

### 5.3 Interfacing the Reader to your PC – Ethernet

This is a standard TCP/IP Ethernet device employing a Lantronix XPort Ethernet modem. It will be necessary to load a program termed DeviceInstaller (included in a separate WinZip file) in order to setup your preferred properties.

#### **Specifications:**

Protocol: TCP/IP

Connectors: RJ45

Serial Baud rate: 10 Base-T or 100 Base-TX (auto-sensing)

Maximum cable run: 2000'

### 5.4 Configuring the XPORT with DeviceInstaller

Open the zip file named DeviceInstaller that should have been provided to you. This program will assist you in the setup of the Ethernet Interface. Unzip and extract the files contained to your PC. Go to the folder you extracted the files to and execute the setup.exe file. Note; if you receive the following message:



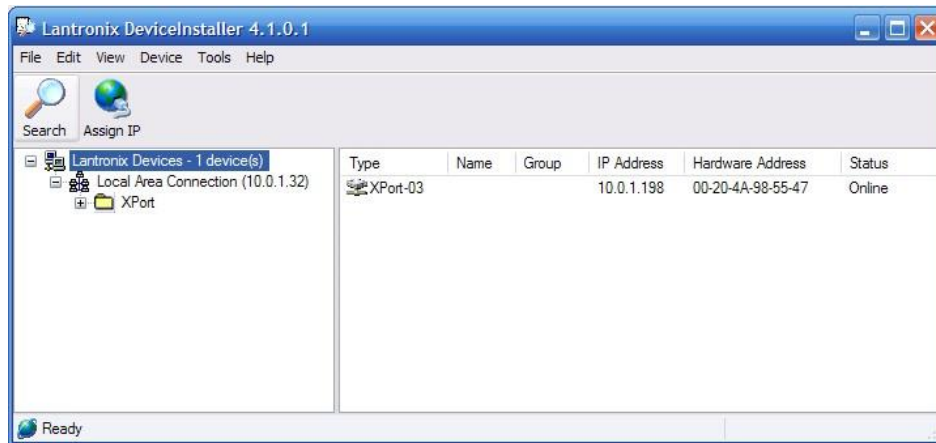
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## Windows Installer Loader

This setup requires the .NET Framework version 1.1.4322. Please install the .NET Framework and run this setup again. The .NET Framework can be obtained from the web. Once the download is found you will be prompted, "Would you like to do this now?"

Say yes and download the file to the same folder you chose for the DeviceInstaller then execute the .Net Framework setup.exe file you just downloaded and follow the prompts. Then go back to original setup.exe file for DeviceInstaller and follow the prompts to install the files in a Lantronix folder under Programs.

Connect the Reader to an Ethernet port, not your laptop or PC, but the same network your laptop or PC is connected, then power the Reader. Verify the light on the left of the Ethernet connector is either solid orange or solid green. Go to your Programs folder under Lantronix and execute the Application File "DeviceInstaller.exe." Then click the search button and wait for DeviceInstaller to find your device.



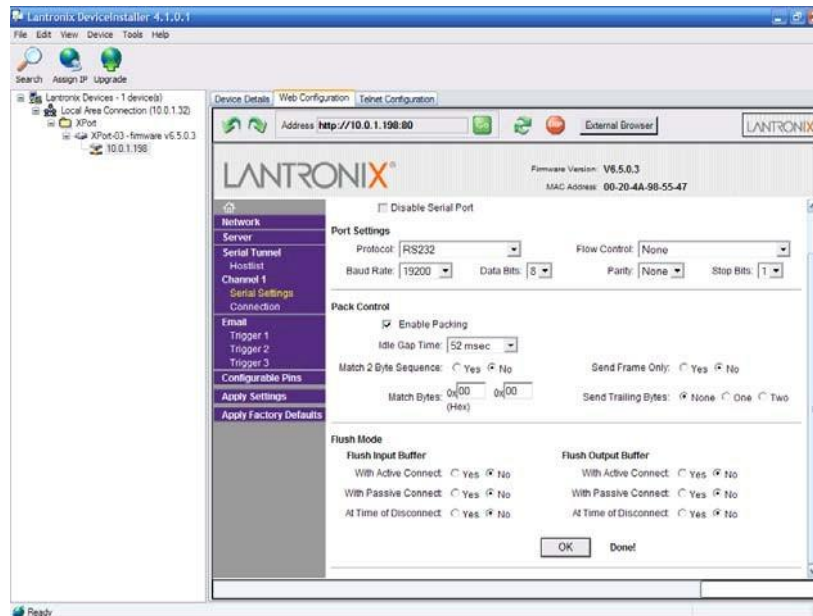
If your device is found, a folder named XPort will appear; expand it to expose the firmware version and expand it one more time to expose its IP address. Navigate to the IP ADDRESS, select it. 3 tabs will appear on the right. Device Details, Web Configuration, and Telnet Configuration; select Web Configuration and click the green button labeled GO. A password window will pop up. Leave it blank and click OK.



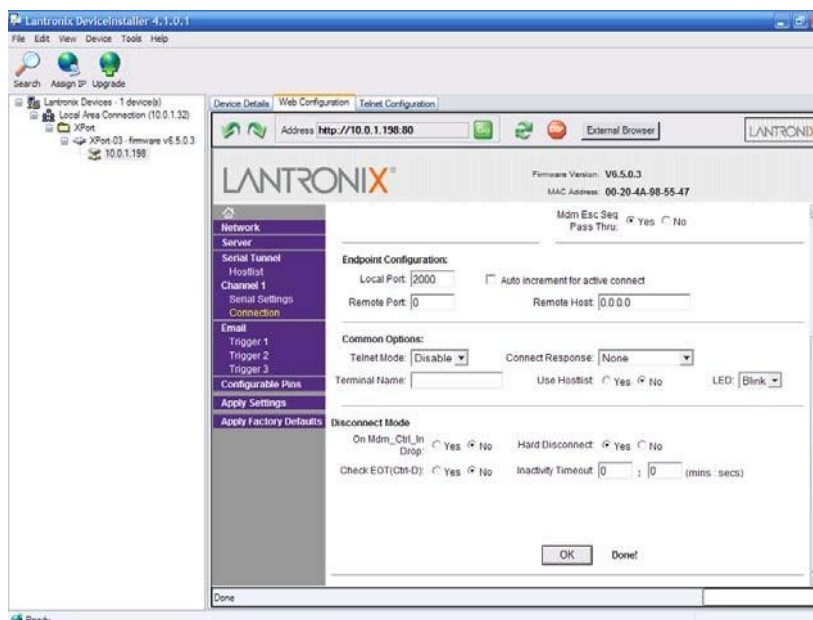


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Select Serial Settings, change the baud rate to match that of the serial port (default 9600), check enable packing, select 12msec idle gap time. Upon completion the next screen should look like that below. Scroll down and click the OK button. While there is still a “Done!” label next to the OK button select Connection on the left to change pages.



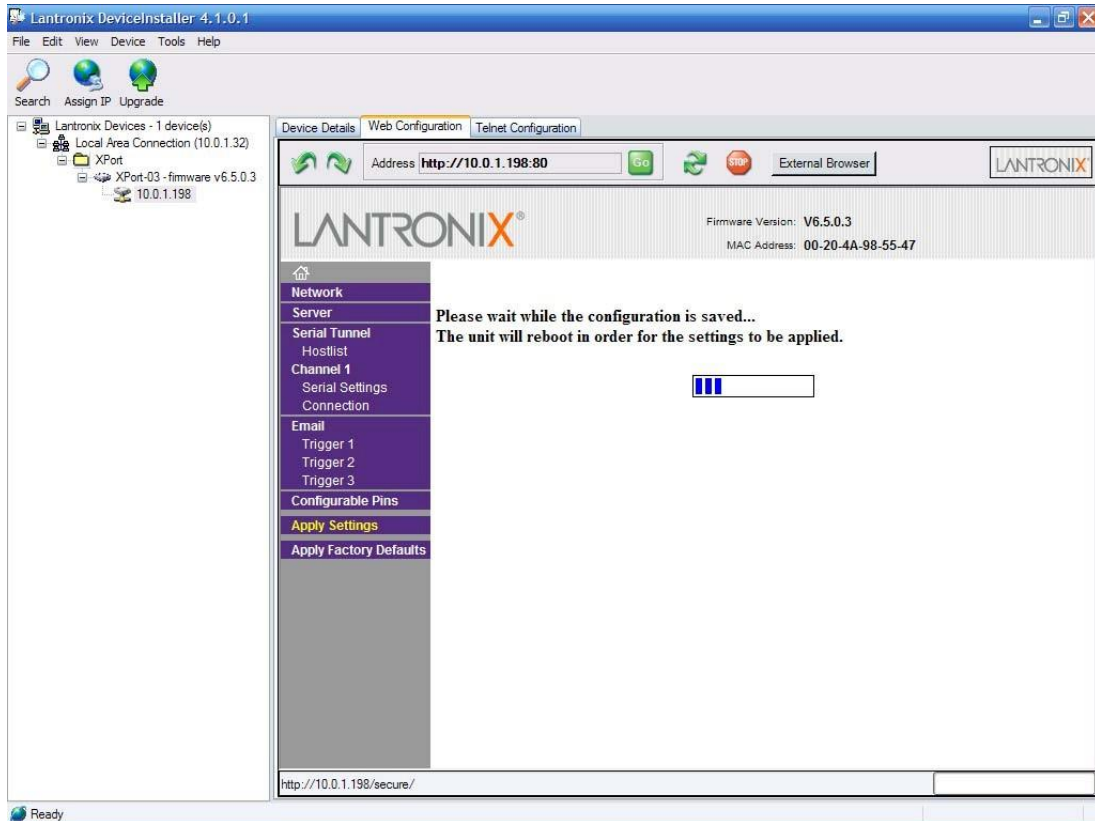
Change local port to 2000 and click OK, while the “Done!” is still present by the OK button click on the Apply settings link on the left.





