

**CASI-RUSCO...*Security Solutions for the 21<sup>st</sup> Century***

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**AMS Readers and  
RFID Tags  
Instruction Manual**

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**The customer accepts full maintenance responsibility. (A full scope of hardware maintenance contracts are available to the customer.)**

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## CAUTION

### ASSET TAGS CONTAIN LITHIUM BATTERIES.

**The MT-1 Mobile Tag and ST-1 Stationary Tag contain batteries, which cannot be replaced or recharged!** The tags must be disposed of in the correct manner and method for lithium battery disposal. The batteries in these tags may present a risk of fire or chemical burn if mistreated. Keep away from children. Do not recharge, disassemble, heat above 212° F (100° C) or incinerate. Using any other battery type may present a risk of fire or explosion.



To maintain UL Listing, connect to an approved UL Listed 12 VDC power supply.



Some devices used in the AMS Readers are sensitive to static electricity. Anti-static precautions ***must be taken*** when handling the printed circuit boards. Static discharge may permanently damage the circuit boards. Damage may not be immediate, but may affect the life of the circuit board.

### FCC Statement

These devices comply with part 15 of the FCC CFR 47 rules. Operation is subject to the following two conditions:

- (1) These devices may not cause harmful interference, and
- (2) These devices must accept interference received, including interference that may cause undesired operation.

The user is cautioned that modifications or changes to an intentional or unintentional radiator not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### CE Compliance

The AMS Reader has been tested and found to comply with the emission limits for access control devices as described in EN 50081-1: 1992, and immunity to EN 50082-1: 1992. These limits are designed to provide protection from harmful interference when the unit is operating in a commercial or residential environment. This equipment generates, uses, and can radiate radio frequency energy. If the unit is not installed and used as instructed in this manual, it may cause interference to radio communications.

Properly grounded and shielded cabling should be used for all incoming and outgoing connections to the AMS Reader and peripheral equipment.

### UL Listing

The AMS Reader and asset tags are UL listed. UL294-access control unit accessory and UL1037 - also suitable as an anti-theft device. To maintain listing, the AMS Reader must connect to UL Listed equipment.



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## **Site Survey Worksheet**

## **Customer Survey**

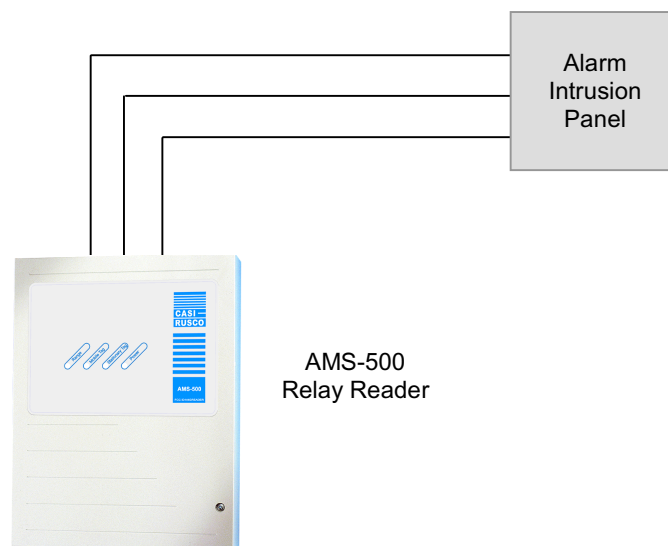
### Overview

The AMS Readers are RF-based monitoring and alarm devices that communicate with ST-1 Stationary Tags, MT-1 Mobile Tags, and PT-1 Personnel Tags. The AMS Reader detects and reports tag movement or encroachment into secure areas or building entrances/exits.

All readers and tags are CE approved and comply with the European EMC directives. They are also UL 294 and UL 1037 approved (access control and burglar alarm system accessories).

### AMS-500 Relay Reader

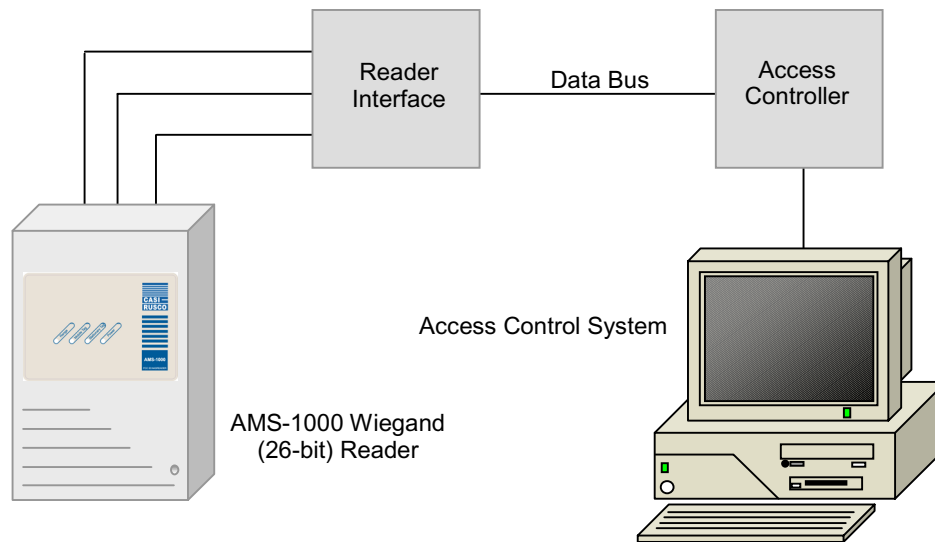
The AMS-500 Relay Reader is designed to protect valuable property against unauthorized movement or removal. With its flexible design, you can easily integrate the AMS-500 with intrusion alarm panels or access control panels, and offer any organization an easy-to-use and economical asset protection solution. Figure 1-1 shows an AMS-500 Relay Reader system connecting to an alarm intrusion panel.



**Figure 1-1** AMS-500 Relay Reader and Alarm Intrusion Panel

## AMS-1000 Wiegand Reader

The AMS-1000 Wiegand (26-bit) Reader is designed to uniquely identify and protect valuable property against unauthorized movement or removal. With its flexible design, you can easily integrate the AMS-1000 with access control. Figure 1-2 shows an AMS-1000 Wiegand Reader connecting to an access control system.



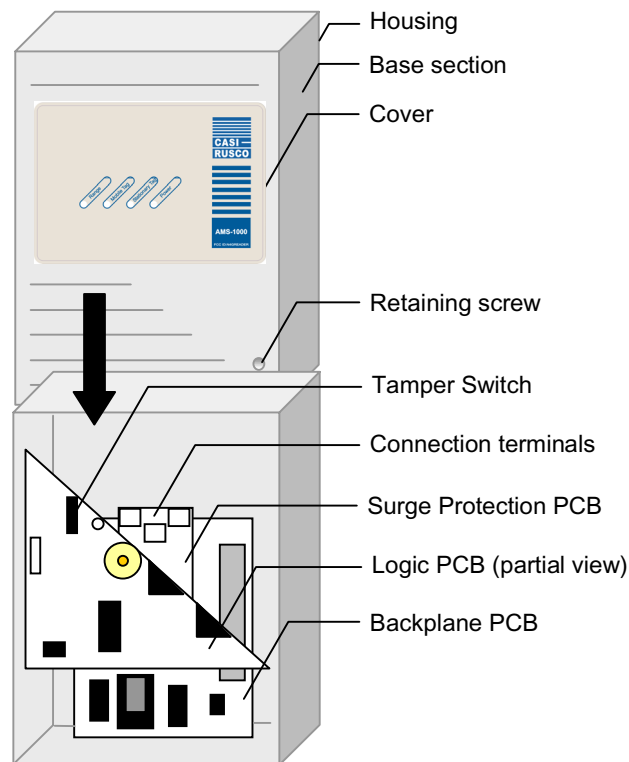
**Figure 1-2 AMS-1000 Wiegand Reader Connecting to an Access Control System**

## Hardware Components and PCBs

The AMS Reader houses internal electronic circuitry inside a plastic enclosure with a removable front cover. The enclosure contains mounting holes and a removable data and power cable knockout. Each reader comes with a Logic and Backplane Printed Circuit Board (PCB).

The Logic PCB contains a radio receiver, microprocessors, and communication circuitry. The Backplane PCB contains termination connectors, power supply circuitry, and a single pole, double throw voltage-free alarm relay circuit rated at 24 VDC/1 Amp. The Surge Protection PCB that connects to the Backplane PCB contains UL-approved screw-type terminal connectors. Figure 1-3 shows the AMS Reader enclosure, PCBs, and connection terminals.





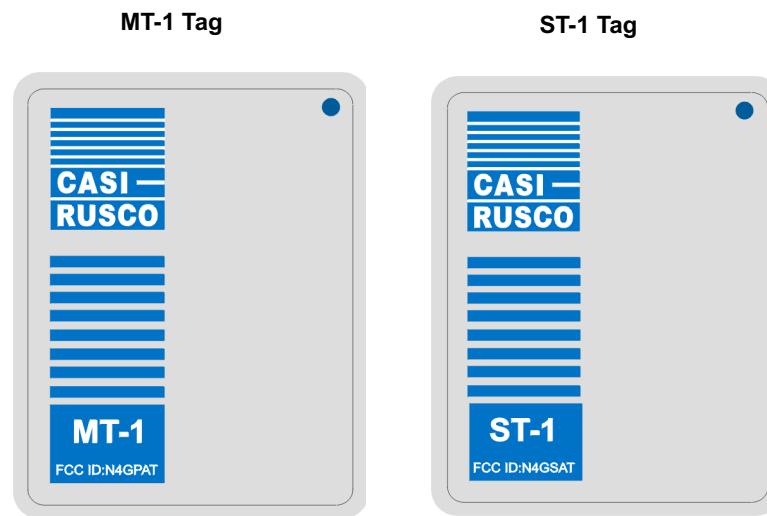
**Figure 1-3 AMS Reader Enclosure, PCBs, and Connection Terminals**

The front cover secures to the housing with a Phillips-head screw. Each reader also comes with an optional Torx security screw for protection against vandalism. The Torx security screws require a TX-10 screwdriver (or equivalent).

You can remove the cover screw, and slide the cover down to access the Logic and Backplane PCBs. The Logic PCB electrically connects to the Backplane PCB using two terminal strips, and mechanically secures at two locations. The Logic PCB also contains rotary switches, DIP switches, etc., that are used to configure the reader.

## RF Identification Tags/RF-Range Programmer

The compact Asset and Personnel tags employ Radio Frequency Identification (RFID) technology to monitor and send alarm information to the AMS Readers. Figure 1-4 shows the asset tags you can employ to protect valuable property. The ST-1 and MT-1 tags feature a tamper switch that generates alarms at the AMS Reader if anyone attempts to remove them from their property.



**Figure 1-4 ST-1 Stationary Tag and MT-1 Mobile Tag**

### ST-1 Stationary Tag

The ST-1 tag protects valuable property that is normally stationary or does not move on a regular basis. The ST-1 sends alarm signals to the AMS Reader if its internal motion sensor detects any movement or removal attempts.

### MT-1 Mobile Tag

The MT-1 tag protects valuable property that moves inside a designated area or building. If the MT-1 tag moves into its pre-programmed security zone or area, the tag automatically sends alarm signals to the AMS Reader. The system will send the tag's Wiegand identification number (AMS-1000 only) to the access control system, sound an alarm, and trigger a relay closure that could connect to a remote alarm or video camera/recording device.

## PT-1 Personnel Tag

The PT-1 Personnel tag (Figure 1-5) functions as an identification card for conventional access applications and also as an RF-based protection device that can restrict or grant access to specific areas using its unique Wiegand 26-bit identification information (AMS-1000 only).



**Figure 1-5 PT-1 Personnel Tag and RP-1 RF-Range Programmer**

## RP-1 RF-Range Programmer

The RP-1 RF-Range Programmer (Figure 1-5) comes with two AAA batteries, and is a durable field device that calibrates and tests RF communication between AMS Readers and RFID tags.

**NOTES**

### Overview

In most cases, you will install one or two AMS Readers at a portal and use the RFID tags to monitor assets and personnel moving in and out of a secure area. You should always consider the following before deciding where to install an AMS Reader.

- Size of the RF detection area to protect with RFID tags
- Size and quantity of entrance/exit portals to protect with RFID tags
- RF environmental conditions

#### NOTE



Do not install the AMS Reader near high concentrations of electromagnetic interference.

To monitor assets and personnel with one AMS Reader, you should install it on the non-hinged side of the portal (Figure 2-1) approximately four feet above the floor. If installing two AMS Readers, place them on each side of the portal approximately four feet above the floor. The two-door configuration ensures the AMS Readers detect and read all RFID tags as they pass through the detection field. Figure 2-1 shows both AMS Reader configurations.