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This is what it should look like while the settings are being applied.



Once the Reader is done updating the settings, turn the unit off for 5 seconds and then back on. Wait until the light on the left of the Ethernet connector is stable and solid and then go back to the DeviceInstaller program and click search. Follow the same steps you used to change Serial and Connection settings, however this time do not click OK. You are simply verifying the changes have taken effect. Setup is finished. If you like, you can use HyperTerminal to test communications with the reader.

#### 5.4.1 HyperTerminal & Ethernet

Open a HyperTerminal session (Start, Programs, Accessories, Communications, HyperTerminal). Name your new connection and choose an icon. On the last pull down menu "Connect using:" select "TCP/IP Winsock." The next box will prompt Host Address, enter the TCPIP address of the Reader and under Port Number enter 2000, then select the Settings tab, then ASCII Setup. Check the box "Echo typed characters locally" then select OK and save. You should not only be able to see Tags reads reporting to your screen but should be able to issue commands to the Reader as well. Test this by entering open square bracket and close square bracket which should result in a question mark being returned.



## 6. Setting up the Reader

This section contains information for configuring the Reader's power and signal cabling. Power and communications are provided through a cable gland at the bottom of the Reader. To access the inside of the Reader assembly, simply remove the 4 screws at each corner of the Reader housing's lid.

Following installation of all Readers wiring, the lid should be reinstalled and the cable glands tightened. For further moisture integrity, Plummer's tape or putty can be applied to the cable glands.

### 6.1 USB Port

In general, cables have only plugs, and hosts and devices have only receptacles. Hosts almost universally have type-A receptacles, and devices one or another type-B variety. Type-A plugs mate only with type-A receptacles, and type-B with type-B; they are deliberately physically incompatible.



#### 6.1.1 Wire Specifications

The maximum length of a standard USB cable (for USB 2.0 or earlier) is 5.0 meters (16.4 ft). The primary reason for this limit is the maximum allowed round-trip delay of about 1,500 ns. If USB host commands are unanswered by the USB device within the allowed time, the host considers the command lost

#### 6.1.2 USB Connector

Plug the Type A plug from one end of the cable into the Type A connector located on your computer. Plug the Type B plug from the other end of your cable into the Type B connector located on the Reader PCBA (see picture below).

#### 6.1.3 USB Driver Installation

Note: Serial and Ethernet users need not use the USB connection to setup Reader however it is an option prior to having wired the serial or Ethernet connections. Once you plug in the USB cable to both the computer and the ActiveRFID Reader, you now power up the computer. Once the computer is fully powered and connected to the Reader via the USB port, power up the ActiveRFID Reader. Your computer will then display that new hardware is found and Figure 1 below will be displayed. Select the "Yes, this time only" option then press "Next>" to continue. At this point Figure 2 should be displayed and you then select "Install the software automatically (Recommended)" then press "Next>" to continue.



Figure 1



Figure 2





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The software will then start looking for the appropriate drivers for the USB device and Figure 3 will then be displayed (which may also say “USB Serial Port”). Once the Driver is found and installed, Figure 4 will then be displayed, showing that the driver is installed properly.

If your computer cannot find the necessary USB driver, instead of searching the internet for the appropriate driver, we have included both 32 bit and 64 bit USB drivers to you either on CD ROM or via email. To find out whether your computer is operating on 32 or 64 bits, from your desktop right click on My Computer and select Properties. If there is no My Computer icon on your desktop, go to your Control Panel via the Start menu and select System. Either way, in figure 2 below you will need to choose “Install from a list or specified location”, choose the location you saved the USB Drivers we supplied to you, and continue.



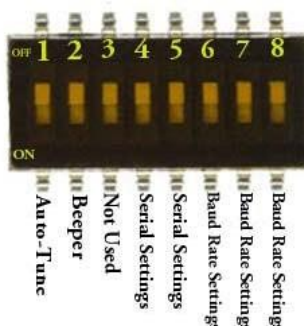
Figure 3



Figure 4

## 6.2 I/O PCBA Dipswitch Settings

There are a series of 8 switches on the left hand side of the Reader PCBA, as depicted below. All three I/O PCBA's, Wiegand, Serial and Ethernet, use this 8 position dipswitch to set and control Reader functions. Switch positions are exactly opposite of those numbered on the device. When a switch is up, it is considered on, and off when it is positioned down.



1. Auto Range Tuning – There are two methods of Auto Range Tuning, one via software command as discussed on page 29, and one via use of this switch. If you are in possession of a Master Range Tuning Tag, this is a Tag programmed with all 5's, you can position that Tag the required distance from the Reader and then with power on the Reader move switch 1 to the on position and then back down to the off position. The Reader will then begin to cycle itself through levels of db power until it has reached a level sufficient to read the Master Range Tuning Tag. In layman's terms, the Reader is stepping out several feet at a time in distance until it reaches the range of the Master Range Tuning Tag, then the Reader will stop and set itself for this



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distance (db gain actually). This process can be immediate or take several minutes to complete. An audio tone will indicate the process has completed, the Reader will return to normal operations and Tags within range will begin to be read. Note: Environments differ in the amount of surrounding metal and sources of interference. Tuning a Reader to 10' in a lab environment may not equate to 10' of tuned range when installed elsewhere. It is always optimal to tune the Reader in its actual environment.

2. Beeper – Position switch #2 up to turn the beeper (audio indicator) off, and down for the beeper to remain on.

Switch positions 4 through 8 are used to set communications settings and should be self-explanatory given the tables below.

3. Not used.

4. Serial settings

5. Serial settings

SW4	SW5	RESULT
OFF	OFF	RS232
ON	ON	RS485
ON	OFF	RS422

6. Baud rate settings

7. Baud rate settings.

8. Baud rate settings.

SW8	SW7	SW6	BAUD RATE
OFF	OFF	OFF	1200
ON	OFF	OFF	2400
OFF	ON	OFF	4800
ON	ON	OFF	9600
OFF	OFF	ON	19200
ON	OFF	ON	38400
OFF	ON	ON	57600
ON	ON	ON	115200

### 6.2.1. Power Requirements

The Reader can be powered from regulated, linear, or switching power sources having the characteristics defined in the Specifications section of this document (7 to 24 volts). The Reader should be operated from a grounded supply that has the same ground reference as the host computer. The positive power connection and the ground connection are applied to the Reader at the left most terminal block, just to the right of the Dipswitches block, (see Figure 9 below).

### 6.2.2 Wire Specifications

Shielded (22 AWG for communication cable length up to 25' and 16 AWG for communication lengths beyond 25') insulated, stranded wire is recommended and all wires should be stripped approximately 3/8 inches and tinned. Whatever cable is selected, it should fit within the range allowed by the cable gland providing wire access to the Reader. The cable gland will accommodate diameters of .090 to .265 inches.





### 6.3 Wiegand Reader

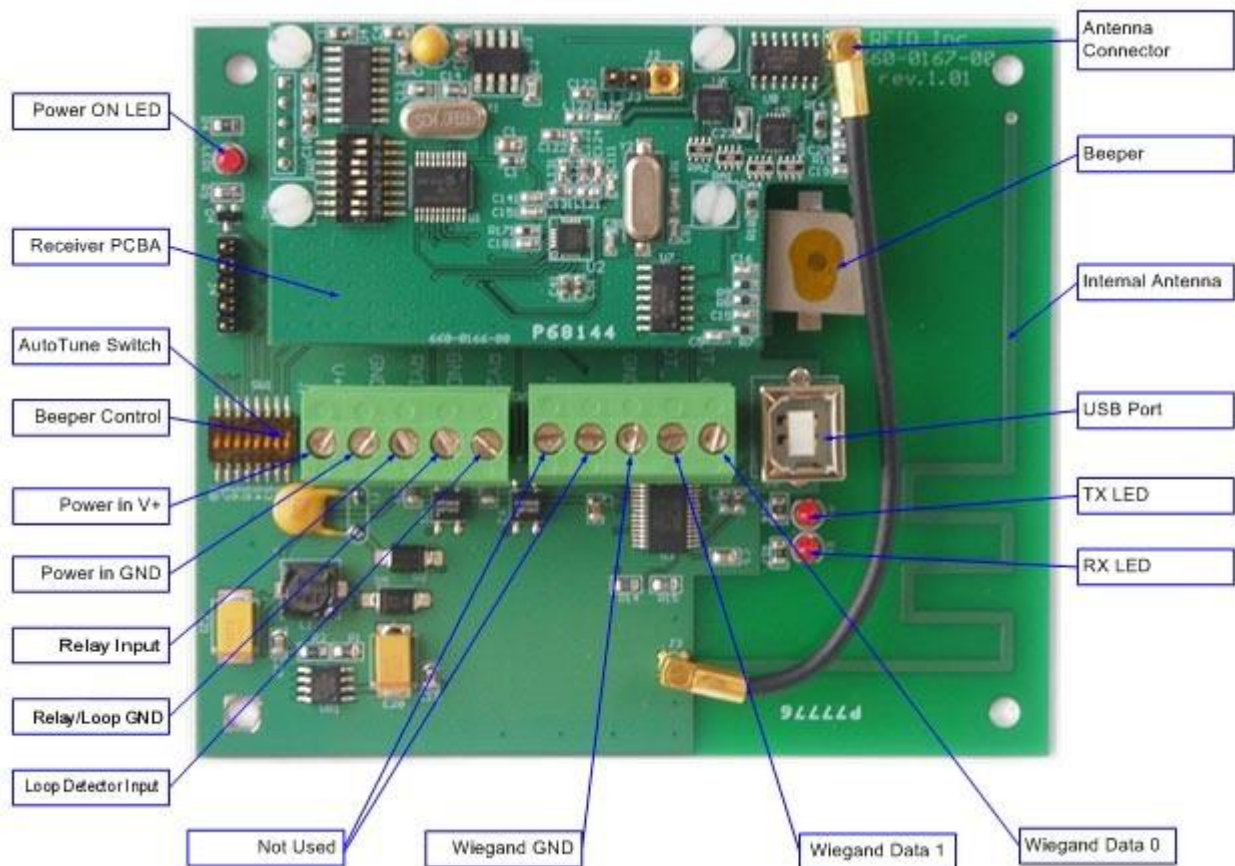


Figure 9

#### 6.3.1 Wiegand Output

This is a 26 bit standard Wiegand protocol with Data 0 and Data 1 normally resting at zero voltage and moving to +5 volts on logic 0 or logic 1. The single line voltage rests at 2.5 volts and pulses to +5 volts for logic 1 and down to 0 volts for logic zero. The Reader is defaulted to a bit length in time of 30 microseconds and bit interval in time of 150 microseconds, which are also the minimum times available. The maximum bit length is 100 microseconds and the maximum bit interval is 1000 microseconds. These settings are held in non-volatile memory. See the Programming Section of this document for modifying these settings. For wiring the Data 0 and Data 1 Wiegand wire to the Reader, see picture above.



#### 6.4 Serial Reader (RS232/RS422/RS485)

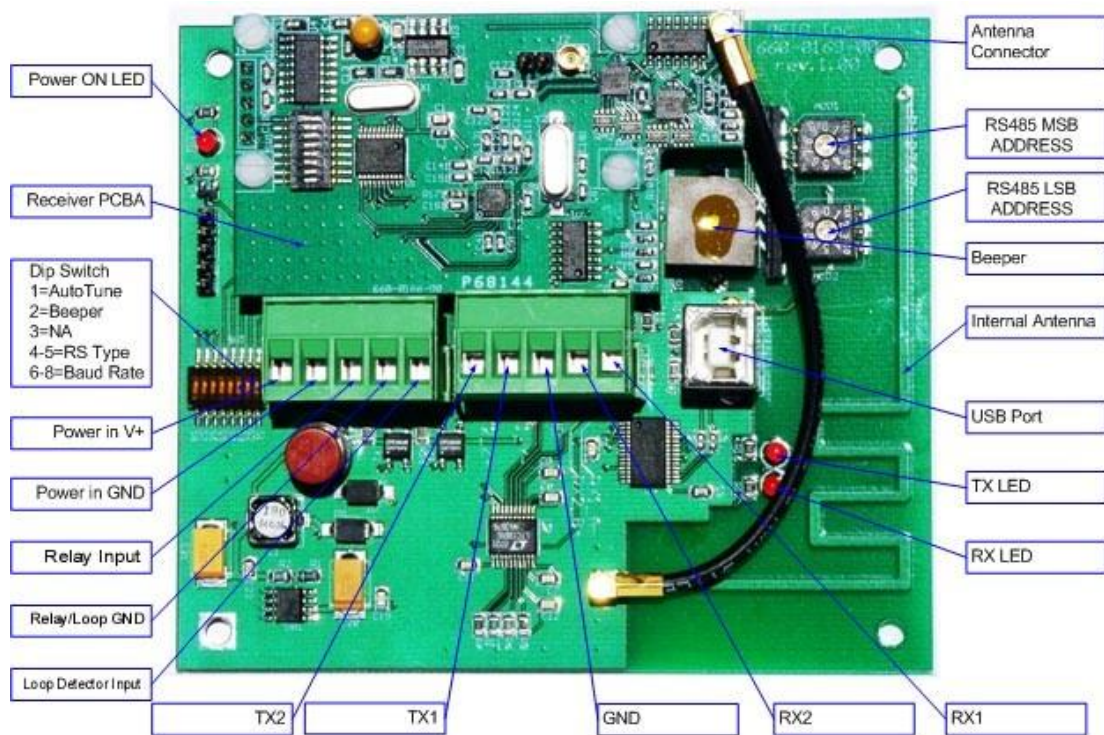


Figure 10

##### 6.4.1 Setting RS485 Reader Addresses

Since the architecture of an RS-485 enabled system dictates linking Readers together in a multi-drop single network channel, it is necessary to assign the Reader an address thus allowing your controller or host computer to know with which Reader it is communicating. This is accomplished by use of the RS485 Switches 1 & 2 in the upper right hand corner of the PCBA, see photo above (Figure 10). These switches are two black squares with white adjustable centers. The white centers have an arrow thus when turned point to a specific number on the black square. The first square (top) designates the first numerical address character when addressing from 0 to 31 while the second square (bottom) designates the second numerical address character. Thus placing the top block's center arrow to 3 and the bottom block's arrow to 1 designates an address 31. Valid addresses range from 00 to FF.



### 6.5 Ethernet Reader

This is a standard TCP/IP Ethernet device employing a Lantronix XPort Ethernet modem. It will be necessary to load a program termed DeviceInstaller (included on the CD) in order to setup your preferred properties. Please see page 10 for instructions on how to load that program.

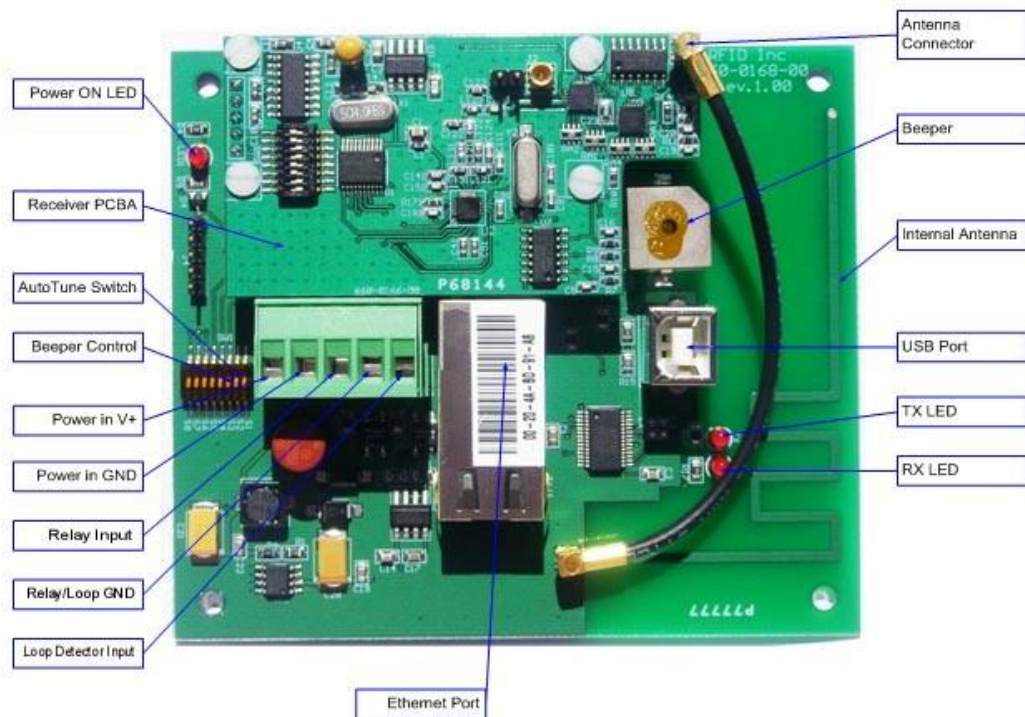


Figure 11



## 7. External Hardware Guide

### 7.1 External Antenna

If an external Antenna is required for more read range or a directional Antenna (circular polarization) is needed, an external Antenna can be selected separately, see Appendix A beginning on page 34. Cable length between Antenna and Reader is found in the ordering table and a standard mounting bracket is included. To connect an external Antenna, simply connect it to the external port at the bottom of the housing, then disconnect the small 4" internal Antenna cable from the smaller of the two PCBA's and connect the small 4" cable that leads to the external Antenna port. Leave the disconnected 4" Antenna cable connected to the larger PCBA in case it is needed in the future, and tape off the end to prevent a short circuit. See figures 9, 10 or 11 beginning pages 17, 18 and 19.

### 7.2 Relay Driver

There is a NO (normally open) sinking silicon relay available which is connected to ground, hence wire our relay driver to your device's negative connection, see the left portion of Figure 15 below. Your device can have a maximum of 100VDC @ 500mA. The relay can be enabled or disabled independently with the [7] and [8] commands (by default the relay is enabled). An enabled relay will close (activate) whenever a Tag is read and will remain active until its timer expires then open (deactivate). The default timer setting is 5 seconds. The timer can be set (see J command on page 31) from 00 to 99 seconds. The relay can also be triggered to close manually with the [9] command. Do not confuse this with enabling the relay. The [9] command simply triggers the relay for one timer cycle whether the relay has been enabled or not.