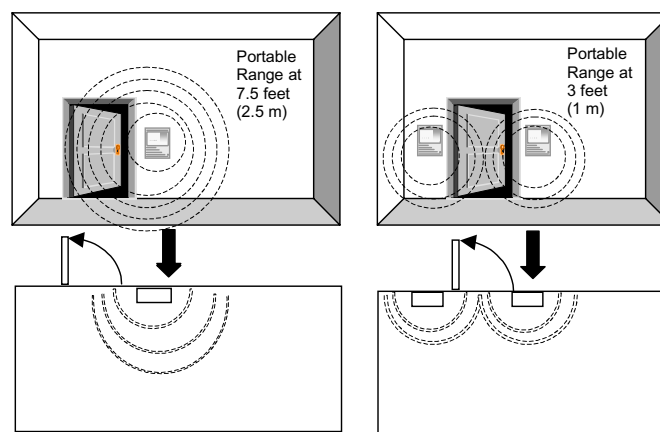
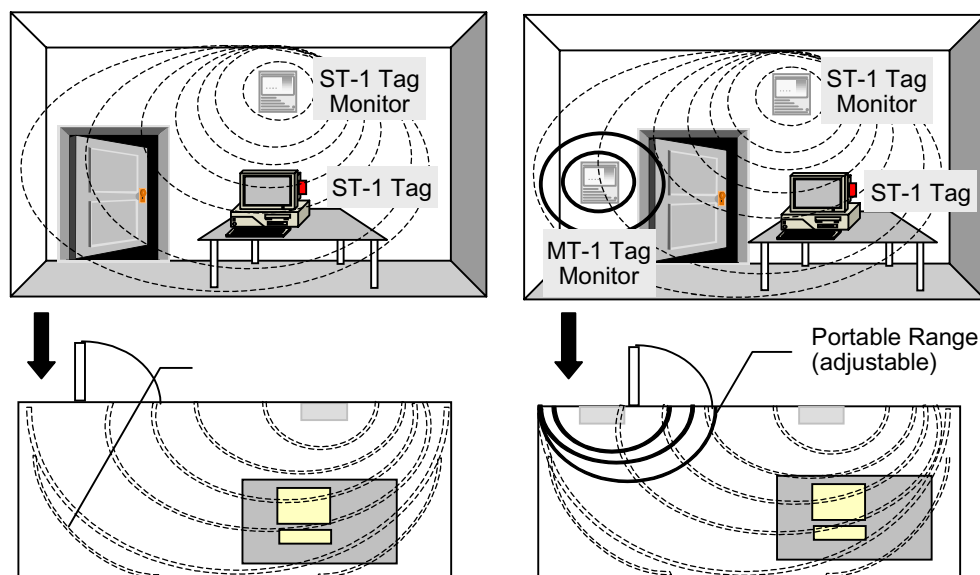


Figure 2-1 One and Two AMS Readers and Portable Range Detection

**It is imperative that you test all AMS readers at their actual location during the site survey.**

Even though you can install an AMS Reader above a portal, you will have to substantially increase the RF detection range to support the distance, which can unfortunately generate unwanted false alarms. Increasing the RF gain will project forward into the secure area, and causes false alarms when RFID tags move in and out of the detection field.

Figure 2-2 shows sample fields for AMS Readers, ST-1 tags, and MT-1 tags.



**Figure 2-2 Stationary Asset Monitoring and Stationary/Portable Asset Monitoring**

In every installation, you must test the ST-1 Stationary Tag and/or MT-1 Mobile Tag tamper alarms to ensure they are read in all areas, rooms, stairwells, elevators, etc., where the customer wants protection.

In applications that employ both MT-1 and ST-1 Tags, the AMS Reader can be configured to provide protection. The RF detection range between the AMS Reader, MT-1 Mobile Tags, and PT-1 Personnel Tags can be attenuated (signal reduction) to zero range to prevent false alarms when assets move into the detection area. For large irregular areas, you can also employ multiple AMS Readers as shown in Figure 2-3.

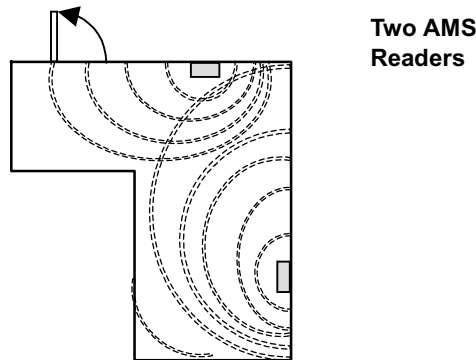


Figure 2-3 Two AMS Readers Protecting an Irregular Area

## RF-Detection Ranges

The RF polar pattern (detection range) that the AMS Reader antenna creates projects forward of the housing. Always install the AMS Reader with the front panel facing towards the target property.

Because the AMS Reader's polar pattern is spherical in nature, the system can read RFID tags from the rear side of the enclosure as shown in Figure 2-4.

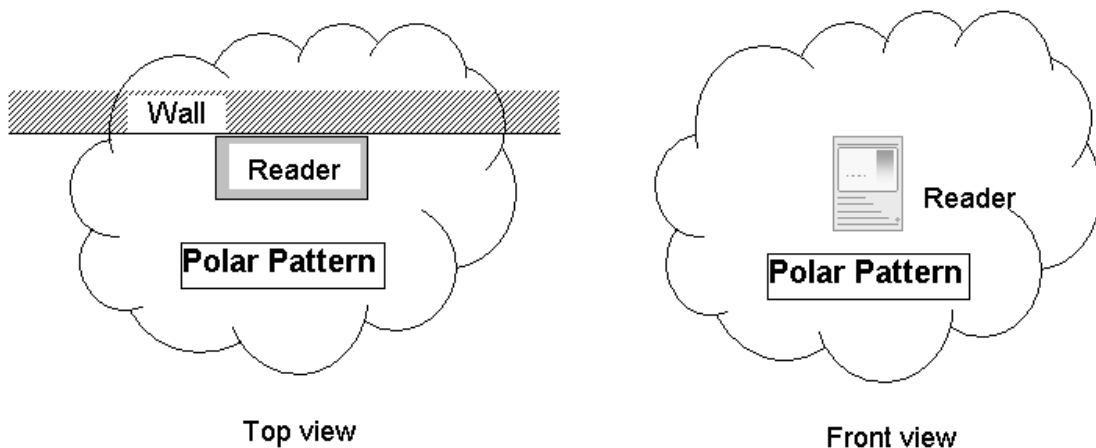


Figure 2-4 Sample AMS Readers and Polar Patterns (top and front views)

## Mounting Locations

To minimize RF reflection, you should never mount the AMS Reader near or on steel beams, metal office furniture, false ceiling supports, or aluminum-

backed plasterboard. RF signals can travel down hallways, elevators, and even around corners in some rare cases. Any one of these items can cause RF hot spots and/or blind areas that can degrade overall system performance.

It is imperative to test the AMS Reader and RFID tags in several locations to determine the best location. Figure 2-5 shows how RF signals can behave inside a closed area.

## Two-Reader/PT-1 Configuration

For AMS Reader systems that will use PT-1 tags, install two AMS Readers at the portals to reduce the shielding effect created by the human body. The human body naturally absorbs radio transmissions.

## Indoor/Outdoor Applications

The AMS Reader is for indoor or weather-protected environments. To use the AMS Reader in an outdoor location, you must use an all-plastic UL Listed weatherproof housing. You should also install a non-metallic rain shield above the weatherproof housing to avoid standing water leaking into the housing and causing electronic equipment damage.

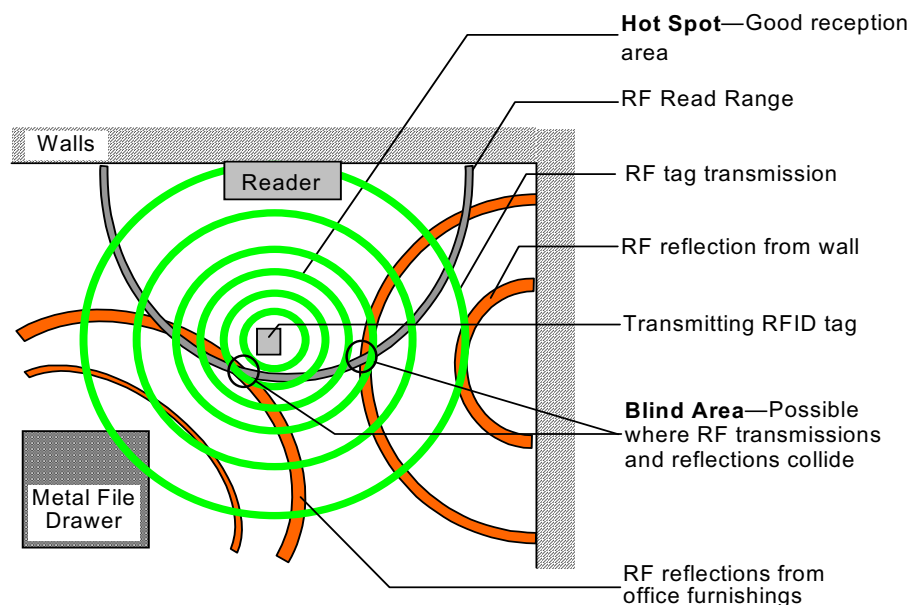


Figure 2-5 RF Hot Spots and Blind Areas



## Common RF Problem Areas

Do not install the AMS Reader close to video screens, television monitors, or other concentration sources of RF interference. The minimum recommended distance is 5 feet (1.5 m) from a 15-inch VDU screen.

**NOTES**

### Overview

Performing a site survey enables you to correctly determine equipment requirements, their mounting locations, and to test/document the RF detection ranges for all RFID tags at the customer's site.

**NOTE** Test every AMS Reader location and RFID tag location before final system design and pricing.



Add a spare reader to every job to accommodate any unforeseen application or site problems.

Consider a two-reader configuration to increase overlapping RF detection coverage.

### Site Survey

The following summarizes the key tasks to perform during a site survey. After reading through the tasks, proceed to the *Site Testing* subsection on See “Site Testing” on page 3.6 to document the physical locations of all AMS Readers, their RF read ranges, assets and personnel, tamper alarm ranges, etc.

- **Floor plan**—Draw a floor plan of the customer's site using the graph on Figure 3-8: Site Survey Floor Plan (one rectangle = 5 feet) on page 3.5. It is very important to maintain a consistent scale of size and distance, and identify the location of all assets/personnel to monitor or restrict.
- **Assets to Protect**—Identify the physical location of all stationary (non-moving) assets. Then, identify the mobile assets and the areas where they will reside.
- **Entrance/Exit Portal Protection**—Identify the location of all portals where mobile assets and/or personnel will require monitoring.
- **RF Environment Assessment**—Determine the RF detection range (full, medium or low) for each AMS Reader the customer needs to employ.
- **Portal Coverage**—Draw two circles around each portal location. Draw one circle showing the target RF detection distance around the portal (mobile assets only), and a second circle to identify the tamper detection

range using the information in Figure 3-6: Portal and Tamper Ranges for Stationary and Portable Assets on page 3.3.

- **Tamper Alarm Coverage**—Add enough AMS Readers to provide complete tamper coverage for all stationary and mobile assets. Draw one circle around each AMS Reader using the tamper radius information shown in Figure 3-6: Portal and Tamper Ranges for Stationary and Portable Assets on page 3.3.
- **Intrusion or Burglar Alarm Integration**—Identify the physical locations of all intrusion or burglar alarms.
- **Access Control System**—Identify the physical locations of all intrusion or burglar alarms, and the port connections for the Wiegand 26-bit data conductors (AMS-1000 Reader only).
- **Commercial Power Requirements**—Identify or specify the location of all 12 VDC power supplies for the AMS Readers.
- **Equipment Configuration/Quantities**—Complete the equipment requirements shown in Figure 3-7: Equipment Requirements on page 3.4 to identify the necessary equipment. Also, make sure to include the cost of material and labor to run cables and terminate the AMS Readers, mount the RFID tags, etc.
- **Abnormal RF Interference**—Inspect the area around each AMS Reader location for abnormal or dense concentrations of RF interference. Because RF fields penetrate floors, ceilings, and walls, you may want to test the RF readings above, below, and inside adjacent rooms using an RF scanner capable of reading 417 through 418 MHz.

**NOTE** You can connect the AMS Reader to an intrusion or burglar alarm panel. Refer to the *Wiring AMS Readers* in Chapter 4 - Installation.



Each AMS Reader requires 12 VDC @ 100 mA. It is recommended that the power source includes a battery backup to ensure the AMS Reader's provide protection and tracking during power failures.

## AMS Reader Detection Ranges

Use the AMS Reader as the center point, and count the number of squares representing the read and tamper ranges. The circle you draw connecting these points represent the detection range for the AMS Reader.







The graph shown in Figure 3-8 Site Survey Floor Plan (one rectangle = 5 feet) on page 3.5 is for drawing the floor plan during the site survey, and to determine the equipment requirements, wireless detection ranges, etc.

## RF Radius

Draw the radius of the detection range for each reader. You may want to use a compass to draw the circle. The circle represents the read range for the reader. Remember, these circles do not represent the actual RF polar patterns. In all cases, you must test the readers at every location and the RFID tags it will be reading.

## Portal and Tamper Ranges

Use the *conservative* portal and tamper ranges shown in Figure 3-6 to determine the portal and tamper ranges for the job. Then, draw the portal and tamper ranges on the graph shown on Figure 3-7: Equipment Requirements on page 3.4.

Portal and Tamper Ranges	
<b>Full Range (S5 - Position 4)</b>	
Portal Range (Max. Radius)	 30 ft. (variable from 0-to-30 feet)
Tamper Range (Max. Radius)	 20 ft.
<b>Medium Range (S5 - Position 3)</b>	
Portal Range (Max. Radius)	 Variable from 0-to-20 feet
Tamper Range (Max. Radius)	 90 ft.
<b>Low Range (S5 - Position 1)</b>	
Portal Range (Max. Radius)	 Variable from 0-to-10 feet
Tamper Range (Max. Radius)	 40 ft.

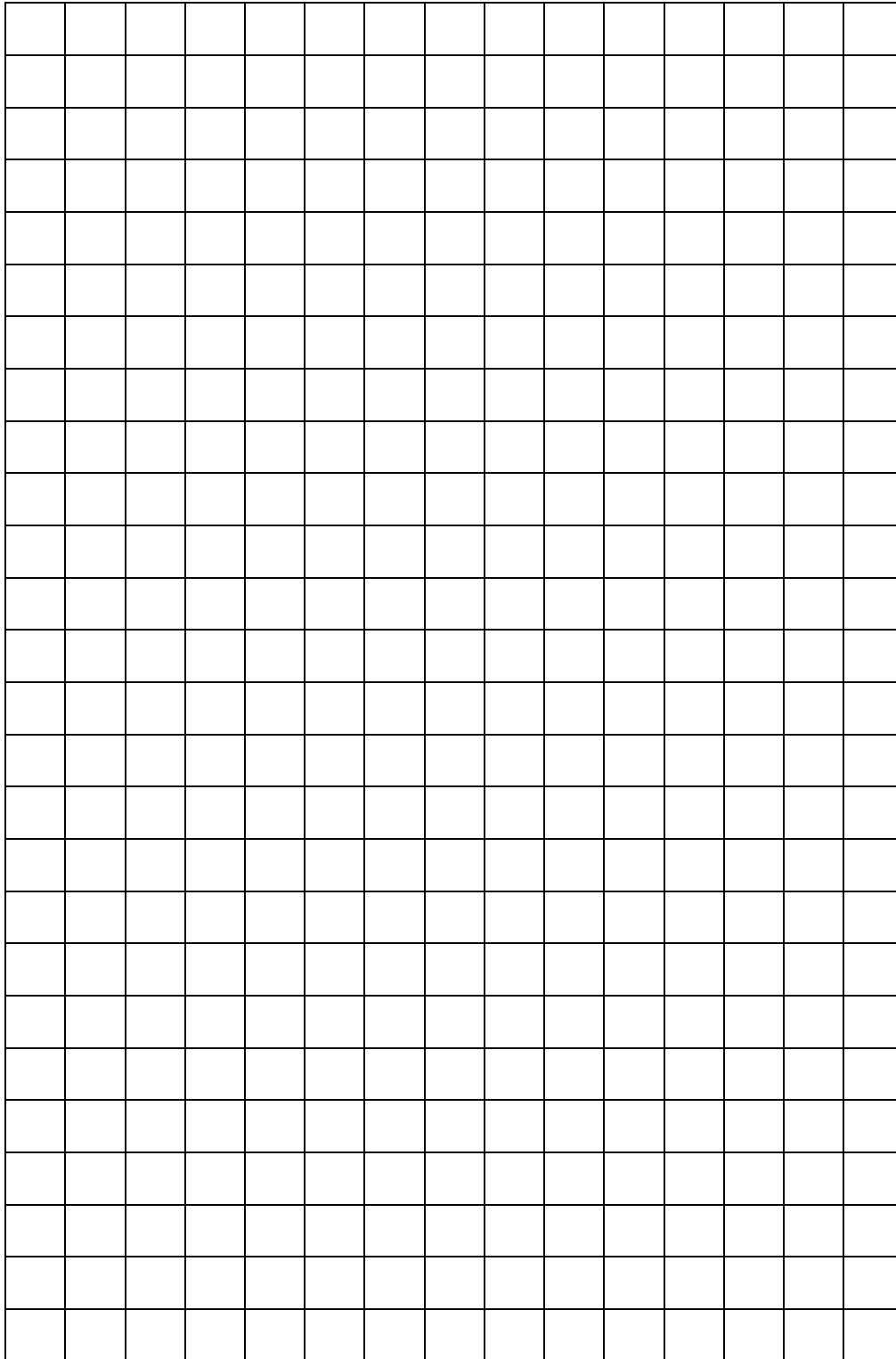
**Figure 3-6 Portal and Tamper Ranges for Stationary and Portable Assets**

## Equipment Requirements

Enter the quantities of AMS Readers, ST-1 Stationary Tags, MT-1 Mobile Tags, and PT-1 Personnel Tags in Figure 3-7.

Equipment Requirements		
Enter the quantity of all stationary assets to protect		
Quantity	Description	Part Number
1	RP-1 RF-Range Programmer	RP-1
	ST-1 Stationary Tag (multiples of 2)	STK-2
Enter the quantity of all portable assets to protect		
	MT-1 Mobile Tag (multiples of 2)	MTK-2
Enter the quantity of all personnel to track		
	PT-1 Personnel Tag (multiples of 2)	PTK-2
Enter the quantity of all AMS Readers based on the site survey		
	AMS-500 Relay Reader	AMS-500
	AMS-1000 Wiegand (26-bit) Reader	AMS-1000
	12 VDC Power Supply	300307001
	Power Supply Battery Backup (optional)	

**Figure 3-7 Equipment Requirements**



**Figure 3-8 Site Survey Floor Plan (one rectangle = 5 feet)**

## Site Testing

Site testing is the most critical part of the site survey process. You should use one or more test AMS Readers and multiple RFID tags that match what the customer plans to employ for their system. During each site test, you should document the physical locations of all AMS Readers and any special application requirements for the customer's assets and/or personnel. See the back of the manual for Site Survey worksheets and related information.

### Test tools

**NOTE** Refer to the "Switch Setting Quick Reference" on page 3.12 for all logic PCB settings and their functions.



You will need the following equipment:

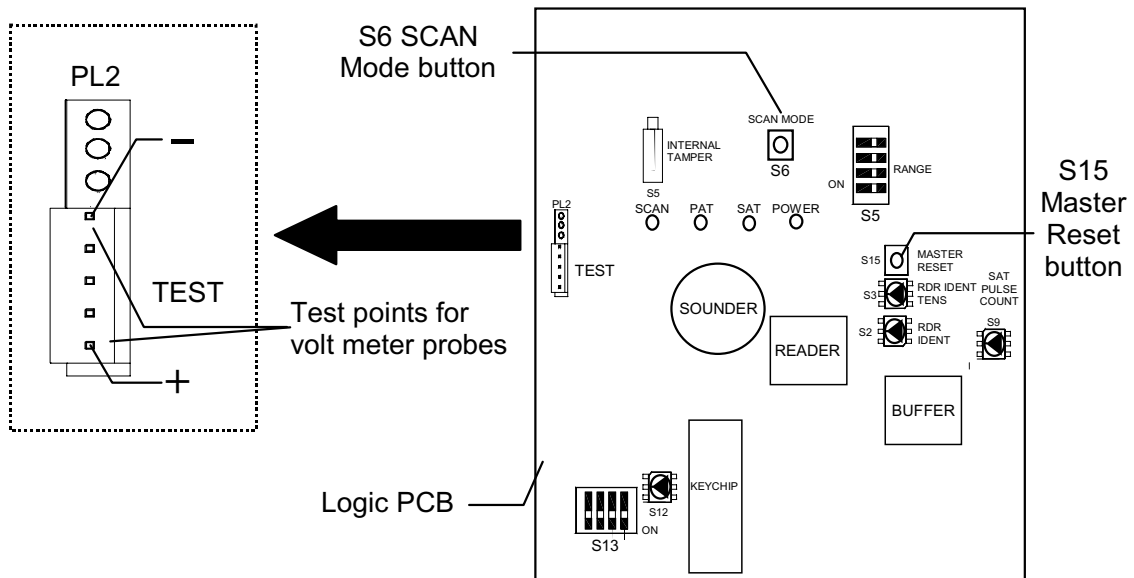
- AMS Readers
- RP-1 RF-Range Programmer
- Voltmeter capable of reading 0-to-5 VDC
- Multiple customer asset samples to test
- Sample ST-1, MT-1, and PT-1 test tags (as required)
- RF Scanner capable of reading between 417 and 418 MHz (optional)
- 12 VDC power supply (1A minimum)
- Small Phillips-head and flat-blade screwdrivers
- 7/32 Nut driver
- Wrench set (US standard)
- Adhesive material or non-metallic clamps to *temporarily* mount test tags

### AMS Reader and ST-1, MT-1, and PT-1 RFID tags

➤ **To test and optimize the RF read range for the AMS Reader and RFID tags:**

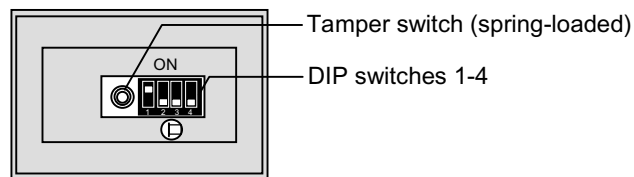
1. Place the AMS Reader at the first location to test RF detection ranges and RFID tags.
2. Remove the AMS Reader's front cover, and connect the voltmeter test probes to the top and bottom pins on the PL2 5-pin header. Figure 3-9: Test Points on the PL2 5-pin header (Logic PCB) on page 3.7 shows where the PL2 header is on the Logic PCB.





**Figure 3-9 Test Points on the PL2 5-pin header (Logic PCB)**

3. Press the spring-loaded tamper switch down, and power up the RFID tag by setting its DIP switch position 1 to the ON position as shown in Figure 3-10.



**Figure 3-10 Tamper and DIP Switches**

4. Press the S6 Scan Mode button on the Logic PCB to enable communication with the RP-1. When the AMS Reader is in Scan Mode, the red power LED continuously flashes.

**WARNING** Use removable adhesive or non-metallic clamps to test tags. To create an accurate test environment, you should affix adhesive strips to all test tags. However, **do not** remove the backing from the adhesive strip that you would normally use to permanently mount the tag to the asset.



5. Perform the following depending on the customer's application requirements:
  - **Stationary Asset Application**—Place the ST-1 Stationary test tag on the sample asset. All ST-1 tags are set to send alarms up to 150 feet away from the AMS Reader. Check the read range between the ST-1 and AMS Reader by slightly moving the tag. Proceed to step 12 if the customer's application *only* requires the use of ST-1 tags to monitor stationary assets. If not, go to the next sub-step to test their mobile assets.
  - **Mobile Asset Application**—Place or temporarily mount the MT-1 Mobile test tag on one or more sample assets. Make sure to press the tamper switch down to deactivate tamper alarms. Then, go to step 6 to set the RF-detection range or proceed to the next sub-step if the application requires PT-1 tags.
  - **Personnel Tracking**—Place the PT-1 Personnel tag on a lanyard or clip it to your shirt, and walk to the location where the customer wants the AMS Reader to detect personnel. Then, go to the next step. (It is important to note the closer the PT-1 is to your body, the shorter the RF signal range.)
6. Place the RP-1 in a vertical position in front of the MT-1 or PT-1 test tags, and point it towards the AMS Reader. Press and hold the **Find** button down until you hear a continuous beep at the reader, which indicates the initial read range is set.
7. Mark the physical location on the floor to identify the target location to read the RFID tags. Then, proceed to the next step to calibrate the AMS Reader's detection range.

**NOTE Important**

Site Survey mode sets the AMS Reader to sound an alarm once every second when the RFID tag is detected at or inside the active RF detection field. This feature allows you to quickly test and set the RF detection range with the RP-1.

If the application requires long range reception for MT-1 and PT-1 tags, refer to the *AMS Reader RF reception gain settings* information on “AMS Reader RF Reception Gain Settings” on page 3.10 to calibrate the AMS Reader.

8. Set the S9 SAT Pulse Count switch on the Logic PCB to position 7 to activate Site Survey mode.
9. Standing outside the target read location (step 7), *temporarily* mount an MT-1 test tag to a sample asset or clip a PT-1 test tag to your shirt. Activate the test tag's motion sensor by walking *slowly* towards the test AMS Reader until you hear continuous beeps. Then, go to the next step.
10. If the alarm beeps before reaching the target RF-detection location, press the - (minus) button on the RP-1 and repeat the walk test again. Conversely, if the beep occurs after passing the target read location, press the + (plus) button on the RP-1 to increase the read range. Repeat this process until you hear the beeps at the target RF-detection location. Then, go to the next step.
11. Perform the walk test again by *slowly* approaching the RF detection location and AMS Reader from several different directions. Repeat this until the AMS Reader consistently beeps when the test tag reaches the target read locations. Then, set the S9 SAT Pulse Count switch back to position 0 to deactivate Site Survey mode and go to the next step.
12. Press the S6 Scan Mode button and S15 Master Reset button on the Logic PCB to save the RF range settings to non-volatile (battery protected) memory. The red power LED will stop flashing to indicate the AMS Reader is back in read mode.

## AMS Reader RF Reception Gain Settings

You can use the Range DIP switch to increase the RF reception range on the AMS Reader. Figure 3-11 shows the DIP switch value, and Figure 3-12: Range DIP Switch (S5) Location on the Logic PCB on page 3.11 shows the Range DIP switch location on the Logic PCB.

You should *only* increase the RF reception strength for long range monitoring and/or containment for MT-1 and PT-1 tag applications. It is very important to note that increasing the RF reception can cause unwanted false alarms and blind spots inside the reception field, depending on the environment.

Range DIP Switch (S5)	
Position	RF Reception Strength
1	Two-times normal
2	Four-times normal
3	Eight-times normal
4	Sixteen-times normal

**Figure 3-11 Range DIP Switch (S5) Reception Strength Settings**

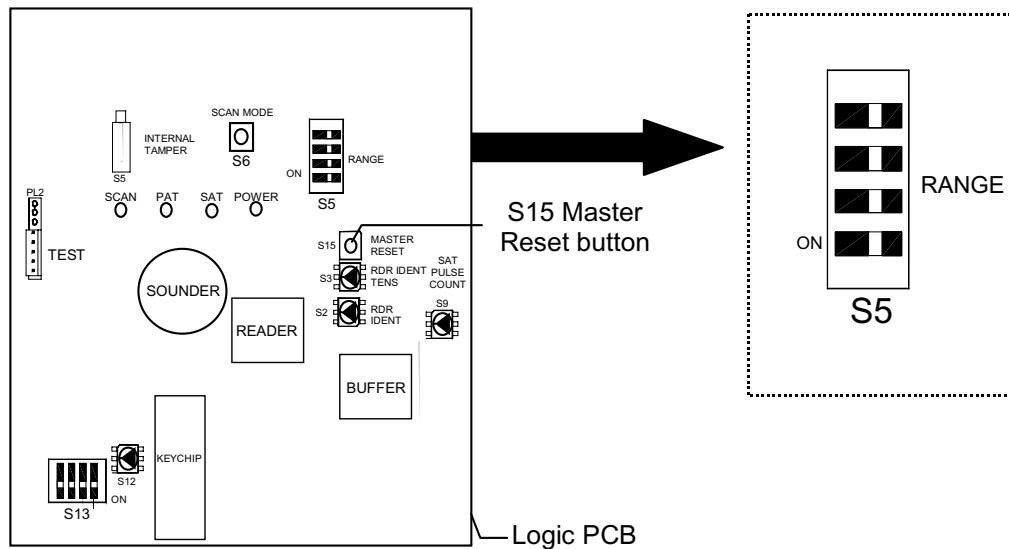
**NOTE**

The AMS Reader only recognizes the highest DIP switch position number and its RF reception strength setting.