### 7.3 Loop Detector

Although termed a Loop Detector input for use in parking applications, this input can be used by any peripheral, see the right portion of Figure 15 below. Wire a peripheral output to this input, the peripheral must be able to take GND from our Reader's GND connection directly to the left of this input and apply it to the loop detector input to enable reading. All three operating modes [S], [D], and [P] will perform normally however command [TA] is disabled. See pages 26, 27 and 28 for these commands.

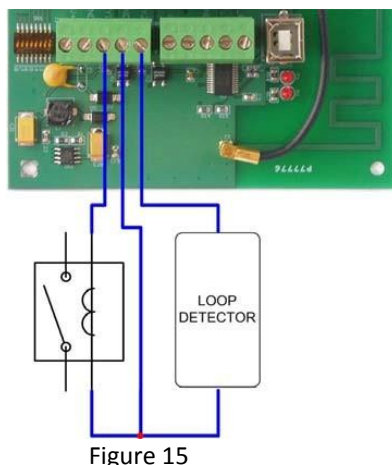
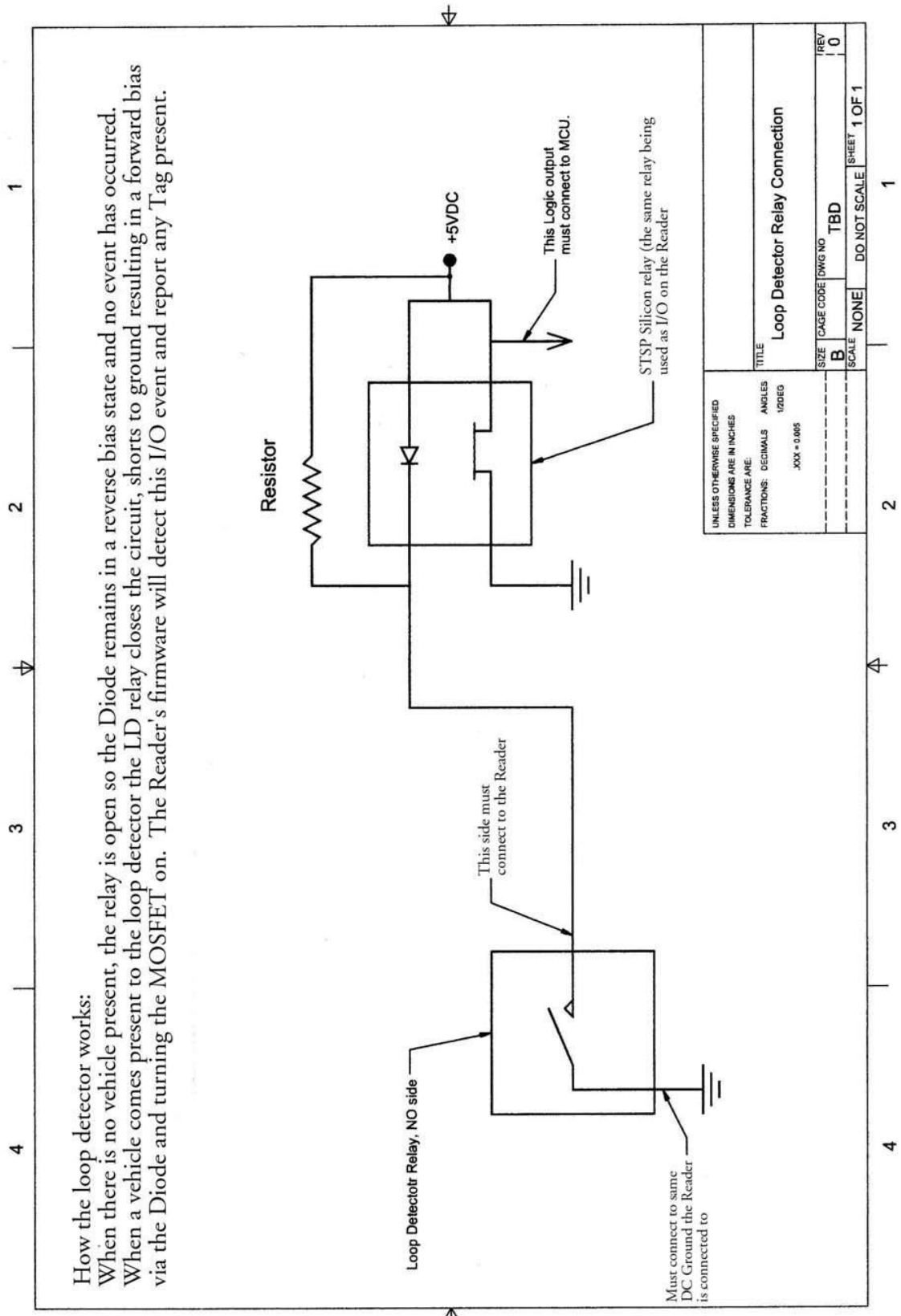


Figure 15



## 7.4 Loop Detector Drawing





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### **7.5 Tag Operating Specifications**

Power Supply	3V Replaceable Battery
TX Frequency	433.92 MHz
Output Power	1 mW default 10mW max
Transmission Range	1' up to 500'
Transmission Rate	2.01 seconds
Transmission Time	590 microseconds
Battery Life	3 years
Operational Temperature	-40° F to +185° F
Humidity	5% to 90%
Material	UV Stabilized (IP65)
Approvals	FCC approval
Extra Features	Anti-Collision algorithm allows reads of multiple Tags simultaneously Optional Tamper detection and Movement Sensor Battery Removal Alarm, Tag warranty issue Low Battery flag sent to Reader & visual to user (LED on AT-CS Tag) Field programming to special OEM Partners RoHS Compliant

### **7.6 Reader Operating Specifications**

RX Frequency	433.92 MHz
RF Input	Internal etched / External antenna optional
Sensitivity	-95 dBm MAX
Bandwidth	541 kHz
Operational Temperature	-40°F to +158°F
Housing Size	4.75" x 4.75" x 3.125"
Weight	13 oz
Max Current	100 ma @ +12VDC
Supply Voltage	+8 to +28vdc
Adjustable read range	3' to 600' plus
Output Options	USB 1.0/2.0 Serial RS- 232/485 Wiegand 26/32 bitç Ethernet LAN
Extra Features	UL 1 NO relay adjustable to 99 seconds Loop Detector Interface to GPS / Cell Modem RoHS Compliant LED to signal data is transferring Housing IP67 rated enclosure, dust and moisture resistant Transmit Tag battery life status Transmit Tag power RSSI Auto Range Tuning Field programming to special OEM Partners Future optional parts for mini controller for gate control, timestamp and card data storage and way to retrieve the data



## 8. Tag Data and Reader Outputted Data Format

Tag data consists of 20 possible characters, some of which can be turned off (optional) by command, some of which cannot (Permanent), preceded by a Line Feed (LF) and ending with a Carriage Return (CR). Readers are shipped by default with all Tag characters set ON. To turn Tag data characters off, use the [L], [R], and [CS] commands explained later on page 25.

Optional	Permanent	Permanent	Permanent	Optional	Optional
Flags	Customer	Facility Code	Tag Data	Signal Data	Checksum
2 bytes	2 bytes	4 bytes	8 bytes	2 bytes	2 bytes

<LF>**XY****CC**DDDDDDDDDDSSCS<CR>

Where: <LF> = Line Feed

**XY** - 2 flag bytes, details as follows:

X - The power output at which the Tag is factory set.

4 = 0dBm gain (standard)

5 = 5dBm gain

6 = 7dBm gain

7 = 10dBm gain (maximum)

Y - Varying data to signify; a) Low Battery, b) Whether or not a battery has been replaced, and c) Tag data ping rate of 1.5 or 2 seconds, represented in a single character as follows:

0 = good battery, original battery, 2 second ping rate.

1 = low battery, original battery, 2 second ping rate.

2 = good battery, not the original battery, 2 second ping rate.

3 = low battery, not the original battery, 2 second ping rate.

4 = good battery, original battery, 1.5 second ping rate.

5 = low battery, original battery, 1.5 second ping rate.

6 = good battery, not the original battery, 1.5 second ping rate.

7 = low battery, not the original battery, 1.5 second ping rate.

**CC** – Customer Codes are assigned uniquely to each client as a security measure thereby eliminating the ability for another person or entity to order Tags from the manufacturer or through any distribution channel in the attempts of gaining access to your secure facility. The manufacturer keeps records of which Customer Codes are assigned to which clients and only the manufacturer can program new Tags.

**DDDD** – Facility Codes are much like a Customer Code and allows for users with 2 or more facilities to issue Tags uniquely to each.

DDDDDDDD – Data, simply unique Tag data.

**SS** – Signal Data is RSSI (Received Signal Strength Indicator), a diagnostic tool that can be used to gauge a Tag's signal and quality in relation to the Reader, consisting of 2 bytes of signal strength indication in db. The value could be negative. A higher negative value means less strength.

**CS** – The Reader generated checksum is calculated by the selected data stream, standard data example - Company Code + Facility Code + Data = CS. If optional data is turned on then the checksum is calculated – Flags + Company Code + Facility Code + Data + Signal Strength = CS. Reverse the bits then convert to ASCII = CS. Line Feed and Carriage return are delimiters.