➤ **To increase the RF reception range on the AMS Reader:**

1. Set the S5 DIP switch positions 1 - 4 to ON as required to increase the RF reception strength at the AMS Reader. Refer to Figure 3-11 for the RF reception settings.
2. Perform the AMS Reader and RFID tag instructions starting on page 3.6 to set the proper detection range for the MT-1 and PT-1 tags.



**Figure 3-12 Range DIP Switch (S5) Location on the Logic PCB**

#### NOTE



If you are in SCAN MODE and want to set the AMS Reader to the maximum reception range, press the **See** button one time and momentarily press the **Find** button. The read range voltage automatically goes to 5 VDC, which is the maximum reception range voltage for the active S5 range setting.

## Tamper alarms

With the AMS Reader devices positioned around the target monitor or containment area, move around the area and activate tamper alarms with test tags. Ensure the AMS Reader reports the tamper alarms from every conceivable location inside the target area. If you find blind spots, consider moving or adding AMS Reader devices to provide sufficient tamper protection.

If the customer wants to use the AMS Reader as a long-range tamper alarm device for stationary and mobile assets, inhibit the reception of MT-1 and PT-1 tags in motion using the RP-1 to set the read range to 0 VDC. This prevents the AMS Reader from reading MT-1 and PT-1 tags in motion.

## Switch Setting Quick Reference

Switch Setting Quick Reference			
Switch	Posn.	Default	Function
<b>S5</b>	1	OFF	Two-times normal reception strength
	2	OFF	Four-times normal reception strength
	3	OFF	Eight-times normal reception strength
	4	OFF	Sixteen-times normal reception strength
<b>S6</b>		OFF	Scan Mode (LED flashes when scan mode is active)
<b>S9</b>		0	ST-1 Stationary Asset tag pulse count setting. Sets the number of ST-1 pulse counts before sending data. Positions 8 and 9 are not used. Position functions follow: 0 = Report tag motion after 5 seconds 1 = Report tag motion after 15 seconds 2 = Report tag motion after 6 seconds 3 = Report tag motion after 12 seconds 4 = Report tag motion after 18 seconds 5 = Deactivates ST-1 motion event reporting 6 = Not Used 7 = Site Survey Mode
		7	Activates Site Survey mode
<b>S10</b>		Pressed	Front panel tamper OFF (ON when cover removed)
<b>S12</b>		0	Sets the relay timer delay settings as follows: 0 = Off 1 = Relay active for 0.5 second 2 = Relay active for 1 second 3 = Relay active for 2 seconds 4 = Relay active for 4 seconds 5 = Relay active for 8 seconds 6 = Relay active for 16 seconds 7 = Relay active for 30 seconds 8 = Relay active for 60 seconds 9 = Relay active for 120 seconds
<b>S13</b>	1	ON	Enable internal sounder (OFF disables sounder)
	2	OFF	Enable external control of LED's (AMS-1000 only)
<b>S15</b>		Pressed	Master Reset. Saves RF range settings to memory and clears lock-up condition after power or data output problems

### Overview

Before installing AMS Readers and RFID tags, you must possess the site survey and all associated documentation that identifies the precise mounting locations for all AMS Readers, assets, and personnel detection areas.

This section describes how to install, wire, and commission AMS Readers and RFID tags.

### AMS Reader

**CAUTION** Use anti-static precautions when handling reader electronic PCBs.



Misalignment can result in bent or broken pins. Press the connectors firmly together until the top PCB comes to a stop against its mounting spacers

► **To install all AMS Readers:**

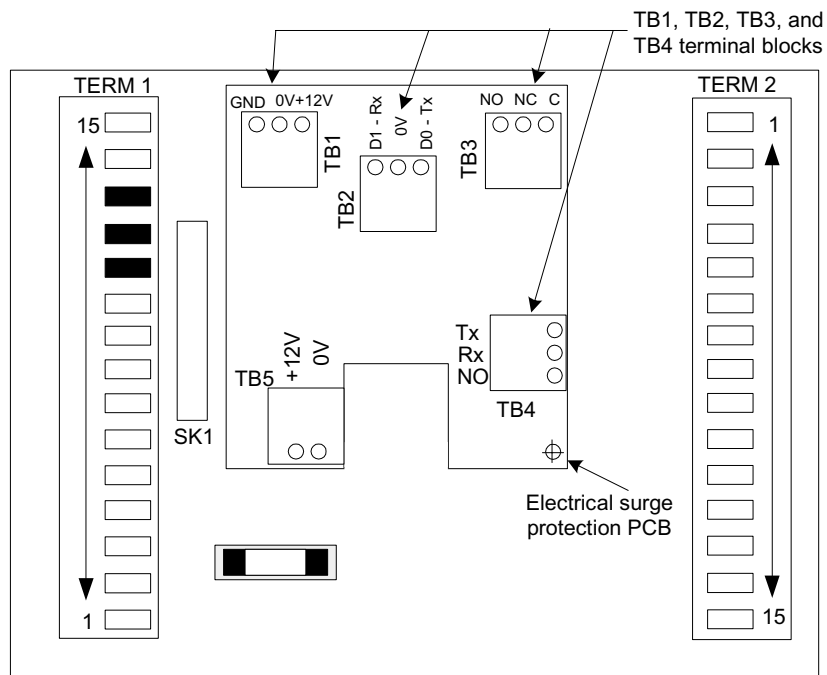
1. Remove the AMS Reader from its protective packaging. Then, remove the front cover's retaining screw and slide the cover down and off. Remove the bag containing the special security replacement screw.
2. Remove the mounting hardware (Phillips-head screw and 7/32 nut) from the Logic PCB. Then, carefully remove the PCB from the housing and place it on a non-static surface.
3. Remove the mounting hardware (four screws) from the Backplane PCB, and carefully remove it from the housing and place it on a non-static surface.
4. Remove the plastic knockout from the rear of the housing to accommodate incoming power and signal conductors.
5. Place the housing onto its target location and mark the four mounting holes.

6. Remove the housing and drill the holes for the mounting hardware. Then, mount the housing using the appropriate surface-specific hardware. Then, proceed to “Wiring AMS Readers” below.

## Wiring AMS Readers

These instructions describe how to terminate conductors (wires) to the Backplane PCB. Depending on site requirements and AMS Reader you are installing, some wiring information in this subsection may not apply.

To comply with UL listing requirements, you must always terminate conductors to terminal blocks TB1, TB2, TB3, and TB4 on the electrical surge protection PCB shown in Figure 4-1. You must route power and signal cables through the knockout hole in the center of the Backplane PCB.



**Figure 4-1** Electrical Surge Protection PCB and TB1, TB2, TB3, and TB4 Terminal Blocks

**NOTE** The TERM 1 and TERM 2 terminal connectors should **only** be used for external LED drive connections.





The TB-1 through TB-4 connectors are screw terminals. The TERM 1 and TERM 2 connectors are clamp-type terminals.

► **To terminate wires to both types of connectors:**

1. Strip approximately 5 cm of insulation off each conductor (wire).
2. Use a small flat-blade screwdriver (preferably 2.5 mm or less) to turn the TB1-TB4 terminal screws counterclockwise and loosen. You can use the same screwdriver to open the clamp-type connectors on TERM 1 or TERM 2.
3. Insert the wire and tighten the screw terminal by turning it clockwise or release the clamp-type connector. Then, check each wire to ensure it is secure.

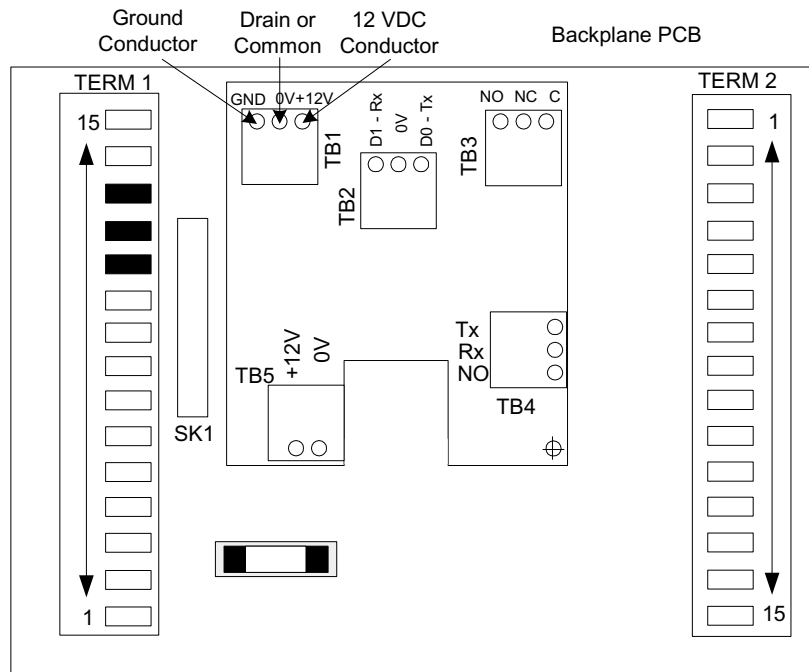
**WARNING** All AMS Reader cables should be a minimum of 3 feet (1 m) away from any 3-phase power junction box, and a minimum of 1.5 feet (0.5 m) from a single-phase junction box



## 12 VDC Power/Ground Connections

AMS Readers require 12 VDC/100 mA for power. You must use a UL Listed 12 VDC power supply that complies with all local codes and regulations. The AMS Reader's onboard voltage regulator can accommodate input voltage between 9 and 14 VDC. The onboard protection diode and fuse protect the reader against reverse polarity and any voltage input greater than 16 VDC.

Use two-conductor Belden 8760 (22 AWG minimum) shielded cables for all power and ground connections. Figure 4-2 shows the ground and 12 VDC conductor terminations.



**Figure 4-2 Ground and 12 VDC Conductor Terminations**

**NOTE**

**Always** connect the GND or 0V terminal to earth ground or a ground plane



**Always** connect the shield conductor to ground at the remote end.

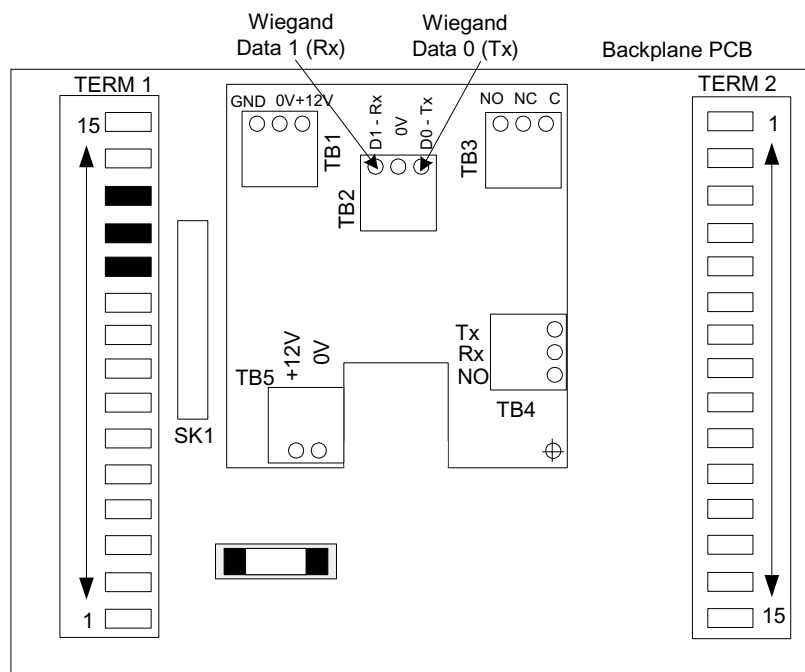
## Wiegand (26-bit) Connections (AMS-1000 only)

The AMS-1000 Wiegand (26-bit) Reader can connect to any access control system that supports Wiegand 26-bit data format.

For Wiegand data, use Belden 9536 (22 AWG minimum) six-conductor shielded cable. Figure 4-3: Wiegand 26-bit Format and Descriptions on page 4.5 lists the Wiegand 26-bit industry-standard format, and Figure 4-4: Wiegand Conductor Terminations on page 4.5 shows how to terminate the conductors for Wiegand Data 1 and Data 0 data communications.

Wiegand 26-bit Format	
Bits	Description
1	Even parity on bits 1-3
2 - 9	Batch code printed on tags
10 - 25	Tag number printed on tags
26	Odd parity on bits 14-26

**Figure 4-3 Wiegand 26-bit Format and Descriptions**



**Figure 4-4 Wiegand Conductor Terminations**

**NOTE** Always connect the GND or 0V terminal to earth ground or a ground plane



Always connect the shield conductor to ground at the remote end.

## External LED Drive Connections

For some access control applications, you may want to use external LED indicators to show conditions like a door is locked or unlocked. To enable external LED drive control, set the S13 DIP switch (Logic PCB) position 2 to the ON position. The LED drive voltage is diverted/controlled by the external power supply.

For LED drive voltage, use Belden 9536 (22 AWG minimum) six-conductor shielded cable. Figure 4-5: External LED Wiring on TERM 1 on page 4.6 lists the external LED wiring for TERM 1. Figure 4-6: External LED Input Colors and Conductor Terminations on page 4.6 shows the external LED wiring on the Backplane PCB's TERM 1.

External LED Wiring (TERM1)	
Pin	Description
11	Green LED External input
12	Amber LED External input
13	Red LED External input

Figure 4-5 External LED Wiring on TERM 1

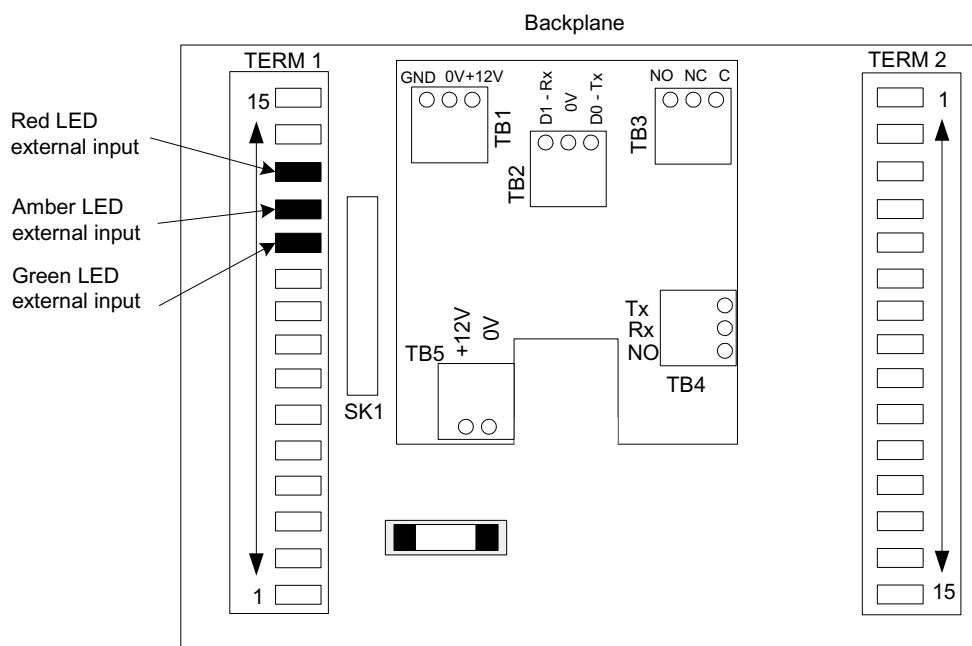


Figure 4-6 External LED Input Colors and Conductor Terminations

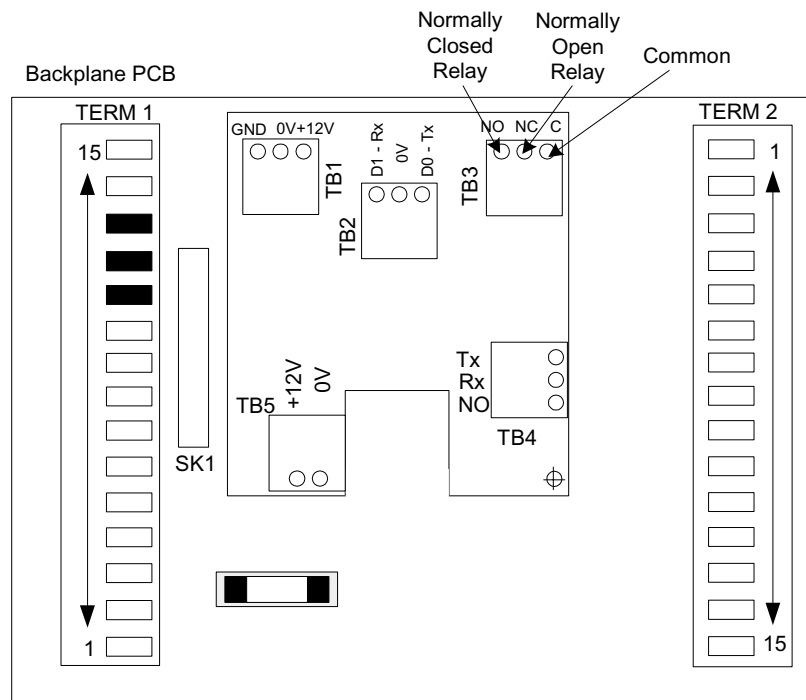
**NOTE** Pulling the LED inputs to ground lights the LEDs.



## Relay Connections

AMS Readers are equipped with a relay that can trigger external devices like CCTV events, burglar alarm panels, etc. The default relay time is set to operate for 5 seconds when the reader receives a tamper or movement alarm. The relay in the reader is factory set to normally open (NO) when applying power.

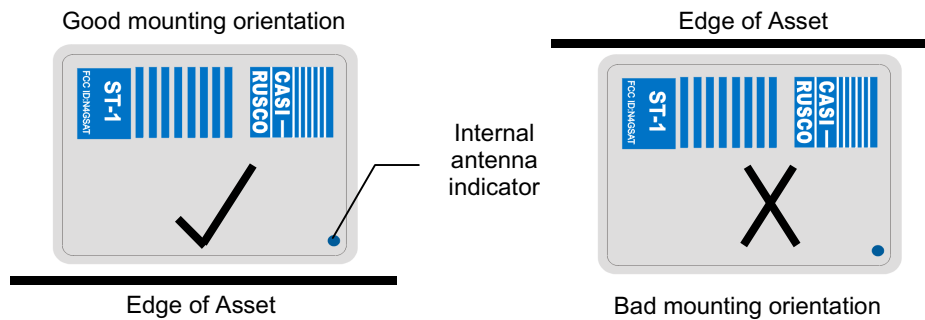
To reset the default relay time, see “Relay Timer Delay Settings” on page 5.7.



**Figure 4-7 Relay Conductor Terminations**

## Installing ST-1 and MT-1 Asset Tags

To correctly install asset tags, place them on an edge or corner of an asset using the internal antenna indicator orientation as shown in Figure 4-8. The indicator shows where the internal antenna is inside the tag, and should always be closest to open air. Also, use the double-sided adhesive pads that come with the tags to ensure good RF-signal performance.



**Figure 4-8 Tag Location and Orientation**

If you are installing tags on metallic surfaces, it is imperative that you test the RF performance before permanently affixing it to the asset's surface. Depending on the tag's location and/or metallic surface, the disturbance to RF performance could result in a substantial reduction in range.

Although laptop computers appear to have plastic housings, they usually have metal screens behind their LCD (liquid crystal display) screens. Before affixing tags to laptop computers, test several different locations to find the best performance position.

## Tag-to-asset Surface Adhesion

To ensure good adhesion between assets and tags, it is important to make sure the surface is dry and free from moisture.

### ► To ensure good asset surface adhesion:

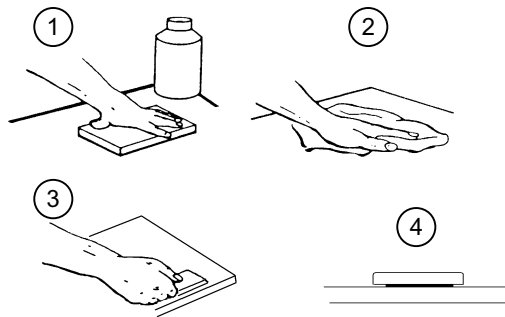
1. You may need to seal or prime these surfaces before affixing tags:
  - Porous (concrete) or fibrous materials (wood) require sealing to provide a unified surface. Optional sealers include varnish and lacquer.
  - Materials like copper, brass, plastic or vinyl may require priming or coating to prevent interaction between the adhesive and asset's surface.

- Glass bonding in high humidity environments may require an appropriate primer to provide long-term bonding.
2. Never reuse asset tag adhesive pads.

## Preparation and Mounting

The double-sided adhesive pad that comes with each asset tag provides consistent spacing and mounting adhesion for a broad range of mounting surfaces. Any alterations or modifications to the mounting recommendations in this subsection should be approved prior to final installation.

Before installing an asset tag, make sure the tag's location on the asset does not restrict or limit the use of the asset. Also, inform site security personnel you are going to install asset tags, and that the AMS Reader may report tamper or movement alarms. This should prevent unnecessary concern or action by the security personnel. Figure 4-9 graphically shows the basic preparation and mounting steps.



**Figure 4-9 Surface Preparation, Cleaning, And Asset Tag Installation**

► **To prepare and clean the surface and install the asset tag:**

1. Gather:
  - Two clean, soft texture cotton cloths
  - Spray bottle of cleaning solution consisting of 50% isopropyl alcohol and 50% water

**WARNING** Always test the cleaning solution to ensure it does not damage the asset's surface.



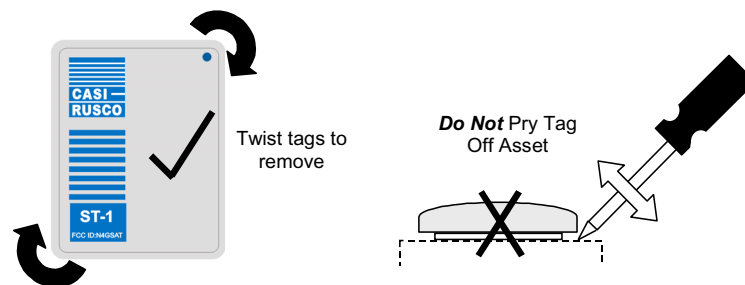
2. Spray a small amount of the cleaning solution onto one of the clean cloths.

3. Test the cleaning solution on the asset by wiping a very *small* amount on a corner or non-visible area to ensure it does not harm the surface. If it does not harm the surface, proceed to step 4. If the solution appears to harm the surface in any way, stop immediately and wipe the remaining solution off the asset with the dry cloth. Then, refer to the literature supplied with the asset to obtain the recommended cleaning solution before proceeding to the next step.
4. Clean the area on the asset where you are installing the asset tag. Then, wipe it off with the dry cloth.
5. Peel the white backing off the adhesive strip and mount it to the tag.
6. Peel the red backing off the adhesive strip on the rear of the asset tag, and press the asset tag to the asset's surface firmly for approximately 30 seconds. The tag's bonding strength depends on the degree of adhesive-to-surface contact. Firm application pressure develops better adhesive contact and improves overall bonding strength.

After you affix the tag to the asset, the bond strength increases as the adhesive flows into the asset's surface. At room temperature, approximately 50% of the adhesion strength is set after 20 minutes, 90% after 24 hours, and 100% after 72 hours. In addition, using a weight or clamp to place consistent pressure on the tag can improve its long-term adhesion to the asset.

## Removing Tags

Figure 4-10 shows the correct way to twist a tag to the left or right to break the adhesive pad. Make sure to remove any residual adhesive from the tag and asset's surface after removal, and *do not* install a new adhesive pad on top of an existing pad.



**Figure 4-10 Tag Removal**

**WARNING** Do **NOT** use a screwdriver (or equivalent tool) to remove asset tags. Doing so can cause permanent damage to the RFID tag and asset.





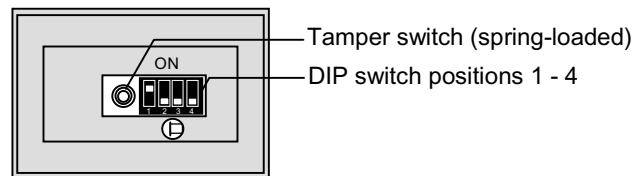
The section describes how to power up, test, and commission AMS Reader using ST-1 Stationary Tags, MT-1 Mobile Tags, and PT-1 Personnel Tags. Before starting the commissioning process, verify that all AMS Readers, cable runs, and system terminations are complete and correct. The system commissioning instructions in this section and their page numbers follow.

- AMS Reader and ST-1 Stationary Tag Systems (page 5.1)
- AMS Reader and MT-1 Mobile Tag Systems (page 5.2)
- AMS Reader and PT-1 Personnel Tag Systems (page 5.4)

## AMS Reader and ST-1 Tag Systems

### ► To commission a system with AMS Readers and ST-1 Stationary tags:

1. Power up the ST-1 tag by setting DIP switch position 1 to the ON position as shown in Figure 5-1.



**Figure 5-1 ST-1 Stationary Tag Tamper Switch and DIP Switch**

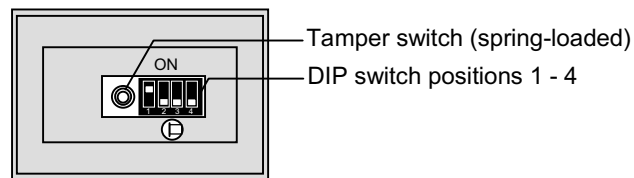
2. Affix the ST-1 tag to the stationary asset according to the *Installing ST-1 and MT-1 Asset Tags* instructions in Chapter 4 - Installation. Repeat step one and two to power up and affix all ST-1 tags to their assets according to the site survey information.
3. Power up the AMS Readers, and verify the red power LED lights on the front panels.
4. Test the read range between each ST-1 and AMS Reader by slightly moving each tag to generate a movement alarm. If the site requires special movement or alarm filtering, perform the instructions in “False Alarm/ Movement Settings” on page 5.9. Then, go to the next step.

5. Demonstrate the alarm reporting functionality to the customer until they approve the system. You should also tell the customer to test their system weekly (respectively) by performing the same movement and alarm test. When the customer approves the system operation, obtain the necessary signatures to officially commission and release the system.

## AMS Reader and MT-1 Tag Systems

➤ **To commission a system with AMS Readers and MT-1 Mobile tags:**

1. Power up the MT-1 tag by setting DIP switch position 1 to the ON position as shown in Figure 5-2.



**Figure 5-2 MT-1 Mobile Tag Tamper Switch and DIP Switch**

2. Affix the MT-1 tag to the mobile asset according to the instructions in “False Alarm/Movement Settings” on page 5.9. Repeat step one and two to power up and affix all MT-1 tags to their assets according to the site survey information.
3. Remove the AMS Reader’s front cover, and connect the voltmeter’s test probes to the top and bottom pins on the Logic PCB’s PL2 5-pin header shown in Figure 5-3. Initially, the voltmeter reading should be between 0 and 5 VDC (default setting is 4 VDC).