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An example:

If Tag: 46FF000100000002-6330

Get the ASCII value of each Tag character in hexadecimal and add all hexadecimal values:  $34 + 36 + 46 + 46 + 30 + 30 + 30 + 31 + 30 + 30 + 30 + 30 + 30 + 30 + 30 + 32 + 2D + 36 + 33 = 0x3CF$  H

Reverse (invert) the bits of last byte  $0xCF = 0x30$  and convert  $0x30$  to ASCII codes = 33, 30

Now let's examine each part:

46 = Flags

FF = Customer Code

0001 = Facility Code

00000002 = Tag Id

-63 = RSSI

30 = Checksum





## 9. Reader Commands and Responses

First it should be noted that anytime an incorrect command is sent to the Reader, the Reader will respond with a question mark, ?, or ?CO if the optional checksum data is turned on. The following commands are entered using HyperTerminal (Host). These commands allow you to control and access certain Reader functionalities. The Reader will echo back the command as noted in each Response, this is done in order to verify the command you sent was received and correctly executed. Again, if the optional checksum data is turned on, you will also see 2 bytes of checksum in addition to the original command.

### Note:

- All commands are issued in ASCII CAPITAL letters, and they are preceded by an open square bracket and ended with a closed square bracket.
- Commands are held in non-volatile memory, meaning that if power is taken away from the Reader the last command or settings will be retained when re-powered.
- The below examples of Reader responses assume that Flag bytes and Signal Data are turned off, but Checksum bytes are turned on.
- The below examples of Reader responses assume non-RS485 networking operations. If RS485 is being employed, add the Reader address to each command, for example [D07] where D is the command and 07 is the address.

### 9.1 [L] – Turn ON/OFF Flag Output

This is a toggle command which turns off or on the Reader's output of the Flag data.

Host: [L55]

Where: **L** = command

**55** = password, so no false shutdown occurs

Reader Response: <LF>**LDCS** <CR>

Where: <LF> = Line Feed

**L** = command

**D** = Status of Flag output, 1 = ON, 0 = OFF

**CS** = Reader generated checksum

<CR> = Carriage Return

### 9.2 [R] – Turn ON/OFF RSSI Output

This is a toggle command which turns off or on the Reader's output of the RSSI data.

Host: [R55]

Where: **R** = command

**55** = password, so no false shutdown occurs

Reader Response: <LF>**RDCS** <CR>

Where: <LF> = Line Feed

**R** = command

**D** = Status of RSSI output, 1 = ON, 0 = OFF

**CS** = Reader generated checksum

<CR> = Carriage Return

### 9.3 [CS] – Turn ON/OFF Checksum Output

This is a toggle command which turns off or on the Reader's output of checksum data.

Host: [CS55]

Where: **CS** = command

**55** = password, so no false shutdown occurs

Reader Response: <LF>**CSDCS** <CR>

Where: <LF> = Line Feed

**CS** = command

**D** = Status of RSSI output, 1 = ON, 0 = OFF



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**CS** = Reader generated checksum

**<CR>** = Carriage Return

#### **9.4 [D] - Duplicate Report Operating Mode**

RS-232 Readers are delivered with this operating mode defaulted. Tag data is immediately reported down the serial line every time a Tag's data is received, which can be up to every 2 seconds.

Host: **[D]**

Where: **D** = command

Reader Response: **<LF>D**CS**<CR>**

Where: **<LF>** = Line Feed

**D** = command

**CS** = Reader generated checksum

**<CR>** = Carriage Return

#### **9.5 [S] - Single Report Operating Mode Command**

This command moves the Reader from its factory default Duplicate Report Operating Mode to Single Report Operating Mode. It will also be necessary to define the timeout counter of the buffered memory although there is a factory default timeout setting of 30 seconds. There is a 10 Tag memory buffer, hence as long as 10 Tags or less are present, they will report only once until taken away from the Reader for the amount of time specified in the Y command. If more than 10 Tags are present, the 11th will overwrite the buffer of the oldest reported Tag.

Host: **[S]**

Where: **S** = command

Reader Response: **<LF>S**CS**<CR>**

Where: **<LF>** = Line Feed

**S** = command

**CS** = Reader generated checksum

**<CR>** = Carriage Return

#### **9.6 [Y] - Timeout of Buffered Memory Command**

*Note: This command works only when the Reader is in the [S] - Single Report Operating Mode.* The factory default timeout is 30 seconds. This timeout can be set from 00 to 99 seconds. In the below result, the timeout has been set to 99 seconds, meaning that if a Tag is read a second time by the Reader within 99 seconds of it being last read, the Reader will not report the data to the communications line. To escape this Mode, issue the [D] command.

Host: **[YDD]**

Where: **Y** = command

**DD** = timeout value between 00 ... 99 seconds

Reader Response: **<LF>Y**DD****CS**<CR>**

Where: **<LF>** = Line Feed

**Y** = command

**DD** = timeout value between 00 ... 99 seconds

**CS** = Reader generated checksum

**<CR>** = Carriage Return

To find the last sent 'Y' command seconds sent:

Host: **[Y]**

Where: **Y** = command

Reader Response: **<LF>Y**DD****CS**<CR>**

#### **9.7 [F] – Find a Specific Tag Only**

This command places the Reader into a mode to report only the Tag specified in the command. It is a nice tool to use to test a specific Tag when many Tags are present. To escape this Mode, issue the [D] command.



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Host: **[FDDDDDDDDDDDDDDDD]**

Where: **F** = command

**DDDDDDDDDDDDDDDD** = Customer Code, Facility Code and Tag data.

Reader Response: **<LF>FDDDDDDDDDDDDDDDDCS<CR>**

Where: **<LF>** = Line Feed

**F** = command

**DDDDDDDDDDDDDDDD** = Tag you are specifying

**CS** = Reader generated checksum

**<CR>** = Carriage Return

To find the last specified Tag sent to Reader from the '**F**' Find command:

Host: **[F]**

Where: **F** = command

Reader Response: **<LF>FDDDDDDDDDDDDDDDDCS<CR>**

*Note: if command is not in use and you enter the **[F]** command, then an error code of '**?CO**' will be outputted to the host system*

### **9.8 [C] – Report Tags only with a specific Facility Code**

This command instructs the Reader to report only Tags with a certain Facility Code (the first 4 header Tag characters). This is another security feature as only the Facility Code assigned to you can be reported by the Reader. If there are Tags in an installation with AAAA, BBBB, and CCCC headers, issuance of the command **[CBBBB]** would only allow Tags with the BBBB header to report, in a duplicate reading mode. To escape this Mode, issue the **[S]** or **[D]** command.

Host: **[CBBBB]**

Where: **C** = command

**BBBB** = Tag Facility Code you are specifying

Reader Response: **<LF>CBBBBCS<CR>**

Where: **<LF>** = Line Feed

**C** = command

**BBBB** = Tag Facility Code you are specifying

**CS** = Reader generated checksum

**<CR>** = Carriage Return

To find the last sent '**C**' command issued to the Reader:

Host: **[C]**

Where: **C** = command

Reader Response: **<LF>CBBBBCS<CR>**

*Note: if command is not in use and you enter the **[C]** command, then an error code of '**?CO**' will be outputted to the host system*

### **9.9 [P] – Polling Mode Command**

This command will place the Reader into a polling mode whereby no data will be reported until the Reader is issued the **T** or **TA** commands (below). To escape this mode, issue the **D** or **S** command.

Host: **[P]**

Where: **P** = command

Reader Response: **<LF>PCS<CR>**

Where: **<LF>** = Line Feed

**P** = command

**CS** = Reader generated checksum

**<CR>** = Carriage Return



### 9.10 [T] - Transfer Request (Polling) Command for a single Tag

This command will prompt the Reader for Tag data of the oldest Tag stored in its buffered memory. If a Reader response of “e” is received, this means the buffer is empty.

Host: [T]

Where: T = command

Reader Response: <LF>TCS<CR>

<LF>DDDDDDDDDDDDDDCS<CR>

Where: <LF> = Line Feed

T = command DDDDDDDDDDDDDDD

= Tag data CS = Reader generated checksum

<CR> = Carriage Return

### 9.11 [TA] - Transfer Request (Polling) Command for all Tags in Buffer

This command will prompt the Reader for all of the Tag data (up to 10) stored in its buffered memory. If a Reader response of “e” is received, this means the buffer is empty.

Host: [TA]

Where: T = command

Reader Response: <LF>TACS<CR>

<LF>DDDDDDDDDDDDDDCS<CR>

:: (repeated for all Tags stored)

Where: <LF> = Line Feed

TA = command

DDDDDDDDDDDDDDDD = Tag data

CS = Reader generated checksum

<CR> = Carriage Return

### 9.12 [Z] – Data Bit and Data Interval Time Lengths (for Wiegand usage only)

These commands set the Reader’s bit length in time (Z1) and interval length in time between bits (Z2), in increments of 10 microseconds. The Reader is defaulted to a bit length of 30 microseconds and a bit interval of 150 microseconds, which are also the minimum times available. The maximum bit length is 100 microseconds and the maximum bit interval is 1000 microseconds. These settings are held in nonvolatile memory.

Host: [Z1D]

Where: Z1 = command, bit length in time

D = variable multiplier by 10 microsecond increment

Reader Response: <LF>Z1DCS<CR>

Where: <LF> = Line Feed

Z1 = command

D = variable multiplier by 10 microsecond increment

CS = Reader generated checksum

<CR> = Carriage Return

Host: [Z2DD]

Where: Z2 = command, bit interval in time

DD = variable multiplier by 10 microsecond increment

Reader Response: <LF>Z2DDCS<CR>

Where: <LF> = Line Feed

Z1 = command

DD = variable multiplier by 10 microsecond increment

CS = Reader generated checksum

<CR> = Carriage Return

Example:

Host: [Z13]

Results = the bit length in time has been set to 30 microseconds whereby ‘Z1’ = command for bit length in time +



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'3' = variable multiplier by 10 microsecond increment resulting in 30 microseconds total bit length. Host: **[2215]**

Results = the bit interval length in time has been set to 150 microseconds whereby '**22**' = command for bit interval in time + '15' = variable multiplier by 10 microsecond increment resulting in 150 microseconds between bits.