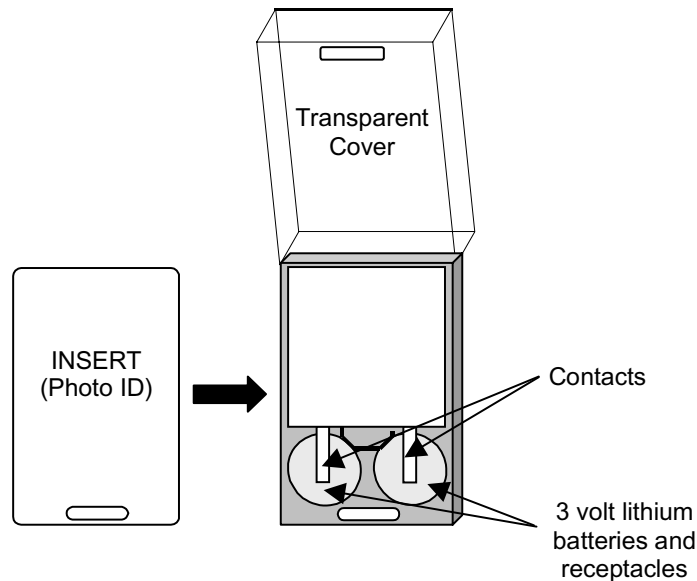


10. If the alarm beeps before reaching the target RF-detection location, press the - (minus) button on the RP-1 to reduce the detection range. Conversely, if the beep occurs after passing the target read location, press the + (plus) button on the RP-1 to increase the detection range. Repeat this process until you hear the beeps at the target detection location. Then, go to the next step.
11. Perform the walk test again by *slowly* approaching the detection location and AMS Reader from several different directions, and set the detection range as required. Repeat this step until the AMS Reader consistently beeps when all MT-1 tags and their assets reach the target detection location.
12. Set the S9 SAT Pulse Count switch back to position 0 to deactivate Site Survey mode. Then, go to the next step.
13. After all the readers are set, press the S6 Scan Mode button and S15 Master Reset button (Logic PCB) on each AMS Reader to save their RF settings to non-volatile (battery protected) memory, and replace the front cover. The red power LED will stop flashing to indicate the reader is back in read mode.
14. Demonstrate the alarm reporting functionality to the customer until they approve the system. You should also tell the customer to test their system weekly (respectively) by performing the same type of alarm tests. When the customer approves the operation of their system, obtain the necessary signatures to officially commission and release the system.

## AMS Reader and PT-1 Tag Systems

➤ **To commission a system with AMS Readers and PT-1 Personnel tags:**

1. Power up a PT-1 Personnel tag by opening the transparent cover and installing the two coin-size 3-volt lithium batteries under the receptacles as shown in Figure 5-4. Then, close the cover. The PT-1 tag's number appears on an inside label.



**Figure 5-4 PT-1 Personnel Tag**

**NOTE**



To get the best RF range from the PT-1 when located close to the body (shirt pocket), make sure the clear plastic top faces outward.

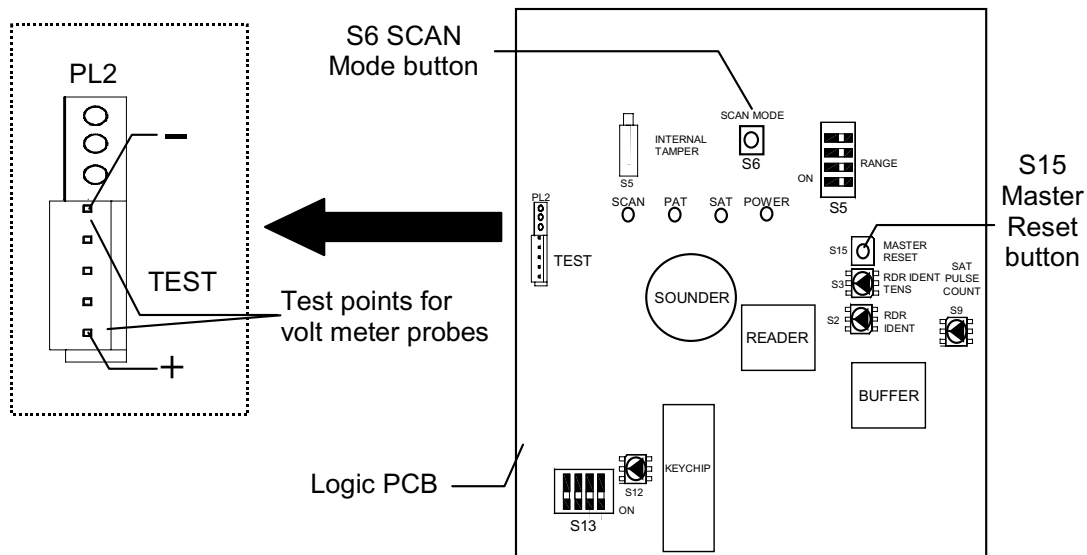
You can replace the PT-1 tag's insert with any standard business card, photograph, or identification card.

2. Remove the AMS Reader's front cover, and connect the voltmeter's test probes to the top and bottom pins on the Logic PCB's PL2 5-pin header shown in Figure 5-5. Initially, the voltmeter should read between 0 and 5 VDC (default setting is 4 VDC).

**NOTE**



To get the best RF range from the PT-1 when located close to the body (shirt pocket), make sure the clear plastic top faces outward.



**Figure 5-5 PL2 5-Pin Header on the Logic PCB**

3. Power up the AMS Readers and verify the red power LED lights on their front panels.
4. Press the S6 Scan Mode button on the Logic PCB to enable communication with the RP-1 RF-Range Programmer. When the AMS Reader is in Scan Mode, the red power LED continuously flashes.
5. Mark the physical location on the floor to identify the target location to detect the PT-1 tags. Then, proceed to the next step to calibrate the AMS Reader's detection range.
6. Set the S9 SAT Pulse Count switch on the AMS Reader to position 7 to activate Site Survey mode.

**NOTE**



Site Survey mode sets the AMS reader to sound an alarm once every second when the RFID tag is detected at or inside the active RF detection field. This feature allows you to quickly test and set the RF detection range with the RP-1.

7. Place the RP-1 in a vertical position in front of the PT-1 tag, and point it towards the AMS Reader. Press and hold the **Find** button down until you hear a continuous beep at the reader, which indicates the initial detection range is set.
8. Standing outside the target detection location (step 9) with the PT-1 tag clipped to your shirt or a lanyard, activate the tag's motion sensor by

walking *slowly* towards the AMS Reader until you hear continuous beeps (once per second). Then, go to the next step.

9. If the alarm beeps occur before reaching the target RF-detection location, press the - (minus) button on the RP-1 to reduce the detection range. Conversely, if the beep occurs after passing the target read location, press the + (plus) button on the RP-1 to increase the detection range. Repeat this process until you hear the beeps at the target detection location. Then, go to the next step.
10. Perform the walk test again by *slowly* approaching the detection location and AMS Reader from several different directions, and set the detection range as required. Repeat this step until the AMS Reader consistently beeps when the PT-1 tag reaches the target detection location.
11. Set the S9 SAT Pulse Count switch back to position 0 to deactivate Site Survey mode. Then, go to the next step.
12. After all the readers are set, press the S6 Scan Mode button and S15 Master Reset button (Logic PCB) on each AMS Reader to save their RF settings to non-volatile (battery protected) memory, and replace the front cover. The red power LED will stop flashing to indicate the reader is back in read mode.
13. Demonstrate the alarm reporting functionality to the customer until they approve the system. You should also tell the customer to test their system weekly (respectively) by performing the same type of alarm tests. When the customer approves the operation of their system, obtain the necessary signatures to officially commission and release the system.

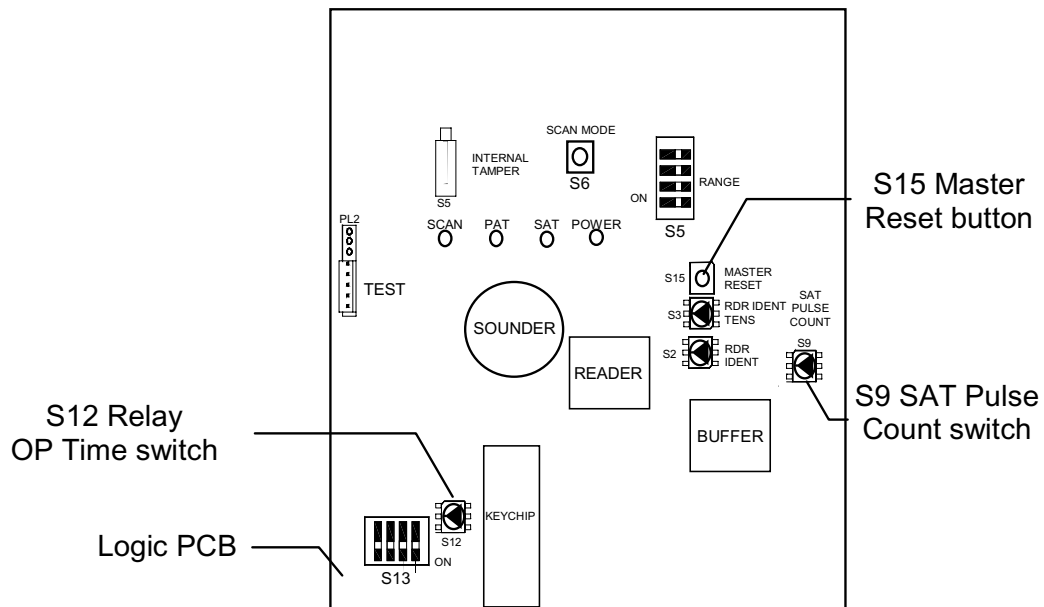
## Special System Settings

The following describes special system settings you may need to employ depending on the RF environment and/or customer requirements.

### Relay Timer Delay Settings

► **To set the relay timer delay:**

1. Remove the AMS Reader's front cover, and locate the S12 RELAY OP TIME switch on the Logic PCB as shown in Figure 5-6.



**Figure 5-6 S12 Relay OP Time Switch on the Logic PCB**

2. Set the appropriate relay-active time on the S12 switch using the information in Figure 5-7.

Relay Timer Delay Settings (S12)			
Position	Description	Position	Description
0	Off	5	Relay active for 8 seconds
1	Relay active for 0.5 second	6	Relay active for 16 seconds
2	Relay active for 1 second	7	Relay active for 30 seconds
3	Relay active for 2 seconds	8	Relay active for 60 seconds
4	Relay active for 4 seconds	9	Relay active for 120 seconds

**Figure 5-7 S12 Switch Settings for Relay Timer Delays**

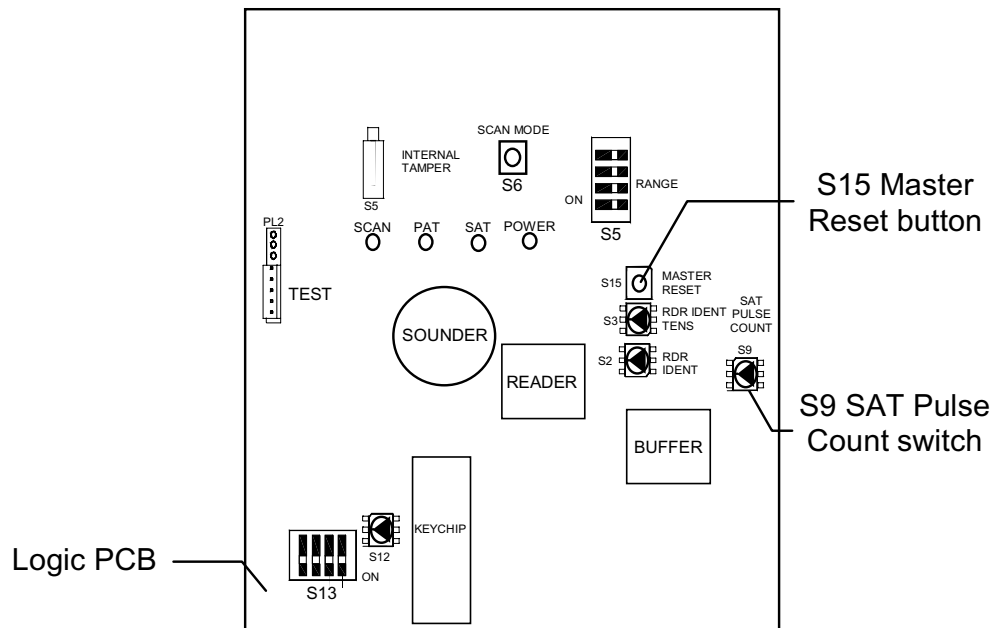
3. Press the S15 Master Reset button (Logic PCB) on the AMS Reader to save the RF settings to non-volatile (battery protected) memory, and replace the front cover.



## False Alarm/Movement Settings

► To suppress false alarms and/or tag movements:

1. Remove the AMS Reader's front cover, and locate the S9 SAT Pulse Count switch on the Logic PCB shown in Figure 5-8.



**Figure 5-8 S9 SAT Pulse Count Switch on the Logic PCB**

- Set the appropriate false alarm or motion settings on the S9 SAT Pulse Count switch according to the information in Figure 5-9.

Relay Timer Delay Settings (S9)			
Position	Description	Position	Description
0	Report tag motion after 5 seconds	5	Deactivates ST-1 motion event reporting
1	Report tag motion after 15 seconds	6	Not used
2	Report tag motion after 6 seconds	7	Site Survey Mode
3	Report tag motion after 12 seconds	8	Not used
4	Report tag motion after 18 seconds	9	Not used

**Figure 5-9 S9 Switch Settings for False Alarm and Tag Movements**

- Press the S15 Master Reset button (Logic PCB) on the AMS Reader to save the settings to non-volatile (battery protected) memory, and replace the front cover.

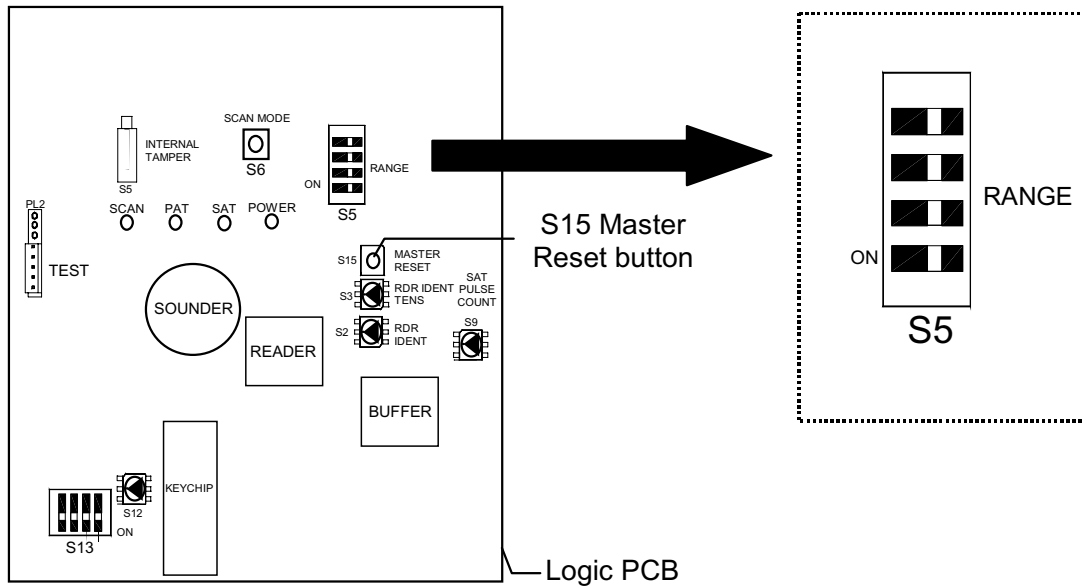
## Long-Range RF Reception Settings

You can use the Range DIP switch on the Logic PCB to increase the RF reception on the AMS Readers. Figure 5-10 shows the DIP switch values, and where the Range DIP switch is on the Logic PCB.

Range DIP Switch (S5)	
Position	RF Reception Strength (On)
1	Two-times normal
2	Four-times normal
3	Eight-times normal
4	Sixteen-times normal

**Figure 5-10 S5 Range DIP Switch Reception Settings and Descriptions**

**NOTE** The AMS Reader only recognizes the highest DIP switch position set to ON.



**Figure 5-11 S5 DIP Switch on the Logic PCB**

You should *only* increase the RF reception strength for long range monitoring and/or containment of MT-1 and PT-1 tags. It is *very* important to note that increasing the RF reception strength can cause unwanted false alarms and blind spots in the reception field.

► **To increase the RF reception strength for long-range monitoring:**

1. Set the S5 DIP switch positions 1 - 4 to ON as required to increase the RF reception strength at the AMS Reader.
2. Perform the appropriate AMS Reader and Tag commissioning instructions as described in this section to set the detection range for the MT-1 or PT-1 tags.

**NOTES**

### AMS-500 Relay Reader

Figure 6-1 shows the AMS-500 Relay Reader dimensions and Figure 6-2 lists the specifications.

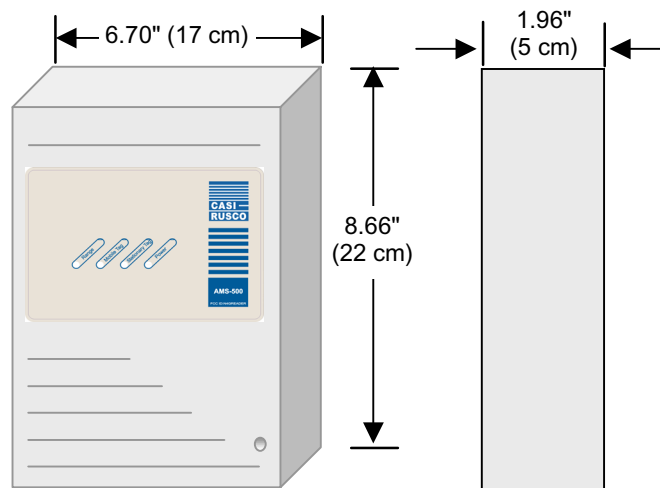


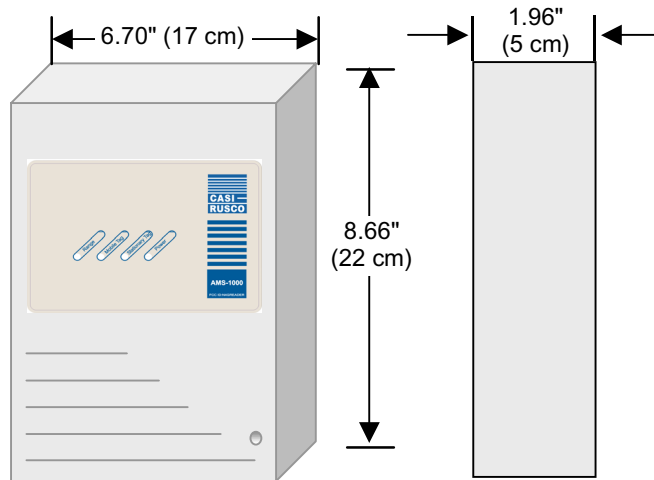
Figure 6-1 AMS-500 Relay Reader and Dimensions

Specifications	
Power Supply Input	9 – 14 VDC @ 100 mA (maximum)
Dimensions (HWD)	8.66" (22 cm) x 6.70" (17 cm) x 1.96" (5 cm)
Weight	26.4 oz (750 g)
Certifications	UL 1037 and 294
Environmental	Housing is IP51 rated
Wiring Specifications	Power — Requires Belden 8760 (22 AWG minimum)
Temperature Ranges	<ul style="list-style-type: none"><li>• Operating: 23° F (-5° C) to 104° F (40° C)</li><li>• Storage: 14° F (-10° C) to 158° F (70° C)</li><li>• Single-pole double-throw voltage free contacts rated at 24 VDC / 1 A (max.)</li></ul>
Alarm Relay	<ul style="list-style-type: none"><li>• Output duration 5 seconds (default setting)</li><li>• Active upon any type of valid tag data received in motion, tamper, or power failure</li></ul>
External LED Inputs	Input voltage TTL-compatible, active low, internal pull-up 5 VDC

**Figure 6-2 AMS-500 Specifications**

## AMS-1000 Wiegand (26-bit) Reader

Figure 6-3 shows the AMS-1000 Wiegand (26-bit) Reader dimensions and Figure 6-4 lists the specifications.



**Figure 6-3 AMS-1000 Wiegand (26-bit) Reader Dimensions**

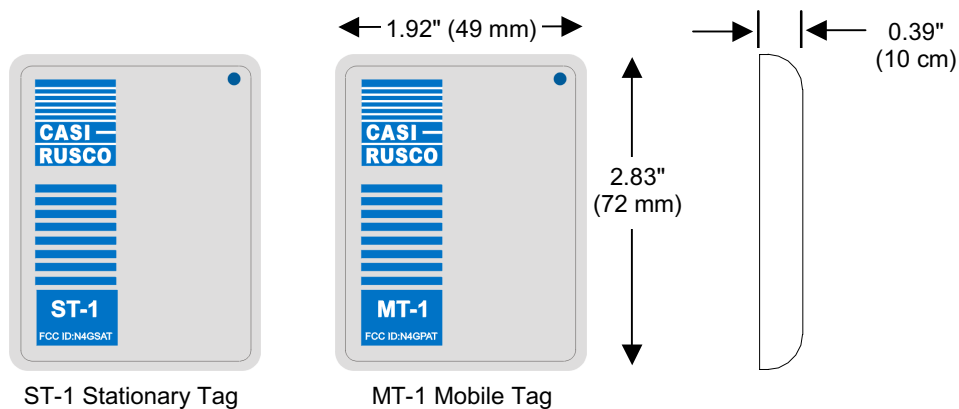
Specifications	
Power Supply Input	9 – 14 VDC @ 100 mA (maximum)
Dimensions (HWD)	8.66" (22 cm) x 6.70" (17 cm) x 1.96" (5 cm)
Weight	26.4 oz (750 g)
Certifications	UL 1037 and 294
Environmental	Housing is IP51 rated
Wiring Specifications	Power — Requires Belden 8760 (22 AWG minimum) Data (Wiegand) — Requires Belden 9536 (22AWG minimum) with a maximum cable run distance of 500 feet
Temperature Ranges	<ul style="list-style-type: none"><li>• Operating: 23° F (-5° C) to 104° F (40° C)</li><li>• Storage: 14° F (-10° C) to 158° F (70° C)</li><li>• Single-pole double-throw voltage free contacts rated at 24 VDC / 1 A (max.)</li></ul>
Alarm Relay	<ul style="list-style-type: none"><li>• Output duration 5 seconds (default setting)</li><li>• Active upon any type of valid tag data received in motion, tamper, or power failure</li></ul>
External LED Inputs	Input voltage TTL-compatible, active low, internal pull-up 5 VDC

**Figure 6-4 AMS-1000 Specifications**



## ST-1 and MT-1 Tags

Figure 6-5 shows the ST-1 and MT-1 tag dimensions and Figure 6-6 lists their specifications.



**Figure 6-5 ST-1 and MT-1 Tag Dimensions**

Specifications	
Power Supply Input	Two 3-volt lithium non-replaceable batteries with an approximate life of 3 years.
Dimensions (HWD)	2.83" (72 mm) x 1.92" (49 mm) x 0.39" (10 mm)
Weight	1.05 oz (30 g)
Certifications	UL 1037 and 294 FCC Part 15.231 parts (a) and (b), intentional radiators
Temperature Ranges	<ul style="list-style-type: none"> <li>• Operating: 23° F (-5° C) to 104° F (40° C)</li> <li>• Storage: 14° F (-10° C) to 158° F (70° C)</li> </ul>

**Figure 6-6 ST-1 and MT-1 Tag Specifications**

# PT-1 Personnel Tag

Figure 6-7 shows the PT-1 tag dimensions and Figure 6-8 lists the specifications.

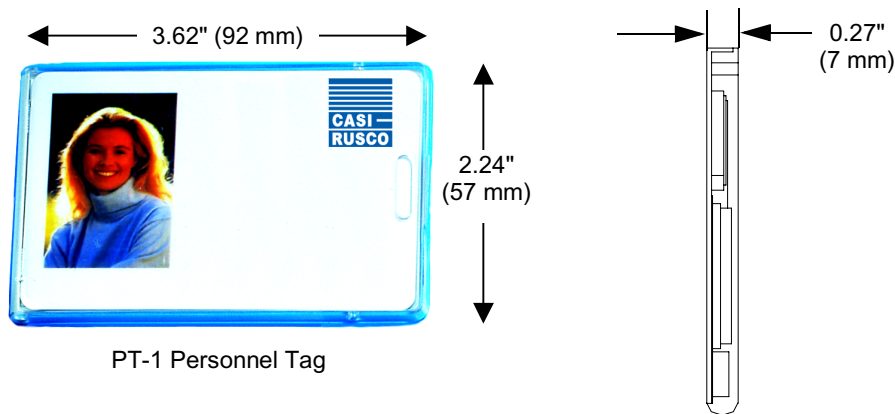


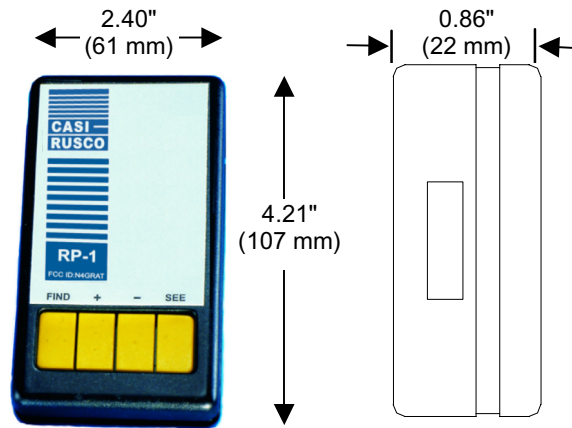
Figure 6-7 PT-1 Personnel Tag Dimensions

Specifications	
Power Supply Input	Two 3-volt lithium replaceable batteries with a approximate life of one year.
Dimensions (HWD)	2.24" (57 mm) x 3.62" (92 mm) x 0.27" (7 mm)
Weight	1.26 oz (40 g)
Certifications	UL 1037 and 294 FCC Part 15.231 parts (a) and (b), intentional radiators
Temperature Ranges	<ul style="list-style-type: none"><li>• Operating: 23° F (-5° C) to 104° F (40° C)</li><li>• Storage: 14° F (-10° C) to 158° F (70° C)</li></ul>

Figure 6-8 PT-1 Specifications

## RP-1 RF-Range Programmer

Figure 6-9 shows the RP-1 RF-Range Programmer Tag and Figure 6-10 lists the specifications.



**Figure 6-9 RP-1 RF-Range Programmer Dimensions**

Specifications	
Power Supply Input	Two replaceable AAA batteries (supplied)
Dimensions (HWD)	4.21" (107 mm) x 2.40" (61 mm) x 0.86" (22 mm)
Weight	1.58 oz (90 g)
Certifications	UL 1037 and 294 FCC Part 15.231 parts (a) and (b), intentional radiators
Temperature Ranges	<ul style="list-style-type: none"> <li>• Operating: 23° F (-5° C) to 104° F (40° C)</li> <li>• Storage: 14° F (-10° C) to 158° F (70° C)</li> </ul>

**Figure 6-10 RP-1 Specifications**

**NOTES**

## Site Survey Worksheet

### AMS Readers and RFID Tag Applications

Use this worksheet to complete a site survey and:

- Gain an understanding of your customer's protection needs.
- Determine the location of asset protection readers and tags.
- Determine the number of devices necessary to provide optimal protection.
- Complete system configuration
- Calculate system pricing.