### 9.13 [Q] – Automatic Tuning of Tag Range

This command starts a function that uses a specific Tag to find the right attenuation to limit read range to approximately the current position of that Tag. Although range can be tuned via dipswitch 2 and the use of a Master Tuning Tag programmed with all 5's, this command can be used if a Master Tuning Tag is not in your possession by issuing the [Q] command followed by 14 characters of Tag data consisting of the 2 characters of Customer Code, 4 characters of Facility Code, and 8 characters of Tag data, for a total of 14 characters. Mount the Reader and Tag in their intended position in the actual environment to be used.

Host: [QDDDDDDDDDDDDDDDD]

Where: Q = command

DDDDDDDDDDDDDDDD = Tag data (Customer Code + Facility Code + Tag Data)

Reader Response: <LF> QDDDDDDDDDDDDDDCS<CR>

Where: <LF> = Line Feed

Q = command

DD = two digit decimal number representing the AGC setting

AA = one or two digit decimal number representing the dBs of attenuation set

CS = Reader generated checksum

<CR> = Carriage Return

*Note 1: If the [F] command is used before this command, make sure the Tag number is the same or use the [D] to disable the [F] command.*

*Note 2: Sending the [Q] command by itself searches for the default Tag number equivalent to the Master Tuning Tag, [Q55555555555555].*

### 9.14 [0] – (zero) Command to set Attenuation Gain manually

This command sets the Attenuation Gain of the Reader to the specified number of dBs in decimal in values from 00 to 62 where the higher this number, the less gain is set.

Host: [0GG]

Where: 0 = command

GG = gain setting represented as a decimal number from 00 to 62

Receiver Response: <LF>0GGCS<CR>

Where: <LF> = Line Feed

0 = command

GG = gain setting 00 to 62 (gain may run negative -62 to -01 as well)

CS = Receiver generated checksum

<CR> = Carriage Return

To find the current dBm setting, use the [1] command:

Host: [1]

Where: 1 = command

Receiver Response: <LF>GGCS<CR>

### 9.15 [4] – (four) Command to set Sensitivity manually

This command allows you to set the Sensitivity level, the lower the number, the lower the tolerance, or sensitivity while the higher the number the higher the tolerance or higher sensitivity.

Host: [4SS]

Where: 4 = command

Where: SS = Sensitivity Setting represented by a decimal number in values of 03, 13, 23, 43, 53, 63, 73

Receiver Response: <LF>4CS<CR>

Where: <LF> = Line Feed

4 = command

SS = Sensitivity Setting represented by a decimal number in values of 03, 13, 23, 43, 53, 63, 73

CS = Receiver generated checksum

<CR> = Carriage Return



To find the current Sensitivity Setting, use the [5] command:

Host: [5]

Where: 5 = command

Receiver Response: <LF>SSCS<CR>

#### 9.16 [403] & [000] – Clear all Attenuation Gain and Sensitivity Settings

These commands clear and return the Reader to its default maximum Attenuation Gain and Sensitivity settings. Issue only the [403] command first, followed by the [000].

Host: [403]

Where: 403 = command

Receiver Response: <LF>0CS<CR>

Where: <LF> = Line Feed

403 = command

CS = Receiver generated checksum

<CR> = Carriage Return

Host: [000]

Where: 000 = command

Receiver Response: <LF>0DDCS<CR>

Where: <LF> = Line Feed

403 = command

DD = decimal number of attenuation setting, valid from 00 to 62

CS = Receiver generated checksum

<CR> = Carriage Return

#### 9.17 [6] – Ignore Tag command

This command causes the Reader to ignore a specific Tag number and is good only for a single Tag.

Host: [6DDDDDDDDDDDDDDDD]

Where: 6 = command and DDDDDDDDDDDDDDDDD = Tag number to ignore

Reader Response: <LF>6DDDDDDDDDDDDDDDDCS<CR>

Where: <LF> = Line Feed

6 = command

DDDDDDDDDDDDDDDD = Tag number to ignore

CS = Reader generated checksum

<CR> = Carriage Return

*Note: Issuing the Ignore command will render all other commands unavailable for the same Tag data. To release a Tag from being ignored, simply issue another [6] command for a fictitious Tag.*

#### 9.18 [X] – Stop Data outputted from Reader

You must X to turn command off.

This command stops transmitting data between the Reader and the host. This is useful when you want to command the Reader without data being sent. The [X] command for Factory Reset will start the transmitting again between the Reader and the host.

Host: [X55]

Where: X = command

55 = password, so no false shutdown occurs

Reader Response: <LF>XCS<CR>

Where: <LF> = Line Feed

X = command

CS = Reader generated checksum

<CR> = Carriage Return



### 9.19 [G] – Read Tag Flag Data

Enter Tag you want to read the Flag data from and the Reader will output that Tag's Flag Data. This cannot be used for Wiegand output.

Host: [GDDDDDDDDDDDDDDDD]

Where: G = command and DDDDDDDDDDDDDDD = Tag you are specifying

Reader Response: <LF> GDDCS<CR>

Where: <LF> = Line Feed

G = command

DD = two digit decimal number representing the Flag Data

CS = Reader generated checksum

<CR> = Carriage Return

### 9.20 [7] – Enable Relay

This command enables the relay, closes the contacts.

Host:

[7]

Where: 7 = command

Receiver Response: <LF>7CS<CR>

Where: <LF> = Line Feed

7 = command

CS = Receiver generated checksum

<CR> = Carriage Return

### 9.21 [8] – Disable Relay

This command disables the relay, opens the contacts.

Host: [8]

Where: 8 = command

Receiver Response: <LF>8CS<CR>

Where: <LF> = Line Feed

8 = command

CS = Receiver generated checksum

<CR> = Carriage Return

### 9.22 [9] – Trigger Relay

This command triggers the relay; closes the contacts for 1 timer cycle. The timer cycle is set by the [J] command.

Host: [9]

Where: 9 = command

Receiver Response: <LF>9CS<CR>

Where: <LF> = Line Feed

9 = command

CS = Receiver generated checksum and <CR> = Carriage Return

### 9.23 [J] –Relay Program Timer

This command sets the individual relay timer to a user defined cycle. The default is 5 seconds.

Host: [JMTT]

Where: J = command

M = Cycle mode, use 'P' for milliseconds and 'H' for seconds

TT = Cycle time, 01 thru 99

Receiver Response: <LF>JMTTCS<CR>





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Where: **<LF>** = Line Feed

**J** =

command

**M** = Cycle mode, use 'P' for milliseconds and 'H' for seconds

**TT** = Cycle time, 01 thru 99

**CS** = Receiver generated checksum and **<CR>** = Carriage Return

Examples: Host: **[JM50]** Results = Sets Relay to 50 millisecond timer.

#### **9.24 [LD] –Loop Detector Command**

This command enables or disables the Loop Detector Input. This is a toggle command.

Host: **[LD]**

Where: **LD** = command

Readers Response: **<LF>LD1CS <CR>** or **<LF>LD0CS <CR>**

Where: **<LF>** = Line Feed

**LD1** = signifies loop detector  
activated **LD0** = signifies loop

detector disabled **CS** = Receiver  
generated checksum

**<CR>** = Carriage Return



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## 10. **WARRANTY**

Products are warranted against defects in materials and workmanship for one (1) year from date of shipment. The supplier shall, at its option, either repair or replace products that prove to be defective and are returned with freight prepaid to the manufacture plant within the warranty period. The foregoing warranty shall not apply to defects resulting from abuse, misuse, accident, alteration, neglect or unauthorized repair or installation. The manufacturer shall have the right of final determination as to the existence and cause of the defect.

THE WARRANTY SET FORTH ABOVE IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. THE MANUFACTURER SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedies provided herein are Buyer's sole and exclusive remedies. In no event shall the manufacturer be liable for direct, indirect, special, incidental or consequential damages, (including loss of profits) whether based on contract, tort, or any other legal theory.

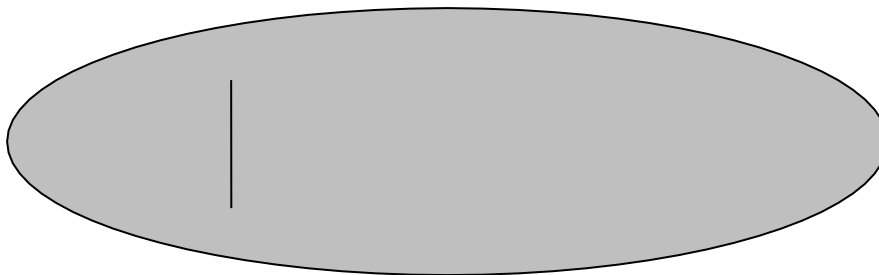


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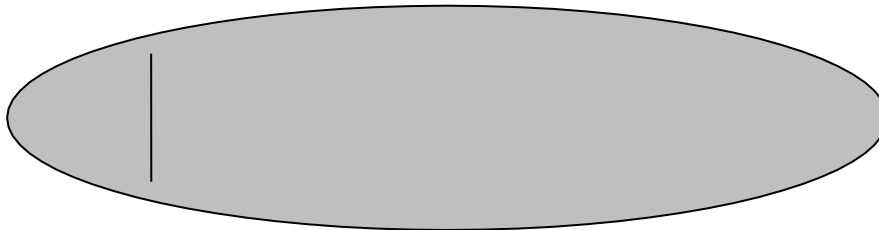
## 11. Appendix A

### 11.1 External Antenna Model ANT-CP Installation Instructions & Product Drawing

While the standard ActiveRFID Reader with internal Antenna is termed as omni-directional, meaning it exhibits a circular reading pattern of 360 degrees around the Reader of 50' (100' diameter), the ANT-CP external Antenna ("CP" stands for circular polarized) is described as having a directional function with a read pattern primarily directly off its face. This Antenna can be used to distinguish one lane of traffic from another or can be used to create a larger coverage area. Please note there is some bleed over to the rear and sides of the ANT-CP Antenna depending upon the range to which the Reader is tuned. That bleed over will be dependent upon the environment thus exact measurement of the bleed over is difficult to quote, however for lane discrimination situations, tuning the Reader down sufficiently will nullify any bleed over issues. The first depiction below shows what bleed over may look like when the Reader is set to 600' of range.



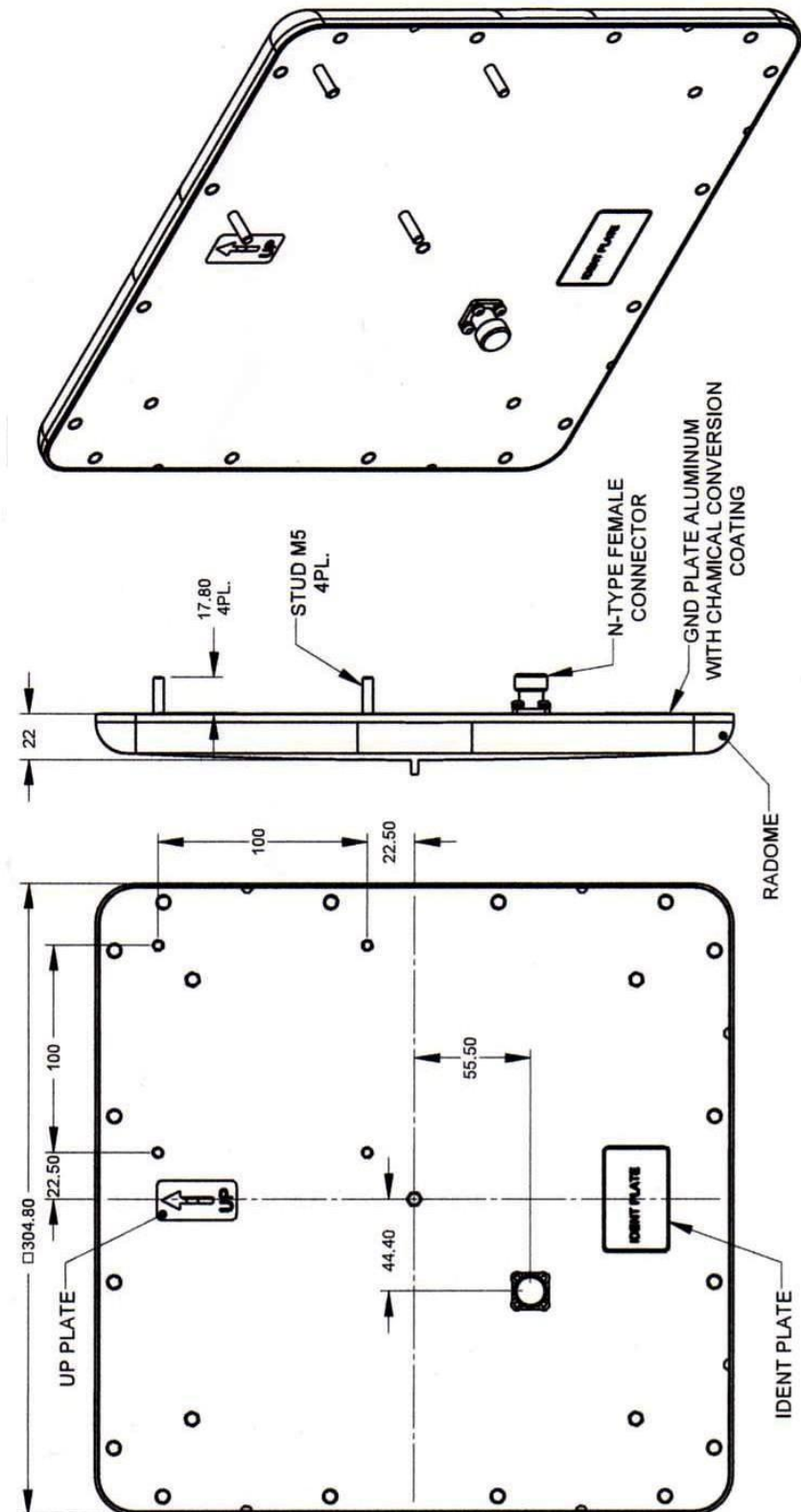
The depiction below shows much less bleed over when the Reader is tuned down to perhaps 50' range.





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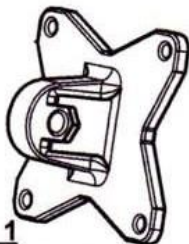


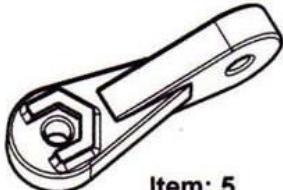



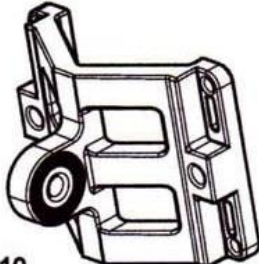





### Model ANT-CP Drawing





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## INSTALLATION INSTRUCTIONS FOR MODELS ANT-CP-12 & ANT-CP-25

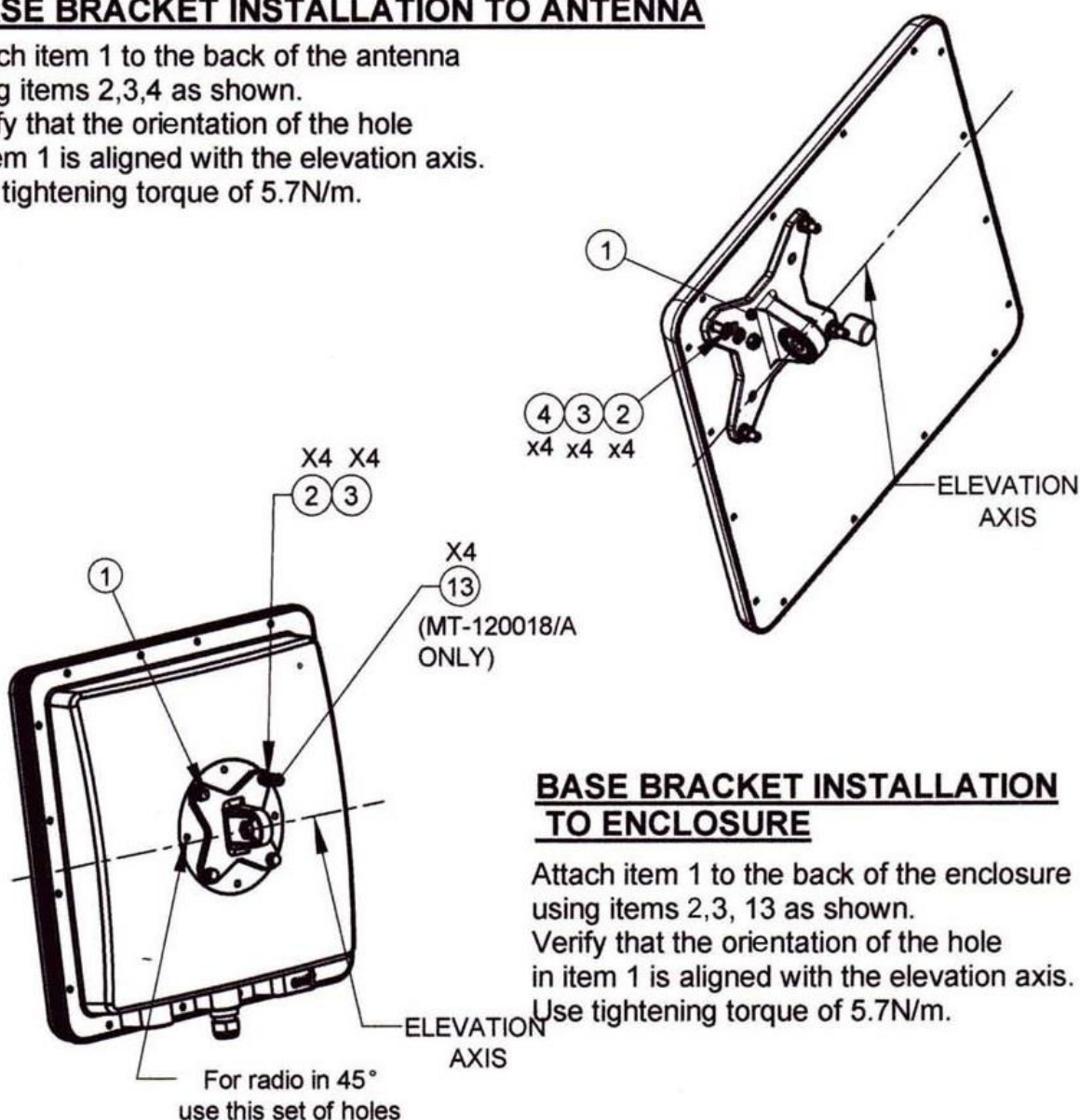
 <b>Item: 1</b> Antenna/enclosure base bracket Qty: 1	 <b>Item: 2</b> Flat washer M5 Qty: 4	 <b>Item: 4</b> Nut M5 Qty: 4	 <b>Item: 5</b> Arm bracket Qty: 1
	 <b>Item: 3</b> Spring washer M5 Qty: 4		
 <b>Item: 6</b> Bolt M8x40 Qty: 4	 <b>Item: 8</b> Washer spring M8 Qty: 4	 <b>Item: 10</b> Wall/Poll bracket Qty: 1	
 <b>Item: 7</b> Washer flat M8 Qty: 4	 <b>Item: 9</b> Nut M8 Qty: 2		
 <b>Item: 11</b> Clamping bracket Qty: 1 SHEET 1 OF 4	 <b>Item: 12</b> Bolt M8x70 Qty: 2	 <b>Item: 13</b> Bolt M5x16 Qty: 4 MT-120018/A only	