Company Name:	Contact Name:
Address:	Title:
Address (continued):	Phone: Fax:
City, State and Zip:	E-mail:
	Installation Time Window:

### How to Assess the Wireless Environment

Please answer the following questions:

Answer

	YES	NO	Score
Does the reader coverage area have physical obstructions?	2 pts	0 pts	
Will the reader be installed near transformers, heavy-duty motors, fluorescent lights, microwave ovens, refrigerators or other industrial equipment?	2 pts	0 pts	
Will the reader location be outdoors?	2 pts	0 pts	
Does the reader coverage area have interfering metal fire breaks, wall structures, or many large metal furniture objects within the area?	2 pts	0 pts	
Will you be tagging laptop computers?	5 pts	0 pts	

Total Score:

Total Score 0 to 2	Total Score 3 to 4	Total Score 5 or Above
FULL RANGE	MEDIUM RANGE	LOW RANGE

**Note:** The Nature of Wireless is completely dependent on the environment in which it is installed. If you have doubts about the environment then you may wish to consider using one of the following three approaches to ensure system operation and costs for your customers facility:

1. Test every reader location and asset tag location using a Reader and tags prior to final system design and pricing.
2. Budget an extra reader or two into your job cost to address any unknowns that may arise during installation.
3. Consider using or increasing overlapping coverage between readers for redundant coverage.



# How to Make A Successful Survey

Follow Steps 1 through 9 to complete a successful survey.

## 1 Sketch Floorplan

Using the area to the right, sketch close to scale the area where the assets are to be protected and monitored.

## 2 Identify Assets to be Protected

Indicate position of all stationary (non-moving) assets. Also note the number of portable (mobile) assets and the area(s) where they will be used.

## 3 Identify Protected Exits/Entries

Indicate the location of exit and entry portals where portable assets need to be monitored and contained.

## 4 Assess Wireless Environment

Using the worksheet on page 1, determine the range (full, medium, or low) for the readers.

## 5 Calculate Portal

Draw two circles around each portal reader location. One circle should be drawn using the portal range radius and the other using the tamper range radius (see *Wireless Range for the Environment* on page 3)

## 6 Calculate Tamper Coverage

Add additional readers ensuring full coverage of stationary assets and entire area where portable assets are to be contained. Draw one circle around each reader using the appropriate tamper range radius.

## 7 Burglar Alarm Integration

If interfacing readers with a burglar alarm system, indicate the position of the burglar alarm control panel.

## 8 Access System Integration

If interfacing readers with an access control system, for each reader indicate position of the access control panel containing an available wiegand port.

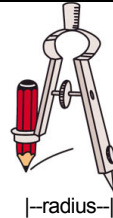
## 8 Power Requirements

Indicate the location of 110 VAC power sources.

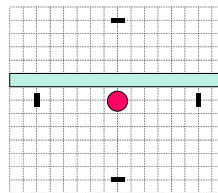
## 9 System Configuration

Use the "System Configuration" worksheet to the right to assemble the list of equipment required for this job.

### HOW TO DRAW READER RANGE



**Using a Compass:** Set the radius according to the wireless range that you have determined for each reader. Place the point of the compass on the reader and draw a circle. The circle represents the effective read range for that reader.



**Counting Squares:** Using the reader as a center point count out the number of squares representing the range you have determined for each reader. The circle that you can draw connecting these points represents the range for that reader.

### System Configuration

Select one of each of the following for every stationary asset to be protected.

Qty	Description	Part No.
	ST-1 Stationary Asset Tags (ST-1)	ST-1

Select one of each of the following for every mobile asset.

Qty	Description	Part No.
	MT-1 Stationary Asset Tags (MT-1)	MT-1

Select the quantity of readers as determined by your site survey.

Qty	Description	Part No.
	AMS-500 Relay Controller/Reader	AMS-500
1	RP-1 RF-Range Programmer	RP-1

### Important Notes:

If desired, each reader can be interfaced to send general tag alarms to a burglar alarm control panel.

This is a standard option available on all readers. If you select this option please make sure to include material and labor for wiring from each reader to the security system.

If desired, each reader can be interfaced to send tag activity to an access control panel.

This is a standard option available on all readers. If using this option make sure to include material and labor for wiring from each reader to an available Wiegand port on the access system.

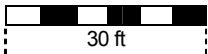
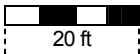

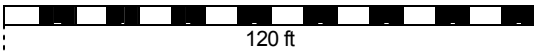
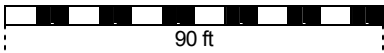
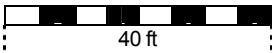
**Power Notes:** Each reader must be provided with power (12 VDC @ 100mA).

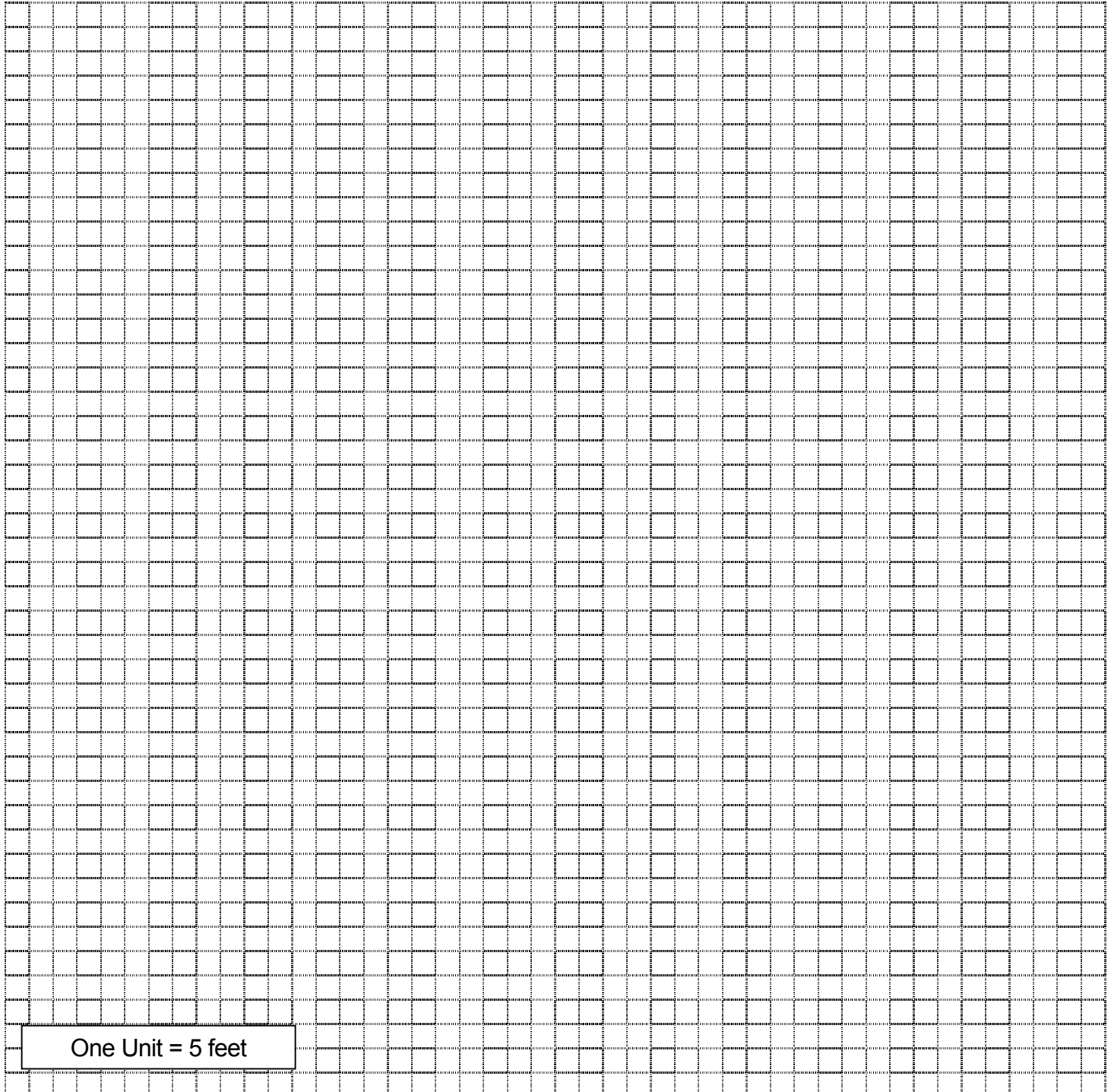
It is recommended that this power source have battery backup ensuring readers will still function and provide protection during a





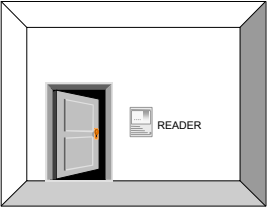
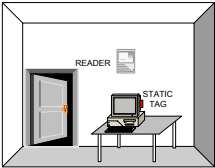

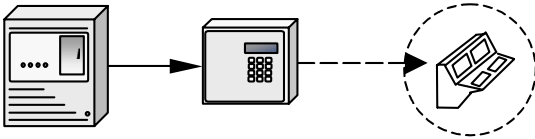
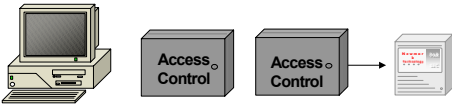
# Select Wireless Range for this Environment

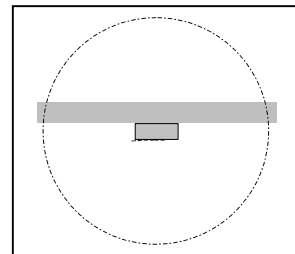
	Full Range	Medium Range	Low Range
<b>Portal Range</b> (Max. Radius)	 Variable from 0 to 30 feet.	 Variable from 0 to 20 feet.	 Variable from 0 to 10 feet.
<b>Tamper Range</b> (Max. Radius)	 120 ft	 90 ft	 40 ft





## Survey Considerations

<b>Mobile Assets:</b>	<p>Portable assets can be protected and contained using the Mobile Asset Tag (MT-1). With proper system design the MT-1 tag can allow free mobility and use within a contained area but will initiate an alarm if an attempt is made to remove the protected object outside of the protected area. For portal monitoring with PT-1's the reader should be located on the side of the door, about 4 feet above the floor. If possible, locate the reader on the side of the door nearest to the path people will walk. The reading range of the reader can be dynamically adjusted to accommodate specific applications using the range adjuster tag.</p>	
<b>Stationary Assets:</b>	<p>Stationary assets can be protected and contained using the Stationary Asset Tag (ST-1). With proper system design the ST-1 Tag will immediately initiate an alarm if the Stationary asset is moved or tampered with. For monitoring unauthorized movement of stationary items protected by SATs, the reader should be mounted approximately 4 feet above the floor and in the center of a convenient wall within the location to optimize coverage. See reader locations and restrictions below:</p>	
<b>People</b>	<p>Human bodies absorb the tag transmissions. Field experience has shown that the optimum location for readers is on the side of doors, about 4 feet above the floor. Again, if possible, the reader should be located on the door nearest to the path people will walk. In some cases it may be necessary to mount more than one reader to provide adequate coverage.</p>	
<b>Burglar Alarm Panel Interface</b>	<p>If desired, each reader provides a built-in relay closure that you can use. It can be used to trigger strobes, sirens or can even interface with an external burglar alarm system. This is a standard option available on all readers. If you select this option, please make sure to include material and labor for wiring from the reader to the security system.</p>	
<b>Access Control Panel Interface</b>	<p>If desired, each reader can interface with an access control system, transmitting activity using a standard 26-bit Wiegand interface. This is a standard option available on all readers. If using this option make sure to include material and labor for wiring from the reader to an available Wiegand port on the access system.</p>	
<b>Important Notes on Wireless:</b>	<p><b>Note:</b> The Nature of Wireless completely depends on the site's environment. If you have doubts about the environment then you may wish to consider using one of the following three approaches to ensure system operation and costs for your customers facility:</p> <ol style="list-style-type: none"> <li>1. Test every reader location and asset tag location using a Reader and tags prior to final system design and pricing.</li> <li>2. Budget an extra reader or two into your job cost to address any unknowns that may arise during installation.</li> <li>3. Consider using or increasing overlapping coverage between readers for redundant coverage.</li> </ol>	
<b>Reader Location and Restrictions</b>	<ol style="list-style-type: none"> <li>1. The presence of steel girders, metal filing cabinets/office furniture, false ceiling supports and aluminum backed plasterboard within the building structure will cause reflections. This will produce reader blind areas and hot spots. If this occurs, it will be necessary to move the reader to an alternative location, which may be in some cases as little as 4 inches in one direction. Radio signals can often travel down corridors, elevator shafts and may even go around corners. Always try and test the reader temporarily in the intended location first to check that it will work properly in that location.</li> <li>2. The readers are designed for indoor use and are not weather-resistant. If a reader is to be mounted outside, it must be housed in an all-plastic suitably rated weather resistant enclosure.</li> <li>3. It is strongly advised that readers should not be mounted close to Video Display Unit (VDU) screens, TV monitors or other sources of radio frequency emission. The minimum recommended distance is 4.5 feet from a 15-inch VDU screen.</li> <li>4. The reader requires a 12V/100mA, DC power supply, which must be CE, UL (or other local authority equivalent) approved. It is recommended that power and signal cables to the reader should be separated from any 3-phase main supply by at least 1m, and from single-phase mains supplies and all other types of cable run by at least 2 feet.</li> </ol>	





# Customer Survey

**Title of this book:** *AMS Readers and RFID Tags  
Instruction Manual*

**My overall rating of this book:**

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Satisfactory
- ☐ Fair
- ☐ Poor

**What I liked most about this book:**

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**What I would change, add, delete, etc. in future editions of this book:**

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[docs@casi-rusco.com](mailto:docs@casi-rusco.com)