## INSTALLATION INSTRUCTIONS FOR MODELS ANT-CP-12 & ANT-CP-25

### BASE BRACKET INSTALLATION TO ANTENNA

Attach item 1 to the back of the antenna using items 2,3,4 as shown. Verify that the orientation of the hole in item 1 is aligned with the elevation axis. Use tightening torque of 5.7N/m.



### BASE BRACKET INSTALLATION TO ENCLOSURE

Attach item 1 to the back of the enclosure using items 2,3, 13 as shown. Verify that the orientation of the hole in item 1 is aligned with the elevation axis. Use tightening torque of 5.7N/m.





## INSTALLATION INSTRUCTIONS FOR MODELS ANT-CP-12 & ANT-CP-25

### INSTALLATION ON A POLE

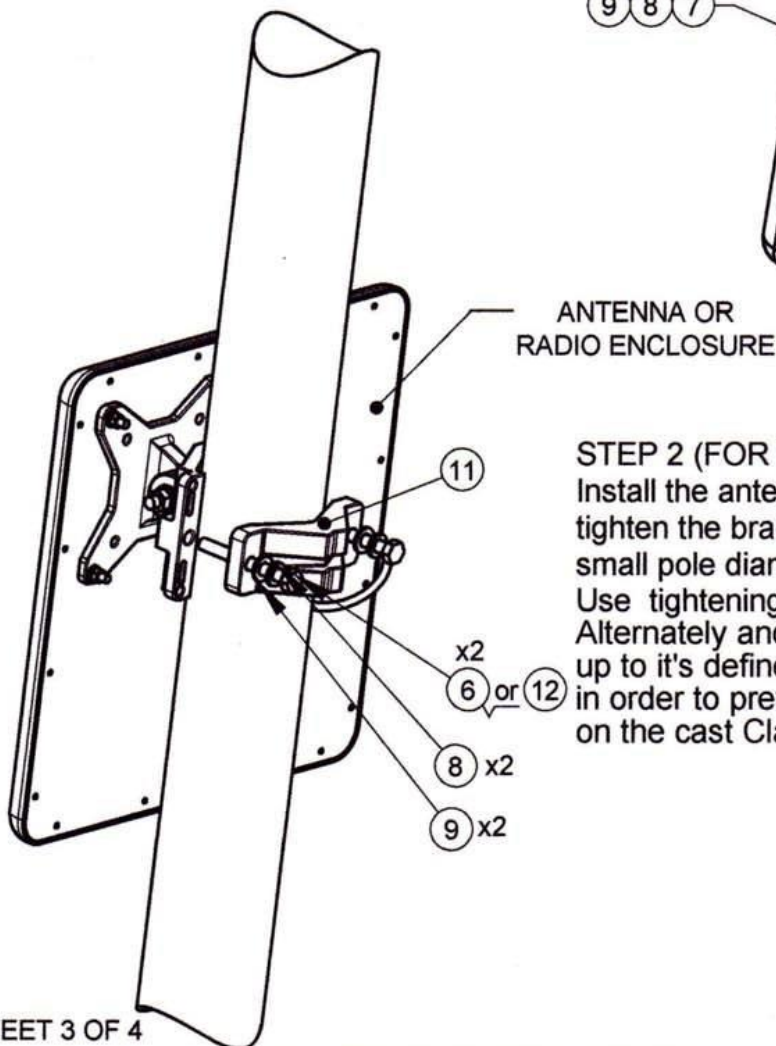
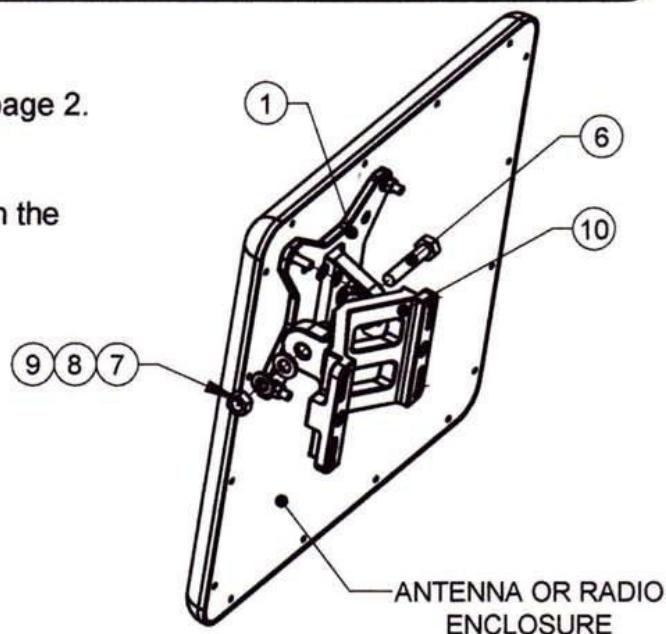
#### Step 1

Connect the base bracket as shown on page 2.

Connect item 10 to item 1 (mate knurled surfaces) using item 6,7,8,9 as shown.

Note: The bolt head shall be positioned in the socket on item 1.

Use tightening torque of 24 N/m.



#### STEP 2 (FOR POLES SIZES 1.75"-3")

Install the antenna to the pole using item 11, tighten the bracket using items 8,9,12 (for small pole diameter use item 6 instead of item 12) Use tightening torque of maximum 14N/m. Alternately and equally tighten the two M8 bolts up to it's defined tightening torque , in order to prevent unequal pressure on the cast Clamps

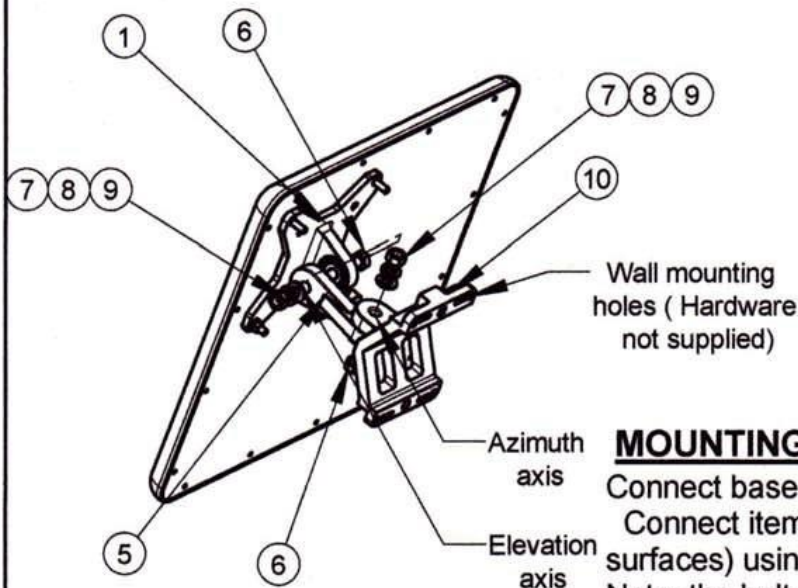
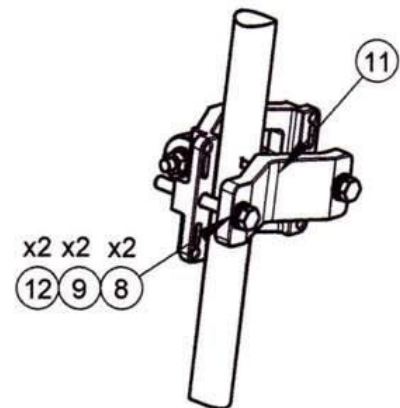


## INSTALLATION INSTRUCTIONS FOR MODELS ANT-CP-12 & ANT-CP-25

### STEP 2 (FOR POLES SIZES 1"-1.75")

Install the antenna to the pole using item 11 as shown, tighten the bracket using items 8,9,12.

Use tightening torque of maximum 14N/m. Alternately and equally tighten the two M8 bolts up to it's defined tightening torque, in order to prevent unequal pressure on the cast Clamps



### MOUNTING ON A WALL

Connect base bracket as shown on page 2

Connect item 5 to item 1 (mate the knurled surfaces) using items 6,7,8,9 as shown.

Note: the bolt head shall be positioned in the socket of item 1.

mount item 10 on the wall on the desired position. (note the azimuth axis orientation)

Attach item 5 to the arm bracket item 10 (mate the knurled surfaces) using items 6,7,8,9 as shown. Note the bolt head shall be positioned in the socket of item 5.

Use tightening torque of 24 N/m to the azimuth and elevation hardware.